

RAIL COACH FACTORY, KAPURTHALA

SUPPLY AND INSTALLATION OF LIQUID ARGON STORAGE TANK, OXYGEN MANIFOLD AND INTEGRATION WITH EXISTING BULK STORAGE SYSTEM FOR LIQUID CO₂ ALONG WITH DISTRIBUTION PIPE LINE SYSTEM.

SPECIFICATION NO. MECH/M&P/2400/18 /Rev-I/2014

IMPORTANT INSTRUCTIONS:

- a) Tenderers are required to provide clause-wise comments, confirming compliance/non-compliance with each clause, indicating deviations and elaborating wherever necessary to avoid back references.
- b) Unless stated otherwise, latest standards/ drawings shall be applicable. With respect of safety standards and environmental regulations applicable to equipment/system, it is mandatory for the bidder to ensure compliance & confirm conformance with such international/national standards (where applicable) in their offer.
- c) The tenderers shall also furnish the information sub clause-wise about the equipments/system offered.
- d) The offers are likely to be reviewed/ignored in case of non-compliance of these instructions.

1.0 SCOPE OF SUPPLY:-

The scope of this tender includes supply of Liquid Argon Storage tank, Oxygen Manifold, Mixing Unit, Distribution pipe lines and Installation & Commissioning and integration with existing Bulk Storage System for Liquid CO₂ as per schedule requirements in Annex-VI. Details of technical parameter mentioned in Schedule-I are applicable.

The equipment/system installed must be of proven design, incorporating latest features and state of the art manufacturing technology.

2.0 PURPOSE:

- 2.1 Rail Coach Factory (Kapurthala), Punjab is a production unit engaged in production of Indian Railway Passenger Coaches. RCF is manufacturing light weight, stainless steel coaches under the new technology of manufacturing stainless steel coaches. Existing MIG/MAG - CO₂ welding is to be replaced by Argon Mixture Welding Systems.

3.0 EXISTING INFRASTRUCTURE- LIQUID CO₂ BULK STORAGE SYSTEM:

- 3.1 RCF has an installation of 30 MT Liquid CO₂ Bulk Storage System from which CO₂ supply is currently drawn and fed to the existing distribution network. The details of existing Liquid CO₂ Bulk Storage System is given as following:
- 3.2 RCF has an installation of 30 ton liquid co2 bulk storage tank of capacity 30,000 liters. From which co2 supply is drawn.
- 3.3 Complete co2 gas supply line network for the workshop exists with various down drops which will be used for argo mix gases.
- 3.4 03 nos.(three) air reservoirs/receivers of 3 cubic meter each capacity compensating sudden increase/decrease of demand i.e.co2 welding gas are also installed.
- 3.5 Direct decanting of road tanker is feasible as additional vaporizer is available in manifold room.
- 3.6 Average consumption of co2 gas is 75 ton/month

4.0 RCF'S REQUIREMENT – CONSUMPTION PATTERN:

- 4.1 RCF has two welding divisions (Ref. Layout Annex. VI- A).

- (a) Shell Division.
- (b) Bogie Division .

Projected requirement of gas mixture is as under:

DIVISION	REQUIRED MIXTURE	MAX. NO. WELDING SETS TO BE CONNECTED	Peak Flow Requirement (approx.)
Shell Division Mix-1	Argon 90% CO ₂ -5% O ₂ -5% (MIX.1)	250 Nos.	250 Sm ³ / hr
Bogie Division Mix-2	Argon 82% CO ₂ -18% (MIX.2)	100 Nos	100 Sm ³ / hr

Estimated Consumption of Gas Mixtures:

- a. 90% Ar. + 5 % CO₂ + 5 % O₂ : 6000 Sm³ / Month (approx)
- b. 82% Ar. + 18 % CO₂ : 2500 Sm³ / Month (approx)

- 4.2 Technical specification of gases proposed to be utilized for system is as under:-

GAS	PURITY (MIN)	MOISTURE (LESS THAN)	HYDRO CARBON (LESS THAN)	N2 (LESS THAN)	O2 (LESS THAN)	OIL AND GREASE	IS STANDARD
Argon	99.997	5 PPM	5 PPM	20 PPM	5 PPM	IS 5760-2003
Oxygen	99.5	5 PPM	NIL	IS 309-2005

- 4.3 Peak consumption rate of :-
- | | | |
|----------------------------|---|-------------------------|
| MIX I | : | 250 Sm ³ /hr |
| MIX II | : | 100 Sm ³ /hr |
| No. of working days /month | : | 25 |
| No. of Shifts per day | : | 02 |
| No. of arcing hours/ shift | : | 04 |

5.0 Turn Key Project::

5.1 Design, supply, installation, commissioning and prove out of the complete Argon Mix Bulk storage system including civil work on Turnkey basis as under:-

- 5.1.1 Installation of two interconnected Liquid Argon tank of capacity of 6 KL each 6x2= total capacity 12 KL
- 5.1.2 Manifold for connecting to O₂ cylinder pack of 16 nos cylinders of total capacity 152 cu m³ with facility for quick change over to second pack, with pressure indicator for each pack Inlet Cylinder packs will be arranged by RCF.
- 5.1.3 Vaporizer of suitable capacities for converting liquid Argon to gas Argon.
- 5.1.4 For supply of Gas Mixture-1 to Shell Division, one no. of Mixing unit (3 gas mix) of capacity 250 Sm³/hr each along with surge tank of compatible capacity.
- 5.1.5 For supplying Gas Mixture -2 to Bogie Division, one no. of Mixing unit (two gas mix type) of capacity 100 Sm³/hr along with surge tank of compatible capacity.
- 5.1.6 One stand by mixing unit which can be connected to system in case of defect in MIX-1 OR MIX-II and can work in place of that main mixture unit during emergency.
- 5.1.7 Distribution pipe line as per para 7.4.
- 5.1.8 System complete with flow regulation pressure indication, safety relief valves and all other safety devices.
- 5.1.9 **Decanting pump for evacuating liquid Argon from road tanker.**
- 5.1.10 All related Civil Engg. works in connection with installation of subject system to be carried out by the bidder including installation of argon tank,vaporizers,mixtures, manifold,pipe line and operators room.
- 5.1.11 All the Mixing Units along with the control shall be housed in a room /shed to be covered of size 10'x8'. Construction of this room and shed is under the scope of bidder. Space required to install the system shall be clearly mentioned in the bid. Electrical wiring complete with provision of light& fan also to be in scope of supply.
- 5.1.12 Necessary approvals from concerned Govt. Authorities/ Statutory Bodies for the installation of the subject system shall be processed and taken by the bidder on behalf of RCF. Bidder shall take the license for installation of the system from Chief Controller of Explosive (CCOE), Nagpur. Licence for storage of liquid argon will be obtained by bidder on behalf of RCF.
- 5.1.13 Detailed engineering of the system including obtaining approval from third party and statutory authorities (for fabrication & installation) for drawing of pressure vessel for fabrication purposes shall be arranged by the supplier.
- 5.1.14 Arranging stage wise inspection during fabrication by nominated inspection agencies and periodic inspection by contractor. However, necessary assistance needed by contractor in this regard would be provided by consignee.
- 5.1.15 Preparation of installation drawings and getting the approval from department of Explosives by successful bidder. If any input is required from RCF same will be provided by RCF.
- 5.1.16 All electrical connections to operate the system will be in scope of supply by contractor
- 5.1.17 Maintenance and periodical inspection of the equipment throughout warranty period.
- 5.1.18 Documents pertinent to the system such as design, drawings, operations, manual/calibration certificate etc. shall be provided to RCF, Kapurthala, by successful bidder.
- 5.1.19 A completion & handover certificate shall be provided to RCF, by successful bidder after successful completion of installation & Commissioning.

