

# **Cold Storage Warehouse Manual (Draft)**

**For**

## **Cold Storages Warehouses for Horticulture Produce and Processed Food Items**

{Ref. Clause 2 (1) (xii) of The Warehousing development and Regulatory Authority (Warehouse Accreditation) Regulation, 2011}

**February 2012**

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## Preface

Department of Agriculture & Cooperation, Ministry of Agriculture had vide its notification No. F-No. 45-69/2011- Hort., Dated 14<sup>th</sup> December 2011, constituted a twenty two member-Committee for recommending norms for accrediting cold storage. The composition of the Committee is at *Appendix 1*. The terms of Reference of the Committee are as follows-

- i. Preparation of check-list for accreditation of cold storages / CA / MA storages.
- ii. Preparation of standards for storages, packaging and preservation of potato, apple and other fruits & vegetables which can be stored in cold storages / CA / MA storages for long / medium duration.
- iii. Any other issue that the Committee may consider important or relevant to the subject or may be assigned to it by the Government.

Though Shri Amit Sahay- Additional Commissioner was initially designated as the member-secretary of the committee who was replaced by Shri OM Prakash, Additional Commissioner (Hort) by another notification dated 11<sup>th</sup> January 2012. Finally, Shri Sushil Singla was designated as the member-secretary of the Committee.

The Committee in its first physical meeting decided to cover form of application for accreditation of the cold storage warehouse and prepare a cold storage warehouse manual. It is being clarified that provisions of general Warehouse Manual, as far as they are relevant to cold storage warehouses, shall be applicable.

*It is further reiterated that the Accreditation of cold storage warehouse is available only for those cold storages which have been set up with scientific design based on heat load calculation keeping in view critical storage conditions, energy efficiency, environmental concern, safety of workmen and goods stored and automation of controls and data logging or which have been modernized and upgraded to meet the above mentioned basic eligibility criterion.*

I take this opportunity to thank all the members of the Committee without whose contributions it would have been impossible to finalize Committee's recommendations. Special mention is due to the valuable guidance received from Shri Karnail Singh, member WDRA, Dr. S. K. Goel- Principal Secretary (Ariculture & Marketing), Govt of Maharashtra and valuable inputs provided from Shri Gurmit Singh and Shri Prabhat Saxena. My special thanks to Dr. R. K. Sharma- Sr. Deputy Director NHB and Shri Lal Singh- Sr. Assistant Director, NHB who supported in making correspondences and organizing consultative meetings of the Committee in absence of member-secretary of the Committee.

The recommendations of the Committee are being submitted for approval of the Government and acceptance of the same by Warehouse Development Regulatory Authority.

**Dated- 14<sup>th</sup> February 2012**

**Bijay Kumar**  
Chairman of the Committee & Managing Director  
National Horticulture Board, Gurgaon- 122015



**Form- 1**

**Application form for Accreditation of Cold Storage Warehouse**

(See clauses– 2 (1 iv), 3(2) and 12 of Warehousing Development and Regulatory Authority (Warehouse Accreditation) Regulation, 2011

To,  
The Officer In-Charge,  
Cold Storage Warehouse Accreditation Agency  
.....  
.....



**Subject- Application for accreditation of cold storage warehouse**

Dear Sir,

I, Mr./ Mrs./ Ms. ...., age....., son of / daughter of / wife of....., Resident of village-.....taluka....., district..... State..... hereby apply for accreditation of / renewal of accreditation of cold storage warehouse named as....., situated at survey No.....village / town.....district....., State..... The particulars of the said cold storage warehouse are enclosed herewith as Section 1 to Section 5.

**I /we hereby, declare that:** (pl. strike out words or phrases mentioned below in *italics* which are not applicable)

- a. I am / we are proprietors of the cold storage warehouse; or, I am duly authorised representative of the applicant company\* to make this application for *accreditation / renewal of accreditation* of the above mentioned cold storage warehouse,
- b. I am aware that the accreditation is as per provisions of the Warehousing (Development and Regulation) Act 2007 and rules framed thereunder. I, hereby, undertake to abide by all terms & conditions of accreditations / *renewal of accreditation*.
- c. All applicable laws and statutory requirements in relation to the warehouse for which the application is being submitted, are complied with.
- d. I / we hereby, solemnly declare that all information herein furnished are true to best of my / our knowledge and that in case it is proved to be untrue / false, I /we undertake to indemnify person or persons concerned in this business against any loss arising out of such false or untrue information and cancellation of accreditation.

**Enclosures:**

- 1.1 Demand Draft for the amount of application fee or proof of payment of prescribed application fee through electronic transfer of money towards application fee
- 1.2 In case a company is applicant, then attested Copy of Registration certificate of company
- 1.3 In case a Company\* is applicant, then attested copy of Memorandum of Association and Articles of Association / Rules & Regulations
- 1.4 when a company\* is applicant, then attested copy of resolution of Company for making application on its behalf for accreditation or its renewal under provisions of WDRA 2007 and Rules & Regulations made there under, indicating the full particulars of the person who is authorised to make application for accreditation
- 1.5 Original copy of authority to the person to make application as applicant on behalf of a company\* for accreditation or its renewal under provisions of WDRA 2007 which need to be signed by CEO of the company\* if the applicant himself is not the CEO of the applicant company\*.
- 1.6 In case of application of renewal of accreditation, attested copy of last accreditation be enclosed.

**Place-**

**Yours sincerely,**

**Date-**

Signature of Applicant  
Name of Applicant- .....  
Profession.....  
PAN NO. / Voter ID No. / UID No.....  
Phone- No.....Cell No.....

\*Company hereinafter referred to includes any legal person such as cooperative society, registered firm etc.

**Section- 1**

**Description of Cold Storage Warehouse**

{Ref. S. 2 (s) of the Warehouse Development and Regulation) Act, 2007}

1. Name of Cold Storage Warehouse .....
2. Postal Address of Cold Storage Warehouse.....  
.....  
.....
3. Location of Cold Storage Warehouse-
  - a. Survey No.....
  - b. Revenue Village / Town City-.....
  - c. Tahsil-.....
  - d. District-.....
  - e. State-.....
  - f. PIN Code-.....
  - g. At Site Phone No.-.....Fax No.....e-mail ID .....
4. Technical Audit report by engineer empanelled with accreditation agency to the effect of Installation being as per data sheet enclosed as Part-6:
  - a. Name and Registration No. of engineer empanelled with accreditation agency/ NHB / NCCD - .....
  - b. Date of issue of Registration Certificate-.....
5. Particulars of Industrial License (if applicable under local laws)-
  - a. Issuing Authority-
  - b. Period of Validity- from.....to.....
6. Particulars of cold storage License (If applicable under local laws)-
  - a. Issuing Authority-
  - b. Period of Validity- from.....to.....
7. No Objection Certificate from Pollution Control Board (if applicable under local laws)-
  - a. Issuing Authority-
  - b. Period of Validity- from.....to.....
8. Fire safety Certificate (if applicable under local laws)
  - a. Issuing Authority-
  - b. Period of Validity- from.....to.....
9. Particulars of NoC / approval by local planning authority for cold storage -
10. If the cold storage has been set up as per scientific design? If yes then tick the applicable option -
  - a. In accordance with technical standards prescribed by Department of Agriculture & Cooperation and under Govt. scheme. If so, particulars of scheme and letter of intent issued be quoted..... or,
  - b. In accordance with any other national or internationally recognised standard design practice based on heat load calculation keeping in view critical storage conditions of goods to be stored, energy efficiency, environmental concern, safety of work men and goods, automation in control etc.,then the design methodology followed must be quoted .....

Date-.....

Signature of Applicant

Place-.....

