

## **Evaluating Construction Management Techniques in perspective of International Law of the New Construction Technology**

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### **Abstract**

At the international level, some rules have been determined and the present paper intends to study the rules in relation with assessing construction management technologies. Taking advantage of scientific methods and new technologies and materials are considered as one of the fundamental necessities to achieve qualitative development in the construction industry. Methods such as industrial construction lead to development of construction industry in many of the societies. Applying new technologies needs investigating technical, executive, and economic conditions of societies, as well as considering international law related to applying these methods and technologies.

**Key words:** construction management, international law, building, new technologies

### **Introduction**

With respect to the importance of using new technologies in the present world, many studies have been done in this field. Karim and colleagues (2012) studies the issue of risk management and its relation with new construction technologies in an article titled

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“assessment of risk factors in construction projects”. They declare that risk management has an important role in success of construction projects and knowing risk factors is very vital. In this study, risk factors have been studied from contractors’ perspective as one of the main factors of a project success. The results indicate five important factors of construction projects including lack of materials, postponing materials delivery, the required technology, low quality of working method, and financial problems. The results of the study helps contractors confront risks of the construction projects.

Wright (2011) has studied the assessment of construction industry capabilities in the United States to achieve success of projects that take advantage of nuclear technology. In this article, it has been mentioned that Kyoto protocol has encouraged many of the countries to act in order to decrease greenhouse gases. Therefore, applying nuclear energy has a significant importance in the public thoughts. Development of this method leads to industrial and technological evolutions; moreover, results of the paper will support construction industry. Adnan and colleagues (2011) have studied effectiveness of construction management information and construction technology. They believe that information management is one of the important factors of construction projects success. Today, the knowledge of information management needs high skills and enough experience and tools in order to be used in construction management and observation.

In the article “the necessity to use new construction technologies”, Golabchi (2006) declares that the society’s need for housing indicates necessity to use construction systems and new materials to increase speed of construction, decrease weight of construction, and increase stability of the buildings against earthquakes. Applying the presented recommendations and strategies of this research could provide the field for wide use of such systems in different parts of housing and constructing industry. The results could be used by experts, consulting engineers, and other officials in executive applications. Mahdavi and colleagues (2010) have studied the importance of industrializing construction and presenting the required strategies to develop it. They believe that growth of population, increasing need for housing, and inefficiency of common and traditional systems in mass house producing have made it necessary to use industrial methods of construction. Over the recent years, some plans have been presented related to industrial construction in Iran; however, they are not successful. The reason is that some of the producing factories are dependent on the industrial countries technologically, and their proper technical rules are not available in Iran. In their article “use of new materials in construction industry”, Hashemi and Dadras (2008) have studied new materials in construction industry. It studies issues such as nano-scale materials, finding new category of constructing materials with high performance that could be called materials with high performance and multi-functionalities. Multi-functional performance refers to emergence of new and different

properties in comparison with properties of the normal materials. This helps materials have various applications.

Rapid growth of population, an increase of construction rate, and materials and resources limits have increased demand for applying new construction technologies. New technologies have provided different construction methods in the case of making buildings for engineers. On one hand, the correct analysis of new technologies of structures, and on the other hand, familiarization with characteristics of the new materials help construction architects and engineers to achieve new methods of construction and also find solutions for quality improvement and increase of new technologies efficiency in this industry.

New look to construction methods requires applying new construction systems. Although construction technology or performing methods are still unfamiliar in using the materials, recognition of the new technologies and discovering their characteristics help to meet their needs in the society. An increase of material quality, saving energy, economic saving, and taking advantage of construction management are the advantages of using these technologies. In this condition, not respecting construction standards as a result of incomplete introduction of new construction systems and technologies for majority of engineers and construction conductors, and lack of precise clarification of advantages and disadvantages of systems bring about some difficulties. At the international level, some rules have been determined and the present paper intends to study the rules in relation with assessing construction management technologies (Bell, 2007, p: 2). Moreover, in the future issues such as paying attention to the environment, public health, making money valuable, and life style will be very important. The living environment is dependent on issues such as low applying of materials, sustainability of life circle, products reversibility, and saving energy. Industrialization and new construction technologies lead to construction flexibility, flexible applying of urban environment, and qualitative development. Moreover, faster construction process makes the money more valuable, also, reproduction method and presence of flexible houses affects life style in the future.

