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EXAMINING OF MODERN CONSTRUCTION METHOD IN WORN OUT RESIDENTIAL TEXTURES WITH PASSIVE DEFENSE APPROACH (CASE STUDY: SHAHIDKHOOBBAKHT NEIGHBORHOOD, TEHRAN)

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ABSTRACT
Current research pays attention to revival of worn out textures in confrontation with enemy air and missile attacks or natural disasters such as earthquakes as well as expectations and needs. In addition, it can be stated today construction need is proportionate to crisis dimensions, rather than just the building and a safe, non-expensive, stable with long life is considered which is built at the shortest toe compared to current construction approaches. Industrialization of construction may be one of the most suitable solutions in solving problems related to crises in our country. Considering emergence of modern construction technologies and advanced implementation methods it seems achievable. Given studies and importance of solving problems related to worn out textures in our country as well as necessity for addressing issues in design of worn out textures with passive defense approach and use of novel construction methods, it is attempted to propose industrialization system and advanced methods of construction. Also, current paper attempts to study ShahidKhoobbakht Neighborhood, District 10 in Tehran as case study. Considering narrow streets, high density, proximity to the fault location, population, quality exhaustion, and type of buildings, this district proposes important indicators of utilizing modern approaches of construction in revival worn out textures at short time in high quality.

KEYWORDS: Crisis, Modern Methods of Construction, Worn Out Texture, Passive Defense, PLSC

INTRODUCTION

One of the main issues which may play critical role in revival of worn out residential textures is utilizing modern methods of construction and its failure in meeting expectations and needs, although, achieving this goal is feasible using technical achievements in construction sector. Despite of availability of related technology, it has not realized yet due to incomplete infrastructure and it seems that the country's engineering community does not have comprehensive and perfect understanding of it. Therefore, still this belief has not been achieved that the building can be designed and implemented with all above advantages in cheaper price and quicker way. Hence, speed and reduced construction costs are closely related to success in construction industrialization. Industrialization of residential buildings is one of the most suitable approaches in solving problems related to passive defence in order to reduce natural and unnatural disasters in our country (Aisa, (1998)). Achieving this goal seems feasible considering emergence of modern construction technologies. Thus, given importance of solving problems of worn our textures in our country and necessity of addressing above issues, current paper attempts to investigate modern construction methods in order to reduce disasters with passive defence approach (Landolfo, 2006).

Various solutions have been suggested to solve this problem. They are solutions based on traditional view to construction and no serious review has been done in the way of its design and implementation (Rogan, 1998). It is clear such thinking does not meet to solve problems of this sector. Hence, the main issue which should be addressed regarding defence approach against worn out crisis is changing attitude toward the subject and solving it in a different view. Paying attention to industrialization of construction and housing as a national necessity is the same change which should be achieved so that modern methods based on novel construction technologies can be used. If direction is shifted toward construction industrialization, not only present demand of the society id met, but also serious positive impacts would be observed on construction speed, quality and total cost. Construction industrialization is one of the main factors in increasing production and establishing balance between supply and demand in the market. Construction industrialization observes all activities related to design, technologies, construction methods and manufacturing production of construction pieces, which are done with complying with scientific principles and based on modular and chain standards and observing cultural, social, and economic requirements and principles of sustainable development and passive defence. Construction industrialization requires progress in the same pace of other industries. Meanwhile,

construction industry as an old industry spends considerable part of national assets and no significant progress has been observed compared to other industries, thus it requires special attention (Davies, 2000). Purpose of construction industrialization on worn out texture crisis is speeding up the production and increasing share of manufacturing products and reducing share of implementation and changing it to installation and assembly. Light building, retrofitting, savings in materials, reduced energy consumption during construction and operation, reducing construction period, thus reducing the costs of construction and operation of buildings in times of crisis are outcomes of construction industrialization. To this end, supporting this industry seems necessary to achieve following goals. In Iran, effect and importance on construction industry can be observed and investigated in following dimensions (Shoja, 2010).