(Name of Applicant)



### Section-3

#### Goods to be Stored, Storage Conditions and Insurance Cover

{Ref. Clause 3 of the Warehousing Development and Regulatory Authority (Warehouse Accreditation) Regulation, 2011}

1. List of Produce / Goods to be Stored-
  - a. ....
  - b. ....
  - c. ....
  - d. ....
  - e. ....
2. Quality Grading System-
3. System of Price Assessment for Produce offered for Storages-
4. Critical Storage Conditions offered by Warehouse Keeper-
  - a. **Pl put tick mark against the Type of Cold Storage applicable and indicate critical storage conditions offered for each type of goods to be stored** (Pl. attach additional sheet if no. of goods are large)-
    - i. Storage for Horticulture Produce not requiring Pre-Cooling-
      - A. if conforms to NHB CS Type-1- Y / N
      - B. Pull Down - Pull-down rate....., RH-.....%, CO<sub>2</sub> level-.....
      - C. Holding – Temperature ..... Humidity..... CO<sub>2</sub> level.....
    - ii. Storage for Horticulture Produce requiring Pre-Cooling-
      - ~~A.~~ If conforms to NHB CS Type-2- Y or N
      - ~~B.~~ Pre-cooling:- hydro-coolers / forced air pre-cooling/ vacuum pre-cooling - batch size and rate of pre-cooling-
      - ~~C.~~ Pull down- (1) Pull-down rate-....., (2) RH-.....%, (3) CO<sub>2</sub> level- .....
      - ~~D.~~ Holding- Temperature ..... Humidity..... CO<sub>2</sub> level.....
    - iii. CA Storage-
      - ~~A.~~ If conforms to NHB CS Type-3-
      - ~~B.~~ Pre-cooling:- hydro-coolers / forced air pre-cooling/ vacuum pre-cooling batch size and rate of pre-cooling **or,**
      - ~~C.~~ Pull down- (1) Pull-down rate-....., (2) RH-.....%, (3) CO<sub>2</sub> level- .....
      - ~~D.~~ Holding- Temperature ..... RH (%),....., N<sub>2</sub> level....., O<sub>2</sub> level....., CO<sub>2</sub> level.....
  - b. **Frozen Storage-**
    - i. Chilling or IQF with frozen storage (Chilling / IQF rate and holding temperature range)-
    - ii. Blast freezing (Cooling rate and holding temperature range)-
5. **Enclosures-**
  - a. Attested Copy of Insurance Policy against Fire/ Floods/ Theft / Burglary/ Riot etc-
  - b. Details of Insurance Cover made available for Goods Stored
  - c. Attested Copy of System Performance Data sheet generated by data logger for Past 1 year
  - d. Attested Copy of Surveillance Report, if any (for renewal of certificate of accreditation)

Date- .....

Signature of Applicant

Place-.....



**Section- 4**

**Managerial Competence**

{ref. S. 4 of warehousing (Development and Regulation) Act, 2007 and clause 3 of The Warehousing Development and Regulatory Authority (Warehouse Accreditation) Regulation, 2011}

**1. Particulars of Managerial Man-power and Job Chart**

S. No.	Designation Assigned*	Function/ Job Chart*	Minimum Educational Qualification	Training Details	Details of Job Experience	Remarks
1	Project Engineer					
2	Manager					
3	Supervisor					
4	Accountant					
5	Record Keeper					
6	Computer Operator					

\*These are by way of example and one or more function may be clubbed keeping in view work load

**2. Particulars of Operating Personnel-their Job Chart**

S. No.	Designation Assigned*	Function/ Job Chart*	Minimum Educational Qualification	Training Details	Details of Job Experience	Remarks
1	Operator					
2	Mechanic					
3	Electrician					
4	Plumber					
5	Grader					
6	Weigher					
7	Sampler					
8	Security Officer					

\*These are by way of example and one or more function may be clubbed keeping in view work load

**3. Put tick mark against following Manuals if maintained at Cold Storage Warehouse-**

- a. Operating Manual for Warehouse Receipt System--
- b. Operation Manual for Plant & Machineries including Annual Maintenance--
- c. Safety Manual Against Hazards of Fire/ Refrigerant Leakage --
- d. Operation Manual for Hazards Covered by Insurance Policies

Date-.....

Signature of Applicant

Place-.....

## Section- 5

### Storage Worthiness of Warehouse

{ref. S. 4 of warehousing (Development and Regulation) Act, 2007 and clause 3 of The Warehousing Development and Regulatory Authority (Warehouse Accreditation) Regulation, 2011}

**Note-** For cold storages set up in accordance with technical standards prescribed by DAC in this regard in which case implementation protocol has been followed under Government schemes of NHM / HMNEHA/ NHB / APEDA / MoFPI etc., applicant may submit a copy of basic data sheet in prescribed format, duly approved by such scheme implementing agency at the time of issue of letter of intent/ in principle approval to the project proposal and also a copy of Joint Inspection Report prepared before release of subsidy under the scheme as evidence for storage worthiness of cold storage. Applications for cold storages not covered by this provision must submit basic data sheet in following format for latest position prior to date of application.

#### Model Basic Data Sheet

(Ref. Section 2 of relevant Technical Standards of NHB as is applicable)

#### A. Identification

Name of Cold Storage			
Location of Cold Storage	Area / Village		Town
	District		State
Name of Promoter Company / Owner			
Type of company (Proprietorship / Partnership / Pvt. Ltd / Ltd)			
Postal address of Promoter			
	Tel / Fax	Mob. No	E-mail
Present activity in brief			
Name of CEO / MD			
Name of Manager / Contact Person			Phone / Mobile No

#### B. Basic Cold Store Design Considerations

##### i) Commodity Storage Requirements

Type of Commodities/Produce		
Ideal / Recommended Storage Conditions – Temperature (DB in °C) – Humidity RH (%) Range – Air Circulation (CMH/MT of Produce) – Ventilation (Air Changes/Day) – CO <sub>2</sub> Range (PPM) – Produce Cooling Rate ( °C/day) – Freezing Point °C – Others		
Cold Chamber Dry bulb (DB in °C)		
Cold Chamber RH (%)		
Max Storage period (months)		
Max product temp (°C) – at the time of loading		
Daily loading rate (MT/day) – in each cold chamber		
Loading Period (months)		
Pull down rate (°C / day)		
Unloading Period (months)		

Daily unloading rate (MT/day) – from each cold chamber		
Ante Room Conditions (T °C & RH %)		
Sorting & Grading Area (T °C & RH %)		
Special Provisions – CIPC treatment for Process Potatoes		
Special Provisions – MA / Ethylene Control / Fumigation/ Fresh Air etc		

**ii) Fresh Air / Ventilation System**

Brief Description of CO <sub>2</sub> Extraction / Ventilation System	
CO <sub>2</sub> Concentration Control Range (PPM)	
Monitoring & Control Instrument – Type – Accuracy	
Ventilation Capacity (Max Air Changes/Day)	
Design Considerations for Energy Recovery and Preventing Wetting of Produce	

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

- No. of chambers:
- Type : Mezzanine/ Palletized
- Max Height of Building

Details	CS Chamber 1	CS Chamber- 2	CS Chamber- 3	CS Chamber- 4
Total Capacity of Each Cold Store Chamber ( MT)				
Internal Chamber Dimensions L x B x H (m)				
No. of mezzanine floors X Height (m) per floor				
Size & Weight of Bags or Boxes being stored				
Total number of Bags/Boxes / crates stored in each Cold Store Chamber				

**iv) Ante Room & Process Areas**

Details	Length (m)	Width (m)	Height (m)
Ante Room			
Sorting & Grading Area			
Loading / Unloading dock			

