Government eProcurement System

eProcurement System Government of India

Tender Details

Date : 05-Aug-2022 05:00 PM

Print

Basic Details

Organisation Chain	Indian Institute of Technology Ropar		
Tender Reference Number	1695-22		
Tender ID	2022_IITRP_705372_1		
Tender Type	Open Tender	**Form of contract**	EOI
Tender Category	Goods	**No. of Covers**	1
General Technical Evaluation Allowed	No	**ItemWise Technical Evaluation Allowed**	No
Payment Mode	Not Applicable	**Is Multi Currency Allowed For BOQ**	No
Is Multi Currency Allowed For Fee	No	**Allow Two Stage Bidding**	No

Cover Details, No. Of Covers - 1

Cover No	Cover	Document Type	Description
1	Fee/PreQual/Technical/Finance	.pdf	Expression of Interest from reputed Vendors or manufactures for supply of Laboratory Furniture

Tender Fee Details, [Total Fee in ₹ * - 0.00]

Tender Fee in ₹	0.00		
Fee Payable To	Nil	**Fee Payable At**	Nil
Tender Fee Exemption Allowed	No		

EMD Fee Details

EMD Amount in ₹	0.00	**EMD through BG/ST or EMD Exemption Allowed**	No
EMD Fee Type	fixed	**EMD Percentage**	NA
EMD Payable To	Nil	**EMD Payable At**	Nil

Work /Item(s)

Title	Expression of Interest from reputed Vendors or manufactures for supply of Laboratory Furniture				
Work Description	Expression of Interest from reputed Vendors or manufactures for supply of Laboratory Furniture				
Pre Qualification Details	Please refer Tender documents.				
Independent External Monitor/Remarks	NA				
Tender Value in ₹	NA	**Product Category**	Laboratory and scientific equipment	**Sub category**	Laboratory Furniture
Contract Type	Tender	**Bid Validity(Days)**	180	**Period Of Work(Days)**	10
Location	IIT Ropar	**Pincode**	140001	**Pre Bid Meeting Place**	NA
Pre Bid Meeting Address	NA	**Pre Bid Meeting Date**	NA	**Bid Opening Place**	M Visvesvaraya Block
Should Allow NDA Tender	No	**Allow Preferential Bidder**	No		

Critical Dates

Publish Date	05-Aug-2022 05:00 PM	**Bid Opening Date**	11-Aug-2022 03:30 PM
Document Download / Sale Start Date	05-Aug-2022 05:00 PM	**Document Download / Sale End Date**	11-Aug-2022 03:00 PM
Clarification Start Date	05-Aug-2022 05:00 PM	**Clarification End Date**	08-Aug-2022 11:00 AM
Bid Submission Start Date	05-Aug-2022 05:00 PM	**Bid Submission End Date**	11-Aug-2022 03:00 PM

Tender Documents

NIT	S.No	Document Name	Description	Document Size

Document				
				(in KB)
	1	Tendernotice_1.pdf	Expression of Interest from reputed Vendors or manufactures for supply of Laboratory Furniture	8186.89

Work Item Documents	S.No	Document Type	Document Name	Description	Document Size (in KB)
	1	Tender Documents	UPLOAD.pdf	Expression of Interest from reputed Vendors or manufactures for supply of Laboratory Furniture	8172.63

Tender Inviting Authority	
Name	Deputy Registrar
Address	Deputy Registrar Store and Purchase M Visvesvaraya Block Indian Institute of Technology Ropar Rupnagar 140001

भारतीय प्रौद्योगिकी संस्थान रोपड़
INDIAN INSTITUTE OF TECHNOLOGY ROPAR
रूपनगर, पंजाब-140001/ Rupnagar, Punjab-140001
Ph. 01881-231285, 231283, e-mail: purchase@iitrpr.ac.in

File No. 1695-22/CH-HOD/FUR/PS/ Dated 05/08/2022

भारतीय प्रौद्योगिकी संस्थान रोपड़ निम्नलिखित मदों की खरीद की प्रक्रिया में है।

Indian Institute of Technology Ropar is in the process of purchasing following item(s) as per details as given as:-

मद का विवरण **Details of the item**	**Expression of Interest (EOI) from reputed Vendors / manufactures for supply of Laboratory Furniture**
वारंटी **Warranty**	As per tender
वितरणसमय-सारणी **Delivery Schedule**	As per tender

निविदा दस्तावेज केंद्रीय सार्वजनिक खरीद पोर्टल http://eprocure.gov.in/eprocure/app से डाउनलोड़ हो सकते हैं। ई-प्रोक्योरमेंट में पंजीकृत नहीं होने वाले इच्छुक बोलीदाताओं को वेबसाइट http://eprocure.gov.in/eprocure/app के माध्यम से भाग लेने से पहले पंजीकरण करना चाहिए। पोर्टल नामांकन मुफ्त है बोलीदाताओं को सलाह दी जाती है 'आनलाइन बोली के निर्देश' पर दिए गए निर्देशों के माध्यम से जाने की सलाह दी जाए।

Tender Documents may be downloaded from Central Public Procurement Portal http://eprocure.gov.in/eprocure/app.AspiringBidders who have not enrolled / registered in e-procurement shouldenroll / register before participating through the website http://eprocure.gov.in/eprocure/app. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at 'Instructions for online Bid Submission'.

निविदाकर्ता वेबसाइट पर निविदा दस्तावेज का उपयोग कर सकते हैं (एनआईसी साइट में खोज के लिए, कृपया निविदा खोज विकल्प और 'आईआईटी' टाइप करें। उसके बाद, सभी आईआईटी रोपड़ निविदाओं को देखने के लिए "गो" बटन पर क्लिक करें) उपयुक्त निविदा का चयन करें और उन्हें सभी प्रासंगिक सूचनाओं से भरें और वेबसाइट पर http://eprocure.gov.in/eprocure/app पूरा निविदा दस्तावेज अगले पृष्ठ में दिए गए कार्यक्रम के अनुसार आनलाइन जमा करें।

Tenderers can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type 'IIT'. Thereafter, Click on "GO" button to view all IIT Ropar tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website http://eprocure.gov.in/eprocure/appasper the schedule given in the next page.

कोई मैन्युअल बोली स्वीकार नहीं की जाएगी। सभी कोटेशन (दरसूची) (तकनीकी और वित्तीय दोनों को ई-प्रोक्योरमेंट पोर्टल में जमा करनी चाहिए)।

No manual bids will be accepted. All quotation (both Technical and Financial should be submitted in the E-procurement portal).

(कुलसचिव / Registrar)

SCHEDULE		
Name of Organization	Indian Institute of Technology Ropar	
Tender Type (Open/Limited/EOI/Auction/Single/Global)	EOI	
Tender Category (Services/Goods/works)	Goods	
Type/Form of Contract (Work/Supply//Service/Buy/Empanelment)	Goods	
Product Category (Civil Works/Electrical Works/Fleet Management/ Computer Systems/Lab Equipment)	Goods	
Date of Issue/Publishing	05/08/2022 (17:00 Hrs)	
Document Download/Sale Start Date	05/08/2022 (17:00 Hrs)	
Document Download/Sale End Date	11/08/2022 (15:00 Hrs)	
Last Date and Time for Uploading of Bids	11/08/2022 (15:00 Hrs)	
Date and Time of Opening of Technical Bids	11/08/2022 (15:30 Hrs)	
Tender Fee/EMD	Rs.___NIL_____/- (For Tender Fee) Rs.___NIL_____/- (For EMD)	
	(To be paid through RTGS/NEFT. IIT Ropar Revenue Account Bank details are as under:	
	Name of the Bank A/C	: IIT Ropar Revenue Account
	SBI A/C No.	: 37360100716
	Name of the Bank	: State Bank of India
	IFSC Code	: SBIN0013181
	MICR Code	: 140002008
	(This is mandatory that UTR Number is provided in the on- line quotation/bid. (Kindly refer to the UTR Column of the Declaration Sheet at Annexure-II)	
No. of Covers (1/2/3/4)	2	
Bid Validity days (180/120/90/60/30)	180 days (From last date of opening of tender)	
Address for Communication	Deputy Registrar, Store & Purchase, M. Visvesvaraya Building, Indian Institute of Technology Ropar, Rupnagar – 140001	
Contact No.	01881-231283,85	
Email Address	purchase@iitrpr.ac.in, drsp@iitrpr.ac.in	

Registrar

आनलाइन बोली (बिड) के लिए निर्देश / **Instructions for Online Bid Submission:**

व्यय विभाग के निर्देशों के अनुसार, यह निविदा दस्तावेज केंद्रीय सार्वजनिक प्रापण पोर्टल (यूआरएलः URL:http://eprocure.gov.in/eprocure/app) पर प्रकाशित किया गया है। बोलीदाताओं को मान्य डिजीटल हस्ताक्षर प्रमाणपत्र का उपयोग करते हुए सीपीपी पोर्टल पर इलेक्ट्रानिक रुप से अपनी बोलियों की सॉफ्ट प्रतियां जमा करना आवश्यक है। सीपीपी पोर्टल पर पंजीकरण करने के लिए निविदाकर्ताओं की सहायता करने के लिए नीचे दिए गए निर्देशों तात्पर्य है, सीपीपी पोर्टल पर आवश्यकताओं के अनुसार अपनी बोलियां तैयार करें और अपनी बोलियां आनलाइन जमा करें।

As per the directives of Department of Expenditure, this tender document has been published on the Central Public Procurement Portal (URL:http://eprocure.gov.in/eprocure/app). The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

अधिक जानकारी सीपीपी पोर्टल पर आनलाइन बोलियां जमा करने के लिए उपयोगी हो सकती है।

More information useful for submitting online bids on the CPP Portal may be obtained at:

http://eprocure.gov.in/eprocure/app

पंजीकरण / **REGISTRATION**

1) बोलिदाताओं को "नामांकन के लिए यहां क्लिक करें " लिंक पर क्लिक करके सेंट्रल पब्लिक प्रोक्युरमेंट पोर्टल (यूआरएलः :http://eprocure.gov.in/eprocure/app) के ई-प्रोक्योरमेंट मोड्युल पर भर्ती करना आवश्यक है। सीपीपी पोर्टल पर नामांकन निःशुल्क है।

   Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL:http://eprocure.gov.in/eprocure/app) by clicking on the link "Click here to Enroll". Enrolment on the CPP Portal is free of charge.

2) नामांकन प्रक्रिया के भाग के रुप में, बोलीदाताओं को अपने खाते के लिए एक अद्वितीय उपयोगकर्ता नाम चुनना होगा और एक पासवर्ड प्रदान करना होगा।

   As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

3) बोलीदाताओं को सलाह दी जाती है कि पंजीकरण प्रक्रिया के भाग के रुप में अपना वैध ईमेल पता और मोबाइल नंबर पंजीकृत करें। इनका उपयोग सीपीपी पोर्टल से किसी भी संचार के लिप किया जाएगा।

   Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

4) नामांकन पर, बोलीदाताओं को सीसीए इंडिया द्वारा मान्यता प्राप्त किसी प्रमाणन प्राधिकरण द्वारा जारी किए गए अपने मान्य डिजीटल हस्ताक्षर प्रमाण पत्र (कक्षा द्वितीय या कक्षा IIIप्रमाण पत्र के साथ महत्वपूर्ण उपयोग पर हस्ताक्षर करने) की आवश्यकता होगी। (जेसे सीफी/टीसीएस/एनकोड/ई-मुद्रा आदि), इनके प्रोफाइल के साथ

   Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.

