



ಭಾ. ಕೃ. ಅನು. ಪ - ಭಾರತೀಯ ತೋಟಗಾರಿಕಾ ಸಂಶೋಧನಾ ಸಂಸ್ಥೆ  
ಹೆಸರಗಟ್ಟ ಕೆರೆ ಅಂಚೆ, ಬೆಂಗಳೂರು-560 089

ಭಾ.ಕೃ.ಅನು.ಪ.- ಭಾರತೀಯ ಬಾಗವಾನಿ ಅನುಸಂಧಾನ ಸಂಸ್ಥಾನ  
ಹೆಸರಗಟ್ಟ ಲೇಕ್ ಪೋಸ್ಟ್, ಬೆಂಗಳೂರು - 560 089

**ICAR-Indian Institute of Horticultural Research**  
Hesaraghatta Lake Post, Bengaluru - 560 089

EPABX: 080-23086100 Extn: 218 & 217

FAX: 080-28466291 – Email: purchase.iihr@icar.gov.in



F.No. 12-95/2024-25/IIHR/CP-331345/

Dated: 14-11-2024

**NOTICE FOR INVITING TENDER THROUGH E-PROCUREMENT**

Online Bids are invited from interested firms under **Two bid system (Technical bid/financial bid)** Repair of CTGC facility - ICAR-IIHR Bangalore Manual bids will not be entertained.

Tender documents may be downloaded from e-procurement website of CPPP <https://eprocure.gov.in/eprocure/app> as per the schedule given in CRITICAL DATE SHEET as under:

**CRITICAL DATE SHEET**

Tender No.	F.No. 12-95/2024-25/CP/IIHR
Name of Organization	ICAR-INDIAN INSTITUTE OF HORTICULTURAL RESEARCH, Hesaraghatta Lake Post, Bangalore
Date and Time for Issue/Publishing	14-11-2024 at 05:00 PM
Document Download/Sale Start Date and Time	14-11-2024 at 05:00 PM
Bid Submission start Date and Time	14-11-2024 at 05:00 PM
Bid Submission End Date and Time	02.12.2024 at 03:00 PM
Date and Time for Opening of Technical Bids	04.12.2024 at 10:00 AM
Address for Communication	Senior Administrative Officer (Purchase), IIHR, Hesaraghatta Lake Post, Bangalore

SD/-  
CHIEF ADMINISTRATIVE OFFICER (SG)

## Annexure-I

### INSTRUCTIONS FOR ONLINE BID SUBMISSION

1. The Tender form/bidder documents may be downloaded from the <https://eprocure.gov.in/eprocure/app>. **Online submission of Bids through Central Public Procurement Portal (<https://eprocure.gov.in/eprocure/app>) is mandatory.** Manual/Offline bids shall not be accepted under any circumstances.
2. Tenderers/bidders are requested to visit the website <https://eprocure.gov.in/eprocure/app> regularly. Any changes/modifications in tender enquiry will be intimated by corrigendum through this website only.
3. In case, any holiday is declared by the Government on the day of opening, the tenders will be opened on the next working day at the same time. The Council reserves the right to accept or reject any or all the tenders.
4. The Firms are required to deposit (in original) **EMD of Rs. 90,000/-** in the shape of Demand Draft in favour of **THE DIRECTOR, ICAR, UNIT-IIHR payable at Bangalore** may be address to **Senior Administrative Officer (Purchase), IIHR, Hesaraghatta Lake Post, Bangalore-560089** on or before **02.12.2024 by 3:00 PM.**
5. **Please note that only online Bids will be accepted.**
6. Bidders need not to come at the time of Technical as well as Financial bid opening at IIHR. They can view live bid opening after login on CPPP e-procurement portal at their remote end. If any dispute arises, Within Bengaluru Jurisdiction only.
7. The firms are also required to upload copies of the following documents for Technical eligibility and Evaluation:-
  - **Technical Bid**
    1. Scanned copy of MSME or Udyog Aadhar or NSIC is a must for EMD Exemption if eligible, otherwise firms have to furnish EMD
    2. Scanned copy of valid firm's registration certificate from registered of companies, PAN Card & GST Certificate is to be enclosed.
    3. PAN Card copy.
    4. GST Number with Registration Certificate.
    5. Bank details of the firm.
    6. Income Tax Returns for the last three years (2021-22,2022-23,2023-24)
    7. Profit and loss account & Balance Sheet which are audited & duly certified by the Chartered Accountant for the last three years (2021-22,2022-23,2023-24)
    8. Turnover of the business should be **Rs.90.00 Lakh** per year (2021-22,2022-23,2023-24). And **Chartered Accountant certified profit and Loss account; Balance sheet to this effect may be enclosed.**
    9. **Tender acceptance letter (Annexure-V) is mandatory.**
    10. **Latest copies of the GST return for six months (Jan to June,2024)**
    11. Scanned copy of Repair / Pre AMC orders of its satisfactory installation
    12. Scanned Copy of Make and model of all systems, sub systems, Sensors and additional items should be mentioned in the technical bid and complete technical details should be provided in the form of Brochures and write-ups
    13. The firm shall submit documents showing minimum of three years' experience in Annual maintenance of CTGC or any other such advanced SCADA based agricultural research facilities.
    14. Technical compliance: The firm shall certify and enclose detailed technical compliance of each component/items quoted under Pre AMC Repair/ Replacement of Components of CTGC Facility

