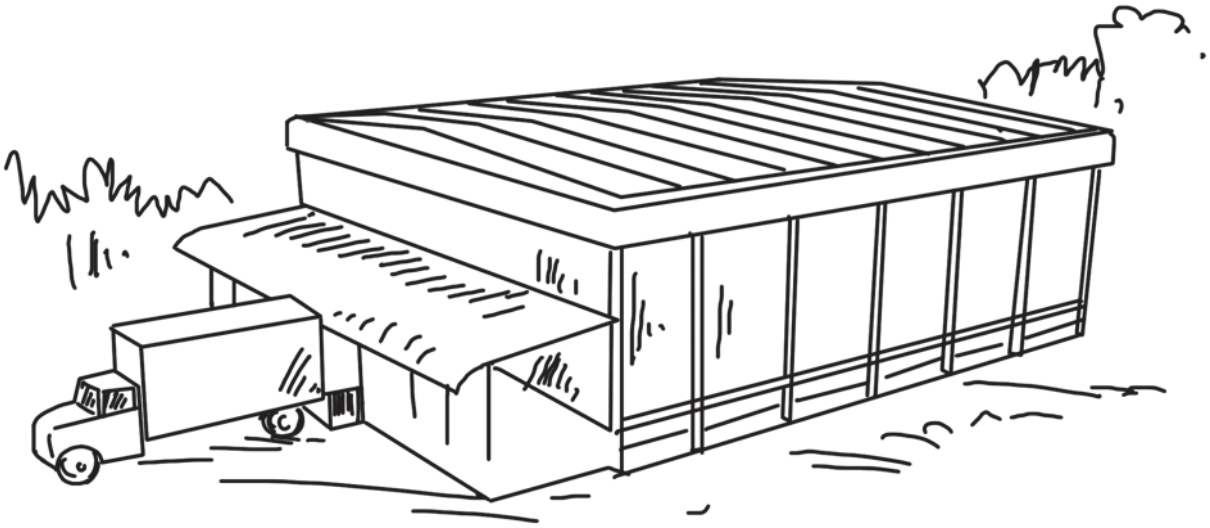
COLD STORAGE



1.0 INTRODUCTION

India is the largest producer of fruits and second largest producer of vegetables in the world. In spite of this per capita availability of fruits and vegetables is quite low because of post harvest losses, which account for about 25% to 30% of production. Besides, quality of a sizable quantity of produce also deteriorates by the time it reaches the consumer. This is mainly because of perishable nature of the produce, which requires a cold chain arrangement to maintain the quality and extend their shelf life. In the absence of a cold storage and related cold chain facilities, the farmers are being forced to sell their produce immediately after harvest, which results in glut situations and low price realization. Sometime farmers do not even get their harvesting and transportation costs. As a result, production of fruits and vegetables is not stabilized and the farmers after burning fingers in one crop switch over to another crop in the subsequent year and the vicious cycle continues. A cold storage facility accessible to them will go a long way in removing the risk of distress sale to ensure better returns.

This project profile is for setting up of a 500 MT capacity cold storage with the objective of buying fruits & vegetables directly from the farmers during the production season and sale them throughout the year to bulk buyers. The storage of fruits and vegetables have been assumed at 50% respectively and the unit will ensure purchases during peak production period of fruits and vegetable so that the average cost of purchases is at 40% of average sales value.

2.0 MARKET POTENTIAL

Cold storages are essential for extending the shelf life, period of marketing, avoiding glut and reducing transport bottlenecks during peak period of production and maintenance of quality of produce. The development of cold storage industry has therefore an important role to play in reducing the wastages of perishable commodities and thus providing remunerative prices to the growers.

The estimated annual production of fruits and vegetables in India is about 130 million tonnes. Due to diverse agro climatic conditions and better availability of package of practices, the production is gradually rising. Although, there is a vast scope for increasing the production, the lack of cold storage and cold chain facilities are becoming major bottlenecks in tapping the potential. Present availability of cold storage capacity is only 103.5 lakh tonnes, out of which units having about 8 lakh tonnes capacity are non functional. Although 90% of these units are made to store only potato, it still does not meet the requirement of the single crop, the production of which is about 300 lakh tonnes. Out of 3443 cold storage units setup till 1988, 2012 units were for potato, 447 units were for multipurpose use, 198 units were for fruits and vegetables and the remaining were for products like meat, fish, milk, etc.