**v) Machine Room & Utility Areas**

Details	Length (m)	Width (m)	Height (m)
Machine Room			
Office Area			

Toilets & Changing rooms			
Any other			

**vi) Building & Construction Details**

- **Type of construction** : Civil/ Pre-engineered Building

Type of External walls of cold chambers	
Type of Internal / Partition walls	
Type of Roof / Ceiling	
Type of Internal structure / Racks	
Type of mezzanine grating	
Types of Lighting fixtures in cold Chambers	
Types of Lighting fixtures in Process & Other Areas	

**vii) Insulation and Vapor Barrier**

- **Type of Insulation** : Insulating Sheets / Metal Skin Composite panels

Type of Insulation	Wall		Ceiling / Roof	Floor
	External	Internal		
Type of material EPS / Metal Skin PUF Composite Panels / XPS/ PUR, Others				
Relevant IS Code				
Density (kg/m <sup>3</sup> )				
Thermal Conductivity at +10°C k value ( W/m.K)				
Thermal diffusivity m <sup>2</sup> /h				
Water vapour transmission rate, ng/Pa.sm, Max.				
Water absorption after 24h immersion, percentage by mass.				
Relevant IS Code of Practice for Thermal Insulation of Cold Store				
Total Insulation Thickness (mm)				
No. of layers & Thickness / layer (mm)				
Type of vapor barrier & thickness (microns)				
Type of Bituminous/Sticking Compound				
Type of Cladding / Covering/External Finish				
Locking/Fixing & Sealing System in case of Metal Skin Composite Panels				
Any other info				

**viii) Cold Store Doors & Air Curtains**

Type of Insulation	Details
No. of Insulated doors	
Type hinged / sliding	
Insulation Material EPS / PUF / Others	
Thickness of Insulation (mm)	
Type of cladding	
Size of door opening	
Provision of Strip curtains – nos. & overlap %	
Air curtains, if any	
Others	

**ix) Material Handling**

- **Proposed Practice** : Manual / Semi Automated /Automated

Procedure	Brief Description
Material Handling Procedures & Equipments	
Cap of Electric Elevator Rating of motor (kW)	
Any other device	

**x) Grading, Sorting Washing & Packing Line (optional)**

- **Proposed Practice** : Manual / Semi Automated /Automated

Procedure	Brief Description
Process Line	
Total Connected Load (kW)	

*Please attach a Plan & Layout of the proposed Cold Store unit in accordance to the Statutory Building By-Laws and BIS Building Codes & Standards duly approved by a Registered Architect and Structural Engineer. The drawings should detail out insulation type, thickness, and fixing methodology in sectional details.*

**C. Heat Load Calculation of Cooling System – Summary**

Ambient Conditions	Summer	Monsoon	Winter
Dry Bulb Temperature (°C)			
Wet Bulb Temperature (°C)			

Refrigeration Load	During Loading (kW)	During Pull Down (kW)	During Holding (kW)
Transmission Load			
Product Load			
Internal Load	Lighting load		
	Occupancy load		
Infiltration Load			
Ventilation/ Fresh Air Load			
Equipment Load - Fan motors etc.			
Total Load (kW/24 hrs)			

<b>Compressor Operation Hours/Day</b>	Loading Period		
	Pull Down Period		
	Holding period		
<b>Multipliers</b>	Safety Factor		
	Defrost Period		
<b>Total Refrigeration Load</b>	<b>Peak Period</b>	<b>Holding Period</b>	<b>Lean Period</b>
Total Load (KW)			

Please attach detailed heat load calculation sheets of the proposed cold store unit in accordance to the prescribed Technical Standards and Guidelines duly approved by a Qualified Engineer.

#### D. Cooling System Design & Equipment Selection

##### i) Cooling System Configuration

Type of Refrigerant	Ammonia / Freon / Others
Type of System	Direct Exp / Gravity Feed / Overfeed
Type of compressor	Reciprocating / Screw / Scroll / Others
Type of capacity control	Automatic In steps / Step less
Type of condenser	Atmospheric / Evaporative / Shell & Tube / Plate Heat Exchanger / Other
Cooling Towers ( if applicable)	FRP Induced Draft / Others
Type of cooling coil	Ceiling suspended / Floor Mounted / Others
Type of defrosting	Air / Water / Electric / Hot gas
Humidification System & Control ( Brief Description)	

##### ii) Compressor Detail

Compressor Make & Model	Nos.	Comp. RPM	Operating Parameters Evap. SST. / Cond. Temp (°C)	Refrigeration Capacity (KW)	Motor Rating. (KW)	Total Electric Power. (BkW)	Remarks Working /Standby

##### iii) Condenser Details

Condenser Make & Model	Nos.	Operating Parameters Cond. Temp.(SDT)/ in/out water temp(°C) & flow (lps)	Condenser Capacity (kW)	Electric Fan /Pump Motor Rating (kW)	Total Electric Power (BkW)	Remarks Working /Standby

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

Cooling Tower Make & Model	Nos.	Operating Parameters DB & WB Temp, in/out water temp(°C)	Cooling Tower Capacity(KW)	Fan & Pump Capacity (CMH/LPS) & Motor (kW)	Total Electric Power (BkW)	Remarks Working /Standby

**v) Air Cooling Units (ACU)**

ACU 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 (BKW)

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

Please attach Detailed Technical Data Sheets of each equipment namely Compressors, Condensers, Cooling Towers, Air Cooling Units giving General Layout, Dimensions, Material of Construction, Rated Capacity, Operating Parameters and COP (please note that the Air Cooling Unit data sheet should include heat transfer area, fin spacing, no. of rows, air flow, face velocity, fan static, air throw, Fan Motor BKW/KW, fin spacing, etc ) duly Certified by the respective equipment manufacturers with reference to the Relevant Codes & Standards.

**E. Electrical Instillation**

Total Connected load (kW)	
Estimated power requirement at Peak Load Period (BkW)	
Estimated power requirement at Holding Load Period (BkW)	
Estimated power requirement at Lean Load Period (BkW)	
Capacity of Transformer (KVA) (proposed)	
Size of Capacitor for power factor correction & their operation	
Make & Capacity of standby D.G. Set (KVA)	

**F. Safety Provisions**

Details of Fire Fighting equipment	Dry	
	Water based	
Handling Refrigerants & Leaks	Leak Detection	
	Handling measures	
Safety devices – LP/HP cut-outs, safety valves, shut off valves etc.		
Details of Emergency alarm system & push button system in cold chambers		

Emergency lighting in Cold chambers & other areas	
Lightening arrestors	
Any other safety provisions	

**G. Codes & Standards Followed**

Building Design & Structure	
Construction Materials	
Thermal Insulation & Application	
Refrigeration Equipment & Systems	
Electrical & Mechanical Systems	
Food Safety	
Others	

**H. Energy Saving Equipment & Measures**

Details of Energy Saving devices	Brief Description and Savings
Light Fixtures CFL/LED	
Natural Lighting for general areas	
VFD for fans / compressors	
Refrigerant Controls and Automation	
Air Purger	
Power Factor Controller	
Energy recovery heat-exchanger for Ventilation System	
Renewable/ Solar Energy e.g. PV lighting	
PLC Control, & Data Acquisition	
Any other features e.g. water recycling, rain water harvesting ...	