5) केवल एक मान्य डीएससी एक बोलीदाता द्वारा पंजीकृत होना चाहिए। कृपया ध्यान दें कि निविदाकर्ता यह सुनिश्चित करने के लिए जिम्मेदार है कि वे अपने डीएससी को दूसरों को उधार नहीं देते हैं जिससे दुरुपयोग हो सकता है।

Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.

6) बोलीदाता फिर अपने यूजर आईडी / पासवर्ड और डीएससी/ईटीकेन के पासवर्ड को दर्ज करके सुरक्षित लॉग-इन के माध्यम से साइट पर लॉग आन करता है।

Bidder then logs in to the site through the secured log-in by entering their userID / password and the password of the DSC / eToken.

निविदा दस्तावेजों के लिए खोजना / SEARCHING FOR TENDER DOCUMENTS/

1) सीपीपी पोर्टल में निर्मित विभिन्न खोज विकल्प है, ताकि बोलीदाओं को कई मापदंड़ों से सक्रिय निविदाएं खोज सकें। इन मापदंड़ों में निविदा आईडी, संगठन का नाम, स्थान, तिथि, मूल्य आदि शामिल हो सकते हैं। निविदाओं के लिए उन्नत खोज का एक विकल्प भी है, जिसमें बोलीदाता कई नामों को जोड़ सकते हैं जैसे संगठन का नाम, अनुबंध का स्थान, स्थान, सीपीपी पोर्टल पर प्रकाशित निविदा की खखोज के लिए तारीख, अन्य कीवर्ड आदि।

There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.

2) बोलीदाताओं ने एक बार निविदाएं चुनी हैं जिसमें वें रुचि रखेत हैं, उसका वे आवश्यक दस्तावेज / निविदा कार्यक्रम डाउनलोड़ कर सकते हैं। ये निविदाएं ''मेरी निविदाएं'' फोल्डर में ले जाई जा सकती हैं। इससे सीपीपी पोर्टल को बोलीदाताओं को एसएमएस / ई-मेल के माध्यम से सूचित किया जा सकता है, यदि निविदा दस्तावेज में कोई शुद्धि जारी की गई है।

Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

3) बोलीदाता को प्रत्येक निविदा को निर्दिष्ट अद्वितीय निविदा आईडी का नोट बनाना चाहिए, अगर वे हेल्पडेस्क से कोई स्पष्टीकरण / सहायता प्राप्त करना चाहते है।

The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

बोली की तैयारी / PREPARATION OF BIDS

1) बोलीदाता को अपनी बोलियां जमा करने से पहले निविदा दस्तावेज पर प्रकाशित किसी भी शुद्धि को ध्यान में रखना चाहिए।

Bidder should take into account any corrigendum published on the tender document before submitting their bids.

2) कृपया बोली के भाग के रुप में जमा किए जाने वाले दस्तावेजों को समझन के लिए निविदा विज्ञापन और निविदा दस्तावेज ध्यान से देखें। कृपया उन अंकों की संख्या पर ध्यान दें जिन में बोली दस्तावेज जमा करना है, दस्तावेजों की संख्या- जिसमें प्रत्येक दस्तावेज के नाम और सामग्री शामिल हैं, जिन्हें प्रस्तुत करने की आवश्यकता है। इनमें से कोई भी विचलन बोली को अस्वीकार कर सकता है।

Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of

documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

3) बोलीदाता, अग्रिम में, निविदा दस्तावेज/ अनुसूची में बताए अनुसार प्रस्तुत करने क लिए बोली दस्तावेज तैयार करना चाहिए और आम तौर पर, वे पीडीएफ/एक्सएलएस/आरएआर/डीडब्ल्यूएफ स्वरुपों में हो सकते हैं। बोली दस्तावेजों को 100 डीपीआई के साथ काले और सफेद विकल्प स्कैन किया जा सकता है।

Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.

4) मानक दस्तावेजों के एक ही सेट को अपलोड़ करने के लिए आवश्यक समय और प्रयास से बचने के लिए जो प्रत्येक बोली के भाग के रुप में जमा करने के लिए आवश्यक हैं, ऐसे मानक दस्तावेज अपलोड करने का प्रावधान (जैसै पैन कार्ड कॉपी, वार्षिक रिपोर्ट, लेखा परीक्षक प्रमाणपत्र आदि) बोलीदाताओं को प्रदान किया गया है। ऐसे दस्तावेजों को अपलोड करने के लिए बोलीकर्ता उनके लिए उपलब्ध ''मेरा स्पेस'' क्षेत्र उपयोग कर सकते हैं। बोली जमा करते समय ये दस्तावेज सीधे ''मेरा स्पेस'' क्षेत्र में जमा किए जा सकते हैं, और उन्हें बार-बार अपलोड करने की आवश्यकता नहीं है इससे बोली जमा प्रक्रिया के लिए आवश्यक समय में कमी आएगी।

To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

बोली जमा करना / **SUBMISSION OF BIDS**

1) बोलीदाता को बोली प्रस्तुति के लिए अच्छी तरह से साइट पर लॉग इन रना चाहिए ताकि वह समय पर बोली अपलोड कर सके अथवा फिर बोली प्रस्तुत करने के समय से पहले। अन्य मुद्दों के कारण किसी भी देरी के लिए बोलीदाता जिम्मेदार होगा।

Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

2) बोलीदाता को निविदा दस्तावेज में दर्शाए अनुसार एक-एक करके आवश्यक बोली दस्तावेजों को डिजीटल हस्ताक्षर और अपलोड करना होगा।

The bidder has to digitally sign the bid document and upload the required bid documents one by one as indicated in the tender document.

3) बोलीदाता को निविदा शुल्क/ ईएमडी को भुगतान के लिए ''आन लाइन'' के रुप में भुगतान विकल्प चुनना होगा और उपकरण का विवरण दर्ज करना होगा। जब भी, ईएमडी / निविदा शुल्क की मांग की जाती है, बोलीदाताओं को टेंडर शुल्क और ईएमडी अलग-अलग आरटीजीएस के माध्यम से आन लाइन पर भुगतान करने की आवश्यकता होती है।

Bidder has to select the payment option as "on-line" to pay the tender fee / EMD as applicable and enter details of the instrument. Whenever, an EMD / Tender fee is sought, bidders need to pay the tender fee and EMD separately on-line through RTGS.

4) एक मानक BoQप्रारुप को सभी बोलीदाताओं द्वारा भरने के लिए निविदा दस्तावेज प्रदान किया गया है। बोलीदाताओं को इस बात का ध्यान रखना चाहिए कि उन्हें आवश्यक प्रारुप में अपनी वित्तीय बोली जमा करनी चाहिए और कोई अन्य प्रारुप स्वीकार्य नहीं है। बोलीकर्ताओं को BoQफाइल को डाउनलोड करने, इसे खोलने और अपने संबंधित वित्तीय उद्धरण और अन्य विवरण (जैसे बोलीदाता का नाम) के साथ सफेद रंगीन (असुरक्षित) कोशिकाओं को पूरा करना आवश्यक है। कोई भी अन्य कक्ष नहीं बदला जाना चाहिए। एक बार विवरण पूरा हो जाने

पर, बोलीदाता को इसे सहेजना होगा और इसे आनलाइन जमा करना होगा, बिना फाइल नाम बदलें। यदि BoQफाइल को बोलीदाता द्वारा संशोधित किया गया है, तो बोली को खारिज कर दिया जाएगा।

A standard BoQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BoQ file, open it and complete the white colored (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.

5) सर्वर का समय (जो बोलीदाताओं के डैशबोर्ड पर प्रदर्शित होता है) बोलीदाताओं द्वारा बोलियों को खोलने के लिए समय सीमा को संदर्भित करने के लिए मानक समय के रुप में माना जाएगा। बोलीदाताओं को खोलना आदि। बोलीदाताओं को बोली प्रस्तुत करने के दौरान इस समय का पालन करना चाहिए।

The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

6) बोलीदाताओं द्वारा प्रस्तुत सभी दस्तावेज पीकेआई एन्क्रिप्शन तकनीकों का उपयोग करके एन्क्रिष्ट किया जाएगा जिससे डेटा की गोपनीयता सुनिश्चित हो सके। दर्ज किए गए डेटा को अनाधिकृत व्यक्तियों द्वारा बोली खोलने के समय तक नहीं देखा जा सकता है। बोलियों की गोपनीयता को सुरक्षित सॉकेट लेयर 128 बिट एन्क्रिप्शन तकनीक का उपयोग कर रखा जाता है। संवेदनशील क्षेत्रों का डेटा संग्रहण एन्क्रिप्शन किया जाता है।

All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.

7) अपलोड किए गए निविदा दस्तावेज केवल अधिकृत बोलीदाता द्वारा निविदा खोलने के बाद ही पठनीय हो सकते हैं।

The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

8) बोलियों के सफल और समय पर जमा होने पर, पोर्टल सभी प्रासंगिक विवरणों के साथ बोली संख्या, बोली जमा करने की तारीख और समय के साथ बोली सफलतापूर्वक जमा करने का संदेश एवं बोली सारांश प्रदर्शित करेगा।

Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

9) कृपया अनुपालन पत्रक की एक पीडीएफ फाइल में सभी प्रासंगिक दस्तावेजों के स्कैन किए गए पीडीएफ को जोड़ दें।

Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

बोलीदाताओं को सहायता / **ASSISTANCE TO BIDDERS**

1) निविदा दस्तावेज से संबंधित कोई भी प्रश्न और इसमें निहित नियमों और शर्तों को निविता आमंत्रण प्राधिकरण को निविदा के लिए अथवा निविदा में वर्णित प्रासंगिक संपर्क व्यक्ति से संबोधित किया जाना चाहिए।

Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

2) आनलाइन बोली प्रस्तुत करने अथवा सामान्य में सीपीपी पोर्टल से संबंधित प्रश्नों की प्रक्रिया से संबंधित कोई भी प्रश्न 24x7सीपीपी पोर्टल हैल्पडेस्क पर निर्देशित किया जा सकता है। हेल्पडेस्क के लिए संपर्क संख्या 1800 233 7315हैं।

Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 1800 233 7315.

बोलीदाताओं के लिए समान्य निर्देश / **General Instructions to the Bidders**

1) निविदाएं पोर्टल http://eprocure.gov.in/eprocure/appके मा ध्यम से आनलाइन प्राप्त होगी। तकनीकी बोलियों में, बोलीदाताओं को सभी दस्तावेजों को पीडीएफ प्रारुप में अपलोड करना होगा।

The tenders will be received online through portal http://eprocure.gov.in/eprocure/app .In the Technical Bids, the bidders are required to upload all the documents in .pdf format.

