



Government of India
Bhabha Atomic Research Centre
Research Reactor Maintenance Division

TENDER NOTICE

Tender Notice No: RRMD/TR- 1/ 06 /2022

Date: 31/03/2022

To,
(Company name)

Sub:Tender enquiry for Fabrication, assembly, testing and supply of ECCS –SPS Channels as per specifications

Sealed tenders, in two parts in the prescribed format, are hereby invited for and on behalf of the President of India by the Head, RRMD BARC, Trombay, Mumbai-400085 for Fabrication, assembly, testing and supply of ECCS –SPS Channels as per the technical specification (as mentioned in Annexure-I of Schedule-B), from experienced vendors having adequate experience and capabilities to execute similar works.

i.	Name of Work	Fabrication, assembly, testing and supply of ECCS–SPS Channels
ii.	Period of Completion	12 (twelve) months
iii.	Quotation Submission	Submission of quotation shall be done only through registered post/speed post, through Indian postal services addressed to “AO-III, RG Office, Dhruva, BARC, Trombay, Mumbai-400085”, so as to reach this office latest by 15.00 hrs on 18.05.2022 , super scribing the ‘QUOTATION’ and our tender Ref. No. , on the envelope. Hand delivery or courier will not be accepted.
iv.	Tender document is prepared in two parts viz. Part ‘A’ (Technical Bid) and Part ‘B’ (Price Bid). Part ‘A’ consists of Technical Bid (Technical Specifications), Schedule ‘A’ (List of Materials to be Supplied by the Department) and Schedule ‘B’ Bill of Quantity.	
v.	Tender Part ‘A’ Opening date	19.05.2022
vi.	Tender Part ‘B’ Opening date	Will be decided after technical evaluation.

Quotations are required to be submitted in separate sealed and super-scribed envelopes containing and indicating the following.

I	First Envelope	Part ‘A’
II	Second Envelope	Part ‘B’ (Price Bid)

All the sealed envelopes shall then be placed in another envelope, sealed & super-scribed with the name of the work, last date of tender submission and submitted through registered post/speed post to the address mentioned above.

The quotation shall be in the format of schedule 'B' of tender, and shall include the Ref. No. of this Tender enquiry, PAN no. and GSTN of the firm. The scope of work and the terms and conditions are given below.

1. Scope of the work:

The work involves Fabrication, assembly, testing and supply of 7 nos. of ECCS –SPS Channels with the following:

- 1.1 Fabrication and assembly of ECCS-SPS processing cards.
- 1.2 Fabrication of Backplane motherboard and Bin for ECCS –SPS processing cards.
- 1.3 Integration, testing and supply of ECCS-SPS channels.
- 1.4 First 2 Nos. of ECCS-SPS channels shall be supplied for functional testing and after clearance from BARC; rest of the modules shall be fabricated.
- 1.5 The electronic circuit components of ECCS-SPS channels shall be procured from the reputed suppliers.

The general arrangement and block diagram of the system is included as Figure-1 & Figure-2 respectively in Annexure-I of schedule-B. However, the actual circuit schematics will be provided to the concerned party at the time of placement of work order.

2. Terms and conditions:

- 2.1 The offer should be valid for consideration for at least 45 days from due date of the offer.
- 2.2 The work shall be completed within **twelve months** after issue of the work order.
- 2.3 Payment would be released after satisfactory completion of the entire job only. Vendor should submit bills in triplicate along with an advance stamped receipt. Release of advance or interim payment cannot be considered.
- 2.4 **Taxes:** Income tax @ 2% and other taxes as applicable will be deducted from your bill amount. It shall be ascertained that the Invoice raised by a registered supplier of taxable goods/services along with other details specifically indicates location of supply, tax component to be separately indicated in the invoice.
- 2.5 The vendor should also clearly reply in his tender to “whether the contractor / vendor has any relative working in BARC or the contractor himself is an ex-employee of BARC or the contractor has any ex- employee of DAE on his payroll”.
- 2.6 The employees deputed at site by the contractor should have a valid Police Verification Certificate.
- 2.7 Contractor should mention their valid **PAN** No. and GSTIN in the quotation, failing which the offer shall be rejected.
- 2.8 No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as “Proprietary” in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to the sub-contractors, consultants, advisers or the employees engaged by a party with equal force.
- 2.9 The vendor or sub-vendor, consultant, adviser or the employees engaged by the contractor shall not use BARC’s name for any publicity purpose through any public media like Press, Radio, TV or Internet without the prior written approval of BARC.