6.0 OPTIONAL

6.1 Telemetry System (connectivity of control through telephone line) for monitoring the product stock level and consumption. Telemetry system should be customizable so that it should allow monitoring by RCF and/ or the respective gas suppliers..It should be quoted as optional.

6.2 Earth Pit with G.I. strip for the Argon storage tank will be provided as optional.

7.0 DESIGN CHARACTERISTICS:

7.1 GAS MIXING UNITS:

Gas Mixers as per Clause 5.1.4 , 5.1.5 and 5.1.6 are to be supplied and installed. The detailed specification is enclosed as annex-I of schedule-I.

7.1.1 All the Mixing units shall be so designed to function on the basis of mass flow / pressure based gas regulating system i.e. dosing to the gas mixture shall be mass based.

7.1.2 External or inbuilt Electric cabinet to contain power regulating devices for various systems, the analyzer and an automation to run/monitor the operating cycle.

7.1.3 Mass flow meters at the outlet of the Gas Mixers can be regulated by programmable logic controller i.e. PLC.

7.1.4 Both Mixer shall have following features:

1. Mix Gas analyzer for all gases.
2. Argon Pressure Gauge.
3. CO₂ Pressure Gauge.
4. O₂ Pressure Gauge (for Mixing unit-I only.)
5. Gas Mix chamber pressure Gauge.
6. Automatic Calibration Device.
7. Filtering Device.
8. Ar. solenoid valve.
9. CO₂ solenoid valve.
10. O₂ solenoid valve (for Mixing unit-1 only).
11. Gas Mix solenoid valve.
12. Any other device which is necessary for mixing chamber only also advise.

7.1.5 Control panel shall have digital display for the following parameters for each mixer:-

- a. On/Off.
- b. CO₂ ratio.
- c. Argon ratio.
- d. O₂ ratio (only for Mix-I).
- e. Pressure gauges for input gases i.e. Ar., CO₂ & O₂.
- f. Moisture indicators for Mixed Gas.
- g. Output pressure setting valve/alarms/warning/shut down alarms.
- h. output pressure of argon mix gas.

7.1.6 Capacity of gas chamber/surge tank of all the mixers should be optimally designed/ compatible with the respective mixer capacities. The tenderer should offer mixers of higher capacity in case the bidder feels that the capacity indicated in para 4.3 is inadequate in view of RCF's requirement as per details given in this document. In that case, justification for the capacity which the tenderer proposes to give, should also be given.

7.1.7 Mixers/ Mixing units regulate in-flow to maintain the set pressure at outlet. If the ratio analyzer reveals a mixture ratio reading which is out of the adjustable tolerance range, the supply line feeding the shop is cut off and suitable indicator is turned on.

7.1.8 Mixing unit shall confirm to Annex-I of Schedule-I

One stand by mixture unit to be provided which will be used in case of breakdown of either of the two mixer.It should be possible quickly connect this unit and isolate defective mixer at shortest possible time so that workshop out put is not affected.

7.1.9 Decanting pump for mobile tanker to static tanker to be provided.

7.2 LIQUID ARGON TANK:

7.2.1 Two vertically mounted double walled interconnected liquid Argon storage tanks of capacity 6KL x 2, total 12 KL water, shall be installed in the vicinity of CO₂ tank already existing at the site. The offered Layout should be designed keeping in view the space requirement for movement/decanting of Road tanker to and from the Argon/oxygen tank.

7.2.2 Inner vessel of the tank should be fabricated from high grade steel adapting the latest manufacturing technologies. Safety standards mentioned /international standards followed shall be detailed in the offer.

- 7.2.3 The tank shall be super insulated with low evaporation rate. Moisture content in the annular space shall be measured with Liquid Nitrogen Trap Method or any other suitable method. Bidders are required to confirm and clarify the same in the tender.
- 7.2.4 Pressure vessel should be of state of art design and with highest reliability and shall have practically zero down time.
- 7.2.5 To resist adverse impact of environment (air, water and pollution) on all the valves, the material of the valve should be of stainless steel only.
- 7.2.6 Liquid Argon tanks shall be as per Annex-II of Schedule-I respectively.
- 7.2.7 Both tanks should be connected in such manner that they can work together or either one of them can be isolated for testing while argon gas can be drawn from second tank for uninterrupted working of system
- 7.2.8 Pump for delivery from mobile tank to static tank should be provided in the offer.
Supply valve should be provided in the offer.

7.3 VAPORIZER:

One vaporizers for connecting liquid Argon to gas Argon and Oxygen of suitable capacities shall be installed. Design of Vaporizers shall be as per Annex- III of Schedule-I.

7.4 Distribution pipe line

7.4.1 Distribution pipe line shall be provided as per Annex-V.

7.5 Oxygen manifold.

7.5.1 Oxygen manifold capable of connecting 16 cylinder pack of total 112 liter cu.mtr capacity should be provide It should be possible to simultaneously have connection to two cylinders packs of 16 cylinder each 16x2, such that when one pack is empty, immediate switch over to second pack can be manually done within minimum time. After connecting to second oxygen pack , empty pack from first connection point will be replaced with refilled pack without interrupting the cycle.

7.5.2 Specification of oxygen manifold is placed at Annex-IV of Schedule-I.

7.5.3 Suitable pipeline for connection from manifold to mixing unit-I and stand by Mixing unit will also be provided by the bidder under scope of supply.

7.6 Interconnecting pipe lines in storage complex:-

Bidder will also be responsible for providing all interconnecting pipe lines with valves and safety devices from CO2 vaporizer to mixer-I and II, Argon tank to vaporizer and Argon vaporizer to mixer-I and II as well as from oxygen manifold to mixer-I. Pipe line for stand by mixer unit also to be provided. Bidder shall also separately provide outlet pipe from mixer -I and mixer-II up to user shop under scope of para 7.4.

8.0 ATMOSPHERIC, CLIMATIC CONDITIONS & ELECTRICAL REQUIREMENTS:

8.1 The ambient temperature in the region varies from 0°C to 50°C depending upon the seasonal changes over the year. The relative humidity may be as high as 100% during some parts of the year. The atmospheric conditions for major part of year are expected to be dusty.

