



LLOYD PANEL SYSTEM

Prefab Panels for

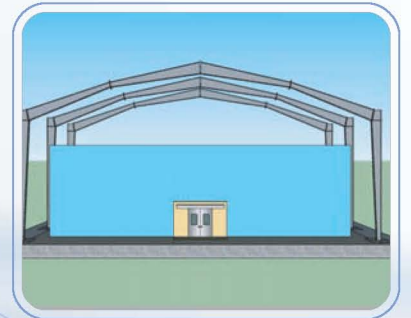
Cold Stores

CA Rooms

Pack House

Ripening
Chambers

Clean Rooms



- ➔ Structurally Robust and Thermally Efficient
- ➔ Environment friendly – CFC, HCFC Free, Zero ODP
- ➔ Exceptional Quality – Continuous & Camlock Panel Manufacturing
- ➔ Carbon Credit manufacturing unit
- ➔ Total Solution to Food Products Storage



LLOYD INSULATIONS (INDIA) LIMITED

The Total Solution Company

ISO : 9001, 14001 & 18001 Certified Company



Definition Of Cold Storage

A cold storage is a building or a group of buildings with Thermal Insulation and a Refrigeration System in which perishable food stuffs can be stored for various lengths of times in set conditions of temperature, humidity and appropriate environment to slow down deterioration and spoilage, which would occur in a natural environment. In some countries cold stores are known as refrigerated warehouses. A cold store may also be defined as a sealed structure, the internal volume of which is maintained at a temperature generally below ambient & other conditions and used for the storage of goods of all types, mainly foods.

The main objective is to secure an insulated envelop which offers maximum resistance to flow of heat and moisture penetration from outside environment. This requires an adequate and good quality insulation and an efficient vapour seal on warmer side of the insulation. Since in case of cold storage, moisture is given out by the products stored, hence vapour seal is desired on the inner side of the insulation also. So in a cold storage the insulation should be covered by efficient vapour seals on both sides so that moisture penetration is prevented on either side.

Existing Cold Store Situation

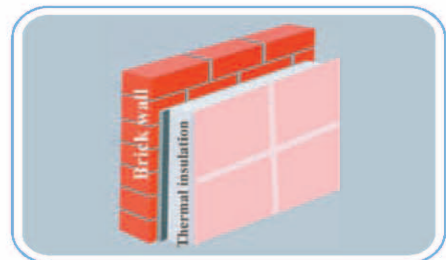
The existing cold store situation in India primarily comprise of a civil building and brick type slab insulation finished with



plaster on inner side and vapour barrier on the warmer side touching the external walls. Due to the moisture generation inside the cold store, going out of the product stored, condensation formation takes place on the plaster surface slowly and gradually. This moisture moves through the pores of the plaster and attacks on the insulation surface. Gradually with more and more deposition of the moisture the plaster becomes weak and there is Algae formation. The slab type open cell conventional insulation with passage of time absorbs the moisture and also gradually passes through the insulation slab joints. This moisture then moves through the vapour barrier joints and gaps reaching to the wall surface. This results into formation of cold spots. A situation thus comes up where the entire insulation system becomes moisture laden and loses its effectiveness.

The Possible Remedies Of Conventional Insulation

The possible remedy for conventional type insulation is one way of adding another vapour barrier on the inner side and using metal sheet as replacement of the porous plaster cladding or applying polymerised cement plaster with reinforcement over the insulation directly. This way the moisture does not come in contact with the insulation. Another method will be going in for prefabricated panels, which will comprise of two metal sheets with insulation sandwich in between. These panels will act as a permanent wall cum insulation. The benefit will be that the existing high thickness wall with insulation will be replaced by a much reduced wall thickness. This concept is also termed as Modern Cold Store Construction Practice.



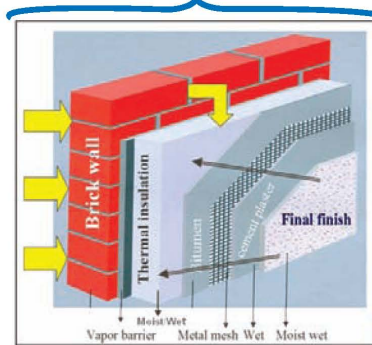
Concept Of Modern Cold Store

The civil building structure comprising of RCC columns, bricks & roofs is replaced with steel structure or Pre-engineered Building concept and Prefab panels. The prefab panels acts as a wall cum insulation of the building as also on the roof. The entire process of construction is a dry procedure & mechanized with no fabrication activities at site. The roof is finally provided with profiled steel sheets.