3. Safety and Security:

- 3.1 All the persons should be physically and mentally fit. The responsibility of all safety precautions related with a particular job at site primarily lies with the Contractor. The contractor & his persons shall strictly observe all security and safety regulations prevailing at the site. All the workers, supervisors & engineers of the contractor shall have proper medical certificates issued by the competent authorities.
- 3.2 The contractor or executing agency shall adopt adequate safety measures as per the Job Hazard Analysis (JHA) control measures suggested. The personal protective equipment to contract workers, supervisors & engineers shall be supplied by the contractor at his own cost.
- 3.3 All workers, supervisors & engineers of the contractor shall wear necessary protective clothing, helmets & canvas/safety shoes properly laced & follow the safety requirements strictly, while working at site.
- 3.4 Contractor personnel shall also abide by the Radiation Safety precautions as directed by the Health Physicist of the site.
- 3.5 BARC shall not be responsible for any damage, injury, death etc of any contractor's personnel under any circumstances. No compensation claim shall be admitted in this regard. All workers should be insured at the cost of the contractor.
- 3.6 All Covid-19 precautions are to be strictly followed.
- 3.7 Security instructions should be strictly adhered to.
- 3.8 The employees deputed at site by the contractor should have a valid Police Verification Certificate.

4. Instructions to Tenders:

- 4.1 Price quoted shall be filled up in the same format given in the Schedule-B with GST if any.
- 4.2 You are requested to contact Shri Sparsh. K. Sharma, SO (D) on Tel no. 25596241/4323 from 10 AM to 5 PM to arrange entry permit if anyone wants to visit the BARC to assess the job clearly and specifically before making the offer.
- 4.3 The acceptance of the tenders will rest with Head, RRMD who does not bind himself to accept the lowest offer, and reserves to him the authority to reject any or all the tenders received without assigning any reason.
- 4.4 Quotation received after the due date and time shall be summarily rejected.

Thanking you,

Yours faithfully,

Sd/-
Head, RRMD, BARC
(For and on behalf of the President of India)

Enclosures: Schedule –A & B

Schedule –A

Tender Notice No: RRMD/TR- 1/ 06 /2022

dated 31/03/2022

Name of Work: Fabrication, assembly, testing and supply of ECCS –SPS Channels

Sl. No.	Description	Qty	Unit	Rate
1.	Water	As required	Litre	Free
2.	Electricity	As required	KWH	Free

Schedule – B

Tender Notice No: RRMD/TR- 1/ 06 /2022 dated 31/03/2022

Name of Work: Fabrication, assembly, testing and supply of ECCS –SPS Channels

Sl. No	Name of items	Qty (Q)	Supply Rate (S)	Installation Rate (I)	Item wise Supply Cost (S x Q)	Item wise Installation Cost (I x Q)
1.	Fabrication, assembly and supply of ECCS –SPS Channels as per specifications in Annexure-I	7 nos.				
2.	Total basic cost of supply					
3.	Total basic cost of Installation	NA				
4.	Basic cost for Dry heat & Damp heat testing on 1 nos. of unit					
5.	Basic cost for EMI/EMC testing on 1 nos. of unit					
6.	GST on basic cost of Supply					
7.	GST on basic cost of installation	NA				
8.	GST on basic cost of Dry & Damp heat testing					
9.	GST on basic cost of EMI/EMC testing					
10.	Total Cost (including all taxes & levies)					

Signature of the contractor with seal

Note: The prices shall be quoted clearly without any overwriting. Overwriting/correction are not acceptable.

Annexure-I

Technical Specifications for ECCS-SPS Channels

1.0 Introduction

The ECCS-Signal Processing System (SPS) generates two output signals SIL and EMRF indicating LOCA condition. It also generates contact output when these two parameters cross their respective set points. The hardwired ECCS-SPS is based on solid state electronics circuit. The electronics consist of DC-DC Converters, Isolation amplifiers; OpAmp based arithmetic circuits, comparator, buffers, Relays, Voltage to Current Converter circuits etc. No programmable device is used in the system.