**I. Operation & Maintenance**

Description	Nos. / Details
Proposed staff for Operation & Maintenance	
Proposed Annual Maintenance Contracts (if any)	
Training & Preventive Maintenance procedures	
Sanitation & Hygiene practice	
Pollution Control	



**J. Estimated Performance Parameters of Proposed Cold Store**

Parameters	Peak Period	Holding Period	Lean Period
Coefficient Of Performance (COP) Of the Cold Store Unit			
Power Consumption (KWH/Day)			
Total Electricity Cost (Rs/Day)			
Electricity Cost towards Storage (Rs/ MT /Day)			

**K. Other Information**

**Enclosures-**

- i. Applicant must submit for record "as built drawings", including cold store layout, P&I and electrical drawing and an operation & maintenance manual along with a list of essential spare parts supplied to him by the refrigeration contracting agency.
- ii. He should also submit a copy of the certificate of satisfactory commissioning of the cooling system in conformance to the performance indicators as per prescribed standards as issued by the refrigeration contracting agency to him.

Place .....

Date .....

Signature and  
Name of Warehouseman with seal

Place .....

Date .....

Signature and  
Name of Project Engineer with seal

**Check list to be filled up by the examiners of the accreditation agency**

Name and complete postal address of warehouse: \_\_\_\_\_

Sl. No.	Parameters	Comments/Findings of Examiners	
1.	<b>About the Applicant and Application in Form 1-</b>		
	a.	If the application is accompanied by prescribed application fee?	
	b.	Whether the applicant is proprietor of cold storage warehouse?	
	c.	In case of joint owners whether all the joint owners have signed the application/ authorised one of them for this purpose in writing?	
	d.	In case the warehouse belongs to a company, then	
	i.	If the company has mandate, as per its constitution, to run business of warehouse?	
	ii.	If the application is supported by attested copy of duly passed resolution of the Board of Management of the applicant Company to apply for accreditation indicating the particulars of person who is authorised to make application on its behalf?	
	iii.	If the particulars of authorised person matches with the particulars of applicant?	
	iv.	If the application has been accompanied with attested copy of such resolution as mentioned in (ii) above?	
	e.	If the photograph of the applicant is duly affixed with self-attestation by proprietor/attestation by CEO of applicant company?	
	f.	In case of renewal, what are the particulars of last valid certificate of accreditation?	
	g.	Overall comments regarding locus / competence of Applicant to make this application?	
2	<b>About the Description of Cold Storage Warehouse-</b>		
	a.	Whether a registered architect has certified the civil structure of cold storage to be as per provisions of BIS code and local building by-laws and as per building plan duly approved by competent authority	
	b.	Whether any engineering firm having expertise in refrigeration engineering has certified that the cold storage has been commissioned as per enclosed data sheet at Part-6	
	c.	If industrial license, if applicable, is during its validity period?	
	d.	If cold storage licence, if applicable, is during its validity period?	
	e.	If pollution-control licence, if applicable, is during its validity period?	
	f.	If fire safety certificate, if applicable, is during its validity period?	
	g.	If approval / NoC from local planning Authority, if applicable, is during validity period?	
	h.	Overall Assessment- If the warehouse has all necessary statutory clearances / No Objection Certificates?	
3	<b>Identity of Warehouseman and capacity to Discharge Liability-</b>		
	a.	If cold storage is owned by warehouseman or it is on lease?	
	b.	If attested copy of documents of acquisition deed (purchase / lease) has been furnished?	
	c.	If attested copy of record of right on land shows the title of warehouseman on land and cold storage?	

	d. Whether CA certificate or Banker's certificate shows adequate net worth of warehouse?	
	e. If a copy of latest income tax return of proprietor / company owning the cold storage has been provided or not?	
	f. Overall Assessment of Identity of Warehouseman and capacity to Discharge Liability	
4	<b>Goods to be Stored, Storage Conditions and Insurance Cover</b>	
	a. Whether the cold storage warehouse offers prescribed critical storage conditions for goods to be stored?	
	b. Whether quality grading system adopted commensurate with AGMARK, CODEX or any other standard?	
	c. Whether the arrangement for quality grading adequate? Whether testing facilities of goods to be stored in the warehouse, in form of a small laboratory, are available? If so, give details of major tests which can be carried out.	
	d. List of laboratories for chemical analysis of the samples (wherever necessary) with whom the warehouse has tied up.	
	e. Whether the criterion adopted for pricing fair and rational?	
	f. Whether norm for determining shelf-life of produce to be stored fair and rational?	
	g. Whether the warehouse has its own weigh-bridge? If so, the details with capacity and date of last calibration.	
	h. No. of beam balances, platform balances with their details.	
	i. Whether the weights/platform balance used in the warehouse are timely calibrated and duly stamped by concerned weights & measures Department.	
	j. Whether the PLC readings for past period support claim that critical storage conditions are generally achieved in cold storage?	
	k. Whether automatic data logger for power-pack operation in place?	
	l. Whether electricity consumption is within acceptable limits of design consumption levels?	
	m. Whether the fire alarm and refrigerant leakage alarm systems functional?	
	n. In case of renewal of accreditation, whether the surveillance data supportive of proper system management?	
	o. Whether the warehouses as well as the goods stored in the warehouse(s) are insured? Whether insurance cover provided adequate and fair? If so, the name of the insurance company and risks covered.	
	p. List of banks operating within approachable distance from the warehouse. Any tie up of the warehouse with any of these banks.	
	q. Overall assessment regarding Goods to be Stored, Storage Conditions and Insurance Cover -	
5	<b>Managerial Competence, Man Power and Security Arrangement</b>	
	a. If the cold storage has a full-time manager who is well conversant with provisions of WDRA 2007 and Management of Cold Storage for perishable food items?	
	b. If the cold storage has engaged a full time or part time project engineer who is registered with a recognised professional organisation ?	
	c. If the cold storage has a full time supervisor who can monitor functioning of cold storage through PLC and who is conversant with stacking, packaging and cold storage management?	

	d. Whether sufficient office equipment, viz. telephone, computers, photocopiers, fax and furniture (table, chairs, almirah, etc.) are available in the office(s) of the cold storage warehouse?	
	e. If the cold storage has adequate number of functional staff for carrying out functions like quality grading, weighing, sampling, account keeping, record management and security arrangement?	
	f. If the Operating Manual Followed by the Cold Storage self-explanatory and elaborate and displayed at relevant places ?	
	g. If the manual for dealing with fire hazard, leakage of refrigerant self explanatory and displayed at relevant places?	
	h. If the cold storage has security men's cabin and proper lighting in the campus?	
	i. If the cold storage fully protected by compound wall / barbed wall fencing?	
	j. If gate pass system in cold storage followed properly?	
	k. Overall assessment of Managerial Competence, Man Power and Security Arrangement?	
6	<b>Storage Worthiness of Cold Storage Warehouse-</b>	
	a. In case the cold storage has been set up under Government scheme of NHB / NCCD / SHM / APEDA/ MoFPI etc. and as per technical standards prescribed by DAC then, <ul style="list-style-type: none"> <li>i. Whether the copies of basic data sheet enclosed is the one approved by concerned agency</li> <li>ii. Whether Joint Inspection Report issued by the Joint Inspection Team deputed by concerned scheme implementing has certified that the project has been found to be commissioned as per prescribed technical standards?</li> </ul>	
	b. In case the cold storage has not been set up under any government scheme of NHB ./ NHM/ APEDA/ MoFPI or has not been set up following implementation protocols prescribed under approved Technical Standards then, <ul style="list-style-type: none"> <li>i. whether the basic data sheet being submitted by applicant is accompanied by a certificate from a chartered graduate mechanical / refrigeration engineering firm that- <i>"the heat load calculation has been done as per procedure laid out by ASHRAE Fundamentals and Refrigeration Handbook with safety factor of 5% to 10% on estimated load and that the design is energy efficient, takes in to account safety of work men and goods stored and environmental concern."</i></li> <li>ii. Whether the refrigeration contracting agency has issued a certificate of satisfactory commissioning of the cooling system in conformance to the performance indicators as per prescribed standards.</li> <li>iii. The refrigeration contracting agency has provide "as built drawings", including cold store layout, P&amp;I and electrical drawing and an operation &amp; maintenance manual along with a list of essential spare parts.</li> </ul>	
	c. If energy-efficiency devices, automated controls and fire & refrigerant leakage alarms have been put in place and are functional?	
	d. If operation of cold storage can be effectively controlled and monitored by PLC?	
	e. If energy consumption level is within 10-20% of design level?	
	f. Whether stacking, packaging and handling system is as per design and prescribed guidelines	