### **Main body**

In Iran, construction capacity is not in accordance with the needs of the society and the current construction does not have proper safety. With regard to the role of construction industry in the economy of Iran, it is necessary to pay more attention to new technologies and applying new materials in the construction field. Today, construction based on pre-fabricated and industrial method is not common in Iran. Regarding the failures in the past four decades, the recent studies indicated that applying new technology for construction is the only way to achieve the considered goals such as responding to quantitative and qualitative needs of construction especially housing. Applying new methods needs precise

investigation of each of the systems in accordance with the international rules as well as technical, executive, and economic conditions of Iran (Hashemi, 2007, P:6).

Wide growth of construction industry, and growing need of the country for developing construction, and also considerable impact of the industry on national capital and industry result in necessity of paying attention to new technologies which are considerable regarding key factors such as time, cost, and durability. Moreover, incorrect methods of construction in the society have led to an unhealthy environment, and consequently an unhealthy biological system. In order to protect environment and arrive at correct construction, the applied materials in the buildings are very important. Choosing appropriate and sustainable constructing materials leads to decrease of energy consumption and provides a healthier environment (Thompson, 2007, p:4).

Lack of modernism flexibility of the twenty first century in applying technology and non-renewable energies for providing lightening, heating and cooling have resulted in critical crisis for eco-systems circle and life on the earth. As a result, in international plans and policies related to development, applying new materials has a specific role in relation with renewable resources of energy. Unfortunately, abundance of fossil energies resources and their low price in Iran, and also the high cost of new technologies of the primary investments are a barrier to development of applying these new technologies. Therefore, changing attitude toward production and development of constructing materials with the purpose of controlling and compensating damages are confirmed by the planners (Surinder, 2006, p: 11).

High-speed growth of population has led to lack of responding to house building demand in the societies and the available solutions for this problem are mostly based on traditional methods, while industrializing construction should be based on new technologies. Industrializing construction not only increases the ability to respond to the present demand but also has positive impacts on construction speed, quality, and final cost of the construction. Construction industrialization is one of the fundamental factors that increases production and brings about a balance between supply and demand in the market. In Iran, considering this issue is important with regard to the following issues:

- An increase of population and demand for housing in Iran especially among the young generation
- Necessity to make a balance between supply and demand for housing in Iran
- Low quality of traditional construction methods
- A decrease of energy resources and the need for saving energy in the buildings in order to decrease consumption patterns in Iran

- High cost of housing and inability of the middle class and the low class of the society to buy houses
- An increase of speed of construction process
- An increase of efficiency and employing educated work force
- An optimal use of materials and resources in Iran
- Iran seismicity and stability of industrial houses

The new technologies should be studied before application so that maintaining international standards in relation with their type of materials and method of their application could be considered.

With regard to the conditions ruling Iran construction industry, it has been revealed that using traditional systems for construction does not meet the needs of society; therefore, using technology is inevitable (Arbabian, 1997, p: 11). The experts believe that in each of the parts, technology is a factor for changing natural resources into the final products and services. In fact, technology is a factor that determines the process and condition of connection among activities involved in a service or producing process. The mentioned process changes data into the final output. In this process, the materials, human skills, work tools, devices, technical knowledge, and work culture have a significant importance. Therefore, it is incorrect to define technology as the only or one of the relevant factors, because it refers to a set of issues that needs to be defined. Technology issue in construction follows the same principle; therefore, common methods of construction should be studied in order to use technology in construction. Moreover, it is recommended to use construction experiences and/or technology of the other societies (Falah, 2001, p: 13).

