CE

Spray Foam Insulation

From Canada

ICYNENE®

THE EVOLUTION OF INSULATION™

This brochure describes Icynene water-blown, spray foam insulation and its use in new build, refurbishment and renovation projects. Icynene is suitable for domestic, commercial and public buildings, including schools and hospitals. It can also be used to insulate vehicles, including camper vans and buses.

Icynene was developed in Canada over 30 years ago as a safe alternative to urea formaldehyde insulation, and remains the only 100% water-blown insulation in the world. Icynene is distributed in over 38 countries and is the world's best-selling open cell insulation. Icynene is only installed by Icynene trained and accredited installers.

ICYNENE®
HEALTHIER. QUIETER. MORE ENERGY EFFICIENT™

Key benefits of Icynene

- Low thermal conductivity: provides good thermal performance in new and existing structures.
- Non-irritant and hygienic: unlike many other spray foam insulations Icynene is totally inert, odorless and produces no harmful emissions after installation.
- Air-tight: it expands in volume by up to 100 times after spraying, pushing its way into cracks and voids to form a complete seal to surfaces and cavities.
- Vapour open: the open cell structure allows water vapour to diffuse through the foam, preventing harmful build up of moisture within a structure.
- A good acoustic insulant: ideal for reducing sound transmission into and around buildings.
- Does not sag: unlike other flexible insulants – such as mineral fibre and cellulose – which slump and sag over time, Icynene retains its shape, giving long term thermal performance.

Certification

- Agrément certificate 08/4598. Icynene LD-C-50
- Agrément certificate *Pending*. Icynene LD-C-70
- Irish Agrément Board 09/0333 Icynene LD-C-50
- European Technical Approval ETA-08/0018 (VTT)
- AMICA (European Association for Chronic Toxic Injury).
- Component chemicals manufactured to ISO 9001.

Technical description

Icynene open cell foam is a water-blown, two-part foam, consisting of a polyol resin and MDI catalyst. It is available in three types, each suited to a different range of applications.

- Icynene LD-C-50 (H_2 foam lite): rapidly expanding foam intended for spraying onto surfaces and used for insulating walls, roofs and floors.
- Icynene LD-C-70 (H_2 foam lite plus): rapidly expanding foam intended for spraying onto surfaces and used where higher foam density is required.
- Icynene LD-P-50: contains less catalyst than LD-C-50, producing a slow rise foam which is ideal for filling cavities, particularly in sensitive structures.

Composition

Properties	LD-C-50	LD-C-70
Density kg/m³	7.5 – 8.3	11±1
Dimensional stability:		
length:	+0.03*	-0.5**
width:	+0.02	-0.2
thickness:	-0.1	+0.2
Maximum thickness in one pass	300mm	300mm
Colour	Yellow	Cream

* (% at 23°C and 75%RH)

** (% at 70°C and 90%RH)

Performance

Structural: Icynene foam is self supporting and does not slump or sag. It is sufficiently flexible to allow differential movement of the materials to which it is bonded without delaminating from the surface.

Chemical: Icynene foam can be sprayed directly onto zinc without causing corrosion. It is compatible with most common chemicals occurring in construction.

Fire: Like most other foams Icynene foam is combustible and must be protected from naked flames and ignition sources.
When Icynene foam is installed in a timber structure behind 12mm plasterboard the structure achieves a fire rating of B-s1, d0.

Icynene does not propagate flame and does not drip. It is self-extinguishing.

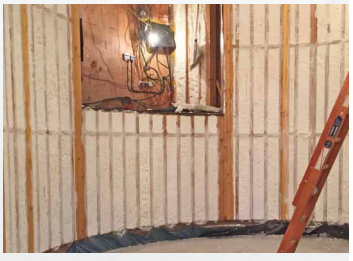
Air: Icynene spray foam is airtight and forms an effective air barrier.

Biological: Icynene does not support the growth of mould or fungus and is not a food source for rodents or insects.