2) कंपनी के नाम में स्मार्ट कार्ड/ई-टोकन के रुप में मान्य क्लास II/IIIडिजिटल हस्ताक्षर प्रमाणपत्र (डीएससी) के पंजीकरण के लिए एक शर्त है और https://eprocure.gov.in/eprocure/appके माध्यम से बोली प्रस्तु करने की गतिविधियों में भाग ले सकते है। डिजिटल हस्ताक्षर प्रमाणपत्र पर अधिकृत प्रमाणित एजेंसियों से प्राप्त की जा सकती है, जिनमें से जानकारी "डीएससी के बारे में सूचना "लिंक के तहत वेब साइट https://eprocure.gov.in/eprocure/appपर उपलब्ध है।

Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://eprocure.gov.in/eprocure/app. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://eprocure.gov.in/eprocure/app under the link "Information about DSC".

3) निविदाकर्ता को सलाह दी जाती है कि https://eprocure.gov.in/eprocure/app. पर ई-प्रोक्योरमेंट के लिए सेंट्रल पब्लिक प्रौक्योरमेंट पोर्टल माध्यम से आनलाइन बोली के जमा करते समय निविदाकार हेतु निर्देशों में उपलब्ध निर्देशों का अनुगमन करें।

Tenderer are advised to follow the instructions provided in the 'Instructions to the Tenderer the e-submission of the bids online through the Central Public Procurement Portal for e Procurement at https://eprocure.gov.in/eprocure/app.

भारतीय प्रौद्योगिकी संस्थान रोपड़
INDIAN INSTITUTE OF TECHNOLOGY ROPAR
रूपनगर, पंजाब-140001/ Rupnagar, Punjab-140001
Ph. 01881-231285, 231283, e-mail: purchase@iitrpr.ac.in

No. 1695-22/CH-HOD/FUR/PS/ Dated: 05/08/2022

INVITATION FOR EXPRESSION OF INTEREST

Indian Institute of Technology Ropar invites Expression of Interest (EOI) from reputed Vendors / manufactures for supply of Laboratory Furniture.

The EOI document containing the details of qualification criteria, submission requirement, brief objective & scope of work and evaluation criteria etc. can be downloaded from the institute website www.iitrpr.ac.in & Central Public Procurement Portal http://eprocure.gov.in/eprocure/app.

Last date for submission of EOI is **11.08.2022** upto 15:00 hrs.

Applicants meeting the qualification criteria will only be invited for pre-bid meeting**.** Draft specifications are enclosed as **Annexure "A".** The applicants are requested to study the draft specifications and come prepared at the time of pre bid meeting. **The detailed tender document with complete specification for Technical Bid and Price Bid will be subsequently issued to the qualified parties in pre-bid qualification.**

Note: Director, IIT Ropar reserves the right to cancel this request for EoI and / or invite a fresh with or without amendments, without liability or any obligation for such request for EoI and without assigning any reason. Information provided at this stage is indicative and IIT Ropar reserves the right to amend/add further details in the EoI.

(Registrar)

भारतीय प्रौद्योगिकी संस्थान रोपड़
INDIAN INSTITUTE OF TECHNOLOGY ROPAR
रूपनगर, पंजाब-140001/ Rupnagar, Punjab-140001
Ph. 01881-231285, 231283, e-mail: purchase@iitrpr.ac.in

2. LETTEROF INVITATION

Dear Sir / Madam,

Indian Institute of Technology Ropar invites Expression of Interest (EOI) from reputed vendors / manufactures for supply and installation of Laboratory Furniture.

The EOI Document containing the details of qualification criteria, submission requirement, brief objective & scope of work and method of evaluation etc. is enclosed.

The EOI Document is also available on the IIT Ropar website. www.iitrpr.ac.in

All queries will be discussed at the time of Pre-Bid meeting. No queries before pre bid meeting will be entertained.

S. No	Critical Dates	Date	Time
1.	EOI Submission Date	11.08.2022	15:00 hrs
2.	EOI Opening Date	11.08.2022	15:30 hrs
3.	Tentative Invitation to eligible bidders in prequalification Pre-bid Meeting	18.08.2022	11:00 hrs
4.	Tentative date of Pre-bid meeting	25.08.2022	11:00 hrs

Yours faithfully,

(**Registrar)**

Encl.: EOI Document.

3 Background:

The Department of Chemistry, Indian Institute of Technology Ropar has constructed a new building. These laboratories have to be furnished before occupancy. In this regard, we are inviting quotations for laboratory furniture. Laboratory furniture must meet the test specifications at par with international standards. Requisite test and safety certificates must be provided along with the technical bid. In addition to this, gas line plumbing need to be provided from the place where gas cylinders are placed in each laboratory. The main furniture items are as follows:

i) Laboratory Fume Hood
ii) Laboratory Furniture
iii) Exhaust System
iv) Electrical system
v) Gas Distribution System and Accessories

4. Venue & Deadline for submission of proposal

Proposal, in its complete form in all respects as specified in the EOI, must be submitted online on Central Public Procurement Portal http://eprocure.gov.in/eprocure/app. In exceptional circumstances and at its discretion, IIT Ropar may extend the dead line for submission of proposals by issuing an amendment to be made available on the Central Public Procurement Portal & IIT Ropar website, in which case all rights and obligations of IIT Ropar and the bidders previously subject to the original dead line will thereafter be subject to the dead line as extended.

5.0 INSTRUCTIONS TO VENDORS

5.1 EOI Documents have been hosted on the IIT Ropar website www.iitrpr.ac.in & Central Public Procurement Portal http://eprocure.gov.in/eprocure/app may be downloaded from their website.

The applicants are expected to examine all instructions, forms, terms and other details in the EOI document carefully. Failure to furnish complete information as mentioned in the EOI document or submission of a proposal not substantially responsive to the EOI documents in every

respect will be at the applicant's risk and may result in rejection of the proposal.

6. Qualification Criteria:

Following will be the minimum pre-qualification criteria. Responses not meeting the minimum pre-qualification criteria will be rejected and will not be called for pre-bid meeting.

Sl. No.	FIRST PRE-QUALIFICATION CRITERIA:			
	Part A - Mandatory:	***Whether complied or not (specify Yes/No)**	**Scores**	
			Maximum	**Achieved**
			Qualified	Not Qualified
1	The bidder should be registered in India and manufacturing plant should be 100% subsidiary in India of parent company if any			
2	The bidder in India or abroad should have a well-established (their own) in-house manufacturing unit for the steel lab furniture and fume hood, quality management system as per International standards providing the products and services on the continuous basis at least for last 10 years.			
	Part B - Marking:		**Maximum Marks**	
3	One similar completed work costing not less than Rs.10.0 Crores for Centrally Funded Technical Institutes (CFTI, which includes IITs, IISERs, IIMs, NITs, IIITs, NITTTRs, IISc and IIEST), CSIR Institutes, Central Universities and/or DAE Institutes (NISER, TIFR) where they have completed the similar works including fume hoods, laboratory furniture & Exhaust System Work with VAV controls in centrally air-conditioned Chemistry laboratories or execution of similar work in any reputed institutions in the last 7 year **Or**		15	
	Two similar completed work costing not less than Rs.5.0 Crores for Centrally Funded Technical Institutes (CFTI, which includes IITs, IISERs, IIMs, NITs, IIITs, NITTTRs, IISc and IIEST), Central Universities and/or DAE Institutes (NISER, TIFR) where they have completed the similar works including fume hoods, Exhaust System Work with VAV controls & laboratory furniture in centrally air-conditioned Chemistry laboratories or execution of similar work in any reputed institutions. **Or**			
	Three similar completed work costing not less than Rs.3.0 Crores for Centrally Funded Technical Institutes (CFTI, which includes IITs, IISERs, IIMs, NITs, IIITs, NITTTRs, IISc and IIEST), Central Universities and/or DAE Institutes (NISER, TIFR) where they have completed the similar works including fume hoods, laboratory furniture & Exhaust System Work with VAV controls in centrally air-conditioned Chemistry laboratories or execution of similar work in any reputed institutions			
4	Should have had an average annual financial turnover of Rs. 30 Crore in respect of Fume hood & Exhaust System, laboratory furniture during the last three years ending 31st March 2022 (Group turnover of any other business other than Fume hood, Exhaust System, Lab work Benches, Gas & Utility Distribution System, Electrical Works and Lab Furniture can't be included). Within this, should have an average turnover of Rs. 1.2 Crore exclusively for Fume hood & Exhaust System for last 3 years or 1.0 Crore for last 5 years. Latest audited financial statement with CA Certificate stating the turnover in the business of Fume hood, Exhaust System, Lab work Benches, Gas & Utility Distribution System, Electrical Works and Lab Furniture may be submitted.		15	

5	The bidder or its parent company in India or abroad should have a well-established (their own) in-house manufacturing unit for the steel lab furniture and fume hood, quality management system as per International standards providing the products and services on the continuous basis at least for the last 10 years. The bidder or its parent company in India or abroad should possess the current/valid approval for such items manufacturing facility by a statutory certifying authority, like factory inspector etc.		10	
6	The bidder / parent company should be an Official member with SEFA (Scientific Equipment's Furniture Association) on a continuous basis at least for the past 5 yrs. "Laboratory Furniture Certificate of Performance" should be submitted		5	
7	The bidder / parent company should possess the key professional staff, at least one, in his organization with good knowledge of codes and standards like SEFA / SHA/ASHRAE 110 and NFPA 45. Such professionals should have a valid membership of SEFA at present and in addition membership of any of the international governing standards. (Bidder to submit necessary documentary proof like his employment letter, recent salary paid proof with P/F deposited challan & his form 16)		10	
8	The bidder should submit 3 certificates, witnessed & certified by the customer, of ASHRAE test of the Fume Hoods having been conducted on project site		20	
9	The range of furniture offered by the bidder should have compliance certificate through SEFA authorized third party testing centres, for all the parameters of SEFA-8. Detailed documentary evidence for the same (Certificate should be within 4 years from the date of tender) must be included in the technical bid. The testing parameters should adhere as per the SEFA 8-M 5th editions Standard Guideline. (The bidder should give a declaration that there has been no change in the product engineering design from the date of the Certificate).		5	
10	Considering the Size of the Project, the Bidder should have solvency of minimum Rs.10 Crore. The Bidder shall produce the Solvency Certificate for Rs.10 Crore from the Bank,		5	
11	The bidder expected to have in-house SERVICE TEAM who would have executed at least 2 Annual Maintenance contract for financial year 2020-21 of minimum value Rs.10 Lakhs and must produce service orders for the Fume Hoods, Lab furniture, Exhaust System along with appreciation letters & completion certificates of such contracts and minimum 3 Running Contracts of value more than Rs.15 Lakhs for current financial year 2021-22 and must produce Service orders and confirmation letter from the customer		15	
	TOTAL		**100**	

Prequalification / Short listing Criteria:

1) Compliance is mandatory in case of Part-A otherwise it will result in disqualification.
2) The bidders qualifying in all the parameters with 100% compliance under Part- B will be shortlisted.
3) In case of requirement, the aggregate marks required may be relaxed by 20% and the minimum required marks would be restricted at 80%.
4) Compliance is mandatory in case of First qualification, otherwise it will result in disqualification.
5) The parties who will qualify in the first pre-qualification only will be considered for second prequalification.
6) For support & verification of above criteria necessary self-attested document must be attached with each point.
7) Technically qualified Bidder should Show a mock up at Site. Date will be informed subsequently.