According to the information collected by the expert committee on cold storage and storage, requirement of cold storage in the next five years may be in excess of 12 lakh tonnes. The working group of the planning commission for IX plan had assessed new cold storage capacity for fruits, vegetables and multi commodity as 15 lakh tonnes; 13 lakh tonnes in private sector, 1.5 lakh tonnes in cooperative sector and the rest 0.5 lakh tonnes in public sector. Thus, there remains a vast potential to be tapped.

3.0 TECHNOLOGY & PROCESS KNOWHOW

(i) Storage of foods and Storage Conditions: Foods and many other commodities can be preserved by storage at low temperature, which retards the activities of micro-organisms. Microorganisms are the spoilage agents and consist of bacteria, yeasts and molds. Low temperature does not destroy those spoilage agents as does high temperature, but greatly reduces their activities, providing a practical way of preserving perishable foods in their natural state which otherwise is not possible through heating. The low temperature necessary for preservation depends on the storage time required often referred to as short or long term shortage and the type of product.

In general, there are three groups of products:

(a) Foods that are alive at the time of storage, distribution and sale e.g. fruits and vegetables,

(b) Foods that are no longer alive and have been processed in some form e.g. meat and fish products, and

(c) Commodities that benefit from storage at controlled temperature e.g. beer, tobacco, khandsari, etc.

Living foods such as fruits and vegetables have some natural protection against the activities of micro-organism. The best method of preserving these items is to keep the product alive and at the same time retard the natural enzyme activity, which will retard the rate of ripening or maturity.

Preservation of non-living foods is more difficult since they are susceptible to spoilage. The problem is to preserve dead tissues from decay and putrefaction. Long term storage of meat and fish product can only be achieved by freezing and then by storing it at temperature below -15°C. Only certain fruits and vegetables can benefit from freezing. However, for fruits and vegetables, one should be very careful about the recommended storage temperature and humidity a deviation from which will have adverse effect on the stored product leading to even loss of the entire commodity.

Products such as apples, tomatoes, oranges, etc. cannot be frozen and close control of temperature is necessary for long term storage. Some product can also be benefited by storing under controlled atmosphere and modified atmosphere conditions.

Dairy products are produced from animal fats and therefore non living foodstuffs. They suffer from the oxidation and breakdown of their fats, causing rancidity. Packaging to exclude air and hence Oxygen can extend storage life of such foodstuffs.

(ii) Technology: A cold storage unit incorporates a refrigeration system to maintain the desired room environment for the commodities to be stored. A refrigeration system works on two principles:

(a) Vapour absorption system (VAS), and
(b) Vapour compression system (VCS)

VAS, although comparatively costlier, is quite economical in operation and adequately compensates the higher initial investment. Wherever possible such a system should be selected to conserve on energy and operational cost. However, it has its own limitations when temperature requirement is below 10°C and many of the fruits and vegetables except seeds, mango, etc. require lower than 10°C for long storage.

VCS is comparatively cheaper than VAS. There are three types of VCS systems available depending upon the cooling arrangements in the storage rooms i.e., diffuser type, bunker type and fin coil type. Diffuser type is comparatively costlier and is selected only when the storage room heights are low. The operational cost of such units is also higher. Bunker type is the cheapest and is preferred when storage room heights normally exceeds 11.5 m. Its operational cost is also low. Fin coil type, although about 5% costlier than the bunker type, is very energy efficient with low operational cost and higher space availability for storage of produce. Such system is used for units with room heights of 5.4m onwards.

In a refrigeration system, refrigerants are used to pick up heat by evaporation at a lower temperature and pressure from the storage space and give up the heat by

condensation at a higher temperature and pressure in a condenser. Ammonia is usually used for the purpose. Although several types of compressors and condensers are available, medium speed reciprocating compressors and atmospheric condensers are preferred because of the relatively lower cost, energy efficiency and ease in maintenance.

