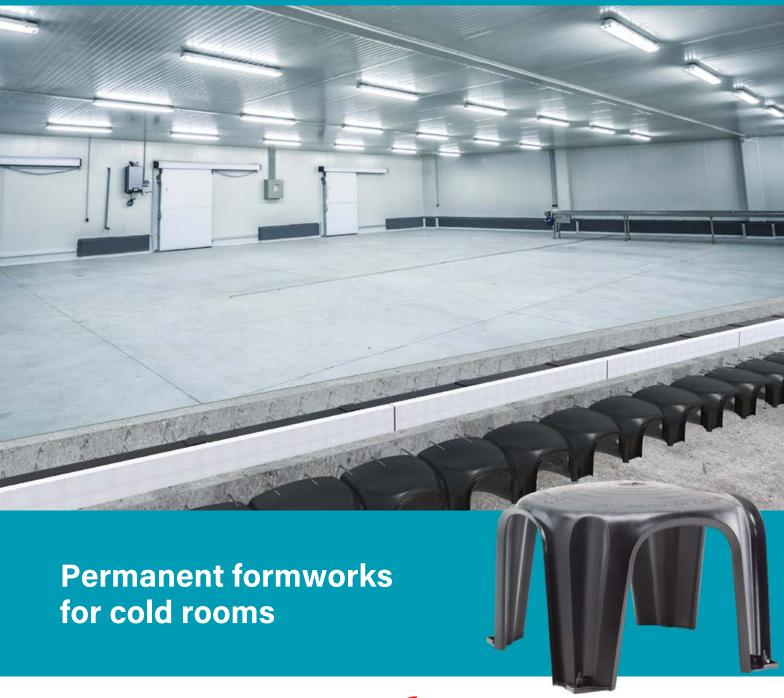


www.daliform.com





KEY:



Ventilation



Air, Humidity



Stable Temperature



Ecological, Environmentally Friendly



Certifications



SWITCHBOARD Telephone +39 0422 2083



FOREIGN COMMERCIAL SECRETARY OFFICE export@daliform.com



TECHNICAL SECRETARY OFFICE tecnico@daliform.com









Cold rooms are facilities in which a constant temperature is maintained in order to conserve foods. They are now used everywhere in the food industry and are divided principally into low-temperature cold rooms, called negative cold rooms (in which the temperature can vary from -4° C to -30° C), and medium-temperature, or positive cold rooms (in which the temperature can vary from 0° C to + 4° C).

A problem that has always been associated with the construction of negative cold rooms negative is the likelihood that the cold will eventually propagate through the structures and reach the ground. This causes the ground temperature to fall below zero, which results in the floor rising and fracturing, a phenomenon known as frost heave.

To avoid this phenomenon, in addition to applying an insulating layer, it is common practise to lift the floor off the ground, placing it at a slightly higher elevation, so that it is possible to ventilate the underlying cavity and consequently maintain the air temperature above zero and eliminate the moisture which is present in the substrate.

An under-floor cavity constructed with Iglu'® is the ideal system for achieving more effective ventilation below the floor, because Iglu'® makes it possible to create a single open space and ensure that air can circulate in all directions. This prevents the onset of frost heave.













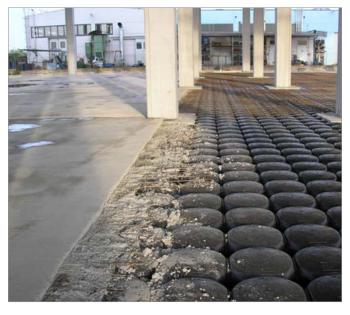
Advantages

- Prevents deformation and lifting of floor (frost heave).
- High resistance to distributed and concentrated loads.
- Effective ventilation in all directions.
- Elimination of freezing air.
- Up to 80% reduction in man hours needed to install the ventilated cavity compared to conventional systems.
- Drastic reduction in the consumption of reinforced concrete due to the domed shape which enables maximum resistance with minimum thickness.
- Adaptability to "out of square" spaces, as the modules can be cut without underpinning.
- Ease of positioning due to lightness and simple linking of the modules.
- Maximum adaptability to diverse perimeters and floor plans.
- Quick and immediate cutting and shaping of the modules.
- Maximum free transit for the underground system in all directions.
- No point of contact between the concrete and the ground.