	g. Whether fire-fighting arrangements are there in the warehouse? If so, details of arrangements including number and type of fire extinguishers, sand buckets, etc. to be given.	
	h. Name of the nearest Fire Brigade Station and distance. Whether telephone numbers of nearest Fire Station are displayed at different prominent places in the warehouse or not?	
	i. Name and Address of Annual Maintenance Contract Agency	
	j. If copies of following operating Manuals maintained in warehouse and used for assigning job charts and training purposes- i. A copy of Operating Manual for Warehouse Receipt System- ii. A copy of Operation Manual for Plant & Machineries including Annual – Maintenance- iii. A copy of Safety Manual Against Hazards of Fire/ Refrigerant Leakage- iv. A copy of Operation Manual for Hazards Covered by Insurance Policy for Insurance Claims-	
	k. Overall Assessment of Storage Worthiness-	

**Final Recommendation -**

- Case recommended for accreditation
- Case not recommended for accreditation

Date-

Place-

Signature of Authorised Person  
Name, Designation and Seal  
of Accreditation Agency

## Guidelines for Grading, Packaging, Marking and Labeling, Stacking and Storage

### 1. Grading of Horticulture Produce-

- a. Grading of horticulture produce received in registered cold storage warehouse should for the purpose of uniformity, be done in accordance with the provisions of the General Grading and Marking Rules, 1988 made under section 3 of the Agricultural Produce (Grading and Marking) Act, 1937 (1 of 1937). However, Fruits and Vegetables may be graded and marked as per buyer's requirements too, provided the minimum requirements specified in the relevant schedule of General Grading and Marking Rules, 1988 are met.
- b. For the above stated purpose, the registered cold storage warehouse should preferably avail services of an "Authorized packer" i.e. a person or a body of persons who has been granted a certificate of authorization to grade and mark Fruits and Vegetables in accordance with the grade standards and procedure prescribed under these rules;
- c. Where ever, Grade designation and Quality of horticulture produce has been set out under General Grading and Marking Rules, 1988 the same should, for the purpose of uniformity, be followed. In other cases CODEX standards and general trade standards for grading & Marking may be adopted as per trading needs. The produce should be marked with Grade Designation accordingly.

### 3. Method of packing: - Horticulture produce may be packed in bags, plastic bins, plastic crates, CFB boxes etc. as per business requirement. Prescriptions regarding packing made under General Grading and Marking Rules, 1988 made under section 3 of the Agricultural Produce (Grading and Marking) Act, 1937 (1 of 1937) should be followed, which is reproduced below ;

- a. Horticulture Produce shall be packed in such a way as to protect the produce properly.
- b. The materials used inside the package must be new, clean and of such a quality as to avoid causing any external or internal damage to the produce.
- c. The use of materials particularly of paper or stamps bearing trade specifications is permitted provided the printing or labeling has been done with non-toxic ink or glue.
- d. Fruits and Vegetables shall be packed in each container in compliance with the recommended International code of practice for Packaging and Transport of Tropical Fresh Fruit and Vegetables (CAC/RCP 44-1995) of practice for export and as per the Instructions issued by the Agricultural Marketing adviser from time to time for domestic market unless a different grading standards as per buyers' choice is being followed.
- e. The containers shall meet the quality, hygiene, ventilation and resistance characteristics to ensure suitable handling, shipping and preserving of the Fruits and Vegetables. Packages must be free of harmful foreign matter and obnoxious smell.
- f. Contents of each package or lot must be uniform and contain only Fruits and Vegetables of same origin, variety and grade designation.
- g. The visible part of the contents of the package (if present) must be representative of the entire content.
- h. Contents of package may have different fruits and vegetables of different grades as per buyer's requirements with proper labeling.

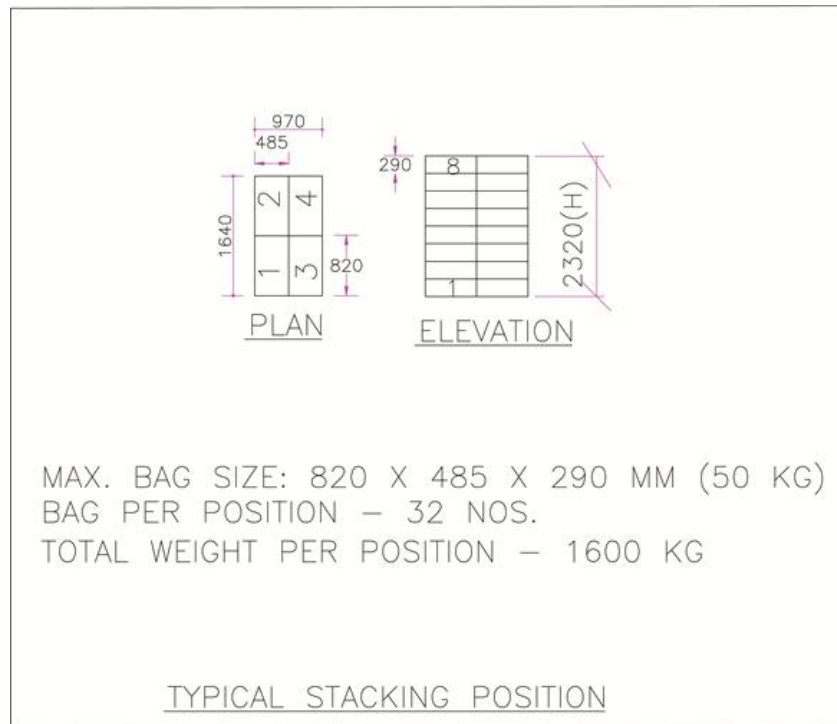
### 4. Method of Marking and Labeling:- The following particulars shall be clearly and indelibly marked on each package, namely:-

- a. Name of the commodity;
- b. Variety;
- c. Grade designation;
- d. Size code (if prescribed);
- e. Lot/batch/code number;

- f. Net weight / No. of units;
  - g. Name and address of the owner
  - h. Date of packing;
  - i. Such other particulars as may be required by warehouseman
5. **Sampling-** It is advisable to take representative samples on random basis. For each lot, minimum of two samples may be taken for carrying out tests for physical characteristics like firmness, colour, size etc. and also for chemical tests for residue of chemicals; one may be treated as laboratory sample and the other as reference sample.
  6. **Stacking** - Horticulture produce need to be stacked in a manner for which the refrigeration and air circulation system has been designed so that air circulation at designed rate is not obstructed. For this design volume to weight ration and prescribed space between two stacks, between side walls and stack and door and stack must be followed depending on packaging, stacking system and commodity stored. No container / bag / crates / CFB box should be stored in a manner that obstructs air flow from Air Cooling Units and for that matter there should be adequate gap between ceiling and top of stack. The stored goods should be adequately protected from ice formation on it due to being in close proximity of cool air coming out of Air Cooling Units. Stack line need to be marked with white paint and no-load line on walls by red paint with line thickness of 5 COM. Each stack needs to be properly flagged by stack label. The packs should be handles in a manner so as not to cause mechanical damage to horticulture produce. Rack system or Palletisation need to be adopted where ever stack height is more. Fork lift is recommended in cases of NHB-CS Type-2 and 3 for stacking beyond height of 1.5 m.
  7. **Storage-** It is necessary to maintain prescribed critical storage conditions in the cold storage at all points of time. Critical Storage Conditions may be prescribed by Technical Standards for Cold Storages. In absence of any such prescriptions storage conditions prescribed by reputed institutions like World Food Logistic Organization (WFLO), ICAR Institutions, CFTRI Mysore, NCDC etc may be used. Automated PLC control for storage conditions is advisable so that storage data logging can be accomplished automatically. Power back up should get switched on automatically in case of power failure and the operating hours of power back up should also get logged automatically. Automatic alarm system against fire and leakage of refrigerant should be kept in order. Unless local laws require wet system of fire control, dry system for fire control may be preferred.
  8. **Typical Cold Store Layout & Stacking Arrangement-** the following can be useful in designing cold storage chambers for potato cold storage with mezzanine floors.

