

U-bahn[®] beton

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Disposable formwork for
lightened single direction
structures in reinforced
concrete cast on site



KEY:

-  Formwork
-  Utility passage
-  Foundations
-  Certifications

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U-bahn[®] beton

U-Bahn Beton[®] is a modular framework in recycled polypropylene that was specifically designed to create **one way slabs that are cast on site** or semi-prefabricated. The various modules, which overlap on the edges, make it possible to create beams of any length.

Thanks to its conic elevator feet, immersing the **U-Bahn Beton[®]** formworks in the concrete casting will obtain thick, parallel beams that are closed from the bottom and top by a flat plate made in sequence with a single casting; this results in reduced use of concrete and steel as well as considerable advantages in terms of fire risk in comparison to formworks in expanded polystyrene.

Light and stackable, it is easy to handle during positioning, functional in its use, can be exposed to bad weather and is easy to store in the yard with minimum dimensions.

Designed according to strict quality criteria, the **U-Bahn Beton[®]** framework is **guaranteed to resist without concrete 150 kg** concentrated on a load imprint of 8 x 8 cm, as foreseen by current regulations.

Unlike with the use of classical hollow brick blocks, the **empty space left by U-Bahn Beton[®]** can be used for the passage of cables and systems.

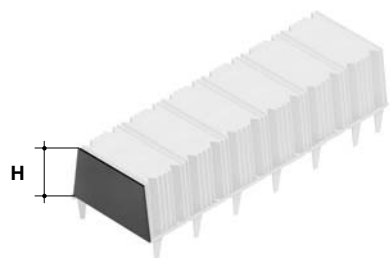


Technical data

U-Bahn Beton® formwork module

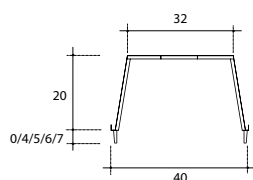


Closing panel



		13	16	20	24
Useful size	cm	120 x 40	120 x 40	120 x 40	120 x 40
Height H	cm	13	16	20	24
Feet height p	cm	0 - 4 - 5 - 6 - 7	0 - 4 - 5 - 6 - 7	0 - 4 - 5 - 6 - 7	0 - 4 - 5 - 6 - 7
Weight per piece	Kg.	2,2	2,6	3,0	3,8
Piece volume	m³	0,055	0,068	0,086	0,102
Pallet dimensions	cm	120 x 120 x 240	120 x 120 x 245	120 x 120 x 250	120 x 120 x 255
Pieces per pallet	pz./PAL	270	270	270	270
Pallet weight	Kg./PAL	604	712	820	1.036

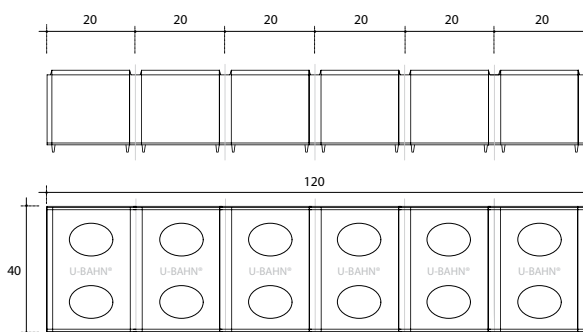
Useful size	cm	40	40	40	40
Height	cm	13	16	20	24
Thickness	cm	0,3	0,3	0,3	0,3
Pallet dimensions	cm	80 x 120 x 60	80 x 120 x 60	80 x 120 x 60	80 x 120 x 60
Pieces per pallet	pz./PAL	1.020	1.020	1.020	1.020
Pallet weight	Kg./PAL	90	90	90	90



Front view

Side view

View from above



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 **U-Bahn Beton®** 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



- Loading and breaking test certified by the University of Padua.
- Environmental Compatibility Certification (CCA).
- Member of the Green Building Council Italia.
- System certification pursuant to ISO 9001 - ISO 14001 - SA Standard 8000.

U-Bahn Beton® o alleggerimento in polistirene?

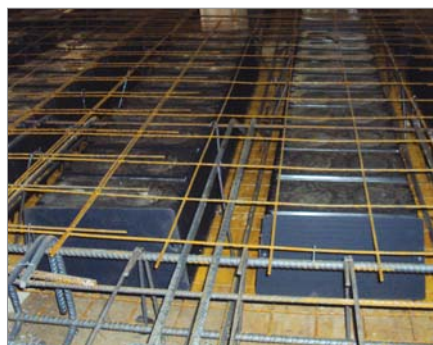
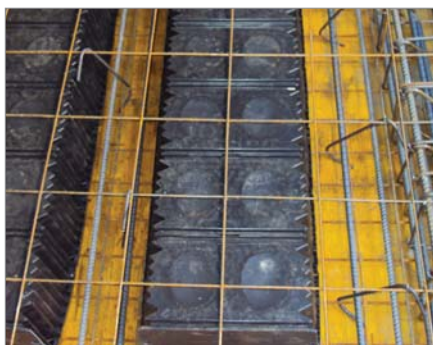
Even if polystyrene is widely used in the construction industry due to its low cost and workability, it has many disadvantages that are being addressed by the technical-scientific community.