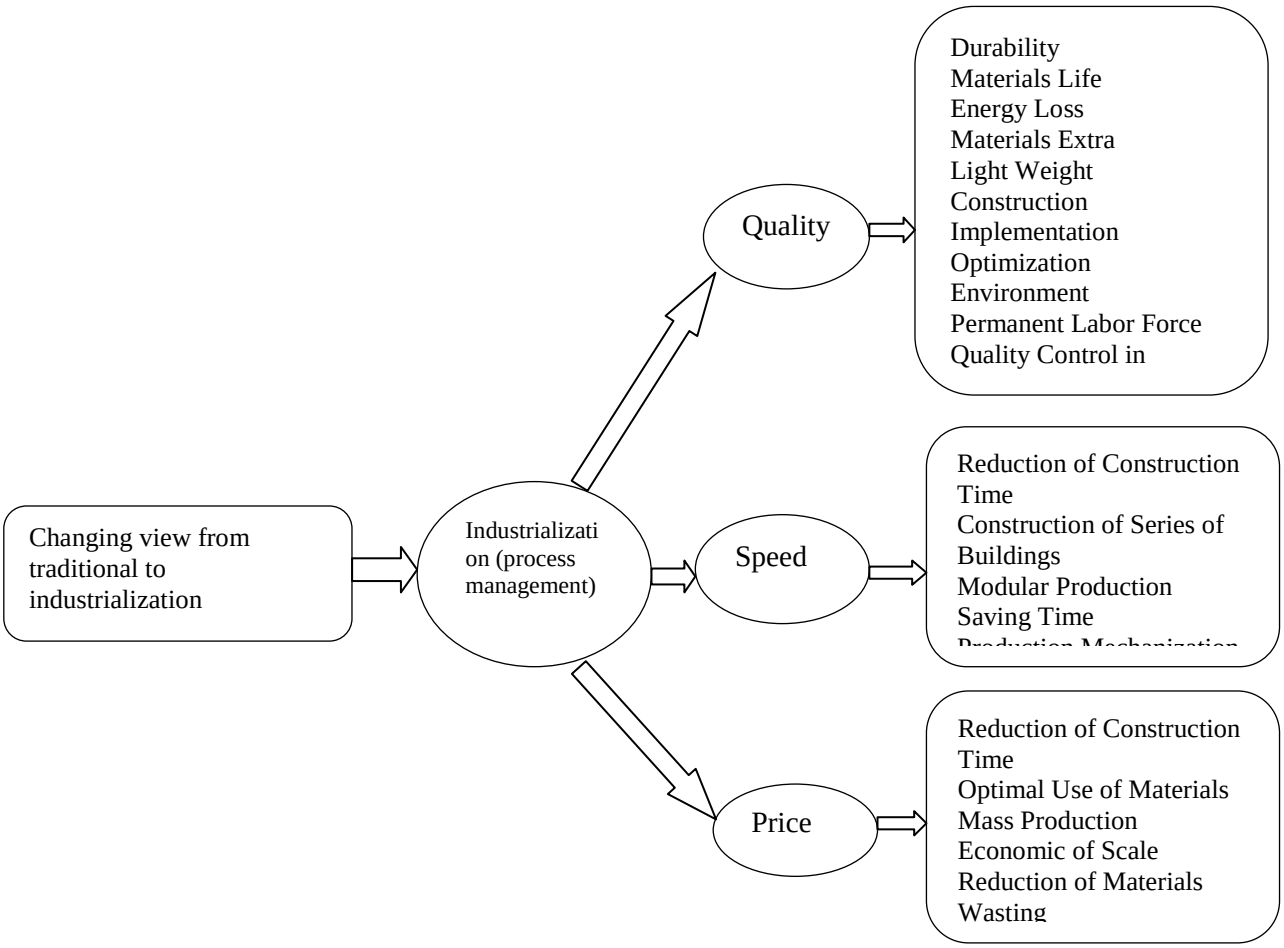


Fig 1: Goals of industrialization (Khalilian, 2013)

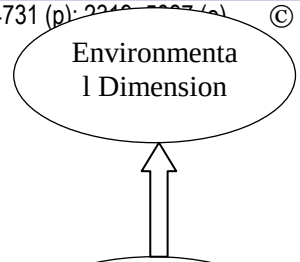


Fig 2:Industrialization dimensions (Khalilian, S. (2013))

The only technical solution for production of residential units in worn out textures is use of industrial methods for implementation of building and various technical techniqueand proper management of worn out residential textures. Construction industrialization does not necessarily mean use of a novel and distinctive construction system; rather it means reduction of costs and increasing speed and ease of construction operation in times of crisis with passive defense approach. It would be achieved by the help of mechanical tools, widening in-situ elements using modular and eliminating or reducing unnecessary details or replacing them by the appropriate procedures (Haghdel, 2000).

In summary, causes and factors affecting process of industrial products can be described as follows:

- Continuous and constant changes in sciences and technology which result from intellectual continuation and endeavor of human beings over the history
- Increasing crisis of population growth in worn out residential textures introduced need for higher production in shorter time, and mass construction thinking as a passive defense solution substituted previous methods
- In comparison between machine and human, effectiveness of machine is much more than human and thus performance of simple workers in crisis has no economic value whether at macro and micro scale.

Mass production and economy of scale is obtained through complying with standards, cheaper price, better quality, quicker and higher production, and its role has become so strong in air attacks and natural disasters that it is necessary for production of every industrial and semi-industrial country (Haghdel, 2000).

Since 1955, the subject of industrial construction production and prefabrication was introduced in Iran. Various factories were assessed; heavy prefabricated systems common in European countries were purchased and entered into the country by spending considerable costs. This process did not gain significant success mainly due to dependence on ordering great complex building projects, and most of the factories were shut down. Following a period of recession, industrialization of housing has been emphasized again and attitude to it from a different view may be effective in success and progress of the goals (Haghdel, 2000).

