राष्ट्रीय प्रौद्योगिकी संस्थान श्रीनगर
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR
(An autonomous Institute of National Importance under the aegis of Ministry of Education, Govt. of India)
हजरतबल, श्रीनगर, जम्मू-कश्मीर, 190006, भारत
Hazratbal, Srinagar Jammu and Kashmir, 190006, INDIA

No. NIT/CPU/23/136
Dated: 26.06.2023

Corrigendum

This has reference to Tender Number NIT/CHS/PMDP/23-24 and Tender ID 2023_NITS_751068_1, dated 28.04.2023, which pertains to the Supply, Installation, Testing, and Commissioning of VRF/VRV-based HVAC Systems, including civil and allied works in the various blocks of NIT Srinagar. In this regard, it is to inform all concerned that certain changes have been made to the commercial parameters and some minor changes in technical specifications, in view of the clarifications/representations received, during the prebid conference. The revised techno-commercial parameters/specifications are annexed to this notice at A and B.

26/6/23

Officer Incharge
Central Purchase Unit

Copy to:

1. Coordinator PMDP for information please.
2. Dean P&D for information please.
3. Chairman CSC with the request to direct the concerned to upload the notice on the Institute website.
4. Concerned file.

Annexure A

Revised Commercial Parameters		
GCC 10.3.3 / Clause 10.3 of Section IV: General Conditions of Contract (GCC)	Payment Conditions / Terms and Mode of Payment	70% of the payment for each BOQ line item shall be released against Material Delivery on pro-rata basis after successful inspection report by the committee.
		20% of the payment for each BOQ line item shall be released against Installation on pro-rata basis.
		10% of the payment for each BOQ line item shall be released against Testing & Commissioning on pro-rata basis.
GCC 6.7	Warranty/ Guarantee/CMC	Warranty period of the supplied products shall be as follows from the date of commissioning at NIT Srinagar. i. Mechanical Component: One (01) Year ii. Electrical Component: As given in technical specifications. OEM Warranty certificates must be submitted by Successful Bidder at the time of delivery of Goods. The seller should guarantee the rectification of goods in case of any break down during the warranty period. Seller should have well established Installation, Commissioning, Training, Troubleshooting and Maintenance Service group in INDIA for attending the after sales service. Details of Service Centres near consignee destinations are to be uploaded along with the bid. Over and above the normal Warranty terms, the successful bidder / OEM shall have to provide Comprehensive Warranty during the entire Standard warranty period as per contract. The comprehensive warranty shall be covering the following scopes: maintenance and replacement of spare parts, components, etc. (Upload an undertaking with the bid, confirming compliance by the bidder, if Bidder is taking onus of this compliance. In case OEM is taking onus of this compliance, OEM undertaking is to be uploaded along with Bidder undertaking). **Comprehensive Maintenance Contract (CMC):** Bidder / OEM has to give an undertaking that after expiry of warranty period, it will provide

		Comprehensive Maintenance Service by entering into the Comprehensive Maintenance Contract (CMC) for next 3 years for the offered products at the rate not more than 5 % of contract price of the items falling under CMC per annum. Buyer reserves the right to enter into a CMC agreement with the Successful Bidder / OEM after expiry of the Warranty period. The payment for the CMC charges would be made Biannually after rendering of the CMC Services of the relevant CMC period. Performance Security of the successful bidder shall be forfeited if it fails to accept the CMC contract when called upon by the buyer. The original Performance Security of contract will be returned only after submission and verification of CMC Performance Security @ 10% of total CMC value valid up to CMC period plus 2 months (if there is no other claim).
Tender Information Summary (TIS) Clause 2.0	Completion time	Nine (9) months from the date of Contract Order.

All other terms and conditions mentioned in the earlier publication will remain the same and continue to be applicable.

Annexure B

Detailed Specs on account of SIT&C of VRF/VRV system in Accounts Section Block of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.	Per HP	28

	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Hi Wall** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall Low gas detection system.		
2.1	2TR	Nos	11
2.2	1.5TR	Nos	1
3	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	28.6 mm dia with 19mm thick insulation	Mtrs.	30
3.2	22.2 mm dia with 19mm thick insulation	Mtrs.	15
3.3	19.1 mm dia with 13mm thick insulation	Mtrs.	40
3.4	15.9 mm dia with 13mm thick insulation	Mtrs.	90
3.5	12.7 mm dia with 13mm thick insulation	Mtrs.	30
3.6	9.5 mm dia with 13mm thick insulation	Mtrs.	125
3.7	6.4 mm dia with 13mm thick insulation	Mtrs.	5
3.8	Cost on account of charging of refrigerant in the piping circuit	Job	2

4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	12
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	20mm dia	Mtrs.	60
6	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 100 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 100A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	06 Amp DP MCB - 12 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	2
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm², copper	Rmt	40
8.2	3c x 1.5 mm², copper	Rmt	700
8.3	2c x 1.5 mm², copper	Rmt	180
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	150
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	50

Detailed Specs on account of SIT&C of VRF/VRV system in Library Block of NIT Srinagar

S. No	DESCRIPTION	Unit	QTY
1	**VRF Outdoor Units** Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. **The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.** It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.	Per HP	60

	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
	Indoor VRF/VRV Units (Nominal Capacity) - Ceiling Mounted Round/4way flow Cassette type Unit		
2	Supply, Installation, testing & commissioning of **Ceiling Mounted Round/4way flow cassette** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have high lift drain pump, and Low gas detection system.		
2.1	1.5TR	Nos	18
2.2	2.0 TR	Nos	4

3	Supply, Installation, testing & commissioning of **Hi Wall** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have Low gas detection system.		
3.1	1.0TR	Nos	5
3.2	1.5TR	Nos	3
3.3	2TR	Nos	4
4	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
4.1	41.3 mm dia with 19mm thick insulation	Mtrs.	25
4.2	34.9 mm dia with 19mm thick insulation	Mtrs.	20
4.3	28.6 mm dia with 19mm thick insulation	Mtrs.	45
4.4	22.2 mm dia with 19mm thick insulation	Mtrs.	40
4.5	19.1 mm dia with 13mm thick insulation	Mtrs.	120
4.6	15.9 mm dia with 13mm thick insulation	Mtrs.	115
4.7	12.7 mm dia with 13mm thick insulation	Mtrs.	110
4.8	9.5 mm dia with 13mm thick insulation	Mtrs.	200
4.9	6.4 mm dia with 13mm thick insulation	Mtrs.	110
4.1	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
6.1	50 mm dia with 9 mm thick insulation	Mtrs.	150
6.2	32 mm dia with 9 mm thick insulation	Mtrs.	75
6.3	20mm dia	Mtrs.	40
7	**Electric Control Panel**		

	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.	Nos	1
	Incomer		
	1No. 200 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.		
	Busbar:		
	TPN aluminium bus bars of minimum of 250A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	63 Amp 4P MCCB with ELCB- 03 No.		
	06 Amp DP MCB - 36 Nos		
8	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
9	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
9.1	4c x 16 mm², copper	Rmt	75
9.2	3c x 1.5 mm², copper	Rmt	1500
9.3	2c x 1.5 mm², copper	Rmt	300
10	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
10.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	350
11	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	100

Detailed Specs on account of SIT&C of VRF/VRV system in Health Center of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
1	**VRF Outdoor Units**	Per HP	24
	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications.		
	The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.		
	The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module.		
	The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.		
	It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted.		
	The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system.		
	The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.		
	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		

	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Hi Wall** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have Low gas detection system.		
2.1	1.0TR	Nos	7
2.2	1.5TR	Nos	4
2.3	2TR	Nos	3
3	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	28.6 mm dia with 19mm thick insulation	Mtrs.	15
3.2	22.2 mm dia with 19mm thick insulation	Mtrs.	20
3.3	19.1 mm dia with 13mm thick insulation	Mtrs.	45
3.4	15.9 mm dia with 13mm thick insulation	Mtrs.	25
3.5	12.7 mm dia with 13mm thick insulation	Mtrs.	55
3.6	9.5 mm dia with 13mm thick insulation	Mtrs.	90
3.7	6.4 mm dia with 13mm thick insulation	Mtrs.	45
3.8	Cost on account of charging of refrigerant in the piping circuit	Job	1
4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	14
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	20mm dia	Mtrs.	60
6	**Electric Control Panel**		

	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.	Nos	1
	Incomer		
	1No. 120 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.		
	Busbar:		
	TPN aluminium bus bars of minimum of 150A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	06 Amp DP MCB - 14 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm², copper	Rmt	30
8.2	3c x 1.5 mm², copper	Rmt	700
8.3	2c x 1.5 mm², copper	Rmt	130
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	140
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	70

Detailed Specs on account of SIT&C of VRF/VRV system in Building near Health Center of NIT Srinagar

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. **The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.** It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature. The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency. The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity. The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant. The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation. The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing. Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.	Per HP	22

	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Ceiling Mounted Round/4way flow cassette** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have high lift drain pump, and Low gas detection system.		
2.1	3.0 TR	Nos	6
3	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	28.6 mm dia with 19mm thick insulation	Mtrs.	25
3.2	22.2 mm dia with 19mm thick insulation	Mtrs.	10
3.3	19.1 mm dia with 13mm thick insulation	Mtrs.	10
3.4	15.9 mm dia with 13mm thick insulation	Mtrs.	45
3.5	12.7 mm dia with 13mm thick insulation	Mtrs.	25
3.6	9.5 mm dia with 13mm thick insulation	Mtrs.	45
3.7	Cost on account of charging of refrigerant in the piping circuit	Job	1
4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	6
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	50 mm dia with 9 mm thick insulation	Mtrs.	40
5.2	32 mm dia with 9 mm thick insulation	Mtrs.	30
6	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	06 Amp DP MCB - 6 Nos		