While selecting size of the equipment, care should be taken to assess all loads and proper provision should be made to take care of the peak demand during summer loading and aging of the equipment. Heat load factors normally considered in a cold storage design are:

1. Wall, floor and ceiling heat gains due to conduction

2. Wall and ceiling heat gains from solar radiation

3. Load due to ingression of air by frequent door openings and during fresh air charge.

4. Product load from incoming goods

5. Heat of respiration from stored product

6. Heat from workers working in the room

7. Cooler fan load

8. Light load

9. Aging of equipment

10. Miscellaneous loads, if any.

(iii) Insulation: All the sides of the cold storage room need to be insulated in order to maintain the required temperature inside. Various types of insulating materials are used for insulation of side walls, partition walls, floor and roof. However, the most commonly used insulation material is thermo coal and Poly Urethane Fibre (PUF) panels depending upon the economics of the project.

4.0 COST OF THE PROJECT

The estimated project cost is given below:

(Rs. in lacs)

Particulars	Amount (Rs)
Land & site development	4.00
Building & civil works	365.93
Plant & Machinery	369.15
Misc. Fixed assets	23.97
Preliminary & pre-operative expenses	39.79
Contingencies & escalation @ 3%	22.89
Working capital margin	38.35
TOTAL	864.08

4.1 Land & Site Development: Details of land & site development are given below.

Particulars	Area (Sqm)	Rate (Rs)	Amount (Rs)
Site levelling, approach road, fencing, etc.	LS	LS	400000
		Say (Rs. in lacs)	4.00

4.2 Building & Civil Works: Details of building & civil works are given below.

Particulars	Area (Sqm)	Rate (Rs)	Amount (Rs)
Cold Storage Chamber (RCC building)	1400	9000	12600000
Insulation of Cold Storage Chamber	5500	3200	17600000
Sorting Verandah	500	6000	3000000
Machine Room (RCC building)	120	9000	1080000
Administration Room (RCC building)	50	9000	450000

Genset Room (Brick wall, CGI sheet roof, Concrete Floor)	30	4000	120000
		Sub total	34850000
Add: Electrification, installation, etc @ 5%			1742500
		TOTAL	36592500
		Say (Rs. in lacs)	365.93

4.3 Plant & Machinery: Details of plant & machinery are given below.

Particulars	Qty	Rate (Rs)	Amount (Rs)
Cold Storage Equipments (500 MT capacity)	1	30000000	30000000
Sorting & Grading Equipment	1	2000000	2000000
Miscellaneous items	LS	LS	100000
		Sub total	32100000
Add: Installation, transportation, taxes, etc @ 15%			4815000
		TOTAL	36915000
		Say (Rs. in lacs)	369.15

4.4 Misc. Fixed Assets: Details of miscellaneous fixed assets are given below.

Particulars	Qty	Rate (Rs)	Amount (Rs)
Installation of Transformer (500 kva capacity)	1	950000	950000
Installation of bore well	1	100000	100000
160 KVA DG Set	1	889000	889000
Weighbridge (40 ton capacity)	1	45000	45000
Furniture & fixtures	LS	LS	50000
Miscellaneous items	LS	LS	50000
		Sub total	2084000
Add: Installation, transportation, etc @ 15%			312600
		TOTAL	2396600
		Say (Rs. in lacs)	23.97

4.5 Preliminary & Pre-operative Expenses: Details of preliminary & pre-operative expenses are given below.

(Rs. In lacs)

Particulars	Amount (Rs)
Travelling expenses	50000
Professional & other fees	100000
Interest during implementation	3779450
Miscellaneous expenses	50000
TOTAL	3979450
Say (Rs. in lacs)	39.79

4.6 Contingencies & Escalation: Contingencies & escalation has been assumed at 3% of the cost of land & site development, building & civil works, plant & machinery and miscellaneous fixed assets.

4.7 Working Capital: Details of working capital are given below.

(Rs. in lacs)

	Period (Days)	Total Current Assets		
		Year 1	Year 2	Year 3
Purchases	30	30.82	36.99	43.15
Power & fuel	30	2.25	2.70	3.15

Salary	30	1.25	1.26	1.27
Goods in process	30	35.88	42.68	49.48
Receivables	15	25.68	30.82	35.96
Total		95.89	114.44	133.00
Working Capital Margin in Year 1 (40%)		38.35		

5.0 MEANS OF FINANCE

The means of finance for the project is estimated as below.

