Cold Rooms & Insulated Panels

Slip Joint System  Camlock System  Refrigerated Vehicle Bodies
Since inception in 1961, TSSC, a primary member of Harwal Group has been setting manufacturing benchmarks in the region with its engineering excellence. The ISO 9001:2008 certified company manufactures a diverse range of products and offers a range of services from its facilities spread across Sharjah, Dubai and Abu Dhabi. TSSC is the largest manufacturer of insulated panels for roofing and cladding in the Middle East. The building materials manufactured by TSSC are fire rated and carry individual product certifications. With over 4 decades of experience, state of the art manufacturing facilities and the largest production capacity in the Middle East, TSSC manufactures products to international quality standards and cater to customer demands by ensuring timely delivery and providing exceptional service.

Range of Products Manufactured by TSSC

**Building Materials**
- Composite Panels
- Profiled Cladding Sheets
- Seamless Roofing System
- Doors & Windows
- Curtain Walls (Stick System & Unitized Glass)

**Cold Stores**
- Cold Rooms
- Freezer Rooms
- Refrigerated Vehicle Bodies

**Factory Manufactured Houses & Shelters**
- Factory Manufactured Houses
- Telecom Shelters
- Portable Cabins
- Containerized Units

**Stainless Steel Products**
- Kitchen & Laundry Equipments
- SS Water Coolers
- SS Refrigerators & Freezers

**Commercial Refrigeration**
- Merchandising Refrigerators (Visi coolers & Freezers)

**Industrial Storage Solutions**
- Racking System

**Metal Products**
- Metal Sheds
- Cable Trays
- Trunkings

**Services**
- Galvanizing
- Coil Coating
Insulated Panels

Insulated panels provide solution to the numerous insulation problems occurring in lightweight prefabrication. One of the common applications of the insulated panels is the building of cold rooms and refrigerated vehicle bodies. For this application, insulated panels find wide use around the world due to its characteristic to provide maximum thermal insulation. Over the last 48 years, TSSC has been at the forefront of this specialized industry manufacturing high quality panels to the satisfaction of its large customer base. The harsh weather conditions in the Gulf region have been a driving force for the increasing demand for insulated panels in the region.

Insulated panels have a monolithic sandwich construction which is formed as a result of injecting rigid polyurethane foam at high density between metal claddings. TSSC offers its customers a wide range of cladding materials to choose, depending on their application requirements.

TSSC manufactures insulated wall, ceiling and floor panels to customer specified sizes that are used in building cold rooms for chiller and freezer applications. The state-of-the-art production facility spread across Sharjah and Dubai uses 15m (49.2ft) long press and manufactures panels in lengths of up to 15m (49.2ft).

TSSC installs and commission cold rooms of any specified capacity. The insulated panels can be joined together in necessary lengths to meet the dimensional requirements. Depending on the application, cold stores can be built to control temperatures ranging from -40°C to 15°C.

The major applications of insulated panels are in the manufacture of:

- Walk-In Commercial Cold Rooms
- Warehouse Cold Storages
- Portable Skid Mounted Cold Rooms
- Offshore Refrigerated Containers
- Refrigerated Vehicle Bodies
Cold Rooms

Depending on the size and use of the cold room, cold rooms can be broadly classified as walk-in cold rooms and warehouse cold stores. Cold rooms are built by TSSC to maintain a temperature range of 15°C to –40°C.

Walk-in cold rooms are smaller in size compared to the large warehouse cold stores and are used primarily by the retail industry to store goods with fast shelf replenishment rate. Due to the small size of the rooms, the insulated floors are built strong enough only to allow the use of hand carts and not suitable for large power equipments such as forklifts. A few uses of walk-in cold rooms are in the supermarkets, hotels, restaurants etc.