Current problems related to worn out texture crisis include production of nonstandard materials, lack of investment, lack of observation on material production process, extensive employment of seasonal unskilled workers in construction and generally technology poverty and reliance on outdated and inefficient methods. Durable materials, quick implementation, saving materials, preventing energy waste and light building, disaster resistant construction and deployment of skilled manpower necessitates construction industrialization as one of the main solutions, since in addition to observing standards and regulations related to stability of buildings in different climatic and seismic conditions of the country, it increases speed of implementing construction projects (Haghdel, 2000).

Research Hypotheses

H1: Industrialization of construction in dimension of reducing losses resulting from missile air attacks, etc. and natural disasters can be effectives as one of the most suitable solutions in current problems of worn out textures in our country's cities.
H2: Industrialization leads to increased public appreciation and its acceptance and advancement in the professional community due to transportation and installation and easiness, fast building, and being economical in construction of worn out textures.
H3: Which method is best fitted to worn out textures following air and missile attacks and natural disasters? Traditional and common method or modern construction methods?

MATERIALS AND METHODS

Current research is an analytical – descriptive research of applied type. In other words, following scientific description of the phenomenon, data are analysed and finally a scientific and logical result is synthesized from the analysis which is providing alternatives for improvement of the plan considering goals and choosing optimal option. Also, considering nature of research data, research method is qualitative based analytical process. To this end, data are collected using documents and field study. At document stage, data are collected from books, journals, studies, maps, aerial pictures and internet websites. At field study stage, in addition to field observation and survey, maps are synchronized and data are collection. Thus, the major sources include specialized books and journals, related research plans and World Wide Web. At regional survey area, descriptive- analytical and inferential methods are used where direct observation and imaging method at field studies are utilized (Khalilian, 2013).
Results obtained from understanding the region and actually environmental survey are analyzed using reasoning - inductive based on the SWOT technique. In this stage, the strategy is selected following extraction of facilities and opportunities and limitations and threats and finally policies, solutions and recommendations are given (Khalilian, 2013).

Area under Study

Introduction of ShahidKhoobbakht Neighborhood and Offering Revival Plan after Event

As mentioned earlier, revival of worn out textures following natural disasters and enemy missile attacks is one of the issues which has not been addressed seriously up to now (Andalib, 2013).
District 15 in Tehran Municipality is one of 22 districts of Tehran Municipality which is situated at southeastern corner of the city. This district is bounded by Districts 12 and 14 in north, districts 16 in west, and District 20 in south, and its eastern boundary is legal and privacy shielding boundary of Tehran (Andalib, 2013).