*Planning stack-position-* In this country, potato is generally stored in 50 Kg bags. A typical 50Kg Bag, when filled with potatoes and stitched measures 820mm (l) x 485mm (w) x 290mm (h).

In order to size a cold store chamber for optimal utilization of space, it is suggested that first an appropriate stacking arrangement of bags is planned out on the drawing board. The arrangement shown in figure 1, has a footprint of 1640mm x 970 mm and can position 32 bags, up to 8 stack height. The total stack height in this case is 2320mm and weighs 1600Kg. Now considering this as a good stacking option, we can continue to size the chamber for optimal utilization of space.



**Figure 1**

This typical stack footprint can be used to size the chamber dimensions as shown in figure 2 and figure 3 and figure 4.

At least 400mm clear space should be left from the internal surface of the walls for air circulation.

The stacks should be placed in rows as shown to an extent that the chamber dimensions (length x width) is close to a square.

The columns supporting the mezzanine should be placed in the row space so they don't obstruct systematic stacking. Hence it is advisable to have the structure engineer design the columns and beams once a stacking arrangement is agreed to.

The door position and stairs should be placed to be clear from obstruction and at a convenient location for ease and safety of the loaders/workers.



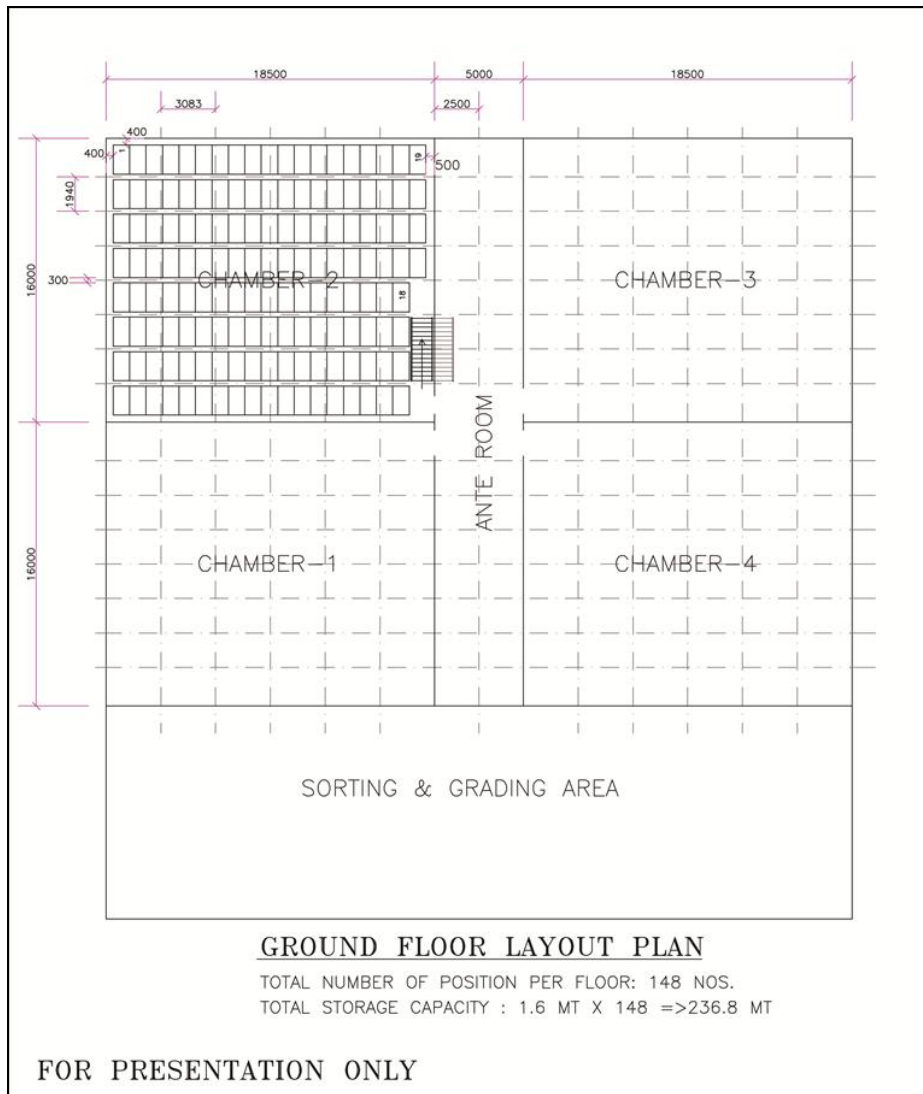
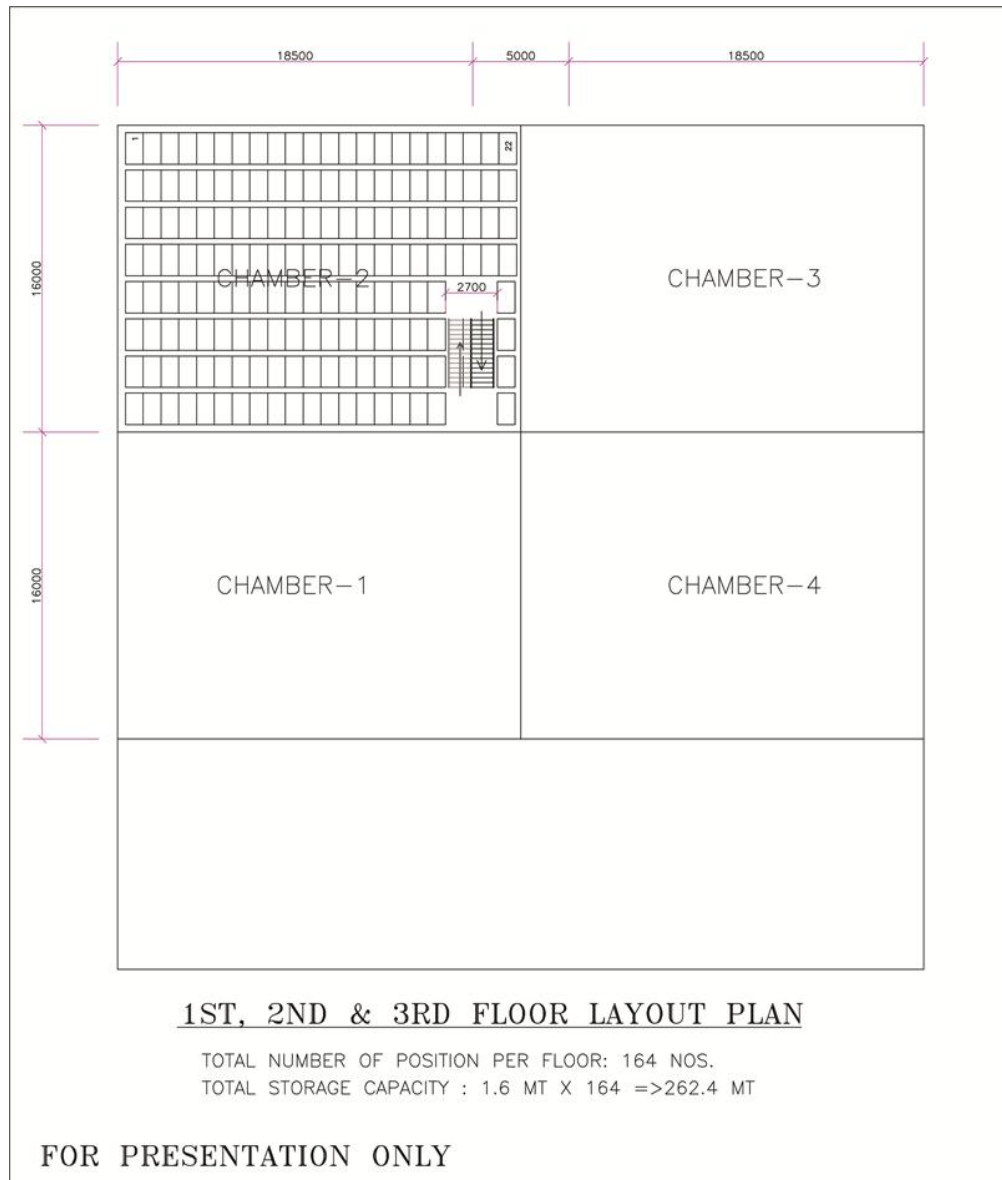