## **Methodology**

### Evaluation method

The most important factor for selecting and evaluating a proper organized system of construction is to use a method that provides the continuous review possibility based on different conditions, and updating or correcting results. Moreover, such a method makes it possible to control all of the stages of the process. In the construction systems evaluation process, evaluation criteria based on plan perspectives and conditions should be determined. Then, determining value or credit of each of them gets important. It is also necessary to recognize how the criteria and facilities which are necessary for evaluation based on a scientific basis are applied (housing and construction research center, 2009).

### Criteria for selecting new technologies

According to the studies, new technologies for residential buildings will be evaluated as technically appropriate methods, if the following conditions are provided:

- The building and its components are designed in a way that has a proper formability.
- Elements that bear vertical loads are put on one another in different floors so that load transferring does not need to be done via horizontal elements. Elements that bear horizontal forces resulted from earthquake are designed in a way that they directly transfer forces toward the foundation and put the relevant elements in a vertical plane.
- Building is designed in a way that vertical elements (columns) are ruined later than horizontal elements (beams).
- Building plan should be based on a simple and parallel form at two directions which are perpendicular to each other and have no unevenness. Also, asymmetric changes of the plan should not be made in the height of the building.
- Mass center of each floor is matched with its toughness center or their distance at each of the building directions is less than 5 percent of the building dimension at that direction in order to decrease torques resulted from earth quacks.
- Non- structured members and components especially glasses and façade particles should be designed and executed so that they get not separated or collapsed by earthquakes and do not bring about financial and human losses.
- Non- structured members, especially internal walls and facades should be executed in a way that they do not bring about a barrier to movement of structured members at the time of earth quack occurrence. If this is not executed, the interaction between members and structured system should be considered in the structure analysis (Golabchi, 2009, p: 34).

## **Discussion and results**

Construction system is usually made based on untraditional and industrial methods and includes combined production of methods and materials for design and construction process, it also represents designs and techniques and results in specific construction forms (Saleh, 2008, p: 21). The term of industrializing construction is used to describe module concepts, pre-fabricated construction, and assembly. It means bearing costs related to equipment, facilities, and technology with the purpose of increasing output, and improving quality (Chilton, 2000, p:3).

Construction system includes design rules and production system so that its parts could have compatibility and take advantage of different construction components that could be

assembled. Components compatibility and different methods of construction system assembly are obtained via dimensional system, allowable error, and joints and connections. In fact, construction system refers to making a system for construction or a set of construction components which are assembled in different ways to make different forms (Hacker et al., 1997). Construction system includes the required activities for a specific type of construction along with techniques and procedures. Such a system includes different technical and managing methods to produce and assemble elements for a certain purpose; it is a set of relevant elements that do activities together to provide a certain performance of construction (Arbabian, 1997).

Production concentration, mass production, standardization, specialization, appropriate organizing, and convergence are needed conditions for the success of the mentioned process. Today, industrial construction means applying organized and modern methods of design, production planning, control, and automation and mechanism process of production. This process refers to applying technologies in order to replace the workmen with machines. Such a phenomenon occurs naturally in the workshop, manufactory, or any other determined place and it replaces workmen with machines. Industrial construction systems have several features. For instance, construction elements are produced as prefabricated forms out of the site. This activity is done in a central building with relevant organized and professional equipment. Moreover, different construction activities have been integrated with the minimum amount of requirement for making, connecting, and processing the elements which could be assembled in the site. Moreover, applying materials and components in the site is done based on a mechanized way. If the concrete components are applied, standard steel elements, concrete with previous mixing, and concrete pumps are used. Furthermore, design, production, and establishment within the site are completely related to each other. Therefore, they should be considered as parts of a convergent process and get planned and organized. Automation could enter construction process to decrease human intervening and improve design, production, and construction quality in the site.

#### Essence of technology and its realm

Paying attention to technological affairs has led to neglecting essence of technology.