Following items for Mock up- a) 6ft Fume hood, b) 8ft L Island table with Reagent Rack, sockets, Valves, sink c) Exhaust Blower, d) Chemical cabinet

SECOND PRE-QUALIFICATION CRITERIA

- The bidder should provide following details for their work experience. The bidder should provide name address of only those organizations where they have completed the similar works including fume hoods, laboratory furniture & Exhaust System Work
- The committee designated by Director IIT Ropar may inspect these organization to assess the quality of work, infrastructure & obtain feedback from the users.
- The committee will submit its report on the basis of its visit or otherwise, after due evaluation based on the documents and/or physical inspection of the site of the parties

Sl. No.	Name of the Organisation with complete address with Ph. No./Fax No. & E-Mail address	Name of the concerned Authority with Post & Communication details.	Value of the work done

Parties who will qualify in second pre-qualification will only be considered for technical evaluation.

MAKE LIST

APPROVED MAKE LIST FOR FUMEHOOD

Sr No	Item	
1	Fumehood	Waldner/ Kotterman/ Kewaunee/ Godrej/ Labguard/ Citizen
2	Fume Hood Valves	Water saver/ Broen
3	Air flow Monitor	TEL, UK/ Phoenix
4	Work Surface - Fume Hood	Granite
5	Fumehood Base Cabinet	Waldner/ Kotterman/ Kewaunee/ Godrej/ Labguard/ Citizen
6	PP Sink	Premier Polymer/ Equivalent
7	Electrical / Data / Voice Sockets	Northwest/ MK/ Legrand

Steel Sheet: Jindal/TATA/SAIL

APPROVED MAKE LIST FOR FURNITURE

Sr No	Item	
1	Furniture	Waldner/ Kotterman/ Kewaunee/ Godrej/ Labguard/ Citizen
2	Work Surface - Benches	18/19mm Thick Jet Black Granite
3	PP Sink	Premier Polymer/ Equivalent
4	Water Tap	Water saver/ Broen
5	Bench Mounted Valves	Water saver/ Broen
6	Spot Extractor	Fumex / Alsident
7	Eye Wash	Guardian / Broen
8	Safety Station	Guardian/ Broen
9	Electrical / Data / Voice Sockets	Northwest/ MK/ Legrand

FM approved storage cabinets for flammables: Justrite/Köttermann/Kewaunee

APPROVED MAKE LIST FOR EXHAUST SYSTEM

Sr No	Item	
1	PP moulded exhaust Blower	Colasit / Plastifer
2	Blower Motor	ABB / CG
3	VFD	Delta / ABB
4	Face velocity and VAV control	Tel/Schneider/Phoenix
	Actuator	Schneider/Siemens

APPROVED MAKE LIST FOR GAS DISTRIBUTION SYSTEM

Sr No	Item	
1	Air Compressor and Accessories	Ingersoll Rand / Atlas Copco / Kaeser / Hitachi
2	Vacuum pump and Accessories	Vacuubrand/ KNF/ Ingersoll Rand
3	Pressure regulators	TESCOM / Spectron / GCE / Rotarex
4	Use point valves and regulator	TESCOM / Spectron / GCE / Rotarex
5	SS316 & SS304 Tubes	Modern Tubes/Sumitomo/Suraj/Venus
6	SS316/ SS-304 fittings	DOMNICK/HUNTER/BEKO/PARKER
7	Isolation valves for tubes (SS316L)	DOMNICK/HUNTER/BEKO/PARKER
8	Use point valves (SS316L	DOMNICK/HUNTER/BEKO/PARKER
9	Pressure gauges	Wika / Baumer
10	Tube / Pipe Supports	JIKA / Hi-Tech
11	Purification Panels	Chem Labs/EX-LOK/SG-LOK/P-LOK
12	Gas Changeover panels	GCE Druva/ SMT Rotarex
13	Flame Gas Detection System	Honeywell/ Oldham
14	Flame Arrestor	Messer/GCE Druva/Rotarex

TECHNICAL SPECIFICATIONS FOR LABORATORY FUME HOOD, FURNITURE, EXHAUST SYSTEM & GAS DISTRIBUTION SYSTEM

INDEX

CHAPTER-01

FUME HOOD SPECIFICATIONS

DESCRIPTION OF THE WORK

1.00 SUMMARY AND SCOPE

A. Section Includes:

Furnish and install all fume hoods, work tops, and under structures as shown in drawings.

B. Accessorization:

Furnish and deliver all service outlets, accessory fittings, electrical receptacles and switches as listed in these specifications, equipment schedules or as shown in drawings. Fittings attached to the fume hood superstructure must be mounted at the factory.

C. Remove all debris, dirt and rubbish accumulated as a result of the installation of the fume hoods to an on-site container provided by others, leaving the premises clean and orderly.

1.02 STANDARD FUME HOOD PERFORMANCE REQUIREMENTS

A. Fume hoods must be of complete airfoil design to ensure maximum operating efficiency. Foil sections at the front fascia of the hood must minimize eddying of air currents at the hood face and the rear baffle system must minimize turbulence in the upper portion of the hood interior.

B. **Standard Fume Hood Type**:

The fume hoods must be of the **variable air volume type** in which the exhaust air volume varies proportionally to the hood opening when used with a hood face velocity controller system.

2.01 MATERIALS AND CONSTRUCTION

A. **Fume Hood Superstructure Frame:**

A free-standing rigid frame structure of steel must be provided to support the exterior panels, interior liner and baffle panels. To allow for maintenance and replacements, the interior liner panels must be removable without disassembly of the frame structure and outer steel panels. Likewise, the exterior steel panels must be removable without the disassembly of the frame structure and inner liner panels. Fume hoods that require disassembly of the superstructure for liner replacement will not be acceptable.

B. **Fume Hood Interior Walls:**

Double wall ends, not more than 4" wide, must be provided to maximize interior working area. The area between the double wall ends must be closed to house the remote control valves. The front vertical fascia section must have a full 135 degree 1" radius (or better) at the front leading edge to provide a streamlined section and ensure smooth and even flow of air into the hood. The vertical fascias must contain the required service controls, electrical switches and receptacles. The hood interior end panels and sash track must be flush with the fascia to prevent eddy currents and back flow of air.

C. **Fume Hood Airfoil:**

A streamlined airfoil must be integrated at the bottom of the hood opening on bench and distillation hoods. This foil must provide a nominal 1" open space between the foil and the top front edge of the work surface to direct an air stream across the work surface to prevent back flow of air. The airfoil must extend back under the sash, so that the sash does not close the 1" opening. The foil must be removable to allow large equipment into the hood. The foil must be of 12-gauge steel to resist denting and flexing. PVC cover must be used as an additional protective cover on the metal deflector vane.

D. **Fume Hood Top Panel:**

Restricted Bypass Configuration:

The top front panel must be of the same material as the exterior fascia. It must have an integral grille stamped into the upper portion.

E. **Fume Hood Baffles:**

A stable, non-adjustable baffle with three fixed horizontal slots must be provided to aid in distributing the flow of air into and through the hood. The baffle must be spaced approximately 2" from the back liner. The baffle must be approximately 18-12" and removable for cleaning.

F. **Fume Hood Duct Collar:**

A polyethylene or equivalent bell-mouthed duct collar must be located in the top of the hood plenum chamber. Coated common steel duct collars will not be acceptable.

G. **Fume Hood Lighting:**

Energy-efficient, LED light with light fixtures of the size given below must be provided in the hood roof. Illumination at 13" above the work surface must be at least 500 lux.

The light fixtures must be isolated from the hood interior by a 1/4" thick tempered glass panel sealed from the hood cavity. Fixtures must be UL labeled.

H. **Fume Hood Sash:**

Combination Sash:

A combination sash must be provided. The sash must have horizontal sliding glass panels in a vertical rising steel frame. The bottom of the sash frame must have a full length metal handle. The sash track must be a neutral colored polyvinyl chloride set flush with the interior liner panels to minimize turbulence. The sash must be counterbalanced with a single weight to prevent tilting and binding during the operation. The glass panels must be 1/4" laminated safety float glass mounted on metal rollers in an aluminum track.

I. **Fume Hood Plumbing Service:**

Utility services must consist of remote control valves located within the end panels, controlled by extension rods projecting through the control panels of the hood, with color coded plastic handles. Interior fitting for gases and water must be nylon panel flanges, angle serrated hose connectors, and color coded. Interior fittings for distilled water must consist of bronze tin lined, white color-coded, panel flange and angle serrated hose connector. Interior fittings for steam must consist of cast bronze flange and angle serrated hose connector with a chemical resistant metallic bronze finish. Water goosenecks must be cast bronze with a chemical resistant metallic bronze finish. All plumbing fittings must be factory installed and piped between the valve and the outlet. Inlet piping must be of 3/8" OD SS304 and must have a single-point connection for each valve provided and carried to a point 150 mm above the fume hood roof. Points of final service connection by other trades must be at the stub provided by the fume hood manufacturer.

J. **Fume Hood Electrical Service:**

The hood superstructure must be pre-wired and contain wire gauge, connections, fixtures and wire color coding. Wiring electrical services must

consist of two duplex receptacles and a light switch. Sockets of 230 Volt AC, and 3-wire polarized grounded with ground fault interruption. The receptacles must be of specification grade, side wired only, to ensure a positive connection. Wiring must terminate in one 6” x 6” x 4” service junction box located on the fume hood roof, which can be connected to a single phase power supply.

K. **Lattice Rod Assemblies:**

Epoxy rods of 1/2” dia must be clamped with the Epoxy clamps to form a lattice arrangement to hold the test samples and rotors within the fume hood.

L. **Hood Work Surface: Black Granite:**

Hood work surface must 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 work surface must be provided. The work surface and cup sink must be of the same colour.

M. **Cup Sinks:**

Molded polypropylene cup drains must be molded in one-piece of acid-resistant polypropylene. They must have an integral mounting flange and an integral tailpiece with a 1-1/2" I.P.S. male straight thread outlet.

N. **Access Opening:**

The interior end liner panels must be furnished with an opening that provides access to the service piping and valves to facilitate installation and maintenance. The openings must be covered with a removable panel with rounded corners. Panels that require tools to remove will not be acceptable. The panel must provide an overlapping seal on all edges.

O. **Fume Hood Finish:**

After the component parts have been completely welded together and before finishing, they must 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 must 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 must 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 must be dried and all steel surfaces must be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components must be individually painted, ensuring that no area is vulnerable to corrosion due to the lack of paint coverage. The coating must then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

P. The completed finish system in standard colors must meet the performance test requirements specified under PERFORMANCE TEST RESULTS.

Q. **Performance Test Results (Chemical Spot Tests):**

a. Testing Procedure:

Chemical spot tests for non-volatile chemicals must be made by applying 5 drops of each reagent to the surface to be tested and covering a 1-1/4" of dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals must be tested by placing a cotton ball saturated with the reagent on the surface to be tested and covering with an inverted 2-ounce wide mouth bottle to retard evaporation. All spot tests must be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 25° ± 1° F (25 ± 1.5° C).. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents must 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 must 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 must be scrubbed with a damp paper towel and dried with paper towels.

b. Test Evaluation:
Evaluation will be based on the following rating system.

