

**CATALOGUE
PRODUCTION SYSTEM FOR
PRESTRESSED JOIST BEAMS**

EQUIPMENT FOR PRECAST CONCRETE PRODUCTS

**DESIGN
MANUFACTURING
&
INSTALLATION**



A LONG-TERM PARTNER

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PRESTRESSED JOISTS BEAMS FOR SLABS

The prestressed joist beam is a structural concrete element used for precast concrete floors or slabs. The joist-and-vault slab is a construction method that integrates the load-bearing features of the prestressed joist beams and the lightening features of the concrete blocks. The system, which has been designed mainly for residential construction, allows its application also in civil and commercial projects, due to its low weight, it is possible to cover large spans without significant increases in the thickness of the compression layer.



ADVANTAGES OF THE PRESTRESSED JOIST BEAMS AND VAULT SYSTEM:

Every construction system offers a set of advantages and unfortunately, some disadvantages, which will be vital to approve its use or not depending on the project.

- This system is a simple construction method which does not require very experienced labors or heavy machinery to be used.
- The system is suitable for building our own homes.
- Possibility of purchasing joist beams and to stock them in standard lengths (usually with steps of 20 cm from minimum lengths).
- The slabs where the vault system is used, especially those which are produced with polystyrene material, offer good thermal and acoustic insulation qualities.
- When using this system, the safety and the quality of the product is guaranteed, because these precast concrete elements are verified under strict quality and tracing tests and controls.
- This system has a very low cost per square meter, considering that up to 70% less labor time will be required for the installation of these products. At the same time, we will save on formworks.
- Seismic resistance. The mentioned slabs will collaborate with the rest of the structural elements included in this construction, and the system will behave like a rigid diaphragm which will absorb the shear forces of the earthquake.

DISADVANTAGES

This system is not recommended for irregular or curved slabs/forms.

This system is not recommended for constructions with high load requirements or large spans.

ELEMENTS OF THE JOIST-AND-VAULT SLAB SYSTEM

A joist-and-vault slab consists of four elements:

JOIST BEAMS:

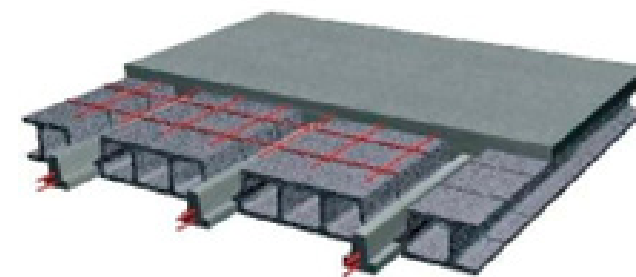
Joist beams are load-bearing elements that transmit the loads from the slab to the supporting walls or to the suitable beams. These mentioned joist beams are placed every 60 cm, measure which has become an international standard. The end part of each joist beam rests on the supporting beam, suitable wall, or any other structural element. Some joist beams are cut at site with the necessary dimension by using a hand-held radial cutter, while other joist beams are casted according to the required lengths and designs. There are other joist beams which have different geometric sections, others which are solid beams, there are reinforced beams or even with an open core, which are the cheapest and easiest to produce. In this case, we will analyze the prestressed joist beams.

VAULTS

The vaults are precast concrete elements which act as a lost formwork. They can be made of vibrated concrete, expanded polystyrene, or even lightweight compressed chipboard or other recycled materials. The vaults are supported between joists and their width respects the standard 60 cm between joist axes. The vaults support the compression layer until the concrete has reached the desired strength.