One channel of ECCS-SPS Hardware consists of

- One SIL(System Inventory Loss) Module
- One EMRF (Excess Moderator Return Flow) Module
- One Standard 19" bin with 6U height for housing cards
- One PCB based backplane for Power supply and Field Interface
- 2 nos. of Interface Modules (IFMs) and Flat Ribbon cables with IDC connectors for interfacing field signals to cards

Figure-1 gives the general arrangement of one channel of ECCS-SPS hardware.

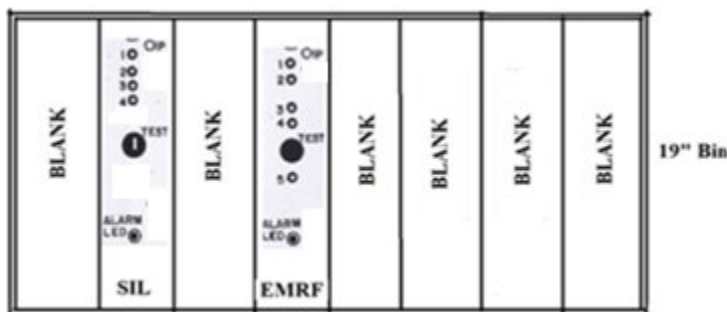


Figure 1 General Arrangement of one ECCS-SPS Channel

Each card is having two 64 pin Euro connectors (Male) and at the backplane end there are two 64 pin Euro connectors of female type for mating. At the rear side, backplane is having one 64 pin IDC connector for each card for either receiving field inputs or sending field outputs. The ECCS-SPS works on 12V DC Power Supply, which is the existing plant supply.

ECCS-SPS has 8 analog inputs and it provides contact outputs from 4 switch over relays and 2 current outputs (4 to 20 mA). Figure-2 gives block diagram of one channel of ECCS-SPS.