Level 0 – No detectable change.
Level 1 – Change in color or gloss.
Level 2 – Surface etching or severe staining.
Level 3 – Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

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

c. 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.	Dichloroacetic Acid	Cotton ball & bottle
16.	Dimethylformamide	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 Chloride	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

*Concentrations are indicated in percentage by weight.

R. **Performance Test Results** (Heat Resistance):

Hot water (190° F - 205° F or 89° C- 96° C) must be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which must be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish must show no visible effect from the hot water treatment.

S. **Performance Test Results** (Impact Resistance):

A one-pound ball (approximately 2" diameter) must be dropped from a distance of 12 inches onto the finished surface of the steel panel supported underneath by a solid surface. There must be no evidence of cracks in the finish due to impact upon close eye-ball examination.

T. **Performance Test Results** (Bending Test):

An 18 gauge steel strip, finished as specified, when bent 180^{O} over a 1/2" diameter mandrel, must show no peeling or flaking off of the finish.

U. **Performance Test Results** (Adhesion):

Ninety or more squares of the test sample must remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart must be cut with a razor blade to intersect at right angles thus forming a grid of 100 squares. The

cuts must be made just deep enough to go through the coating, but not into the sample. They must then be brushed lightly with a soft brush and examined under 100 foot-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".

V. **Performance Test Results** (Hardness):

The test sample must 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 must be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness must be pushed across the paint film in a chisel-like manner until one is found that cuts or scratches 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.

W. **Fume Hood Liners:**

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

Liner Tests – Chemical Spot Tests – 24 Hours

1. Chemical spot tests must be made by applying 10 drops (approximately 1/2 cc) of each reagent to the surface to be tested. Each reagent (except those marked **) must be covered with a 1-1/2" diameter watch glass, convex side down to confine the reagent. Spot tests of volatile solvents marked ** must be tested as follows: A 1" or larger ball of cotton must be saturated with the solvent and placed on the surfaces to be tested. The cotton ball must then be covered by an inverted 2-ounce, wide mouth bottle to retard evaporation. All spot tests must 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. $\pm$ 3 degrees F (25 $\pm$ 1.5 ^{o} C).

2. At the end of the test period, the reagents must 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 must be cleaned with a cotton swab soaked in the solvent used on the test area. Spots where dyes have dried must be cleaned with a cotton swab soaked in alcohol to remove the surface dye. The test panel must then be evaluated immediately after drying.

3. Ratings/Legend:

1 – Epoxy Resin
2 – Glass Reinforced Polyester
3 – Stainless Steel 304
4 – Stainless Steel 316
5 – Reinforced Phenolic Resin

A = No effect
B = Change in gloss or colour
C = Etching or severe staining
D = Swelling, pitting, or severe etching

RESULTS:	1	2	3	4	5
1. Acetic Acid 98%	A	B	B	B	A
2. Acetone **	A	D	A	A	A
3. Acid Dichromate	A	A	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	A	A	A	A
9. Chloroform **	A	D	A	A	A
10. Chromic Acid 60%	B	B	C	C	A
11. Cresol	A	A	A	A	A
12. Dichloroacetic Acid	A	D	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	A	A	A	A
20. Furfural **	B	B	A	A	C
21. Gasoline **	A	A	A	A	A
22. Hydrochloric Acid 37%	A	A	B	B	A
23. Hydrofluoric Acid 48%	B	D	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	D	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	A	B	A	A
32. Nitric Acid 70%	B	D	B	A	A
33. Phenol ** 85%	A	C	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	D	A	A	A
37. Sodium Hydroxide 20%	A	D	A	A	A
38. Sodium Hydroxide 10%	A	D	A	A	A
39. Sodium Hydroxide Flake	A	B	A	A	A
40. Sodium Sulfide	A	B	A	A	A
41. Sulfuric Acid 77%	A	A	C	A	A
42. Sulfuric Acid 96%	C	D	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 that these solvents must be tested with cotton and jar method

X. **Fume Hood Base Cabinets**

Normal Base cabinet:

Base units under hoods must be fabricated of cold rolled prime grade roller leveled furniture steel. Steel used in the construction must 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 must match that of the fume hood outer panels.

2.0 MATERIAL OF CONSTRUCTION

Fume Hood superstructure Powder coated 60 micron or better	: 18 gauge CRC Sheets, Electrode position
Table top	: 32 mm Jet Black Granite Table top
Electrical sockets	
Gas fixtures	: PVC
Gas piping	: Brass Lacquer Coated
Vacuum Fixtures	: SS304
	: Brass Lacquer Coated
Vacuum Piping	
Water fixtures	: Copper/SS/PP
Water Piping	: Brass Lacquer Coated
Electrical cables	: 3/8" OD SS304
	: Copper wire with PVC Sheet

3.0 APPLICABLE CODES & STANDARDS:

ASHRAE Standard 110.1995 or recent - Method of Testing Performance of Laboratory Fume Hoods
NSF STD#49 - Photometric Method of Testing
NIH03-112C - National Institute of Health Specifications
UL - Underwriters Laboratories
ASTM D552 - Bending Test
NFPA-45 - National Fire Protection Association

CHAPTER-02

LAB FURNITURE SPECIFICATIONS

DESCRIPTION OF WORK

1.00 SUMMARY AND SCOPE

A. Section Includes:

1. Furnish all cabinets and casework, including tops, ledges, supporting structures. Include delivery to the building, set in place, level, and scribe to walls and floors as required. Furnish and install all filler panels, knee space panels and scribes as shown on drawings.

2. Furnish and deliver all utility service outlet accessory fittings, electrical receptacles and switches identified on drawings as mounted on the laboratory furniture. All plumbing and electrical fittings, not pre-installed in equipment, will be packaged separately and properly marked for the delivery to the appropriate contractor.

3. Furnish and deliver, for installation by the mechanical contractor, all laboratory sinks, cup sinks or drains, drain troughs, overflows and sink outlets with integral tailpieces, which occur above the floor, and where these items are part of the equipment. All tailpieces must be furnished with the couplings required to connect them to the drain piping system.

4. Furnish service strip supports where specified, and set in place service tunnels, service turrets, supporting structures and reagent racks of the type shown on the drawings.

5. Removal of all debris, dirt and garbage accumulated as a result of the installation of the laboratory furniture to an onsite container provided by others, leaving the premises and room clean and orderly.

1.01 BASIS OF WORK

Laboratory Furniture as the standard of construction for steel laboratory furniture. The construction standards of this product line must provide the basis for quality and functional installation.

2.00 CABINET STYLE:

Steel:
Cabinet bodies, drawer bodies, shelves, drawer heads and door assemblies must be fabricated from Cold Rolled Steel.

2.01 DRAWER AND DOOR STYLE:

The outer drawer and door head must have a channel formation on all four sides to eliminate sharp raw edges of steel and the top front corners must be welded and ground smooth. Drawer and door, when closed, must be recessed to create an overall flush face, and with optional pull.

2.02 MATERIALS

General Requirements:

It is the intent of this specification to provide a high quality steel cabinet specifically designed for the laboratory environment.

A. **Steel:**

Cold Rolled Steel.

Cold rolled sheet steel must be prime grade 12, 14, 16, 18 and 20 gauge U.S. Standard; roller leveled, and must be treated at the mill to be free of scale, ragged edges, deep scratches or other injurious effects.

B. **Glass:**

Glass used for framed sliding and swinging doors must be 1/8" float glass. Glass used for unframed sliding doors, must be 1/4" float glass. Glass used in fume hoods or other hazardous locations must be 7/32" laminated safety float glass, except the glass shielding fluorescent lights in fume hoods must be tempered glass to provide greater resistance to heat and impact.

C. **Drawer and Door Pulls:**

Pull must be of modern design, offering a comfortable handgrip, and be securely fastened to doors and drawers with screws. All pulls must be satin finish aluminum, with a clear lacquer finish. Two pulls over 24" long are required on all drawers. Use of plastic pulls (molded or extruded), or a design not compatible for usage by the handicapped will not be accepted.

D. **Hinges:**

Hinges must be made of Type 304 stainless steel .089” thick, 2-1/2” high, with brushed satin finish, and must be the institutional type with a five-knuckle bullet-type barrel. Hinges must be attached to both doors and cases with two screws through each leaf. Welding of hinges to doors or cases will not be accepted. Doors under 36" in height must

be hung on one pair of hinges, and doors over 36" high must be hung on 3 hinges.

E. **Positive Catch:**

A two-piece heavy-duty **cam action** positive catch must be provided on all base cupboard doors and positioned near the pivoting edge of the door to provide a clean unobstructed opening. Main body of the catch must be confined within an integral cabinet divider rail, while the latching post must be mounted on the hinge side of the door. Nylon roller type catches will not be accepted.

F. **Elbow Catches:**

Elbow catches and strike plates must be used on left hand doors of double door cases where locks are used. The elbow catches must be made of burnished cast aluminum, with bright brass finish.

G. **Shelf Adjustment Clips:**

Shelf adjustment clips must be nickel-plated steel.

H. **Base Molding:**

Base Molding must be provided on all table legs, unless otherwise specified, to conceal leveling devices. Shoes must be a pliable, black vinyl material. Corner clip must be provided to hold the base molding firmly. Use of a leg shoe, which does not conceal leveling devices, will not be accepted.

I. **Sink Supports:**

Sink supports must be the hanger type, suspended from top front and top rear horizontal rails of sink cabinet by four 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and rear top rails. Two 3/4" x 1-2/2" x 12 gauge channels must be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. When sink capacity exceeds 3,750 cu. in., the sink supports must be suspended from full-length reinforcements welded to the two end rails. Two 1" x 2" x 10 gauge full-length channels must be hung from the four 1/4" dia. rods to provide an alternate sink cradle.

2.03 CONSTRUCTION

A. Steel Base Cabinet Construction:

1. General:

a. The steel furniture must be of modern design and constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry. First class quality casework must be ensured by the use of proper machinery, tools, dies, fixtures and skilled workmanship to meet the intended quality and quantity of the project.

b. All cabinet bodies must be flush front construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in the same plane without overlap. Exterior corners must be spot welded with heavy back up reinforcement at exterior corners. All face joints must be welded and ground smooth to provide a continuous flat plane.

c. Each cabinet must be complete so that units can be relocated at any time without requiring field application of finished ends or other such parts.

d. Case openings must be rabbeted on all four sides for both hinged and sliding doors to provide a dust resistant case.

e. All cabinets must have a cleanable smooth interior. Bottom edges must be formed down on sides and back to create easily cleanable corners with no burrs or sharp edges, and front edges must be offset to create a seamless drawer and door recess rabbet for dust stop.

2. Steel Gauges:

Gauges of steel used in construction of cases must be 18 gauge, except as follows:

a. Corner gussets for leveling bolts and apron corner braces, 12 gauge.
b. Case and drawer suspension channels, 14 gauge.

c. Top and intermediate front horizontal rails, table aprons, hinge reinforcements, and reinforcement gussets, 16 gauge.

d. Drawer assemblies, door assemblies, bottom, bottom back rail, toe space rail, and adjustable shelves, 20 gauge.

