Research on Humanized Design Strategy of Overseas Construction Camp

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Abstract. This paper analyses the meaning of overseas construction camp design of Chinese contractors, and summarizes the research status of construction camp buildings at home and abroad. Based on the existing research, some suggestions and ideas for humanized design of construction camp are given, which can provide references for humanized design of overseas construction camp in the future.

1. Introduction

With continuous development of the construction industry, the construction enterprises, which have higher strength, have regarded the overseas or external market as their main developing focuses. It is common that the enterprises in developed areas dispatch their construction teams of overseas projects to the underdeveloped areas. For example, in 2016, the business turnover of contract foreign projects in China reached 10,589 billion RMB and the number of overseas contract workers reached 969,000. The methods how to solve construction camp problems required by a large amount of offshore construction personnel have been put on the agenda.

Construction Camp is temporary comprehensive service facilities built for tasks of construction projects, which could be divided into living camp, office camp and work camp based on the different functions. In overseas projects, the construction camp generally refer to the living camp. The living camp have high self-restrained ability in overseas projects, especially in the underdeveloped areas and dangerous areas, which plays an important role in the smooth development of the project. Besides meeting the construction requirement of the project, overseas construction camp actually undertake the role of being the second home for overseas builders. For a long time, the managers focus more on the physical role of camp supporting the work, regarding it as the memorizer of human resource in the field of construction and neglecting the physical and mental health of its users, which is unfavorable for the long-term development of individual, community and society.

The research on the design of overseas construction camp, especially humanization design of the camp, could improve the level of the living environment for its users, which has practical meaning and application value. With good economic and social meaning, this kind of research could not only fill in the gaps of architectural design in the research of temporary engineering field, but also directly serve lots of actual users.

2. Development status of research at home and abroad and literature analysis

2.1. Relevant development status of camp buildings in China

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Since 21st century, the construction industry in China has been developed rapidly. For instance, in 2016, the gross output of national construction enterprises reached 19.356678 trillion RMB, accounting for 6.66% of total national GDP and the number of employees in this area reached 51.8524 million, accounting for 6.68% of national employed population. With its own obvious characteristics, the construction industry moves as the hot spot of local economic development changes. It is common that contractors develop their business across regions and the first-line employees move with the projects so that it is hard to achieve nearby employment. To guarantee the stable human resources, contractors should provide comparatively centralized working and living conditions which could be realized by establishing temporary buildings and facilities. In general, the early temporary facilities at construction site are called work shed, sample room and temporary dormitory whose structure is scabrous, function is simple and only purpose is to provide the accommodation. Therefore, the site of the dormitory basically is the pronoun of poor and scrambled environment. However, as government concerns more about vulnerable groups, a set of rules and technique standards aiming at on-site office facilities of temporary accommodation have been proposed, which lays a certain normative foundation for on-site temporary accommodation. Moreover, engineering contractors pour more attention to their own enterprise image. Some companies have proposed relatively perfect enterprise standardization, thus continuously standardizing the construction criterion of temporary facilities and improving the living and working conditions of construction.

2.2. Analysis of research literature concerning construction camp at home
The literature regarding camp buildings at home mainly focuses on the following aspects: industry criterion (Technical code of temporary building of construction site, JGJT 188 – 2009), local standards (Beijing, Shanghai), enterprise standards (CCC, CSCEC, CNPC, CRBC and other companies) and research papers. There are lots of literature about humanization design. The researches concerning camp buildings focus more on the management direction. In term of design, few construction industries introduce the overall concept of camp, whose researches still focus more on the temporary construction.

In literature, taking the safety into account, national standard focuses more on the structure safety, fire safety as well as moderate anti-seismic safety and gives consideration to the human concern of vulnerable groups. Despite having certain requirements of function deployment and technical index, national standard does not form the complete design concept and system. Obviously, researches focus more on the construction of physical environment and neglect the humanistic care for Chinese users. Technical code of temporary building of construction site provides guidance to the on-site construction in terms of temporary construction site, architectural and structural design, fire prevention and evacuation, architectural equipment and field management. Living facilities and management standards for construction engineering make some certain requirements on setting and management of living facilities, health and epidemic prevention. Enterprise standards (CCC, CSCEC, CNPC, CRBC and other companies) offer requirements on the setting form of camp, parameter standard, external image, security. Exploration and research of temporary architectural design of Quan Feng, elaborated the development processes, theoretical basis, design characteristics and expression mode of temporary architecture. Study on design of humanized outdoor public space of residential area of Luo Yang, elaborated the basic concept of humanized design, the research strategy and expression mode of humanized design in outdoor space. Statistics analysis on development of China’s construction industry in 2016 of Department of planning, finance and foreign affairs, Ministry of housing and urban-rural development of the People’s Republic of China and China Construction Industry Association rendered the statistics of the overall development data of China’s construction industry in year 2007 to year 2016 and analyzed the statistical data of 2016.

2.3. Current situation of construction camp in foreign countries
Most of countries always use construction camp, contractor site compound or workers accommodation to describe holistic concept of temporary facilities, overall planning and design needing coordinating,
and focus more on the protection of basic rights to life and psychological feelings of users. On the basis of mastering certain construction design methods and meeting the requirements of policies, the local governments always establish relevant rules and requirement for the construction of camp buildings because of humanitarianism, thus revealing the responsibility of the contractor in society.