According to Heidegger, essence of technology is a specific ratio formed for humans over the new period. He considers the world in a special way and organizes it based on the mentioned ratio. To him, this ratio and consideration are the basis of development of the new sciences. The new sciences have not resulted in achievement of this ratio. In fact, the new sciences act as tools to achieve what is called the essence of technology. Contrary to the belief that technology is a tool for achieving new sciences, it should be mentioned that the new sciences are tools to achieve technology. (Rikhtegaran, 2001, p: 22). In different



positions, when he talks about Logos, he describes components of the world and describes the object based on non-metaphysical terms. He declares how the ratio of human to the object and his consideration of the nature change in each of the worlds. He interprets components of the world as a “fourfold” term.

A newer consideration of nature and objects would enter the realm of technology. In this new ratio and consideration of the realm of technology, only perception, knowledge, nature, and objects are not considered. In fact, doing and capturing the essence of objects are also important. Knowledge pays attention to “doing”; therefore, the ability to do something is the criteria for knowledge and perception. In the realm of technology, the ability to “do” means mastering the earth and nature via capturing power. It is obvious that to capture nature, the nature should be prepared and at hand. The preparation of nature for being captured is achieved via essence of technology and the new ratio of human with the object. The essence of technology has made a ratio in which nature is an energy standing reserve resource prepared for human’s consumption.

The essence of technology provides the opportunity to perceive the world in a certain way, organize it, and make a ratio with it. In the realm of technology, the nature changes into a constant ratio and into an energy resource for human’s consumption, then this way of making a ratio with the world in a technological era is changed into the dominant way the world is perceived (Yu, 2002, p:10).

All technological products are produced based on their specific roles. This specific role facilitates the process of fulfilling daily affairs. When any product is produced to arrive at a specific kind of profiting and is only produced to be consumed and play an important role, its presence in the manufactured is meaningless. This issue is true that in the age of production, we can confront reproductions of the greatest works of art with the best quality (Saleh, 2008, p: 11).

#### Construction management based on international standards

Regarding work process based on international standards, the project director selects a firm that presents construction management services as CM (construction management) via negotiations or competition. Then, construction manager acts as an employer’s consultant and fulfills planning and organizing affairs, as well as current activities management in design and execution phases (Ardent, 2002, p:16).

Construction management method is considered as one of the common methods of executing projects and it has a recognized and special position among managers and projects decision-makers. Generally, two categories of employers are interested in this method. First category refers to employers who deal with construction projects, while their



profession is something else; for instance, health offices, education office, and defense office employers. Since these employers are not constantly involved in projects, they select professional managers to execute the projects. The second category of employers refers to those who employ professional managers with the purpose of accelerating execution, improving quality or other issues (Prieto, 2000, p: 14).

The following factors are the causes of construction management emergence:

1. The necessity of presence of a factor that takes the responsibility of all construction aspects.
2. The necessity of integration and correct relation between design and execution.
3. The necessity of technical applying of planning and management for design and construction phases.
4. Time limit for executing plan and covering a part of plan and construction phases.
5. The employer's tendency to control project execution activities and recognize weaknesses.
6. The employers' fear of not taking part in the project execution and not achieving the determined goals (Arden, 2002, Prieto, 2000).

#### International law of construction

A study on construction system of countries indicates that in Germany that has a state government system, all constructions are done based on direct intervention of the municipalities and their direct control. However, in England the emphasis is on the private sector and respecting rights of the third parties is necessary in construction (Lewcock, 1986, p:4). Since France is very conservative, it is rarely flexible in this field and has the least intervention in qualitative aspects and technical standards of construction. In Italy construction depends on improving life quality and protecting environmental and historical values. Finally, the United States has a very efficient and assured construction control system that highly respect the third party's rights, qualitative rules, and construction technical standards (Dewsbury et al., 2002, p:14).

Australia and Malaysia have very accurate and efficient construction control rules that are considered as proper pattern for all developing countries. Sweden, Netherlands, Norway, Finland, and Denmark have also acceptable systems (Barry, 1999).