3. Base Cabinets:

a. End uprights must be formed into not less than a channel formation at top, bottom, back and front. The front edge must further offset to form a strike for doors and drawers, and must be perforated for the support of drawer channels, intermediate rails and hinge screws. An upright filler must be screwed in place in all cupboard units to close the back of the channel at the front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning. The upright filler must be perforated with shelf adjustment holes at not more than 2" centers painted prior to assembly. The inside front of the upright must be further reinforced with a full height 16 gauge hinge reinforcement angle.

b. Top horizontal rail on base cabinets must interlock within the flange at the top of end panels for strength, but must flush as the face of the unit. Top rail must have a full width rabbet for swinging doors and drawers. Reinforcements must be provided at all front corners for additional welded strength between vertical and horizontal case members.

c. Intermediate rails must be provided between doors and drawers, but not between the drawers unless necessary for locks in drawers. When required, intermediate rails must be recessed behind doors and drawer fronts, and designed so that security panels can be added as required.

d. Intermediate vertical uprights must be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type must be used at the center of double door cupboard units.

e. Cabinet bottom, and bottom rail must be formed of one piece of steel except in corner units and must be formed down on sides and back to create a square edge transition welded to cabinet end panels, and the front edge must be offset to create a seamless drawer and door recess rabbet for dust stop.

f. Toe space rail must extend up and forward to engage the bottom rail to form a smooth surface fully enclosed toe space, 3" deep x 5" high. Whenever the toe space base is omitted for units to set on building bases on separate steel bases, then the toe space rail must extend back 4-1/2".

g. Back construction must consist of a top and bottom rail, channel formed for maximum strength and welded to the back and top flange of end uprights, open for access to plumbing lines.

Cupboard units must be provided with removable back panels.

h. Die formed gussets, with multiple ends for strength, must be furnished in each bottom corner of base units to ensure rigidity, and a 3/8"-16 leveling bolt, 3" long, and must engage a clinch nut in each gusset. Access to the leveling bolts must be through plug buttons in the bottom pan. Each leveling bolt and gusset must be capable of supporting 500 lbs. Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust will not be accepted.

i. Adjustable shelves must be formed down 3/4", returned 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end, shelves over 42" long, which must be further reinforced with a channel formation welded to the underside of the shelf.

j. Drawer bodies must be made in one-piece construction including the bottom, two sides, back and front. They must be fully covered at the interior bottom on all four sides for easy cleaning. The top front of the inner drawer body must be offset to interlock with the channel formation in the drawer head providing a 3/4" thick drawer head.

k. Drawer suspension assembly must consist of 2 sections providing a quiet, smooth operation on Telescopic channels. All drawers must be self-closing from a point 5" open. Cabinet channels must maintain alignment of the drawer and provide an integral drawer stop, but the drawer must be removable without the use of tools. Drawers must provide 13-5/8" front to back clearance when fully extended. Drawers must rise when opened thus avoiding friction with lower drawers and/or doors. Drawer suspension system must incorporate a double stop, lock open feature. Case suspension channels must be Galvanized Steel, drawer suspension channels must be Cold Rolled Steel. Drawer suspension channels on Stainless Steel Cabinets must be zinc plated after they are formed.

l. Steel Door assembly (two-piece) for solid pan swinging doors must consist of an inner and outer door pan. Outer door pan must be formed at all four sides. The corners on the pull side of the outer door pan must be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan must be flanged at all four sides with hinge reinforcements welded in place. The door assembly must be 3/4" thick and contains sound deadening material.

m. Steel Drawer/door assemblies must be painted prior to assembly. Both must be punched for attaching drawer pulls. Likewise, inner pan formation of door and drawer body must be indented for in-field installation of locks when required.

n. Doors must be readily removable and hinges easily replaceable. Hinges must be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be accepted.

o. Knee space panels, where shown or specified, must be 20 gauge, finished same as casework cabinets, and easily removable for access to mechanical service areas.

2.04 PERFORMANCE REQUIREMENTS

A. **Steel Casework Construction Performance:**

1. Base cabinets must be built to support a uniformly distributed load of at least 200 lbs. per square foot of cabinet top area, including working surface without objectionable distortion of interference with door and drawer operation.

2. Base cabinet corner gussets with leveling bolts must support 500 lbs. per corner, at 1-1/2" projection of the leveling bolt below the gusset.

3. Each adjustable and fixed shelf 4 ft. or shorter in length must support an evenly distributed load of 40 lbs. per square ft. up to a maximum of 200 lbs., with nominal temporary deflection, but without permanent set.

4. Drawer construction and performance must allow 13-5/8" clear when in an extended position and suspension system must prevent friction contact with any other drawer or door during opening or closing. All drawers must operate smoothly, a minimum of 10,000 cycles with an evenly distributed load of 150 lbs.

5. Swinging doors on floor-mounted casework must support 200 lbs. suspended at a point 12" from the hinged side, with doors swung through an arc of 160 degrees.

Weight load test must allow only a temporary deflection without permanent distortion or twist. Door must operate freely after the test and assume a flat plane in a closed position.

B. Steel Paint System Finish and Performance Specification:

Steel Paint System Finish:

After Cold Rolled Steel and Textured Steel component parts have been completely welded together and before finishing, they must 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 must 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 must 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 must be dried and all steel surfaces must be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components must be individually painted, ensuring that no area is vulnerable to corrosion due to lack of paint coverage. The coating must then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

The completed finish system in standard paints must meet the performance test requirements specified under PERFORMANCE TEST RESULTS.

I. Performance Test Results (Chemical Spot Tests):

a. Testing Procedure:

Chemical spot tests for non-volatile chemicals must be made by applying 5 drops of each reagent to the surface to be tested and covered with a 1-1/4" of dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals must 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 must be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 25° ± 1° C. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents must 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 must 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 must be scrubbed with a damp paper towel and dried with paper towels.

b. Test Evaluation:

Evaluation must be based on the following rating system.
Level 0 – No detectable change.
Level 1 – Change in color or gloss.
Level 2 – Surface etching or severe staining.
Level 3 – Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

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

c. 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.	Dichloroacetic Acid	Cotton ball & bottle
16.	Dimethylformamide	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 Chloride	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 in percentages by weight.

II. Performance Test Results (Heat Resistance):

Hot water (190° F - 205° F or 88 ^{o} C - 96^{o} C) must be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which must be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish must show no visible effect from the hot water treatment.

III. Performance Test Results (Impact Resistance):

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

IV. Performance Test Results (Bending Test):

An 18 gauge steel strip, finished as specified, when bent 180^{o} over a 1/2" diameter mandrel, must show no peeling or flaking off of the finish.

V. Performance Test Results (Adhesion):

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

VI. Performance Test Results (Hardness):

The test sample must 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 must 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.

4. WorkTops:

The worktops must be of 18/19 mm Jet black Granite of an even surface and the level Tolerance less than 1 mm. The front edge of the granite must be chamfered at an angle of 28 deg and smoothened. The back splash for the wall bench must be granite 18/19 mm thick material for a height of 4” from the finished table top level.

5. Polypropylene Molded Sinks:

Sinks must be injection molded from Poly(propylene) resin. Polypropylene must have very high resistance to attack from a wide range of chemicals and ability to withstand temperatures up to 100° C (212° F). The impact resistance must be high which will minimize damage during and after installation. Sinks must be with self draining base and must be suitable for mounting on top or underside of the work benches. Sinks must be compatible to a vast number of acids, alkalis and reagents. The size of the sink must be 600L x 450D x 315H mm AND BOWL SIZE: 550L x 400D x 315H mm. Sinks must have a bottle trap with a reducing coupler of size 51 x 31 mm, with 38 mm polypropylene pipe of one foot length. All gaskets and O-rings must be made from Nitrile.

6. Reagent Rack in Island Bench:

Reagent racks must be designed to fix to the worktop.

It must be 14.5" wide & 24” ht, vertical Uprights made of 1.2 mm thick CRCA provided with granite supports and must be designed to have 2 Tier at 12” gap b/w the shelves.

Each Upright must have provision for fixing the 2 nos Sockets with switch and it will be b/w the bottom shelf & worktop. 12” wide shelves must be made up of ¾” thick granite with ¾” edge lip all around & placed over the granite supports.

2 Nos Horizontal & 2 Nos Vertical 12 mm dia epoxy rods must be fixed to the uprights to create a grid for holding the apparatus.

7. Dual Purpose EyeWash/Drench Hose Units:

Deck mounted eyewash/drench hose units must be capable of use as a fixed eye wash with hands-free operation or as a drench hose. Units must 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 must be hinged swing-away style and must be permanently attached to the spray head with a stainless steel pin. The valve must be self-closing type with a stainless steel squeeze handle and a locking clip to hold the valve open once activated. Units must be furnished with a deck flange with locator guide to hold the unit facing forward and an 8 ft. reinforced PVC hose.

8. Safety Shower:

Ceiling mounted Safety Shower consisting of 10" diameter orange ABS plastic shower head. 1" IPS chrome plated brass stay-open ball valve. Valve must be made with chrome plated brass ball and Teflon seals. Furnished with stainless steel actuating arm and 29" stainless steel pull rod.

Supply with 1" NPT female inlet and with ANSI-compliant identification sign.

9. Solvent Storage Cabinets for flammable liquid storage

- Fusible links hold doors wide open and melt at 165° F (or 74°C) for automatic closure (on self-close models).
- Sturdy, 18-gauge double wall steel with 1 ½" insulating air space.
- Minimal air-gaps to provide better protection.

- Easy close, self-latching door; handle must not require manual rotation to engage mandatory three-point latch for protection under fire conditions.

- Fully-welded (not riveted) construction holds square ness for longer life, offering greater protection in a fire since air gaps are reduced.
- Continuous piano hinge providing smooth closure.
- Built-in grounding connector (on outside side panel) for easy grounding.

- Dual vents with built-in flame arresters strategically placed at bottom and opposite top must be welded and not screwed in place.

- Durable and chemical resistant, lead-free powder coat paint finish, inside-and-out, retrains high gloss look and minimizes the effects of corrosion and humidity.
- Adjustable leveling feet for stability on uneven surfaces.

- Concealed self-close mechanism providing obstruction-free access to top shelf space. Self-indexing doors that close in sequence and assure a tight closure from top to bottom (on self-close models).

- Rounded safety corners and doors to reduce accidental nicks or cuts and potential hand injury.

- Exclusive "spill-catcher" shelves with built-in troughs to catch incidental drips and easily adjust on 2¼ "centers for versatile storage. Heavy-gauge galvanized steel must be ribbed for extra strength to support a substantial 350-lb weight capacity.

- Welded shelf hangers must interlock with the shelf to offer maximum "no slip" stability.

- Fully painted interior with no thin spots – minimal air gaps at the seams.

- 2” liquid-tight containment sump with up to a 5-gallon capacity on 45-gallon models holds leaks, meeting EPA requirements.