WHY MODERN COLD STORES

Total Thickness: 360 mm



Conventional

Replaced with

Thickness 80 to 100 / 200 mm



PUF Panels

Modern



Lloyd's Expertise & Experience

Lloyd Insulations is a Design, Engineering, Manufacturing & Contracting Company with 50 years plus work experience in Thermal Insulation Sector including Cold Store insulation with conventional Thermal Insulation slab. With the advent of Modern Technology of Prefab panels – Lloyds put up the first panel plant at Pithampur (Indore) in 1994 & first work of Modern Cold Store in 1997 at Indore. Then it was a work of projects & more plants. Put up 2nd Plant at Baddi (HP) and now state of the art continuous zero ODP panel plant at Cheyyar (Chennai).



Cold Stores for the past 16 years. With these manufacturing units logistically located and an installed capacity of 2 million sqm. per annum is geared up to take on the challenge to supply & apply for construction of cold stores across the country for all category of food products.

Galvanized / Galvalume Steel as facings on both sides.

Lloyd PUF Panels come with standard Tongue & Groove joint and optional camlocks. Lloyd PUF Panels are manufactured in the most Modern Continuous & Semi automatic Panel making line and can be supplied in lengths up to 12m (Limited due to restriction in transportation). Lloyd PUF panels are available in a standard width of 1m and in various thickness to suit the industry requirements. The standard thicknesses are 60, 80, 100, 120, 150 & 200mm.

Lloyd PIR panels system comprises of Pre-fabricated sandwich panels with CFC & HCFC free Polyisocyanurate Foam at a density of 45 ± 2 kg/m³ as core and with plain ribbed sheeting made out of Galvanized/ Galvalume Steel as facings on both sides.

Pioneers In Pre-fabricated Pre-insulated Sandwich Panels

Being pioneers and leaders in the field of Thermal Insulation, Lloyd Insulations were the first to introduce Pre-fabricated Pre-insulated Sandwich Panels in India in 1994 for Modern Cold Stores Construction & have been serving the requirements of special insulated buildings and Modern

Lloyd Panel System

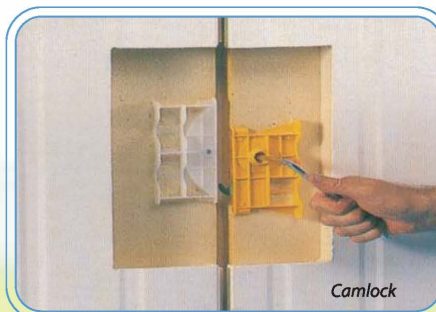
Lloyd Panel System Offers One Step Solution For Thermal Insulation Of Cold Rooms.

Lloyd panel system comprises of Pre-fabricated sandwich panels with CFC & HCFC free Polyurethane Foam at a density of 40 ± 2 kg/m³ as core and with plain ribbed sheeting made out of

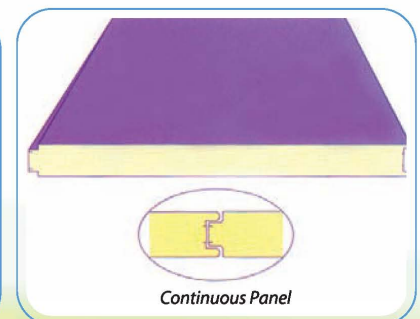
Lloyd Panels now available with Zero ODP feature.



Camlock Panel



Camlock



Continuous Panel



Thermal & Load Characteristics of Lloyd Panel

	mm	60	80	100	120	150	200
Thickness	mm	60	80	100	120	150	200
'U' value	w/m ² k	0.36	0.26	0.21	0.19	0.14	0.11
Panel weight	Kg/m ²	11.25	12.05	12.85	13.65	14.85	16.85

PROPERTIES

INSULATION

Foam Overall Density	40+/-2 kg/ cu.m
Foam Thermal Conductivity (K-Value) at 10° C mean Temp.	0.023 W/m° K
Compressive Strength @ 10% deformation	2.10 Kg/ sq.cm.
Tensile Strength	2.5 Kg/ sq.cm.
Flexural/ Bending Strength	3.0 Kg/ sq.cm.
Shear Strength	2.5 Kg/sq.cm.
Closed Cell Contents	90-95 %
Horizontal Burning Characteristics	125 mm (Extent of Burn) - Max., Fire Retardent, Self extinguishing Quality Foam.
Water absorption	0.2% volume at 100% RH. - Max
Water Vapour Permeability	0.12 ng/pasm at 88% RH & 38° C-Max
Dimensional Stability at:	
-25° C Cold Temp.	±2%
+ 70° C Hot Temp.	±2%