Applications

Iglu'® is the most secure and economical constructive solution for installing ventilated cavities under both positive and negative cold rooms. It guarantees that the temperature of the cavity remains above zero by removing the moisture present in the substrate. This prevents the freezing and deformation of the foundation sediments (the lean concrete/soil assembly) which pushes the laying surface upwards and causes the floor to crack (a process known as frost heave).

The use of Iglu'® for the construction of industrial flooring for cold rooms was established in the 2014 LGPCF (Guidelines for Industrial Flooring in Cold Rooms) by ENCOPER (National Association of Flooring and Cladding Manufacturers).

The text specifies the essential requirements necessary for the durability of all reinforced concrete slabs intended for industrial use in cold rooms. In particular, it addresses the essential requirements of mechanical resistance and stability for which there are no provisions in the more generic standard, UNI 11146.



Mechanical ventilation at a controlled temperature

A temperature-controlled mechanical ventilation system can be installed inside the cavity constructed with Iglu'® formworks in order to provide more efficient and effective insulation between the cold room floors and the ground.

For this purpose, electrical temperature sensors must be placed on the upper surface of the formworks and then embedded in the casting in order to be able to measure the temperature inside the cavity.

As soon as the temperature drops below the critical threshold, mechanical ventilation is activated, and this conveys the hot air produced by the refrigeration motors into the cavity to prevent the freezing of the underlying soil.

To ensure optimal ventilation in all directions, it is necessary to create a direct connection between the external environment and the ventilated under-floor cavity through the openings previously created in the peripheral retaining walls, taking care to connect the various spaces of the foundation grid between them so that the entire under-floor cavity is interconnected.

The calculation and dimensioning of the system must be performed by a qualified technician.

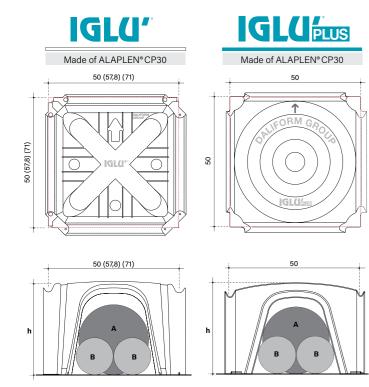








Range



Depending on the different heights, the shape of the shuttering will differ from what is shown in the drawing.

	H in cm	20
Working dimensions*	cm	50x50
Height h tunnel clearance	h cm	13
Max pipe diameter A	1 x Ø cm	13
Max pipe diameter B	2 x Ø cm	10
Quantity of concrete to the crown**	m^3/m^2	0,035
Weight of each unit	kg.	1,482
Pallet	a x b x h	110x110x234
dimensions	kg.	457
b	Units	300
a	m²	75
L-Plast panels	H cm	18
	Lcm	205
	D cm	7

The material is waterproof and can therefore be stored outside. * Recyclable material is allowed a size tolerance of \pm 1,5%. ** The volume may vary depending on the pouring condition and the tolerance of

Pressures at the bottom of the structure

50x50

50x50

50x50

The table expresses, starting from the various examples of overload and of thickness (to be given to the slab), the pressures that would be applied to the feet of the structure, in relation to the (eventual) thicknesses of the lean concrete.

nnnnnmm

57,8x57,8

50x50

50x50

50x50

50x50

50x50

1,557

50x50

50x50

50x50

57,8x57,8

			Pressure at pillar base kg/cm²							
Use	Loads kg/m²	Slab cm	Mesh Ø mm cmxcm	Thickness of the lean concrete cm	lglu′° H 20	Iglu'®+ H 20	Iglu'®+ H 22	lglu′°+ H 25	lglu′° H 27	Iglu'®+ H 27
				0	1,11	1,14	1,23	1,23	1,50	1,7
Residences	400	4	Ø 5/25x25	5	0,39	0,39	0,41	0,42	0,45	0,56
				10	0,21	0,21	0,22	0,22	0,24	0,3
				0	1,49	1,53	1,64	1,73	2,00	2,25
Offices	600	4	Ø 5/25x25	5	0,49	0,5	0,52	0,54	0,58	0,71
				10	0,26	0,26	0,27	0,28	0,29	0,37
				0	2,49	2,56	2,74	2,87	3,31	3,71
Garages	1100	5	Ø 6/20x20	5	0,78	0,79	0,82	0,84	0,91	1,11
				10	0,39	0,4	0,41	0,42	0,44	0,55
				0	4,43	4,56	4,87	5,1	5,88	6,56
Workshops	2100	6	Ø 6/20x20	5	1,33	1,35	1,4	1,43	1,55	1,89
				10	0,65	0,66	0,67	0,69	0,72	0,91