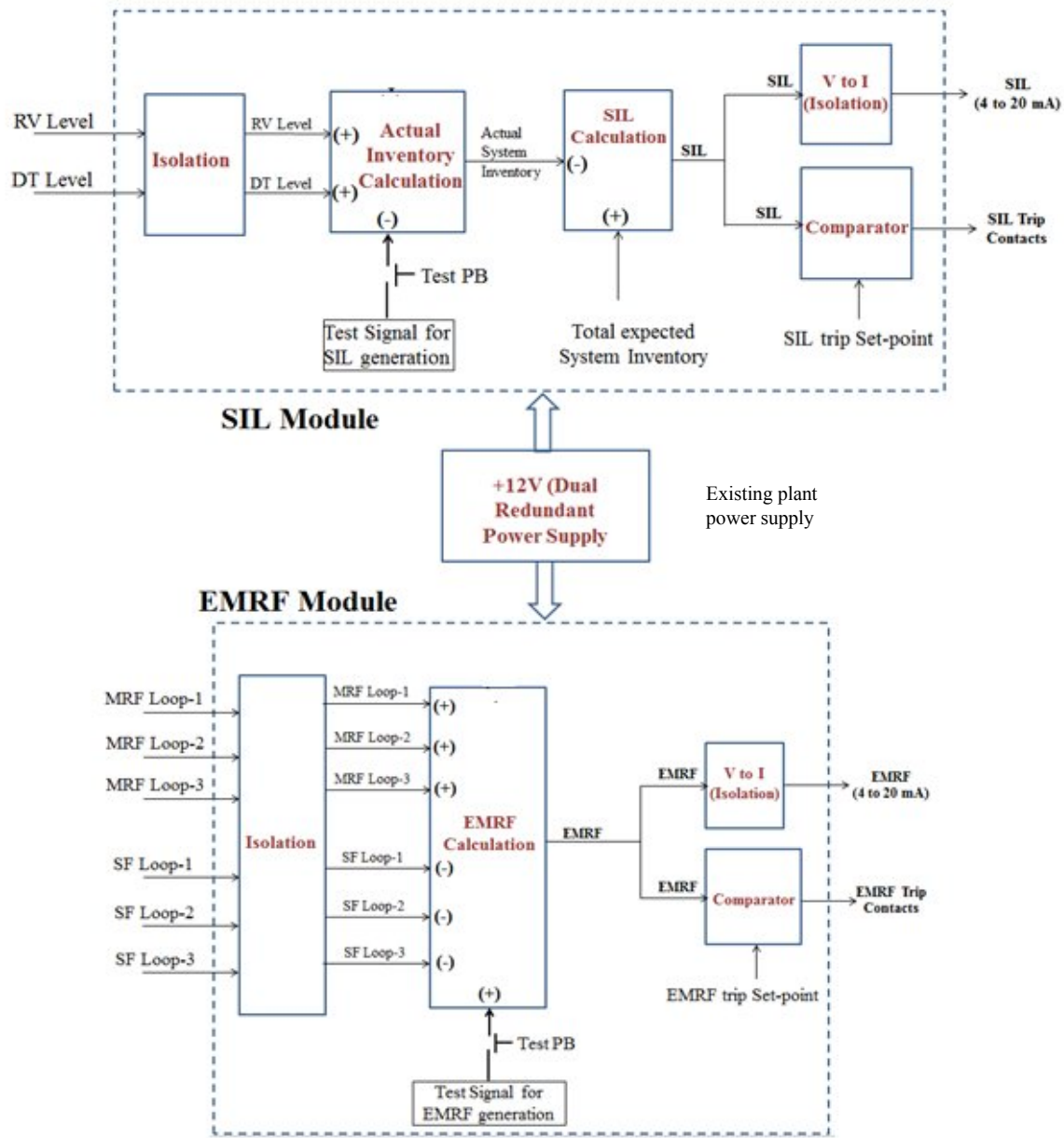


Figure 2 Block diagram for one channel of ECCS-SPS

The actual circuit diagram of SIL, EMRF, backplane PCBs and IFMs will be provided to the party at the time of placing the order.

2.0 Technical specifications of SIL Module

A SIL module processes 2 analog field inputs namely Reactor Vessel level and Dump tank level. These input signals are isolated and using these signals along with pre-settable parameters to compute instantaneous value of SIL and generates a trip contact output if this value exceeds set-point. The value of set-point is adjustable.

Bill of Material for one SIL Module:

Description	Quantity	Part number /Make & Type
Ceramic Capacitor 0.1 μ f, 20V,10%	4	Yageo/Equivalent
Ceramic Capacitor 27 μ f, X7R, 35 V,10%	8	Yageo/Equivalent
Ceramic Capacitor 10 μ f,X7R, 35 V,10%	1	Yageo/Equivalent

Description	Quantity	Part number /Make & Type
Ceramic Capacitor 2.2 μ f, 50V,10%	3	Yageo/Equivalent
Ceramic Capacitor 0.01 μ f, X7R,40V,10%	5	Yageo/Equivalent
Ceramic Capacitor 0.01 μ f,X7R,20V,10%	7	Yageo/Equivalent
Ceramic Capacitor 1 μ f,20V,10%	2	Yageo/Equivalent
Ceramic Capacitor 1nf,X7R, 1KV, 10%	2	Yageo/Equivalent
Ceramic Capacitor 1nf,X7R, 40V, 10%	13	Yageo/Equivalent
Ceramic Capacitor 1 μ f, X7R, 40V, 10%	13	Yageo/Equivalent
Ceramic Capacitor 0.47 μ f, X7R,35V,10%	1	Yageo/Equivalent
Ceramic Capacitor 0.47 μ f, X7R, 20V, 10%	1	Yageo/Equivalent
Ceramic Capacitor 100pf, X7R, 25V, 5%	1	Yageo/Equivalent
Ceramic Capacitor 200pf, X7R, 25V, 5%	1	Yageo/Equivalent
Uni Directional Transient Voltage Suppressors	3	Liteon Semiconductor SMCJ10A
Surface Mount Glass Passivated Rectifier 1kV, 1.0A	3	Diode Incorporated BYG10M-E3/TR
Diode Schottky 15V 1A	1	Microchip Technology Lsm115je3/Tr13
Rectifier Diode	12	Syc 1n4007
Zener Diode 10V, 1W	2	Micro Commercial Components SMAJ4740A-TP
Zener Diode 16V, 1W	2	Micro Commercial Components SMAJ4745A-TP
Fuse 32V,1A	1	Bourns SF-0603F100-2
Test Point Red	10	Keystone Elect.Corp. 5010
Tip Jack	1	Keystone Elect.Corp. 11013-B
Tip Jack	5	Keystone Elect.Corp.11013-R
LED (Coloured In Green)	1	Dialight 550-0208F
LED (Coloured In Red)	1	Dialight 550-0408F
Inductor 10 μ H ,700mA, \pm 10%	3	Tdk MLP2520S100MT0S1
Potentiometer Right angled 10K, 1W, 10%	5	Bourns 91A1A-B28-E15L
Potentiometer 100K, 1/2W, 10%	3	Bourns 91A1A-B28-E15L
Potentiometer 2K, 1/2 W, 10%	3	Bourns 91A1A-B28-E15L
Resistor 10 k Ω , 1/8W, 0.5%	5	Panasonic
64 Pin Male Right Angled Customized Euro Connector With Board Lock	2	Eptgmbh 103-41664C1
PNP Bipolar Transistor	1	On semi MMBT5087LT3G

