



Thermopor Kaa Ghar
TKG INSULATION SOLUTIONS

FOR ARCHITECTS, ENGINEERS & CONSULTANTS

EPS Insulation Technical & Specification Guide

Densities, ASTM grades, thermal performance, R-values, load capacities, temperature ranges and construction methods for residential, commercial, poultry and cold storage projects.

MANUFACTURING SINCE 1989

CONFORMS TO ASTM C578 / D6817 / D1621

DENSITY 12-32 KG/M³



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A technical reference for specifying TKG EPS insulation sheets: density and grade selection, thermal performance, load capacity, and standard construction methods for each application type.

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About TKG. Thermopor Kaa Ghar manufactures EPS insulation sheets and blocks at its own facility in North Karachi, and has done so since 1989. TKG's role is manufacturing and technical specification: recommending the right density and thickness for your project. Installation is carried out by your own contractor or installation team.

About the figures in this guide. Thermal and compressive values are the minimum requirements of ASTM C578 for the EPS grade matching each density. They are industry-standard reference values, not results from a TKG-specific laboratory certificate. Final specification should always be confirmed against project drawings.

01 · MATERIAL OVERVIEW

What TKG sheets are made of

Expanded Polystyrene (EPS) is a closed-cell rigid foam, approximately 98% trapped air held inside a fused polystyrene bead structure. It is the same base material used worldwide in building insulation and cold-chain packaging. In Pakistan EPS is commonly known as "Thermopor". TKG sheets are manufactured in densities from 12 to 32 kg/m³ and thicknesses from 0.5" to 20", in a standard 8'×4' sheet, with custom sizes cut to drawing.

12–32	0.5"–20"	3.1–4.2	8' × 4'
DENSITY, KG/M³	THICKNESS RANGE	R-VALUE PER INCH (MIN.)	STANDARD SHEET

DENSITY & SPECIFICATION MATRIX

DENSITY	TKG TIER	ASTM C578 GRADE	R / INCH (MIN.)	TYPICAL USE
12 kg/m³	Economy	Type XI	3.1	Non-structural cavity fill and void fill, protective packaging. Not for flooring or foot traffic.
16 kg/m³	Standard	Type I	3.6	General wall and roof insulation, false ceilings.
20 kg/m³	Value Plus	Type VIII	3.8	Roofs and walls needing higher thermal performance, chilled rooms.
24 kg/m³	High	Type II	4.0	Commercial roofs and walls, cold storage (0°C to -10°C).
32 kg/m³	Superior	Type IX	4.2	Deep-freeze cold storage, frost heave protection, highest load and R-value need.

R-values are the ASTM C578 minimum thermal resistance per inch, measured per ASTM C518 at a mean temperature of 24°C (75°F), for the grade matching each density. Units: ft²·°F·h/BTU; to convert to metric (m²·K/W), divide by 5.678. Installed performance also depends on joint sealing, workmanship and vapour-barrier detailing.

Choosing a density. Higher densities give both higher thermal resistance and higher load capacity (see page 6). 12 kg/m³ is the exception: a light, non-structural grade for cavity fill and packaging, not rated for flooring or foot traffic.



Block cutting line, TKG facility, North Karachi.

02 · PERFORMANCE

Thermal conductivity & R-value

Thermal conductivity (λ) measures how easily heat passes through a material, in W/(m·K): the watts of heat flowing through 1 metre of material for every 1°C of temperature difference. Lower is better. It is a property of the material, independent of board thickness.

R-value (thermal resistance) combines conductivity with actual thickness: $R = \text{thickness} \div \lambda$. It answers "how well does this sheet stop heat". Doubling the thickness doubles the R-value. Higher is better.

MAXIMUM THERMAL CONDUCTIVITY BY DENSITY, W/(M·K) AT 24°C

0.047 12 KG/M ³	0.040 16 KG/M ³	0.038 20 KG/M ³	0.036 24 KG/M ³	0.034 32 KG/M ³
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Derived from the ASTM C578 minimum R-values. EPS insulates better at lower temperatures, so in chilled and cold storage applications actual conductivity is lower than shown.

R-VALUE BY THICKNESS, IMPERIAL (FT²·°F·H/BTU)

DENSITY	1"	2"	3"	4"	6"
12 kg/m³	3.1	6.2	9.3	12.4	18.6
16 kg/m³	3.6	7.2	10.8	14.4	21.6
20 kg/m³	3.8	7.6	11.4	15.2	22.8
24 kg/m³	4.0	8.0	12.0	16.0	24.0
32 kg/m³	4.2	8.4	12.6	16.8	25.2

R-VALUE BY THICKNESS, METRIC (M²·K/W)

DENSITY	1"	2"	3"	4"	6"
12 kg/m³	0.55	1.09	1.64	2.18	3.28
16 kg/m³	0.63	1.27	1.90	2.54	3.80
20 kg/m³	0.67	1.34	2.01	2.68	4.02
24 kg/m³	0.70	1.41	2.11	2.82	4.23
32 kg/m³	0.74	1.48	2.22	2.96	4.44

Minimum values per ASTM C578 at 24°C (75°F) mean temperature, for grades XI, I, VIII, II and IX respectively. Thicknesses up to 20" are available; R-value scales proportionally with thickness.