7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm², copper	Rmt	30
8.2	3c x 1.5 mm², copper	Rmt	170
8.3	2c x 1.5 mm², copper	Rmt	60
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	70
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	25

Detailed Specs on account of SIT&C of VRF/VRV system in Administrative Block of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
1	**VRF Outdoor Units** Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. **The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.** It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature. The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency. The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity. The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.	Per HP	92

	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Hi Wall** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have Low gas detection system.		
2.1	1.5TR	Nos	40
2.2	2TR	Nos	4
3	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	41.3 mm dia with 19mm thick insulation	Mtrs.	50
3.2	34.9 mm dia with 19mm thick insulation	Mtrs.	80
3.3	28.6 mm dia with 19mm thick insulation	Mtrs.	100
3.4	22.2 mm dia with 19mm thick insulation	Mtrs.	20
3.5	19.1 mm dia with 13mm thick insulation	Mtrs.	150
3.6	15.9 mm dia with 13mm thick insulation	Mtrs.	90
3.7	12.7 mm dia with 13mm thick insulation	Mtrs.	180
3.8	9.5 mm dia with 13mm thick insulation	Mtrs.	70
3.9	6.4 mm dia with 13mm thick insulation	Mtrs.	130
3.10	Cost on account of charging of refrigerant in the piping circuit	Job	1
4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	44
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	20mm dia	Mtrs.	120
6	**Electric Control Panel**		

	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 250 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 300A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 06 No.		
	06 Amp DP MCB - 44 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	2
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm^2, copper	Rmt	120
8.2	3c x 1.5 mm^2, copper	Rmt	3400
8.3	2c x 1.5 mm^2, copper	Rmt	300
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	350
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	200

Detailed Specs on account of SIT&C of VRF/VRV system in TEQUIP Lab of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications.	Per HP	72
	The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.		
	The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module.		
	The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.		
	It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted.		
	The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system.		
	The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.		
	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		

	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Hi Wall** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have Low gas detection system.		
2.1	1.5TR	Nos	9
2.2	2TR	Nos	20
3	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	41.3 mm dia with 19mm thick insulation	Mtrs.	10
3.2	34.9 mm dia with 19mm thick insulation	Mtrs.	45
3.3	28.6 mm dia with 19mm thick insulation	Mtrs.	90
3.4	22.2 mm dia with 19mm thick insulation	Mtrs.	15
3.5	19.1 mm dia with 13mm thick insulation	Mtrs.	75
3.6	15.9 mm dia with 13mm thick insulation	Mtrs.	125
3.7	12.7 mm dia with 13mm thick insulation	Mtrs.	75
3.8	9.5 mm dia with 13mm thick insulation	Mtrs.	100
3.9	6.4 mm dia with 13mm thick insulation	Mtrs.	40
3.1	Cost on account of charging of refrigerant in the piping circuit	Job	1
4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	29
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	20mm dia	Mtrs.	90
6	**Electric Control Panel**		

	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 160 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 200A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	63 Amp 4P MCCB with ELCB- 03 No.		
	32 Amp 4P MCCB with ELCB- 01 No.		
	06 Amp DP MCB - 30 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	2
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm^2, copper	Rmt	40
8.2	3c x 1.5 mm^2, copper	Rmt	1120
8.3	2c x 1.5 mm^2, copper	Rmt	150
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	180
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	100

Detailed Specs on account of SIT&C of VRF/VRV system in Indus hostel of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
1	**VRF Outdoor Units**	Per HP	32
	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications.		
	The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.		
	The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module.		
	The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.		
	It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted.		
	The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system.		
	The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.		
	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		

	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, installation, testing and commissioning of VRF **Floor mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for operationon three phase AC supply complete as required. The unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
2.1	8 TR	Nos	3
3	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports duly insulated with 19mm thick elastomeric nitrile rubber insulation (internal/external) etc. as per approved shop drawings and specifications of following sheet thickness complete as required.		
3.1	Thickness 0.80 mm sheet	Sqm	125
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	5
5	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
5.1	34.9 mm dia with 19mm thick insulation	Mtrs.	20
5.2	28.6 mm dia with 19mm thick insulation	Mtrs.	20
5.3	22.2 mm dia with 19mm thick insulation	Mtrs.	9
5.4	19.1 mm dia with 13mm thick insulation	Mtrs.	30
5.5	15.9 mm dia with 13mm thick insulation	Mtrs.	15
5.6	12.7 mm dia with 13mm thick insulation	Mtrs.	15
5.7	9.5 mm dia with 13mm thick insulation	Mtrs.	10
5.8	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	3
7	**Drain Piping for VRF IDUs**		

	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
7.1	40 mm dia with 9 mm thick insulation	Mtrs.	20
8	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 160 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 200A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	63 Amp 4P MCCB with ELCB- 01 No.		
	32 Amp 4P MCCB with ELCB- 01 No.		
	16 Amp 3P MCCB - 03 Nos		
9	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
10	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
10.1	4c x 16 mm^2, copper	Rmt	25
10.2	4c x 4 mm^2, copper	Rmt	60
10.3	2c x 1.5 mm^2, copper	Rmt	25
11	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
11.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	35
12	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	35

Detailed Specs on account of SIT&C of VRF/VRV system in Girls hostel of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications.	Per HP	20
	The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.		
	The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module.		
	The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.		
	It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted.		
	The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system.		
	The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.		
	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		

	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Hi Wall** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have Low gas detection system.		
2.1	2TR	Nos	8
	Refrigerant Piping for VRF system		
3	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	28.6 mm dia with 19mm thick insulation	Mtrs.	20
3.2	22.2 mm dia with 19mm thick insulation	Mtrs.	25
3.3	19.1 mm dia with 13mm thick insulation	Mtrs.	10
3.4	15.9 mm dia with 13mm thick insulation	Mtrs.	35
3.5	12.7 mm dia with 13mm thick insulation	Mtrs.	5
3.6	9.5 mm dia with 13mm thick insulation	Mtrs.	45
3.7	Cost on account of charging of refrigerant in the piping circuit	Job	1
4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	8
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	20mm dia	Mtrs.	20
6	**Electric Control Panel**		

	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.	Nos	1
	Incomer		
	1No. 60 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.		
	Busbar:		
	TPN aluminium bus bars of minimum of 100A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	63 Amp 4P MCCB with ELCB- 01 No.		
	06 Amp DP MCB - 08 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parametersof all Indoor units and Outdoor units.	Nos	1
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm^2, copper	Rmt	20
8.2	3c x 1.5 mm^2, copper	Rmt	221
8.3	2c x 1.5 mm^2, copper	Rmt	40
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	50
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	20

Detailed Specs on account of SIT&C of VRF/VRV system in Jehlum hostel of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.	Per HP	36

	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Ceiling Mounted Round/4way flow cassette** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have high lift drain pump, and Low gas detection system.		
2.2	2.0 TR	Nos	4
3	Supply, installation, testing and commissioning of VRF **Ceiling mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for operationon single phase AC supply 230V±10%, 50Hz complete as required. The unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
3.1	4.5TR	Nos	4
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	2
5	Supplying & fixing of powder coated extruded aluminium Return Air/Exhaust Air Grills with louvers but without volume control dampers complete as required.	Sqm	2
	Refrigerant Piping for VRF system		

6	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
6.1	41.3 mm dia with 19mm thick insulation	Mtrs.	10
6.2	34.9 mm dia with 19mm thick insulation	Mtrs.	20
6.3	28.6 mm dia with 19mm thick insulation	Mtrs.	25
6.4	22.2 mm dia with 19mm thick insulation	Mtrs.	20
6.5	19.1 mm dia with 13mm thick insulation	Mtrs.	10
6.6	15.9 mm dia with 13mm thick insulation	Mtrs.	110
6.7	12.7 mm dia with 13mm thick insulation	Mtrs.	10
6.8	9.5 mm dia with 13mm thick insulation	Mtrs.	75
6.9	Cost on account of charging of refrigerant in the piping circuit	Job	1
7	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	8
8	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
8.1	40 mm dia with 9 mm thick insulation	Mtrs.	30
8.2	32 mm dia with 9 mm thick insulation	Mtrs.	30
9	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 100 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150 A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		

	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	16 Amp DP MCB - 08 Nos		
10	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
11	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
11.1	4c x 16 mm², copper	Rmt	20
11.2	3c x 1.5 mm², copper	Rmt	225
11.3	2c x 1.5 mm², copper	Rmt	70
12	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
12.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	80
13	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	25

Detailed Specs on account of SIT&C of VRF/VRV system in Jehlum Extension of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.	Per HP	36

	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Ceiling Mounted Round/4way flow cassette** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have high lift drain pump, and Low gas detection system.		
2.1	2.5 TR	Nos	10
3	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	41.3 mm dia with 19mm thick insulation	Mtrs.	15
3.2	34.9 mm dia with 19mm thick insulation	Mtrs.	15
3.3	28.6 mm dia with 19mm thick insulation	Mtrs.	30
3.4	22.2 mm dia with 19mm thick insulation	Mtrs.	10
3.5	19.1 mm dia with 13mm thick insulation	Mtrs.	35
3.6	15.9 mm dia with 13mm thick insulation	Mtrs.	70
3.7	12.7 mm dia with 13mm thick insulation	Mtrs.	15
3.8	9.5 mm dia with 13mm thick insulation	Mtrs.	50
3.9	Cost on account of charging of refrigerant in the piping circuit	Job	1

4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	10
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	50 mm dia with 9 mm thick insulation	Mtrs.	40
5.3	32 mm dia with 9 mm thick insulation	Mtrs.	50
6	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150 A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	16 Amp DP MCB - 10 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm^2, copper	Rmt	30
8.2	3c x 1.5 mm^2, copper	Rmt	330
8.3	2c x 1.5 mm^2, copper	Rmt	75
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	85
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	25

