Research on Interface Management of Electromechanical Equipment System of Urban Rail Transit

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Abstract: As a complex system project, urban rail transit mechanical and electrical engineering has a small space, a large number of specialties, and a high degree of technical intensiveness. There will be a large number of complex interface problems in the construction of the project. Improper management will seriously affect the project quality, schedule, safety and cost. Interface management strategy is the soul and core of interface management. It is of great significance to study interface management strategies to improve the level of interface management and even the entire project construction management level. This article starts with the development process of urban rail transit, introduces the basic concepts and management characteristics of urban rail transit electromechanical engineering, elaborates the basic theories of urban rail transit electromechanical engineering interfaces and interface management, analyzes the root causes of interface problems, and introduces mechanical and electrical engineering. The characteristics and classification of engineering interfaces, and discusses the work objectives, main content and basic methods of interface management.

1. Introduction

Engineering construction is a very important link before the formal operation of urban rail transit. It is a very complex systemic project. According to the implementation stage and professional division, it can be roughly divided into civil engineering and mechanical and electrical engineering. Urban rail transit electromechanical engineering (referred to as electromechanical engineering, hereinafter the same) is a multi-collection, heterogeneous branch, full-level composite professional project, which contains most of the equipment of mechanical engineering, electrical engineering and power electronics engineering It has many specialties, advanced technology, cross-interconnection, high integration, and limited installation space. Interface management problems are common in urban rail transit engineering construction. Various specialties and various types of equipment in electromechanical systems, and Civil engineering, rail laying, and decoration are interrelated and interact with each other, and they have complicated and complicated interface relationships. The quality of the entire electromechanical project is good or bad, and the stability of daily operation safety is not only dependent on the quality control of the single system's internal R & D, batch production, installation and commissioning processes, but also the quality of work of various interface management. There are various “invisible” technologies for interface management. Insufficient grasp of interface management will lead to the problem of losing one another. If the interface problems in any link cannot be handled properly, it will be easy to push each other and delay the construction period. In other words, the performance of the entire system will be unstable, and even the normal operation cannot be used.

2. Overview of Urban Rail Transit Engineering Interfaces

The term “interface” is derived from computer technology. It can be said to be a communication protocol used to establish connection and transmission functions between devices, or a protocol format for data exchange between devices. Later, it was borrowed from other fields, which refers to the part where two objects (systems) are connected to each other, interact with each other, and interact through it. There are nine subsystems in the urban rail transit electromechanical system,

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each of which is relatively independent and interconnected, and finally forms a complete rail transit electromechanical system. Among these nine subsystems, the rail transit system can operate normally, thanks to the coordinated operation of the interfaces. Managers should carefully inspect and strictly manage each interface with their own management techniques. Involving multi-professional and complex rail transit systems, the technical requirements are also quite strict. In terms of interface management, only effective management methods can reduce construction costs, improve management efficiency, and avoid disputes during operations.

Regarding the “interface” of the rail transit industry, its definition has not yet been universally recognized. In general, many classifications can be divided from the perspectives of engineering specialty and management, and the interconnections between many classifications divided by this different perspective are It is called the Urban Rail Transit Engineering Interface, and the interface object refers to the components or components of the system that are related or connected to each other in terms of mechanical, electrical, functional, software coordination, and communication protocols.

The concept of interfaces introduced in engineering construction management is because two or more system organizations, equipment facilities, functions, or areas of planned interaction, because there is a high probability of conflicts between the interfaces, coordination between the interfaces is required. Unite. An interface is associated with at least two external objects. The meaning of “interface” in management is also extended from the above concept of “interface”. Only in the late 1970s did the electromechanical engineering interface problem of urban rail transit begin to get people's attention, and then it was analyzed and discussed by scholars.

During the construction of the project, under the constraints of today's laws and the market, the owner cannot complete the entire project alone. This requires the use of resources available in the society, the operation mechanism of the market today, and the assignment of work tasks to the contractors to complete this. Projects. For example, project design work is delivered to professional units engaged in rail transit design, construction and construction tasks are entrusted to professional units engaged in engineering construction, and supervision of various projects is delegated to professional supervision units. Generates a lot of interface management requirements. In addition, the multi-discipline of urban rail transit mechanical and electrical engineering is highly integrated, and the equipment must work together and be monitored centrally, which results in a large number of internal technical interface work.

3. Interface Management Strategies Based on Key Influencing Factors

The traditional interface management model takes interface management issues as the management object and on-site coordination as the core of the work. Basically, the interface management is carried out passively. Although interface interfaces are also divided, it basically stays at the lower level such as the division of standard segments and physical interfaces. level. The traditional interface management model has obviously failed to meet the needs of domestic urban rail transit construction management and improvement, and research on interface management strategies should be strengthened. Based on the analysis of the key influencing factors of interface management, this chapter proposes targeted solutions, and formulates a combination of refined interface management strategies with pre-control as the core. These strategies are the product of the combination of basic management theories and mechatronic engineering interface management practices. It is a new attempt in the field of interface management strategy research.