- and Undertaking of Annual Maintenance Contract. Any change of make/model of components shall be duly supported by detailed specifications/compatibility criteria of such part.
15. Interested bidders must inspect and examine the Site and its surrounding during office hours and shall satisfy themselves before submitting their tender as to the nature of the Site, the quantities and nature of repairs and material necessary for the completion of the repairs and the means of access to the Site, the accommodation he may require and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect this contract. The office shall not bear any charges whatsoever any in this regard
  16. Participating Firms are requested to clearly understand the scope of work, location and details of work to be executed before participating in the tender. Pre AMC-Repair/ Replacement of Components of CTGC Facility and Annual Maintenance Contract are to be provided for the facilities located at ICARIIHR Bengaluru
  17. The firm executing the tendered work shall be responsible for adhering to all required safety norms including mandatory requirements for such work. As such none of the representative of the firm shall work without proper safety gear as per the requirements.
  18. All tools and tackles as required for executing the work will be at firm's responsibility
  19. In case any incident occurs with the deployed labor of the contractor/agency while working, it will be the responsibility of the contractor/agency. This office shall not be liable for any claim.
  20. The contract will be non-transferable and hence the firm shall not be entitled to assign or sub-contract the work or any part of it to any other person or party failing which the contract will be cancelled immediately.

□ **Financial Bid:-**

- a) Price Bid as BOQ XXX.xls
- b) **Evaluation criteria: Tender will be awarded to the lowest quoted Firm among those firms qualified in the Technical Bid. In case, two or more firms quote the same amount in r/o all the items work together as a whole, then the tender will be awarded to the Firm which has got more average turnover in the last 3 years, based on IT returns/Profit & Loss account/Turnover duly certified by the CA and uploaded along with Tender through CPP.**

SD/-  
CHIEF ADMINISTRATIVE OFFICER (SG)

Terms & Conditions

Terms & Conditions

1. The tenderer shall quote rates, which will include the supply, installation & other incidental charges. GST, if any, should be indicated separately.
2. The rates should be quoted as per the BOQ uploaded on the CPP Portal (reference may be obtained from Annexure-III). GST, if any, should be indicated separately. It must be noted that the contract shall be awarded to the firm which fulfils all the required terms and conditions and remains L-I for **Total cost**.
3. The firm must also possess valid PAN No. & GST registration number and a copy of the same must also be enclosed with the tender document.
4. **Latest copies of the GST return for six months (Jan to June, 2024)**
5. Copy of Income Tax Return Statement may be furnished for the Financial year 2021-22,2022-23,2023-24.
6. Profit and loss account & Balance Sheet which are audited & duly certified by the Chartered Accountant for the last three years (2021-22,2022-23,2023-24).
7. **Turnover of the business should be Rs.90.00 Lakhs per year (2021-22,2022-23,2023-24). And Chartered Accountant certified profit and Loss account; Balance sheet to this effect may be enclosed.**
8. Modification in the tender documents after the closing date is not permissible.
9. The successful firm shall **commence work** within 10 days from the date of confirmed **work order** and if the work not completed in time then EMD shall be forfeited. The rates quoted shall be valid for one year from the date of opening of tender.
10. The contractor/bidder or his representative may contact the undersigned at **Tel. No. 080-23086100 Extn: 217 & 211** for any further clarification. No variation in terms and quality of the items/specifications shall be entertained or else EMD/Security deposit shall be forfeited.
11. The bidder is advised to visit the site of works at his own expenses and obtain all information that may be necessary for preparing the quotation. Submission of quotation is acceptance by the tenderer that he has inspected the site or he is aware of all conditions.
12. The Director, ICAR-IIHR, shall have the right to reject all or any of the offers, accept more than one offer, and assign part of the job without assigning any reason.
13. Merely quoting of lowest rates does not mean that order shall be given to that firm. The competent authority will finally decide on the basis of quality & performance of past installations.
14. The Firms are required to deposit (in original) an **Earnest Money Deposit of Rs. 90,000/-** amount mentioned against item in the form of Demand Draft from any of the Commercial Bank in favour of **THE DIRECTOR, ICAR, UNIT-IIHR payable at Bangalore** may be address to Senior **Administrative Officer (Purchase), IIHR, Hesaraghatta Lake Post, Bangalore-560089 on or before 02.12.2024 by 03:00 PM**. No quotation shall be considered without the earnest money deposit. Demand draft drawn in favour of any officer other than 'THE DIRECTOR, ICAR UNIT-IIHR payable at Bangalore' will not be accepted and the tender will be rejected. The earnest money will be refunded only after the finalization of the procurement and no interest will be paid on earnest money. The request letter for refund of EMD & performance security is to be submitted by the firm.
15. Rates once finalized will not be enhanced/reduced during the currency of the contract.
16. In case, the successful bidder shows inability at any stage, after the contract is finalized and awarded, for whatsoever reason(s), to honour the contract, the earnest money /performance security deposited would be forfeited.
17. The Director, ICAR-IIHR reserves the right to cancel the contract at any time during the currency period of the contract without giving any reason.
18. The firm, to whom the tender will be awarded, will have to deposit the performance security equal to 3% of the total amount at the time of installation of equipment. If the services are not found to be satisfactory, the performance security is liable to be forfeited. No interest will be paid on performance security. If the services are not found to be satisfactory, the performance security is liable to be forfeited. No interest will