39 41,3 43 45,5 44 55,4 60,7 65,7 70,7 75,7 27 29,5 26,5 30,8 25,5 33,6 45 45 45 45 45 14,5 16 14 16,6 13,5 18,1 25 25 25 25 0,065 0,064 0,067 0,077 0,090 0,083 0,112 0,114 0,117 0,118 2,239 1,622 2,185 2,552 2,823 2,801 4,261 4,402 4,661 4,867 110x110x236 110x110x247 110x110x236 120x120x261 110x110x243 120x120x246 77x155x246 77x155x244 77x155x244 77x155x244 685 500 668 627 860 653 527 527 547 551 300 300 300 300 240 300 228 120 116 114 110

MMMMMMMMM

50x50

57,8x57,8 71x71 71x71 71x71

The overload hypotheses indicated are normally those laid down by law; the actual load capacity is far superior. To know the exact values or sizing as shown in the project, contact the technical department.

Pressure at pillar base kg/cm²														
lglu′⊕+ H 30	lglu′ [®] H 35	lglu′®+ H 35	lglu′ [®] H 40	lglu'®+ H 40	lglu′® H 45	lglu′® + H 45	lglu′® H 50	lglu′®+ H 50	lglu' [®] H 55	lglu′®+ H 60	lglu′®+ H 65	lglu′®+ H 70	lglu′®+ H 75	lglu′®+ H 80
0,96	1,11	1,11	1,23	1,32	1,51	1,59	1,52	1,65	1,81	2,19	3,3	3,3	3,3	3,3
0,36	0,40	0,39	0,42	0,43	0,47	0,48	0,47	0,57	0,53	0,67	0,99	0,99	1,00	1,00
0,2	0,22	0,22	0,23	0,23	0,25	0,25	0,25	0,31	0,27	0,34	0,48	0,49	0,49	0,49
1,27	1,46	1,46	1,61	1,73	1,96	2,07	1,97	2,13	2,31	2,81	4,1	4,11	4,13	4,15
0,46	0,50	0,5	0,53	0,55	0,59	0,6	0,59	0,71	0,66	0,83	1,21	1,21	1,22	1,22
0,25	0,27	0,265	0,28	0,28	0,30	0,3	0,30	0,377	0,33	0,42	0,59	0,59	0,6	0,6
2,09	2,37	2,38	2,60	2,81	3,15	3,33	3,16	3,38	3,63	4,43	6,21	6,23	6,25	6,27
0,71	0,77	0,77	0,81	0,84	0,90	0,92	0,90	1,08	0,98	1,25	1,8	1,8	1,81	1,81
0,37	0,39	0,4	0,41	0,42	0,44	0,45	0,44	0,55	0,47	0,61	0,86	0,86	0,87	0,87
3,7	4,15	4,19	4,55	4,91	5,48	5,79	5,49	5,83	6,19	7,6	10,3	10,3	10,4	10,4
1,21	1,30	1,3	1,37	1,42	1,51	1,55	1,51	1,8	1,63	2,07	2,95	2,96	2,96	2,97
0,61	0,64	0,64	0,67	0,68	0,72	0,73	0,72	0,89	0,76	098	1,39	1,40	1,40	1,40

Hypothesis of ULS calculation based on Iglu'® system h27 cm

Supposing a distributed load, the table shows minimum slab thickness, reinforcement and pressure on soil depending on lean concrete thickness.

Hypothesis of load kg/ m²	Thickness o the lean concrete cm	Pressure at pillar base Kg/cm²	Slab cm	Mesh Ø mm cmxcm	
	0	5,40			
2.000	5	0,67	3	Ø5 25 x 25	
	10	0,25			
	0	10,00			
4.000	5	1,20	4	Ø5 20 x 20	
	10	0,46			
	5	1,90			
6.000	10	0,67	5	Ø6 20 x 20	
	15	0,35			
	5	4,00		Ø8 20 x 20	
13.000	10	1,40	6		
	15	0,72			
25.000	10	2,60			
	15	1,30	10	Ø8 15 x 15	
	20	0,81			

6



Method for creating under-floor cavities



Construct the lateral foundation beams, leaving openings for the ventilation of the under-floor cavity according to the design.



