

Analysis on Classified Storage and Traceability of Construction Project Archives

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Abstract: With the development and progress of economic construction and market economy, urban construction is also developing rapidly. In the field of construction engineering, a large number of construction engineering files are constantly being produced and accumulated. Therefore, the role of file management is becoming more and more important. The archives are the true records of the whole process of project construction, including the information on the whole process from project design to completion, and are also the main basis for operation management after project delivery. However, there are many aspects to construction project archives, and there are many problems. Nowadays, the classification and preservation of archives are receiving more and more attention. In this article, the origin and development history of construction project archives is first expounded, and its attributes and importance are analyzed. Secondly, the differences between ancient and modern archives management are compared, and at the same time suggestions on improving the archives' traceability system, strengthening the use of archives, and establishing and improving archives management are given. In this paper, we summarize the problems in archives sorting and put forward specific solutions to improve the standardization and systematic management of archives work and enhance the authenticity and integrity of construction project archives.

Keywords: Construction project archives; Archives management; Classification and storage; Traceability

Online publication: May 31, 2023

1. Introduction to construction engineering archives

1.1. The origin and history of development of construction project archives

1.1.1. The origin of construction project archives

Our country has a long history with countless classics, so are the archives, and information resources are abundant. With the continuous development of production practice, commerce, society, and technology, the conversion of texts into archives has become a necessity for future reference. Archives are organized and preserved, and their content, form, and names are continuously enriched.

Archives are not a social phenomenon that has always existed, and the research on its origin is relatively complicated, especially for construction project archives. Archives are created due to various factors such as social needs and technical conditions. Throughout the years, and throughout the world, human experience accumulation and social management are inseparable from the assistance and support of written materials.

In "Historical Records Book of Meditation," it was recorded that a Jinan man named Gongyu Dai presented Emperor Wu of the Han Dynasty with a picture of the Mingtang of the Yellow Emperor, so that he could build the hall according to the picture. According to Sima Qian's record, there were engineering drawings of the building in the Yellow Emperor's time, making it the earliest architectural file in the current

literature records ^[1].

The oldest surviving architectural archive in China is a copperplate architectural design plan unearthed in the west of Sanji Village, Pingshan County, Hebei Province in 1977 – *Zhaoyu Tu* from the King of Zhongshan's tomb of in the Warring States Period ^[2]. It is speculated that this copperplate map of the Warring States Period is at least 2,200 years old. It is the earliest scaled drawing and architectural plan found in China, and it is also the earliest copper building discovered in the world. The unearthing of this copperplate mega-field map has very important research value and significance in archaeology, history, linguistics, sociology, architecture, etc.

1.1.2. The history of development of construction engineering archives

In the transition from primitive society to slave society, after classes and countries appeared, documents came into being. Due to various factors such as the production of written records, the development of society, the gradual formation of the country, and the specific social needs after entering the class society, archives gradually emerged and developed.

In the process of development and evolution, construction project archives have also absorbed the essence of archaeology, philology, modern management, informatics, and other disciplines. Construction project archives are the soul of a project, and they are historical records in various forms such as words, diagrams, audios, and videos, etc. of project construction activities, which should be preserved. Project archives has the record of the whole process of a project, from project approval, bidding, survey, design, construction, to completion, which is a true reflection of the project construction process and results ^[3].

Construction project archives are also a kind of scientific and technological archives, a complex of archives, a product of human engineering construction activities, produced in human engineering construction activities, and serving various engineering construction activities. Logically, engineering construction activities and technology first should come before construction project files. After the appearance of construction project archives in ancient China, with the emergence and continuous development of engineering construction activities, construction project archives were gradually formed, and the main body of the formation and the content of the archives themselves have been constantly changing.

1.2. Attributes and characteristics of construction project archives

1.2.1. Attributes of construction project files

1.2.1.1. Originality

Project archives are directly formed during a project construction, and they are original records of the entire project's preliminary preparation, design, equipment procurement, construction and supervision, commissioning, and production preparation, etc., not made up after the whole process.

1.2.1.2. Authenticity

Archives are the real records of the project construction process, which can truly reflect the real situation of the construction and its various activities. Project files are just a visual record of the entire process of a project construction, and do not decide whether the project construction process is correct.

1.2.1.3. Value

Engineering project archives must have value, and should be able to provide information for verification, reference, and utilization for subsequent operations of the project. Therefore, the documents in project archives should be identified, organized, and then archived, rather than receiving it blindly without any processing.

1.2.2. Characteristics of construction project archives

Most of the construction projects are long-term and large-scale projects, which require a lot of manpower, material resources, and financial resources. Because of this, engineering archives have their own characteristics.