Detailed Specs on account of SIT&C of VRF/VRV system in Chenab hostel of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature. The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency. The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity. The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant. The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation. The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing. Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.	Per HP	32

	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, installation, testing and commissioning of VRF **Floor mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for operationon three phase AC supply complete as required. The unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
2.1	8 TR	Nos	3
3	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports duly insulated with 19mm thick elastomeric nitrile rubber insulation (internal/external) etc. as per approved shop drawings and specifications of following sheet thickness complete as required.		
3.1	Thickness 0.80 mm sheet	Sqm	125
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	5
5	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
5.1	34.9 mm dia with 19mm thick insulation	Mtrs.	20
5.2	28.6 mm dia with 19mm thick insulation	Mtrs.	20
5.3	22.2 mm dia with 19mm thick insulation	Mtrs.	9
5.4	19.1 mm dia with 13mm thick insulation	Mtrs.	30
5.5	15.9 mm dia with 13mm thick insulation	Mtrs.	15
5.6	12.7 mm dia with 13mm thick insulation	Mtrs.	15
5.7	9.5 mm dia with 13mm thick insulation	Mtrs.	10
5.8	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	3
7	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
7.1	40 mm dia with 9 mm thick insulation	Mtrs.	20
8	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		

	1No. 160 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 200A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	63 Amp 4P MCCB with ELCB- 01 No.		
	34 Amp 4P MCCB with ELCB- 01 No.		
	16 Amp 3P MCCB - 03 Nos		
9	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
10	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
10.1	4c x 16 mm^2, copper	Rmt	25
10.2	4c x 4 mm^2, copper	Rmt	60
10.3	2c x 1.5 mm^2, copper	Rmt	25
11	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
11.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	35
12	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	35

Detailed Specs on account of SIT&C of VRF/VRV system in Drawing Hall No:-1 of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.	Per HP	34

	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, installation, testing and commissioning of VRF **Floor mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for three phase operation unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
2.1	12.8 TR	Nos	2
3	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports , duly insulated with 19mm thick elastomeric nitrile rubber insulation (internal/external) etc. as per approved shop drawings and specifications of following sheet thickness complete as required.		
3.1	Thickness 0.80 mm sheet	Sqm	110
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	4
5	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		

	Thickness of pipes should be as per VRF manufacturer's recommendation.		
5.1	34.9 mm dia with 19mm thick insulation	Mtrs.	10
5.2	28.6 mm dia with 19mm thick insulation	Mtrs.	30
5.3	19.1 mm dia with 13mm thick insulation	Mtrs.	15
5.4	15.9 mm dia with 13mm thick insulation	Mtrs.	25
5.5	12.7 mm dia with 13mm thick insulation	Mtrs.	10
5.6	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	2
7	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
7.1	40 mm dia with 9 mm thick insulation	Mtrs.	20
8	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	22 Amp 4P MCCB - 02 Nos		
9	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all indoor/outdoor units.	Nos	1
10	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
10.1	4c x 16 mm², copper	Rmt	30
10.2	4c x 6 mm², copper	Rmt	60

10.3	2c x 1.5 mm^2, copper	Rmt	30
11	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
11.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	40
12	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	30

Detailed Specs on account of SIT&C of VRF/VRV system in Drawing Hall No:-2 of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.	Per HP	34

	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, installation, testing and commissioning of VRF **Floor mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for three phase operation unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
2.1	12.8 TR	Nos	2
3	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports , duly insulated with 19mm thick elastomeric nitrile rubber insulation (internal/external) etc. as per approved shop drawings and specifications of following sheet thickness complete as required.		
3.1	Thickness 0.80 mm sheet	Sqm	110
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	4
	Refrigerant Piping for VRF system		

5	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
5.1	34.9 mm dia with 19mm thick insulation	Mtrs.	10
5.2	28.6 mm dia with 19mm thick insulation	Mtrs.	30
5.3	19.1 mm dia with 13mm thick insulation	Mtrs.	15
5.4	15.9 mm dia with 13mm thick insulation	Mtrs.	25
5.5	12.7 mm dia with 13mm thick insulation	Mtrs.	10
5.6	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	2
7	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
7.1	40 mm dia with 9 mm thick insulation	Mtrs.	20
8	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		

	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	22 Amp 4P MCCB - 02 Nos		
9	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all indoor/outdoor units.	Nos	1
10	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
10.1	4c x 16 mm^2, copper	Rmt	30
10.2	4c x 6 mm^2, copper	Rmt	60
10.3	2c x 1.5 mm^2, copper	Rmt	30
11	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
11.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	40
12	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	30

Detailed Specs on account of SIT&C of VRF/VRV system in Drawing Hall No:-3 of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU. It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings. The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency. The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.	Per HP	34

	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, installation, testing and commissioning of VRF **Floor mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for three phase operation unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
2.1	12.8 TR	Nos	2
3	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports , duly insulated with 19mm thick elastomeric nitrile rubber insulation (internal/external) etc. as per approved shop drawings and specifications of following sheet thickness complete as required.		
3.1	Thickness 0.80 mm sheet	Sqm	110
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	4
5	**Refrigerant Piping for VRF system**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		

5.1	34.9 mm dia with 19mm thick insulation	Mtrs.	10
5.2	28.6 mm dia with 19mm thick insulation	Mtrs.	30
5.3	19.1 mm dia with 13mm thick insulation	Mtrs.	15
5.4	15.9 mm dia with 13mm thick insulation	Mtrs.	25
5.5	12.7 mm dia with 13mm thick insulation	Mtrs.	10
5.6	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	2
7	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
7.1	40 mm dia with 9 mm thick insulation	Mtrs.	20
8	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	22 Amp 4P MCCB - 02 Nos		
9	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all indoor/outdoor units.	Nos	1
10	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
10.1	4c x 16 mm^2, copper	Rmt	30
10.2	4c x 6 mm^2, copper	Rmt	60
10.3	2c x 1.5 mm^2, copper	Rmt	30
11	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		

11.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	40
12	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	30

Detailed Specs on account of SIT&C of VRF/VRV system in Prefab Dinning Hall of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications. The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site. The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module. **The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.** It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted. The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system/Centralized remote controller for Air-conditioning system. The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.	Per HP	30

	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		
	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, Installation, testing & commissioning of **Ceiling Mounted Round/4way flow cassette** type Unit of suitable capacity suitable to operate from 230+10% volt, 50 HZ, 1 phase power supply with cordless remote control, fittings & required cable to connect indoor unit to socket.Refrigerant Pipe size and gas quantity should suit to the copper pipe length at actual.The capacity guarantee should be ensured by the contractor/manufacturer.Each unit shall have high lift drain pump, and Low gas detection system.		
2.1	4.0 TR	Nos	6
	Refrigerant Piping for VRF system		
3	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		

	Thickness of pipes should be as per VRF manufacturer's recommendation.		
3.1	34.9 mm dia with 19mm thick insulation	Mtrs.	20
3.2	28.6 mm dia with 19mm thick insulation	Mtrs.	15
3.3	22.2 mm dia with 19mm thick insulation	Mtrs.	10
3.4	19.1 mm dia with 13mm thick insulation	Mtrs.	30
3.5	15.9 mm dia with 13mm thick insulation	Mtrs.	45
3.6	12.7 mm dia with 13mm thick insulation	Mtrs.	15
3.7	9.5 mm dia with 13mm thick insulation	Mtrs.	35
3.8	Cost on account of charging of refrigerant in the piping circuit	Job	1
4	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	6
5	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
5.1	50 mm dia with 9 mm thick insulation	Mtrs.	30
5.2	32 mm dia with 9 mm thick insulation	Mtrs.	30
6	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150 A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	32 Amp 4P MCCB with ELCB- 02 No.		
	16 Amp DP MCB - 6 Nos		
7	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1

8	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
8.1	4c x 16 mm^2, copper	Rmt	30
8.2	3c x 1.5 mm^2, copper	Rmt	200
8.3	2c x 1.5 mm^2, copper	Rmt	65
9	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
9.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	75
10	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	25

Detailed Specs on account of SIT&C of VRF/VRV system in Tawi Dinning Hall of NIT Srinagar.

S. No	DESCRIPTION	Unit	QTY
	VRF Outdoor Units		
1	Supply, Installation, testing & commissioning of Variable refrigerant flow modular type air-conditioning system suitable to operate from 415+10% volt, 50 Hz,3 phase AC power supply for **Cooling & Heating** by using inverter driven capacity control compressors complete with individual controller and fittings with necessary wiring, connection & termination, painted MS frame for outdoor unit etc. as per quantity given below including full charging of R-410A refrigerant gas complete as per specifications.	Per HP	32
	The outdoor unit shall be factory assembled, weather proof casing (Material of construction of casing shall be vendor's standard design), constructed from heavy gauge GI sheets steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.		
	The inverter technology based D.C Twin Rotary / Scroll compressor modular type VRF equipment should of designed, so that refrigerant piping between outdoor units and furthest indoor unit shall be extendable up to 225m. Allowable level difference between outdoor & indoor unit shall be 50m in case of outdoor unit on top & 40m in case of outdoor unit at bottom. Allowable level difference between two indoor units connected to same outdoor unit shall be upto 15m. All the outdoor units comprising of multiple modules should have 100% inverter type compressor in each module.		
	The units should comply with minimum COP of 3.65 at 100% load (Heating mode) and minimum 6.5 at 50% load in cooling mode at following conditions: 0 Deg C to 40 Deg C in cooling mode and -20 Deg C to 20 Deg C in heating mode. IEER not less than 6.5. Anti Ice Circuit/ Auto defrost kit if required to operate at this temperature in winter to be provided in ODU.		
	It should also be provided with duty cycling for D.C inverter Twin Rotary/ Scroll compressors capable of changing the rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life or similar features if available in D.C Twin Rotary / Scroll will also be accepted.		
	The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system.		
	The machine must have a sub cool feature to use coil surface more effectively through proper circuit/ bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.		
	The outdoor unit should be fitted with low noise level and should not be more than 67 db (A) at normal operation when measured at a point 1 mtr. In front of the unit at a height of 1.5 mtrs.The outdoor unit should be fitted with low noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.		
	The outdoor unit shall have refrigerant cool PCB chamber for better operation at high ambient temperature.		
	The outdoor unit shall have feature to change the evaporative temperature with respect to load for better comfort and energy efficiency.		
	The systems shall have free phase technology & operation shall be continuous in case of phase reverse in supply electricity.		
	The system shall have automatic refrigerant charge function for optimal charging for additional refrigerant.		