Description	Quantity	Part number /Make & Type
MOSFET P-Channel	1	Infineon Technologies BSP170PH6327
General Purpose Relay	1	Te Connectivity MT2- C93416
Resistor 100Ω, 300mW, 0.1%	2	Vishay
Resistor 1kΩ,1/10 W,0.1%	3	Panasonic
Resistor 1kΩ,1/10 W,5%	11	Panasonic
Resistor 1.2kΩ,1/10 W,5%	1	Panasonic
Resistor 1mΩ,1/10 W,0.1%	4	Panasonic
Resistor 100kΩ,1/10W,0.1%	4	Panasonic
Resistor 13kΩ,1/10W,0.1%	1	Panasonic
Resistor 56kΩ,1/10 W,0.1%	1	Panasonic
Resistor 95kΩ,1/10 W,0.1%	1	Panasonic
Resistor 200kΩ,1/10 W,0.1%	1	Panasonic
Resistor 95kΩ, 1/10 W,0.1%	1	Panasonic
Resistor 4.7kΩ, 1/10 W,0.1%	1	Panasonic
Resistor 5kΩ, 1/10 W,0.1%	1	Panasonic
Resistor 2.5kΩ, 1/10 W,0.1%	1	Panasonic
Resistor 330Ω,1/10 W,5%	1	Panasonic
Resistor 0Ω,1/10 W,5%	11	Panasonic
Resistor 15Ω,1/10 W,5%	2	Panasonic
Resistor 2.49kΩ,1/10 W,5%	1	Panasonic
Resistor 5.62kΩ,1/10 W,5%	1	Panasonic
Resistor 8.25kΩ,1/10 W,5%	1	Panasonic
Resistor 470Ω,1/10 W,5%	1	Panasonic
Tactile Switch(Push Button) Right Angle	1	Tyco
Isolated 2w Dual (+/-12v) Output DC/DC Converters	2	Murata NMK1212SC
Isolated 2w Dual (+/-15v) Output DC/DC Converters	1	Murata NMK1215SC
Ldo Voltage Regulators (-5v)	1	Texas Instruments LM2990S-5.0/NOPB
Ldo Voltage Regulators (+5v)	1	Texas Instruments LM2940S-5.0/NOPB
Precision Isolation Amplifier	3	Texas Instruments ISO121BG
Low Power, Low Noise, High Precision Op Amp	3	Texas Instruments OPA207ID
Analog Quad Differential Comparator	1	Texas Instruments LM139AD
Hex Buffers Open Collector	2	Texas InstrumentsSN7407
Voltage To Current Converter	1	Texas Instruments XTR111AIDGQR
4 Channel Opto Isolator IC	1	Vishay ILQ615-2X007
4 Input Or Gate	1	Texas Instruments CD4072BM

Description	Quantity	Part number /Make & Type
Emi Suppression Filter 100 MΩ @ 100Mhz	1	Murata BNX027H01L
Low Noise, Very Low Drift, Precision Voltage Reference	1	Texas Instruments REF5050AID

As far as possible, industrial grade components should be used. FR4 Glass Epoxy PCB should be used with lacquer coating on circuit tracks.

3.0 Technical specifications of EMRF Module

An EMRF module processes 6 analog inputs (4 to 20 mA) coming from field. Using these signals along with pre-settable parameter, value of EMRF signal is computed and compared with the set-point (which is adjustable). If EMRF value exceeds set-point, trip contact output is generated.