8.2 The equipments/systems offered shall be capable to work under these atmospheric conditions without any adverse effect on their performance.

8.3 The whole machine set-up electrical/electronic system shall be designed for low tension power supply/feed of three phase 400 V + 10% -15% & 50 Hz +/- 3%. In case of any other specific requirements, the bidders shall clearly mention the utilities that RCF needs to provide.

8.4 The necessary incoming electrical supply shall be made available by RCF at a single point to the power panel which may be located within the complex mixing Argon, Oxygen, CO₂ storage. Beyond this, cabling work would be in the scope of tenderer. Bidder to quote for rate of main power cable in rupees per meter length.

8.5 Total power requirement shall be indicated by the tenderer s in their offers.

8.6 Necessary separate earthing pits and earthing strips as per relevant IS Specification for safe working of electrical and electronic system and/or storage tank shall be made by the tenderer s under their scope of work. Cost of earth pits should be separately indicated as optional.

9.0 SPECIAL FEATURES:

Special features incorporated into the system, if any, shall be indicated separately by the tenderer, clearly indicating the advantages of these features.

10.0 DEVIATIONS:

The tenderer should certify that the plant offered fully meets the specifications. Various design features incorporated in the machine to fulfill different technical and performance requirements should be fully explained in the offer. However, minor deviations from this specification, which do not affect or in any way interfere with the stipulated performance standards, or would result in improved productivity/safety/reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance. The Tenderer in such eventuality shall clearly indicate the details of the deviations and their implications.

11.0 TECHNICAL LITERATURE:

The successful bidder shall supply 4 copies of technical literature of equipments including Electrical and Electronic equipments. The circuit diagram and pipe line layout diagram shall also be supplied by successful bidder. Any other literature, if required for proper function of the system shall also be supplied by firm to RCF. Bidder should also submit detailed part list of all spares including its make and manufacturer for both Electrical & Mechanical spares including its make and manufacturer for both electrical and mechanical spares. List of bought out item to be submitted along with make and model.

- 11.1 All technical data regarding safe handling of cryogenic Liquids, drawings/layout of the installation and to provide necessary training for safe operation of equipment.
- 11.2 Documents pertinent to the system such as operations manual/calibration certificate etc. shall be provided to RCF, Kapurthala, by successful bidder.
- 11.3 All documents necessary for obtaining approval of statutory authorities Chief Controller Of Explosions Nagpur. All designing documents as well as certificates will be supplied by the successful bidder in three copies.

12.0 TRAINING:

Technical experts of the manufacturer during commissioning of machine will fully and adequately train operators/ maintenance staff nominated by the consignee regarding complete operation, comprehensive preventive maintenance and basic breakdown maintenance.

13.0 COMMUNICATION:

All notices, communications, references made by contractor or railways regarding work shall be written. However telephonic messages shall be followed by writing. Immediate attention by contractor shall not wait for written messages.

14.0 SAFE WORKING OF CONTRACTUAL STAFF:

Contractor to abide by all conditions under factory act while working inside RCF plant, he will agree to make available all safety equipment and ensure its enforcement of all safety precaution, he will depute only competent staff with valid competency certification for under taking work of installation and commissioning and will ensure enforcement of minimum wages act. and other legal requirements.

15.0 SUBLETTING OF CONTRACT:

The contractor shall not assign or sublet the contract or any part thereof or allow any person to become interested therein in any manner whatsoever without the special permission of the RCF.

16.0 TRANSPORTATION & RISK IN TRANSIT:

The contractor shall make his own arrangements for safe and sound delivery of equipment and supplies at site. In case any insurance which could be done shall be arranged at their own cost. Any road clearances or statutory road permit to move the vessel is to be obtained by the firm. .

17.0 MAINTENANCE OF THE EQUIPMENT:

Successful bidder shall conduct periodic checks and necessary maintenance during the period of warranty, as per stipulated guidelines of safety & CES guidelines, which in turn fully abide by the Indian Government regulations for period under warranty.

18.0 APPROVAL OF THE DRAWINGS:

The layout of the system shall be submitted by Successful bidder within 75 days after getting the order. The layout shall be approved by the consignee before installation.

Contractor shall get the design and drawing approved from the consignee within 60 days of the submitting of this layout.

19.0 ERECTION & INSTALLATION OF THE SYSTEM:

The successful bidder should complete installation & commissioning within 04 months from approval of General Arrangement drawings, receipt of material or taken over the clear site whichever is later. The installation shall be done by qualified & competent engineers.

20.0 WARRANTY:

Firm will agree to provide warranty for two years for working of plant against manufacturing and workmanship related defects including warranty for bought out items.

21.0 INSPECTION AND TESTING:

- 21.1** Bills of materials will be furnished by the contractor along with the bid for the purpose of pre-dispatch inspection of materials by RITES nominated inspection agency. Material shall be offered in not more than three lots for inspection.
- 21.02** All materials under this contract shall be subjected to shop tests as per applicable material standards. Where required, contractor shall notify RITES in writing at least four weeks in advance on the availability of the materials at the manufacture's works for inspection by the appointed inspection agency and shall extend all facilities to the inspecting agency including testing facilities at no cost.
- 21.03** All fabrication/erection work covered by this specification shall be subject to inspection by RITES and the contractor shall advise RITES promptly at various stages of erection for inspection.
- 21.04** Entire pipe line, accessories, fitting etc. after erection in the field are to be tested for performance.
- 21.05** All welded joints shall be subjected to hand hammer test while under test pressure. Defects revealed by the above tests shall be repaired, defective parts shall be replaced and the system retested. Test pressure shall be maintained until the entire section under test has been examined for leaks. Defects revealed shall be rectified and the sections retested.
- 21.06** The leakage losses should not exceed beyond those stipulated in SME B31.1 viz., 0.5% of the total flow for the entire system at the working pressure for compressed air, 0.1% for Argomix and Nitrogen and Zero percent for Oxygen.
- 21.07** The contractor shall arrange to provide for the duration of tests. All such instruments and gauges as would be necessary for conducting the test .
- 21.08** All instruments used for tests shall be calibrated by an approved independent or National Laboratory. Calibration certificate may be produced at the time of commissioning.
- 21.09** If the result of the tests of the system performance fall short of the required prescribed standards, the contractor shall bear all expenses for improving the performance of the system by necessary rectification/replacement of equipment/materials and carry out another acceptance test.
- 21.10** The test pressure shall not be below those stipulated in S=ASME B31.1 viz., 1.2 times the working pressure of the passing through gases and 1.1 times for compressed air. OR as per the standard followed by manufacturer which ever is higher.
- 21.11** Valves, regulators, check valves, etc. Shall be checked as per manufacturer's specifications.
- 21.12** The pipe line system for each shop shall be subjected to pneumatic test after assembly. There shall not be any pressure drop for the first 2 hours except that arising out of temperature variations. In 24 hours, the maximum pressure droop allowed at the farthest point is 1%.