Unlike walk-in cold rooms warehouse cold stores are very large sized stores used to store goods at very low temperatures for a longer period. These are built with strong reinforced insulated flooring that allows the use of power equipments for loading and unloading goods. In order to achieve working temperature requirements of 15°C to –40°C, these large cold stores are in most cases fitted with more than one refrigeration unit.

Rack power system is the advanced power system used by TSSC in which the refrigeration units are connected together in a racking arrangement. This system provides high energy efficiency compared to the use of ordinary split units. TSSC is the only specialized company in the region capable of installing this system.
For quick freezing and chilling applications, blast-freezers and blast-chillers are used where the temperature in the cold room drops to as low as -40°C from the room temperature in a span of few hours. TSSC™ is a pioneer in the design, manufacture, supply and installation of these modules and are ideal for sudden freezing of medium sized fish and chicken.
Portable Skid Mounted Refrigerators & Offshore Refrigerated Containers

The portable skid mounted refrigerators are cold rooms built on a mobile unit in order for them to be used as a mobile refrigeration system. Cold rooms of different types can be constructed to be used as portable units and are always built on a strong steel base in order to provide the unit the necessary strength. These cold rooms find its use in applications that include high mobility including offshore applications.

The complete unit is built to the size of a container trailer so that it could be lifted using crane or large fork lifts and moved from one place to another on a trailer or a container. Cold rooms designed with partition walls and doors for different uses can also be built upon the same steel base.
Various Use of TSSC Cold Rooms

TSSC Cold rooms are Used in

- Super Markets
- Food Services
- Catering
- Restaurants
- Butchery
- Hospital
- Beverages Room
- Processing Areas

Applications

- Fresh & Frozen Poultry
- Meat
- Fish
- Dairy Products
- Ice creams
- Vegetable & Fruits
- Flowers
- Chemicals
Structure

TSSC uses a wide range of cladding materials to manufacture insulated panels. These include

1. Polyester pre-painted galvanised steel
2. PVC (Plastisol) coated galvanised steel
3. Stainless Steel
4. Aluminium (Stucco embossed or pre-painted)

Depending on specific customer requirements, TSSC also supplies panels manufactured using other cladding materials. The surface profiles of the insulated panels are made smooth or ribbed depending on the requirement.

The manufacturing process of the insulated panels involves injection of polyurethane foam at high pressure between the claddings using a high pressure mixer. The panels are supplied in standard sizes or are custom made to order sizes. The different kinds of panels used in the construction of a coldroom are the wall, ceiling and floor panels. The ceiling and floor panels are manufactured with the same width as the wall panels. Corner panels are used together with wall panels for partitioning in applications where multiple compartments need to be built.

The claddings are formed at the edges in “U” shape to guarantee superior adhesion between the sheet and polyurethane and are shallow ribbed to provide additional strength and dimensional stability. The floor panels are made strong to withstand uniformly distributed load of up to 2.5 tons per square meter.
Assembly

Cold room walls, ceilings and floors are assembled by joining together insulated panels in required lengths. The panels are tightly joined by the slip joint system for good structural stability.

Slip joint is a unique, interlocking, tongue-and-groove joint technology which has been adopted across the world and provides unsurpassed sealing and waterproofing. It is a well-organized sandwich panel system which utilizes a male female action on the longitudinal joint to achieve superior tightness and insulation. Panels slip into place allowing for easy and rapid installation, whilst improving structural strength and thermal efficiency and also offering a clean, smooth aesthetic look.

Insulated panels are joined together in required lengths to assemble cold room walls, ceilings and floor. The panels are then tightly joined by a tongue and groove system into a monolithic assembly. For joining the panels together camlocks with steel hooks are used to securely lock them together. The camlocks are moulded and permanently anchored in the injected rigid polyurethane foam core during the manufacture of the sandwich panel.