Bill of Material for one EMRF Module:

Description	Quantity	Part Name/Make & Type
Ceramic Capacitor 0.1uF, 20V,10%	6	Yageo/Equivalent
Ceramic Capacitor 27 uF,X7R, 35 V,10%	8	Yageo/Equivalent
Ceramic Capacitor 10uF,X7R, 35 V,10%	1	Yageo/Equivalent
Ceramic Capacitor 2.2uF, 50V,10%	3	Yageo/Equivalent
Ceramic Capacitor 0.01uF,X7R,40V,10%	9	Yageo/Equivalent
Ceramic Capacitor 0.01uF,X7R,20V,10%	4	Yageo/Equivalent
Ceramic Capacitor 1uF,20V,10%	3	Yageo/Equivalent
Ceramic Capacitor 1nF,X7R, 1KV, 10%	6	Yageo/Equivalent
Ceramic Capacitor 1nF,X7R, 40V, 10%	29	Yageo/Equivalent
Ceramic Capacitor 1uF, X7R, 40V, 10%	29	Yageo/Equivalent
Ceramic Capacitor 0.47uF, X7R, 35V, 10%	1	Yageo/Equivalent
Ceramic Capacitor 0.47uF, X7R, 20V, 10%	1	Yageo/Equivalent
Ceramic Capacitor 160pF, X7R, 25V, 5%	1	Yageo/Equivalent
Ceramic Capacitor 2nF, X7R, 25V, 5%	1	Yageo/Equivalent
Ceramic Capacitor 120pF, X7R, 25V, 5%	1	Yageo/Equivalent
Uni Directional Transient Voltage Suppressors	7	Liteon Semiconductor SMCJ10A
Surface Mount Glass Passivated Rectifier 1KV, 1.0A	3	Diode Incorporated BYG10M- E3/TR
Diode Schottky 15V 1A	1	Microchip Technology LSM115JE3/TR13
Rectifier Diode	12	SYC 1N4007
Zener Diode 10V, 1W	2	Micro Commercial Components SMAJ4740A-TP
Zener Diode 16V, 1W	2	Micro Commercial Components SMAJ4745A-TP
Fuse 32V,1A	1	Bourns SF-0603F100-2
Test Point Red	9	Keystone Elect.Corp. 5010

Tip Jack	1	Keystone Elect.Corp. 11013-B
Tip Jack	10	Keystone Elect.Corp. 11013-R
LED (Coloured In Green)	1	Dialight 550-0208f
LED (Coloured In Red)	1	Dialight 550-0408f
Inductor 10uH ,700mA,±10%	3	Tdk Mlp2520s100mt0s1
Potentiometer Rightangled 10K, 1W, 10%	3	Bourns 91A1A-B28-E15L
Potentiometer 100K, 1/2W, 10%	7	Bourns 91A1A-B28-E15L
Potentiometer 2K, 1/2W, 10%	7	Bourns 91A1A-B28-E15L
Resistor 10KΩ, 1/8W, 0.5%	12	Vishay
64 Pin Male Right Angled Customised Euro Connector With Board Lock	2	Eptgmbh 103-41664c1
PNP Bipolar Transistor	1	Onsemi Mmbt5087lt3g
MOSFET P-Channel	1	Infineon Technologies Bsp170p H6327
General Purpose Relay	1	Te Connectivity Mt2-C93416
Resistor 100Ω, 300mW, 0.1%	2	Vishay
Resistor 1KΩ,1/10W,0.1%	3	Panasonic
Resistor 200KΩ,1/10W,0.1%	1	Panasonic
Resistor 1KΩ,1/10W,5%	11	Panasonic
Resistor 1.2KΩ,1/10W,5%	11	Panasonic
Resistor 1MΩ,1/10W,0.1%	8	Panasonic
Resistor 100KΩ,1/10W,0.1%	6	Panasonic
Resistor 60KΩ,1/10W,0.1%	1	Panasonic
Resistor 120KΩ,1/10W,0.1%	2	Panasonic
Resistor 160KΩ,1/10W,0.1%	2	Panasonic
Resistor 4.7KΩ,1/10W,0.1%	1	Panasonic
Resistor 5KΩ,1/10W,0.1%	1	Panasonic
Resistor 2.5KΩ,1/10W,0.1%	1	Panasonic
Resistor 330Ω,1/10W,5%	1	Panasonic
Resistor 0Ω,1/10W,5%	15	Panasonic
Resistor 15Ω,1/10W,5%	2	Panasonic
Resistor 2.49KΩ,1/10W,5%	1	Panasonic
Resistor 5.62KΩ,1/10W,5%	1	Panasonic
Resistor 8.25KΩ,1/10W,5%	1	Panasonic
Resistor 470Ω,1/10W,5%	1	Panasonic
Tactile Switch(Push Button) Right angle	1	Tyco
Isolated 2W Dual (+/-12V) Output DC/DC Converters	2	Murata
Isolated 2W Dual (+/-15V) Output DC/DC Converters	1	Murata
LDO Voltage Regulators (-5V)	1	Texas Instruments LM2990S-5.0/NOPB
LDO Voltage Regulators (+5V)	1	Texas Instruments LM2940S-5.0/NOPB
Precision Isolation Amplifier	7	Texas Instruments ISO121BG
Low power, Low noise, High Precision Op-Amp	3	Texas Instruments OPA207ID
Analog Quad Differential Comparator	1	Texas Instruments LM139AD

