Building Production Systems

Industrial Production and Prefabricated Systems in Construction

by
Alaattin Kanoğlu
Assoc.Prof.Dr.

Basics of Industrial Production

- Division of work
- Repetition
- Specialization
- Standardization
- Mechanization
- Scientific Management

Division of work: Work must be divided into small and simple tasks. Thus, laborers can learn and fulfill these simple tasks easily.

Repetition: Industrial production means producing the same units continuously and repetitively. Productivity of laborers increases since they repeat the same action for the small tasks.

Specialization: Laborers become specialists on the certain parts of the work since they repeat the same action.
Standardization: Products and processes must be standardized. Standardization can be achieved by;
–Unification, and
–Combination
Mechanization: Machines are needed for obtaining speed, high quality and high precision in production. Their productivity is high in repetitive and standard production processes.
Management-related issues: High volume of production and accelerated speed of production needs well coordinated processes.

Questions? Is it possible to apply these basic features of industrial production in building production?

- What sort of systems exist in prefabricated building production?
- Does prefabrication always mean industrial production?
- What are the factors affecting industrial production in construction industry?

Prefabricated Construction Systems

In conceptual dimension, prefabricated systems can be categorized as:

Open systems: by means of standardization of dimensions and details, the components produced by different companies in construction industry can be used together to design and construct the buildings. The components can be selected from the catalogues.
Mekano systems: the components are not interchangeable with the components of another system. The components are produced as the certain parts of a package and can not be replaced.

In practical dimension, prefabricated systems can be categorized as:

- Skeleton Systems,

- Panel Systems,
- Cellular Systems,
- Combined Systems.

Skeleton systems: prefabricated systems that comprise structural, load-bearing elements such as columns, beams, and slab elements. One of the dimensions of these elements is greater than the other dimensions.

Panel systems: prefabricated systems that comprises structural, load-bearing elements such as walls and slab elements. Two dimensions of these elements are greater than the third one.

Cellular systems: prefabricated systems that comprises three-dimensional cellular units.

Combined systems: prefabricated systems that use different types of elements stated above together.

Classification of Skeleton Systems

Column/Beam/Slab Systems

- Column and Slab Systems
- Frame Systems
  - –H Formed Frames
  - –T Formed Frames
  - –Other Types of Frames

Classification of Panel Systems

Large panel systems: panels are greater than 2 m2 **Small panel systems:** panels are smaller than 2 m2	**Classification by size**
Heavy panel systems: lifting equipment is required **Light-weight panel systems:** panels can be lifted without equipment	**Classification by weight**
Wooden panel systems Metal panel systems Plastic panel systems Combined panel systems	**Classification by materials**

Classification of Cellular Systems

Complete Cellular Systems: cellular units are fully completed **Incomplete Cellular Systems:** cellular units are partially completed	**Classification by completeness**
Wooden cellular systems Metal cellular systems Plastic cellular systems Combined cellular systems	**Classification by materials**

Prefabrication vs Industrial Production

Does prefabrication always mean industrial production? If any prefabricated production of buildings or components of buildings provides the basic requirements of industrial production i.e., division of work, repetition, specialization, etc., then it may be qualified as industrial production.... So, prefabrication and industrial production are two different concepts that:

- may fully or partially ovearlap on each other, or
- may not...

Factors affecting industrialization in BP

The product-related difficulties

- Since the variety of building functions and types standardization and unification is difficult.
- Due to the differences of spans, size of rooms and components originating from building function standardization is difficult.
- Since the relationship among the building and the land, the sub-structure should be produced on-site.
- Standardization and unification at component level is difficult due to some reasons like earthquake or climate.
- Transportation and assemblage is difficult since the weight of the building and its components.

The demand-related difficulties

- The duration of life-cycle of buildings is too long, so is the period of demand.
- The building demand has a postponeable character since the instable economic conditions and high value of the product.
- The local character of the demand creates additional difficulties.

The product-related facilities

- Building can be divided into components and these components can be produced in accordance to the principles of industrialization. Mechanization is possible.
- The details and production process can be standardized and unified.
- It is possible to produce a product that is almost completed at factory.

The demand-related facilities

- The need and purchasing wishes for various types of buildings increases in emerging countries.
- Suitable payment conditions can easily convert these wishes to demand.
- Especially the need for residential buildings unavoidable and the stability of demand can be obtained.