POLYURETHANE FOAM

CFC & HCFC FREE RIGID POLYURETHANE FOAM (PUF) as per IS 12436 STANDARD	
Foam Overall Density	40+/-2 kg/ cu.m
Foam Thermal Conductivity (K-Value) at 10° C mean Temp.	0.023 W/m° K
Compressive Strength @ 10% deformation	2.10 Kg/ sq.cm.
Tensile Strength	2.5 Kg/ sq.cm.
Flexural/ Bending Strength	3.0 Kg/ sq.cm.
Shear Strength	2.5 Kg/sq.cm.
Closed Cell Contents	90-95 %
Horizontal Burning Characteristics	125 mm (Extent of Burn) - Max., Fire Retardent, Self extinguishing Quality Foam.
Water absorption	0.2% volume at 100% RH. - Max
Water Vapour Permeability	0.12 ng/pasm at 88% RH & 38° C-Max
Dimensional Stability at:	
-25° C Cold Temp.	±2%
+ 70° C Hot Temp.	±2%

POLYISOCYANURATE FOAM

CFC & HCFC FREE RIGID POLYISOCYANURATE FOAM (PIR) as per IS 12436 STANDARD	
Foam Overall Density	45+/-2 kg/ cu.m
Foam Thermal Conductivity (K-Value) at 10° C mean Temp.	0.023 W/m° K
Compressive Strength @ 10% deformation	2.10 Kg/ sq.cm.
Tensile Strength	2.5 Kg/ sq.cm.
Flexural/ Bending Strength	3.0 Kg/ sq.cm.
Shear Strength	2.5 Kg/sq.cm.
Closed Cell Contents	90-95 %
Horizontal Burning Characteristics	25 mm (Extent of Burn) - Max., Fire Retardent, Self extinguishing Quality Foam.
Water absorption	0.2% volume at 100% RH. - Max
Water Vapour Permeability	0.12 ng/pasm at 88% RH & 38° C-Max
Dimensional Stability at:	
-25° C Cold Temp.	±2%
+ 70° C Hot Temp.	±2%

Option of third generation blowing agent viz .n – Pentane which has a zero ODP and is environment friendly

Main features of Lloyd Panel system

- A high strength to weight ratio, with significant savings in steel work and load bearing foundations, allowing large spans to be constructed with no intermediate columns.
- Dimensional stability.
- Maintenance-free surface.
- High thermal efficiency ensures low heat transmission, resulting in lower refrigeration load.
- No deterioration of thermal efficiency over time.
- Panels can be furnished in single jointless height / Length upto 12 mtrs. Partition wall can be easily erected as the panels are self supporting.
- Panel system incorporates special "L" shaped single piece panels for CORNERS. This avoids wall to wall direct jointing - provides additional stability, strength, aesthetical appearance, easy house keeping etc.
- To facilitate easy erection / dismantling for transferring the cold rooms from one location / sites to another, system is provided with CAMLOCK jointing arrangement instead of conventional flashing / screws.
- To arrest thermal leakage, joints are finished in tongue and groove configuration which in combination with CAMLOCKS ensures a foam to foam joint rather than a metal to metal joint.
- For additional reinforcement "U/L" shaped flashing are provided at wall to ceiling joints.



Benefits of Prefab Panels

- ⇒ Panels have both side metal facing acting as impermeable vapour barriers
- ⇒ Avoids moisture coming in contact with insulation
- ⇒ No deterioration of insulation
- ⇒ Joints between panels sealed
- ⇒ Moisture remains over metal sheet
- ⇒ Equilibrium situation leading to Energy Conservation
- ⇒ Construction of Modern Cold Stores
- ⇒ Panels are washable
- ⇒ Hygienic environment inside

Modern Cold Stores

Pre-engineered Building framework & prefab panels façade & roofing.

Lloyd Pre-engineered Buildings

Modern steel buildings made out of steel components fabricated at factory and assembled at site. The basic steel components comprise of columns, rafters,

purlins & runners. The steel components are manufactured at the factory and brought to the site in small sized components. No welding is done at site.

PEB Main Component

- ⇒ PEB frames are tapered and flanges and webs often have variable thickness.
- ⇒ The frame geometry matches the shape of the internal stress diagram, thus minimizing material waste and reducing the total weight.
- ⇒ False Ceiling with Insulation replaced by Polyurethane Sandwich Panels fixed to the rafters
- ⇒ Brick walls & Insulation replaced by Polyurethane Sandwich panels directly fixed to the columns.
- ⇒ 4-6 tiers can be formed of height 7 feet each.
- ⇒ Maintaining an air gap of 1-2 feet on the sides and 4 feet for stair case.



Prefab Sandwich Panels

- ⇒ Pre-fabricated Polyurethane Sandwich panels with two metallic / FRP sheets having Polyurethane Insulation sandwiched in between.
- ⇒ The panels are provided with Tongue & Groove jointing system and optional cam locking arrangement.