Totally, the perspective of countries' internal laws toward B.O.T contracts is determined in three categories:

1. Some countries have a narrow perspective and try to make various laws to determine how the method is used via determining detailed standards of construction,

exploitation, observation on plan execution, and respecting environment rules. This perspective brings about disorders in the plan execution process. For instance, the government representatives' intervention disturbed the plan of making a tunnel which was left to a private company by German government.

2. Some countries such as china are flexible and give freedom of act to the private section to make different contracts and execute plans. Administrative rules in these countries are limited and the legislator only defines the general framework of the contract and leaves the details determination to the parties' agreement.
3. Some countries such as Hungary have a middle position. They avoid giving a high amount of freedom to the private sector, and they do not determine detailed rules. In this method, the government neither determines details nor gives absolute freedom to the private sector for making contracts and executing projects.

Development of construction industry is considered as one of the symbols of countries growth and development. The maximum portion of fixed capital and employment exists in industry section and attracting efficient and educated people in this section. Quality improvement in materials production, design methods, accelerating construction process, competition in technological progress, optimal use of work force, and taking advantage of new construction process are the effective components of this industry.

Planning, designing, and executing construction projects need selecting or determining a proper executing method among a number of different choices. The industrial countries' studies and experiences indicate that quality control and assessment in construction industry is more complicated than that of other industries. It is not easy to show by short-term tests that a construction system has the required durability in the real external conditions or in the long-term aggressive conditions. This issue and complexity of construction systems made up of different components lead to difficulty of standardizing the products. Therefore, passage of time and understanding all technical aspects is needed to achieve the purpose of the present paper (Housing and building research center, 2009).

## **Conclusion**

Comparing advantages and disadvantages of using new materials and technologies, what matters is that by addressing executive disadvantages and teaching people the imported technologies it is possible to exploit the mentioned advantages. Moreover, by addressing the disadvantages that have been mentioned, the construction industry will be developed and give people the opportunity to live in the buildings based on the up-to- date technology. This will not happen, unless a correct planning is done in the macro-level of the construction industry of the country. So far, effective affairs have not been done to change the construction methods, and the traditional methods are still used. New methods of

construction bring about the opportunity to take advantage of features such as lightness of materials, easiness of assembly, speed of execution, lack of dependence on various equipment and devices, and lack of need for experienced work force for decreasing weight of the buildings, increasing stability, decreasing construction time, increasing durability, and decreasing housing projects execution. Today, the construction industry of Iran needs to move toward mass production, time and cost saving, using technologies, and new construction materials. The attempt to use technologies and new materials leads to high speed execution and lightness of the structure. Moreover, using these new materials should be based on international standard execution details in order to achieve their real performance. In order to develop quality of construction industry, it is necessary to apply new technologies and materials as well as the scientific methods. Methods such as industrial construction have led to improvement of this industry in many of the societies. Applying new technologies needs an investigation into economic, technical, and executive conditions of societies as well as paying attention to international laws to exploit these methods and technologies. Industrial production is also an important need in Iran and arriving at it requires making culture and establishing the production. The successful plans formed based on industrial construction methods should be introduced and Iranian architects and engineers should be familiarized with advantages and facilities of such buildings because the growing need for housing has left no solution but industrial construction. Research and planning centers of the country should provide design and construction standards with regard to the relevant international laws, Iran conditions, development of construction execution methods based on the new style, and exploiting the new technologies. Proper applying of new technologies in construction industry addresses problems such as energy, time, place, and cost limits. Therefore, applying the new world technologies and experiences based on new methods and materials is important in the field of construction. Today, methods of construction by stable and light materials have considerably developed in different countries of the world and executive rules of them could be helpful.

