Analysis on project management of military barracks in high altitude area

Chang Liu, Bin Xiao* and Weijie Wang

Department of management engineering and equipment economics, Naval University of Engineering, Wuhan, Hubei Province, 430033, China

*Corresponding author’s e-mail: xb_cyl@163.com

Abstract. The construction conditions of engineering projects in high altitude areas are poor, the construction period is short, the transportation distance is long, the natural environment is bad, and the buildings are seriously damaged. The application of mature construction technology is greatly restricted. The contradiction between engineering construction and environmental protection is extremely prominent. The project management has special geological conditions, harsh natural conditions, short construction time, lack of technical equipment, weak support force and lack of information technology. It is necessary to strengthen the organization and management, do a good job in planning and design, scientific organization of construction, strict process supervision, optimization of personnel, application of information technology, and improve the quality and efficiency of management of military barracks project in alpine and high altitude areas.

1. Introduction
Cold high altitude, "high" refers to the elevation, generally above 4000 meters; "Cold" refers to the perennial average temperature is low, the freezing period is generally about 270 days, frozen soil does not change the climate area, with low oxygen, low pressure, strong radiation, cold, dry and other basic characteristics, every year there are a large number of officers and soldiers and staff into the cold and high altitude areas to work and live. "Barracks" means the construction and acquisition of houses and equipment exclusively for the use of troops. It includes the barracks project of institutions, troops, colleges and universities, hospitals, nursing homes, rehabilitation centers, scientific research and technology and large-scale training ground construction. It involves the management of the whole process of the project, including the decision-making, implementation and use stages. With the state's continuous investment in plateau areas and national defense construction, the construction level of barracks in alpine and high-altitude areas has reached a new level, the accommodation conditions of grassroots officers and soldiers have been continuously improved, the barracks security work has been carried out steadily, and the maintenance funding for barracks has increased year by year. However, complex geological conditions, significant topographic height difference, strong plate activity, frequent mountain disasters and fragile ecological environment have seriously affected labor efficiency, mechanical efficiency and material purchase. The imbalance between the actual geographical conditions and the ever-expanding maintenance support problems, the short service life of the buildings, the serious damage and the actual housing needs of the army construction and development are full of contradictions. This paper discusses the necessity of project management in alpine and high altitude areas and the main problems existing in the construction of barracks.
2. Study on the necessity of project management of barracks in alpine and high altitude areas

The geological conditions of high altitude and high altitude are harsh, perennially frozen soil areas or high-temperature frozen soil belts and melting areas crossing the frozen soil areas, the foundation is degraded and eroded, the seasonal melting layer is frozen and thawed, and the unfavourable frozen soil has physical resistance. The construction environment is harsh, the service life and utilization rate of the construction machinery is low, the engine power is reduced, the clutch slips, the wear is aggravated, the rubber is aged, the starting operation is difficult, the design principle, the construction method, the construction technology, the construction machinery configuration and the inspection method are put forward higher requirements. Previous studies have been conducted on railways, highways, bridges, tunnels, hydropower, power transmission infrastructure and line engineering, construction materials and machinery, personnel safety and work efficiency. The research results show that the roadbed with high cold ice often suffers from significant road diseases 2-3 years after the completion of the project, and it is in urgent need of renovation or reconstruction within 5-10 years[1]. The slight change of the characteristics of the high-temperature frozen soil and the high cold ice section and the permafrost can lead to serious damage of the roadbed, which is manifested as melting and subsidence damage, frost heaving and grouting. More than 80% of the damage of qinghai-tibet highway is caused by melting and sinking, 20% is caused by frost heaving and turning, and part of the reverse arch deformation is 50-100cm. According to the characteristics of plateau construction, Feng, C., et al. studied the design and construction technology of special cable crane under specific conditions such as steep terrain of plateau canyon, but the previous research on the project management of barracks in high altitude areas of the plateau was rare[2]. With the implementation of the western development strategy and One Belt And One Road strategy, the economic engineering activities of human beings are gradually expanding in the plateau region, and there are more and more alpine and high-altitude construction projects. Future engineering a massive increase in the original project, the project quality technical requirements under the background of big promotion, analysis problem of freezing and thawing and alpine hypoxia on our barracks, the main impact of the project management by optimizing the organization of project management decision, planning design, construction supervision, construction teams, and the application of technical measures to effectively solve the current problem, alpine high altitudes barracks for engineering project, design, construction, operation and management to provide some reference.