22.0 OPERATION OF THE SYSTEM:

The system will be operated by firm for one months after commissioning and there after handed over to nominated RCF personnel's.

23.0 RESPONSIBILITIES OF THE AGENCIES:

23.1 RESPONSIBILITIES OF RCF:

- 23.1.1** Adequate space adjoining to existing Liquid CO₂ Bulk Storage tank shall be provided to the successful bidder for complete installation of Argon Mix. Bulk Storage System.
- 23.1.2** Water, electricity & compressed air required for installation & commissioning and operation of the Argon Mix. Bulk Storage System shall be provided free of cost to the successful bidder. Source Power will be of good quality, uninterrupted and free of surge and Compressed Air will be free of moisture.
- 23.1.3** Portable diesel welding sets, road mobile cranes, FLT's etc., if required, by the supplier/contractor for installation can be provided on rental/hire basis, if available with RCF.

23.1.4 Maintenance of existing Bulk Storage System will be carried out by RCF.

23.1.5 All necessary information required for processing the approvals from the concerned regulatory bodies like CCOE etc. shall be provided by RCF to the successful bidder.

23.2 RESPONSIBILITIES OF THE CONTRACTOR:

23.2.1 The contractor shall execute the work with great promptness, care and accuracy and shall complete the work within 4 months after getting the approval of GA drawing, receipt of material or taking over clear site whichever is later.

23.2.2 The contractor shall place and keep on the works at all times qualified, efficient and competent staff to give necessary directions to his workmen and to see that they execute their work in sound and proper manner. However, the contract staff must keep updated the plant organization informed of the progress time to time.

23.2.3 The contractor shall at once remove from the works any agent, permitted sub contractor, supervisor, workman or labourer who shall be objected to by the Railways. However, these staff should observe the rules and regulations as applicable to RCF staff.

23.2.4 The contractor will submit a correct record to consignee showing the names of all the staff and workmen employed by him at railway premises.

23.2.5 The contractor or his staff and employee will observe rules & regulations of Rail Coach Factory, Kapurthala in regard to entry in the factory, safety and identification. Contractor will also to meet all legal requirements while working in RCF premises. The minimum wages act and provide strictly equipment to the staff for ensuring safe working conditions with in RCF.

23.2.6 Contractor shall keep adequate spare parts and necessary tools available all the time at site so that maintenance work is not delayed on this account.

23.2.7 Contractor shall maintain the system for its maximum efficiency and shall carryout preventive maintenance periodically to keep the system fit for operation at all time.

23.2.8 The statutory fees to the department of explosives for obtaining approval will be borne by Railways but such approvals is the responsibility of the contractor. Contractor shall advise Railways on necessary fees along with amount and name of statutory agency well in time based on which RCF will process for necessary payments.

23.2.9 Contractor while carrying out side work at site will ensure that there is no disruption/stopage of existing system in RCF . If any work requirs such disruption it will be done in off duty hours or sunday/holiday with prior intimation to RCF.

24.0 REFERENCES:

The tenderers should provide satisfactory evidence, acceptable to the purchaser to show that he or his sub vendor/s are reputed / licensed manufacturers and has adequate plant and manufacturing capacity and a sound Quality Assurance Program. He should furnish a statement giving a list of such equipment/systems as per his offer and/or similar systems (where three liquefied gases are stored and /OR mixed with net value of work at least 35% of present tender) supplied and commissioned by him, at least two customers during the last 5 years along with the purchaser's name, name of contact person, contact person's phone/mobile number, email ID and address. These installations should have been commissioned at least 06 months before the opening of this tender so that the performance can be adjudged. The details of such installations like date of supply, date of installation, quantity supplied their performance and whether the contracts were executed successfully should be provided.

ANNEXURE-I OF SCHEDULE-I

TECHNICAL PARAMETERS FOR GAS MIXERS

The Gas mixers should have the capacity range compatible with the requirements mentioned in this document and should have features as per Para 7.1 of technical specification along with features shown below.

Features:

These mixture are required as under:

- (a) One mixer with three gas mixing arrangement with flow 250 Sm³/hrs.
- (b) One mixer with two gas mixing arrangement flow rate of 100Sm³/hrs.
- (c) Stand by mixer with three gas system that can be integrated either with mix I or with mix II system, in case of breakdown of any one of the main mixer with capacity of 100Sm³/hrs.

Following features are prescribed:

Type	Gas mixing system for three gases with fluctuating gas mixture production requirements for Mix 1 & stand by Mixer, two gases system for Mix II
Mixing Range	Argon 75-100% CO ₂ 0-30% O ₂ 0-10% (Not for Mix II)
Gas Inlet Pressures	Min: 13 bars, Max: 20 bars (dynamic)
Max Inlet Pressure Difference of Gases	3 bars
Control Pressure	12 bars
Receiver/Outlet Pressure	5 bars controlled by pressure switch/solenoid valve/their combination
Housing	Painted Steel
Leak Integrity	1x10 ⁻³ mbar (technically leak tight)
Setting Accuracy	+/- 1% abs.(scale 0-25%), +/- 2% abs. (scale 0-100%)
Mixing Precision	Better than +/- 1% abs.
Make	Witt or Thermco only

Features

- (1) Construction entirely based on digital electronics.
- (2) High accuracy with facility of storage of calibration curves.
- (3) Alarm and counter function.
- (4) Self diagnostics.
- (5) Gas mixture withdrawal should be possible from zero to maximum flow capacity.
- (6) Intermittent gas mixture withdrawal should be possible.
- (7) It should have lockable transparent door for protection of settings.
- (8) Gas pressure if low should trigger an audible alarm and should shut down the system.
- (9) Output should be independent of pressure fluctuations.
- (10) The features of analyzing system for Argon, CO₂ and O₂ (only for Mix-I) should be available.
 - a. There should be permanent control of CO₂ & O₂ threshold values.
 - b. There should be interface for documentation.
 - c. The remote control device for transmission of measurement result should be available.
 - d. There should be integrated data logger & interface to readout the logged data with a USB stick.
- (11) It should have facility of automatic calibration for increased operational safety.
- (12) Compatible Gas receiver with safety relief valve is to be provided.
- (13) One integrated Filtering unit for argon, CO₂ & O₂ with particle size up to 20 microns for protection of gas mixing system against contamination through particles should also be part of the system.
- (14) There should be gas flow measurement device to measure the quantity of gas consumed. Its approximate capacity should be 250Sm³/hr & 100Sm³/hr. m³/hr for Mix-I & Mix-II respectively. The totalizer should be part of analyzer software. The consumption of argon, CO₂ & O₂ will be shown individually.