1.2.2.1. Complete and systematic

Due to the technical nature of construction projects, project archives also present comprehensive and systematic features. Construction project archives record all links from the beginning to the end of a project, so that the data of the projects are traceable, making the project more refined. The original data of the project can be found in the files, and the problems in terms of construction and scheme can be simulated, making project management more systematic and comprehensive. At the same time, the maintenance records after project delivery can also be found in the archives, which plays a guiding role.

1.2.2.2. Extensive and fluidity

Construction project archives involve a wide range of specialties, including project proposals, applications, project decisions, project plans, etc. The process involves municipal administration, construction, supervision, material suppliers and other units, and construction technology, etc., requiring strong professional knowledge. Moreover, the relationships involved are complicated, and the corresponding data can be easily affected by many factors, which makes engineering files highly fluid. Therefore, the scope of original materials of engineering archives is wide and fluid, with a huge amount of data.

1.2.2.3. Professionalism and complexity

The quality assurance of engineering projects requires the cooperation and coordination of multiple disciplines. Meteorology, construction, water supply, and drainage, electrical, geology, information, etc. must be integrated and coordinated to promote the completion and delivery of engineering projects on schedule. Therefore, this makes engineering archives highly professional, which is different from ordinary enterprise archives.

1.2.2.4. Complexity and detail

The majors involved in the project archives, the units involved in the completion of the project, the project links, and the scale of the project all make the number of files huge. However, the information for each link needs to be timely, complete, and true, which makes archiving a meticulous job.

1.2.2.5. Lag and perfection

Engineering archives need to be continuously improved and supplemented in order to form a sound engineering archive that explains the quality of the project in detail. Therefore, the engineering archives are perfected and supplemented with delayed data to ensure the integrity and authenticity of the archives.

2. Classification and storage of construction project files

2.1. Ancient and modern

2.1.1. Ancient

Since the Qin dynasty, which more than 2,000 years ago, documents were widely used in the daily activities of the country. Based on the content recorded in the *Qin Bamboo Slips of Sleeping Tiger Land*, in the Qin Dynasty, archives already had a special storage place – a “library.” The management system of the library was clearly stipulated in the form of laws and regulations and had full-time guards and inspection personnel. A character in *Qin Bamboo Slips of Sleeping Tiger Land* Neishiza said: “Do not use fire to enter Zang

(Tibetan) mansions and libraries.” The buildings were connected.

A perfect document filing system is key in archives management, and a relatively complete document filing system was established in the Han dynasty.

During the Tang dynasty, the archives appraisal system had been formed: the storage period of archives was divided into two levels: permanent retention and short-term retention (three years), and appraisal and destruction were carried out every three years. Besides, the specific types of permanent files were also stipulated, and there were also records of the destroyed files.

In the Song dynasty, the earliest and most specific archive classification method known in our country – “Thousand-Character Classic Method” (*Qianziwen Jiagefa*) – appeared in the Song dynasty. This classification method solved the problem of piled up and chaotic archives to a certain extent, and it was also a great leap forward in the development of ancient archives in our country.

The archives of the Ming dynasty were well preserved. The Ming Dynasty paid more attention to the construction of archives institutions than any other feudal dynasty before the Ming dynasty. Xuanwu Lake in Nanjing in the Ming Dynasty was the storage place for the national archives of the Ming dynasty government. It was called “Houhu Yellow Book Library” at that time. It used to be the “national archives” and “big data center” of the Ming Dynasty. Its management was very scientific and was used until the formation of Republic of China. Back then, the “warehouse of yellow books” was placed in an east-west direction to ensure sunlight from morning to night and prevent dampness and mold ^[3].

2.1.2. Archives management in the information age

The construction of archives informatization is an inevitable trend in the development of engineering archives. The rapid development of the information age has resulted in huge challenges in the traditional archives management model. There are problems in the traditional archives management model ^[4]. In the traditional archives management, management personnel and archives resources is taken as the center, and archives managers are required to manage the archives manually. The human, financial, and material input by the unit is far from the output of archives management, and archives resources cannot be fully utilized. In the development of the information age, the efficiency, integration, and scientificity of information technology provides an alternative for archives management model ^[5]. Therefore, under the background of the current information age, it is necessary to transform the traditional archives management. The efficiency and quality of management work is the inevitable requirement of archives management, and it is also the research focus of this paper.

2.2. Significance of classified storage of construction project files

Documents are the predecessor of archives, and archives are the destination of documents; documents are the foundation of archives, and archives are the essence of documents; documents are factors of archives, and archives are the combination of documents ^[6].