3. Practical problems of barracks project management in alpine and high-altitude areas

3.1. The geological conditions are special and it is difficult to improve the quality.

For construction projects in alpine and high altitude areas, the terrain and landform are complex, the tectonic activity is intense, and the engineering geological conditions are poor. In the warm season, the freeze-thaw layer melts and sinks. At the same time, ecological fragile, vegetation once destroyed, it is
difficult to recover. In the foundation construction of the frozen soil area, the protection of natural ecology and the restoration of vegetation should be paid attention to[3]. The difficulties and problems in the construction seriously affect and restrict the construction progress and quality of the project.

3.2. The natural environment is bad, material and financial resources loss.
"Four seasons in a day, a hundred steps in different days", low oxygen, large temperature difference, strong solar radiation and other natural environmental conditions, dizziness, headache, chest tightness, fatigue and other altitude reactions are particularly strong, the efficiency of the construction personnel decreased significantly, which is also the main reason for the loss of personnel and unstable construction team in high altitude areas. In addition, the water in the micro pores of concrete, under the action of drastic change in temperature difference and frequent alternations, forms the joint action of freezing expansion pressure and osmosis pressure, and the structure produces denudation damage from the table to the inside, which reduces the strength of the concrete structure and increases the maintenance cost.

3.3. The construction time is short, the construction management cost is high.
The severe natural environment, such as large cold temperature difference, windy and dry, and thunderstorms, as well as short construction time and high technical difficulty, bring a series of new problems to the cost control of engineering projects in high altitude areas. The construction period is concentrated from mid-April to the end of October. There are no high-rise buildings in the projects under construction. Prefabricated components are used in large quantities and the construction period is short. Housing construction often has cracking, leakage and other quality problems. In high altitude areas, except for military stations, barracks and road classes, there are very few settlements and nomads, and there is no shuttle bus. In winter, there are often snowstorms and avalanches, and it is difficult to raise materials and poor transportation conditions, so the supply of construction and maintenance materials is particularly difficult, and the construction and maintenance period is often delayed. Most of the building materials do not meet the grade standards, rough construction, engineering quality is not guaranteed.

3.4. Less technical equipment, maintenance loss.
Alpine hypoxia on construction machinery has a certain influence, because your reduce in the cylinder, the combustible mixture too thick, combustion deterioration and insufficient combustion, exhaust smoke increases, the oil viscosity increase, starting resistance increases, engineering machinery power decrease will not work properly, and technical reliability and service life are not guaranteed, virtually increased the cost of construction. For every 1 km rise in altitude, the power and torque of the diesel engine are reduced by 8%-13%, fuel consumption rate is increased by 6%-9%, boiling point of cooling water is reduced by 8.8℃, thermal strength is increased by 2%-5%, and heat dissipation of cooling water jacket is reduced by 8%-10%. Power and torque have the greatest impact on engine performance. For every 1 km increase, power decreases by 8%-13%[4]. The wear degree of engine cylinder is tested at about 4000m, which is about 35%. It has influences on the power system, hydraulic transmission system, cold start, air filtration and constituent materials of mechanical equipment[5]. The failure rate of water, electricity, heating and other infrastructure is high.

3.5. The safeguard force is weak, the tracking supervision experience lacks.
Cold high altitude in the traffic inconvenience, the market is not developed city, the construction enterprise technology there are personnel of the characteristics of big quantity is less, liquidity and some professional theoretical level is low, fewer people were willing to high altitude areas, security technology strength is very weak, has led to some engineering problems difficult to solve, hard to ensure the construction quality; Secondly, the quality of some project managers is not high, knowledge and experience is extremely lacking, in difficult conditions, the long-term separation between the two places, the idea of building a successful career and settling down is not appropriate, unwilling to
manage, not to manage the phenomenon is very serious.