ANNEXURE-II OF SCHEDULE-I

TECHNICAL PARAMETERS - LIQUID ARGON TANK

(To be read along with para 7.2)

1. Construction : Double Walled
2. Insulation : Vacuum + Perlite Insulation
3. Design Code : PED / CE/ EN-13458-2
4. Max. Working Pressure : 17 Bar To 24 Bars
5. Inspection Authority : TUV / DRIRE
6. Working Temperature : - 196 deg. Celsius
7. Inner Vessel : Stainless steel
8. Outer Vessel : Blast cleaned Carbon steel with high-quality anti-Corrosion surface protection and a white polysiloxane finishing coat.
9. Control Box, Inter space Pipe work : Stainless steel
10. Valves & Pressurizing Coil : Stainless steel
11. Gross Capacity (liters) : (2 tanks of 6 KL) 6 KLx2 nos= Total capacity 12- KL
12. Net Capacity (liters) : More than 90% of gross capacity
13. Max. flow-up to 8 bar (Sm³/hr.) : 1500 +/- 10 %
14. Weight Empty (Kg.) : ~4500(Approx.)
15. Foundation Design : The Vessel shall be designed to comply with norms of CCOE, Nagpur
16. Make : Ferrox, VRV or Chart Linde only
17. Daily Evaporation Rate O₂ (%) : 0.22 +/- 10%
18. Connectivity : Both tanks should be interconnected by suitable valves & piping such that any one tank can be isolated for testing etc while Argon gas is drawn from the other.
19. Decanting Pump : Decanting pump of suitable capacity from mobile tanker to static tanker should be provided.

ANNEXURE-III OF SCHEDULE-I

TECHNICAL PARAMETERS - VAPORISERS

GENERAL:

Type	:	Ambient Air Heated
Configuration	:	Vertical
Design	:	Should be compatible with the fluid being handled and the design of the whole system (including tank parameters)
Duty Cycle	:	8 Hours of continuous operation before deicing.
Pressure Drop at Design Flow	:	Not more than 0.25 bar.

MATERIAL OF CONSTRUCTION:

Fins	:	Aluminum A 6063 T5
Bends & Headers	:	A-6063 T5
Structural & Frame	:	Aluminum A 6061 T6
Bolts/Supports	:	S.S. 304
Nuts	:	S.S. 304 Nyloc Anti-Vibration Nuts.
Make	:	IWI/Rhine only

ANNEXURE-IV OF SCHEDULE-I

TECHNICAL PARAMETERS - OXYGEN MANIFOLD

1. Max. Working Pressure : 17 Bar
2. Inspection Authority : TUV / DRIRE
3. Gross Capacity (litres) : 16X2 CYLINDER PACK with facility for quick change from one pack to another, each pack with capacity of 112m3
4. Flow Capacity (Sm³/hr.) : 237 +/- 10 %

ANNEXURE-V OF SCHEDULE-I

PIPELINE DISTRIBUTION SYSTEM:

- 1.0 The objective of the pipeline distribution systems is to distribute Argo mix, Gas from the compressor (S) /storage tanks to various consuming points in the Shell and Bogie of RCF, as per layout drawings at Annex- 'vi (A,B,C &D)The work shall comprise of the design, supply of materials, erection, testing, flushing and cleaning, corrosion protection, painting and commissioning of the complete system including civil & structural works.
- 2.0 The service pipelines for distribution would generally run overhead Inside/outside of shops at a height of 6/ 8 mtrs starting from Storage Points to Shell, Bogie Shop and supported by Brackets/Hangers along periphery & inside the shop. Distribution system would be connected to the down take pipes running vertically on the columns/near consuming points up to a height of 1.5 mtrs from ground level. All the pipelines including the down take pipes, right up to the points of interfacing with the equipments shall be provided by supplier. The height may vary depending upon site conditions.
- 3.0 The pipe line distribution system shall incorporate all safeguards and safety features stipulated by statutory and other regulations in force from time to time such as (Indian Boiler Regulations, Indian Explosives Act, and Indian Factories) Act etc and shall be executed as per relevant Indian Standards/British Standards/American Standards, wherever applicable. The workmanship shall be to the highest standards and as per sound engineering practice.
- 4.0 The proposed system should conform to the CE directive 97/23/CEE on equipment under pressure or equivalent Indian standard.
- 5.0 It shall be clearly understood that the tenderer shall base his designs after a thorough study of site conditions, layout drawings and other relevant drawings. The contractor is advised to study the site, particularly with regard to the type, arrangement and configuration etc. of the civil Engineering structures, alignment of the pipes and the nature of the work, etc. The existing structures that can be used to offer most economical solution.
- 6.0 The contractor shall attach with his design the detailed drawings for pipelines and catalogs for the fittings and accessories and also the plan of installation details with the bid.
- 7.0 Components of pipe work shall be designed, manufactured, assembled and tested in accordance with the latest revision of relevant standards published by Indian Standards Institutions/BIS. In case where suitable Indian Standards are not available, relevant/British/American Standards shall be followed.
- 8.0 All piping materials shall be new and standard of laying pipes shall be of first class quality, workmanship and shall be accompanied by manufacturers test certificate, wherever applicable.
- 9.0 All fittings and lengths of pipe for service lines shall be examined before assembly and if necessary hammered to free them from scale or dirt. They shall be washed out with a suitable non-flammable solution which would effectively remove grease and dirt, where required.
- 10.0 For bogie shop,for shell assembly and sheet metal. Bridge will be required for section ""AA"" of sketch No 1/5 existing structure can be made use of where ever available
- 11.0 Inside the shop floor areas, the pipelines shall be clamped on support brackets/Hangers to be fixed to the RCC/Steel columns/beams/roof girders etc. Outside the shop floor areas, the pipelines shall be similarly clamped on the brackets carried on support structures. Brackets inside the shop floor area shall be under the scope of work by contractor. In all these case, the contractor shall provide suitable clamps and these clamps shall be secured to the support brackets/inserts by means of screw/bolts and nuts etc. The foundations required for supporting structures shall be made by the successful bidder. It is to be noted that PEB structures have been used for the construction of Shell, Bogie &Paint Shop.
- 12.0 Support structure from storage area to shell assembly shop for co2 line already exists which can be used for supporting main pipe line up to shop for mix1,however provision of suitable clamps & supports brackets to be provided by the bidder in scope of supply.
- 13.0 Support structure from storage area to bogie shop & sheet metal shop for MIX-2 has to be provided by bidder. Refer section(VI-E).
- 14.0 Wherever pipelines or structures cross the rail tracks/roads & traverse, tracks, the structures are to be designed so as to give a clear minimum height of 8mtr from top of rail level/road to the lowest point of overhead pipelines/structure. Also, the horizontal distance between the centers of the rail track to the nearest edge of the structure should be at a minimum distance of 2745 mm.
- 15.0 Piping systems shall be designed, fabricated and installed so as to have sufficient flexibility and prevent development of undesirable forces or moments at points of connections to equipment, anchorages or at guide points due to thermal expansions.
- 16.0 The contractor shall be responsible for the proper fabrication of all piping systems with regard to expansion and flexibility including the branch lines and connections to equipment. The contractor, in his design, shall indicate the type of expansion loops they are incorporating and show them in the layout drawing.