03 · HEAT FLOW & ENERGY

How much heat does it stop?

The table below compares conducted heat through a typical RCC roof with and without a TKG EPS layer. Figures are calculated from standard material values, not a site measurement, so you can check the working.

ROOF BUILD-UP	U-VALUE, W/(M ² ·K)	REDUCTION IN CONDUCTED HEAT
No insulation	3.04	n/a
1" EPS, 20 kg/m³	1.00	67%
2" EPS, 20 kg/m³	0.60	80%
3" EPS, 20 kg/m³	0.43	86%
4" EPS, 20 kg/m³	0.33	89%

Assumptions: 150 mm reinforced concrete slab (λ 2.3 W/m·K, ISO 10456), 75 mm cement screed (λ 1.4), surface resistances 0.17 internal (heat flow downward) and 0.04 external m²·K/W (ISO 6946), EPS at the ASTM C578 Type VIII minimum. Steady-state conduction only; excludes thermal bridging and workmanship effects.

EFFECT ON COOLING LOAD

- Heat is stopped at the roof or wall before it reaches the slab.
- Ceiling and wall surface temperatures stay lower, and so does indoor air.
- The AC has less heat to remove: shorter, less frequent compressor cycles.
- Lower cooling-related electricity use, and at design stage a smaller AC plant may be specified.

Actual electricity savings depend on AC system, usage hours, orientation, glazing and other envelope elements. We recommend your MEP consultant include the insulated U-value in the cooling load calculation.

WATER RESISTANCE & DURABILITY

Closed-cell structure

Low water absorption; tolerates humidity, condensation and coastal salt air.

No rot, no mould

Non-fibrous and chemically inert; does not support mould growth or biological decay.

Stable R-value over time

EPS cells hold air rather than a blowing gas that diffuses out, so it does not lose thermal performance as it ages when protected under screed, render or cladding.

Installation note. EPS resists moisture, but every roof and wall system still needs correct waterproofing and vapour-barrier detailing at joints and penetrations. On roof retrofits, existing waterproofing must be inspected and repaired before sheets are laid. The insulation protects the slab from thermal stress; it does not replace waterproofing.



04 · SPECIFICATION

Temperature range by density

DENSITY	COMFORTABLY MANAGES	TYPICAL APPLICATION
16–20 kg/m ³	Ambient to hot-climate exposure (Karachi and Lahore roof surface conditions)	Residential and light commercial roofs and walls
20 kg/m ³	Down to 0°C	Chilled storage, mild cold rooms
24 kg/m ³	0°C to –10°C	Standard cold storage, food distribution
32 kg/m ³	–10°C to –25°C and below, sustained freeze–thaw cycling	Deep freeze rooms, blast freezers, industrial cold chain

EPS thermal resistance improves as temperature drops, so its insulating performance does not degrade at freezer temperatures.

Fire. Standard EPS is combustible and is not fire-rated on its own. Where a fire rating is required, sheets must be protected by a non-combustible layer such as concrete screed, gypsum board or cement render. Always confirm against the local building code for the specific occupancy.

FLOOR & TRAFFIC LOAD CAPACITY

Load capacity by density

DENSITY	ASTM C578 GRADE	COMPRESSIVE STRENGTH* (10% DEFORMATION)	DISTRIBUTED LOAD	RATED FOR
12 kg/m ³	Type XI	5 psi (35 kPa)	720 psf ~3,500 kg/m ²	Non-load-bearing: cavity fill and packaging only
16 kg/m ³	Type I	10 psi (69 kPa)	1,440 psf ~7,000 kg/m ²	Standard flooring loads, no foot traffic
20 kg/m ³	Type VIII	13 psi (90 kPa)	1,872 psf ~9,100 kg/m ²	Standard flooring loads plus light foot traffic
24 kg/m ³	Type II	15 psi (104 kPa)	2,160 psf ~10,500 kg/m ²	Standard flooring loads plus heavy foot traffic
32 kg/m ³	Type IX	25 psi (173 kPa)	3,600 psf ~17,600 kg/m ²	Standard flooring loads plus heavy foot traffic

*ASTM D1621 compressive resistance at 10% deformation: the ASTM C578 minimum for the grade matching each density (ASTM D6817 equivalents EPS12, EPS15, EPS19, EPS22, EPS29). Distributed load is this lab index converted to psf and kg/m². It applies only when the sheet is fully and evenly supported underneath, as in standard installation, not to a concentrated point load or an unsupported span. For long-term sustained loads, design working loads well below the 10% value. Actual installed performance depends on screed thickness, span and finish: confirm against structural drawings.