Hex Buffers Open Collector	2	Texas Instruments SN7407
Voltage to Current Converter	1	Texas Instruments XTR111AIDGQR
4 Channel Opto Isolator IC	1	Vishay Ilq615-2x007
4 Input OR Gate	1	Texas Instruments CD4072BM
EMI Suppression Filter 100MΩ @ 100MHz	1	Murata BNX027H01L
Low Noise, Very Low Drift, Precision Voltage Reference	1	Texas Instruments REF5050AID

As far as possible, industrial grade through-hole components should be used. FR4 Glass-epoxy PCB should be used with lacquer coating on circuit tracks.

4.0 Standard 19" bin (6U)

Standard 19" in bin, having 6U height, is used to house the modules of the ECCS-SPS. It should have good workmanship and standard dimensions.

5.0 Backplane PCB

Backplane should be made of FR4 glass-epoxy PCB with lacquer coating on circuit tracks. It should have EURO connectors (4 nos. of 64 pin EURO connectors (Female) for card interface) and IDC connectors (2 nos. of 64 pin IDC Connector (male) for field Interfaces).

6.0 Interfacing Modules (IFMs) for field signal interfacing to cards

IFM modules should have 64 pin IDC and corresponding field signal termination blocks for facilitating field signal interface to cards of ECCS-SPS through Flat Ribbon Cables.

7.0 Qualification tests on Hardware

Qualification of hardware components is intended to meet the required reliability level. Dry heat-damp heat test and EMI /EMC test should be carried out **on 1 channel of ECCS-SPS Hardware.**

The following qualification tests will be carried out.

- Dry heat & damp heat test
- EMI/EMC test

Scope, testing details and acceptance criteria for Qualification tests are mentioned below.

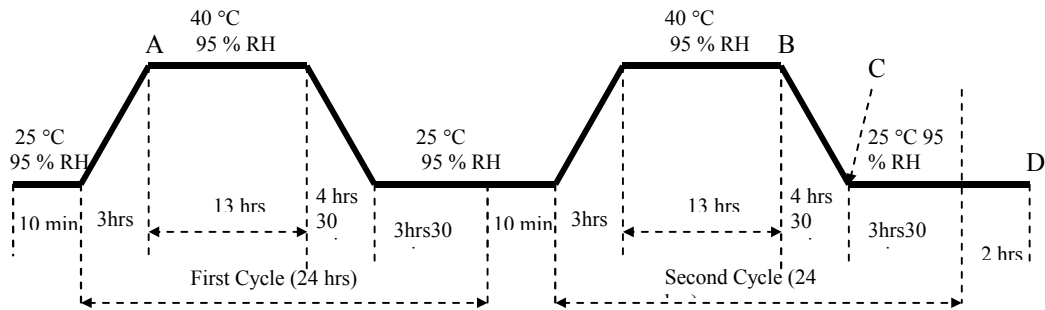
7.1 Dry heat- Damp Heat Tests:

Scope:

Dry Heat & Damp Heat tests are to be conducted at an approved lab / facility.