	The fan static pressure of the outdoor unit shall be minimum 75 Pa to avoid hot air recirculation.		
	The compressor is inverter based D.C Twin Rotary / Scroll compressor system shall be highly efficient. The system should response efficiently in accordance to the variation in cooling or heating load requirement. All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters shall be provided in the compressor casing.		
	Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths. The system shall have oil recovery cycle of 8 or more hours. The system must be provided with oil balancing circuit to avoid poor lubrication.		
	Final Configuration/ selection of module for ODUs based on piping circuit to provide sufficient redundancy in system to be done by contractor as per floor & project requirement.		
2	Supply, installation, testing and commissioning of VRF **Floor mounted ductable** type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan / dynamically balanced blower, multi speed motor, coil section with DX copper coil, electronic expansion valve, corded remote control with complete wiring, fittings & required cable to connect indoor unit to socket., outer cabinet, vibration isolators, drain pan, other necessary supports, canvas connection for duct connection etc., suitable for operationon single phase AC supply 230V±10%, 50Hz complete as required. The unit shall have automatic force shut down provision in case of fire on receiveing signal from BMS System.Each unit shall have high lift drain pump.		
2.1	6 TR	Nos	4
3	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports duly insulated with 19mm thick elastomeric nitrile rubber insulation (internal/external) etc. as per approved shop drawings and specifications of following sheet thickness complete as required.		
3.1	Thickness 0.80 mm sheet	Sqm	40
4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm	4
5	**<u>Refrigerant Piping for VRF system</u>**		
	Supply & Installation of interconnecting suitable sizes of one end expanded refrigerant copper pipe work, insulated with 13mm thick (pipe size upto 19.1mm dia) & 19mm thick (pipe size above 19.1mm dia) with XPLE Class-O tubular/ closed cell electrometric nitrile rubber tubular insulation sleeves sections of specified thickness between each set of indoor & outdoor units with outer mechanical protection of aluminum cladding for all exposed pipes as per specification. All piping inside the room shall be properly fixed/supported with suitable size of clamp/ M.S. hanger and all external piping shall run in M.S. painted cable tray etc. as reqd.		
	Piping vaccumiazation and Nitrogen testing to be done by contractor and price for the same to be included		
	Thickness of pipes should be as per VRF manufacturer's recommendation.		
5.1	34.9 mm dia with 19mm thick insulation	Mtrs.	10
5.2	28.6 mm dia with 19mm thick insulation	Mtrs.	30
5.3	19.1 mm dia with 13mm thick insulation	Mtrs.	40
5.4	15.9 mm dia with 13mm thick insulation	Mtrs.	20
5.5	12.7 mm dia with 13mm thick insulation	Mtrs.	20
5.6	9.5 mm dia with 13mm thick insulation	Mtrs.	35

5.7	Cost on account of charging of refrigerant in the piping circuit	Job	1
6	Supply, Installation, testing and commissioning of necessary fittings, **Y-joints** and headers etc.	Set	4
7	**Drain Piping for VRF IDUs**		
	Providing & fixing of heavy duty PVC Pipe complete with fittings, supports as per specifications and duly insulated with 6 mm thickness of XPLE Class-O tubular/ closed cell tubular nitrile rubber as required & as per specifications.		
7.1	40 mm dia with 9 mm thick insulation	Mtrs.	20
8	**Electric Control Panel**		
	Supplying, installation, testing & commissioning of cubical type wall mounted power distribution panels suitable for 415V, 3 Phase, 4Wire 50 Hz AC supply system fabricated in compartmentalized design from CRCA sheet steel of 2mm thick for frame work and covers, 3 mm thick for gland plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having suitable capacity extensible type FP Aluminium Alloy bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MV A for I Sec. with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with 1.5 sq.mm.		
	Incomer		
	1No. 120 Amps Four Pole, MCCB with thermal & magnetic releases.with 3 Nos. R,Y,B Indication Lamps with 2A back up SP MCB with ON indication.MCCB shall be provided with spreader link and direct rotary handle.	Nos	1
	Busbar:		
	TPN aluminium bus bars of minimum of 150A capacity with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc.		
	Outgoings		
	Supplying and fixing following outgoing MCCB/MCB including connection, inter-connection etc. with suitable size of wires complete as required.(Each MCCB to be provided with ON indiation with 2A backup SP MCB)		
	63 Amp 4P MCCB with ELCB- 01 No.		
	32 Amp 4P MCCB with ELCB- 01 No.		
	22 Amp 3P MCCB - 04 Nos		
9	**Centralised Remote Controller:-** Supply, installation, testing & commissioning of touch screen type centralised remote controller along with control wiring etc all complete cabable of monitoring parameters of all Indoor units and Outdoor units.	Nos	1
10	**Electric Cables:-**Providing and fixing of electric power cabling from distribution panel to floor panel and from floor panels to outdoor units suitable for 415v, 3 phase, 50 Hz and from floor panels to individual indoor units suitable for single phase supply.		
10.1	4c x 16 mm^2, copper	Rmt	30
10.2	4c x 6 mm^2, copper	Rmt	75
10.3	2c x 1.5 mm^2, copper	Rmt	50
11	**Cable Trays:-** Providing and fixing of hot dip galvanised perforated/ladder cable Trays of following sizes:		
11.1	150mm in width and 50mm depth (16SWG) perforated type	Rmt	60
12	Cost on account of providing & fixing of ACP conduit to completely conceal the refrigerant piping circuit including cable trays etc.	Sqm	75

Detailed Specifications for the Construction of 800 KVA sub station for Central heating system near Electric M&R Department at NIT Srinagar.

PART(A)

S.No.	Description of the Item	Quantity	Unit
01.	Earth work in excavation by mechanical means (Hydraulic excavator) manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil. 2×31′.6″×3′.6″×1′.8″= 366.03 cft. 1×19′.6″×3′.6″×1′.8″=113.29 cft. 1×74′.0″×2′.6″×1′.8″ =307.10 cft. 2×36′.0″×3′.6″×1′.8″= 418.32 cft. 1×22′.6″×3′.6″×1′.8″ =200.86 cft. 2×11′.0″×3′.6″×1′.8″= 127.82 cft. =1463.28 cft or 41.43 cum. (A)	41.43	Cum
02.	Providing & laying of **Stone Soling** tightly hand packed including watering, ramming & carriage from source to site of work complete job. 100 mm nominal size. Quantity. V. No (1A) i.e 1463.28 cft÷1′.8″×0′.6″= 440.73cft. Or 12.48 cum D/d 12.50 for voids= -1.56 cum Total = 10.92 cum	10.92	Cum
03.	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering – All work up to plinth level : 1:4:8 (1 Cement : 4 coarse sand (zone-III) : 8 graded stone aggregate 40 mm nominal size) Including carriage. Quantity. V. No (2A) i.e 440.74 cft÷6′.4″ = 290.88 cft. or 8.23 cum.	8.23	Cum
04.	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement – All work up to plinth level. **R.C.C** 1:1.5:3 (1 cement : 1.5 coarse sand (zone-III): 3 graded stone aggregate 20 mm nominal size) Including carriage. **Strip Foundation:-** Quantity. 1×199′.0″×3′.6″×0′.10″=578.09 cft. 1×74′.0″×2′.6″×0′.10″ =153.55 cft. =731.64 cft. Or =20.71 cum.	20.71	Cum
05.	**P.C.C (1:2:4)** **Foundation Wall:-** 2×31′.6″×2′.6″×2′.6″= 393.75 cft. 1×19′.6″+2′.6″×2′.6″= 121.87 cft. 2×31′.0″+2′.0″×2′.6″ = 310.00 cft. 1×20′.0″+2′.0″×2′.6″= 100.00 cft. 2×36′.0″+2′.6″×2′.6″ = 450.00 cft. 1×22′.6″+2′.6″×2′.6″= 140.62 cft. 2×35′.6″+2′.0″×2′.6″ = 350.00 cft. 1×23′.6″+2′.0″×2′.6″= 115.00 cft. 2×11′.6″+2′.6″×2′.6″ = 143.75 cft. 2×11′.6″+2′.0″×2′.6″ = 110.00 cft.	76.30	Cum

