



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)



**D08575**



Distr.  
LIMITED

ID/WO.122/30  
12 May 1972

**United Nations Industrial Development Organization**

**ORIGINAL: ENGLISH**

**Meeting on prefabrication in Africa  
and the Middle East**

**17 - 29 April 1972**

**Budapest, Hungary and Bucharest, Romania**

**THE DEVELOPMENT OF THE ROMANIAN INDUSTRY  
OF PREFABRICATED ELEMENTS**

by

**Ion Vasilescu**

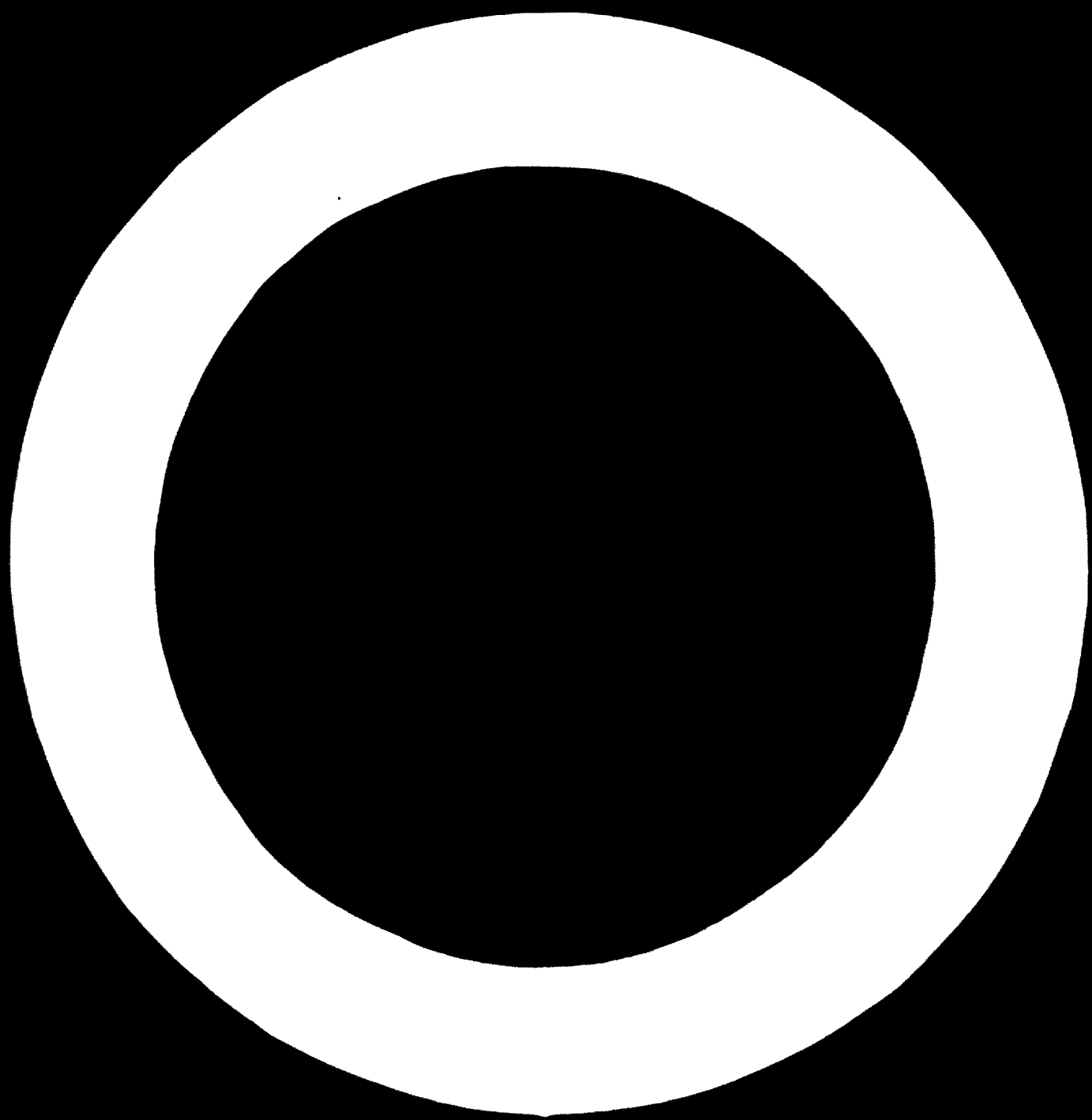
**Engineer**

**Design and Research Centre  
Industrial Central for Precast Concrete  
Bucharest, Romania**

1/ The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. This document has been reproduced without formal editing.

id.72-2782

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.