Durability: Icynene spray foam can be expected to last for the life time of the building.

Environmental: Icynene spray foam does not contain any chemical blowing agents, HFCs or PBDEs. It has a Global Warming Potential (GWP) of 1 and an Ozone Depletion Potential (ODP) of 0.

Water: Icynene spray foam will not 'wick' water, but it is not a waterproofing measure and will not prevent the passage of liquid water. If wetted, Icynene foam retains it shape, without shrinking or distorting, and regains its performance when dry. Icynene foam is vapour open and does not prevent the passage of water vapour.



Performance data

Properties	LD-C-50	LD-C-70	LD-P-50
Compressive strength (>10% deformation) (kPa)	≥6.7	*Pending*	≥6.7
Dynamic stiffness (MN/m³)	4.3 – 8.4	*Pending*	4.3 - 8.4
Reaction to fire	Class F	Class E	Class F
Thermal conductivity (W/mK)	0.039	0.036	0.039
Water absorption (kg/m²)	0.3	>5% by volume	0.3
Water vapour permeability, μ	3.3	4.3	3.3
Air permeability (m³/(m s Pa)	7.6×10^{-9}	4.2×10^{-8}	7.6×10^{-9}

Design work

Fire

Icynene LD-C-50 must not form the exposed surface of an element in habitable rooms. They should be protected behind a layer of fire resistant material, such as 12.5mm plasterboard with joints supported and sealed. Where Icynene is applied within an unoccupied roof space the existing ceiling will usually provide sufficient protection.

Icycnene LD-C-70 can be coated to give a Class 0 surface, making it suitable for use as exposed surface. (Note the coating will reduce the vapour permeability of the foam.)

Icynene foam must be kept away from heat producing appliances and be separated from flue pipes. The required separation distance will be determined from the flue material and the temperature of exhaust gases.

Thermal

Icynene foam is effective in reducing heat loss by conduction through the building fabric. It forms a continuous layer of insulation, without gaps or breaks: in contrast to rigid insulation boards which are difficult to fit accurately into framing.

Icynene spray foam expands around pipes, services and penetrations to provide an unbroken layer of insulation which will not slump or settle. As Icynene foam is flexible it accommodates differential movement in other building components while maintaining an airtight seal.

Airtightness

Air leakage is responsible for a significant proportion of heat loss from buildings and for the transportation of contaminants into the building. On application, Icynene foam forms an airtight barrier, reducing air movement between the building interior and the atmosphere.

U-value table LD-C-50

Element	Bridging timbers	LD-C-50 thickness (mm) between timbers	LD-C-50 thickness (mm) across face	U-value (W/m²K)
Existing sloping roof	50 x 150mm rafters: 400mm centres	150	70	0.20
		150	90	0.18
New sloping roof	47 x 200mm rafters: 600mm centres [1]	200	20	0.20
		200	40	0.18
		200	60	0.16
		200	120	0.13
Loft [2]	50 x 100mm joists: 400mm centres	100	100	0.20
		100	120	0.18
		100	150	0.16
		100	200	0.13
Timber frame wall [3]	38 x 140mm studs: 600mm centres	140	–	0.30
		140	10	0.28
		140	45	0.21
	38 x 200mm studs: 600mm centres	200	45	0.17

Plasterboard taken as 12.5 mm at 0.25 W/mK and all timber percentages taken from BRE Report BR 443.

U-value table LD-C-70

Element	Bridging timbers	LD-C-70 thickness (mm) between timbers	LD-C-70 thickness (mm) across face	U-value (W/m²K)
Existing sloping roof	50 x 150mm rafters: 400mm centres	150	70	0.18
		150	90	0.16
New sloping roof	47 x 200mm rafters: 600mm centres [1]	200	20	0.18
		200	40	0.16
		200	60	0.15
		200	120	0.12
Loft [2]	50 x 100mm joists: 400mm centres	100	100	0.18
		100	120	0.17
		100	150	0.15
		100	200	0.12
Timber frame wall [3]	38 x 140mm studs: 600mm centres	140	–	0.28
		140	10	0.25
		140	45	0.20
	38 x 200mm studs: 600mm centres	200	45	0.16

[1] 47 mm cross battens at 600 mm centres.