- 17.0 This is a fixed price contract for scope of work as detailed in the enclosed drawing at Annex VII for Shell shop, Bogie shop & Paint Shop. However, if the length of Argomix, Gas Pipelines or Down takes, as detailed in Annex VII is to be increased or reduced, the value of contract will increase or decrease proportionally.
- 18.0 Payments shall be made in stages: (1) 80% Payment for material on supply and receipt of plant at RCF..
(2) Installation and final commissioning charges with after issue of PTC on successful commissioning of plant.
(3) Proving out and Testing 10% of balance value of material cost and installation cost.
- 19.0 Pipe supporting truss structure shall be made up of structural steel, plates, duly pre-fabricated at contractor's premises and to be transported to site. These structures should be made of high tensile Steel conforming to ASTM A 572 GRADE 50 These structures shall be fitted with fasteners at site for easy and quick installation and painted with approved paints. Only minimal welding and other erection work will be allowed at site which can't be done at Contractor's premises or may impose practical problems for transportation etc. Electricity will be provided by RCF/Icon at its discretion on chargeable basis.
- 20.0 Material used for pipe line must be corrosion resistant on the inside and outside by use of materials like stainless steel, aluminum conforming to Schedule carbon alloy steel schedule 40 ANSI B3610 or ASTM A53/A106/A333. or IS equivalent. Pipelines offered must be seamless pipes.
- 21.0 All Pipes must be pre coated with protective paints. The colour of pipe line must be as per IS standard and same to be got approved from RCF.
- 22.0 Pipes used must have close control on dimension from outside as well as inside, in order to provide leak free connection with the fittings.
- 23.0 The pipeline system for argomix gas vessels, vessel accessories and components installed in the gas storage area should be designed for leakage free service for a minimum period of 10 years from date of commissioning, up to designated pressure. Although the warranty, guarantee will be required for a period of two years from the date of commissioning.
- 24.0 All fitting used shall be for non corrosive material i.e. engineering grade Plasting/ composites / stainless steel. Any other equivalent alternative material standard of the pipe lines may be also detailed in the offer as an optional alternative. The fittings shall be quick and easy to assemble and disassemble.
- 25.0 Preferred makes of pressure gauges isolating valves & necessary fittings shall be Wika, Mass, H Guru.
- 26.0 **PIPE LINE DISTRIBUTION SYSTEM:**
- 26.1 Sufficient number of isolating valves, as may be necessary shall be incorporated in the pipe lines system for easy & quick isolation of sections. The location of these valves shall be indicated by the bidder in the schematic layout drawing before installation to the system.
- 26.2 Suitable down take pipes are to be provided at the consuming points indicated in the layout drawing.
- 26.3 All down take pipes are to be taken down along the RCC/steel columns and the contractor shall provide necessary clamps and suitably secure them.
- 26.4 All down take pipes, except those which have to pass through trenches, shall have a shut off valve located at a height of 1.5m . These non-return valves shall be of such design that pressure regulators can be directly mounted on it.
- 26.5 The down take pipes shall be taken from the service line in such a way that no moisture should be passed to down take pipes. The down take connection shall be running vertically along the structure and Nipple valve/QRC(Quick Release coupling) to be provided at the end.
- 26.6 Isolation valves to be located at accessible places for its operation during use/break down in service line keeping in view of staff safety.
- 26.7 The Gap between different service pipes as well as different down take pipe should be sufficient for maintenance purpose.
- 26.8 Adequate steps should be taken to ensure that minimum required pressure is maintained at farthest point in the system by making loops.
- 27.0 **VALVES:**
- 27.1 Suitable Valves shall be provided in the pipe line system for section isolation equipment isolation, pressure relief, control of pressure and flow rates, for venting and draining etc. The valves provided shall be suitable for the service conditions in all respects and shall be selected and located considering easy operation and maintenance. The provided valves shall include, but no limited to the following. :-I
- i. Isolating Valve at the start of each main branch pipe.
 - ii. At the end of each drop and each tapping connection.
 - iii. Cut-off/Isolating Valves in the header in the compressor Room so that each Compressor Can be used separately.
 - iv. The bidder shall furnish a schematic drawing showing the details of the proposed arrangement .

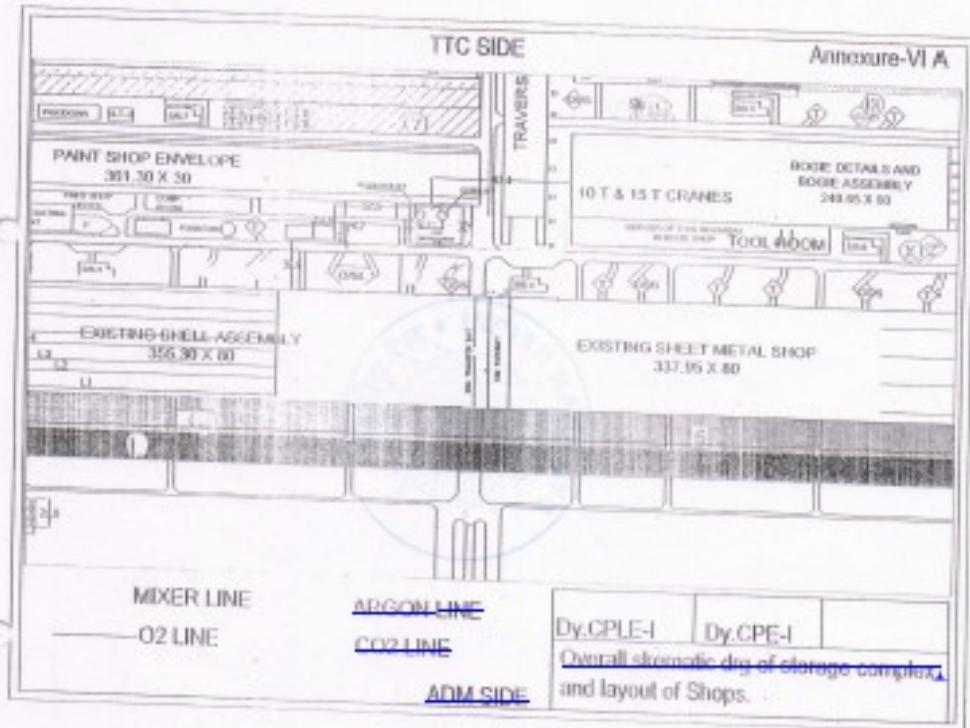
- 27.2** The contractor shall clearly indicate in the enclosed different **Annexes to Schedules** the makes of different types of valves, meters and gauges used in the scheme and locate them in the schematic diagram.
- 27.3** All valve to be provided at suitable location from operation & maintenance point of view and should be preferably of make : Danfoss, Essab, Vanaz, Marc, Care Legris, Parker, AUDCO.
- 27.4** Pressure gauge should be provided at convenient locations at 2mtr. height above ground level at a interval of approx. one gauge on either end in each bay in each shop.
- 28.0** Approximate length of pipe lines required to be provided is estimated as under:-
- a. Ø 50 mm Main Pipe Line:- 2066 meter.
 - b. Ø 32 mm Feed Pipe Line:- 1808 meter.
 - c. Ø 15 mm Pipe Line for down drops:- 1866meter.