	$\overline{1}$×74′.6″+2′.0″×2′.6″= 370.00 cft. $\overline{1}$×24′.6″+1′.6″×2′.6″= 90.00 cft. = 2694.99 cft or 76.30 cum		
06.	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement – All work up to plinth level : 1:2:4 (1 cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 20 mm nominal size) R.C.C Slab:- $\overline{1}$×30′.0″×25′.0″×0′.6″=375.00 cft. $\overline{1}$×34′.6″×27′.6″×0′.6″=474.37 cft. $\overline{1}$×11′.0″×11′.0″×0′.6″=60.50 cft. = 909.87 cft or 25.76 cum	25.76	Cum
07.	Steel reinforcement for R.C.C. work including straightening, cutting ,bending, placing in position and binding all complete upto plinth level. "Cold twisted bars" Strip:-10mm $\overline{2}$×$\overline{404}$×4′.8″=3765.28 rft. $\overline{7}$×$\overline{2}$×199′.0″=2786.00 rft. Slab:- 10 mm dia M-bar 5″ c/c $\overline{2}$×$\overline{47}$×25′.0″= 3700.00 rft. 7″ c/c $\overline{2}$×$\overline{44}$×30′.0″= 2644.00 rft. $\overline{2}$×$\overline{85}$×34′.6″= 5865.00 rft. $\overline{2}$×$\overline{60}$×27′.6″= 3300.00 rft. $\overline{2}$× $\overline{2}$×$\overline{27}$×11′.0″= 2644.00 rft. =23248.28 rft. Or 7087.89 Rm@0.62 kg/Rm=4394.49 kg.	4394.49	Kg
08.	Centering and shuttering including strutting, propping etc. and removal of form for Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc. $\overline{1}$×199′.0″×0′.10″= 165.17 sft. $\overline{2}$×74′.0″×0′.10″= 122.84 sft. $\overline{1}$×990′.0″×2′.6″= 2475.00 sft. $\overline{1}$×23′.6″×30′.0″= 705.00 sft. $\overline{1}$×34′.6″×28′.0″= 966.00 sft. $\overline{1}$×9′.6″×11′.0″= 104.50 sft. $\overline{1}$×292′.0″×0′.6″= 146.00 sft. =4684.51 sft or 435.36 Sqm.	435.36	Sqm
09.	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In stringers, treads, landings etc. of stair cases, including use of chequered plate wherever required, all complete. (chequered plate) For Duet:- $\overline{1}$×635′.0″= 193.59 Rm. (ISMC: 75)@9.14 kg/Rm=1769.41 kg 60′.0″×4′.0″= 240.00 or 22.30 sqm @ 65.91 kg/sqm = 1469.79 Kg. total =3239.20 kg	3239.20	Kg.
10.	Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete. Hot finished welded type tubes. 100×100×6mm $\overline{20}$×20′.0″= 400.00 rft., 121.95 Rm.	2070.73	Kg.

	Total Quantity= 2070.73 Kg.		
11	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. 1×37′.0″×29′.0″= 1073.00 sft. 1×47′.0″×24′.0″= 1128.00 sft. 1×14′.0″×14′.0″= 196.00 sft. = 2397.00 sft @ 5.50 kg/Sft. Subjected to complete detail in bill as per actual = 13183.50 Kg.	13183.50	Kg.
12.	Providing and Fixing of poly coated sheets corrugated 0.50 mm thick complete in all respects. 2×37′.6″×16′.6″= 1237.50 sft. 2×47′.6″×14′.9″= 1401.25 sft. 1×14′.6″×15′.9″= 228.37 sft. =2867.12 Sft. or 266.46 Sqm.+143.12 sqm For walls 1×110′×14 =1540.00 sft. or 143.12 sqm	409.58	Sqm
13.	Providing & fixing poly coated **plain sheet** 0.80 mm thick ridge. 1×37′.9″×1′.6″= 56.62 sft. 1×47′.0″×1′.6″= 71.62 sft. =128.24 sft. or 11.92 Sqm	11.92	Sqm.
14.	Providing and fixing of **Plain Eaves Boarding** complete job including two coats of painting and one coat of priming **(1st Class Budloo wood)** (i) 300 x 30 mm 2×37′.6″=75.00 Rft. 4×16′.6″=66.00 Rft. 2×47′.0″=94.00 Rft. 4×14′.9″=59.00 Rft. 2×14′.6″=29.00 Rft. =323.00 RTft. or 98.47 Rm.	98.47	Rm.

Detailed Specifications for Removing of existing Gypsum board ceiling in Library Ground and First floor hall for laying cables etc for central heating system at NIT Srinagar including provide and fixing of new Gypsum board ceiling.

PART(B)

S.No.	Description of the Item	Unit	Quantity
01.	Dismantling of Gypsum board ceiling including stacking of serviceable material and disposal of unserviceable material,complete job. $\overline{3}$×76′.0″×8′.0″=1824.00 sft $\overline{3}$×34′.0″×8′.0″=816.00 sft =2640.00 sft or 245.35 sqm.	Sqm.	245.35
02.	Providing and fixing 10mm to 12 mm thick Gypsum board ceiling (white) 2′.0″×2′.0″ of same pattern as per existing complete in all respects include cost of frame work. $\overline{3}$×76′.0″×8′.0″=1824.00 $\overline{3}$×34′.0″×8′.0″=816.00 sft =2640.00 sft or 245.35 sqm.	Sqm.	245.35

Detailed Specs for creation of 800kVA Sub-Station along with Installation of DG Sets for Central Heating System of the Institute.

S.No	Particulars	Qty
1	**800 kVA OLTC Transformer with RTCC panel:** Supplying, Erection, Testing & Commissioning of 800kVA outdoor type ONAN cooling transformer with copper winding having OLTC with RTCC / AVR tap changing arrangement , star-delta 11 Kv/433 V, 3 ph 50 Hz vector group Dyn11 , class 2 , winding designed from 6kV to 12 kV, complete with rating and diagram plate, earthing terminals 2 Nos, lifting lugs, air release hole with plug, dehydrating silica gel breather, prismatic oil level gauge, oil filling hole with plug on conservator, oil conservator with drain plug, thermometer pocket, jacking lugs, bottom drain cum filter plug, top filter valve, 4 Nos bidirectional rollers, explosion vent with diaphragm, marshalling box, 150mm OTI with alarm trip, Buchholz relay with alarm & trip, 2 Nos shut off valves for Buchholz relay, magnetic oil level gauge,Detachable radiators with terminal box on HV side suitable for termination of one No 3 x 300 sqmm HT cable and terminal box on LV side suitable for termination of (2 Nos on each phase and neutral) 1 x 300sqmm LT cable, confirming to IS: 2026 with first filling of oil as per IS: 335 etc complete as required.(Transformers are to be installed on RCC foundation of 1.0 Mtr Height from the sub- station floor level). Transformer must be designed and tested to the standards of IS: 2026, BS: 171.The job includes all controlling wiring from transformer to VCB panel and RTCC panel. complete in all respects. Warranty : 3 Years	1 No
i	800kVA oil type OLTC based transformer with RTCC panel.	
ii	Input operating voltage 11kV, output 415V	
iii	Breaking = 20kA RMS	
iv	Short time withstand for 3 sec= 20kA rms	
v	Insulation level = 75kV peak	
vi	**Neutral point is to be double earthed.**	
2	**HT PANEL**	
	Supplying, installation, testing and commissioning of indoor type, IP 52, metal clad, floor mounted 11 kV VCB Panel with 1 Nos VCB, totally enclosed, with removable Gl Plates on top & bottom of the panel, all mounting plates shall be GI sheets. horizontal drawout, horizontal / vertical isolation type breaker as pe IS 13118, IEC 62271 - 100-200 as amended upto date, having capacities as mentioned below, single break, trip free mechanism, motorized/manual charged and manually closing breaker suitable for use on 11 kV, 3 -Phase, 50 Hz, AC supply with short circuit fault level of 350 MVA, complete with self contained fully interlocked rack in and rack out mechanism, air insulated but encapsulated copper busbars of 630 A capacity, Power frequency withstand voltage: 35 kV, Impulse withstand voltage: 95 kV Peak .Breaker featured with mechanical/electrical ON/OFF indicator with hand trip device, spring release coil, shunt trip coil and auxiliary switch suitable nos of NO + 4 NC and equipped with following switchgear and accessories i/c connections suitable for 3 X 300 sq mm XLPE 11 kV cable (cable entry from bottom), as per detailed specifications complete as required with two years warranty on all below mentioned allied accessories	1 No Complete job
i	Incoming - 1 No 1000 Amps VCB	
ii	11 KV/110 PT of Class 0.5 accuracy and 100 VA burden and protection fuses /MCB for HT metering upto 12 kV on incomer- 1 Set	
iii	Load Manager - 1 No, TNC switches.	
iv	Microprocessor based numerical relay with O/L, E/F and S/C protection - 1 Set.	
v	Dual ratio Dual Core CTs with ratio of 200/100/5+5 of burden 15 VA, accuracy class 5 P 10 for protection and class 0.5 for metering, 0-200 A Digital Ammeter, selector switch for ammeter and protection fuses - 3 Set	
vi	Microprocessor based numerical relay with O/L, E/F,UV, OV and S/C protection - 1 Sets.	
vii	provision for connecting the alarm and trip contacts of the winding temperature relay of transformer with necessary hooters, acknowledge / reset buttons etc i/c interconnections - 1 Sets	
viii	suitable number of window annunciator	