[2] LD-C-50 above ceiling joists.

[3] 47 mm counter battens at 600 mm centres.

As Icynene foam is flexible, it accommodates differential movement produced by drying out and temperature fluctuations, ensuring long-term protection against air leakage.

Applying Icynene foam to an existing structure will reduce air movement: it is vital to ensure that, after application, there will be sufficient ventilation for the health and well-being of building occupants, and for the safe operation of any combustion appliances. It may be necessary to install additional vents to maintain ventilation rates.

Condensation

Interstitial condensation forms when high concentrations of water vapour form behind impermeable layers on the cold side of thermal insulation. It can cause decay and rust of building materials leading to structural damage and a reduction in the thermal performance of building materials.

In order to prevent interstitial condensation designers should first ensure water vapour is extracted from the occupied space as close to the point of generation as possible, and then specify constructions which will not lead to high concentrations of water vapour.

Open cell Icynene foam is vapour permeable, allowing the passage of water vapour. It is suitable for 'breathing wall' constructions, which rely on using materials of low vapour resistance.

Where it is proposed to insulate existing structures the effect of upgrading the thermal performance on the temperature and vapour conditions within the structure must be assessed by condensation risk analysis. This is particularly important in pitched roofs with roofing underlays which have high vapour resistance. Remedial measures, such as the installation of a vapour control layer, may be required to reduce a condensation risk.

Acoustic

The transmission of sound between rooms in buildings, and into a building from outside, causes disturbance for occupants and should be limited. As an open cell material Icynene foam is effective in reducing airborne sound through separating walls and floors when applied between timber or metal studs and joists.

Airborne sound insulation and impact sound transmission results exceed the standards required in Building Regulations and Building Standards for new dwellings and those formed by material change of use (see acoustic performance table).

Icynene foam can also be applied to the underside of roofs to reduce the transmission of external noise into a building. It can also be sprayed on the underside of sheet metal roofs to reduce intrusive rain noise.

Acoustic performance

Construction	Test criteria	Results
Timber framed separating wall[1]	Airborne sound insulation (D_{nTw} (+C_{tr}))	59dB
Twin frame timber wall, Icynene applied to each frame[2]	Airborne sound insulation (D_{nTw} (+C_{tr}))	50dB
Steel stud wall[3]	Sound transmission class	48dB
Floor: robust details E-FT-1[4]	Airborne sound insulation (D_{nTw} + (C_{tr}) Impact sound transmission (L'_{nTw})	59(-10)dB 47dB

Test references:

[1] BPC. Report P/4950I/09 [2] ADC. 143 22009 [3] ATL. NGC 2004012

[4] BPC. Report P/4950H/09

New build

Icynene foam is well-suited for insulating walls and roofs in new buildings; it provides a high standard of thermal insulation, minimises air leakage and reduces the transmission of contaminants from outside, as well as reducing nuisance noise. Icynene foam forms a permanent, seal to studs, flexing and moving with the rest of the construction, so improving the long-term airtightness of the building and reducing energy use.

Timber or steel frame walls may be insulated by spraying Icynene foam between the studs, to their full depth (figure 01), while walls of portal frame builds may be insulated by filling the cavities between the internal and external faces with Icynene foam (figure 02).

Roofs may be insulated by spraying to the underside of the deck (flat roofs), timber sarking, or to the underside of the roofing membrane (pitched roofs - figure 05). Because Icynene foam expands when sprayed it is easy to form a continuous layer of insulation even across challenging roof shapes.

Icynene may also be sprayed to the underside of metal roof decks to minimise rain noise.

Refurbishment - walls

Icynene can be used to upgrade existing masonry walls by internally insulating them. The internal face should be battened out to the required depth with battens at 600mm centres. Icynene is then sprayed to the depth of the battens and trimmed. The wall is then finished with plasterboard (figure 04).