be paid on performance security.

19. If any dispute(s) arises between IIHR and the firm with reference to the contract, IIHR will decide it and its decision will be binding on the firms.
20. Bid Validity: 90 days
21. Payment: - No advance or part payment will be given. The payment will be released after satisfactory completion of the work and certificate from the Indentor/Engineer.
22. **The supplier/firm has to submit the GST return for having remitted the GST amount paid by the institute to the concerned authority within 30 days from receipt of payment from IIHR, otherwise their EMD and SD/PS will not be released and such firms shall be blacklisted.**
- 23. No EMD exemption is given for MSME/ Udyog Aadhar or NSIC and other firms**
24. **GST extra as applicable should be indicated separately in the column provided. Otherwise such quotes will be rejected.**

**Payment Terms: In order to facilitate for speedy settlement of payment you are requested to Furnish the following details as below:**

1. **Name of the firm:**
2. **Name of the Bank:**
3. **IFSC Code of Bank:**
4. **Name of the Account & Account No.:**
5. **Branch Code:**
6. **Amount to be paid:**
7. **E-mail address of the party:**
8. **GST No. and Pan No. Copies**

25. Liquidated Damage clause: It would be realized @ 0.5% (half per cent) of the base price (excluding taxes) of the delayed goods for each week of delay subject to maximum 20%.
26. Prices:  
Price structure:
  - a) The tenderer shall quote for the complete requirement of repair of CTGC and for the full quantity as shown against a serial number in the List of Requirements in Annexure - VIII. Unless otherwise specified in Annexure – VIII, the tenderers are, however, free not to quote against all the serial numbers mentioned in the list of requirements (in case there are more than one serial number in the list of requirements).
  - b) The guarantee & warranty of the CTGC Facility is One year from the date of Repair.
  - c) The rates and prices quoted shall be in Indian Rupees
  - d) GST rate and amount and basic value of repair are to shown separately along with GST registration No. and Pan No. otherwise tender will be rejected.
  - e) The rates and prices quoted by the supplier shall remain firm and fixed during the currency of the contract and shall not be subject to variation on any account, whatsoever, including statutory variations, if any.
  - f) The performance security / Security deposit, deposited by the successful bidder shall be released on satisfactorily certificate and also producing the relevant documents of GST returns for having remitted the GST amount paid by the institute to the concerned authority.

‘Terms & Conditions are acceptable’

Dated

(Authorized signatory of the firm)

**Repair of CTGC facility at ICAR-IIHR Bangalore**

(Reference for BOQ) (To be quoted in format provided on CPP Portal) at ICAR-IIHR,Bangalore.

Sl. No.	Name of item	Quantity	Per unit price* (infigures/words) (as per BOQ)
01	<b>Repair of CTGC facility at ICAR-IIHR Bangalore</b>	01 Unit	

\*Annexure-VIII

- Items should be of reputed make and suitable for high end elite users
- **GST extra as applicable should be indicated separately in the column provided. Otherwise such quotes will be rejected.**
- **ICAR-IIHR Bangalore.**

**Note:** The above mentioned Financial Proposal/Commercial bid format is provided as BoQ\_XXXX/xls along with this tender document at <https://eprocure.gov.in/eprocure/app>. Bidders are advised to download this BoQ\_XXXX.xls as it is and quote their offer/rates in the permitted column and upload the same in the Financial bid. **Bidder shall not tamper/modify downloaded price bid template in any manner.** In case if the same is found to be tampered/modified in any manner, tender will be completely rejected and EMD would be forfeited and tenderer is liable to be banned from doing business with IIHR.