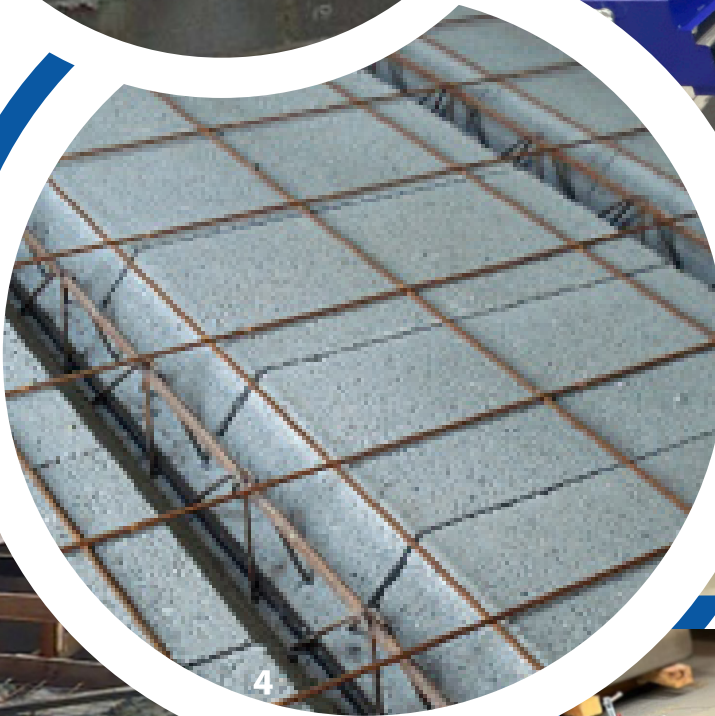
REINFORCED CONCRETE COMPRESSION LAYER

The compression layer consists of two elements: a **steel mesh** and a **steel reinforcement** in supports that serve to resist the bending stresses; and an upper concrete pouring layer. This layer helps to join joist beams, vaults, ribs, and mesh in an integrated piece that works as a solid element and as a monolithic slab, where all the elements mentioned above work together. The mentioned compression layer will have variable thickness depending on the state of the design loads of the slab.

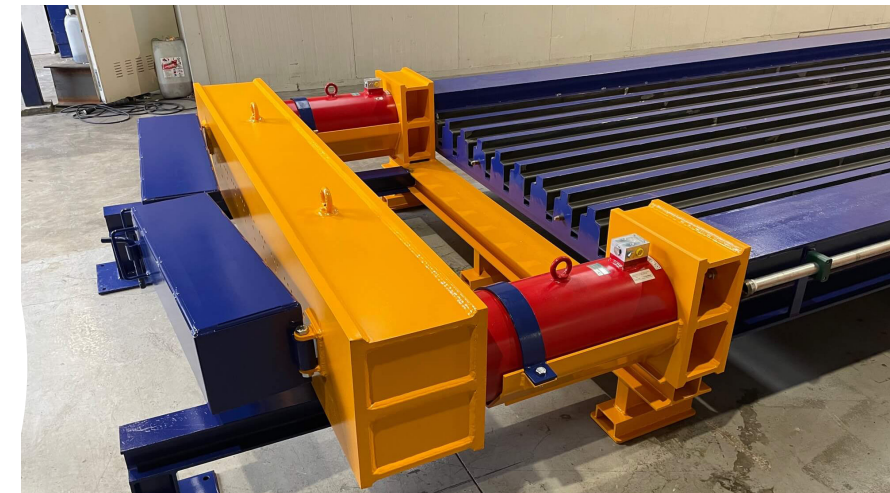


CONSTRUCTION PROCESS FOR JOIST-AND-VAULT SLABS

- 1** First, the joists are placed on their correct position over the wall supports. The minimum support space that the joist beams must have on each side is between 5 cm and 10 cm, or as indicated by the local regulations. When two parallel joist beams are raised, two vaults are also placed on their final position, one at the beginning and the second one at the end of the length of the joists to keep the same distance between them alongside the beam length and therefore, to allow the other joists to fit easily.
- 2** The usual procedure is to shore the perimeter of the job and place intermediate supports in perpendicular to the joist beams, in this way the weight of the concrete could be supported perfectly until it reaches its maximum strength. When the concrete is already dry, the slab behaves as a unitary element, like a precast concrete slab.
- 3** After placing the formwork and the telescopic props, which support the joists, the reinforcement and the steel compression meshes are incorporated. The electrical installations could be placed between the joist beams through a corrugated hose.
- 4** Once all the elements are in place, the concrete is poured. During this pouring process, it is vital to vibrate the concrete to make the aggregates and the cement reach all parts of the slab, therefore, getting a good distribution on the whole slab.