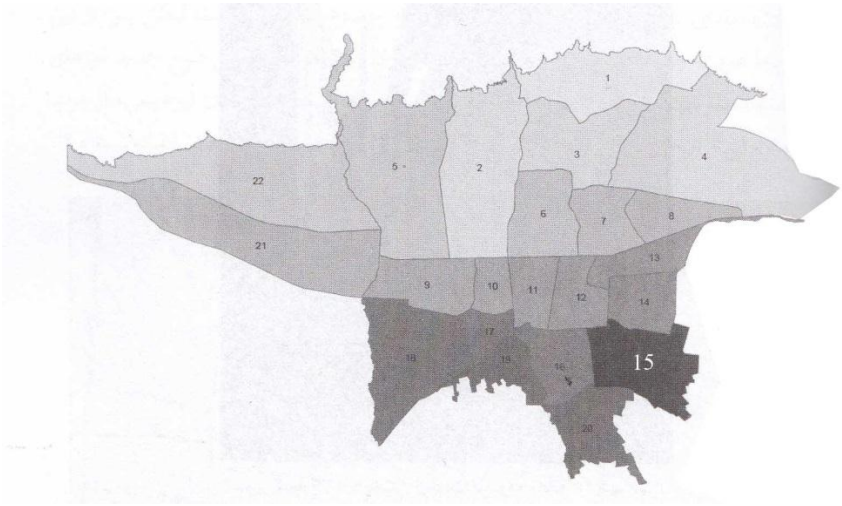


Fig 3: District 15, Tehran municipality

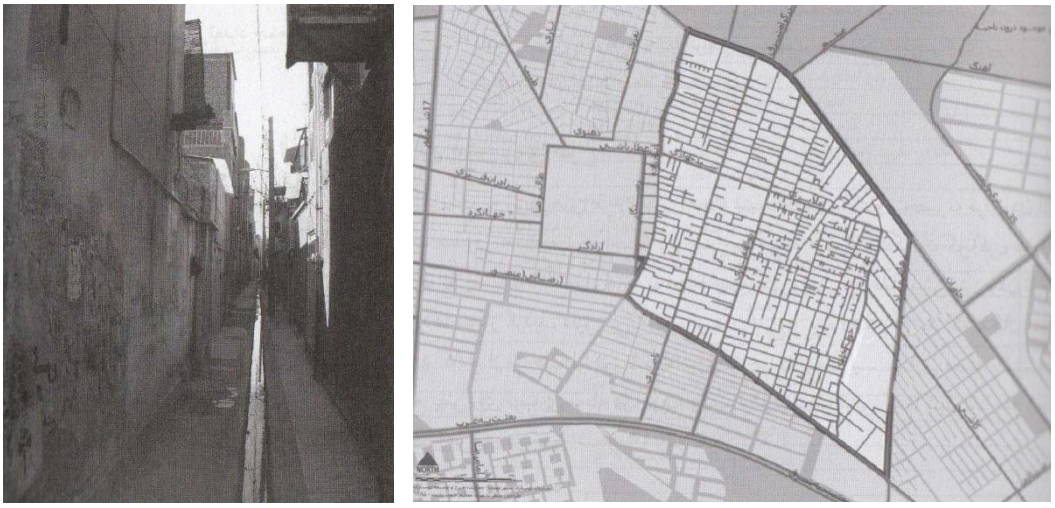


Fig 4: Map and image of ShahidKhoobbakht neighborhood

Area of district is above 2343.6 hectares which accounts for 5.5 percent of total area of Tehran districts. In addition, shielding space of Tehran in the municipal area of this district is over 16,500 hectares, which is 14.6% of the total area of privacy shielding space of Tehran. Based on formal figures, the population living in the district between the years 1981 to 2002reached to about 420.6 thousand from 692.8 thousand (Andalib, 2013).
Factors such as dependence of low-income families living in the city and district, construction of much of the district's residential texture from 1959 to 1986 and as a result, the influx of immigrants to the city and its periphery and residency in this district, housing and separation of land policies applied in those years, construction of considerable part of the district's texture within framework of residential cheap complexes for low-income and families lead totexture compression, granularity of parts, high density housing, narrow passageways, narrow and inadequate access networks, physical or functional exhaustion of the texture, small building units at the margins with poor image and without specific architecture, which are salient characteristics of large part of residential texture in this district (Andalib, 2013).

Obstacles for Plan

Considering worn out residential texture and its overall structure, various problems and obstacle are expected after occurrence of accidents in this texture. It is because of worn out texture's density in a given point of Tehran (Andalib, 2013).

Modern construction methods are investigated for cheap and quick mass construction at crisis conditions and according to the country's possibilities, and finally modern construction system in such textures in the country at crisis and emergency conditions is introduced (Andalib, 2013).
Due to following differences, earthquake is especially important compared to other natural disasters in this district of Tehran:
A) very high damage, B) a very short time (less than a minute occurrence of earthquakes), C) destruction of vast areas of tens of square kilometers, D) continuing threats posed by the aftershocks which sometimes takes more than one turn at different times, E) prediction of its approximate time is very difficult and its accurate prediction is now almost impossible (Chamran, 2005).
Considering above characteristics, it needs more accurate analysis because of such factors as development and increasing number of cities sometimes in similar areas, increased density and related demographic facilities, and increased recording knowledge (Ebrahimian, 2004).

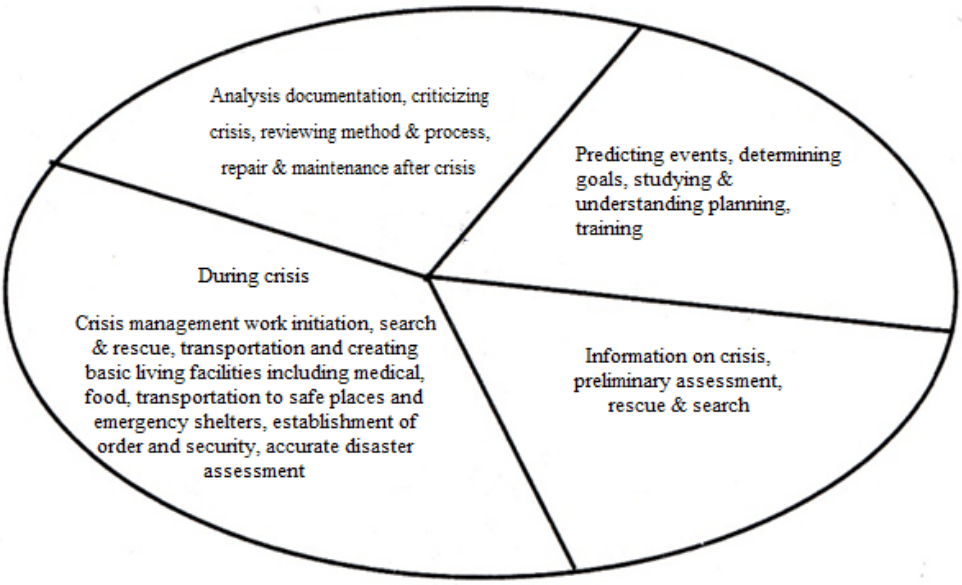


Fig 5: Structure before, during and after crisis (Savadkuhifar, 2007)