05 · APPLICATION REFERENCE

Common uses by density

12 kg/m³ · Economy

Non-structural cavity fill · interior void fill · protective packaging for fragile goods.

16–20 kg/m³ · Standard / Value Plus

Residential wall cavities · roof slabs · false ceiling systems · over-roof retrofits · cavity walls, especially west and south-facing · poultry farm and metal shed roofs and walls.

24–32 kg/m³ · High / Superior

Commercial roofs and walls needing higher thermal resistance · cold storage walls, ceilings and floors · freezer rooms and under-floor frost heave protection · pharmaceutical and blood-bank cold rooms (2–8°C).

WHY EPS FOR THESE APPLICATIONS

Lightweight

Approximately 98% air, so the EPS layer itself adds negligible dead load. The protective screed laid over it does add load (roughly 180–240 kg/m² for 3–4"), which should be checked by the structural engineer.

Inert once cured

Non-fibrous with no ongoing off-gassing once cured. Suitable for residential interiors, food storage, pharma rooms and poultry sheds.

CFC and HCFC-free

Expanded with pentane, not ozone-depleting agents. Recyclable, or safely landfilled at end of life.

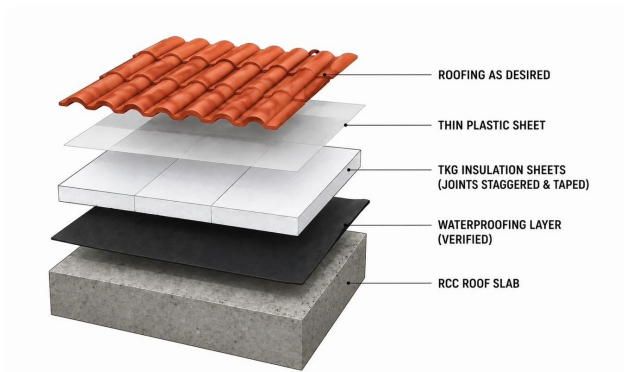


EPS sheets stacked after cutting.

06 · CONSTRUCTION METHODS

Residential

New-build or retrofit. Typical density: 16–20 kg/m³ for walls and false ceilings, 20–24 kg/m³ for roof slabs where higher thermal performance is needed.



Roof slab method (new construction)

RCC slab → waterproofing → TKG EPS sheets → protective concrete screed (3–4")

Waterproofing is verified first; the EPS layer then stops heat before it reaches the slab. The standard method when specified at design stage.



Cavity wall method (new construction)

Outer brick → cavity → TKG EPS sheets → inner brick or block wall

A continuous thermal break around the envelope; most valuable on west and south-facing walls carrying 6–8 hours of direct sun.



Over-roof retrofit (existing buildings)

- 1 Structural check of the existing roof for the added screed load.
- 2 Remove existing tiles, then verify or repair waterproofing.
- 3 Lay TKG EPS sheets, joints staggered and tight.
- 4 Pour protective screed.
- 5 New tiles or coating.

The most common retrofit method, carried out by your roofing contractor.

Internal lining

EPS fixed to the inner wall face, covered with plaster or board. For homes where external wall work isn't possible.

False ceiling method

EPS laid above an existing false ceiling, below the roof slab. No roof access needed; less effective than over-roof insulation as the slab itself still heats up.

External wall insulation

EPS bonded to the external wall face with a render finish over. No loss of interior floor area.

07 · CONSTRUCTION METHODS

Commercial & industrial

Factories, warehouses, offices and retail blocks. Large roof areas take the most heat gain, so they benefit most from insulation. Typical density: 20–24 kg/m³ for roofs and walls.

New-build roof slab

Structural slab → waterproofing → TKG EPS → protective screed → finish. A full thermal envelope from day one, which reduces the cooling load and can allow a smaller AC plant to be specified (confirm with the MEP load calculation).

Cavity wall, commercial

Outer skin → cavity → TKG EPS → inner block or concrete. Especially valuable on west-facing industrial walls exposed all afternoon.

Roof internal retrofit

EPS panels fixed to the underside of an existing roof structure where external roof work isn't feasible. Blocks heat radiating into the space below.



OVER-ROOF RETROFIT · MOST COMMON FOR EXISTING FACILITIES

Typical sequence: structural check → old tiles removed and roof cleaned → waterproofing verified or repaired → EPS sheets laid and screed poured → screed cures → new tiles or coating applied. On active facilities this is usually scheduled during low-production periods (weekends, nights, seasonal downtime) and phased area by area to minimise disruption.