7.1.1 Damp Heat Test:

No of cycles.	2
Duration of each cycle	24 hours
Upper Temperature	40±2 °C
Relative Humidity at upper temperature	95% RH
Lower Temperature	25±3 °C
Relative Humidity at lower temperature	95% RH
Rise & Fall	As per IS-9000 part V



Damp Heat Cycles

Observation:

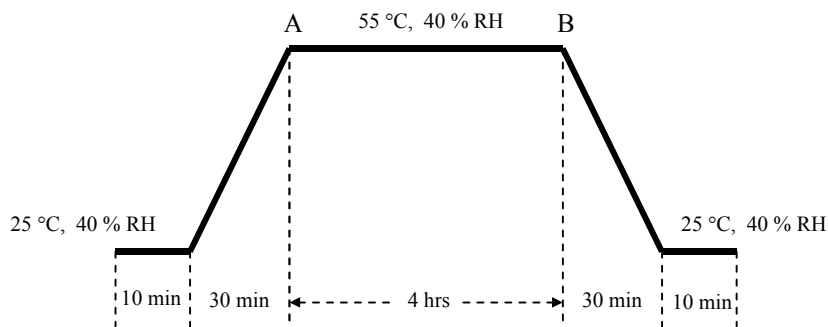
Functionality to be tested (minimum) at equilibrium points (A, B & C) and after a recovery period (D) of 2 hrs.

Acceptance criteria:

Instrument must meet all the functional and performance specifications

7.1.2 Dry Heat Test:

No of cycles.	1
Duration of cycle	5 hr 21 min. (4 hour maintained at peak)
Upper Temperature	55±2 °C
Relative Humidity at upper temperature	< 50% RH
Lower Temperature	25±3 °C
Relative Humidity at lower temperature	< 50% RH
Rise & Fall	As per IS-9000 part III



Dry Heat Cycle

Observation:

Functionality to be tested (minimum) at equilibrium points (A & B) and after completion of test.

Acceptance criteria:

Instrument must meet all the functional and performance specifications.

7.2 EMI / EMC Test:

Radiated and conducted susceptibility tests:

As various electrical noise sources exist in reactor operating environment, therefore C&I equipment/systems are to be qualified for satisfactory operation in such environment. Electrical noise is coupled to the C&I equipment through conduction and radiation. Conducted noise immunity tests in low frequency range and Radiated noise immunity tests in high frequency range should be conducted on the C&I equipment for qualification as detailed below:

Immunity to radiated radio-frequency electromagnetic field as per IEC 61000-4-3:

The hardware, i.e. ECCS-SPS channel; will be tested for immunity to RF electromagnetic field in the frequency band of 80 MHz - 1000MHz at 3m up to a field strength of 10 V/m. Acceptance criteria for RF immunity shall be "Normal performance within limits specified by the purchaser".

Immunity to conducted radio-frequency electromagnetic field as per IEC 61000-4-6:

The conducted RF disturbances voltage should be superimposed on the AC input power ports using CDN and signal ports using EM clamp of the EUT in the test frequency range of 150 kHz to 80MHz. The voltage level should be Level 2, 130dB μ V i.e. 3Vrms.

Acceptance criteria for conducted immunity shall be "Normal performance within limits specified by the purchaser".

Conducted & Radiated emission test as per IEC 61000-6-4:

For EMC, the hardware should not degrade the ambient noise level in which they are operating. The hardware will be tested for conducted & radiated emissions so that the emissions are within specified limits. The test shall be conducted as per IEC-61000-6-4 and the limits are given below.

A) Conducted Emissions Test, 150 kHz to 30 MHz:

Frequency Range(MHz)	Applicable Test Limit (dB μ V/m)	
	Quasi-peak,	Average
0.15 to 0.5	79	66
0.5 to 5	73	60
5 to 30	73	60

Note: These are Limit Line for Group 1 & Class A equipment

B) Radiated Emission Test, 30 MHz to 1 GHz

RE as per IEC 61000-6-4: The EUT shall meet the limit at the measurement distance of 10m.

Frequency Range (MHz)	Quasi-Peak Test Limit (dB μ V/m)
30 to 230	40
230 to 1000	47

8.0 Other terms & Conditions:

Inspection & Testing:

Inspection & testing of all items will be carried out by BARC at vendor's works for ascertaining conformity to functional & performance specifications.

Guarantee:

The material should be guaranteed against any defective design & poor workmanship for a period of 12 months from the date of receipt of material at purchaser's end.