The use of camlocks in connecting the panels makes TSSC cold rooms easily expandable as well as dismountable thus allowing easy reassembly at various locations.
System Details

Implementation of Panel Steel Construction
Insulation

At TSSC polyurethane foam is used to insulate the panels. As part of the company’s green initiative, TSSC ensures that all foaming agents are environment friendly and CFC free. Polyurethane is manufactured by reacting a liquid polyol component with Methylene Diphenyl di-Isocyanate (MDI), a liquid polymeric isocyanate component, in the presence of a blowing agent and other additives. The mixed components then react exothermally to form a rigid thermosetting polymer and since the blowing agent evaporates during this exothermic reaction, a rigid closed cell low density insulation product is created.

The characteristics of the panel insulation are that it neither deteriorates over time nor does it absorb smell. The panels are neither toxic nor cause allergies and do not support the growth of fungi or mildew. According to European Fire retardant standards, these products are classified as B2.

(Illustrated on the side is a list of comparative insulation values for different kinds of insulation materials)

Fire Rated Panels

TSSC panels with PIR core are recommended for use where improved fire performance is required. The panels are light weight sandwich panels with good cold-retention qualities and a PIR fire retardant core suitable for all insulated applications such as industrial and commercial premises including cold stores.

<table>
<thead>
<tr>
<th>Product</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panels with PIR core</td>
<td>Cold store internal/external walls. Offers superior thermal performance, required for fire rated approvals.</td>
</tr>
</tbody>
</table>
Flooring

TSSC recommends polyurethane slabs to be used for floor insulation in order to achieve maximum cold room insulation. In the case of small cold rooms, TSSC advises the PU slabs to be reinforced with plywood in order that the load is uniformly distributed and the slab is protected against any impact damage. Depending on the customer requirement, either marine plywood or the standard water boiled plywood could be used.

For large refrigerated warehouses which require the use of power equipments such as forklifts, a concrete reinforcement is required over the TSSC™ PU slabs for additional strength. For best results, TSSC recommends the laying of vapour proof barriers such as polyethylene sheets under and above the PU boards.

Ceiling

In order to achieve maximum cold room insulation, it is important that the same insulated panels that are used for the walls and floor be used for the ceiling as well. In applications where ceiling panels are long, the panels would need to be suspended from the main structure. The ceiling also is used to conceal the plumbing, electrical and other utilities above the ceiling panels. The panels are built strong in order for it to hold the weight of the personnel walking over the ceiling for the maintenance of these units.

Dimensions

The standard width of the panels are 1200mm (47.24”) and are available in the following thickness ranges: 50mm (1.97”), 60mm (2.36”), 80mm(3.15”), 100mm(3.94”),120mm (4.72”), 150mm(5.91”),170mm(6.69”)and 200mm (7.87”). TSSC™ can manufacture panels up to 15 meters (49.2ft) long. Density of insulation can be varied according to the project needs.
Accessories

Cold rooms that require high sanitation standards require the joining bolts to be concealed in order to avoid the corrosive parts being exposed to the cold room. TSSC supplies curving or rounded corner profiles for this application.

Some other accessories supplied by TSSC™ include bumpers, internal or external ramps and hydraulic ramps for small cold rooms.
Insulated Doors

TSSC manufactures a choice of CFC free polyurethane insulated doors in different thickness for various applications. The main types are

1. Sliding doors
2. Hinged doors
3. Traffic swing type doors with glass port hole
4. Hydraulic self closing doors
5. Controlled atmosphere doors
6. Display thermal glass doors
7. Insulated sectional doors

Hinged doors are of various types such as single leaf or double leaf, overlapping or flush. These doors are always open in the outward direction towards either left or the right.

For applications that require flexibility in the location of the door, TSSC™ supplies retro-fit reach-in doors. If the location of the door would be on a single panel, it could be factory installed. However, if the door space need to be shared between two panels, the hole would need to be size cut at the site.

The size of standard doors are 90cm(2.95ft) x 190cm(6.23ft) and are insulated with CFC free polyurethene of density 42 kg / cubic meter(2.62 lb/ft3).