Wall insulation is typically with 80mm thick Rigid Polyurethane Foam Panel, with 0.5mm thick Colour Coated and Galvanized Sheet on both sides, with Tongue & Groove jointing system and cam-lock arrangement or without camlocking in case of continuous panels technology.

Wall panels can be either vertically fixed or bolted to the steel purlins or fixed horizontally by bolting to the columns.

Ceiling Panels are 100mm thick (minimum) & partition wall panels are 60 mm thick (minimum). Floor insulation is with Polyurethane foam slabs 40-45 Kg/m³ or Expanded Polystyrene slabs. Usually panel thickness recommendation is as follows :-

Temperature (deg.C)	Thickness (mm)
0 & above	80
-10 to 0	100
-10 to -20	120
-20 to -30	150
-30 to -45	200



Rain & Sun Guard - Metal profile roof sheet as rain guard protection over the ceiling panels for water shedding & protecting the panels. Also it keeps the attic space cool, through cross air circulation by exhaust fans.



Refrigeration System - Lloyd Insulations offer energy efficient cooling system offering both Ammonia and Glycol Technology.

Piping Insulation - Rigid Insulation Pipe section of Rockwool Rockwool of density 144 kg/m³ or Superfoam Polyurethane Foam of density 36±2 kg/m³ with aluminium foil lamination in thickness of 50 & 75mm.



Lloyd Pre-fab Doors

Lloyd offers the complete set of insulated door including metal aluminium frame & locking arrangements. The door comprise of two metal sheets galvanized & colour coated with Polyurethane foam insulation sandwich in between. The thickness is usually of 80mm. Doors are of hinge & sliding type.

Energy Savings in Modern Cold Store Case Study :

Capacity : 6000 MT, Potato

Size : 105' (32m) x 105' (32m) x 60' (18m) (H)

Conventional : 225mm brick & 225mm EPS on wall, 100mm EPS on ceiling, 60mm EPS on floor

Thermal Transmission value (Q) = 24 KW

Modern : 80mm Lloyd PUF Panel on Wall, 100mm Lloyd PUF panel on Ceiling, 60mm EPS or 50mm PUF slab on floor

Thermal Transmission value (Q) = 21 KW

Savings : 12-15% initially & 40-50% at later stages when conventional cold stores become ineffective due to failure of insulation.

APPLICATIONS



Cold Stores



Post Harvest Management



Ripening Rooms



CA Rooms



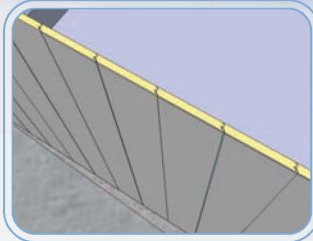
Clean Rooms



Walk-in Cold Rooms

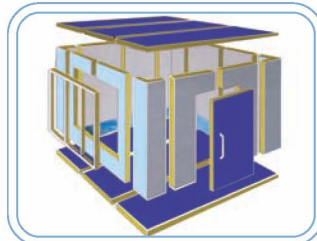


Lloyd Panel System- Features



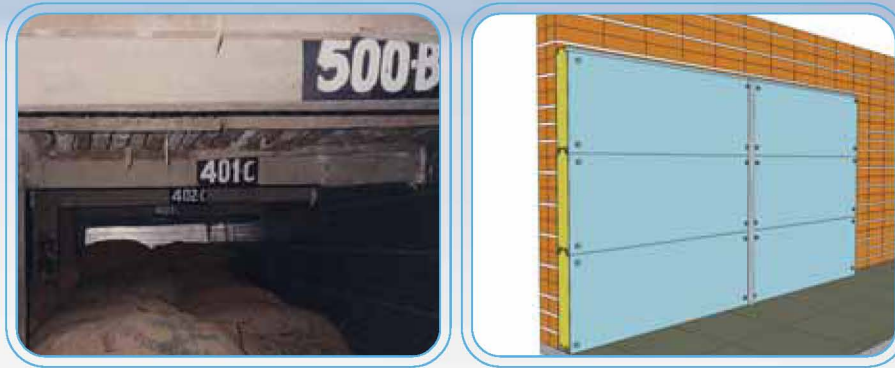
Standard Conformance

1. Meets Technical Standards and Protocol for the Cold Chain in India of National Horticulture Board (NHB).
2. Meets IS : 661 – Thermal Insulation of Cold Storage – Code of Practice (4th Revision) of Bureau of Indian Standards (BIS).
3. Green panels - 5 Points





REVAMPING OF EXISTING STORES



Removal of existing conventional insulation and fixing of Lloyd Panels, prefabricated Polyurethane sandwich panels with ribbed steel facing on one side and paper facing on inner side, on to the walls from inner side of the cold stores. This concept is suitable for refurbishment of existing cold stores with sound civil construction and failed insulation system.

Cold Storage concept to commissioning



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