(Rs. in lacs)

Particulars	Percent	Amount (Rs)
EQUITY		
A. Equity from Promoters	40%	345.63
B. Subsidy from Central/State Govt.	-	
DEBT		
Term Loan from Banks/FIs	60%	518.45
TOTAL	100%	864.08

6.0 PROFITABILITY STATEMENT

(Rs. in lacs)

Particulars	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
A. INCOME							
Capacity utilisation	50%	60%	70%	70%	70%	70%	70%
Income from sales/ annum	625.00	750.00	875.00	875.00	875.00	875.00	875.00
B. OPERATING EXPENSES							
Purchases	375.00	450.00	525.00	525.00	525.00	525.00	525.00
Power & Fuel	27.36	32.83	38.30	38.30	38.30	38.30	38.30
Salary	15.24	15.32	15.39	15.47	15.55	15.62	15.70
Repair & Maintenance	9.56	9.84	10.14	10.44	10.76	11.08	11.41
Selling Expenses	6.25	7.50	8.75	8.75	8.75	8.75	8.75
Miscellaneous Expenses	3.13	3.75	4.38	4.38	4.38	4.38	4.38
Total Operating Expenses	436.53	519.24	601.96	602.34	602.73	603.13	603.54
Less working expenses capitalised	38.35	0.00	0.00	0.00	0.00	0.00	0.00
Operating profit	226.82	230.76	273.04	272.66	272.27	271.87	271.46
C. FINANCIAL EXPENSES							
Depreciation	33.23	33.23	33.23	33.23	33.23	33.23	33.23
Interest on Term Loan	71.29	65.84	53.96	42.08	30.20	18.32	6.44
Interest on WC Loan	9.21	10.99	12.77	12.77	12.77	12.77	12.77
Net Profit	113.10	120.70	173.08	184.58	196.07	207.55	219.02
Net cash accruals	146.33	153.93	206.31	217.81	229.30	240.78	252.25
Principal Repayment	0.00	86.41	86.41	86.41	86.41	86.41	86.41

6.1 Income from Sales: Income from sales at installed capacity is estimated as below.

Product	Proportion	Installed Capacity (MT)	Quantity (MT)	Avg Price (Rs/ MT)	Amount (Rs)
Fruits	50%	5000	2500	50000	125000000
Vegetables	50%	5000	2500	25000	62500000
Income from sales at 100% capacity (Rs)					187500000

6.2 Purchases: Purchases at installed capacity is estimated as below.

Product	Qty/year (MT)	Avg Rate (Rs/MT)	Amount (Rs)
Fruits	2500	20000	50000000
Vegetables	2500	10000	25000000
Expenses on consumables at 100% capacity (Rs)			75000000

6.3 Power & Fuel: Expenses on power & fuel at installed capacity is estimated as below.

A. Expenses on power

Connected load	250
Average load factor	70%
Proportion running on power	80%
Hrs/day	24
Days/annum	300
Annual power consumption	1008000
Rate (Rs/unit)	5
Expenses on power per annum at 100% capacity (Rs)	5040000

B: Estimate of Diesel

Proportion running on fuel (diesel)	20%
Hrs/annum	1440
Diesel consumption (litres/ hr)	6
Diesel Price per litre	50
Expenses on diesel per annum at 100% capacity (Rs)	432000
Expenses on power & fuel at 100% capacity (Rs)	5472000

6.4 Salary: Expenses on salary in the 1st year is estimated as given below. It is assumed that salary expenses will increase @ 0.5% every subsequent year.

Particulars of Employees	Numbers	Salary/Month (Rs)	Cost/annum (Rs)
Manager	1	15000	180000
Technicians/machine operators	4	10000	480000
Sales staff	3	4000	144000
Unskilled workers/helpers	20	3000	720000
Expenses on salary in the 1st year (Rs)			1524000

6.5 Repair & Maintenance: Expenses on repair & maintenance in the 1st year is estimated as given below. It is assumed that expenses on repair & maintenance will increase @ 3% every subsequent year.