Compared with foreign countries, the current management concept of relevant competent departments of China's construction industry and construction enterprises pour more attention to the management of temporary construction or temporary facilities at the construction site, which only concerns more on the structural security as well as daily management requirements and emphasizes the safety of residents to a larger degree. Actually, this has some differences with the understanding of the concept of international project management. The contractors simply regard accommodation, living and office conditions required in the contract for the construction project as temporary houses or facilities, which is still in the process of meeting the needs of low-level use and behind the current actual social development, thus being adverse to the implementation of overseas projects. Far away from home, the project managers and workers of the overseas project all face with new challenges in the aspect of natural and social environment. Presently, the business areas of Chinese contractors are always in the underdeveloped countries where the economic development is lagging behind and social security conditions are poor. Additionally, even some countries and regions are often exposed to security threats of war, terrorism and communicable diseases. With considering the safety and security, overseas officials always live and work in the closed construction areas. Therefore, a humanized, safe and comfortable camp building becomes an important basis to execute the overseas projects.

With the expansion of the engineering scale, scarce city land, upgrade of technical standards in each country, the temporary projects increasingly reflect the semi-permanent trend, even permanent trend and the regional and special camp buildings begin to emerge. To adapt to the intensifying market competition, each enterprise maintains its own image and develops its inner standards of the camp buildings.

2.4. Analysis of research literature concerning construction camp in foreign countries
The types of foreign literature mainly include the international standards of relevant human rights organizations, assembly resolutions, standards of financial institutions, laws, regulations and code criteria formulated by some countries in main areas, as well as published research reports and articles, such as relative meeting documents of ILO, standards proposed by financial institutions, like IFC and EBRD, protective labor laws enacted by the United States, Indonesia, South Africa, the Middle East and other countries, related papers and researches of South Africa and Australia. The researches and reference materials in this domain are few. The basis of formulating relevant rules of each country is to provide the basic requirements for the living conditions of the workers and stress on functional requirements and living conditions that should be given priority. The bank organizations represented by IFC and EBRD, have put forward the detailed dissertations covering work methods and specific indicators and rendered reference items to the investigation projects. Several representative countries place emphasis on basic functional requirements and living conditions in related areas. However, due to the different culture, the using habits of China and foreign countries are different. Most of the overseas camp buildings are inhabited by worker, while the Chinese camps are accustomed to living separately from foreigners. The differences between domestic and international projects result in the differences of research directions. Based on the research of South Africa project, this paper analyzed the problems and reasons of the construction and management of workers' camp buildings, and offered relative suggestions.

3. Thoughts on humanized design of construction camp
The humanized design of camp buildings includes two elements, humanized element and design of camp building. The humanized element means that the camp buildings not only provide safe jobs and living areas, but also meets the requirements of camp staff in terms of physiology, social belonging,
respect and self-realization. Therefore, the workers in foreign country could receive extra care and warm and have the place of entertainment and relaxation.

The overseas camp buildings should be designed according to the humanization and different needs of persons, thus achieving and creating the unity and harmony of physical environment (PE) and social environment (SE). The physical environment includes the beauty and structural safety of camp buildings, the availability of related supporting facilities and the reliability of infrastructure such as hydropower, while the social environment includes creating a comfortable indoor living environment, a relatively closed but relaxed camp environment, a warm environment that is similar to the street community. For instance, everyone has his own individual space, but there are all kinds of exact entertainment activities in the camp or the people in camps could wave to each other, thus demonstrating the humanity. Fig 1 shows the flow chart of humanized design of camp buildings.

![Flow chart of humanized design of camp buildings](image)

4. Conclusions
The overseas camp building is the basis for world engineering contractors to implement the overseas projects. With the deep development of the Belt and Road Initiative policy in China, overseas construction projects will attract the attention of all aspects of society. Promoting the researches in this domain is not only the technological progress, but also the civilization process of society.

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References
[1] ILO. (1961)R115 worker's housing recommendation. http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---normes/documents/normativeinstrument/wcms_r115_zh.
[2] John Smallwood. (2005) Construction Camps in Building and Civil Engineering Construction, Nelson Mandela Metropolitan University, http://www.irbnet.de/daten/iconda/CIB_DC29573.

[3] Grace Muiruri and Cornelius Mulinge. (2014) Health and Safety Management on Construction Projects Sites in Kenya, FIG Congress 2014.

[4] Alice Yan Chang-Richards, Suzanne Wilkinson, Erica Seville, David Brunsdon. (2014) Provision of temporary accommodation for construction workers, https://core.ac.uk/download/pdf/35472349.

[5] ILO. (1992) Safety and healthy in construction. http://www.ilo.org/global/topics/safety-and-health-at-work/normative-instruments/code-of-practice/WCMS_107826/lang--en/index.htm.

[6] ILO. (2006) The regulations of domestic worker in Indonesia. https://www.baidu.com/link?url=NeUvc0RuyW47IPANjlmpmp1L05twFgNcKYcg1sqV2wvo-C-V_gvccn5YoSdeoG1W&wd=&eqid=ac0b939d0003e1b300000025d085975.

[7] IFC/EBRD. (2009) Workers’ Accommodation processes and standards, https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation.

[8] Changrichards, A. Y, et al. "Workforce behaviour and business responses: Case studies of construction organisations." (2014).

[9] International Code Council. (2009) International Building Code. https://www.baidu.com/link?url=FTA_RM-tg0ybDwVcU4TWXVHBjH1grXXigZAUv2i8E4qAPI4vrxZWBr4JDjwyoy5i&wd=&eqid=8e31daac000130800000025d0867be.