As insulating the inner face will change the temperature profile through the wall, condensation risk analysis should be carried out to determine whether a vapour control layer (VCL) will be required.

System built walls, such as Trusteel, can be insulated with Icynene LD-P-50 in the wall cavity. Similarly, cavities behind lath and plaster on solid stone walls can also be insulated with Icynene LD-P-50.

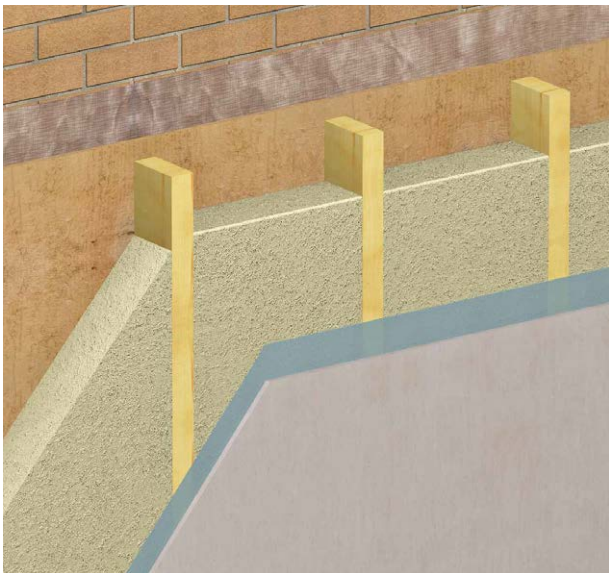


Figure 01: insulating timber frame walls

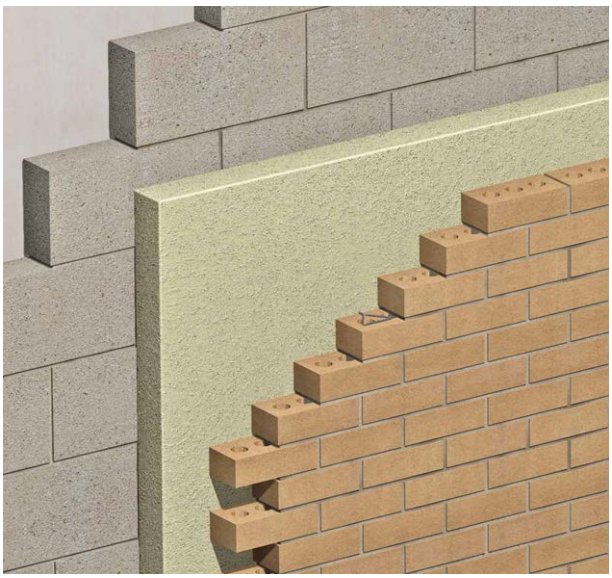


Figure 02: insulating masonry walls

Figure 03: insulating / refurbishing ground floors

Figure 04: insulating / refurbishing walls and intermediate floors

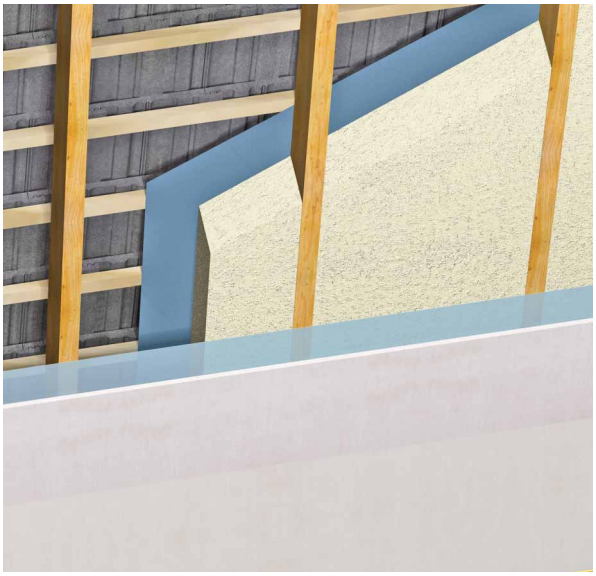


Figure 05: insulating pitched roofs

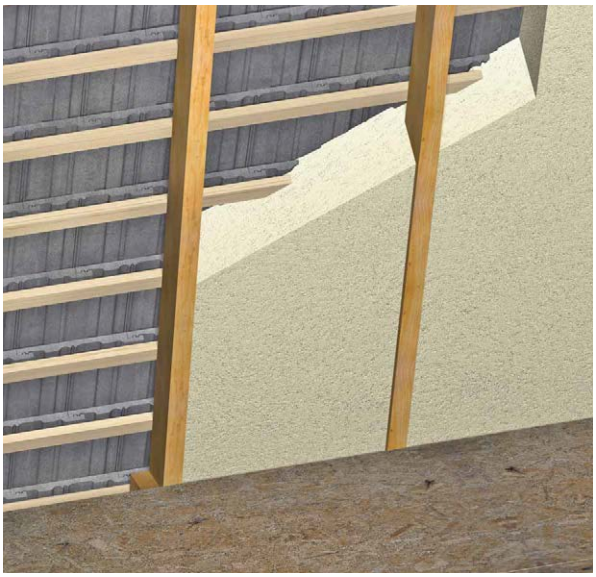


Figure 06: insulating / refurbishing pitched roofs

Refurbishment - floors

Suspended timber floors suffer from heat loss by conduction to the underfloor void, while sub-floor ventilation to prevent damp results in draughts between the boards and at the floor perimeter.

Icynene foam can be sprayed to the underside of the boards, filling the space between the joists (figure 03). The insulation will reduce conduction heat loss through the floor – making it warmer underfoot – and also eliminate air infiltration through the deck and the perimeter.

The installation should leave a minimum 150mm air gap between the underside of the joists and the surface of the sub-floor void. High-rated electrical cables (such as cooker or shower supplies) should be de-rated or set in trunking or conduit to avoid overheating.

Refurbishment - roofs

Icynene foam can be sprayed on the underside of tiles and slates and timber sarking to upgrade the thermal performance of existing pitched roofs (figure 06). The loft may be insulated in order to improve the overall thermal performance of the dwelling, or to provide additional living space. Where a low U-value is required it may be necessary to fix cross battens to the underside of the rafters to increase the depth of Icynene foam.