RESULTS AND DISCUSSION

PLSC System

Use of PLSC system can gain considerable prevalence in revival of worn out textures at crisis conditions due to significant advantages such as speed and high quality of construction, performance, substitution of weak points of systems and combination of the proposed system's strengths (Khalilian, 2013). In the selected system, it is attempted to cover weaknesses of the systems by other prefabricated systems so that a suitable combined system is obtained. For example, in system of prefabricated concrete beams and columns, columns are integrated using metal joints due to transportation limitations. Prefabrication principle is used in columns because of shear stress and getting out. The greatest limitation in LSF system is the limited number of floors. Also in metal structure, lack of use of other prefabricated system for roof and wall after implementing the structure is the other disadvantage of this system. PLSC combined system uses all strengths of these systems (Khalilian, 2013).

Introduction of PLSC Composite System

Implementation method of PLSC system and constituents of PLSC system are described in summary.

PLSC System

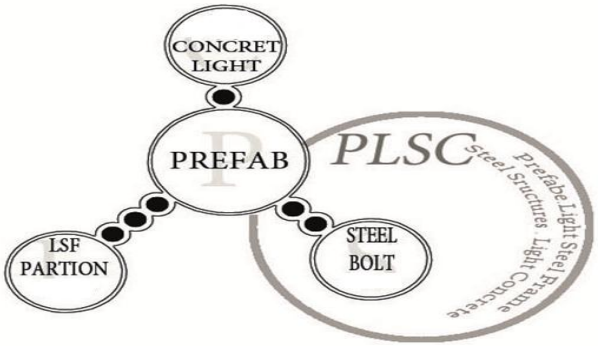


Fig 6: PLSC System

The main aim of using this system is overcoming limitation at crisis condition in textures with mass worn out residential buildings and improving construction material production and using prefabricated pieces in engineering construction. Governance of this attitude in construction forces leads to increased skeletal resistance of of the buildings, shortening construction time, reduction of implementation costs and minimizing construction losses at crisis condition in worn out textures (Khalilian, 2013).

PLSC (Prefab .Light.Steel. Concrete) Constituents

Constituents of PLSC system are described and a brief explanation is given about the way of implementation in this section.

Foundation: for installing prefabricated metal columns and establishment of the system

Concrete prefabricated foundation is implemented with prefabricated chaînage in tuned locations (Khalilian, 2013).

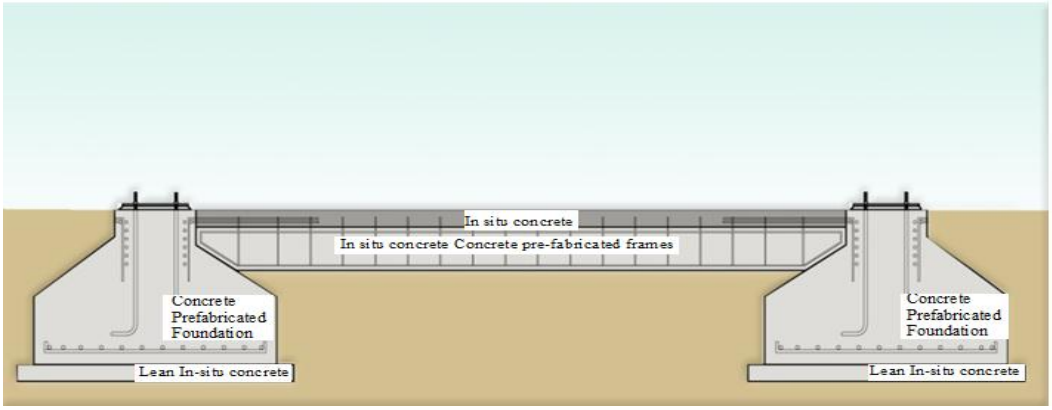


Fig 7: PLSC system's foundation (Khalilian, 2013).

Structure: Using bolt and nut prefabricated steel structure leads to development of construction and implementation quality as well as increased speed of skeleton implementation. Also, wasting in girders is minimized using modular system (Khalilian, 2013).