With reference to lightened slabs, the Italian Ministerial Decree of 16.02.2007 to enclosure D.5.1 establishes that: *"In the case of polystyrene formworks, or formworks in similar materials, there must be appropriate vents for the overpressures"*. Even prior to this, the UNI 9502 standard - article 7.2.2 - established that: *"In the case of elements incorporating materials that when subject to high temperatures turn to gas, there must be appropriate vents facing the side exposed to fire to ensure that the bearing capacity is not compromised by explosions"*.

Therefore, using polystyrene slabs cast on site requires the extra expense of fitting vents in the cavity to counteract the excessive pressure of gas that is sublimated by the formwork. However, in the event of a fire there would still be the problem of toxic gas escaping into the environment (styrene).

As U-Bahn Beton® is made of polypropylene, it is not toxic even if burnt. Moreover, the slab will not explode due to the escaping of over pressurised gas from the feet (4 every 20 cm of the formwork) that act as safety valves.

Other advantages of U-Bahn Beton® compared to EPS are the dimensions, handling (just think of transferring it overhead on the slabs being built) and outdoor storage. Polystyrene is, in fact, bulky and cannot be stacked; it is particularly fragile on its edges and corners that crumble leaving those annoying balls that, statically charged, stick to everything (especially to the reinforcements) and are very hard to get rid of.



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.

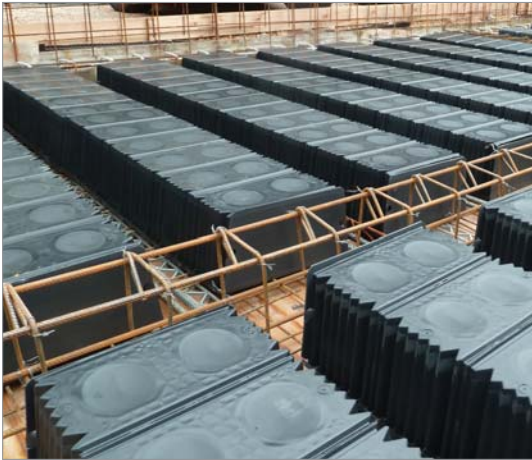
The technical consultancy is only valid for the Daliform Group construction systems.

To contact the technical office: Tel. +39 0422 208350 - tecnico@daliform.com

To obtain updated technical cards, support material, new photos and case studies, go to www.daliform.com

The information contained in this catalogue could be changed. Before placing an order, request a confirmation or updated information from the 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.

Advantages



- Reduction in time and cost related to positioning the formworks.
- High precision and regularity of the width of the concrete slab ribbing.
- Flexible, practical and simple creation of lengths below the standard size.
- Greater yard cleanliness and improved disposal of the waste in comparison to traditional formworks (hollow blocks and EPS).
- Better work performance guarantee in comparison to expanded polystyrene that, due to its crumbling into granules, tends to attach itself statically to everything, and is difficult to remove, compromising the correct filling of the concrete for the beams and in the nodes.
- Possibility to trim the soffit with immediate economic advantages, avoiding expensive plastering.
- Possibility to perform a single concrete casting for the creation of lightened slabs with the slab also in the soffit. In comparison to traditional formworks (hollow blocks and EPS), the layer making up the soffit must first be cast, then the formworks and the reinforcements are positioned, and then concrete is again cast.
- Quicker execution of prefabricated slabs without the need to prepare specific safety vents in the case of a fire.
- Providing the slab with greater fire resistance.
- Considerable reduction in the yard of overall volumes as well as the overhead handling of traditional formworks (hollow blocks and EPS) thanks to its characteristics of stackability, modularity, lightness and manoeuvrability.
- Better seismic behaviour; the presence of a dual reinforced concrete layer, which makes it possible to more solidly connect the vertical structures of a building in comparison to a traditional slab.
- Advantage of using the cavities created using **U-Bahn Beton®**, which run along the entire slab, as an equipment room for various types of systems.

Applications



Application example:
Underground parking building with the 'top-down' technique.

U-Bahn Beton® is the ideal solution for creating lightened one way slabs for all types of structures:

residential, commercial, executive, industrial buildings as well as public structures (schools, hospitals, etc).