**Annexure-IV**

EPABX: 080-23086100 Extn: 218 & 217

FAX: 080-28466291 - Email: purchase.iihr@icar.gov.in



**ICAR-INDIAN INSTITUTE OF HORTICULTURAL RESEARCH**

**HESSARAGHATTA LAKE POST, BANGALORE-560 089**

Name of the Firm \_\_\_\_\_

Registered/Postal Address \_\_\_\_\_

1	Permanent Account Number (PAN)	
2	GST Registration No.	
3	Bank Details	
a	Bank Name	
b	Branch Address	
c	Account Number	
d	Type of account (current/saving) MICR No.	
e	IFSC Code	

Date:

Name of the Authorized Signatory

Place:

Stamp & Signature

**TENDER ACCEPTANCE LETTER**  
(To be given on Company Letter Head)

**Date:**

To,  
The Director,  
ICAR-IIHR,  
Hesaraghatta Lake Post,  
Bangalore-560089.

Sub: Acceptance of Terms & Conditions of Tender.

Tender Reference No. \_\_\_\_\_

Name of Tender/Work:

\_\_\_\_\_  
\_\_\_\_\_

Dear Sir,

1. I/ We have downloaded/obtained the tender document(s) for the above mentioned 'Tender/work' from the web site(s) namely:

\_\_\_\_\_  
As per your advertisement, given in the above mentioned website(s).

2. I/We hereby certify that I/We have read the entire terms and conditions of the tender documents from Page No. \_\_\_\_\_ to \_\_\_\_\_ (including all documents like annexure(s), schedule(s), etc...) which form part of the contract agreement and I/We shall abide hereby the terms/conditions/clauses contained therein.
3. The corrigendum(s) issued from time to time by your department/organization too have also been taken into consideration, while submitting this acceptance letter.
4. I/we hereby unconditionally accept the tender conditions of above mentioned tender documents/corrigendum(s) in its totality/entirely.
5. I/we do hereby declare that our Firm has not been black-listed/debarred by any Govt. Department/Public sector undertaking.
6. I/we certify that all information furnished by our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then your department/organization shall without giving any notice or reason therefore or summarily reject that bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.
7. I/We have inspect the site in person & obtained all the requisite information as per technical bid point 15.

Yours Faithfully,

(Signature of the Bidder, with Official Seal)



## Annexure-VI

### **INSTRUCTIONS FOR ONLINE BID SUBMISSION**

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.

More information useful for submitting online bids on the CPP Portal may be obtained at <https://eprocure.gov.in/eprocure/app>.

#### **REGISTRATION**

- Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL <https://eprocure.gov.in/eprocure/app>.) by clicking on the link '**Online bidder Enrollment**' on the CPP Portal which is free of charge.
- As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- 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.
- 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/nCode/eMudhra etc.) with their profile.
- 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 DSC's to others which may lead to misuse.
- Bidder then logs in to the site through the secured log-in by entering their users ID/password and the password of the DSC/e-Token.

#### **SEARCHING FOR TENDER DOCUMENTS**

- 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.
- 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.
- 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.

## PREPARATION OF BIDS

- **Bidder are requested to visit the site at the institute and discuss with Dr. R.H. Laxman. P.S / Dr. V. Sridhar, P.S ICAR-IIHR, Bangalore before preparing the bid clarify the doubts and understand the requirements.**
- Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- 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.
- 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/JPG formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.
- 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' or 'Other important Documents' 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.

## SUBMISSION OF BIDS

- Bidder should log into the site will in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other technical issues.
- The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- Bidder has to select the payment option as 'offline' to pay the tender fee/EMD as applicable and enter details of the instrument.
- Bidder should prepare the EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the concerned official, latest by the last date of bid submission or as specified in the tender documents. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the uploaded bid will be rejected.
- Bidders are requested to note that they should necessarily submit their financial bids in the Format provided and no other format is acceptable. If the price bid has been given as a standard BoQ format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BoQ file, open it and complete the white coloured (unprotected) cell 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.

- 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.
- 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. Any bid document that is uploaded to the server is subjected to symmetric, encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid openers public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- Upon the successful and timely submission of bids (i.e. after clicking 'Freeze Bid Submission' in the portal), the portal will give a successful bid submission message and a bid summary will be displayed with the bid no. and the date and time of submission of the bid with all other relevant details.
- The bid summary has to be printed and kept as an acknowledgement of the submission of the bid.

#### **ASSISTANCE TO BIDDERS**

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

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**Annexure-VII**

Details of Repair & EMD

Sl. No.	Purchase of item	Qty	Earnest Money in INR	File. No. for reference
01	<b>Repair of CTGC facility at ICAR-IIHR Bangalore</b>	01 UNIT	Rs.90,000/-	<b>F.No.</b> 12-95/2024-25/CP/IIHR /

Note: EMD defined on to the Portal is MINIMUM. Bidder has to submit the EMD as per item for which quoting for.

**\* ICAR-IIHR Bangalore.**

**Technical Specification for Repair of CTGC facility at ICAR-IIHR Bangalore.**

**CTGC - Carbon Dioxide Temperature Gradient Chambers Facility at ICAR-Indian Institute of Horticultural Research**

**1. Project background**

**Introduction**

Indian Institute of Horticultural Research (IIHR) is a premier institute of Indian Council of Agricultural Research engaged in basic and applied research, training and extension activities in on Horticultural farming. Indian Council of Agricultural Research (ICAR) is an autonomous organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. ICAR-IIHR requires its CTGC Facility including all sub systems like SCADA, electrical systems to be one time repaired and maintained on annual maintenance contract subject to regular condition assessment and maintenance in accordance with the systems manufacturing manuals and recommendations as well as industry best practice.