## THE DEVELOPMENT OF THE ROMANIAN INDUSTRY OF PREFABRICATED ELEMENTS

After the second world war and the liberation from the fascist occupation, Romania began to put into practice a vast program of reconstruction, of industrial development, of rising the living standard of the people, - in short, of transforming Romania from a backward country into a country whose economic and social development goes at a rapid pace.

The industrial production of Romania in 1971 was 19 times bigger than that of the year 1938, which was considered the year with the biggest industrial production before the war. The high rhythm of the industrial production is continuously increasing, so that in 1975 the production will be with 53% bigger than that of the first year of the present five year plan.

This period witnesses the building of a great number of industrial and agrotechnical constructions, of dwellings, schools, social and cultural buildings, electrification works, of water supply works and irrigations, sewings, and so on.

In the conditions of a high rhythm of economical and social development, characteristic to our country, to have used the traditional methods in the field of constructions would have led to practically hampering the materialization of the investments, to the failure of the economic plans. That is why even from the first years of planned development the production of prefabricated elements was given a special attention. The industrialization of the constructions is a necessity of our times, and the prefabrication is an important part of it. Compared to the traditional methods, the using of prefabricated parts in construction shows the following advantages :

- a reduced manufacturing time of the constructions which decreases as far as half of the traditional period. It has been observed that generally this reduction represents 30% for the industrial constructions and it is 40% for the dwelling

buildings.

- the increasing of the labour productivity by transferring a great part of the site activities on to the plants and factories, where they can be performed with mechanical means. As a result, there will be an important decreasing of the number of the highly qualified workers on the sites ; the respective activities will be performed in factories, where the handling of the equipment requires less high qualification ;

- the decreasing on the construction sites of the auxiliary and organizational works ;

- a low consumption of wood and steel, - a very important feature of the countries where there is a scarcity of such materials ;

All these features lead to the lowering of the cost price

The prefabrication spread out almost in every field of building activities. There hardly exists any construction work not to use prefabricated elements. Thus

#### - The Industrial Buildings

The greatest part of the industrial buildings is carried out with prefabricated elements.

In our country, where the steel is in great scarcity, metal constructions are practically excluded except when they can not be replaced by prefabricated elements, and cast-in-place concrete buildings became an exception.

The industrial buildings are made entirely out of prefabricated parts, not only their structure but also the joining and separating parts. The structure elements are generally made out of a wide range of products of prestressed concrete, a fact which make them meet the requirements of various functions and technologies.

The sizes of the prefabricated elements are up to 24 m. and they weigh up to 16 tons. Depending on their peculiar exploitation conditions, the wall-panels are usually made out of

light-weight concrete, of autoclaved cell concrete - protected or unprotected.

Such constructional solutions have been applied to over 10,000,000 s.m. of industrial buildings.

#### - Dwelling Buildings

Almost all the buildings made by state enterprises are being built with industrialized methods, the prefabricated parts being used either for precast boards and front panels or for the complete building.

During the last ten years there have been used over 15,000,000 s.m. of prefabricated boards and there have been built over 120,000 apartments, made entirely of large prefabricated panels.

The five year plan foresees that more than half of the dwellings built by state enterprises during 1975 should be entirely built in prefabricated parts.

#### - Agricultural and sootechnical buildings

This kind of buildings requires light prefabricated roofing and joining parts ; from among the materials frequently utilised for such buildings, the asbestos cement and the autoclaved cell concrete are widely used. Over 200,000 s.m. of reinforced and prestressed concrete are produced annually for vineyard pillars.

#### - Irrigation and Water Supply

Prestressed concrete pipes and troughs are being used for this kind of works. During the last 10 years over 4,000 km. of pipes and over 2,000 km. of prefabricated channels have been made in our country, which is one of the main producers of prestressed concrete parts for water supply and irrigation.

#### - Electrification

It has been possible to perfect a vast electrification program of the rural areas due to the organising of an indus-

trial production of supporting poles for open-air transmission lines. All the necessary prefabricated parts are made of prestressed concrete in specialized process lines in a number of 12 factories. The open-air transmission lines supported on prefabricated poles form a network covering all the country.

#### - Buildings and Light Building Elements

The production of light building elements has largely developed during our times. Among the light building elements, the prefabricated parts made of autoclaved cell concrete have a continuous development, as they are being used both for industrial and for dwelling buildings, in towns as well as in the country. The advantages of this material as well as its enlarging fields of use required the building, during the present five year plan, of five more factories producing prefabricated elements of autoclaved cell concrete. From these five factories, two are already working and three are still in work. Thus, the annual output capacity will increase to almost 1,500,000 c.m.

Meanwhile, the production of prefabricated elements with artificial, light aggregates, - such as the granulite, for instance, is still growing. The granulite concrete is supposed to be also used for large span prestressed concrete elements.