3.6. The lack of information technology, low quality and efficiency of project management.
Barracks project management has not established a platform, the traditional comprehensive information network and document system is not perfect, resources are difficult to share, often adopt the traditional way of "person check, hand copy", communication between the upper and lower levels is poor, affecting the barracks information management and protection[6]. Due to the lack of a file management system, the project management information is not kept completely and most as-built drawings are missing, which cannot provide data support for decision-making. The management of barracks lacks intelligent monitoring and visual equipment, and most of them adopt manual dynamic observation, which is time-consuming and laborious for regular maintenance and transformation of infrastructure.

4. Solve the high altitude area barracks project management problems of the main countermeasures

4.1. Strengthen organizational management and ensure scientific decision-making.
First, the key to the smooth organization and implementation of the project is to highlight "Leading" and "general manager", give full play to the role of "front-line headquarters", manage resource allocation, reasonably analyze the structure of personnel, layout of temporary construction projects, equipment scheduling plan and security risk prevention. The second is to highlight the "system" and "norms", fully demonstrate the project, strictly control the civil construction, decoration and other funding standards, put an end to overspending, waste, excess area and other phenomena. For control engineering, after the collective discussion with technical experts, do a good job in technical disclosure and follow-up guidance, control the process; Third, highlight "strengthening" and "improving", explore the model of agent-supervision integration, whole-process agent-construction and agent-construction contract, improve the credit evaluation system, and establish a modern construction management system. Strictly carry out site control, comprehensive, whole-process, all-weather tracking and supervision of project quality, never leave any potential accident and problems loopholes.

4.2. Meet practical needs, do a good job in planning and design.
First, we must adhere to the system of thinking. Barracks construction project is a complex system engineering, following the five stages of initiation, planning, implementation, control and closure, strictly implementing the construction project life cycle theory of project approval, design planning, bidding, construction, acceptance, maintenance and protection[7]. Reasonably distinguish different regional characteristics, different time nodes of the work mode and technical means, enhance the timeliness and pertinence of the project construction, good at using the vision of long-term development to measure the current performance, for the construction and development of the unit to seek long-term benefits. Second, existing vegetation should be protected. The project traverses different types of frozen earth areas, and the maintenance is frequent, which leads to the arduous task of ecological environment protection and restoration. Plateau high altitude area vegetation is rare, land desertification serious, a touch of green is precious. In the construction process, the original ecological vegetation area should not be destroyed, and the project should be fully constructed to integrate with the environment beautification and cultural facilities. Third, we should focus on long-term benefits. Some units site selection is not reasonable, insufficient demonstration, hasty decision design molding, deliberately pursue speed and not to consider quality clearance, design structure is not reasonable, the foundation is not solid, the project is often strong in the dry, China and not strong. The BIM full information model can be used to deepen the design and construction scheme, take into account the site layout, building model, traffic organization and functional streamline, and reduce the rework cost.
4.3. Adapt to the characteristics of the plateau, scientific organization of construction. Firstly, one should reasonably arrange the site, planning the use of construction site. Barracks construction open-air operation, affected by the natural conditions of the plateau. Make the best use of formal works, existing buildings and facilities for construction services, reduce temporary engineering costs, reduce engineering costs. In strict accordance with the preparation to formal, off-site to site, underground to ground, foundation to main construction to subsidiary, civil construction to installation, roofing to internal installation, first deep then shallow, pipe groove and groove, pay attention to concrete cast-in-place structure to avoid construction in cold period, high-altitude work, structure hoisting to avoid construction in wind season. Secondly, new materials should be used to extend the service life of barracks. The traditional wood, steel, cement, environmental restrictions, can't give full play to its performance, high altitude region to effectively use of high-tech materials, with light weight, thermal insulation, with uv resistance, impermeability, frost resistance, good seismic performance, energy conservation and environmental protection building materials, also can use temperature of concrete, steel, lightweight, high strength, can tear open outfit recycling of fabricated materials, high strength steel, thus weakening the influence of the engineering geological conditions, improve the service life of the building. Thirdly, to overcome the construction problems, to ensure that the scheduled occupancy. Building foundation collapse, permafrost thawing, water supply and power shortage in alpine and high altitude areas make it difficult to configure the plumbing facilities in traditional ways. For major projects, it is suggested to set up an intensive underground integrated pipe network to collect underground power, heat, water supply and drainage pipes into the integrated pipe system. It adopts the methods of aerial foundation design of permafrost layer, grouting technology of deep excavation, snowmelt and ice melting technology of heating waste heat. Solar energy, wind power generation, passive solar energy heating, gravity natural circulation heating, indoor diffuse supply and power saving system, plateau energy saving stove and new plateau coke horizontal atmospheric pressure boiler are used to solve the problems of oxygen supply, heating, water supply and drainage.