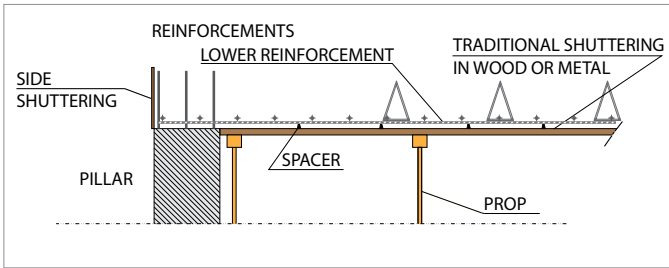
U-Bahn Beton® is fundamentally used in all applications that require one way beams and slabs as well as a reduced use of concrete and reduced weight. With **U-Bahn Beton®** slabs with a greater thickness can be created with less concrete.

A particular type of use of **U-Bahn Beton®** is for constructions carried out using the '**top-down**' technique (by compartments or layers) where instead of working from the bottom upward, work is performed from the top downward; first the slab is created and then the excavation is made.

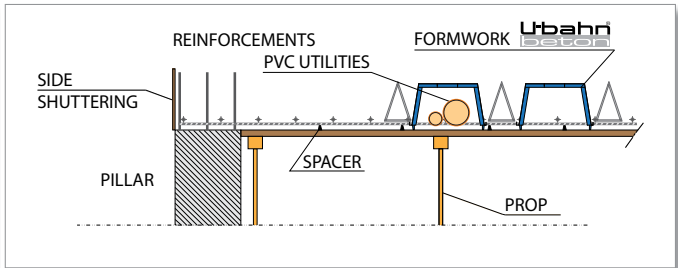
Underground parking buildings in historical city centres are often created using this technique due to the obvious constraints related to the presence of numerous buildings as well as the need to quickly restore traffic flows.

For projects that use this technique, it is of strategic importance to supply the yard with light-weight and non-bulky material.

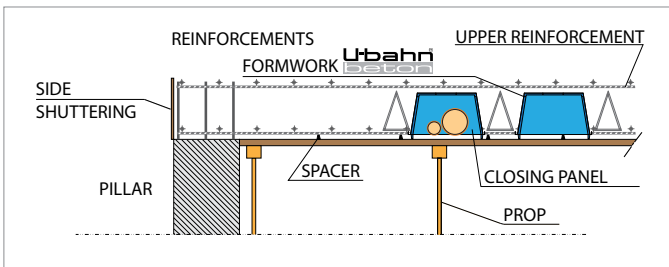
Positioning



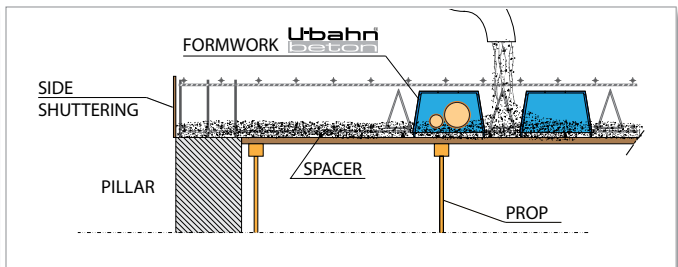
1 The entire surface of the slab to be cast on site is shuttered with wood deck (or similar systems), then the welded reinforcement irons and mesh are positioned according to the design and the spacing lattice for the upper reinforcement is arranged.



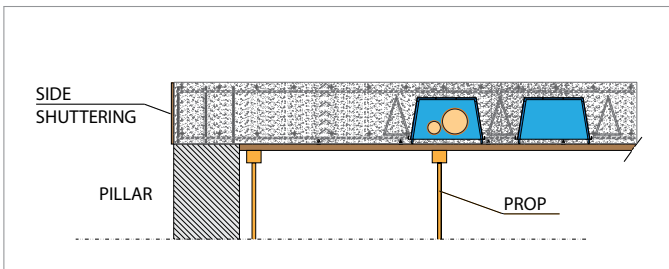
2 The U-Bahn Beton[®] formworks are positioned with the desired centre distance that will determine the width of the beams. Thanks to the conic elevator foot, the U-Bahn Beton[®] formworks will be lifted from the surface, making it possible for the lower slab to be formed. The systems will be arranged in the internal cavities of the formworks.