The gable walls should also be insulated with Icynene spray foam to form a well conditioned space. If the loft is going to be used as an occupied space the Icynene foam must be protected with a fire-resistant covering such as 12.5mm plasterboard.

Icynene foam may be sprayed onto the underside of a vapour open roofing underlay. The foam maintains the drape of the underlay, allowing wind-driven rain to drain from the batten space without the need for counter battens.

Where the roofing underlay has a high vapour resistance (being either bituminous felt or polyethylene) condensation risk analysis must be carried out to test for a risk of interstitial condensation. Where there is a risk of condensation a vapour control layer should be installed to the underside of the roof, immediately above.

Single or twin-skin metal sheet roofs may also be upgraded with Icynene foam to reduce air leakage, minimise sound transmission and avoid condensation forming on the underside of the roof.

Manufacturer/Supplier

Icynene foam insulation is only applied only approved contractors who have undergone Icynene's rigorous training procedures and is guaranteed for 25 years after installation.

Technical Support

Icynene offers a comprehensive technical support service for designers and building owners:

- Site inspections
- U-value calculations
- Condensation risk analysis
- Design advice

Contractors

Other products

Icynene also produce a 100% water blown closed cell foam (MDR 210) which offers all the benefits of a closed cell product but without the chemical blowing agents. MDR 210 is a rigid foam and is not vapour open, it is particularly suited to commercial applications and has been used more recently in the insulation of storage containers, and for their conversion into residential units.

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