**2. SCADA based CTGC System Description**

CTGC is a Carbon dioxide and Temperature Gradient Chamber, A facility for measuring the impacts of elevated CO<sub>2</sub> and temperature which are vital parameters of climate change. The chamber is with field like environment with higher CO<sub>2</sub> and warming conditions concurrently which influence the crop growth and insect pests. This facility is first of its kind to simulate the future climate change scenario conditions with both CO<sub>2</sub> enrichment and warming conditions. The scientific parameters generated from the experiments conducted using this facility is of with authenticity and of immense help to understand the impact of climate change on crop growth and biotic stresses.

**3. Functionality of CTGC**

In CTGC facility the air in the chambers is heated by the natural solar radiation and by using infrared heaters. The temperature well within chambers is thus elevated to pre-determined levels. The temperature gradient is achieved by maintaining the air inlet and outlet and cooling/heating mechanism. The cooling pads are arranged at one end of the chamber and the other end exhaust fans are maintained to facilitate air inlet and outlet system. The water is circulated along with cooling pads and thus temperature gradient is maintained. The cooling/heating rate and as well as CO<sub>2</sub> concentration is controlled by SCADA based PLC, based on these parameters measured inside the chambers.

**4. Infrastructure: Major components of CTGC**

**i. The eight CTGC Chambers**

Each one of the eight chambers is 30 meters of length, 6 meters width and 4 meters height at the centre. These are covered with high quality, light weight, rigid, multi layered polycarbonate sheet of high quality with UV and excellent impact resistance, superior clarity. The thickness of the sheet is 6mm and has >90% light diffusion with > 85% PAR (Photosynthetically Active Radiation) transmission.

**ii. Heating system**

The heating system in four CTGC chambers consisting of 2 for temperature and 2 for both temperature and CO<sub>2</sub> is provided with infrared heaters. The gradient of  $5 \pm 0.5^{\circ}\text{C}$  above ambient increase in temperature within each chamber with  $1 \pm 0.5^{\circ}\text{C}$  increase at regular interval is set with SCADA with

proper control and regulation. The heating system employed is in a self-contained sheet steel enclosure. Each chamber fitted with six such heating and circulating units maintaining the desired temperature range over and above the ambient temperature. All the heating devices are controlled through PLC as per SCADA program for temperature management with independent chamber control. The temperature settings have a cut off for above  $50 \pm 0.5^{\circ}\text{C}$  under any circumstances.

### **iii. CO<sub>2</sub> supply system**

CO<sub>2</sub> supply system is consisting of CO<sub>2</sub> tank of 20 Kilo liters Liquid CO<sub>2</sub> capacity with all necessary accessories to maintain the liquid, gas pressure and with relevant safety, licensing norms. Gas is supplied from the CO<sub>2</sub> tank site to the CTGC chambers through SS 304 grade seamless Tubing. The chambers with elevated CO<sub>2</sub> are provided with proper monitoring system and controls to maintain uniform CO<sub>2</sub> concentration vertically and horizontally even in combination with gradient temperature condition.

### **iv. Control panel**

Control panel consisting of temperature, humidity and CO<sub>2</sub> controllers with Supervisory Control and Data Acquisition (SCADA) control system- with SCADA control software, PC linked to Program Logic Control (PLC), Digital Expansion Blocks, Interface Module etc.

### **v. Air circulating unit**

Air circulating unit has cooling pads, water pumping and cooling pads installed at the one end of the chamber. This unit is provided for maintaining the set humidity and temperature with at least 90% efficiency to attain a maximum of 80% RH. The humidity is monitored and maintained by automatically with connected sensors for auto maintain of desired Humidity conditions. 48-inch exhaust fans are standardizing with SCADA control for the air temperature and CO<sub>2</sub> concentration in the chamber.

### **vi. Temperature sensors and control**

The RH + Temperature transmitter installed is a micro-controller based Masibus/Redix make model number SC804. This is high performance 2-wire RH+ T transmitter. It has 2 x 4-20 mA outputs with True 2-wire operation for accuracy of  $\pm 2\%$  RH,  $\pm 0.5^{\circ}\text{C}$ . The ambient temperature is sensed with weather station for temperature range -40 to 123.8 $^{\circ}\text{C}$  with accuracy  $\pm 0.5^{\circ}\text{C}$ . Analog Input Module employed is made by Radix Electro Systems Pvt Ltd with 8 channels, each with universal analog inputs capable of connecting 8 thermocouples, Linear input - 0~50 mV, 0/4~20 mA, communication ports isolated RS485/MODBUS RTU, up to 19200 Baud with user programmable. It's scalable with 3 key tactile keypad, nonvolatile, indefinite duration 3 key programming.