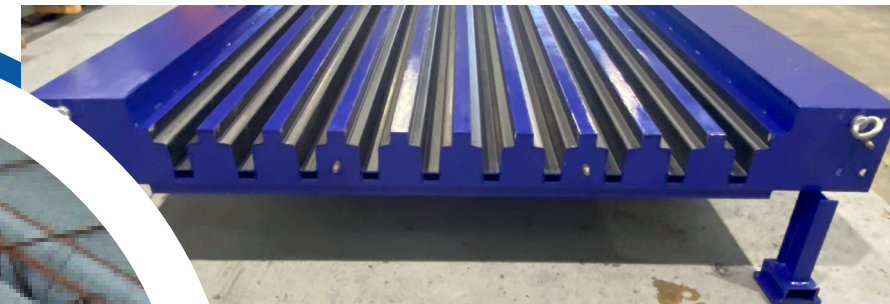


MANUFACTURE OF PRESTRESSED JOIST BEAMS ON A SELF-SUPPORTING MOLDTECH STATIONARY TABLE



The self-supporting stationary table for prestressed joists is a system that allows the production of joist beams with standard cross-sections and a very high technical quality. MOLDTECH will adapt and customize the self-supporting table to client's production capacity requirements and the necessary joist sections, to respect the local regulations where this production system will be installed.

This mentioned self-supporting battery mould is an equipment designed to produce prestressed joist beams with inverted casting position and tapered section, which will allow an easy demolding process. These tables usually have 8 to 10 parallel production lines, and lengths that usually respect the modules of 11.80 m and their multiples, i.e., tables of 11.80-, 23.60-, 35.40-, 47.20 m etc. Generally, these tables do not exceed 80 to 100 meters in length.



COMPONENTS

PRESTRESSING HEADS

The **prestressing heads, active and passive**, are located at the ends of the self-supporting table, and allow the prestressing wires of the joists to be fixed in their correct position according to the joist cross-section to be produced. These prestressing heads are used as a support base for tensioning the wires by using the suitable hydraulic prestressing jack, which consists of a hydraulic power unit and its tensioning lance. The prestressing heads are also designed and supplied with hydraulic detensioning cylinders, which allow the wires to be relaxed once the concrete reaches the desired and required strength, and transmit the compressive stress to the concrete section. This will allow the joist beams to increase their load-bearing capacity.



Prestressing active heads Moldtech.



Prestressing passive heads Moldtech.



THE FIXED SELF-SUPPORTING BATTERY TABLE

This **self-reacting stationary table** has several parallel production lines where the client could cast several joist beams. All these production lines will respect the required cross-section of the precast concrete joists. They are produced upside down, i.e., the base of the joist will be facing upwards, from where the concrete will be poured. The section will have a minimum conical slope, which will facilitate the demoulding process. Chemical release agent will be also used which will help for an easy and quick removal of the finished joist beams. These self-reacting stationary batteries are usually equipped with pneumatic or electric vibration system, allowing the correct compaction of the concrete and ensuring the perfect casting of the section. In this way,



CROSS SEPARATORS

The transversal stoppers are used to define the length of the joist beams to be produced. They are placed alongside the self-supporting table following the desired lengths of the beams. These stoppers are mechanically fixed to the inner laterals of the production line. These stoppers have a “comb” system which maintains the prestressing wires in their correct position alongside the entire length of the self-reacting stationary table.



PRODUCTION SYSTEM FOR PRESTRESSED JOIST BEAMS

HYDRAULIC TENSIONING UNIT

As we have already explained before, a hydraulic tensioning unit and the suitable tensioning jack will be used to tension the wires or strands, which will be fixed by wedges to the prestressing heads.

Once the concrete has acquired the desired and required strength, the hydraulic detensioning unit permits that the compressive load is transferred to the precast concrete element before cutting the tensioning wires between joists, and proceed to make the demoulding of the joist beams. These beams could be in stock.



MOLDTECH PRESTRESSED JOIST BEAMS PRODUCTION SYSTEM

PRODUCTION PROCESS

- Cleaning of the self-reacting table and apply of the release agent.
- Laying of the required number of wires, generally with a dimension of 4-6 mm diameter, and proceed to do the prestressing of the wires.
- Placement of the transversal stoppers according to the length of the joist beams to be produced. Fixing the stopper.
- Concrete pouring and vibration of the self-reacting table.
- Setting of the concrete until the desired strength is achieved.
- Relaxation of the active head cylinders to transmit the prestressing stress to the concrete and therefore, to the precast concrete element.
- The wires between joists are cut and the transversal stoppers are removed.
- The joist beams are demoulded and transported to the stockage area.