4.4. Improve working methods and tighten process supervision. First, the good work as a whole, to ensure the progress of the project. Size and the structural characteristics, combined with engineering complexity, improve construction sequence, water plan, schedule control, material supply and production and living facilities, main construction, auxiliary engineering and utility of form a complete set and the cohesion between working procedure, type of work, both the reasonable requirements of all parties involved in construction and construction phase of the coordination and efficient organization construction. Second, to perform the contract, strict construction quality. The performance of the contract should be dynamically managed. Firstly, the contract disclosure should be carried out to decompose the contractual responsibilities. According to the contract terms, the workflow flow chart of quality, progress, investment, safety and other objectives should be made, and the pre-event, in-process and post-event control should be paid attention to. Third, we need to make sure that we have a solid foundation. Expand the use units of facility materials with high degree of standardization and interchangeability, and replace the worn parts. Give full play to the role of source control, all materials and equipment without a production certificate shall not be used, all materials and equipment that have not passed the inspection of the contractor shall not be used, and the supplier shall be responsible for the replacement of the materials and equipment that have not passed the inspection and shall assume all responsibilities arising therefrom.

4.5. Optimize the talent team, improve the security ability. The construction and maintenance of barracks is a highly demanding and professional work. The quality of this work team is the key. We should select professionals who understand laws and regulations and technologies and actively coordinate with local departments to ensure timely and efficient employment. Second, we should train the barracks team well, encourage them to learn more
in daily life, study frequently, and constantly enrich their own construction, supervision, bidding experience. Through the introduction, training, education and other ways to establish a strong sense of responsibility, high level of business management and construction team. Third, we need to put the barracks team good use, post personnel by tracking cycle, metrics, data collection and information processing, completes the time limit for a project performance tracking, completes the barracks demand research, participant, supervisor, good use of the right to exercise their duties as well, to understand the latest construction laws and regulations and in the tendering and bidding, contract signing, cost standards and key materials and other issues to consider, dare to serious on key issues. Fourth, we should manage the project personnel well, establish the accountability system, regulate the administrative actions of the operational departments and executive personnel, prevent and reduce the occurrence of illegal behaviors in the construction quality management of barracks, so as to promote the standardized, orderly and healthy development of the barracks construction project.

4.6. Information technology should be applied to improve management level.
First, management information systematization. Integrated database, including barracks construction, information query, geographic information and greening management, was used to add information analysis function, and project text was established, stored, retrieved, extracted, modified and summarized. According to the classification retrieval system archiving, classification principles according to the characteristics of the project set in advance. File the image, text and form separately to facilitate keyword query [8]. Second, construction management visualization. Comprehensive use of network equipment, servers, workstations and software systems, the implementation of the barracks system data can be checked, the construction site can be visible, material supply consumption can be known. Learn from the use of BIM to build a system platform, and do a good job of design, construction, maintenance life management. Third, the construction means of modular. Modular building form is a complete set of system engineering, tends to industrialization, integration, information, customized production, construction site assembly, can improve the seismic performance of barracks, shorten the construction period, reduce environmental pollution.

5. Conclusions
The barracks project in the alpine and high altitude area is of great significance for implementing the western development and One Belt And One Road strategy, maintaining the border and social security and stability. Due to the bad weather, the project construction management experience in a relatively immature state, a lot of improvement measures or in combination with engineering practice. It is hoped that this study on barracks project management in alpine and high-altitude areas can provide some references for the construction team of military and civil engineering to improve the quality and efficiency of barracks project management.

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