(Rs. in lacs)

Particulars	Cost (Rs)	Rate	Amount (Rs)
Building & civil works	365.93	1.00%	3.66
Plant & Machinery	369.15	1.50%	5.54
Misc. Fixed assets	23.97	1.50%	0.36
Expenses on repair & maintenance in year 1			9.56

6.6 Selling Expenses: Selling expenses have been assumed at 1% of sales.

6.7 Miscellaneous Expenses: Miscellaneous expenses have been assumed at 0.5% of sales.

6.8 Depreciation: Depreciation has been calculated by straight line method. The details of calculation are given below.

(Rs in lacs)

Description	Cost (Rs)	Rate	Amount/annum (Rs)
Building & Civil Works	365.93	3.34%	12.22
Plant & Machinery	369.15	5.28%	19.49
Misc. Fixed Assets	23.97	6.33%	1.52
TOTAL			33.23

6.9 Interest on Term Loan & Principal Repayment: Interest rate has been assumed at 13.75%. Duration of Loan repayment has been considered for a period of 7 years including moratorium period of 1 year with equal monthly instalments. The details of calculation are given below.

(Rs in lacs)

Month	Year	1	2	3	4	5	6	7
Month 1	Opening balance	518.45	518.45	432.04	345.63	259.22	172.82	86.41
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest (13.75%)	5.94	5.94	4.95	3.96	2.97	1.98	0.99
	Closing balance	518.45	511.25	424.84	338.43	252.02	165.62	79.21
Month 2	Opening balance	518.45	511.25	424.84	338.43	252.02	165.62	79.21
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.86	4.87	3.88	2.89	1.90	0.91
	Closing balance	518.45	504.05	417.64	331.23	244.82	158.41	72.01
Month 3	Opening balance	518.45	504.05	417.64	331.23	244.82	158.41	72.01
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.78	4.79	3.80	2.81	1.82	0.83
	Closing balance	518.45	496.85	410.44	324.03	237.62	151.21	64.81
Month 4	Opening balance	518.45	496.85	410.44	324.03	237.62	151.21	64.81
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.69	4.70	3.71	2.72	1.73	0.74
	Closing balance	518.45	489.65	403.24	316.83	230.42	144.01	57.61
Month 5	Opening balance	518.45	489.65	403.24	316.83	230.42	144.01	57.61
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.61	4.62	3.63	2.64	1.65	0.66
	Closing balance	518.45	482.45	396.04	309.63	223.22	136.81	50.40
Month 6	Opening balance	518.45	482.45	396.04	309.63	223.22	136.81	50.40
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.53	4.54	3.55	2.56	1.57	0.58
	Closing balance	518.45	475.24	388.84	302.43	216.02	129.61	43.20
Month 7	Opening balance	518.45	475.24	388.84	302.43	216.02	129.61	43.20
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.45	4.46	3.47	2.48	1.49	0.50
	Closing balance	518.45	468.04	381.64	295.23	208.82	122.41	36.00
Month 8	Opening balance	518.45	468.04	381.64	295.23	208.82	122.41	36.00
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.36	4.37	3.38	2.39	1.40	0.41
	Closing balance	518.45	460.84	374.44	288.03	201.62	115.21	28.80
Month 9	Opening balance	518.45	460.84	374.44	288.03	201.62	115.21	28.80
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.28	4.29	3.30	2.31	1.32	0.33

	Closing balance	518.45	453.64	367.23	280.83	194.42	108.01	21.60
Month 10	Opening balance	518.45	453.64	367.23	280.83	194.42	108.01	21.60
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.20	4.21	3.22	2.23	1.24	0.25
	Closing balance	518.45	446.44	360.03	273.63	187.22	100.81	14.40
Month 11	Opening balance	518.45	446.44	360.03	273.63	187.22	100.81	14.40
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.12	4.13	3.14	2.15	1.16	0.17
	Closing balance	518.45	439.24	352.83	266.43	180.02	93.61	7.20
Month 12	Opening balance	518.45	439.24	352.83	266.43	180.02	93.61	7.20
	Repayment	0.00	7.20	7.20	7.20	7.20	7.20	7.20
	Interest	5.94	5.03	4.04	3.05	2.06	1.07	0.08
	Closing balance	518.45	432.04	345.63	259.22	172.82	86.41	0.00
Principal Repayment		0.00	86.41	86.41	86.41	86.41	86.41	86.41
Interest		71.29	65.84	53.96	42.08	30.20	18.32	6.44

6.10 Interest on Working Capital Loan: Interest rate on working capital loan has been assumed at 16%. Details of calculation are given below.