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## **References**

1. Rikhtegaran, Mohammad Reza, (1992), “ art and technology: contemplating art and beauty principles” art magazine
2. Falah, Mohammad Hasan, Vatani Osqui, Asghar, ( 2002), “ feasibility of light steel framework system in decreasing energy consumption”, 2<sup>nd</sup> assembly of optimizing fuel consumption in building”, international assembly center of the media
3. New construction technologies, (2009), housing and construction research center related to supporting law of house demand and construction, housing and urbanism ministry
4. Golabchi, Mahmoud, (2006), “ the necessity to exploit new construction technologies”, the second construction seminar in Tehran
5. Mour, Foler, trans. Golabchi, Mahmoud, (2005), “perceiving behavior of structures”, no. 2502, edit. 3<sup>rd</sup>, Tehran university pub.
6. Hahemi, Elaheh sadat, Dadras, Sara, (2007), “ use of new materials in construction industry”, 14<sup>th</sup> conference of civil engineering students
7. AISI (American Iron and Steel Institute). “ Residential Steel Framing Manual “ , publication (RG- 930), 1998
8. Arbabian, H., Changes in building construction in an earthquake country, PhD ,Thesis, University of Manchester, 1997
9. Abd Karim, Nur Alkaf and Abd Rahman , Ismail and Memmon, Aftab Hameed and Jamil, Nurhidayah and Asmi, Significant risk factors in construction projects: contractor’s perception, Ade (2012)*Significant risk factors in construction projects: contractor’s perception*. In: 2012 IEEE Colloquium on Humanities, Science & Engineering Research (CHUSER 2012), 3-4 December 2012
10. AIA Minnesota. “Understanding Project Delivery.” [www.aia-mn.org](http://www.aia-mn.org).
11. Adnan , Enshassi; Abushaban, Saleh, Examination of Usage and Effectiveness of Information Technology Management within Construction Organizations, The Islamic University Journal (Series of Natural Studies and Engineering) Vol.19, No.1, pp 121 - 138 , 2011, ISSN 1726-6807
12. Berger, H. “Light Structures – Structure of Light” Basel , Switzerland, Berkhauser, 1996
13. British Steel Institute “ The Lightweight Steel Framing System for Housing” SureBuild , May 1994
14. B. Prieto. “BOT Projects at Risks.” PB Net Work, March 2000. pp.44-46
15. Barry, R., 1999, the construction of building, 7th ed., Blackwell science Ltd, Oxford, UK.
16. Chilton, J. “Space Grid Structures “ Architectural Press , Oxford, 2000

17. Dewsburya,G., Clarkea, K., Rouncefielda, M., Sommervillea, I. Taylorb, B. and Edgeb, M., 2002, Designing acceptable 'smart' home technology to support people in the home, *Technology and Disability*, Vol.14 , pp1–9 TAD132
18. E.Bell, Trudy, "Understanding Risk Assessment of Nanotechnology", 2007
19. Erik R Wright, Assessment of U.S. construction industry capabilities for successful delivery of nuclear power projects, 2010, Degree, M.S.C.E. Advisors Makarand Hastak, Purdue University. Engineering, Civil
20. Hacker, H. and Julie, Georgees, "Residential Steek Design and Construction (Energy Efficiency cost Savings Code Complacence.) " 1997
21. INTL Development Research Center, "A Place to Live: More Effective Low- Cost Husing in Asia". 1984
22. Lewcock, R., 1986, the old walled city of Sana'a. UNESCO, report, Yemen, no.6
23. Mathur, G.C., "Low Cost Housing in Developing Countries ", South Asia Books, 1993
24. Roan , A, "Light Steel Farming in Residential Husing" *New Steel Construction*, April/May 1998, p. 36
25. Surinder Mann, "Nanotechnology and Construction", *European Nanotechnology Gateway*, 2006
26. Scharff, R., "Residential Steel Framing Handbook " , *Walls and Ceiling Magazine* 1996
27. Saleh, Joseph, H. (2008), *Analyses for Durability and System Design Lifetime*, Cambridge, Cambridge University Press
28. Super Frame R.C. Techniques in High-Rise Buildings Construction ,” *Kajima Coporation Research Department* , 200
29. Trebilcock, p., *Building Design Using Cold Framed Steel Section: An Architect's Guide”* , *The Steel Construction Institute*, 1994.
30. Thompson, Steve (2007), *A People-focussed, Sustainable Approach to Design Using Open Building Manufacturing*, *The Transformation*