EXTERNAL WALL RETROFIT · EIFS METHOD

TKG sheets applied to the external wall face → covered with fibreglass mesh and weather-protective plaster → finished with paint. The industry-standard External Insulation and Finish System, well suited to factories, warehouses and commercial buildings with harsh west or south exposure. No interior disruption.



EPS sheets being laid on a roof ahead of the protective screed.

08 · CONSTRUCTION METHODS

Poultry farms, sheds & metal structures

Poultry housing, warehouses, fulfilment centres and any tin or metal-sheet shed. Density and thickness are sized to the specific shed, typically 16–20 kg/m³ for roof and wall cladding on metal structures.



STEP	WHAT HAPPENS
01	Special adhesive applied directly to the existing metal or tin sheet surface (roof and/or walls)
02	TKG EPS sheets bonded to the surface using the adhesive
03	Mesh laid over the EPS sheets for reinforcement
04	Cement and sand render applied over the mesh as the protective outer finish

Reduces heat stress

Lower roof and wall surface temperatures reduce thermal stress on birds and livestock inside the shed.

Keeps ventilation clear

Installed only on roof and wall surfaces; ventilation openings and fans stay completely clear.

Phased installation

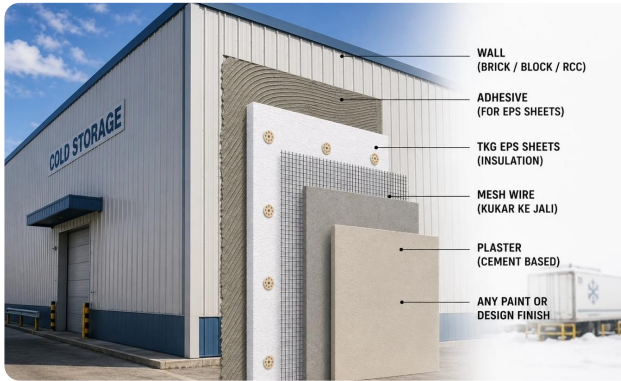
Can be done section by section on an active farm without disrupting the flock or operations.

The same adhesive, mesh and render method works on any metal or tin-sheet structure, not just poultry housing.

09 · CONSTRUCTION METHODS

Cold storage & climate-controlled facilities

Food, pharma and blood-bank cold chain. Recommended density 20–32 kg/m³ depending on the temperature range; higher densities give more thermal resistance per inch and more load capacity for freezer floors.



High-density wall & ceiling

Adhesive → TKG EPS sheets → mesh → cement-based plaster, joints vapour-sealed

Also used as the insulation core in site-built and panel systems. Vapour sealing on the warm side is critical to keep moisture out of the insulation.



Under-floor frost heave protection

Prepared base → vapour barrier → high-density EPS → concrete slab

Ground moisture beneath a freezer slab can freeze, expand and lift the structure. A continuous EPS layer under the slab keeps the ground below the frost line.

Complete insulated envelope

Walls, ceiling and floor treated as one continuous thermal boundary, minimising thermal bridges.

Retrofit wall panels

High-density EPS bonded to existing cold room walls, vapour-sealed and lined, to add thermal resistance to an under-insulated room.

Pharma & blood-bank rooms

For 2–8°C rooms. Non-toxic and non-reactive; suitable for food and pharmaceutical storage environments.

DENSITY	BEST FOR (TEMPERATURE RANGE)
20 kg/m ³	Down to 0°C
24 kg/m ³	0°C to –10°C
32 kg/m ³	–10°C to –25°C and below, sustained freeze-thaw cycling

EPS thermal resistance improves at lower temperatures. Exact density and thickness should be confirmed against the target temperature, slab load and structural drawings.

10 · GET THE RIGHT SPECIFICATION

Talk to our technical team

Every project is different: roof span, wall exposure, temperature target and structural load all affect the right density and thickness. Share your drawings or project details with our team on WhatsApp or phone and we'll recommend a specification, with a formal quotation to follow. Installation is carried out by your own contractor or installation team.

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EMAIL	info@tkginsulation.com
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KARACHI DEALERSHIP	Aun Ali Brothers, Timber Market, Karachi (opposite Miskeen Petrol Pump, Siddiq Wahab Road, Old Haji Camp)

8' x 4' STANDARD SHEET	2x2 · 4x2 · 4x4 CUSTOM SIZES (FT)	0.5"-20" THICKNESS	12-32 DENSITY, KG/M ³
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- ASTM C578
- ASTM D6817
- ASTM D1621
- CFC / HCFC-free
- Cut to drawing

Specification partner program

TKG works with architects, engineers and consultants who bring TKG into their projects, with partner benefits on referred projects and priority service for regular partners. Ask our team for details.



TKG manufacturing facility, North Karachi.