What has been mentioned above is only a part of the possibilities of the prefabricated parts in Romania, for they are extensively used for turistic buildings, schools, bridges, railways, and so on.

The large field of utility of the prefabricated parts leads to a continuously increasing production, year by year, so that during 1971 2,500,000 c.m. of prefabricated elements have been produced, and the five year plan provides for an increasing production of over two times.

The organization of the prefabrication production arises important problems. Being heavy elements, the transport costs related to the cost of the product in itself may greatly influence its advantageousness. That is why the production must be organized in such a way that the transport expenses should not exceed 5 - 6% of the value of the product.



Our studies and experience showed that the more the technicality of a product and its mass production increases, allowing of a maximum mechanisation, the smaller the influence of the transport length on the cost price becomes. Accordingly, the products have been classified into the following categories :

- products which are being manufactured in organised factories ;
- products which are being manufactured on production-grounds near the constructors ;
- products manufactured on the site.

The first category includes : the prefabricated elements of prestressed concrete for industrial buildings, prefabricated elements of autoclaved cell concrete, prestressed concrete pipes, prefabs for open-air transmission line poles, for dwellings of a high degree of refinishing and assembling, prestressed concrete railway sleepers, prefabricated elements for small span bridges, certain elements of mass production carried out with automatic or semi-automatic installations for big production capacities.

The second category includes : non-standardised prefabricated elements, miscellaneous, large panels for dwellings with a lesser degree of refinishing and assembling, floor slabs for dwellings.

The third category includes the heavy elements without a standard dimension, as for instance poles for industrial halls, special prefabricated elements or elements specific to a certain building.

Consequently, the prefabrication production is so organised as to take into account the classification mentioned above.

The economic unit which controls the greatest part of the Romanian production of prefabricated elements is the Central Industrial Department of Prefabricated Parts. This unit is composed of a group of 16 big prefabrication factories, uniformly spread on the whole of the territory. A prefabrication factory is generally a complex unit which supplies a large scale of products to the sites on its area. Usually a factory makes a great variety of products, but some of its activities have

common characteristic, allowing of mechanisation and automation, as it is the case of the concrete production, of the stockyard for the finished products, the reinforcing workshop, the thermal power station, the plumber's workshop, and so on. The process lines are specialized on groups of products, the internal process being so organized as to manufacture a wide range of products within a given overall dimension. Thus, a complex factory has process lines specialized on large panels for dwellings, on joining elements for industrial buildings, on structure elements for industrial buildings, floor slabs, prefabs for agro-technological buildings, open-air transmission line poles, prestressed concrete pipes, and so on. This kind of production organization which has proved to be the most efficient with us, determines the optimum output capacity of such a factory between 100,000 - 120,000 c.m., carried out on 5 - 6 parallel process lines.

As the factories work on serial production it is only natural that the greatest part of the process should be carried out by mechanical means, with metal moulds. But this fact does not prevent the continuous bringing in the production of more economic assortments, fact that determines the average age of a product at 4 - 5 years.

The Central Industrial Department facilitates the bringing into current production of the new assortments by the help of its own research and projection institute.

It is this institute that works out the development plans of the Central Department and makes the technological researches. It also co-operates with the other research and projecting institutes of the constructors in order to better know and satisfy the requirements of the users.

It has been found out that two essential facts determine the organization on a production on industrial scale of the prefabricated elements:

- the typification, in the present conditions of diversity and economic efficiency, and
- the ensuring of the selling, - that is, planning.

Both conditions are being secured in Romania in the following way:

Each industrial branch has its own research and projecting institutes which typify the respective products as well as use the new standardized products in their own constructional projects.

A separate institute is specialized in the typification of social-cultural and dwelling buildings.

The problem whether typification leads to uniformity and monotony appeared here as well as in other countries under the same conditions. It is one of the greatest concerns of our architects and designers, who make serious attempts to concord the technique with the beauty; the close co-operation between the architect, the designer and the constructor proved to be fully successful in most of the cases.

Before being introduced into current production, each prefabricated element is tested from the point of view of both its bearing capacity and manufacturing technology.

In order to be able to control the behaviour of the products during transport and erection, the Central Industrial Department has a building unit which makes exemplifying buildings with the new products, pointing out their performances to the builders.

The factories within the Central Industrial Department supply it with approx. 8,000 tons of metal moulds per year for the rapid replacement of the worn-out metal moulds.