Schedule of requirements ANNEXURE-VII OF SCHEDULE-I

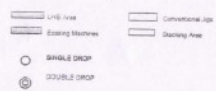
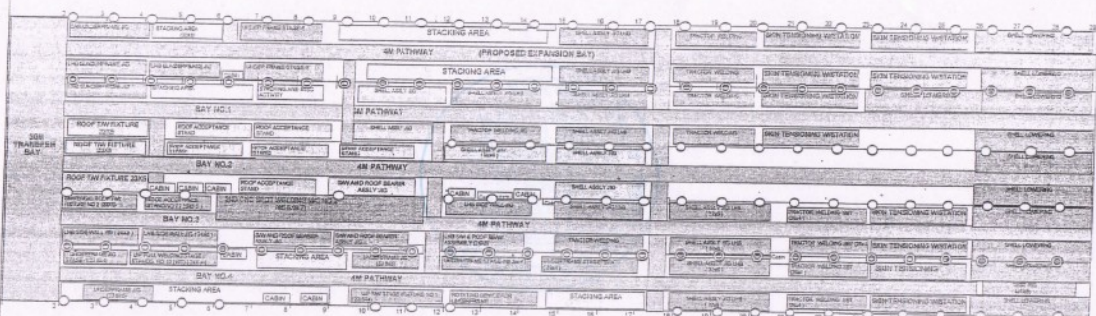
S.N	Name	Qty.	Rate/Unit	Transport Charges to RCF	Taxes	Total
1	Argon Tank 6 KL each	2				
2	Oxygen Manifold	1				
3	Mixing unit 1(250 m ³ /hr) for 3 gas mixing	1				
4	Mixing unit 2(100 m ³ /hr) for 2 gas mixing	1				
5	Standby Mixing unit(100 m ³ /hr)	1				
6	Interconnecting Pipelines as per para 7.5	1				
7	Vaporizer for Argon	1				
8	Supply of 50mm N,B.Seamless pipe Sch-40 (As per Para7.4)	2066 Mtrs.				
9	Supply of 32mm N,B, Seamless Pipe Sch.40. (As per Para7.4)	1808 Mtrs.				
10	Down drop Pipeline 262X6, Ø 15 mm.	1866 Nos.				
11	Supply of M.S.counter Flange O.D.150mm,I.D.50mm, thickness-15mm thick with four holes of 12mm including bolts,nuts,washers & gasket fitment at 24 Mtrs.Length	180 Nos.				
12	Supply of M.S.Counter flange O.D.100mm,I.D.32mm,thickness -12mm with four holes of 12mm including bolts,nuts,washers & gasket fitment at 24 Mtrs.Lenght	165 Nos.				
13	Supply & fitment of C.S.50mm flanged type ball valve class 150 API-6D size 50mm	8 Nos.				
14	Supply of C.S.flanged type ball valve class 150 API-6D size 32	12 Nos.				
15	SS Ball valve- 15 mm for down drop	311 Nos.				
16	Fittings ,Clamps, Bend, TCC etc.	1000 Kg.				
17	Support Column from Mix 2 to Bogie Shop	1 unit.				
18	Painting of pipe line complete 50mm N.B.,32mm N.B.,15mm N.B.& Supports with approved synthetic enamel paint (Painting fabrication on unit testing installation cost of pipe line)	900m2. Unit				
19	Installation testing of item 1 to 5					
20	Civil work and electrical work for operator room. Electrical works for system.	unit				

21	Cost of approvals from CCOE and other statutory licenses (subject to the actuals)					
22	Electrical works to make the system functional	Unit				
23	Ant other cost not included above but considered necessary for commissioning of system (total 1 to 21)					
24	Decanding pump for evacuating Liquid Argon from Road tanker					
Optional						
25	Telemetry System	1 unit				
26	Earth Pit for Argo Tank used connecting G.I Strip.	1				

Note :- Actual Quantity may vary based on the site condition at the time of commissioning.



ACTUAL LAYOUT PLAN OF FABRICATION AND SHELL ASSEMBLY SHOP SHOWING LOCATION OF AGROMIX DROPS



NOTE: INTER COLUMN DISTANCE - 12 METERS
Pillar numbers counted starting from transfer bay towards LPG buffer

FABRICATION SHOP FROM TRANSFER BAY TO SHELL ASSEMBLY SHOP			SHELL ASSEMBLY SHOP		
PILLAR ROW NO	PILLAR NO	TOTAL DROPS	PILLAR ROW NO	PILLAR NO	TOTAL
JERU LINE	2 TO 14	12	23RD LINE	19 TO 28	10
A LINE	3 TO 11 (DOUBLE)	20	4 LINE	12 TO 20 (DOUBLE)	24
B LINE	18	16	5 LINE	12 TO 28	17
C LINE	20 & 21 TO 14	8	6 LINE	19 TO 28	10
D LINE	2 TO 14 (DOUBLE)	28	7 LINE	19 TO 28 (DOUBLE)	20
E LINE	3 TO 4, 10 TO 12	8	8 LINE	19 TO 28	11
TOTAL		116	TOTAL		116

Dr-SP1	Dr-SP2	Dr-SP3	Dr-SP4	Dr-SP5	Dr-SP6	Dr-SP7	Dr-SP8	Dr-SP9	Dr-SP10	Dr-SP11	Dr-SP12	Dr-SP13	Dr-SP14	Dr-SP15	Dr-SP16	Dr-SP17	Dr-SP18	Dr-SP19	Dr-SP20	Dr-SP21	Dr-SP22	Dr-SP23	Dr-SP24	Dr-SP25	Dr-SP26	Dr-SP27	Dr-SP28	Dr-SP29	Dr-SP30	Dr-SP31	Dr-SP32	Dr-SP33	Dr-SP34	Dr-SP35	Dr-SP36	Dr-SP37	Dr-SP38	Dr-SP39	Dr-SP40	Dr-SP41	Dr-SP42	Dr-SP43	Dr-SP44	Dr-SP45	Dr-SP46	Dr-SP47	Dr-SP48	Dr-SP49	Dr-SP50	Dr-SP51	Dr-SP52	Dr-SP53	Dr-SP54	Dr-SP55	Dr-SP56	Dr-SP57	Dr-SP58	Dr-SP59	Dr-SP60	Dr-SP61	Dr-SP62	Dr-SP63	Dr-SP64	Dr-SP65	Dr-SP66	Dr-SP67	Dr-SP68	Dr-SP69	Dr-SP70	Dr-SP71	Dr-SP72	Dr-SP73	Dr-SP74	Dr-SP75	Dr-SP76	Dr-SP77	Dr-SP78	Dr-SP79	Dr-SP80	Dr-SP81	Dr-SP82	Dr-SP83	Dr-SP84	Dr-SP85	Dr-SP86	Dr-SP87	Dr-SP88	Dr-SP89	Dr-SP90	Dr-SP91	Dr-SP92	Dr-SP93	Dr-SP94	Dr-SP95	Dr-SP96	Dr-SP97	Dr-SP98	Dr-SP99	Dr-SP100
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Dr-SP101 to Dr-SP150 (omitted for brevity)

