

## Reference Data Sheet for Cold Storage Type 1 as per NCCD Guidelines:

**i) Cold Store Chamber Sizing and Capacity**

- Please enclose Sketch with Plan layout and sections showing the storage chamber

Details	Chamber 1	Chamber 2	Chamber 3	Chamber 4	Chamber 5
Temp. Zone & Relative Humidity conditions	0 to 2 °C 90-95% RH	0 to 2 °C 95 - 100% RH	0 to 2 °C 65 - 75% RH	0 to 2 °C 90 - 95% RH	0 to 2 °C 85 - 90% RH
Name of Produce	Potato	Seed			
Number of platform per chamber	4	4			
Type of platform used	Wood grating	Steel grating			
Dimensions of CS chambers in each group (L x W x H) m	23 x 20 x 11				
Storage Capacity of each chamber in tons	1488 MT				
Storage unit used (Bags, crates, carton, bulk heap, etc.)	Bags	Bags	Bags		
Total number of storage unit	29750	25000			
Weight per storage unit	50 kg	50 kg			
Heat load per chamber (kW)					
Any other information	Describe other information like bulk heap storage and number of cooling tunnels, total cooling load per chamber.				

**Figures / data are as examples for user. Each chamber is a common temperature zone**

**ii) Handling Area**

Details	Dimensions	Temp °C
Describe Handling, receiving area (covered, open shed)	Handling Area Dimensions (L x W x H)m	Expected temperature in handling area.
Describe Loading / Unloading platform	Dimensions (L x W x H) m of the loading and unloading platforms.	Expected temperature in loading platform

Loading and handling area may be common in some storage designs

**iii) Facility covered Areas**

Cold Storage Area and height	Total floor area in m <sup>2</sup> (sum of all storage chambers internal area.)
Machine room area/ height	Dimensions in metres
Generator room area / height	-- " --
Admin Block area / height	-- " --

**iv) Building & Construction Details**

Type of building construction	Specify if building is with RCC civil construction or with pre-engineered structural steel construction with insulated panels.
External walls/Internal walls /Partition walls of cold chambers	Specify whether the walls are constructed with civil building with insulation slabs fixed in the walls or composite panels used.
Specification of Roof/Ceiling	Specify ceiling is construction – civil work with insulation slabs fixed or composite panels used.
Lighting fixtures in cold chambers	Specify use of special lights and fixtures with weather protection.
Specification in handling/External compound areas	Materials used in construction of handling, external compound area.
Others	Describe if chambers are divided into vertical temperature zones (RCC floors, insulated vertically)

**v) Insulation and Vapour Barrier**

Type of Insulation	Wall		Ceiling / Roof	Floor
	External	Internal		
Specification of insulation material	Describe the type of material used for insulation of walls/ceiling and partition and floor.			
Specification of composite panels	Describe the type of composite insulated panels used for insulation			
Relevant IS Code	State applicable IS Codes applicable for the specification of the below characteristics of the insulation material used.			
Thermal Conductivity (k-value) at +10°C (mean temperature)	Indicate the heat transfer ability of the product in W/m.K at 10 °C mean temperature			
U-value	Provide the U-value of the insulation.			
Thermal diffusivity (m <sup>2</sup> / sec)	Indicate heat transfer relative to the storage of thermal energy.			
Vapour barrier specification	Describe type of material and thickness of the vapour barrier used.			
Total Insulation thickness	Indicate total insulation thickness and number of layers.			
Specification on Cladding	Describe external finish / cladding material			
Locking/Fixing & Sealing System in case of Metal Skin composite Panels	Cam lock system for discontinuous panels / Tongue and Groove joints for continuous composite panels (Single or double).			

**vi) Cold Store Doors & Air / Strip barriers or curtains**

Description	Details
No. of doors per chamber.	Quantity of number of insulated doors.
Type hinged / sliding/ Rolling	Type of Door movement and Operation.
Size of door opening	Internal clear opening dimensions (W x H).
Insulation Material	Type of insulation along with its 'U-value'.
Thickness of Insulation	Provide the thickness of insulation in millimetre.
Type of skin	Galvanised/Stainless steel/GRP
Provision of Strip curtains/Air curtains – nos.	Strip or Air curtains used – number and dimension (W x H)

Internal Emergency Door release	Internal release mechanism for emergency opening even when locked from outside or Push button type alarm located inside the cold chambers near the door.
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**vii) Heat Load Estimation Inputs**

