УДК 691

Умирдинов И.О.
Ферганский политехнический институт

Umirdinov I.O.
Fergana Polytechnic Institute, Fergana, Uzbekistan

TECHNOLOGY OF MANUFACTURING SPACE MODULES FOR REINFORCED CONCRETE CONSTRUCTIONS.

Abstract: *In this article, the technology of preparing space modules for reinforced concrete structures is presented based on various theories.*

Key words and phrases: *concrete strength, plastic, structure, plate, strength, construction, technology.*

Аннотация: *В данной статье представлена технология подготовки космических модулей железобетонных конструкций на основе различных теорий.*

Ключевые слова и фразы: *прочность бетона, пластика, конструкция, плита, прочность, конструкция, технология.*

This technology involves the production of special cavities placed inside a reinforced concrete slab. Where static calculations allow, concrete is replaced with voids made of 100% recycled polypropylene. There is normal air inside the cavities. Thus, using such lightweight constructions, it is possible to build buildings with large spans.

One of the possible ways to obtain lightweight constructions is to use the technology of arranging coatings with non-removable gaps. Reducing the weight of the structure by removing the material that does not participate in the process (by 20-40%), without worsening the strength properties, together with the order of delivery of a smaller amount of concrete mixture for concreting the object, determines the appropriate economic effect. In addition, the effectiveness of this approach is improved by reducing the load on the load-bearing elements of the structure and its foundations.

Using recycled plastic blanks not only reduces building materials, but also the energy needed to process and transport them. According to statistics provided

by the manufacturer, one standard truck loaded with hollow modules replaces seven concrete mixers. As a result, it further reduces the logistics burden on highways, which is especially important for large cities. Reducing the use of building materials has several advantages. In terms of environmental safety of technology, it is important to reduce the emissions of automobiles and special vehicles. Also, the blanks take up little space on the construction site, as they are delivered to the facility disassembled. The design is carried out according to the existing construction standards, first simple slabs are calculated, then the parameters for hollow slabs are recalculated and determined.

For plates with a thickness of 200-350 mm, devices are used in the form of an ellipse, and for plates of 300-600 mm, in the form of a sphere. Modules of spaces allow to exclude the cost of concrete, which is not involved in the work of monolithic reinforced concrete slabs , that is, they are not located in the holes of the slabs, where additional strength is needed, and around the columns. Spacers are placed in the lower reinforcement layer and allow to install the upper reinforcement mesh in the design position without using an additional frame.

In recent years, unified modules made of polymer materials of various shapes have been widely used abroad as non-removable gap formers. Such systems include Airdeck, BubbleDeck, Cobiax, U-Boot Beton and U-Bahn Beton.

According to the Airdeck technology, the bottom cover of the intermediate plate is made in the form of a ready-made reinforced concrete structure with polypropylene melt additives. The working dimensions of the device-box are 20x20 cm, and the height is from 12 to 35 cm. Each interval of the device-box is 30 cm.

BubbleDeck technology is divided into three types:

An analogue of A-airdeck technology, differing only in the form of reinforcement and attachment;

Type B - plate-sized flat reinforcement modules consisting of fixtures and reinforced frames are installed in a formwork on the construction site and concreted using a two-step technology;

Type C - ready-made reinforced concrete intermediate slabs manufactured in the factory with facilities for delivery to the construction site. As a device, spherical or elliptical hollow balls made of recycled plastic (polyethylene, polyvinylpropylene or polyvinyl chloride) with a diameter of 18 to 36 cm are used, depending on the thickness of the concrete slab. The devices are located inside the armature module and are kept in the design position thanks to the special cellular shape of the lower and upper bars.

Cobiax technology includes two types of linear reinforcement modules (up to 250 cm long) for concreting media with a thickness of 20 to 35 cm. ("Eco-Line" system) applies. The main difference from the above-mentioned technologies is the manual placement of modules with spacers before the concrete is poured into the formwork .

Daliforms Group offers a technology similar to Cobiax, but with significant differences. It has two systems, u-Boot Beton and U-Bahn Beton. The U-Boot Concrete System uses block-shaped units made of recycled polypropylene with working dimensions of 52x52 cm and a height of 10 to 56 cm. U-Boot Concrete System units can be used with a thickness of 20 to 76 cm. allows to concretize intermediate slabs. Distances between devices are set using expansion joints with a graduated scale. The U-Bahn Beton system uses P- shaped devices made of recycled polypropylene with working dimensions of 120x40 cm and a height of 20 cm . The ends of the devices can be closed with standard plugs. This system is specially developed for the implementation of one-sided intermediate slabs made of monolithic reinforced concrete.

At the same time, technologies for the production of lightweight constructions are widely used in modern construction. A vivid example of the use of such technologies is the 167 m high skyscraper "Santa Fe II" built in 2013 in

Mexico. It is the construction of the tallest residential building in Mexico. Reinforced-concrete intermediate plates have a thickness of 250 mm and an average weight of only 3.5 kn/m2. The 80×80 cm foam polystyrene units are placed on a plate with 100 cm long steps in two directions for concreting internal ribs 20 cm thick.

The name of the technology	Constructive thickness of the Oriopa,	The size of the device, cm ^{3}	Devices step , cm	The number of devices is pcs/m ^{2}	Device size, m ^{3} /m ^{2}	Don't rush reduced thickness, cm
Airdeck	25	4100	30	11	0.045	20.4
BubbleDeck	25	3100	20	25	0.076	17.2
Cobiax	25	9100	35	8.2	0.0 7 5	17.5
U-Boot Concrete	25	28000	64	2.44	0.068	18.2
Mo nofant	25	121500	100	1	0.1215	12.85

Above from the table apparently _ _ apparently , polystyrene most of the time taking off unobtainable empty spaces _ as plate using _ shortened thickness another to technologies compared to much little , this while of structures heavy weight _ to minimize take will come . The number of devices per 1 m ^{2} area simplifies the process of reinforcement and concreting, at the same time, it predetermines the rationalization of sections without being bound by the usual form of devices made of polymer materials.

Adabiyotlar ro‘yxati.

1. ГОСТ 30459-2008 Добавки для бетонов и строительных растворов. Определение и оценка эффективности. Дата последнего изменения. 12.09.2018г. С. 25.

2. Иванов Ф.М., Москвин В.М., Батраков В.Г. и др. Добавка для бетонных смесей суперпластификатор С-3. Бетон и железобетон, 1978 г, № 10, с.13 - 16.

3. Fan W., Stoffelbach F., Rieger J. et al. A new class of organosilanemodified polycarboxylate superplasticizers with low sulfate sensitivity. Cement and Concrete Research. 2012 . V. 42, pp. 166-172.

4. Каримов М. У., Джалилов А.Т. Изучение влияния на реологические свойства бетона и на свойства водно-цементного раствора суперпластификатора на основе гидролизованного полиакрилонитрила//

«Новые полимерные композиционные материалы» Материалы IX международной научно-практической конференции. Нальчик 2013г. С.91-94

5. Kuzibaevich, M. B., & Nabijonovich, A. N. M. (2021). Analysis of study of physical and mechanical properties of vermiculite concrete with new generation complex chemical addition KDj-3. *International Engineering Journal For Research & Development*, *6*(3), 5-5.

6. Kozibaevich, M. B. (2021). Study of the effect of new synthesed complex chemical additions on rheological properties of portland cement. *Innovative Technologica: Methodical Research Journal*, *2*(12), 133-137.

7. Касторных Л. И., Синицина Н. А. Исследование свойств легких самоуплотняющихся бетонов// «Строительные материалы и изделия» сентябрь 2014, том 14, № 4 Ст.47-51.