### **vii. CO<sub>2</sub> analyzer and sensors**

CO<sub>2</sub> monitoring is done by microprocessor-based CO<sub>2</sub> analyzer with nondispersive infrared absorption (NDIR) measuring method. The provision for measuring CO<sub>2</sub> concentration is made through sampling points in each chamber and is interfaced with SCADA.

### **viii. SCADA (Supervisory Control and Data Acquisition):**

A supervisory computer is the core of the SCADA system which is gathering data of all eight chambers on the process/status and sending control commands to the field connected process/status devices. A high-performance Graphical HMI is the front end of operator. Data acquisition begins at the PLC level and includes instrumentation readings and equipment status reports that are communicated to SCADA as required. Data is then compiled and formatted in such a way that a control room operator using the HMI (Human Machine Interface) can make supervisory decisions to adjust or override normal PLC controls. Data is also fed to a historian, built on a database management system, to allow trending and other analytical auditing. The present supervisory computer is connected via a USB to serial link to the PLC.

#### **ix. Data management system**

The SCADA program has a user configured database which provides the software about the connected instrumentation and parameters which are to be accessed. The database also has information on how often the parameters of the instruments are accessed and if a parameter is a read only value (e.g. a measured value) or read / write, allowing the operator to change a value (set point). The SCADA software continuously updates its own database with the latest analogue while functioning. The data on various parameters viz., temperature, relative humidity, CO<sub>2</sub> concentration recorded at each gradient of the chamber is recorded at a pre-set interval.

#### **x. Standard signal cables**

Standard signal cable is provided for connecting sensors to the PLC/SCADA system in control room. Cables are of standard make and ISI certified and enough caution is taken to avoid any signal loss in the wires while connecting from source to the SCADA. Cables system has ferrules and identifiers for easy identification in the field to facilitate easy maintenance.

#### **XI. Particular Specification**

Tender for Comprehensive AMC for servicing and maintenance of SCADA based “CTGC” Carbon dioxide Temperature Gradient Chamber including SCADA based work station, UPS System and CO<sub>2</sub> distribution system at IIHR Bengaluru.

#### **Scope of present Pre AMC one time repairs to CTGC Facility work and AMC:**

1. This Pre AMC one time Repairs to CTGC facility includes dismantling of entire existing structure except foundation and all re-fabrication / repair work.
2. Refabricating of required structure with using either existing material for purlin weld and or to be fabricated with 50x50mm structure Pipe with nut bolts or new pipe structures of suitable dimensions. So that each chamber is 30 meters of length, 6 meters width and 4 meters height at the center. Three such chambers renovation / refabrication is proposed under the present work scope.
3. Any additional fabrication material is under the scope of tenderer only. No separate approvals rates would be paid for any major/minor requirement of fabrication material or associated work there off.
4. Need to make air tight structure by proper sealing and joints that should also with stand double the normal maximal gusty winds at Bangalore, hence facility structure shall withstand wind speeds up to 60KMPH.
5. The exhaust fan and cooling pads, etc., which will be released during dismantling, are to be re fixed /fabricated in to the same position including any fabrication material supplies. The fabricated exhausts should be secured properly and free from vibration /noise /plant /human entanglements.
6. Replacement of damaged / non-functional cooling pad water pump motor sets is also in the scope of repairs with any plumbing work of water inlet out let are also to be handled.
7. The duct line installed in the CTGC is to be removed completely.
8. The heater, which will be released during dismantling, is to be placed in the same position including any fabrication requirements.