ix	SITC of GOD Switch on two pole structure and 11kV , 10kA Surge protection or lighting arrestors , 1-Phase, of quality material and to be installed both at GOD Switch at end of 11kV line and near transformer or as decided at the time of execution of the work.	
	NOTE: The panel shall be complete with test terminal blocks, fuses, circuit labels, illuminating lamps in each panel, indicating lamps etc., wiring for interconnection with suitable size copper cable, suitable cable end box with cable entry from top for incoming and outgoing cables, HV Danger Notice board, Earth bus bars, foundation bolts and nuts etc. as required)	
3	**LT Panel**	
	Supplying, installation, testing & commissioning of cubical type LT panel suitable for 415 V, 3 Phase, 4 Wire 50 Hz AC supply system having front surface area as per the requirements and accessories fabricated in compartmentalized design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland, plates i/c cleaning & finishing complete with 7 tank process for powder coating in approved shade, having 1200 Amp capacity extensible type TPN aluminum alloy bus bars of high conductivity, DMC / SMC bus bars of high conductivity, DMC/ SMC bus bar supports, with short circuit withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm x 50 mm x 5 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm x 5 mm at the rear with 2 Nos. earth stud, solid connections from main bus bar to switch gears with required size of Al. bus bars and control wiring with suitable size of sq. mm. PVC insulated copper conductor S/C cable, cable alleys, cable gland plates in two half, i/c providing following switch gears :- Complete in all respects. Warranty : 2 years on all below mentioned allied accessories	1 No Complete job
i	**Incomer 1200 Amp ACB:** **1 Nos. of 1200A 4P** electrically operated **Draw-Out type ACB** with Ics=Icu=50KA having Microprocessor based releases for O/L, S/C & E/F protection. 1 No of 1200 Amps each four pole MCCB/horizontal drawout type air circuit breaker of fault breaking capacity 50 KA (Ics=Icu upto433 V manually operated, fitted with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact, conforming to IS 1397- 2 : 1993 as amended up-to-date completewith following accessories for each ACB. (1) Independent manual spring closingmechanism- 1 No. (2) Microprocessor release (EMI & EMC certified) for over current, earth fault &short circuit protection- 1 set. (3) Analog 96 mm square flush pattern /Digital type Voltmeter (0-500 V), with selector switch & back up HRC fuses/MCBs-1 set. (4) Analog 96 mm. square fl ush pattern/Digital type Ammeter (0-1200Amp), with selector switch and one set of 3 Nos. CT'sof ratio 1000/5A Class I accuracy and 15VA burden- 1set. (5) 3 Nos. Phase indication LED lamps with2 Amp back up HRC fuse, breaker 'ON' indicating light with 2 A HRC fuse, test terminal block set, fuses, circuits as per standard practice, auxiliary contacts for positive interlocking of the breakers as required. (f) Shunt trip coil 220 V A.C. TNC switch Warranty : 2 years	
ii	**Bus Couplers :** **2 Nos. 1200 Amps** horizontal/vertical four poledrawout type, Air Circuit Breakers (ACB)offault breaking capacity 50 KA (Ics=Icu upto 433 V) manually operated, with interlocked door, automatic safety shutters, mechanical ON/OFF and service/test/isolated position indicators and frame earthing contact conforming to IS 13947- 2 : 1993 as amended upto date complete with following accessories for each ACB: 1) Independent manual spring closing mechanism 1 No. (2) Breaker 'ON' indicating light with back up2 A HRC fuse test terminal block, fuses, circuits contactors for positive electricalinterlocking of breakers, etc. as required-1 set.	

	Warranty : 2 years	
iii	**Automatic Transfer Switches:** **1)** 1 Nos of 630 A 4 pole ATS with double break contact system offering high short-time withstand, adjustable time delay of 0.1 sec - 3 hour. **2) 2 Nos of** 400 A 4 pole ATS with double break contact system offering high short-time withstand, adjustable time delay of 0.1 sec - 3 hour. Warranty : 2 years	
iv	**Bus Bars :** 1) 1 No along the panel TPN Aluminum bus bars of minimum of **1200 Amps capacity** with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar cross section, size supports & their spacing etc. for with standing fault level of 31 MVA for 1 Sec. 2) 2 No Tappings of TPN Aluminum bus bars of minimum **630 Amps capacity** from existing 1000A Bus with heat shrinkable coloured sleeves and i/c DMC/SMC bus bar cross section, size supports& their spacing etc. for withstanding fault level of 31 MVA for 1 Sec. **Interlocking :** Electrical through advance contacts in ACB's (ATS& bus couplers) and mechanical (castel key) interlocking should be provided to ensure that only one supply is available at a time on each section of bus and to eliminate any possibility of accidentally approaching two supplies at one bus section.Warranty : 2 years	
v	1 Set - Digital Load Managers with RS 485 communication port with 3 suitable ratio CTs with Class-0.5 accuracy and HRC fuse protection.	
vi	Mechanical & Electrical Interlocking arrangement among Automatic Transfer Switch (ATS) and Bus couplers.	
vii	4 Nos. 4P high protection 70kA, surge protectors for the four incomer lines along with the necessary HRC fuses of suitable ratings.	
viii	4 Sets of Red, Yellow & blue LED type 22.5mm dia. Indicating lamps with protective fuses.	
ix	1 Sets of CTs of the ratio 1000/5 A with class 1.0 Accuracy (to APFC Relay) and suitable CTs for various meters)	
x	**Outgoing:** **a)4- pole, 250 Amp. MCCB** (Adjustable type) Easy pact CVS, Icu = 36kA Ics = 100% Icu as per IEC 60947-2 including spreaders of same rating. Complete in all respects. = **4 Nos** **b)4- pole, 160 Amp. MCCB** (Adjustable type) Easy pact CVS, Icu = 25kA with Ics = 100% Icu as per IEC 60947-2 including spreaders of same rating. Complete in all respects = **4 Nos** **c) 4- pole, 125 Amp. MCCB** (Adjustable type) Easy pact CVS, Icu = 25kA with Ics = 100% Icu as per IEC 60947-2 including spreaders of same rating. Complete in all respects = **4 Nos** **d)4- pole, 100 Amp. MCCB** (Adjustable type) Easy pact CVS, Icu = 25kA with Ics = 100% Icu as per IEC 60947-2 including spreaders of same rating. Complete in all respects = **4 Nos** **e)** Digital Voltmeter with selector switch and LED indication lights on each phase protected by HRC back up fuses MCBs. **f)** Digital Ampere meter Along with selector switch and suitable rating/ratio of current transformers and protected by HRC back up fuses MCBs. **NOTE:-** **Digital Multi function meter must be fitted to individual outgoing compartments /MCCB compartments to monitor the load , V_{L-L}, V_{L-N} & freq of each outgoing MCCB .**Warranty : 2 years **INSULATION RUBBER MATING INSIDE PANEL ROOM:** High quality high resistant rubber insulation mating of **16mm size** along the whole area of panel room.	

4	**Power Pack:** Supplying, installation, testing &commissioningof power pack with 220 Volt AC input & 24 VoltDC continuous output suitable for closing/tripping/indication of... Nos. HT panel boardswith 2 Nos. 12 Volts each maintenance freebatteries of 100 (suitable) AH each, chargingunit, capacitor bank for emergency deliveringfor trip system complete with suitable capacityof Ammeter & Voltmeter i/c connections with2.5 sq. mm FRLS insulated copper conductorcable etc. as required. complete in all respects. **Warranty : 2 years on all items in the enclosure**	1 No
5	**APFC Panel 225 kVAR :-** SITC of APFC panel made out of1.6mm thick CRCA sheet with angle iron support of suitable size, dust and vermin proof, floor mounting, frontopen able hinged door and powder coated painting, comprising the 4 No strip BusBar of aluminum conductor PVC sleeved 800 Amp capacity with heat shrinkable sleeve and SMC/DMC support, proper locking arrangement cable termination gland plate and providing and fixing of 'C' section MS channel 100 x 50 mm for base i/c providing and fixing of following electrical accessories/ switch gears connection interconnection as required complete in all respects with following specifications.**Warranty : 2 years on all below mentioned allied accessories**	1No Complete Job
i	**Incomer** 4 pole 400A MCCB 36kA thermal magnetic release O/L & S/C Protection.	
ii	**Metering & Indication**	
	RYB Phase Indicating Light, 230V AC CT for Metering 400/5A, CL-1.0, 5VA Digital VAF Meter APFC Relay 12 Stage Controlling MCB, 6A, SP, 10kA Exhaust Fan With Filters.	
	OUTGOING	
iii	**5kVAR Capacitor bank 1 No**	
	MCB,16A,TP, 10kA 5kVAR Capacitor Duty Contactor 5kVAR Capacitor Bank 440V MPP HD ON Indicating Light, 230V AC A/M Selector Switch	
iv	**10 kVAR Capacitor bank 2 No**	
	MCB,32A,TP, 10kA 10 kVAR Capacitor Duty Contactor 10 kVAR Capacitor Bank 440V MPP HD ON Indicating Light, 230V AC A/M Selector Switch	
v	**15 kVAR Capacitor bank 2 No**	
	MCB,32A,TP, 10kA 15 kVAR Capacitor Duty Contactor 15 kVAR Capacitor Bank 440V MPP HD ON Indicating Light, 230V AC A/M Selector Switch	
vi	**20 kVAR Capacitor bank 1 No**	
	MCB,63A,TP, 10kA 20 kVAR Capacitor Duty Contactor 20 kVAR Capacitor Bank 440V MPP HD ON Indicating Light, 230V AC A/M Selector Switch	
vii	**25 kVAR Capacitor bank 4 No**	
	MCB,63A,TP, 10kA 25 kVAR Capacitor Duty Contactor 25 kVAR Capacitor Bank 440V MPP HD ON Indicating Light, 230V AC A/M Selector Switch	
viii	**50 kVAR Capacitor bank 1 No**	