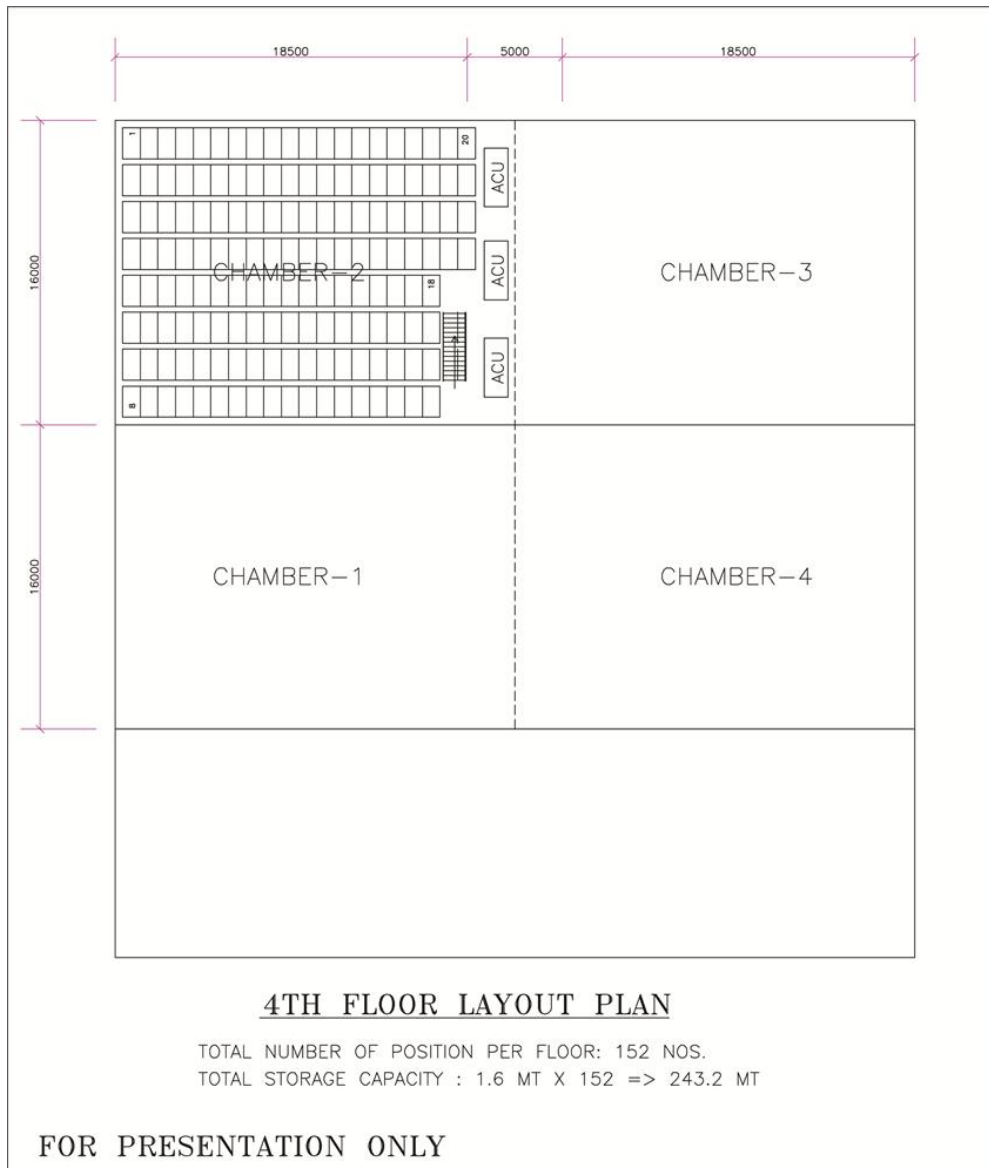
Figure 2



**Figure 3**

The air cooling units should be placed as shown so that the air throw is parallel to the spaces provided. This type of bag stacking arrangement is very similar to palletisation / bin stacking and will allow better air distribution and uniform temperature and humidity in the cold store compared to an unplanned and haphazard arrangement generally practiced. The cooling coils should be positioned on the side of the stairways for easy maintenance and to avoid providing walking passages across the chamber.

This arrangement is for long term bulk storage and in case of Fi-FO suitable changes can be made, but it would reduce storage capacity.



**Figure 4**

Similarly, considering stack height, a clear floor to ceiling height should be provided for loading and air circulation. Figure 5

Finally the stack positions on each floor can be counted and summarized into total storage capacity of the Chamber. However please keep in mind that in practice the bags slightly overlap when being stacked in rows and also some bags can fit in other spaces like below the landing of the stairs, etc. therefore the overall capacity of the chamber may increase by about 5%.

The dimensions shown are clear space requirements, in a single line drawing, for the architect/structural engineers to rely on for overall design of the cold store building. Figure 5 and figure 6.

