

## Modern Methods of Constructions and Their Components

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### Abstract

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Increasingly in the construction industry appears concept of modern methods of construction in delivering faster and more efficient construction. One of these systems and methods are volumetric structural systems. This article analyzes the modern methods of constructions, and points to one of their components, specifically to modular constructions. Examined their design and also shows the benefits that come with this of type modern methods of constructions. Common ground benefits of modular construction philosophy begin to break the unprofessional especially from the public. Examples from abroad clearly demonstrate that this technology has potential even in modern architecture. The success of this technology depends on how they use the possibilities architects, planners and building engineers.

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**Keywords:** modern methods of construction, construction components

### Introduction

Many people prefer homes built the traditional way, board by board, nail by nail, right close by at the construction site. Nevertheless, they don't construct them like they used to. The huge mainstreams of houses these days are built with at least some factory-built components.

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And a healthy proportion are put together almost totally off-site. The cause is generally cost. The building method approach to home building save time, and time is money, not just to the people who raise houses but as well to the people who pay money for them (Off-site Construction, 2013. Modern methods of construction (MMC) originated in the United Kingdom (UK) as a common term for offsite methods of construction and onsite methods of construction.

Offsite MMC are prefabrication elements or parts of structures, constructed in factory, then transported and assembled on-site. Onsite MMC are building blocks and parts of structures takes place directly on site. Virtually all of the good quality products are built in factories around the world. Cars, planes, ships, computers, printers, cell phones, even the pen you write with are built in factories. In addition, even site built homes use many components that were produced in factories. Modular homes take a shorter time for construction compared with site-built homes. This is due to the fact that while the modular is being built in the factory, another crew is building the foundation at the same time (Chen, 2010).

## **1. Defining and Classifications of Modern Methods of Construction**

MMC originated in the United Kingdom as a common term for offsite methods of construction and onsite methods of construction. Offsite MMC are prefabrication elements or parts of structures, constructed in factory, then transported and assembled on-site. Onsite MMC are building blocks and parts of structures takes place directly on site.

### Defining of Modern Methods of Construction

Authors Chen (Chen, 2010) argues that MMC in the construction industry has enhanced productivity and improved quality as well as several benefits as shortened construction time, lower overall construction cost, improved quality, enhanced durability, better architectural appearance, enhanced occupational health and safety, material conservation, less construction site waste, less environmental emissions, and reduction of energy and water consumption. MMC (Report by the National Audit Office) are about better products and processes. They aim to improve business efficiency, quality customer satisfaction, environmental performance, sustainability and the predictability of delivery timescales. MMC are, therefore, more broadly based than a particular focus on product.

They engage people and process to seek improvement in the delivery and performance of construction. The authors (Burwood and Jess, 2005) defined MMC as those which provide an efficient product management process to provide more products of better quality in less time. It can be classified in various ways and may involve key services (e.g.) plumbing, key items (e.g. foundations) inner shell (walls etc), external walls, or any combination of these elements. It can also be classified by material (timber, steel, concrete and masonry). According to Warszawski (Warszawski, 1999). MMC are defined as a set of element or component which are inter-related towards helping the implementation of construction works activities. He also expounded that MMC are an investment in equipment, facilities, and technology with the objective of maximizing production output, minimizing labour resource, and improving quality. Thikha (Triakha, 1999) defined MMC as a system in which concrete components prefabricated at site or in factory are assembled to form the structure with minimum in situ construction.

#### Classifications of Modern Methods of Construction

Studies in the literature by various authors (Waste and resource programme, 2007), have been prepared following the classifications of MMC, listed in table 1.

Table 1 Classifications MMC

	<b>Systems</b>	<b>Components</b>
Offsite MMC	Volumetric Construction	Modular Construction
		Pod Construction
	Hybrid Construction	Semi-volumetric Construction
	Panellised Construction	Open Panels
		Closed Panels
		Structural Insulated Panels - SIPS
		Composite Non-structural Insulated Panels
		Prefabricated Parts
	Natural materials	Prefabricated Lightweight and Roof Panels
		Timber Frame construction
		Multi-layered Engineered Timber (Solid)
	Light weight facades	Components from Renewable Materials
		Masonry block walls with timber frame
		Masonry block walls with metal frame
	Sub-Assemblies and Accessories Systems	The Ventilated Facade system
		Floor or Roof Cassettes
Pre-cast concrete foundation assemblies		
Onsite MMC	Prefabricated auxiliary structures (site assembled)	Pre-assembled products
		Tunell Form
		Stick Build Timber Frame
		Insulated Concrete Formwork (IFC)
		Thin Joint Blockwork / Clay Block
		Oak Framed Buildings
		Glulamined Framed Building

## 2. Modular construction as one of the components of the modern methods of constructions

As shown in the previous of table, modular construction as one of the components of the modern methods of constructions. Each building consists of several separate modules of steel construction. The modules themselves are designed to suit the poor weather conditions.

The entire production is the production of individual parts of the module, such as: frame, floor, ceiling, walls, and other accessories.