	MCB,63A,TP, 10kA 50 kVAR Capacitor Duty Contactor 50 kVAR Capacitor Bank 440V MPP HD ON Indicating Light, 230V AC A/M Selector Switch	
6	**HT Cable**	
i	Supplying and Laying of one No. HT. cable of 11 KV grade XLPE armoured Al. Conductor earthed conforming to IS 7098 (Part II) and of size **3 X 300** sq mm in the suitable pipe /masonry open duct enclosed with iron plate etc as required. Complete in all respects including termination with heat shrinkable kit of suitable size and fixing of Copper lugs of same ratings. **Warranty : 2 years**	70 Mtr
ii	Supplying and making indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs and other jointing material for 3 x 240 Sq mm. XLPE almunium conductor cable of 11 KV grade as required. **Warranty : 2 years**	4 sets
iii	Supply, Installation, Testing & commissioning of **Trivector meter and PT of 11kV/110V** for **800kVA Transformer** enclosed in cubicle panel made of1.6mm thick CRCA sheet with angle iron support of suitable size, dust and vermin proof, floor mounting, front open able hinged door and powder coated painting, comprising of SMC/DMC support for PT of capacity of 11kV/110V , proper locking arrangement cable termination, gland plate and providing and fixing of 'C' section MS channel 100 x 50 mm for base i/c providing and fixing of following electrical accessories: 1. Trivector meter 2. PT ratio of 11kV/110V 3. CT of 100/5A or as per **Reckoner** with class 1.0 accuracy. Complete in all respects. **Warranty : 2 years**	1 No
7	**LT Cable over Cable Tray**	
i	Supply and Laying of PVC Insulated and FRLS PVC round sheathed, armoured **solid single core copper cable of 300 sq mm** industrial cable of 1.1kv grade of following sizes in suitable size conduits. Complete in all respects including termination with heat shrinkable kit of suitable size and fixing of Copper lugs of same ratings. **Warranty : 2 years**	200 Mtr
ii	Supply and Laying of PVC Insulated and FR PVC round sheathed, armoured solid copper conductor industrial cable of 1.1kv grade of following sizes in suitable size conduits. Complete in all respects. **Warranty : 2 years**	
	3 core 1.5 sq mm cable	100 Mtr
	3 core 2.5 sq mm cable	100 Mtr
	3 core 4 sq mm cable	100 Mtr
	3 core 6 sq mm cable	100 Mtr
iii	Supplying and laying of one XLPE insulated & PVC sheathed aluminum conductor armoured power cable of 1.1kv grade of following size in the existing RCC/HUME/STONEWARE/METAL or direct in ground including excavation, sand cushioning, protective covering and refilling the trench etcas required. Complete in all respects. **Warranty : 2 years**	
	3.5c × 50 sq mm	1000 mtr
	3.5c × 70 sq mm	800 mtr
	3.5c × 95 sq mm	550 mtr
	3.5c × 150 sq. mm	350 mtr
	3.5c × 185 sq. mm	1400 mtr
iv	Supplying and Laying DWC HDPE pipe as per IS14930 (Part-II) complete with fitting and accessories in ground at the depth of 75cm laying of cable including excavation and refilling the trench etc as required. **Warranty : 2 years**	
	(OD)/ (ID) 50mm / 39mm	1800 mtr
	(OD)/ (ID) 90mm /76mm	850 mtr
	(OD)/(ID)120mm/103mm	1300 mtr
v	Supplying, installation, testing & commissioning of**OUTDOOR Panel** factory assembled Dust & Vermin Proof wall / floor mounted LT cubical type compartmentalized panel of **300 A TPN Aluminum Busbar (10mm thickness) panel** (CPRI Approved) fabricated out of 2 mm thick MS sheet, **300mm Deep** with locking arrangement, cable alleys, bus bar chamber etc powder coated self supported suitable for 3 phase 4 wire, AC supply, i/c supplying & fixing following accessories as detailed below, i/c bus bars connections / inter connections to MCCB compartments , arrangement for cable entry, supports, end terminations, 2 Nos. earthing stud inter connection with 25mm x 5mmm GI strip (externally), painting, etc. complete as required. **The compartmentalized panel consisting of various outgoing compartments for 63/125/160/ A MCCBs with a minimum space of 200 mm between each outgoing compartments. (panel**	3 Nos

	should be 2.5 feet above ground including Iron Stand as per requirement & as and when required)Warranty : 2 years	
vi	Supplying, installation, testing & commissioning of**OUTDOOR Panel** factory assembled Dust & Vermin Proof wall / floor mounted LT cubical type compartmentalized panel of **200 A TPN Aluminum Busbar (10mm thickness) panel** (CPRI Approved) fabricated out of 2 mm thick MS sheet, **300mm Deep** with locking arrangement, cable alleys, bus bar chamber etc powder coated self supported suitable for 3 phase 4 wire, AC supply, i/c supplying & fixing following accessories as detailed below, i/c bus bars connections / inter connections to MCCB compartments , arrangement for cable entry, supports, end terminations, 2 Nos. earthing stud inter connection with 25mm x 5mmm GI strip (externally), painting, etc. complete as required. **The compartmentalized panel consisting of various outgoing compartments for 63/125/160/ A MCCBs with a minimum space of 200 mm between each outgoing compartments. (panel should be 2.5 feet above ground including Iron Stand as per requirement & as and when required)Warranty : 2 years**	1 No
vii	P/F of 4- pole, 250 Amp. MCCB (Adjustable type) Icu = 36kA with Ics = 100% Icu as per IEC 60947-2including spreaders of same rating. Complete in all respects. **Warranty : 2 years**	4 Nos
viii	P/F of 4- pole, 100 Amp. MCCB (Adjustable type), Icu = 25kA with Ics = 100% Icu as per IEC 60947-2 including spreaders of same rating. Complete in all respects. **Warranty : 2 years**	13 Nos
ix	P/F of 63 Amps. 4P MCCB of breaking capacity 25 KA with thermal magnetic release ICU=Ics=100%, necessary spreader terminals and phase barriers on incoming & outgoing side complete as required (for out going).**Warranty : 2 years**	3 Nos
x	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	10 Nos
xi	Supplying and laying 25 mm X 5 mm G.I strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with G.I. nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of G.I. nut bolt & spring washer spaced at 50mm)	50 Mtr
8	**Bridge Earthing for Power station and DG Sets:** P/F of Maintenance free Chemical Earthing using copper Electrode of size 76 mm dia, 03 meter long connected with 50X6 mm Copper internal strip complete with excavation, civil works, cast iron cover with back fill compound along with **60 kg bag of Back fill compound/SOR Compound (highly conductive, non corrosive moisture retaining chemical)** complete. The voltage between Neutral & Earth not to exceed 0 volts & IR value less than 1 ohm. The earth resistance shall be as per IS 3043. Copper strip of size 32 mm X 5 mm be connected to main Distribution board.	15 Nos
	Supplying and laying 25 mm X 5 mm copper strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of brass nut bolt & spring washer spaced at 50mm)	150 Mtr
9	**Supply, Installation, Testing And Commissioning of 3_Phase 320 kVA DG Set with AMF Panel (includingchangeover of suitable rating) :Warranty : 2 years** **OUTPUT CAPACITY RATING/ PHASE** Nominal Rated Capacity (KVA) 320 No of Phase Three Phase **ENGINE : QSL9 series** Power Rating kVA / kWe 275/220 No. of Phases 3 Output Voltage and Frequency (V and Hz) 415 V, 50 Hz Power Factor 0.8 (lagging) Current (A) 382approx RPM 1500 ISI Marking to IS :10001 for engine No BIS license Type of Engine cooling Liquid Cooled Type of governer Mechanical Class of governer A1 Number of cylinders (nos) 6 No of Strokes (nos) 4 Rated RPM of Engine (RPM) 1500	1 No

Overload capacity for one hour for every 11 hours
continuous running at full load (%) 10
Starting voltage (volt) 12v

ALTERNATOR

AC GENERATOR(ALTERNATOR)
320 KVA
FRAME
Rating of AC Generator (KVA) 320
Power Factor of AC generator 0.8
Efficiency at rated Power factor at 75% of full Load91.3
Compliance of Alternator to IS:13364(part-1) Yes
Type of alternator Brushless
Voltage Regulation Grade VG 3
Alternator IP Rating IP 23
Class of Insulation H

CONTROL PANEL/POWER COMMAND FEATURES:

Intuitive operator interface which includes LED backlit LCD display with tactile feel soft-switches & generator set status LED lamps.
Digital AVR for shunt or PMG excitation with torque matching. Digital electronic governing with temperature compensation and smart starting.
SAE J1939 interface to Full Authority Electronic (FAE) engines. Remote start-stop
Engine metering: Oil pressure, Coolant temperature, Battery voltage, Engine speed AC Alternator metering: L-L Voltage and L-N Voltage, Current (1 and 3 phase), Volt-Amperes (phase and total) and Frequency.
Engine protection: Low lube oil pressure, High/Low coolant temperature, Over speed, Battery Over/Under/Weak Volts, Fail to crank/start, Sensor failure.
AC Alternator protection: Over/Under voltage, Over/Under frequency, Over current, Short circuit and Loss of AC sensing. Data logging: Engine hours, Control hours, Engine starts and upto 10 recent fault codes Configurable glow plug control Configurable cycle cranking 12 and 24 Volt DC operation Sleep mode Programmable I/Os (4 inputs and 2 outputs), expandable with AUX101/102 modules Modbus interface (RS485 RTU) InPower compatible (PC based service tool)
Control Panel Manual
IP Rating of Control Panel IP 53

ACOUSTIC ENCLOSURE

Sheet Thickness 1.6 millimeter
Thickness of Foam 40 millimeter
Density of Foam for sound insulation 28
Noise level at 1 meter (dB) 75

BATTERY

Battery Type & Specification Low Maintenance free to
IS: 14257 for high cranking performance
Battery capacity 2*12V DC
No of batteries 2

CONSUMPTION:

Fuel consumption @75% load
with radiator and fan (litre/hr)= 71 ltrs Approx

AUTOMATIC MAIN FAILURE PANEL:

Suitable rating of Automatic Main Failure panel with bypass provision/Changeover as per site requirement.

TEST REPORTS WARRANTY / INSTALLATION & COMMISSIONING:

Warranty 2 year
Installation & Commissioning With Installation
Agreed to STC of the Product Yes

NOTE:- The DG Set must be supplied with Separate 1000 Liters of Stainless SteelStorage Tank (MS Steel Tank). Complete in all respects.