2 Lay the interlocking male/female formworks from left to right and top to bottom, making sure that the arrow marked on the formwork itself is facing upward.

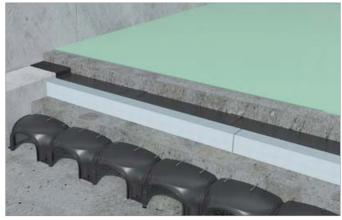


Lay the electro-welded mesh on top of the formwork.

Cast the concrete from the centre of the arch, allowing it to flow inside the Iglu'e legs to provide a carrier substrate for the subsequent layers and for the floor which will bear the design loads.

It is imperative that this carrier substrate be rigid and planar.

Contraction joints must be provided according to the design.

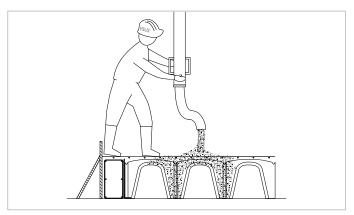


6 After the required time, proceed with the laying of the insulating material, the polyethylene separator sheet and the reinforced concrete support, all in accordance with the design.

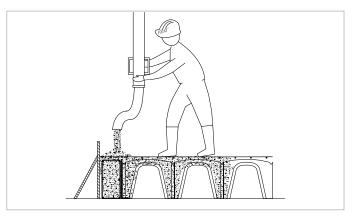


To ensure a correct installation and perfectly created under-floor cavity please refer to the product's usage requirements.

Casting method



Casting the concrete starting from the centre of the arc, letting it go inside the legs of the Iglu'®.



2 Continue the casting filling all curbs and foundation beams.



Dry assembly method



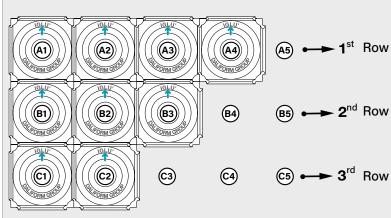
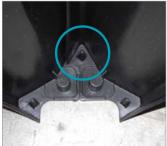


Fig. 1 - Dry positioning of the first formwork, the arrow is facing the foundation curb.

Fig. 2 - Dry positioning sequence of the modules by row.

- 1 Position the first element to the upper left with respect to the work surface, making sure that the arrow is pointing up (Fig. 1).
- Unite the elements in sequence, by horizontal row, proceeding from the left towards the right and from the top downwards (following the direction normally used for writing), as shown graphically on the crown of each unit (Fig. 2).
- To unite the units in sequence, be careful to perfectly link the "male-female" hooking elements at the base of the support feet (see photo sequence Fig. 3).





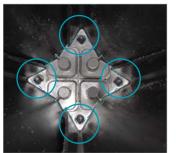




Fig. 3 - Detailed view of the male-female system linking phase - note the perfect seal of the feet.







Case Study: Negative Cold Room with Iglu'®



In the case study presented here, it was necessary to create a negative cold room with an under-floor cavity that would allow good air circulation so as to prevent the moisture from forming condensation that would then turn into ice.

The design that was developed for achieving this objective involved the use of Iglu'® h 27 cm modules.

Due to the domed shape and supporting feet of the modules, Iglu'® guaranteed a higher capacity with respect to the design load, whether distributed or concentrated, and assured that the performance required of the industrial floor was achieved.

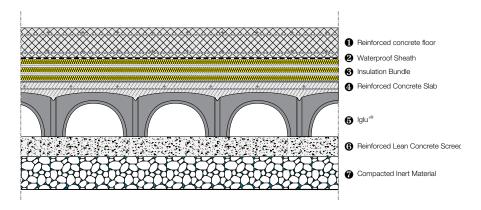
Laid side by side, the Iglu'® modules facilitated the formation of a cavity which enabled the efficient circulation of air. This circulation was augmented by the peripheral retaining wall in which openings to the exterior had been created.

Once the Iglu'® modules were positioned, the next steps were the installation of an electro-welded 200 x 200 mm mesh with a diameter of 6 and filling with concrete in order to construct the carrier substrate for the overlying layers and for the floor which would bear the design load.