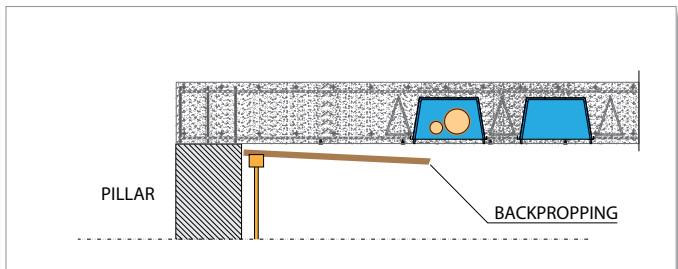
3 The positioning is completed by closing the open final ends of the U-Bahn Beton[®] formwork with a lateral closing plug above which the reinforcements, welded mesh as well as the instruments for cutting and punching are positioned according to the design.



4 The concrete casting must be performed in two phases to prevent the floatation of the formworks: an initial layer will be cast to form a thickness equal to the height of the elevator foot. Casting will continue for this first portion of the slab until the concrete starts to set and become less fluid.



5 Once suitably set, the casting can be restarted from the starting point, completely burying the U-Bahn Beton[®]. The casting is then levelled and smoothed in a traditional manner.



6 Once the structure has hardened, the formwork can be removed. The surface is smooth in correspondence of the soffit.



Photographic details of the complete positioning, reinforcing and casting sequence.

Specifications

Creation of a one way slab in reinforced concrete to be cast on site on suitable horizontal formwork (or on a prefabricated plate). The total thickness of the slab is _____ cm, to be partially lightened (according to the design) with recycled plastic modules, such as **"U-Bahn Beton®"** from the Daliform Group, with an extended form of 120 cm with an isosceles trapezoid section with a max base of 40 cm height 20 cm, with a length that can be divided in sub-multiples of 20 cm and joinable in line together to overlap the final edge; supplied with 24 truncated-pyramidal feet that are 4 cm in height, resting on the horizontal support for the formation of the thickness of the soffit suitably reinforced with welded mesh, 10 x 10 cm, with a Ø 5 mm steel rod.

This includes the supply and positioning of the **"U-Bahn Beton®"** modules to be placed in parallel, suitably distanced rows to form continuous joists between beams that are closed on their respective final tunnels with closing panels; a welded mesh 20 x 20 cm - Ø 5 mm is placed above the formworks. The upper and lower reinforcements will be connected, in the joists, with vertical C-shaped steel hooks min Ø 8 mm placed at a centre distance of 30 cm along the joist axis.

Also included is the supply and casting of the concrete needed to create the slab (in the full and lightened zone), filling and vibrating first the part under the formworks until completely covering the feet of the **"U-Bahn Beton®"** (no further) (minimum resistance class C25/30, fluidity class S5 and diameter of aggregates suitable, in order to avoid phenomenon like "segregation"), the casting will then continue until the slab is completed as soon as the first layer starts to set (in this second phase, a fluidity class different than the previous one is permitted) until the slab is completed with the formation of a min 4 cm layer. The horizontal support formwork, welded mesh, reinforcement bars, beam cages and vertical C-shaped connectors will be entered somewhere else.

The **"U-Bahn Beton®"** modules, must be produced in **"ALAPLEN® CV30"**, must be safe to walk on and certified with a resistance characteristic of 150 kg in the weakest point on an 8 x 8 cm support; they must not release any polluting substances and must have an Environmental Conformity Certificate and be produced by a company using an Integrated Management system (ISO 9001, ISO 14001, OHSAS 18001, SA 8000). The executive design of the lightened slabs must have graphs and calculations provided by the company supplying the **"U-Bahn Beton®"** modules that must exhibit technical sheet and safety sheet for the product and for **"ALAPLEN® CV30"** grain texture and that must also exhibit the product certificate approved by a EOTA member (European Organisation for Technical Approvals).

The cost for the creation of holes with the dimensions and sections foreseen by the architectural drawings is also included, the price also includes and covers all costs for providing the finished work in a workmanlike manner; it does not include the supply and positioning of the horizontal formwork that supports the slab and accessories, the lattice and the metal reinforcement, which will be entered separately.

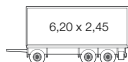
cost Euro/m². _____

Supply and installation cost grid

No.	Item	U.M.	Quantity	Unit price	Total
1	Supply and casting of concrete fluidity class S5 - thickness _____	m³/m²			
2	Supply of the U-BAHN BETON® formwork	m³/m²	1		
3	Dry positioning of the U-BAHN BETON® formwork	H/m²			
4	Supply and pose of bending reinforcement and shear/punching	Kg/m²			
5	Supply and casting of concrete fluidity class S _____	m³/m²			

Total cost €/m²

Logistics - pallet capacity

MEANS OF TRANSPORT	NO. OF PALLETS	
Tractor (8.20x2.45)	12	
Trailer (6.20x2.45)	10	
Tractor+ Trailer type "BIG" (8.40+7.20x2.45)	12 + 12	
Semi-trailer (13.60x2.45)	22	
20 feet container	11*	
40 feet container	18*	

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