The quality of construction projects is closely related to the quality of construction project files, and file management directly affects the overall economic benefits of the enterprise ^[7]. Therefore, it is necessary to make real records of the entire construction project to ensure the accuracy and completeness of all documents, which can be used as an important reference for the verification by the audit department, project completion acceptance, daily maintenance, and even future reconstruction. Therefore, it is necessary to focus on the management of construction project files, improve the effectiveness and standardization of file management, and promote the sustainable development of construction project file management.

(1) Archives have the function of evidence and basis. As an important base for documents, archives are a kind of non-renewable resources, which play an irreplaceable role in the collection, management,

utilization, and protection of documents. Project archives play an irreplaceable role in the construction, management, maintenance, and transformation of projects.

- (2) Construction project archives are the true records of the labor achievements and historical achievements of builders. To some extent, they can serve as a monument for the builders.

For important documents, it is important to maintain the confidentiality of information to ensure the integrity and availability of information.

It is important to strive towards standardized and scientific management of construction project archives management. The general requirements of a good quality archive are as follows: the rules and characteristics of the formation of files should be followed, the files should be organically connected, the different values of files should be distinguished, and the archives should be organized in a way that facilitates storage and utilization ^[8].

3. Opportunities and challenges faced by construction project archives

3.1. Challenges

3.1.1. Irregular, incomplete, and inaccurate files

Although archives are managed by different departments, most people do not know enough about archives management, and the standards of each participating unit are different. This results in difficulties in information sorting, making it impossible to collect engineering files in time, and even incomplete and inaccurate files.

3.1.2. Delayed file collection, resulting in the loss of documents

Due to the relatively large scale of construction projects, it is very difficult to manage them. Many projects do not require file management personnel, let alone relevant institutions. Information are usually archived separately by different departments, which results in a scattered archive.

3.1.3. Poor archive conditions

During the construction period, the storage conditions of the archives are poor, and the awareness of protection is weak, resulting in damage and loss of archives. There are many departments in a project, and each department has related files. Because of this, the project files are very large. It can be said that archives start to be generated when a construction project is approved. As people's requirements for construction continue to increase, more departments will be established for construction projects, and the amount of project files will increase accordingly.

3.1.4. The handover of construction project files is not standardized

After the project files are generated, they all need to be handed over to the relevant file management personnel, and handover procedures must be followed when handing over. The increase in projects has brought greater pressure on the transfer of files, which is a huge challenge to the file management of engineering construction. However, there are many deficiencies in the current project file transfer system. For example, after the files are transferred, they are only stored in various functional departments casually. This has brought huge hidden dangers to engineering file management.

3.2. Countermeasures

3.2.1. Improving the management system of engineering archives

When signing a contract, relevant clauses should be set up for project filing, where the filing responsibilities of each unit involved in the construction are clearly stipulated. Besides, it is important to strictly follow the national regulations and normative requirements during the project construction, and collect and sort out

the filing responsibilities of each link in a timely manner.

3.2.2. Strengthening the functions of the archives administrative department

The main person in charge of the archives administrative department should be included as a member of the leading group of key construction projects. Not only that, but the construction unit should also report the construction project to the local archive administrative management department upon approval from the provincial authorities.

3.2.3. Strengthening the allocation and training of project archives management personnel, and improving the professional quality of archivists

Project archiving is a very professional job. Construction units should select personnel who understand both construction business and archives business to engage in archives management and keep the personnel relatively stable. The archives administration department should also select archivists to participate in the training of key project archives management. Besides, the project file management network should be improved, the allocation and training of project file management personnel and instructors should be strengthened, and their professional quality should be continuously improved.

3.2.4. Clarifying the responsibilities and rights of archives management

It is a very cumbersome and complicated task to manage engineering archives. If there is no corresponding management standard, it will be difficult to manage engineering archives well. Therefore, relevant management norms should be created, so as to determine file management responsibilities in accordance with relevant regulations. The construction unit should have more detailed requirements for the records of any project. From special personnel management to fixed-point supervision, from simple records to design changes, from the use of signatures to various systems, all tasks should be included in standardized management.

4. Conclusion

Construction project files play an extremely important role in all aspects of engineering construction. For archives management personnel, it is necessary to strengthen the concept of comprehensive quality management, constantly standardize the quality of archives, and strengthen communication with other departments and personnel, so that the integrity and authenticity of engineering data can effectively guaranteed, so as to ensure the quality of construction projects. File management plays a role in promoting orderly development of project archives.

For construction projects, the management of project files is very necessary. If the archives of the project cannot be managed effectively, the construction quality of the project cannot be improved, and the project will lose its competitiveness. To effectively manage engineering files, it is important to understand its professional and extensive characteristics and formulate corresponding methods. Only in this way can engineering file management be effective.

Disclosure statement

The author declares no conflict of interest.

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