- Keyed, fail-safe closing mechanisms must be provided to ensure the three-point latching system works the first time, every time. Available in Lever or Sure-Grip handle styles to safely secure contents. Double key set included.

- Highly visible trilingual warning label “Flammable Keep Fire Away” must be provided

- Must comply with OSHA 29 CFR 1910.106 and NFPA Code 30, section 6.3.3 FM approved.

10. Acid Storage Cabinets for Corrosives.

- All models must have the same quality features as flammable cabinets including: double-wall construction, dual vents, grounding wire connection, adjustable shelves, leak proof sills, three-point self-latching doors and leveling feet.

- To resist aggressive chemicals, acid cabinets must also include polyethylene trays attached to galvanized steel shelves and a separate polyethylene liner for the bottom sump.
- The liner must be removable for easy cleaning of drips and leaks.

- The popular 30-gallon two door cabinet must include an extra polyethylene top work tray which must be secured to the cabinet-top for a handy work surface.

- An all-epoxy, baked-on powder coat finish, inside-and-out, for increased chemical resistance.

- Paint must be exclusively formulated to resist the acids, bases and solvents often used in laboratories.

11. Chemical Storage Cabinets (Tall Units with Glazed Swinging Doors)

1. Glazed doors should be 3/4” thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan should be 18 gauge steel, formed into a channel or flanged shape at all four sides. It should be pierced and formed to create a 3” wide frame with a bevelled edge around the glass opening in the center of the door. Inner door pan should be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Door glazing should be held in place by a rubber or vinyl gasket around the entire edge of the glass. Doors should be glazed with 1/8" float glass.

2. Full height storage cabinets should have a completely finished interior same as exterior.

3. End uprights should be formed at front, bottom and back to provide maximum strength and rigidity. Front fascia of upright should be 1-1/4" wide with inside edge formed in a channel 1/2" x 3/8". A full height box reinforcement should be fitted to the channel, formed to provide a recessed strike for door and to reinforce the cabinet. The backside of

the reinforcement should be perforated with shelf adjustment holes spaced at not more than 1" centers. Back of upright should be formed in a 2-1/2" formation. 16 gauge hinge reinforcement must be welded to inner side of front uprights.

4. Cabinet tops should be formed into a channel shape at front with flange at rear and sides for electro-welding cabinet top to cabinet back and ends. Front fascia channel must be strengthened with electro-weld reinforcements.

5. Cabinet bottoms for storage cabinets should be formed down on sides and back to create a square edge transition welded to cabinet end panels, and front edge shall be offset to create a seamless door recess rabbet for dust stop. Cabinet bottoms should be formed to provide a flush 1" face rail with a return flange to give a 9/16" deep x 5" high toe space. All cabinets should have a cleanable smooth interior.

6. Toe space rails should interlock in back of bottom rail and with end panel to provide a welding plate, and shall extend to the floor with a flange turned back and up for support.

7. Cabinet backs must be welded to the top, bottom and ends. Backs should be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be enclosed by a formation in cabinet back and enclosed by end uprights.

8. Adjustable shelves should be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end. Shelves over 42" long should be further reinforced with a channel formation electro-welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.

12. Wall Units:

1. Upper cabinets should have a completely finished interior same as exterior and should be designed so that no mounting hardware is visible when installed.

2. End uprights should be formed at front, bottom and back to provide maximum strength and rigidity. Front edge of end upright shall be 3/4” wide. A pilaster should be added to the inside front of the upright for cabinet and hinge reinforcement and should be perforated for hinge screws, and shelf adjustment holes.

3. Cabinet tops should be formed with a 7/8" high C formation at the front edge and turned down at the back to engage a wall hanging rail.

4. Cabinet flush bottoms should be formed with a 7/8" high C formation at the front edge.

5. Cabinet false bottoms should be formed down on all four edges and shall be removable.

6. Cabinet backs must be welded to the top, bottom and ends. Backs should be perforated for shelf adjustment holes. Holes should be enclosed by end uprights.

7. Adjustable shelves should be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end. Shelves over 42" long should be further reinforced with a channel formation welded to underside of shelf. Shelves should be adjustable on not more than 1" increments.

Glazed doors should be 3/4" thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan should be 18 gauge steel, formed into a channel or flanged shape at all four sides. It should be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan should be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Glass should be held in place by a rubber or vinyl gasket around the entire edge of the glass. Doors should be glazed with 1/8" float glass

8. Swinging doors under 36" high should be hung on one pair of hinges, doors over 36" high shall be hung on three hinges.

13. Laboratory Service fixtures:

I. **General**

A. All laboratory service fixtures must have the construction and must meet the performance requirements set forth in this specification. Fixture types must be as indicated in the fixture schedule or fixture details included in either the project drawings or these specifications.

B. All service fixtures must be factory assembled (including the assembly of valves and shanks to turrets, flanges and other mounting accessories), and each fixture must be individually factory tested. Fixtures must be tested in the manner and at the pressures set forth below.

C. Except as otherwise indicated, faucet and valve handles must be forged brass Nylon type and must have a color coded screw-on index disc. Color code requirements for indexing service fixtures must follow DIN Standard 12920:1995.

II. **Finish**

1. **General**

a. Laboratory service fixtures and safety equipment must be furnished with a powder coated finish to enhance the appearance of the fitting and to protect against corrosion. Coating material must be a blend of epoxy and polyurethane. The hybrid blend must ensure a finish coating with optimum combination of chemical resistance, mar and abrasion resistance and resistance to fading under ultraviolet (UV) light.

b. Fittings inside fume hoods must have an epoxy finish color-coded to match the fixture service index color. Coating material must be free flowing epoxy powder with a particle size of 35 micron or better.

2. **Mar and Abrasion Resistance**

Finishes must have a pencil hardness of 2H-4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch pounds. Finish must have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

3. **Reparability**

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

III. **Water Faucets and Valves**

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

B. Goosenecks must 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 must have a 3/8" IPS male inlet thread and be threaded directly into the faucet body so as to be absolutely rigid. Swing goosenecks must utilize a PTFE packing with an externally adjustable packing nut.

C. Water faucets and valves must be fully assembled and individually tested at 80 pounds per square inch (PSI) water pressure.

APPLICABLE CODES & STANDARDS

a. SEFA 3 – Scientific Equipment and Furniture Association
b. SEFA 8 - Scientific Equipment and Furniture Association
c. NFPA 30 - National Fire Protection Association
d. NFPA-45 - National Fire Protection Association
e. UL - Underwriters Laboratories
f. ASTM D552 – Bending Test

CHAPTER-03

EXHAUST SYSTEM SPECIFICATIONS

1.0 CENTRIFUGAL PP EXHAUST FAN

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

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

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

d. Aerodynamic performance of the fan must be tested and comply **'ISO 5801 standards**. Sound level must be tested and comply with **'ISO 5136.2'** standards.

e. The casing must be of self-supporting design, thermoformed welded by machine. The material of construction must be **polypropylene (PP)** and suitable for use against corrosive 'medium' and a maximum allowable operating temperature of 70 °C (158^{o} F).

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

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

h. **Electro-galvanized stands** must be used to support the fan and the motor in view of the corrosive environment.

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

2.0 MOTOR AND ACCESSORIES

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

3.0 PP/FRP DUCTING:

a. PP means PPGL: One side must be smooth & glossy finish and other end must be mat finish.

- The smooth surface must be the inner surface of the duct.
- On the mat side, FRP lining must be done.

- 25 mm x 25 mm Stitch welding must be done on the inner surface and continuous welding on the outer surface with 5 mm welding thickness.

b. FRP Lining must be done on the outer surface of PPGL i.e. on mat side.

- One layer FRP must be 1 mm.
- The final layer must be with a fine mat to have a smooth and good finish.
- While making the lining, there should not be any air pockets or any sort of uneven finish.
- There must be a time gap between the FRP layers, allowing each layer to get dried.

c. Isophthalic resin must be used.

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

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

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

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

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

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

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

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

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

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

n. Neoprene gasket 5 mm thick must be used between the flanges

4.0 PP DAMPERS

Dampers must be double thickness heavy than the thickness of the large duct & must be rigid in construction.

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

5.0 PVC FLEXIBLE HOSE

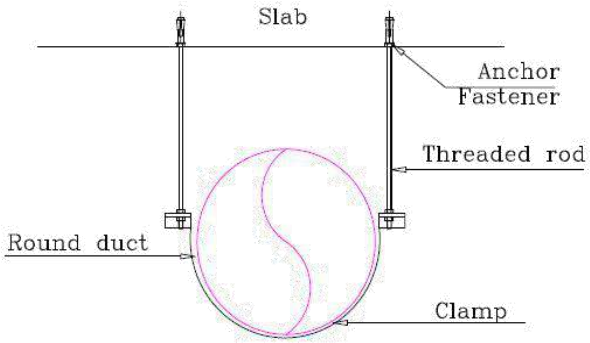
Provide flexible duct connections wherever ductwork connects to vibration isolated equipment and on all exhaust final connections to fume hoods, spot extractor and canopy as indicated on the drawings. Construct flexible connections of PVC coated collapsible hose clipped into duct and equipment to make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

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

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

6.0 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 must be supplied.



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

7.0 Bird screens

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

8.0 FUME WET SCRUBBER SPECIFICATION

- These fume scrubbers must be of Single stage packed bed type. Single Stage packed Bed removes the bulk of the contaminant from the air stream and must be continuously wetted to prevent plugging.

- In a scrubber, water must be the media which removes pollutants from the air. When the water is re-circulated, addition of fresh water is necessary to purge contaminants and replace evaporation losses. Fresh water must be added to the recycle reservoir continuously or periodically.

- Scrubbers are frequently used in applications where the air stream is being treated to remove acid fumes. The addition of chemicals must be controlled manually.

- Fume scrubbers must be fabricated from PP+FRP with suitable thickness based on the size & volume. The maximum temperature rating for the scrubber is 60 °C.

- Bolted access ports must be provided for inspection of the interior packing and mist eliminator elements. Hardware must be MS.

- The Scrubber must be provided with access ports / doors to allow limited access to the internals of the unit. The Scrubber shell must have flanged pipe connections or female NPT connections for introducing makeup and drain water as well as recirculation liquid connections.

- The Scrubbers must be equipped with random-dumped PP rings packed with appropriate depth of the packing.

- The Scrubber must be equipped with a high efficiency material for the mist eliminator must be PVC.

- The fan and motor must be designed for system static pressure per application depending on packing depth and mist eliminator selection. Pressure drop calculations must be done through the Scrubber and plus external delta Pressure for the IIT Ropar's ductwork losses.

Single Stage Packed Bed scrubbers complete with auxiliaries and options described herein.
The system must include but not limited to the following:

- All scrubber internals necessary to provide adequate process capture and to achieve the designed performance.
- Mist eliminator to separate the water mist from carrying over.

- Flanged connections for all external water fill, water makeup and drain, overflow piping as required.

- Complete shop coating of required areas with coat or resistant paint for external surfaces.
- Self-contained recirculation pumps system.