Dr-SP151 to Dr-SP200 (omitted for brevity)

Dr-SP201 to Dr-SP250 (omitted for brevity)

Dr-SP251 to Dr-SP300 (omitted for brevity)

Dr-SP301 to Dr-SP350 (omitted for brevity)

Dr-SP351 to Dr-SP400 (omitted for brevity)

Dr-SP401 to Dr-SP450 (omitted for brevity)

Dr-SP451 to Dr-SP500 (omitted for brevity)

Dr-SP501 to Dr-SP550 (omitted for brevity)

Dr-SP551 to Dr-SP600 (omitted for brevity)

Dr-SP601 to Dr-SP650 (omitted for brevity)

Dr-SP651 to Dr-SP700 (omitted for brevity)

Dr-SP701 to Dr-SP750 (omitted for brevity)

Dr-SP751 to Dr-SP800 (omitted for brevity)

Dr-SP801 to Dr-SP850 (omitted for brevity)

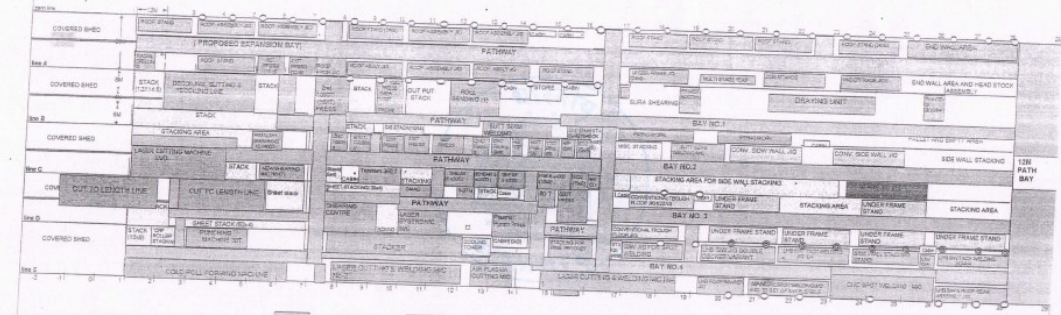
Dr-SP851 to Dr-SP900 (omitted for brevity)

Dr-SP901 to Dr-SP950 (omitted for brevity)

Dr-SP951 to Dr-SP1000 (omitted for brevity)

LAYOUT OF SHEET METAL SHOP, SHOWING PROPOSED LOCATION OF ARGOMIX DROPS

Annexure-VI C



Pillar Row No	Pillar No.	Total Drops
Line 1a	3 to 23	28
Line A	4 to 16	9
Line B	16	14
Line C	18 & 19	2
Line D	19 to 22	30
	23 to 28 (include 26)	
Line E	28 to 33, 36 TO 38	7
	33	
TOTAL		64

Existing MSP
 PATHWAY
 LHS AREA
 STACKING AREA
 DOUBLE DECKER JIG
 CONVENTIONAL JIG
 MSP FOR WHICH LOCATION IS FINALIZED

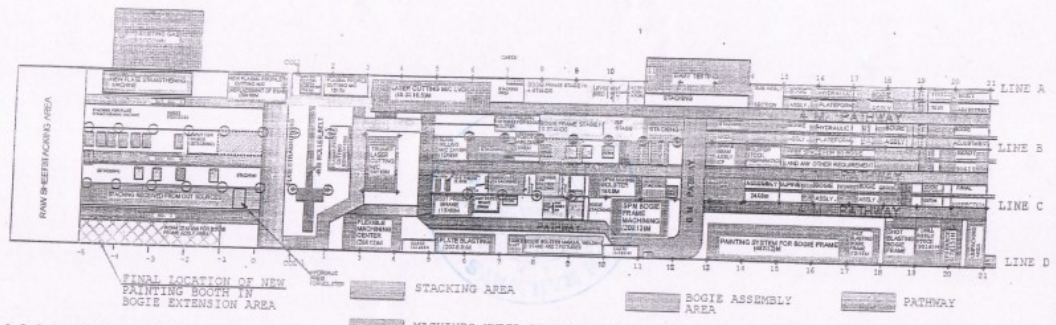
Pillar numbers counted starting from weigh bridge and towards transfer Bay
 ○ SINGLE DROPS POINT
 ⊙ DOUBLE DROPS

NOTE: INTER COLUMN DISTANCE - 12 METERS

DRP-1	DRP-2	DRP-3	DRP-4	DRP-5	DRP-6	DRP-7	DRP-8	DRP-9	DRP-10	DRP-11	DRP-12	DRP-13	DRP-14	DRP-15	DRP-16	DRP-17	DRP-18	DRP-19	DRP-20	DRP-21	DRP-22	DRP-23	DRP-24	DRP-25	DRP-26	DRP-27	DRP-28	DRP-29	DRP-30	DRP-31	DRP-32	DRP-33	DRP-34	DRP-35	DRP-36	DRP-37	DRP-38	DRP-39	DRP-40	DRP-41	DRP-42	DRP-43	DRP-44	DRP-45	DRP-46	DRP-47	DRP-48	DRP-49	DRP-50	DRP-51	DRP-52	DRP-53	DRP-54	DRP-55	DRP-56	DRP-57	DRP-58	DRP-59	DRP-60	DRP-61	DRP-62	DRP-63	DRP-64																																
																																DRP-65				DRP-66				DRP-67				DRP-68				DRP-69				DRP-70				DRP-71				DRP-72				DRP-73				DRP-74				DRP-75				DRP-76				DRP-77				DRP-78				DRP-79				DRP-80			

NO.	DATE	REVISION

LAYOUT PLAN OF BOGIE SHOP SHOWING PROPOSED LOCATION OF ARGOMIX DROPS



- A, B, C, D TACK WELDING JIG (STAGE-I)
- E & F TACK WELDING JIG (STAGE-II)
- G & L TACK WELDING JIG (STAGE-IV)
- H BOGIE FRAME FAB. JIG
- I & J SIDE FRAME WELDING MANIPULATOR
- K SIDE FRAME WELDING MANIPULATOR WITH PIT

- SINGLE DROP POINTS
- DOUBLE DROPS POINTS

NOTE: INTER COLUMN DISTANCE - 12 METERS

PILLAR NUMBERS COUNTED STARTING FROM MACHINE SHOP TOWARDS TRANSFER BAY

TTC SIDE