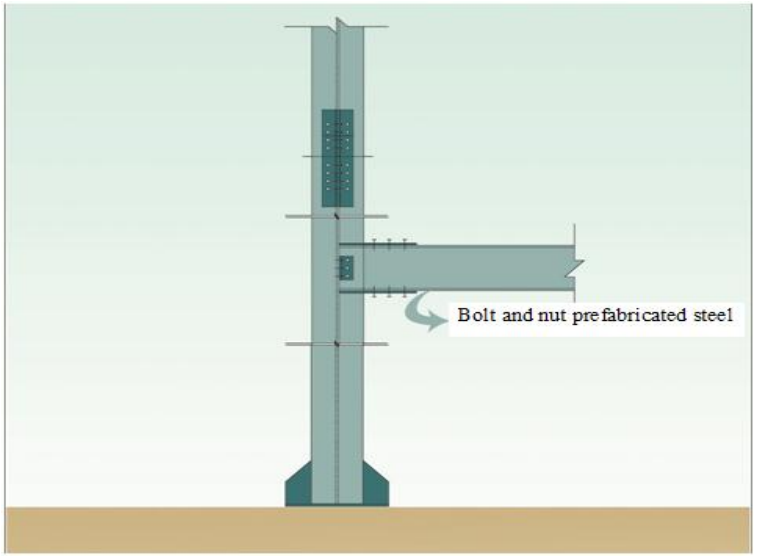


Figure 8. PLSC system's skeleton (Khalilian, 2013)

Wall: Constituents of the walls are LSF construction system. Walls are installed as panel form in this system for separating internal and external spaces of the building in module way. Steel studs are usually holed already for passing

electrical and mechanical facilities and the studs are joined often in top and down with 40 – 60 cm distances and rounds (main horizontal elements), and they are built as panel by installing chalk or concrete panels. Fig 23-2 indicates a sample of LSF wall (Khalilian, 2013).

Inner casing of the wall is made of plaster sheets, sheets of MDF, PVC sheet, cement board, wooden planks and sandwich panels, cement fiber, cement board, tile up, or Rabytsand traditional works (brickwork, stone facades, metal, etc.) can be used for the outer casing of wall. Casing added to both sides of the wall increases wall stiffness and seismic resistance by 40%. Implementation of common casings in LSF system is shown in Fig 4-2 (Khalilian, 2013).

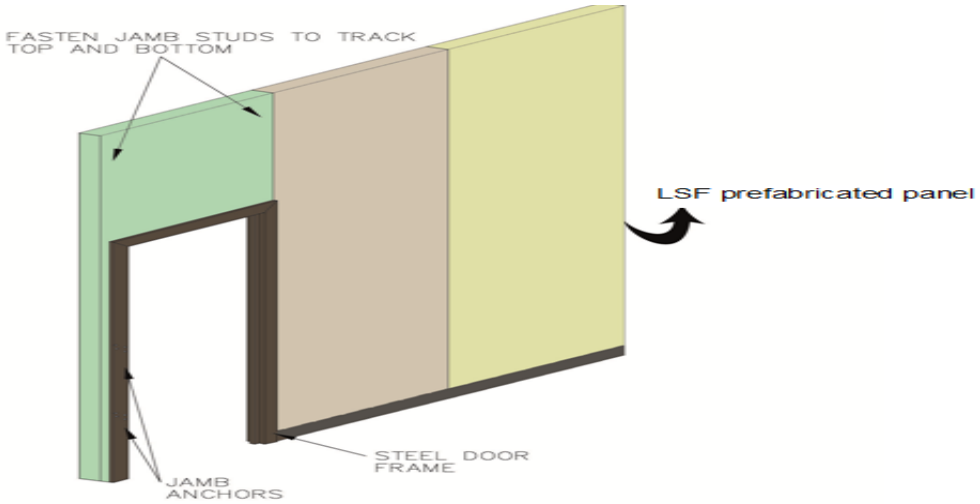


Figure 9. Walls in PLSC system (Khalilian, 2013)

-Roof : Various ways are used for roofs in PLSC system, so that simple flat forms to crossed roofs with unequal slopes can be implemented. This way of roof implementation includes:
Intermediate roofs (floors) are installed in concrete slab system with the ultimate flooring according to joinery table. In addition, a steep roof with minimal slope is used for roof. An interesting characteristics in PLSC system is creating volume and form desired by the architecture based on structural skeleton so that more variety is provided in architectural plans in PLSC system compared to traditional construction system which allows compatibility to local architecture. Unlike traditional systems in which the final and joinery form of the building is not much distinguished after framing stage. There is short distance between framing stage and joinery stage in PLSC system, so that implementation of joinery stage is done in higher speed and ease and implementation of final construction stages and higher accuracy and delicacy is observed in PLSC system compared to other systems used in construction. Fig 9-1 gives a sample of joinery implementation in PLSC system and its final plan (Khalilian, 2013).