9.0 SPECIFICATION FOR VARIABLE FREQUENCY DRIVES

The variable speed drives must convert three-phase, 60 HZ utility power to adjustable voltage and frequency, three-phase, AC power for step less motor speed control from 10% to 100% of the motor's 60 Hz speed. Input voltage must be as specified in the schedule.

The VFD output power must vary frequency to the motor from 6 to 60 Hz with resultant motor speed varying at the motor nameplate rated speed, with output voltage variation from zero to motor rated voltage for optimum volts per hertz (V/Hz) ratio for fan and pump loads. Output current must be rated 110% of motor full load amps (FLA) for 1 minute based upon VFD's variable torque FLA rating.

10.0 FEATURES

Hand/Off/Auto selector to start and stop the motor. In the auto position, the drive must start/stop from a remote contact closure. In the auto position, motor speed must be determined by the follower signal. In the manual position, motor speed must be determined by manual adjustment.

Power on indication that the VFD is being supplied by the power line.

Fault indication that the VFD has tripped on a fault condition.

Display must indicate load parameters such as load percent, frequency or running load amps.

Terminations for safety interlocks such as freeze and smoke shut-down.

Speed Reference Input: Must accept both a manual speed signal and a 0-10 VDC speed reference analog input signal from the Building Automation System (BAS).

Feedback Signal: Provide 0-5 VDC or 0-20 mA analog output signal to indicate actual operating speed of VFD. Output signal must be fed into the BAS.

CHAPTER-04

GAS DISTRIBUTION SYSTEM SPECIFICATIONS

1 SCOPE OF SUPPLY /WORK

1.1 General Requirements:

The gas distribution system has two independent types of systems namely Bottled gas system and Compressed air system. The bottled gas system feeds the process fluids from the gas banks to the laboratory utility points whereas the compressed air is fed from the compressor room.

The gas system consists of the following from the gas yard; main isolation valve, floor isolation valves, branch isolation valves, pressure gauges, tubes & tube fittings, point of use regulators, gas purifiers, supports, clamps etc.

2 TECHNICAL REQUIREMENTS

2.1. General:

It is the intent of this specification to provide a high quality gas distribution
System for the laboratory usage.

2.2. Gas Tubing:

2.2.1. Tubing sizes 1/8" up to 3/4" OD must be made of SS 304 & SS 316 seamless tubes.

2.2.2. Tubing must have a minimum of 8% Nickel

2.2.3. Tubing must have carbon content <0.040%.

2.2.4. The tubing must be supplied with plugged ends.

2.2.5. Tubing hardness must have a max HRB 80.

2.2.6. Tubing supplied must be MOC of SS 304 & SS 316.

2.3. Tube Fittings:

2.3.1. The fittings must be of "Flareless" design and consist of primarily four components, i.e. body, front ferrule, rear ferrule and nut.

2.3.2. Tube to tube joints and braces must be joined by the way of orbital welding.

2.3.3. The fittings must be capable of holding the maximum working pressure of the tubing without any leak after only one and a quarter turn pull ups of the nut.

2.3.4. The rear / back ferrule on Stainless Steel Tube Fittings must have a machined recess on the inside diameter and must have complete surface hardening to substantially reduce the

required pull up torque. Both the requirements i.e., complete surface hardness and machined recess must be met for all rear ferrules of sizes ranging from 1/8” to 3/4” OD.

2.3.5. Nuts for SS fittings must have silver plated threads to act as a lubricating agent to avoid galling and to reduce tightening torque.

2.3.6. All the fitting end connections must be compatible to tube of hardness less than or equal to RB 80.

2.3.7. Stainless Steel Tube Fittings made from bar stock (straight configurations) must meet ASTM A269 / ASTM A269M standards and those made from forgings (including elbows, crosses and tees) must meet ASTM A182 / ASME SA182 standards. For Brass fittings the standards are respectively ASTM B16 / ASTM B453 & ASTM B283.

2.3.8. Moisture trap**:** Inline type, Clear acrylic / glass tube, regenerable, with 1/4" ferrule fittings at both ends with all SS 316/316 fittings inside. **Make**: Reputed DOMNICK/HUNTER/BEKO/PARKER Valves manufacturer (Panel mounted).

2.4. PRIMARY CONTROL MODULES

2.4.1. Supply of Gas Primary control modules along with pigtails, bull noses, cylinder brackets, restraining chains, support brackets and necessary fittings for connecting cylinders in the gas banks.

2.4.2. Performance testing of the manifolds with respect to the purity, flow rate and leakage of gases.

2.4.3. Material of construction for the manifold must be Brass and working pressure rating must be 250 bar. The manifold must have been tested for 250 bar.

2.4.4. The gases used for this application must be high purity analytical grade. The complete primary control module must be pre-cleaned and certified for 5.0 purity gas application.

2.4.5. Only SS 316 double braided bellow hoses, heavy wall construction.

2.4.6. The braided hoses must be tested for 300 bar and certificates produced.

2.4.7. The primary control module must be supplied with the following specifications.

(a) The Body of the primary control module must be Brass
(b) The regulator must be provided with an inlet (0-300 bar) and an outlet gauge (0-10 bar)
(c) The regulators must be provided a back mounting support which must be mounted on a Powder coated MS profile.
(d) Inlet and outlet port size must be 1/4” Female NPT connections.
(e) The regulator must be provided with an integrated relief vent to blow at 1.5 times the outlet pressure.
(f) Leak tests must be performed on all the regulators.

2.4.8. Mild steel cylinder holding brackets to hold both 9" dia and 15" dia cylinders, powder coated with restraining chains with locking arrangements.

2.5. ISOLATION VALVES

2.5.1. Stainless Steel 304 & 316, ½" ferrule type.

2.5.2. Teflon gland packing with Silicone based lubricant.

2.5.3. The valves must be factory tested at 1000 PSIG and certification must be produced.

2.5.4. The factory leak test must be performed to a maximum allowable leak rate of $1X10^{-3}$ cc/sec He

2.5.5. Operating pressure must be 0-150 Bar.

2.6. PRESSURE GAUGES

2.6.1. Bourdon type, centre back connection for dropper gauge and bottom connection for Regulator gauge.
2.6.2. Inlet size ¼" MNPT with dial size of 50 mm
2.6.3. Bourdon and socket material SS 316
2.6.4. Casing must be SS 316
2.6.5. Accuracy must be +/- 1% of FSD.
2.6.6. Factory Calibration Certificate must be provided along with the supply.

2.7. FLANGES

Flanges must be as per ANSI B 16.5 class 150

Flanges must be socket weld type.

3. SUMMARY OF MATERIAL OF CONSTRUCTION

Tubes : SS 316 & SS 304
Tube fittings : SS 316 & SS 304
Valves : SS 316 & SS 304
Primary Control Modules : Brass
Tubing Supports : Mild Steel
Tube support clamps : Polypropylene
Cylinder Bracket : Mild steel
Pressure Gauge : SS Bourdon and BLACK Zinc body
Gas fixtures : Brass Powder Coated

4.0 INSPECTION AND TESTING

4.1 Performance Test for Gas System:

4.1.1 Installation Purging Procedures:

4.1.1.1 The sealed tubes after starting the process of cutting and deburring must be purged with general purity nitrogen.

4.1.1.2 Connect the tubes to the flexible hose of the regulated supply (at 2 bars) and blow the debris for 5 min.

4.1.1.3 To confirm the purging is totally complete, blow the tubes intermittently holding the pressure for a few seconds at the end of the tube.

4.1.1.4 Now use the tube to swage the fitting. And install the tube with the fitting at the required place.

4.1.2 Pre Testing Purging Procedure

4.1.2.1 Once the main header and the sub header installation is complete, check for the misalignment or improper fitting connections

4.1.2.2 Connect the regulated pressure from the Nitrogen cylinder and blow the system for 15 mins nonstop.

4.1.2.3 Start the process again after a 15 mins duration and blow the system for another 10 mins.

4.1.2.4 Reconnect the needle valves and open the port fully.

4.1.2.5 Start the purging process one more time with the valve open and blow the whole system for 30 mins.

4.1.2.6 Now the system is completely purged and ready for handing over post pressure test.

4.1.2.7 Please note purged air must be directed outside of the Lab.

4.1.3 Pressure Testing Procedure

4.1.3.1 Ensure complete piping must be purged prior to pressure test. Use Nitrogen for leak check. Please note purged air must be directed outside of the Lab.

4.1.3.2 Ensure the system point is not hooked up to the lab equipment.

4.1.3.3 Shut-off point of use valve and pressurize system through the cylinder regulator.

4.1.3.4 Increase pressure slowly to maintain 30 psi and shut-off the cylinder valve. Observe the pressure gauge for evidence of pressure drop.

4.1.3.5 If the pressure drops, trouble-shoot leaking joints by using “Snoop” liquid leak detector and rectify as necessary.

4.1.3.6 Proceed to increase pressure to 100 psi if no leak is detected after 15 mins. of pressurization at 30 psi.
4.1.3.7 Repeat item (4.1.3.4) if leak is detected.

4.1.3.8 Proceed to increase pressure to 1.5 times the working pressure of the system (Normally with the same system and procedure as above).

4.1.3.9 Maintain pressure for 12 hours and check for evidence of pressure drop.

4.1.4 Preliminary Testing

4.1.4.1. Preliminary Leak testing will be carried out in two phases:

- Pressure decrease method (Pressure testing: 1.5 times the maximum working pressure)
Necessary formats must be used and all relevant data must be recorded during the test. GDS vendors and staff of IIT Ropar will jointly witness the test and certify the same.
- TIFF leak detection.

Necessary formats must be used and all relevant data must be recorded during the test. GDS vendors and staff of IIT Ropar will jointly witness the test and certify the same.

5.0 Orbital Welding:

Method for joining tubes must be orbital welding, orbital welding is a cleaner, reliable way of joining pipes and purity is guaranteed by orbital welding.

FORMAT – 1

S. No	Contact Details of the Applicant	
1.	Name of Firm	
2.	Type of Organization Firm/ Company/ partnership firm registered under the Indian Companies Act, 1956/ the partnership Act, 1932	
3.	Whether the firm has been blacklisted by any Central Govt. / State Govt./PSU/ Govt. Bodies / Autonomous? If yes, details thereof.	Yes/No
4.	Address of registered office with telephone no. & e-mail id	

Enclose:-

1. Copy of Certificate of Incorporation.
2. Undertaking in respect of 3 above as per Format 3.

Signature of the applicant

Full name of the applicant

Stamp & Date

FORMAT -2

Declaration
We hereby confirm that we are interested in Supply and Installation of Laboratory Furniture All the information provided herewith is genuine and accurate. Authorized Person's Signature. Name and Designation: Date of Signature: Note: The declaration is to be furnished on the letter head of the organization.

FORMAT 3

I/We(Name)_____
Agency/Partner/Sole Proprietor (strike out which is not applicable) of (Firm) _____ do hereby solemnly affirm and declare that the individual/firm/companies are not black listed by any Government Department or an autonomous body.

DEPONENT

DATE, THE **ADDRESS**

_____

_____

_____

VERIFICATION

Verified that the content of above affidavit is true and correct to the best of my/our knowledge and belief. No part of it is false and nothing has been kept concealed therefrom.

DATE, THE **DEPONENT**