10	**Supply, Installation, Testing And Commissioning of 3_Phase 250 kVA DG Set with AMF Panel (includingchangeover of suitable rating)** Warranty : 2 years **OUTPUT CAPACITY RATING/ PHASE** Nominal Rated Capacity (KVA) 250 No of Phase Three Phase **ENGINE : L8.9 series** Power Rating kVA / kWe 250/200 No. of Phases 3 Output Voltage and Frequency (V and Hz) 415 V, 50 Hz Power Factor 0.8 (lagging) Current (A) 348approx RPM 1500 ISI Marking to IS :10001 for engine No BIS license Type of Engine cooling Liquid Cooled Type of governer Mechanical Class of governer A1 Number of cylinders (nos) 6 No of Strokes (nos) 4 Rated RPM of Engine (RPM) 1500 Overload capacity for one hour for every 11 hours continuous running at full load (%) 10 Starting voltage (volt) 2*12v Dc **ALTERNATOR** AC GENERATOR(ALTERNATOR) 250 KVA FRAME Rating of AC Generator (KVA) 250 Power Factor of AC generator 0.8 Efficiency at rated Power factor at 75% of full Load 58 Compliance of Alternator to IS:13364(part-1) Yes Type of alternator Brushless Voltage Regulation Grade VG 3 Alternator IP Rating IP 23 Class of Insulation H **CONTROL PANEL/POWER COMMAND FEATURES:** Intuitive operator interface which includes LED backlit LCD display with tactile feel soft-switches & generator set status LED lamps. Digital AVR for shunt or PMG excitation with torque matching. Digital electronic governing with temperature compensation and smart starting. SAE J1939 interface to Full Authority Electronic (FAE) engines. Remote start-stop **Engine metering**: Oil pressure, Coolant temperature, Battery voltage, Engine speed AC Alternator metering: L-L Voltage and L-N Voltage, Current (1 and 3 phase), Volt-Amperes (phase and total) and Frequency. **Engine protection:** Low lube oil pressure, High/Low coolant temperature, Over speed, Battery Over/Under/Weak Volts, Fail to crank/start, Sensor failure. **AC Alternator protection:** Over/Under voltage, Over/Under frequency, Over current, Short circuit and Loss of AC sensing. Data logging: Engine hours, Control hours, Engine starts and upto 10 recent fault codes Configurable glow plug control Configurable cycle cranking 12 and 24 Volt DC operation Sleep mode Programmable I/Os (4 inputs and 2 outputs), expandable with AUX101/102 modules Modbus interface (RS485 RTU) InPower compatible (PC based service tool) Control Panel Manual IP Rating of Control Panel IP 53 **ACOUSTIC ENCLOSURE** Sheet Thickness 1.6 millimeter Thickness of Foam 40 millimeter	2 Nos

	Density of Foam for sound insulation 28 Noise level at 1 meter (dB) 75 **BATTERY** Battery Type & Specification Low Maintenance free to IS: 14257 for high cranking performance Battery capacity 2*12V DC No of batteries 2 **CONSUMPTION:** Fuel consumption @75% load with radiator and fan (litre/hr)= 42 ltrs Approx **AUTOMATIC MAIN FAILURE PANEL:** Suitable rating of Automatic Main Failure panel with bypass provision/Changeover as per site requirement. **TEST REPORTS WARRANTY / INSTALLATION & COMMISSIONING:** Warranty 2 year Installation & Commissioning With Installation Agreed to STC of the Product Yes **NOTE:- The DG Set must be supplied with Separate 1000 Liters of Stainless SteelStorage Tank (MS Steel Tank). Complete in all respects.**	
11	Supply, Installation, Testing, Commissioning of factory fabricated high quality steel Diesel storage tank above the ground modular ISO containerised self bunded fuel storage tank design and constructed to AS1940,AS1692,AS1657,UL142 and ULC-s601-14 compliance as standard. the following specifications are listed below: **Warranty : 2 years** • Double walled construction consists of • 6 mm inner primary steel tank • 6mm outer secondary steel tank • Lockable self contained pump bay and dispensing area to the front of the tank. • Curved roof feature for curved water drasinage to the top of the tank. • Extra paint thickness based on 250-300 microns for extra protection during harsh climate. • Supplied with all statutory signage. • In built tank access ladder and platform • Dual 2" manway tank access points • Updraft vent pipe • Audible overfill protection alarm • 6" & 4" sockets for installation of submersible pumps • Dual hose high mast retractable units • Suitable for fuel farm configuration(Master & Slave) **Incoming Fuel:** • 80 nb Tanker fill pipe work. • Camlock adaptor & Cap • Non Return valve • Hydraulic overfill valve with optional unload pump. • High level alarm: hazardous rated & Battery powered. **Outgoing Fuel:** • Anti siphon valve (foot valve) • Pipe work terminates under walkway with ANSI flanges • 6"&4" sockets in both manholes for the mounting of submersible pumps.	1 No

	PUMP BAY: • Pumpbay complete with water/product drain valves • Internal access for hoses from pylon kits • Lockable bund doors with rubber dust seal. • Access ladder to work platform mounted on left & right side • Dual 50mm side wall cavity sockets. **Warranty:** 12 Month manufacturer warranty 12 Month Paint warranty 7 year structural warranty	
12	**Internal Electrification of Panel Room**	
i	P/F of 1600 VA square wave Inverter with all accessories including battery rack. **Warranty : 2 years**	1 No
ii	**P/F of Tall Tubular 200Ah Battery, 12V** **Tubular battery including suitable plastic trolley along with brass terminals in all respects.** **3 Years warranty**	2 Nos
iii	P/F of 1200mm sweep Metallic ceiling fan with 300 watt 5 step regulator of and hook for fan. The job includes providing of fan hook in wooden/concrete ceiling wherever needed. Complete in all respects. **Warranty : 2 years**	5 Nos
iv	P/F of 300 mm Sweep Heavy Duty Crompton Greaves Exhaust Fan (metal type) in existing opening, including making good the damage, connection, testing, commissioning etc. as required. Complete in all respects. **Warranty : 2 years**	6 Nos
v	P/F of 2 ft*2ft LED luminaries with URG <19 recess mounted with high lumen output with durable housing with Al heat sink with Diffuser to give glare free light with removable driver. **Warranty : 2 years**	12 Nos
vi	Supplying & Fixing of Charging Point of following **modular switch of 16 Amp, 2 No of Socket outlet of universal type 3-pin 6 Amp, Indicator** and GI metal box along with modular base & cover plate of 6 module for modular switches in recess including connections etc as required. Complete the job in all respects. **Warranty : 2 years**	4 Nos
vii	Supplying & fixing following **modular switch of 25 Amp**, Socket outlet of **3 pin 25 Amp** and GI metal box along with modular base & cover plate of 3 module (100mm × 75mm) for modular switches in recess including connections etc as required. complete the job in all respects. **Warranty : 2 years**	5 Nos
viii	Wiring for light point / fan point /exhaust point / call bell point with 1.5 sq. mm FRLS PVC insulated Copper Conductor Single Core Cable in surface / recessed medium class PVC Conduit with Modular Switch, Modular Plate, Suitable GI box & earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc as required.	20 Nos
ix	Supplying and fixing 5A to 32 A rating, 240/415 V, 10 kA, "C"curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required. **Warranty : 2 years**	
	a) Single Pole.	15 Nos
	b) Double pole.	2 Nos
x	Supplying and fixing 63 A rating, 240/415 V, 16kA "C"curve, Double Pole miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. **Warranty : 2 years**	2 Nos
xi	Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) **Warranty : 2 years**	
	a) 16 way Double Door	1 Nos
13	Supply, Installation, Testing and Commissioning of 7/8 mtrs long octagonal pole galvanized continuously tapered (bolt fixing type) in single section made out of 3mm thick sheet having top dia 70mm and bottom dia 130mm with 4 nos hot dip galvanized foundation bolts of size 20mm dia × 700 long with integral junction box/base plate (200×220×16mm) along with suitable size of GI single arm bracket 1500mm long i/c providing and fixing bakelite sheet of size 25cm×10cm×6cm thick, connector, 2nos al busbar of suitable size and SP MCB of 6 amp rating inside the pole atleast 1.25 mtrs above from bottom of pole complete with door and locking arrangements etc as required. Complete in all respects. **Warranty : 2 years**	5 Nos
14	Supply , installation ,Testing and commissioning of 100W , 10000 lm Smart Bright LED Flood Light (White Light) Input Volt (AC 90-300V) **>120 lumens per watt** with Aluminum and thermoplastic glass housing and having long life span of upto 50,000 hrs. complete in all respects. **Warranty : 2 years**	10 Nos

15	Supply and fixing of ABC powder based type fire extinguishers confirming to IS 2878 - 1976 and cylinders fully charged of 9 KG capacity hanged on wall with bracket complete as required. **Warranty : 2 years**	5 Nos
16	Supply and Testing of all safety equipment and necessary power station equipment tools The following items are listed below: **Warranty : 2 years** 1) Hammer drill 1 No 2) Portable screw drill 1 No 3) 46pcs Screwdriver Bit Set, Socket Set, Torx Bit Set. 1 No 4) Safety Helmet 5 Nos 5) Reflective Safety Jackets Mesh Type 5 Nos 6) Safety Harness Belt 5 Nos 7) High beam patrolling Torch 3 Nos 8) HT /LT gloves 3 Set each 9) Danger Boards marked 11kV safety Signs 5 Nos 10) Heat Gun 1 No 11) Portable Crimping tool upto 70 sq mm size 1 No 12) Crimping tool 70 sq mm to 400 sqmm size 1 No 13) Cutter Machine 1 No 14) Voltmeter/ Clamp-meter 1 No each 15)Portable Ladder platform type 8 ft 1 No 16 Extendable / Adjustable Ladder 10 Mtr 1 No Note: All the items needs a high quality display rack to display all the safety items as per safety norms.	1 No