This project confirms Iglu*"s great flexibility and variety of potential applications. The client for this project, after considering various alternatives, recognised Iglu* as the most viable, economic, fast and secure way to provide support for a cold room, and this was confirmed by the final, state-of-the-art implementation.

Client: Private

Surface Area: 3.600 m² Capacity: 4.000 kg/m² Thickness: 25 cm (10") Materials: Iglu'®







Accessories

L-Plast accessory

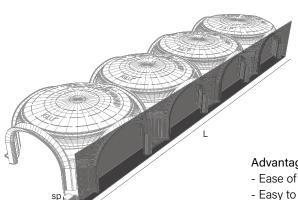


L-Plast is used for new constructions to create the slab and foundation beams with a single concrete casting; when restructuring is used to easily create reinforcement curbs for existing foundations.

Furthermore, L-Plast is ideal for creating air ducts in general, such as for cold rooms, for example (if forced ventilation is necessary) or in geothermal applications where air must be blown into the under-floor cavity.

When restructuring, when the existing walls must be reinforced or when an underpinning must be created, L-Plast is a useful work tool that helps creating a new slab or reinforcement base with a single casting.

L-Plast is delivered in 2 m panels with a pre-folded line (die cutting). Simply fold it along the line and position on the ground the short part of the L, keeping the long part vertical, sustained by a part of Iglù° or another foundation cage.



H (cm)	D (cm)	L (cm)	th (cm)	Reference Iglu'®
18	7	205	0,25	h 20
25	7	205	0,40	h 27
33,5	16,5	205	0,40	h 35
33,5	16,5	205	0,40	h 40
33,5	16,5	205	0,40	h 45
49	7	205	0,50	h 50
54	12	205	0,50	h 55

Advantages:

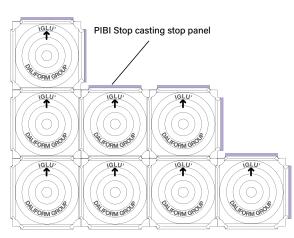
- Ease of positioning due to die cutting.
- Easy to cut to permit the passage of ventilation pipes, sewer and system piping.
- Quick to install, saving up to 80% of the time required for traditional procedures.

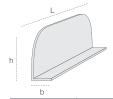
PIBI Stop - for diagonal beams



It is a casting stop panel for obstructing, as needed, the "side tunnels" of the individual Iglu'® and is available for all heights. Given its ease of positioning, PIBIstop is optimal for creating foundation beams without the need to use classical wood shuttering. In combination with Iglu'®, it is ideal for creating diagonal beams.

Finally, based on its characteristic of being connected to the individual unit, it is particularly suited for reconstruction where an underpinning must be created where the existing structures are often not squared.





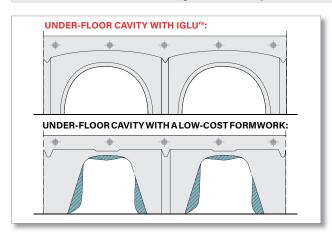
H (cm)	D (cm)	L (cm)	th (cm)	Reference Iglu'®
14	2+2+2+5	40	0,40	h 20
27	5	45	0,40	h 27
30	5+5+5+5	45	0,40	h 35
30	5+5+5+5	45	0,40	h 40
30	5+5+5+5	45	0,40	h 45
50	5+5+7	49	0,40	h 50
50	5+5+7	49	0,40	h 55



Iglu'®: excellence

The quality of the "compound", the particular shape, the thicknesses, the dimension of the product and the work techniques make Iglu'® a product of excellence. Designed for solving problems with Radon and humidity in modern, economic terms, also respecting the environment, Iglu'® will not undergo, either during and after the casting, dangerous deformations due not only to the weight of the concrete but also to the dynamic effect of the work operations, such as: the load of the fresh concrete, pressure from casting compression and vibration, the weight of people and equipment, guaranteeing safety, the lack of deformations and a water-proof seal. Numerous national and international recognitions have been obtained over the years that attest to the vast and well-appreciated contribution that Iglu'® has provided to the construction industry: Award for Technological Building Innovation "Construmat 95" Barcelona, Carnia Alpe Adria Award "100 greenest projects in Italy, Environment Business Award 2006. Numerous Product and System Certifications have been received that prove not only product quality, but also the validity of the constructive solutions and the applications in the building industry. All of this, together with the advantages mentioned below, confirm that Iglu'® is the product of reference for operators and professionals.