9. The IR heating installed shall achieve ambient + 5° C temperature with gradient Hence required tunnelling of gradient with variable exhaust speed through SCADA control is proposed.
10. Repairs to Green House Polycarbonate sheets, structure including dismantling the damaged polycarbonate sheets and replacing all sheets with new poly carbonate sheets. The scope includes supply, fixing of Polycarbonate sheets, with its fixtures Hardware requirement for fasteners, silicon- sealants, aluminium Profile, aluminium beadings Rubber Beadings, screws, any miscellaneous Items. The polycarbonate sheets shall be fastened / fixed on to Re fabricated new structure for water tight leak proof with proper sealants.
11. Supply of 6mm Thick multi wall UV Stabilized Polycarbonate sheet has >90% light diffusion with > 85% PAR (Photosynthetically Active Radiation) with 10-year onsite Warranty for yellowing, breaking etc. LEXAN make XL102UV Clear model or similar any Indian brand ISI certified with onsite warranty product preferred.
12. CO<sub>2</sub> analyzer: Supply and installation is under this scope with non-dispersive infrared absorption (NDIR) measuring method. The provision for measuring CO<sub>2</sub> concentration is made through few sampling points in each chamber and is interfaced with SCADA. Scope includes complete CO<sub>2</sub> analyzer, CO<sub>2</sub> inlet release and sample PU tubing, electrical control, communication and interfacing with SCADA.
13. SCADA system: Supply and installation is under this scope with sufficient input output expansion ports for all chambers which can gather data of all chambers on the process/status and sending control commands to the field connected process/status devices. Graphical HMI layout is to be made for front end of operator. Data acquisition from the PLC level and includes instrumentation readings and equipment status reports are required.
14. Sensors: Supply and installation of all sensors are in this scope. All communication cabling requirement needs to be met with where ever cabling replacement is to be done.
  - i. At least 15 numbers (5nosx3chambers=15) of RH + Temperature sensors with local digital display is required. 2 x 4-20 mA outputs with True 2-wire operation for accuracy of ± 2% RH, ± 0.5°C. Radix SC804 or similar Made in Indian Brand models.
  - ii. Analog Input Module with 8 input channels. Each channel shall have a universal input – 8 thermocouples, RTD Pt100, 0/4~20 mA and 0~50 mV that can be user programmed. Radix SCM 201 or any similar Indian make with local digital display. It shall have exceptional accuracy and performance in high ambient temperatures.
  - iii. The ambient temperature is sensed with additional temperature sensor (weather station quality) for temperature range -40 to +70 °C with accuracy ±0.5°C.
  - iv. Standard signal cable is to be provided for connecting sensors to the PLC/SCADA system in control room. Cables are of standard make and ISI certified.



**PART: A: Pre AMC one-time Repairs charges to CTGC facility**

Sr. no.	Technical Details	Specifications	Qty.
1	Dismantling of entire existing structure except foundation and all re-fabrication / repair work. Refabricating of required structure with using either existing material for purlin weld and or to be fabricated with new pipe structures of suitable dimensions. Three such chambers renovation / re-fabrication is proposed under the present work scope.	As per existing Material or new pipe structures of suitable dimensions So that each chamber is 30 meters of length, 6 meters width and 4 meters height at the center.	3 chambers (01, 02 & 03)
2	Repairs to Green House Polycarbonate sheets, structure including dismantling the damaged polycarbonate sheets and replacing damaged sheets with new poly carbonate sheets. The scope includes supply, fixing of Polycarbonate sheets, with fixtures, fasteners, silicon-sealants, aluminum Profile, aluminum beadings Rubber Beadings, screws,any miscellaneous Items. The polycarbonate sheets shall be fastened/fixd on to fabricated new structure for vibration free, water tight leak proof to with stand gusty winds of 60 kmph.	6mm Thick multi wall UV Stabilized Polycarbonate sheet with >90% light diffusion with > 85% PAR with 10 year onsite Warranty LEXAN make XL102UV Clear model or similar Indian brand IS certified Any Made in India	45 sheets (For 3 chambers, 12m x 2.1 m size each with fasteners, profile, sealants)
3	48" Exhaust Fan assembly with fan belt, aluminum Louvers with depth frame, Balanced blade fan assembly suitable for control through VFD	Any Made in India or ALMONARD Make 900MM 700RPM, 415Volts 1200Watts 3phase	6 nos. (For chamber 01,02 & 03)
4	Cooling pad: 100 mm Celdec pad size(6mx1.5m)	CelDec or Munteer	3no. (For chamber 01,02 & 03)
5	Aluminium frame, distribution Pipe, etc for above		3no. (For chamber 01,02 & 03)

6	Variable Frequency Drive VFD: Input voltage: AC Single/Three phase, Input frequency- 50Hz/60Hz, Output frequency:0- 599Hz,Control mode: Space voltage vector control, and sensorless vector control (SVC), Motor type: Asynchronous motor (AM) and synchronous motor (SM), Speed ratio: For AMs: 1: 100 (SVC)	Any Made in India Product	3 no. (For chamber 01,02 & 03)
7	PLC - IO basic 16 DI / 16 DO with add on expansion ports Up to 32 DI / 32 DO, Output Relay with suitable expansion ports Type. RS485 – 2nos. Power supply: DC 24V Power, 20W rated power output BD board supported, Expansion module: 16 outputs, relay type/ 32 outputs, relay type	Any Made in India Product	1 no.
8	SCADA supply, integration and performance tuning for required parameters.	Any Made in India Product	1no
9	Temperature + Humidity transmitter with display Integral sensor type, Dual row digital display, smart sensor for Rh and temp sensor, Surface/Wall Mount, 2-Wire-RH+T Transmitter	Any Made in India Radix SC804 or similar Range Rh:0-100%Rh, Temp:0-70°C Accuracy Rh: ±2%Rh, Temp: ±0.5°C, Output:4-20mA	15no. (for chamber 01,02 & 03 each chamber 5 sensor)
10	Analog Input Module-8 I/P channels, 2x16 backlit LCD, 3 key, 3P, 4-20 mA output, RS485/MODBUS RTU Ord. Code 2310 or Analog Input Module- Input :6 nos. 4-20maDC Relay output: 2nos.relay contact (NO+NC) output. (30VDC/2A, 264VAC/2A) Photoelectric isolated RS485 interface.		4 or 6 based on model
11	Control box comprising of all electrical protection, mcb contactors etc. (Common for all three chamber)	Any Made in India Product	1 no.