The sliding doors are usually used for applications which require larger door openings. It opens and closes with minimal effort and is available with both left and right hand sliding option. TSSC™ also supplies electric sliding doors which are available in either bi-parting or single door models.

Doors up to a height of 5m can be fitted for cold rooms of any size ranging from standard modules to large sized warehouses.

Other features of TSSC™ doors include

1. Durable hardware and attractive hinges and handles built for years of trouble-free usage.
2. Safety release handles that glows in the dark to prevent entrapment inside cold storage.
3. Door heater wire.
4. Aluminium or stainless steel railings for very high durability.

TSSC also supplies a range of door accessories that include

1. Interior or exterior ramps manufactured according to client requirements
2. Display thermal glass
3. Hydraulic door closers (self-closing doors)
Refrigeration

TSSC installs branded refrigeration systems in its cold rooms that are chosen for their proven consistency and efficiency. However, based on the client requirement TSSC also installs cold rooms without refrigeration equipments, thus providing the flexibility to the client to choose the system of their choice.

Walk-in coldrooms are normally equipped with monoblock, split system or individual units. For large warehouse cold stores, TSSC recommends the use of rack power system. TSSC™ is one of the very few companies in the region capable of providing the customer with a rack power system. This involves a special compressor arrangement in a racking style. This system helps in reducing power consumption considerably compared to the use of other refrigeration systems such as split units. TSSC™ uses branded compressors for its rack system to ensure proven quality records.
Frost Heave Protection

In large sized low temperature cold store applications, it is very likely that frost formed due to refrigeration get deposited under the floor and eventually lead to the cracking of the insulated floor. This would hamper the effectiveness of refrigeration and spoil the goods refrigerated. TSSC™ recommends the use of frost heave protection for such cold stores. The different types of protection available are underground pipe ventilation system and electric floor mat heater. TSSC™ provides assistance in the design of the underground pipe ventilation system and also supplies electric floor mat heater.

Underground pipe ventilation system involves the laying of pipes / ducts under the insulated floor of the refrigerated room. The pipes with both ends left open are laid at an inclination to allow the flow of water formed due to precipitation. Air circulates through these pipes and prevents the formation of frost that could otherwise accumulate under the floor of the cold store.

In situations where underground pipes could not be laid, electric floor mat heater could be supplied as an additional accessory. These mats when laid under the cold store floor provide heating and thus prevent the formation of frost.

Project Management

With extensive experience in carrying out major projects in the GCC countries, TSSC provides full range of services in constructing cold rooms including design, supply, installation and commissioning of a complete refrigeration plant. The highly qualified and experienced technical staffs ensure that the final product delivered to the customer confines to the highest quality standards set by the company in manufacturing and installation. TSSC could also install a monitoring system for projects that involve more than one cold room.

As part of the company’s efforts to satisfy the needs of all its customers, TSSC offers 24-hour service to ensure that all systems installed by the company operate without fail at all times. The large volume of returning customers is an evidence of TSSC commitment in providing comprehensive service to the satisfaction of its clients. TSSC actively involves in the development of new products that meet the diverse needs of their valuable customers.
Packing

**Standard Packing**
1. Insulated panels of standard dimension are stacked together in one bundle.
2. Panels of different sizes could be stacked together for easy transportation.
3. In order to avoid any damage to the insulated panels, a PU board is placed atop the first panel of the stack before it is stacked on a wooden pallet.
4. The stack is then covered with a polyethylene sheet covering all sides of the stack. The packing is wound by plastic strings and sealed using polypropylene tape to ensure that the insulated panels reach the customer without any tampering.
5. When panels are transported by container, insulated panels are stacked both horizontally and vertically in order to achieve optimum container space usage.