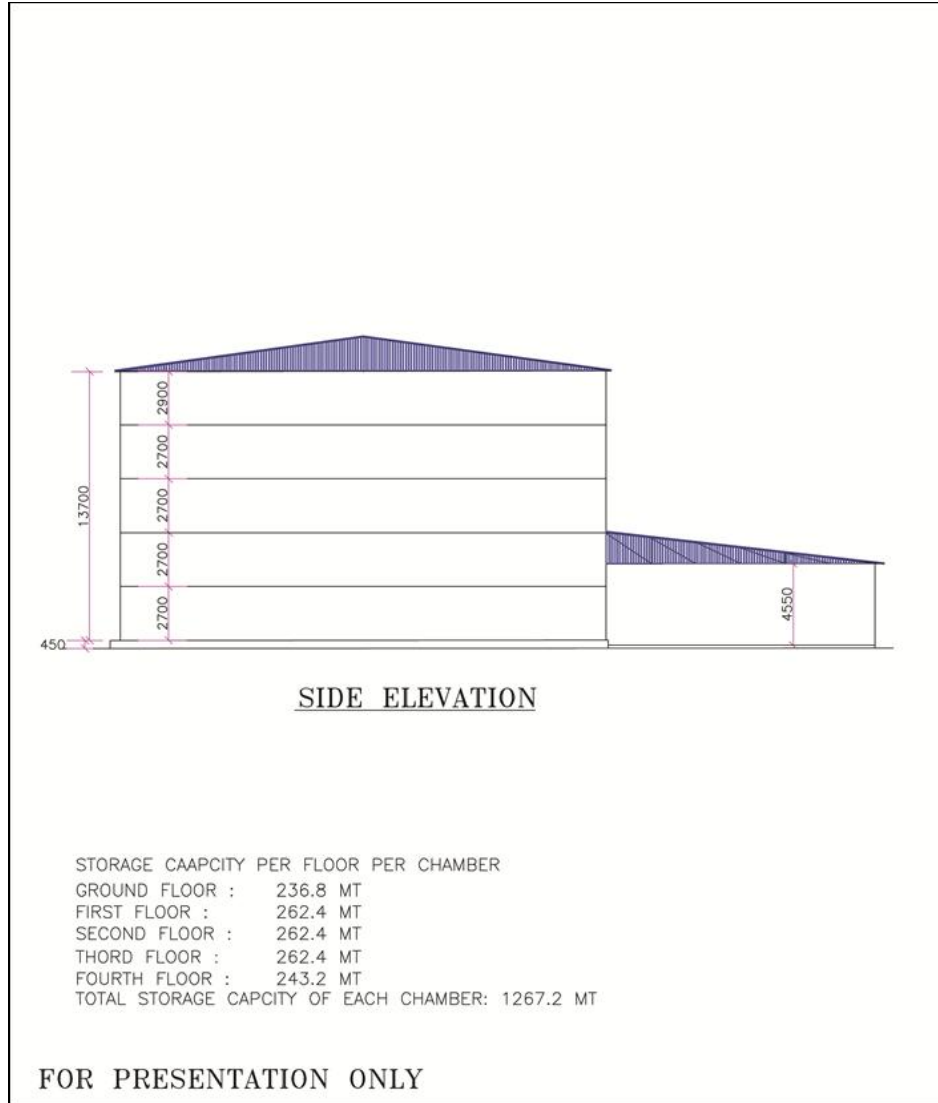
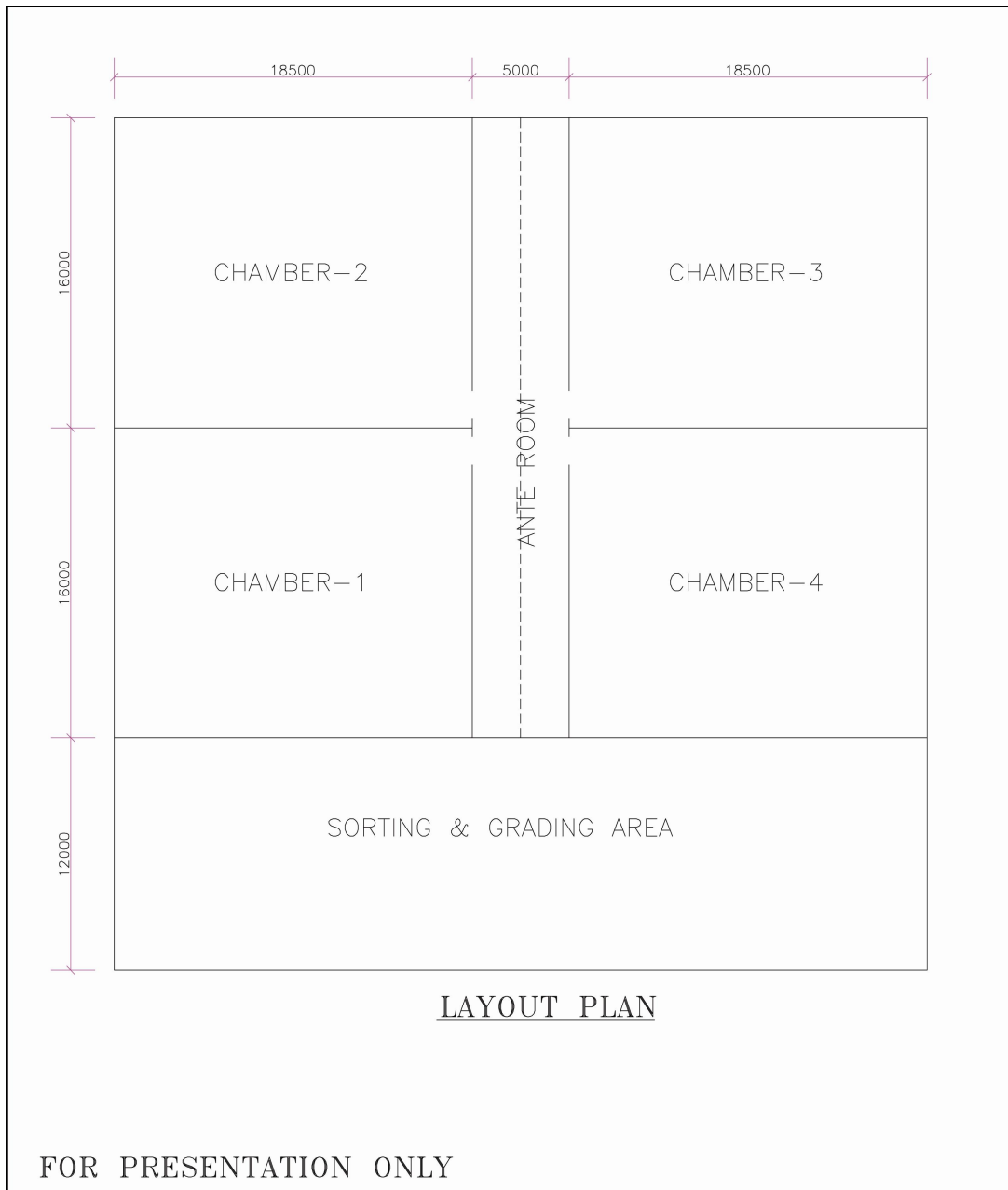


Figure 5



**Figure 6**

- 9. Operation Manual-** Provisions of Warehouse Manual for dry warehouses, *as far as applicable in cases of cold storage warehouse, shall hold good.* Cold Storage Warehouse should maintain following operating manuals for the purpose of job assignment among work-men and also for training purposes. This may also be useful for dispute redressal between holder of warehouse receipt and warehouse man too. The part of manuals useful for day-to-day working by work-men may be displayed at their respective work stations-
- a. Operating Manual for Warehouse Receipt System
  - b. Operation Manual for Plant & Machineries including Annual Maintenance,
  - c. Safety Manual Against Hazards of Fire/ Refrigerant Leakage
  - d. Operation Manual for Hazards Covered by Insurance Policy for Insurance Claims.

**List of commodities notified for issuance of NWRs by the cold storage warehouses**

1. Table Potatoes (with or without CIPC application)
2. Seed Potatoes
3. Processing {Potatoes (With CIPC application)}
4. Apples
5. Carrots
6. Nagpur Mandarin
7. Khasi/Darjeeling/NE Oranges
8. Kinnow
9. Sweet Lime / mosambi
10. Lemon
11. Pomegranate
12. Grapes
13. Almond
14. Raisins
15. Onion
16. Dehydrated Garlic
17. Garlic
18. Ginger
19. Dried edible mushrooms
20. Red Chillies
21. Coriander (Dry)
22. Cinnamon
23. turmeric
24. Tamarind
25. Date Palm
26. Frozen Processed Food Item of horticulture Origin including those frozen in IQF or Blast Freezing.