(Rs. in lacs)

Particulars	Year 1	Year 2	Year 3
Total current assets	95.89	114.44	133.00
Bank Loan (60%)	57.53	68.67	79.80
Interest @ 16%	9.21	10.99	12.77

7.0 DEBT SERVICE COVERAGE RATIO (DSCR)

(Rs. in lacs)

Year	1	2	3	4	5	6	7	TOTAL
Net Profit	113.10	120.70	173.08	184.58	196.07	207.55	219.02	
Depreciation	33.23	33.23	33.23	33.23	33.23	33.23	33.23	
Interest	71.29	65.84	53.96	42.08	30.20	18.32	6.44	
Total	217.62	219.77	260.27	259.89	259.50	259.10	258.69	1734.85
Interest	71.29	65.84	53.96	42.08	30.20	18.32	6.44	
Loan repayment	0.00	86.41	86.41	86.41	86.41	86.41	86.41	
Total	71.29	152.25	140.37	128.49	116.61	104.72	92.84	806.57
DSCR	3.05	1.44	1.85	2.02	2.23	2.47	2.79	

Average DSCR = 2.15

8.0 BREAK EVEN POINT (BEP)

(Rs. in lacs)

Year	1	2	3
A. Net sales	625.00	750.00	875.00
B. Variable cost			
Purchases	375.00	450.00	525.00
Power & Fuel	27.36	32.83	38.30
Selling Expenses	6.25	7.50	8.75
Miscellaneous Expenses	3.13	3.75	4.38
Interest on Working Capital Loan	9.21	10.99	12.77

Total variable cost	420.94	505.07	589.20
C. Contribution (A-B)	204.06	244.93	285.80
D. Fixed & Semi-fixed Costs			
Salary	15.24	15.32	15.39
Repair & maintenance	9.56	9.84	10.14
Interest on Term Loan	71.29	65.84	53.96
Depreciation	33.23	33.23	33.23
Total fixed cost	129.31	124.23	112.72
E. BREAK EVEN POINT	63.37%	50.72%	39.44%
F. BEP at operating capacity	31.69%	30.43%	27.61%
G. Cash BEP	23.54%	22.29%	19.47%

9.0 INTERNAL RATE OF RETURN (IRR)

(Rs. in lacs)

Year	0	1	2	3	4	5	6	7
CASH OUTFLOW								
Capital Expenditure	763.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working Capital	0.00	95.89	18.56	18.56	0.00	0.00	0.00	0.00
Total (A)	763.04	95.89	18.56	18.56	0.00	0.00	0.00	0.00
CASH INFLOW								
Profit After Tax		113.10	120.70	173.08	184.58	196.07	207.55	219.02
Add: Depreciation		33.23	33.23	33.23	33.23	33.23	33.23	33.23
Add: Interest		71.29	65.84	53.96	42.08	30.20	18.32	6.44
Add: Salvage Value								
Total (B)	0.00	217.62	219.77	260.27	259.89	259.50	259.10	258.69
NET FLOW (B-A)	-763.04	121.73	201.22	241.72	259.89	259.50	259.10	258.69

IRR = 20%

MACHINERY SUPPLIERS

(a) Bombay Ammonia Refrigeration Company
No. 9/47, Industrial Area, Kirti Nagar, New Delhi - 110015, Delhi, India

(b) R. E. C. Systems
E - 8, M. G. Road, U. P. S. I. D. C. Industrial Area Phase - 1, Ghaziabad - 201 001, Uttar Pradesh, India

(c) Kalair Engineering Company

No. 95, Street No. 4, Ravi Nagar Extension, P. O.- Tilak Nagar, Near Keshopur Sabzi Mandi, New Delhi - 110 018, Delhi, India