<table>
<thead>
<tr>
<th>Panel thickness (mm)</th>
<th>50</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>150</th>
<th>170</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panels per bundle</td>
<td>30</td>
<td>25</td>
<td>20</td>
<td>17</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

**Special Packing**
1. Special crating – For special transportation needs, insulated panels are packed in crates (semi or full) as per the requirement. This provides additional safety for the panels and also helps in minimizing the transportation cost involved in all modes of transportation such as air, sea and land.
2. Corners of the insulated panels are protected using the special foam angles and cardboards for transport using chartered ship/air consignment, break bulk consignment and the consignments that involve both air and land transportation.
3. When long and heavy insulated panels are packed, a thick PU board is placed on top of the wooden pallet in order to give more protection to the panel on the top.
Storage

Unloading at site
Extreme care and attention needs to be given when unloading the panels at the site. This should be done not only for the protection of the panels but also the safety of the handling personnel.
Panels should never be dropped onto hard or uneven surfaces or thrown from vehicles.

Storage
Panels supplied in bundles should be stored on flat even ground able to withstand the weight of both the panels and the lifting equipment.
The Polyethylene sheet wrap could remain on the bundle when the panels are stored for short periods provided they are not exposed to sunlight and humidity. For long storage periods, TSSC advises its customers to remove the Polyethylene sheet wrap and store the panels indoors.

Protective film
Both sides of TSSC insulated panels are covered with nylon protective film to protect the panels from scratches. The protective film should only be removed after the panels are installed in order to ensure maximum protection.

The protective film could remain on the insulated panel for any storage period. However, for long periods of storage panels should be stored indoors.
**Insulated Truck Bodies**

TSSC is a pioneer in the manufacture of isothermal bodyworks. The company employs most modern construction techniques based on proven research to manufacture reliable insulated vehicle bodies.

TSSC manufactures insulated panels for vehicle bodies in sizes of up to 7 meters in length and 3 meters in width. The panels are reinforced to give maximum strength and durability. TSSC takes pride in being one of the very few companies in the region to build truck bodies using only 6 panels, one for each side of the body. All the corners and edges of the vehicle body are protected using specially extruded aluminium profiles. The insulated body is built to hold temperatures ranging from +15°C to -20°C.

Rigid Polyurethane insulated panels are used as walls, roof and floor elements which are built to match various types of vehicle chassis. The monolithic sandwich construction of these elements is a result of injecting rigid polyurethane foam at high density between metal claddings. The panels can be made using the standard plastisol (PVC) coated GI sheets or any other material according to customer choice.
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Vehicle bodies to suit pickups, trucks, trailers and semi-trailers (up to 40ft long) are manufactured by TSSC™ which could be supplied to the customer or fitted with the vehicle according to the requirement.
Movable partition:
TSSC provides specialized partitions which are called movable partitions inside the insulated body. The partition could be moved both horizontally and vertically and can be locked in either direction. This allows for high level of flexibility in designing compartments of any size that could be used for freezers and chillers according to the requirement. The partitions are built complete with rubber gaskets, thermostat, 12V DC fan, aluminium ventilation grill, rollers, locks etc. A provision for fixing the compartment vertically at three different positions could also be provided according to the customer specification. Insulated bodies for cargo trucks are fitted with belts inside to hold the goods intact. These are applicable when the truck is half filled with goods and needs to keep then intact from tampering caused by the motion of the vehicle.

Eutectic Plates:
TSSC is one of the very few companies in the region to build refrigerated vehicle bodies using eutectic plates. The eutectic plates are used to maintain a certain temperature inside the insulated body for long periods after the unit is disconnected from the power supply. Eutectic plates are used in applications where temperatures need to be reduced to upto (-30°C).

Eutectic plates finds its use in ice cream transportation application where very low temperature needs to be maintained in order to preserve the goods intact for immediate use.