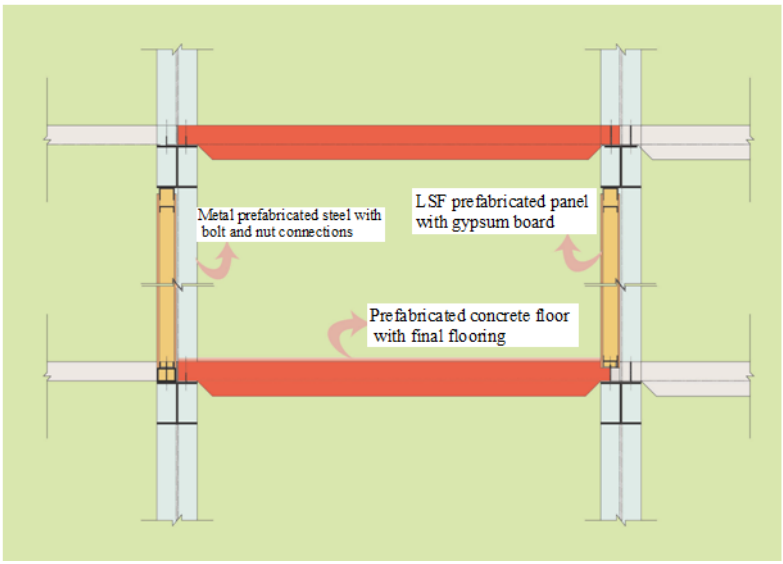


Fig 10: Roof PLSC system (Khalilian, S. (2013))

Facilities: In this system, mechanical facilities are installed as prefabricated cell in WCs and bathrooms, and they are joined to the building's dockets.

Also, electrical facilities are considered at every panel which is joined by a male and female at the end of wall. Maintenance, repair or replacement of parts is done simply which is one of advantages of PLSC leading to increased useful life of the building (Khalilian, 2013).

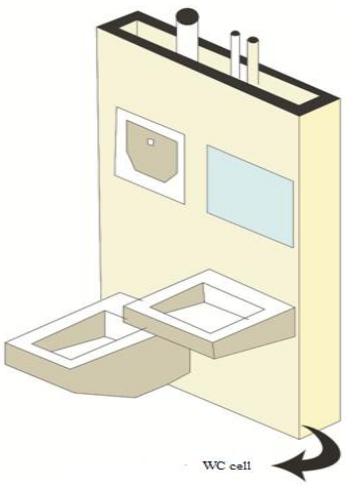


Fig 11: Facilities of PLSC system (Khalilian, 2013)

Advantages of Using PLSC System in Worn Out Textures before and After Event
Considering above materials, use of PLSC system in worn out texture is for measures which have considerable advantages, main of which are given in Tables 1 and 2.

Table 1: Advantages of using PLSC system for different groups (Khalilian, 2013)

No.	Group	Advantage
1	Designers	Flexibility in the design based on the modules of the plan-variety in view's materials - to meet the requirements of building's standard – designing a modern construction system - full compliance with the provisions of section 19 automatically
2	Constructors	Quick system implementation – reduction of labor force costs - low stop time – uninterrupted parallel activities in other parts of the construction - resistance maintenance - ease of installation of facilities system - requiring little workshop space - safety in workshop place - prefabrication and mass production – reduced costs
3	Users	Lower operating costs - good audio performance - healthy indoor environment - Increased interior space
4	Environment protection authorities	Less material - less traffic and transportation – preventing from waste of energy - clean construction site - reducing energy consumption
5	National resources	Requiring far less material than traditional systems and minimal material wasting

Table 2: Advantages of using system (Khalilian, 2013)

No.	Advantage	Results
1	Resistance, high hardness Accuracy in implementation of details	Good seismic performance Elastic behavior of structure
2	No delays caused by weather in the production, construction, and installation of the structure	Significant reduction of construction time Quick return on the initial investment Making it economical for constructions of the Guards
3	High resistance to decay and termite attack, uniform quality , Recyclability	Environmental sustainability and compliance with principles of sustainable construction durability and sustainability of structure, extending the life of the building structure Reduced cost of building maintenance and repair