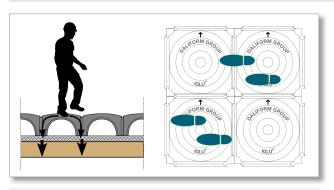
Non-deformability of the preforms and real concrete consumption



<u>Under-floor cavity with Iglu'</u>[®]: Iglu'[®] is produced according to high quality standards. The thickness and quality of the raw material (even if recycled) make it absolutely rigid and non-deformable under the weight of the operators and the concrete in its "fluid" phase, which guarantees: compliance with under-floor cavity geometry and the real consumption of concrete.

<u>Under-floor cavity with a low-cost formwork:</u> Low-cost formworks, to be such, are produced using less material, resulting in a reduction in the thicknesses and the structure, due to which the product can be significantly deformed under the pressure of the casting, resulting in an increased use of concrete, thereby increasing costs. This creates a FALSE savings in an underhand manner as the person using it is convinced of the savings, but ends up spending more.

Guaranteed results and operator safety



After a few Iglu'® modules have been positioned, they can be walked on. Thanks to its arch form, Iglu'® provides greater resistance guaranteeing pedestrian accessibility before concrete casting, also when walking directly on the centre of the arch.

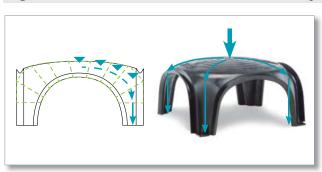
SAFETY (Leg. decree 81/08)

Most work accidents, whose scope is becoming increasingly alarming, occur on building sites.

With Iglu'® operators work safely with full compliance of Leg. Decree 81/08. In fact, to guarantee pedestrian access during positioning and casting, which is a necessary condition to guarantee operator safety, the Iglu'® frameworks guarantee a minimum breaking resistance of 150 Kg concentrated on a surface of 8 x 8 cm; they are constantly subjected to a rigorous quality control system.

Iglu'® has numerous studies and tests that measured the circulation of air in the cavity; calculation tables approved by engineers from certifying bodies; calculation procedures for the interaction with the ground to be applied in the case of heavy loads.

Iglu'®: arch effect and modularity

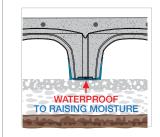


The arch is the most classic "pressing structure". Early Romans adopted this static solution to create large openings without compromising structure resistance. Iglu'®, due to its exclusive shape, provides the concrete casting with maximum structural performance, thanks to the arch effect; therefore with an equal slab thickness or, if we want, with an equal static performance a thinner slab and therefore reduced use of concrete.

The 50x50 cm modularity of Iglu'® makes it possible to immediately simulate the calculation thanks to its perfect geometries and exactly identify the minimum points of thickness.



Complete seal at the pillar base





Attention to quality and individual aspects provides Iglu'® with important constructive details, such as the perfect seal at the base of the pillar that prevents humidity from rising due to capillarity. It is fundamental to prevent numerous points of contact (equal to the number of pillars on which the slab rests) between the structure and the underlying ground to obtain an optimal result to find a definitive solution against rising humidity. Sometimes attention is not paid to certain details, believing incorrectly that all products are the same as Iglu'®, which makes the result worthless.

Environmental compatibility



Daliform Group has again demonstrated to be extremely precise with regard to respecting health and the environment having been the first to obtain Environmental Compatibility Certification (CCA) for its products.

This certificate is very important for Iglu'® because it demonstrates: the lack of dangerous substances in its composition (even if recycled materials are used); the lack of emissivity of toxic substances during the various phases of the product's life and operating cycle, which benefits the health of the intermediate users (production and installation personnel) as well as final users (people living in the building) as well as the environment in general.

Certifications



Daliform Group products comply with the strictest international standards and have received product certifications such as :

BBA (UK), Technical Construction Certificate issued by the Technical and Test Institute for Constructions Prague (Czech Republic), Technical Construction Certificate issued by the Agency for Quality Control and Innovation in Building (Hungary), Hygienic Certificate issued by the National Institute of Hygiene (Poland), Acoustic check for the verification of DIN standards, Avis Technique issued by the French institute CSTB. A series of rupture load tests have been carried out and certified by the University of Padua as well as "Productive process monitoring tests".