Doors
The different kinds of doors for the insulated truck body are manufactured individually within our factory to meet specific client requirements. These include double and triple leaf rear doors with 270°opening, single leaf doors or side hatches

Floors
The internal flooring of the vehicle body is made using high grade chequered aluminium finish plates. Other finishes such as Aluminium T-profiles, fibre glass, stainless steel etc are also supplied by TSSC™. TSSC uses single piece chequered aluminium panel without any joints which enhances the strength and durability of the floor.

Skid Mounted Insulated Containers
These mobile isothermal rooms have the same standards and options as TSSC modular coldstorage, blast-chillers and blast-freezers.
# Insulated Container Bodies

| Cladding Formation | Can be made with shallow ribs or smooth surface. Edges are formed in “U” shape. Standard cladding used is 200 micron plastisol coated GI sheet. Pre-painted steel or aluminium can also be used. The latest addition to the choice of cladding is the one piece GRP. The reverse side of the cladding is perfectly lacquered with foamable primer to ensure proper adhesion to the rigid foam during insulation. |
| Design | Panels are made using single piece of cladding up to 7 meters in length and 3 meters in width to match any type of vehicle chassis. |
| Insulation | Rigid injected polyurethane foam. |
| Density | 42 kg/m³ or as per requirement. |
| Thickness | Up to 200mm. |
| Floor Panels | Reinforced panels reinforced with water boiled plywood or marine plywood covered with chequered aluminium non-slip plates. Stainless steel floor or Aluminium planks are the other options. |
| Steel Base | If required TSSC can provide a steel base for supporting the container |
| Doors | Hinged type doors including: Double leaf Single leaf Side delivery door |
| Hinged Door | Cladding can be 200 microns plastisol coated GI sheet, stucco aluminium or pre-painted steel. Accessories: stainless steel door fittings, Gasket TPE rubber and PVC strip curtain. |
| PVC Strip Curtains | Reduces infiltration load up to 50%, yet allow access to stored products Width range 20 cm, Thickness 2mm. Length as per customer order. Stability 60 degree C to -40 degree C |
| Mounting Accessories | Aluminium extruded profiles, Rivets, Sealant. |
| Aluminium Extruded Profiles | TSSC uses specialized extruded profiles to mount the different sides together. These special profiles are exclusively manufactured for TSSC vehicle bodies and provide extra strength to the body. |
| Drain Points | Provided for draining. Number of drains depends on client requirements. |
## Insulated Container Bodies

<table>
<thead>
<tr>
<th>Extra Options &amp; Accessories</th>
<th>Pressure port</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ventilator mechanisms</td>
</tr>
<tr>
<td></td>
<td>Side panel lights</td>
</tr>
<tr>
<td></td>
<td>Canopy</td>
</tr>
<tr>
<td></td>
<td>Automatic tail lift</td>
</tr>
<tr>
<td></td>
<td>Tail ramp</td>
</tr>
<tr>
<td></td>
<td>Bells fitted inside cargo trucks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Support Structure</th>
<th>All wall panels are specially reinforced with embedded steel frames and bolted down to the steel chassis or base for rigidity and strength for long hauls.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Refrigeration Units(Optional)</th>
<th>Can be supplied by the client or supplied and installed by TSSC</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Guarantee</th>
<th>TSSC panels are guaranteed against manufacturer defect for 5 years and refrigeration units are guaranteed against manufacturer defect for 1 year (unit service will be maintained by TSSC™ for that year)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th>Custom designs can be provided upon client’s request. TSSC is an ISO 9001:2000 quality certified company.</th>
</tr>
</thead>
</table>
Quality Assurance Policy

For decades, the Quality Management System followed by TSSC has ensured that the products and services offered by the company always surpass the expectations of its customers. Continuous improvement is an ongoing characteristic of our ISO 9001:2008 system to improve every operational process. As a leading manufacturer, TSSC has always stayed focused on finding new ways to design, produce, sell and deliver quality products at economic prices.