ADVANTAGES OF THE MOLDTECH SELF-REACTING SYSTEM FOR THE PRODUCTION OF JOIST BEAMS



- High quality of the final product.
- Low investment compared to track production methods.
- Fast production speed.

Production capacity according to customer requirements with the possibility of future expansion.

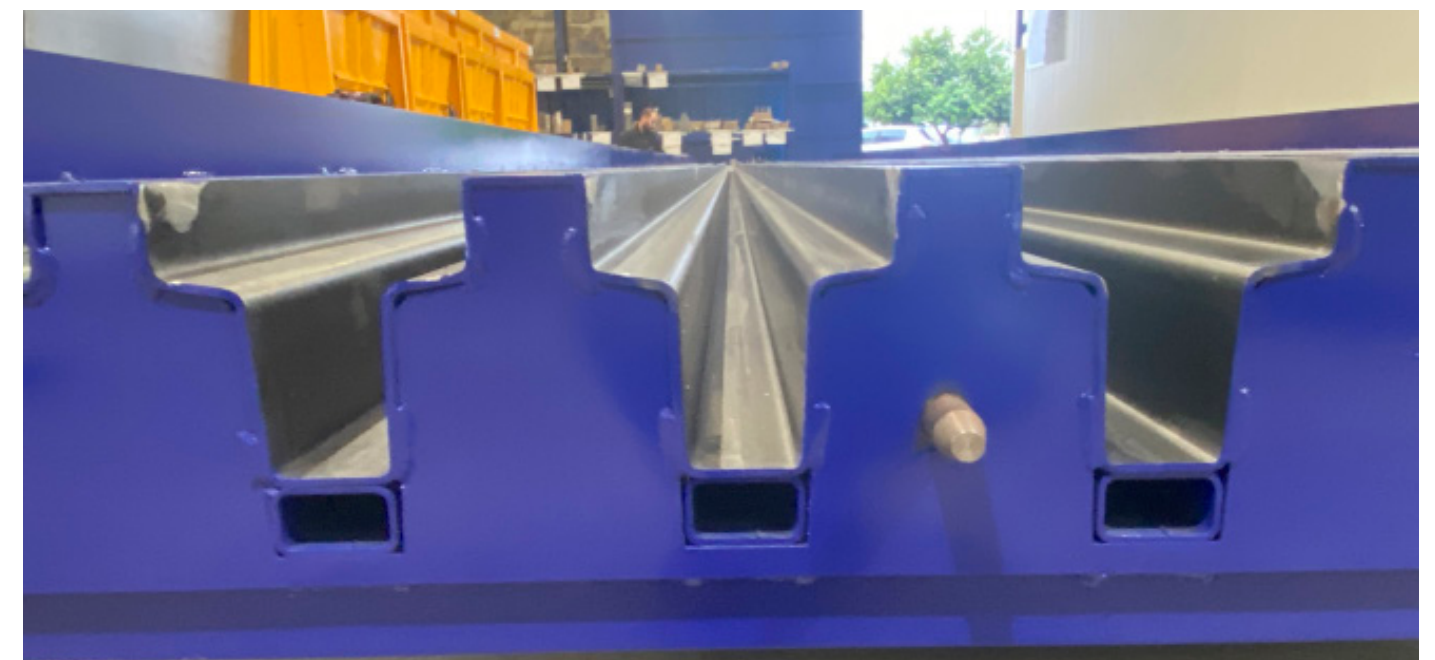
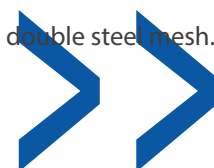
Very few personnel required, high labour efficiency.

Flexibility to produce lengths of all types without the need to cut concrete.

Sections of joists according to the customer's technical specifications.

Low investment in civil works. The self-supporting table is installed on a simple concrete slab with double steel mesh.

Easy relocation of the self-supporting table if required.





EQUIPMENT FOR PRECAST CONCRETE PLANTS



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