Daliform Group technical office



FEASIBILITY STUDY

Predimensioning and optimisation of the structures, comparative and/or revised proposals, material and manpower estimates, cost analysis. Evaluation of forced ventilation in the case of cold rooms.

CALCULATION REPORT

Reports certifying the execution of Daliform Group constructive systems.

SUPPORT FOR THE EXECUTIVE DESIGN

Support by design professionals. Upon request, the formwork positioning plan can be supplied with a list of the products required to carry out the work and the relative accessories.

ON-SITE SUPPORT

If necessary, our technical staff can be present on-site to help the construction company during the operational phase.

The technical consultancy is only valid for the Daliform Group construction systems. To contact the technical office: Tel. +39 0422 2083 tecnico@daliform.com To obtain updated technical cards, support material, new photos and case studies, go to www.daliform.com



Specifications

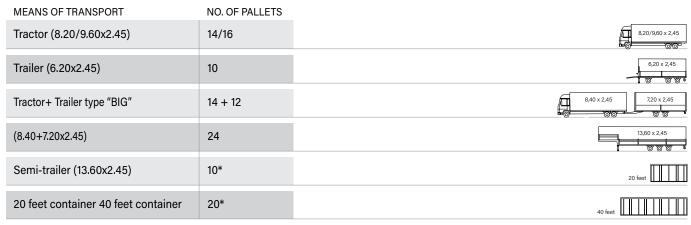
Construction of the carrier for a cold room consisting of a cm high cavity, achieved through the supply and installation of Daliform Group's Iglu'® recycled plastic formworks for the rapid, dry formation of a self-supporting pedestrian platform above which to produce a class C25/30 reinforced concrete casting to fill the formwork up to the top (flush) and of a cm upper slab, reinforced with a Ø cm, 20 x 20 cm electro-welded mesh, levelled and smoothed with a trowel. There are plans to install a cm thick insulating layer, a polyethylene separator sheet, and thecm thick concrete flooring reinforced with Ø cm, _x _ cm electro-welded twin mesh above the reinforced concrete cap.
Iglu' [®] formworks must have dimensions of 50 x 50 cm (centre distance) and cm in height, with a convex shape to be placed only on the four lateral feet to guarantee maximum ventilation and facilitate the passage of utilities. When dry, they provide breaking resistance of 150 kg in correspondence of the centre of the arch with an 8 x 8 cm clamp.
Formworks in recycled plastic, such as Iglu' [®] , must not release polluting substances, have an Environmental Compatibility Certification and be produced by a Certified Company according to International Standards UNI EN ISO 9001 (Quality), UNI EN ISO 14001 (Environment); UNI EN ISO 45001 (Safety) and SA 8000 (Social responsibility). The company that supplies the Iglu' [®] formworks must also exhibit the product certificate approved by an EOTA member agency (European Organisation for Technical Approvals).
Including accessories, waste, cutting and all other expenses: /m²

Supply and installation cost grid

No.	Item	U.M.	Quantity	Unit price	Total
1	Supply and casting of lean concrete with a thickness of	m³/m²			
2	Supply of the IGLU" formwork, h	m²/m²	1		
3	Dry installation of the IGLU" formwork on the prepared surface	H/m²	0.0125		
4	Supply and positioning of the welded mesh Ø mm - 20x20 cm	Kg/m²			
5	Supply and casting of concrete C25/30 - for filling up to the crown	m³/m²			
6	Supply and concrete casting CLS C25/30 - for a slab of cm	m³/m²			

Total cost €/m²

Logistics - pallet capacity



^{*} the m² per pallet can vary based on the type of container.

The information contained in this catalogue could be changed. Please request updated informations from DALIFORM GROUP, which reserves the right to make changes at any moment without notice. In consideration of recycled material, it is specified that there are tolerance margins caused by environmental factors.



Photo gallery



Negative cold room - Chatillon En Vandellais (France)



Negative cold room - France



Negative cold room - Italy



Negative cold room - Italy



Negative cold room - Boisseron (France)



Negative cold room - Ed Lens (France)





www.daliform.com









Tel. +39 0422 2083 - Fax +39 0422 800234 export@daliform.com - www.daliform.com Via Serenissima, 30 - 31040 Gorgo al Monticano (TV) - Italy









Certified Management System UNI EN ISO 9001, UNI EN ISO 14001, UNI EN ISO 45001, SA 8000

Rating di legalità: ***