TSSC has QA/QC departments to continuously monitor their operational processes and product quality. TSSC’s state of the art QC laboratories ensure that products supplied meet the various international standards to which they are designed and produced. The production line implements a continuous quality system that conforms the quality at each stage of production. Most of TSSC products are approved by third party certifying agencies. We are ISO 9001 : 2008 certified by VINCOTTE INTERNATIONAL MIDDLE EAST. TSSC composite panels have very high fire ratings and TSSC is under the process of obtaining FM approval for all the panels they manufacture. Besides these, most of TSSC products are DCL approved.

Moreover, TSSC’s stringent vendor qualification system selects the best international manufacturers and suppliers for the production and procurement needs. Some of the major suppliers for TSSC include:

- HUNTSMAN USA
- BAYER GERMANY
- KASON USA
- DAN-DOORS DENMARK
- PASTORE & LOMBARDI ITALY
- CORUS UK
- OTEFAL ITALY
- ARCELOR EUROPE
- HINDALCO INDIA
- UNI COIL KSA
- BLUESCOPE AUSTRALIA
- JSW STEEL INDIA
- UTTAM GALVA INDIA
- BASF GERMANY
- NATIONAL STEEL INDIA
- ESSAR STEEL INDIA
- POSCO SOUTH KOREA
- YUSCO TAIWAN

Guarantee:
TSSC offers up to 25 years guarantee (according to the specifications) against manufacturing defects for all polyurethane insulated panels.
Cladding Specifications

Galvanised Polyester coated sheets

**Hot Dip Galvanised coated coil - ASTM 755**

<table>
<thead>
<tr>
<th>Property</th>
<th>Measurement</th>
<th>Unit</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield strength</td>
<td>(170 - 310)</td>
<td>Mpa</td>
<td>ASTM 653</td>
</tr>
<tr>
<td>Elongation %</td>
<td>≥26</td>
<td>%</td>
<td>ASTM 653</td>
</tr>
<tr>
<td>Zinc coating G60</td>
<td>180 gms/ sq mt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total coating thickness (Top side)</td>
<td>22-25</td>
<td>Microns</td>
<td></td>
</tr>
<tr>
<td>Primer Thickness</td>
<td>5 to 7</td>
<td>Microns</td>
<td></td>
</tr>
</tbody>
</table>

Galvanised Plastisol coated sheets

**Plastisol coated sheets - ASTM 755**

<table>
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<th>Property</th>
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<tr>
<td>Elongation %</td>
<td>&gt; 26</td>
<td>%</td>
<td>ASTM 653</td>
</tr>
<tr>
<td>Zinc coating G60</td>
<td>180 gms/ sq mt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total coating thickness (Top side)</td>
<td>200</td>
<td>Microns</td>
<td></td>
</tr>
<tr>
<td>Primer Thickness</td>
<td>5 to 7</td>
<td>Microns</td>
<td></td>
</tr>
</tbody>
</table>

Insulation Foam Properties

<table>
<thead>
<tr>
<th>Test</th>
<th>Measured Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density core</td>
<td>40 - 42</td>
<td>Kg/m³</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>&gt;100</td>
<td>Kpa</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>&gt;100</td>
<td>Kpa</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>&gt;100</td>
<td>Kpa</td>
</tr>
<tr>
<td>Thermal Conductivity (‘K’ Value)</td>
<td>0.022</td>
<td>w/ (m²K)</td>
</tr>
<tr>
<td>Closed Cell Content %</td>
<td>&gt; 93</td>
<td>%</td>
</tr>
<tr>
<td>Water Absorption By Volume (After 24 hours)</td>
<td>1.0</td>
<td>%</td>
</tr>
<tr>
<td>Fire Classification</td>
<td>B3 As per DIN 4102 (B2 &amp; PIR upon request)</td>
<td></td>
</tr>
</tbody>
</table>
Polyisocyanurate Foam Properties