Product Storage condition	List Product wise storage temperature in °C, relative humidity required in %, Air circulation rate in CMH.
Loading Period	Total no. of days/weeks for completion of product loading in a season.
Maximum storage period	Product wise maximum storage period planned in weeks/months.
Product loading temperature	Product loading temperature during the peak season in °C.
Loading rate per day	Daily throughput in metric tons which enters into the cold storage.
Pull down period	Time in hours to bring initial product temperature to storage temperature.
Estimated Daily unloading rate from each cold chamber	Provide the unloading rate in MT per day.
Ante Room cum staging area conditions	List Temperature to be maintained in °C
CO <sub>2</sub> Concentration Control	List recommended range of CO <sub>2</sub> concentration in PPM.
Fresh air changes	Number of air changes per day considered
Brief Description of Fresh Air Ventilation system	Capacity of Fresh Air Fans for Replenishment of fresh air into each of the cold chambers.
Explain heat recovery system, if used	Description of heat recovery system, recommended efficacy, type of system, cross heat exchange used.

**viii) Heat Load Calculation of Cooling System - Summary**

Ambient Conditions Dry Bulb temperature (Summer)	Peak conditions based on summer
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Building dimensions: Total Capacity of the storage: Number of the chambers :	Provide the Dimensions of the building, total capacity of storage and number of chambers.
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Note: Please attach additional heat load estimation for, as applicable depending upon, different group of commodity planned.

Refrigeration Load		During Loading (kW)	During Holding (kW)
Transmission Load (kW)		Heat transferred through walls , ceiling and floor due to difference in outside and inside temperature	
Product Load (kW)		Heat transferred from the product due to difference in product temperature at the time of loading and storage room temperature.	
Internal Load (kW)	Lighting load	Internal heat generated due to lights in the cold room.	
	Occupancy load	Heat transferred due to human activity within the cold room.	
Infiltration Load (kW)		Heat transferred from outside air during door opening.	
Ventilation/ Fresh Air Refurbishment Load (kW)		Heat transferred d fresh air replenishment	
Equipment Load - Evap. Fan motors, MHE etc. (kW)		Total Heat transferred from various above sources in a day.	

Compressor Operation Hours/Day	Pull Down Period	Indicates compressor running hrs. during pull down time of the product in a day
	Holding period	Indicates compressor running hrs after the product reaches the room storage temperature.
	Defrosting Period	Duration of Defrosting in a day.

Total Refrigeration Description(kWh)	Peak Period(kWh)	Holding Period(kWh)

**Cooling System Design Detail**

**ix) Cooling System Configuration: Mechanical Refrigeration**

Type of Refrigerant	Provide the technical name of the refrigerant.
Total refrigeration system capacity	Provide the total refrigeration capacity in kW.
Type of System	Direct Expansion/ Gravity Feed/ Overfeed/ Secondary pump.
Type of compressor	Reciprocating/Screw/Scroll.
Type of capacity control	Step less/ step in / Auto unloading of cylinders.
Specify Unloading steps in percentage	Screw Compressor from 10 to 100% Reciprocating from 25 to 100%.
Type of condenser	Atmospheric/ Evaporative/water cooled/Air cooled.
Cooling Towers (if applicable)	Natural draft/ Induced Draft.
Type of Evaporators/ Air cooler	Ceiling or Floor mounted - Induced draft/ Forced Draft / Dual discharge.
Type of defrosting	Air/ Water / Electric/ Hot gas.
Humidification System & Control	Describe the method of humidification and controls used. If using dehumidifier explain here.

**Refrigeration Equipment Details**

**x) Compressor/ Rack Detail**

Compressor/ Racks Type, Make & Model	Qty.	Comp. RPM	Operating Parameters SST. / Cond. Temp (°C)	Refrigeration Capacity (kW)	Power Consumption (kW)	Total connected Motor (kW)	Remarks Working /Standby
					Full load: Part load:		

**xi) Condenser Details**

Condenser Type, Make & Model	Qty.	Operating Parameters Condensing Temp.(CT) WBT, water in/out temp(°C)	Condenser Heat Rejection Capacity (kW)	Electric Fan /Pump Motor Rating (kW)	Total Electric Power (kW)	Remarks Working /Standby

**xii) Cooling Tower Details ( if applicable)**

Cooling Tower Type, Make & Model	Qty	Operating Parameters DB & WB Water Temp, in/out (°C)	Cooling Tower Capacity (kW)	Fan & Pump Capacity (CMH/LPS) & Motor (kW)	Total Electric Power (kW)	Remarks Working /Standby

**xiii) Pressure Vessels**

Description	Type Horizontal Vertical	Refrigerant	Operating Temp & Pressure	Construction Shell, Dish Ends & Nozzles	Total Refrigeration load	Holding Volume
Low Pressure						
High Pressure						

Note: The design and testing of the pressure vessel should comply with ASME Sec VIII Div 1.