12	Supply and laying of Control cabling as per requirement		
13	0.75/1 HP Monoblock pump model	Kirloskar/Crompton/ABB/BB	3
14	Heating Fan in circular enclosure with air heaters in built	Fabricated with Air heaters	4 for two chambers
15	Solenoid Valves Fluid Control Systems, Media CO <sub>2</sub> / air or superior quality	Rotex Automation Ltd Code 20101-2.5-2G ATM 0-12	
16	CO <sub>2</sub> Analyzer / Monitor Infrared gas monitor with analyzer quality continuous sampling, measurement and display at site and SCADA. CO <sub>2</sub> range of between 0–2000ppm and 0–100% by volume, Complete with sample gas conditioner.	Fuji /Edinburgh/ Guardian NG /Quantek / Fluke or any superior quality Made in India Product	2
17	CO <sub>2</sub> Tubing Parker Legris Polyurethane ether food-grade "crystal" with required numbers of Connectors: Parker Legris push-in fittings, perfect sealing based on NF E49-101 in Two sizes: OD/ID= 12mmx8mm- supply, 6mmx4mm.	Any Made in India Product or Parker Legris food-grade "crystal"	100 meters As per requirement

**Part B: CTGC AMC Service Charges after Completion of Pre AMC one-time Repairs:**

Sl no	Details	Year
1.	AMC Service Charges for CTGC Facility including all Service Labor charges. Any Consumable / spare parts needed shall be sourced separately as and when needed.	1st year (0-12Months)
2.	AMC Service Charges for CTGC Facility including all Service Labor charges. Any Consumable / spare parts needed shall be sourced separately as and when needed	2nd year (13thto24th month)
3.	AMC Service Charges for CTGC Facility including all Service Labor charges. Any Consumable / spare parts needed shall be sourced separately as and when needed.	3rd Year (25thto36th month)

**Note:** The AMC Service Charges contract will start only after successful satisfactory completion of Pre AMC-Repair /Replacement of Components and acceptance of the same by the indenter/ Technical Committee.

**Annual Maintenance**

- The Contractor shall visit the ICAR-IIHR Location Site on the basis of his quote throughout the annual period to undertake the following as a minimum:
- Carry out an initial system health check and metering COMMs integrity check in order to gather an overview of the status of the CTGC Facility.
- Investigate any system defects, deficiencies, deviations, alarms raised since previous visit and advice of strategies on reducing or eliminating these alarms either during the visit or within a post visit report.
- Perform a full database backup, to help to prevent potential catastrophic system failure from losing essential data, potentially being used for reporting or Research purposes.
- Liquid/Gas based CO<sub>2</sub> storage tank, supply, distribution and handling of such facility with authorized/trained technicians as and when required as per the PESO safety standards is also desired.
- In addition to the above and time permitting, the Contractor will provide the following services:
- Undertake any changes/enhancements to system set-ups. To be advised by the Client prior to the maintenance visit.
- Undertake Client and client’s agent refresher training. Requirements to be advised prior to the maintenance visit.
- Any materials required for breakdown or for such other required work is to be

executed on cost of material, which should be approved by the competent authority of the institute.

- The required log books, maintenance schedule charts are to be maintained and be made available for inspection by the concerned authority of the institute.
- Periodic CO<sub>2</sub> gas leak testing and other safety regulations are to be monitored and records to be maintained properly.
- All spares parts and materials shall be genuine and of same make and type as installed wherever applicable and a minimum quantity of spares and materials for routine maintenance may be kept at site to minimize time of maintenance.
- The firm / agency / contractor has to keep SCADA based CTGC Free Air Temperature Elevation Facility's well maintained for the required research work at all times.
- Proper care shall be taken to avoid major/minor breakdown at the SCADA based CTGC Free Air Temperature Elevation Facility.
- In the event of any breakdown, the same will be rectified immediately within 4 hours from the time of reporting of the fault.
- Similarly, if any breakdown takes place due to negligence of firm/ agency/ contractor, the whole component has to be replaced/ rectified to bring it to the original condition immediately.
- The maintenance periods for the system shall not be exceeded. However, within the duration of the contract it may be found necessary to shorten these periods after experience to cater for operation under adverse conditions etc.
- The Contractor shall therefore provide within the Tender Return a Schedule of Rates for each item of equipment detailing the cost associated with each maintenance item associated with the item of equipment.
- Similarly, prior to take over of facility under AMC any deviations, defective or out of service parts like sensors, motors, components etc., are needed to be replaced or repaired on chargeable basis as denoted by "one time repair charges"

**SD/-**  
**CHIEF ADMINISTRATIVE OFFICER (SG)**