a. Mechanical Characteristic of the Polyisocyanurate Foam

Overall Density (40 - 45 Kg/m³ upon request)
- Tensile Strength: > 100 Kpa
- Compression Strength > 100 Kpa
- Shear Strength > 100 Kpa
- Fire Property Classification: Class 1 or A Best class with less Fire spread and smoke development as per ASTM E84

b. Insulation Capacity

K Value (Thermal conductivity of PIR) - 0.022 - 0.026 W/mK

<table>
<thead>
<tr>
<th>Polyisocyanurate Core Thickness (mm)</th>
<th>35</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>75</th>
<th>100</th>
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</thead>
<tbody>
<tr>
<td>Overall Heat Transfer Coefficient U Value (W/m² K)</td>
<td>0.68</td>
<td>0.60</td>
<td>0.48</td>
<td>0.40</td>
<td>0.32</td>
<td>0.24</td>
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</tbody>
</table>

c. Water Absorption of the foam - 1% of Volume

d. Fire Properties as per ASTM E84:
   - Flame spread - 20
   - Smoke Development - 350

   Classified as best class, class 1 or class A with less fire spread & smoke development

   Our PIR foam is approved by DCL (Dubai central laboratory) as per EN: 13165:2008.

e. Dimensional Stability %: Length & Width ≤ 3%
   Thickness ≤ 8%
### Free Standing Height and Ceiling Span

Insulated Panel with 0.5 mm thick polyester pre-painted Galvanized Steel cladding

<table>
<thead>
<tr>
<th>Nominal Panel Thickness (mm)</th>
<th>U-Value (W/m²°C)</th>
<th>Panel Weight (Kg/m²)</th>
<th>Max. Wall Height (m)</th>
<th>Max. Ceiling Span (m)</th>
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<tbody>
<tr>
<td>50</td>
<td>0.46</td>
<td>10.40</td>
<td>4.0</td>
<td>3.0</td>
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<tr>
<td>80</td>
<td>0.288</td>
<td>11.66</td>
<td>6.0</td>
<td>4.0</td>
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<tr>
<td>100</td>
<td>0.23</td>
<td>12.50</td>
<td>8.0</td>
<td>5.0</td>
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<tr>
<td>120</td>
<td>0.192</td>
<td>13.34</td>
<td>10.0</td>
<td>6.0</td>
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<tr>
<td>150</td>
<td>0.15</td>
<td>14.60</td>
<td>12.0</td>
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<tr>
<td>200</td>
<td>0.115</td>
<td>16.70</td>
<td>15.0</td>
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### Heat Transfer Coefficients:

<table>
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<tr>
<th>Thickness in mm 'U' Value W/(m² °K)</th>
<th>50</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>150</th>
<th>170</th>
<th>200</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>4.60</td>
<td>2.88</td>
<td>2.30</td>
<td>1.92</td>
<td>1.53</td>
<td>1.35</td>
<td>1.15</td>
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<tr>
<td>15</td>
<td>6.90</td>
<td>4.32</td>
<td>3.45</td>
<td>2.88</td>
<td>2.30</td>
<td>2.03</td>
<td>1.73</td>
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<td>20</td>
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<td>5.76</td>
<td>4.60</td>
<td>3.84</td>
<td>3.06</td>
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<td>13.53</td>
<td>11.50</td>
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</tbody>
</table>

Allowable heat Transmission 10 to 12 W / m²
Certificates
Harwal Group is an international manufacturing conglomerate specialized in various manufacturing technologies with headquarters in UAE. With a diverse range of products that serve a spectrum of industries, we build valuable partnerships with our customers and provide them excellent service.

Our Group companies in the Gulf region include Cosmoplast, Interplast, Intermetal, TESC, Technomec, Emirates Recycling, Union Beverages Factory and Harwal Containers Manufacturing. Collectively they cater to diverse market sectors with a customer base spanning across the Middle East, Europe, USA, Asia Pacific, Africa, CIS and beyond.

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