### The Basic the Design of the Modular Construction

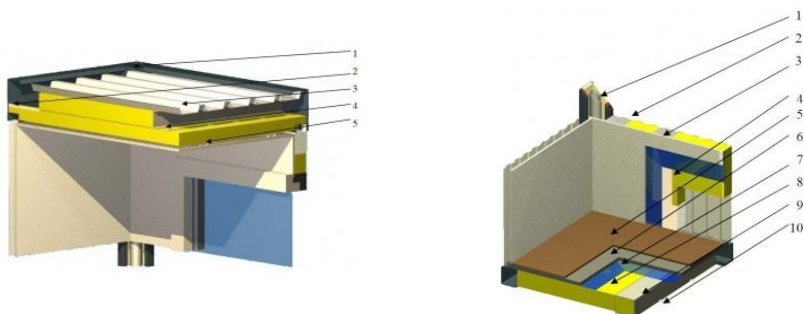
The steel structure consists of hollow profiles and rolled, self-supporting, anti corrosion primer and polyurethane topcoat paint. Standard container module has a galvanized profiled sheet. Atypical containers can have final surface treatment of as wood, metal, fiber-cement or plaster. Figure 1 shows a modular metal frame construction (Rikostav, 2007).



Figure 1 Metal frame ([www.fagus.sk](http://www.fagus.sk))

Inner surface can be made of materials such as drywall, wood paneling, ceramic tiles. Thermal insulation is used mineral wool. Composition of layers modular construction is shown in Figure 2.

Figure 2 Composition of layers modular construction



([www.fagus.sk](http://www.fagus.sk))

Composition floors and walls (Figure on the left):

1. Insulated transverse column,
2. The external cladding,
3. Internal cladding of fermacell plates with wallpaper or chipboard,
4. Frame of galvanized sheet metal to accommodate the insulation, which is separate vapor barrier,
4. PVC flooring, linoleum, carpet, laminate flooring,
5. Cement board CTD, 6. Water vapor barrier foil

Composition ceiling (Figure on the right):

1. Steel cube,
2. Transverse beam used to downcomer water an insulated with polystyrene,
3. Galvanized of trapezoidal sheet, 4. Ceiling insulation of mineral wool,
5. Steel U-profiles to grip the ceiling,
6. White PVC extrusions.

Appearance of each module can be customized according to the requirements always to be met. The same applies to the design of windows and doors. The modular system can be combined as the extension of the walled building. Can be built on a concrete base, concrete blocks, and panels. May be three floor. Individual modules can be optionally built beside or behind. Dimensions of individual modules allow interesting layouts. It is this flexibility module gives the opportunity and space to the imagination. The facade may be standard of painted galvanized trapezoidal sheet ([www.ikosatv.sk](http://www.ikosatv.sk)).

### The Benefits of Modular Constructions

Today, modular constructions are more than just temporary construction trailers and portable classrooms. There are countless applications for modular building solutions – from permanent housing in both remote and urban locations to retail space solutions and municipal facilities, to industrial site offices and special event requirements.

Hundreds of end users benefit from the ease of use and flexibility that modular construction offers. Attractive prefabricated buildings can be any size, have multiple stories and custom designed to meet specific needs.

Modular constructions are manufactured in a dry, secure facility, where predictability of quality centered in a factory benefits the project. Modules are easily transported to site for installation. This process saves project time and money because site preparation occurs while the buildings are being manufactured and there are no weather delays. Site installation is also much faster than 'stick-built' ([www.atcol.com](http://www.atcol.com)).

The authors (Lender and Media, 2010) one key advantage of modular construction is that it's more cost effective than traditional on-site building. Modular builders take advantage of economies of scale by building multiple similar pieces at once. They also get to work on smaller pieces of the building, reducing the need to use ladders or scaffolding. Finally, since the bulk of the construction and finishing work is done indoors, there's less risk of weather-related delays in construction that can cause workers to sit around idly waiting for the ability to work.

The nature of factory building also makes modular homes faster to build. They're frequently built on an assembly line that continuously operate. Companies have their own inspectors on site, so the units can be checked as they're built without having to wait for a city inspector to come and sign off on the work. Finally, when they get built on-site, all that needs to be done is to have them placed on the site and joined together. This process can be completed in hours or days instead of weeks or months.

A modular home is a new home. This means that it's built to modern standards and comes with new appliances and systems. Since it's a newly built home, you also get to select your lot and, based on your community's laws and your builder's advice, site the house where you want it on your parcel. On the other hand, building a new home means that you need to find a lot and prepare it for building if it isn't already developed. You also can't move in when you close since you have to wait for the construction to finish.

### 3. Conclusion

Modern methods of constructions are not new in developed countries in Europe and the USA. Modern methods of constructions should be seen as innovation in construction. It is imperative that modern methods of constructions are seen as an evolution of construction using new and innovative techniques rather than a revolution. Modern methods of constructions are not to be seen as a threat to traditional methods. Both methods should be able to work together and improve their processes collectively. This paper analyzed of the modern methods of constructions, and points to one of their components, specifically to modular constructions. Examined their design and also shows the benefits that come with this of type modern methods of constructions. Common ground benefits of modular construction philosophy begin to break the unprofessional especially from the public. Examples from abroad clearly demonstrate that this technology has potential even in modern architecture. The success of this technology depends on how they use the possibilities architects, planners and building engineers.

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