**xiv) Evaporators /Air Cooling Units (ACU)**

ACU Type, Make & Model	Nos.	Operating Parameters Evap. (SST) & TD* (°C)	Cooling Capacity (kW)	Air Flow (CMH) & Face Velocity (m/s)	Material of Coil Tubes & Fins	Fin pitch (mm)	Total Fan Electric Power (kW)

\*TD – Temperature difference between Evap. (SST) °C & Return Air (at coil inlet).

Note: Please attach Detailed Technical Performance Data Sheets of each equipment namely Compressors, Condensers, Cooling Towers, Air Cooling Units giving General Layout and Dimensions duly Certified by the respective equipment manufacturers with reference to the Relevant Codes & Standards.

**xv) Electrical Installation:**

Total Connected load	Provide the total connected electrical power in kW.
Estimated power requirement at Peak Load Period	Provide the maximum power consumed during peak demand in kW.
Estimated power requirement at Holding Load Period	List the power consumed during holding period in kW.
Estimated power requirement at Lean Load Period	List the power consumed during lean periods in kW.
Capacity of Transformer	Provide the rated capacity of the transformer in kVA.
Size of Capacitor	Provide the Size of capacitor bank for power factor correction & their operation.
Make & Capacity of standby D.G. Sets	Provide the make and rated Capacity of the Generator in kVA.

**xvi) Material Handling procedure**

Procedure	Brief Description
Material Handling Procedures & Equipment	Describe the details of product movement inside the cold storage and equipment used.
Capacity of mechanised belt conveyor if any- Rating of motor	Electric motor capacity in kW connected for lifts / hoists / conveyors etc.
Any other device please specify	

Attach a Plan & Layout of the proposed Cold Store unit approved by a Registered Architect.

**xvii) Safety Provisions****Include Machine room ventilation system for self-containing**

	Yes / No
Fire Fighting equipment installed as per Fire safety standards of State Fire Department	All Fire -fighting equipment complied as per state Fire-fighting department
Handling measures for Refrigerants & Leaks installed	Specify the sensor types and alarm system used, if any
Safety devices – LP/HP cut outs, safety valves, shut off valves etc. installed	
Emergency lighting in Cold chambers & other areas installed	
Lightening arrestors installed	
Any other safety provisions (describe)	

**xviii) Energy Saving Equipment & Measures**

<b>Details of Energy Saving devices</b>	<b>Brief Description and Savings</b>
Light Fixtures	Type of light fixtures-CFL/LED.
Natural Lighting for general areas	Specify the provision for natural lighting is included.
VFD / Electronic Technology for fans / compressors	Control of fan motors speed using variable frequency drives or by electronic technology in 2 steps fan for evaporators.
Refrigerant Controls and Automation	Automation controls used to save energy for optimizing the performance of the refrigeration system.
Air Purger	List the type and operation of air purger.
Power Factor Controller	Measure of efficient use of electrical power in the connected system.
Energy recovery	Provide use of energy recovery for ventilation system.
PLC Control & Data Acquisition	Automation for monitoring and control of the parameters and Refrigeration plant.
Any other Components	Describe the monitoring and control used such as CO <sub>2</sub> scrubbers, odor control, ozonisers, ethylene scrubber etc.

**xix) Estimated Performance Parameters of Proposed Cold Store**

<b>Parameters</b>	<b>Peak Period</b>	<b>Holding Period</b>
Coefficient Of Performance (COP) of the Cold Store Unit	COP of the cold storage during peak and holding periods.	
Power Consumption (kWh/Day)	Power consumption during peak and holding period.	
Prevailing Electricity costs	Provide prevailing electricity costs in Rs/kWh.	

**xx) Brief description of any other technologies or infrastructure used**

Reefer trucks operated (if any)	
Specialised packaging lines(if any)	
PLC Automation(if any)	
Dock Levellers systems(if any)	
Alternate energy options(if any)	
Modern Pack-house(if any)	
Others	

**Append details in separate data sheets for 'add-on components' if also applying for these components.**

All mandatory rules & regulations (BIS, ISO, IS etc.) relevant to the item must be complied with.