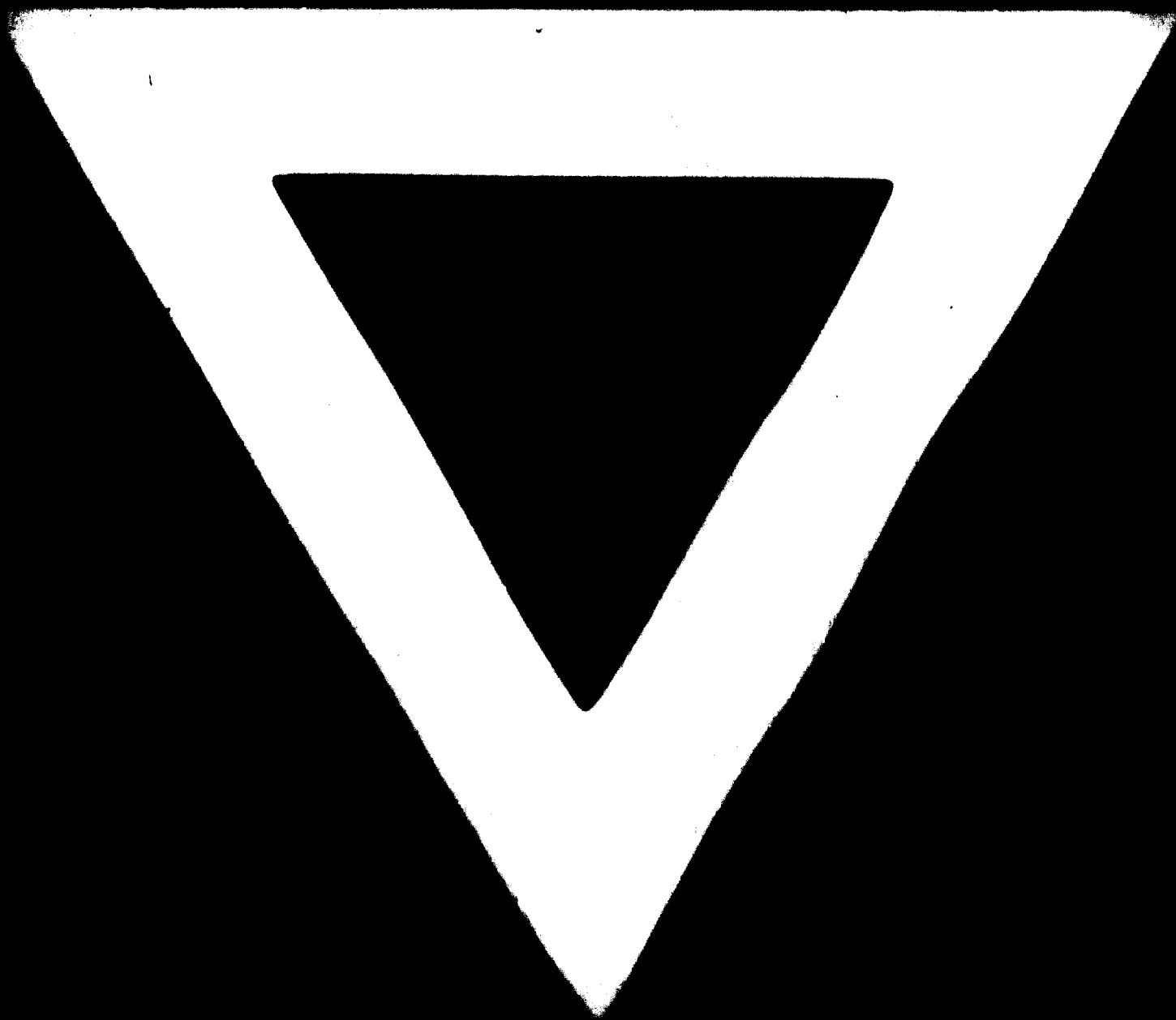
As it has been pointed before, a large amount of prefabricated parts are being made on the production grounds of the various local builders. Every big building unit of dwellings, of industrial and hydrotechnical constructions and have on their areas smaller productive units which meet the requirements of the local users especially as regards the small series products which are not advantageous for the production of big factories. Generally such a production ground has a capacity of 10,000 - 30,000 c.m. and the carrying of the products up to the building sites is made by traffic means, the maximum length being as far as 20 - 30 km.

Almost all the big towns or district residences have such production grounds which produce large parcels for completely prefabricated dwellings sufficient for 400 -- 800 apartments a year. Most of these grounds are owned by the district building enterprises, which on their turn are dependent on the respective district people's council.

By what I said above I intended to present some aspects of the prefabrication production in Romania so that you may form a general opinion about the part which this specific industry plays in the carrying out of the building plans of our country.

I can not deny the fact that we are coming up against difficulties specific to our country, if we take into account that the greatest part of its territories is in a seismic area of 6 - 9 degrees on the Richter scale. This makes more difficult the problems of joining of the elements, the calculations have to be done with the greatest care and the erection has to be very attentively controlled. But in spite of all this, the prefabrication industry is in full swing, because, as I pointed out before, we can not have a high economic and social development without the industrialization of the building construction.





30. 11 73