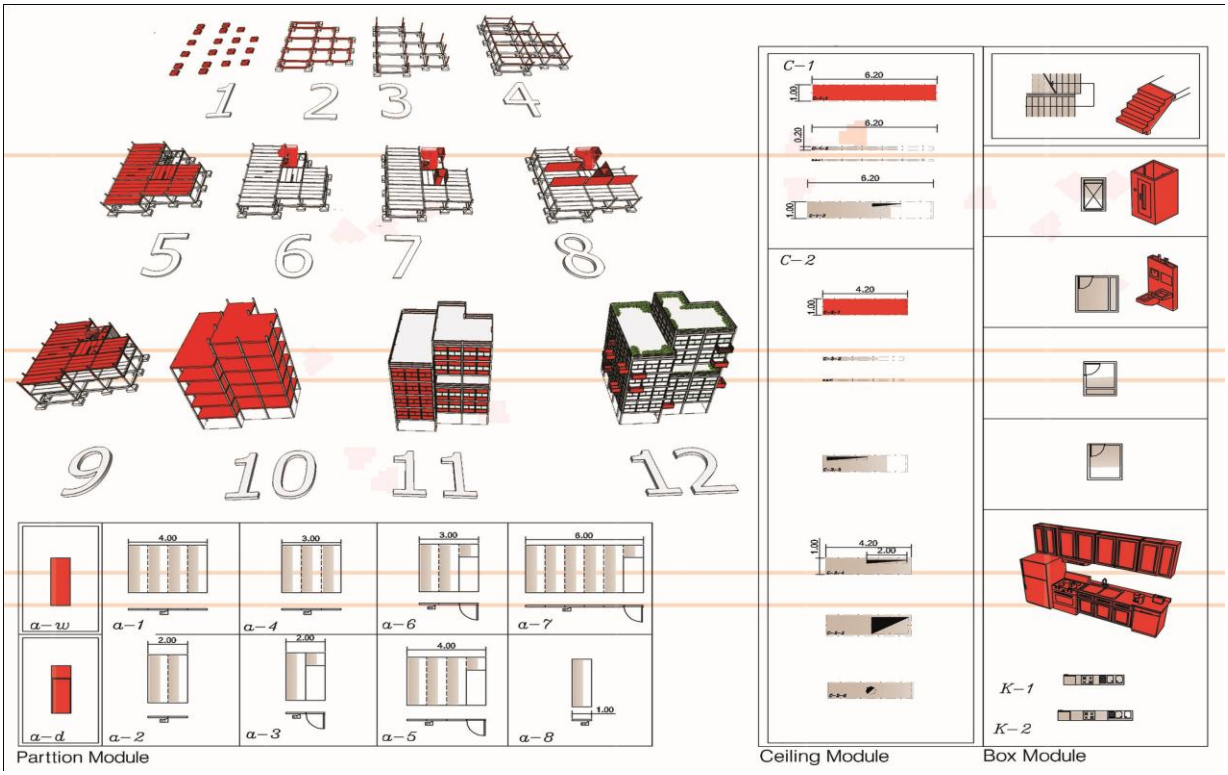
PLSC System Results

Reviews of previous sections and comparison between PLSC system and other systems show that PLSC system provides many advantages at crisis conditions with defense approach in worn out texture of the country's construction industry, main of which include increased construction speed, increased durability and useful life and very low energy (Khalilian, 2013).

Considering conditions at crisis time, creating needed structures with various usages is necessary and modern systems with prefabrication capability should be used. It has many effective applications which were mentioned in the previous section. It also leads to rapid and unceasing process in various applications.

Creating annual 1.5 million residential, administrative and industrial units using this method at crisis condition in worn out texture and prefabrication production with country's facilities provide ground for construction of PLSC system prefabrication system with structure rapid capability and internal and external pieces (Khalilian, 2013).

Fig 11: Design sample based on modern construction methods of PLSC system (Khalilian, S. (2013))



CONCLUSION

Current research attempts to provide proposal to eliminate and reduce crisis harms with passive defense approach in worn out texture at natural disasters and missile attacks in residential texture. Thus, analysis of worn out texture problems and various methods with shared criteria of structure, architecture as well as strengths and weaknesses of prefabricate factories, following general results can be mentioned.

1. Type of selected system
2. Importance of series in mass production
3. Species and limiting them
4. Accurate supervision over similar species
5. Simplification of facilities

It is necessary to consider production and construction planning as a unity rather than separate parts. Thus, planning may not fail. Therefore, the projects which are prepared using traditional approach do not fit to requirements of construction industrialization over the time, though they are used again. It suggests incomplete thinking toward industrialization of construction.

Industrialization of construction is a totally independent field in passive defense. However, in order to realize it as a really independent field, progress thinking should be more evident. Current system of permits is not satisfactory, since only traditional and conventional methods are permitted for development and progress process is disturbed. Perhaps we all wait so that a crisis happens so that we are forced to progress. Decision makers in construction area essentially do not welcome progress at crisis condition and even they may resist it. Their reaction regarding construction methods is encouraging only when it is riskless and profitable, which has no place at crisis condition in worn out texture.

Conscious intervention in the urban space in order to prevent from texture worn out, contemporary making with minimum costs of strengthening the structure of spaces, rehabilitation through a series of activities to improve collection besides passive defense measures are vital steps for maintenance, survival and development of this collection

(Ahmari Luee, 2010). In order to observe passive defense principles in this area of the capital, following cases are recommended (Savadkuhifar, 2013).

1. Transferring good warehouses outside of residential areas by making the residential area to supply area for goods needed
2. Periodic training courses for residents in bazaar area on how to deal with accidents and increasing their preparation before happening
3. Transfer people to temporary habitation places in parks and pre-specified spaces in the area of the plan and equipping it for habitation of residents prior to any possible accident
4. Organizing sewer and water output and transferring them to subsurface
5. Application of aerial subway or monorail to the southern part of the area.
6. Construction of multilevel parking around the residential texture
7. Create multipurpose shelters for different parts of the residential texture area

Reparability, speed in implementation, easy repair and maintenance and reconstruction, easy transportation and need for simple expertise are other advantages of PLSC system.
Now it is time to think of revival of worn out textures with passive defense approach in confrontation with natural and unnatural disasters and modern construction methods are used in residential buildings of worn out texture.

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