The PDCA cycle was first proposed by Dr. Deming, an American quality management expert, so it is also called Deming loop. The meaning of the PDCA cycle is to divide management into four stages, namely plan, do, check, and action. In management activities, it is required to make various plans in accordance with the plan, plan implementation, and check the effect of implementation, and then incorporate the success into the standard. The unsuccessful work method is left to the next cycle to resolve. This is the basic management method and the enterprise General rules of management. The PDCA cycle management strategy is of great significance in interface management. Interface management can be divided into steps such as interface project

identification, interface file management, interface conference management, interface test management, and post-evaluation of interface management. And interface file management is the planning phase, interface installation and commissioning is the execution phase, interface test management is the inspection phase, and post-interface management evaluation is to find inadequate management and continue to improve. The interface meeting is the management carrier for the implementation of each stage of work. These four steps are the large PDCA cycles managed by the entire interface. In fact, in the specific work, many small PDCA cycles are nested in the large PDCA cycles.

Interface management project identification Use the engineering project decomposition method to gradually decompose and identify the interface management project layer by layer. The first step of interface management project identification is to identify the interface relationship. The purpose is to find two or three majors that have interface relationships. This problem can be solved by building a matrix table. The matrix table of electromechanical engineering interface of urban rail transit is shown in Table 1.

Table 1 Matrix Table of Urban Rail Transit Electromechanical Engineering Interface

	POW	TXM	SIG	ISCS	BAS	FAS	AFC	ACS	PIS	PSD
POW		★		★		★				
TXM	★		★	★		★	★	★	★	
SIG		★		★					★	★
ISCS	★	★	★		★	★	★	★	★	★
BAS				★		★				
FAS	★	★		★	★		★	★		
AFC		★		★		★		★		
ACS		★		★		★	★			
PIS		★	★	★						
PSD			★	★						

The second step of interface management project identification is to identify the sub-projects of each interface, so that the nature and characteristics of the sub-interface projects can be identified. Carry out interface management activities. The main line of work is to develop interface documents and supervise implementation. One of the effective methods to achieve the goals of interface management is to hold interface management meetings on a regular or indefinite period. The interface management meetings can be divided into interface matter discussion meetings according to the nature of work. 3. There are three types of interface issues confirmation meetings and interface issues seminars. Interface matters discussion meeting: It mainly includes user requirements discussion and preliminary design discussion, and discusses the function, composition and interface of the device. Interface Matter Confirmation Meeting: It mainly includes design liaison meeting and interface file confirmation meeting to confirm the implementation functions and technical index requirements of various interfaces of various electromechanical equipment. Interface seminars: Daily interface conferences, which mainly provide communication channels for the negotiation of interface parties. Including construction operations, testing and joint coordination.

4. Interface Management Strategy Based on Bim Technology

For large and complex engineering projects, using BIM technology for interface management has obvious advantages. The BIM model is a “contextual presentation” of the entire building design. The process of modeling is also a comprehensive “three-dimensional review” process. In this

process, a large number of problems hidden in design can be found. These problems often do not involve specifications, but are closely related to professional cooperation, or they are conflicts in space. It is difficult to find them in the traditional single-special review process. Compared with traditional 2D deepening design, the advantages of BIM technology in deepening design are mainly reflected in three aspects: three-dimensional visualization, precise positioning, collision detection, reasonable layout, and equipment parameter review calculation. IM BIM technology focuses on solving hardware interface management problems. Hardware interface problems are mainly manifested in different professions (structure, HVAC, fire protection, water supply and drainage, electrical bridges, etc.) in the same space. Interface or standard space range soft interface. Relevant inspection through BIM technology on the computer can effectively deal with these professional interfaces and improve the efficiency of interface management.

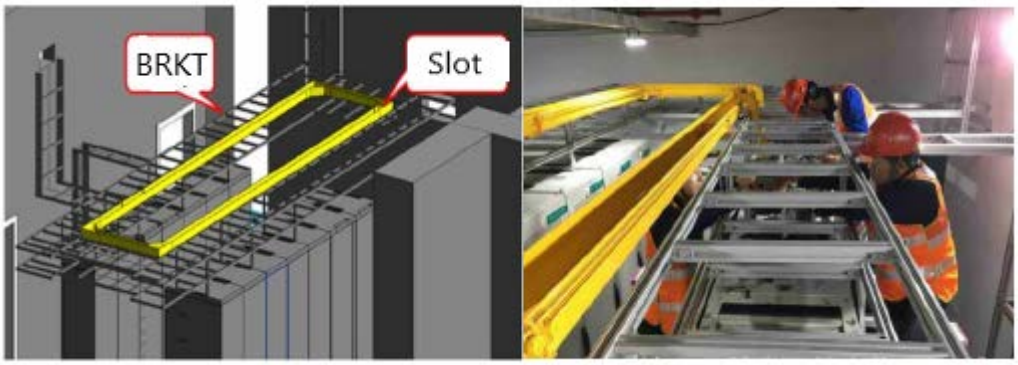

Fig.2 Machine Room Cabinet and Wire Trunking Placement Process

For the application results of BIM technology in interface management, the project leader needs to analyze it carefully and compare the actual situation on site. The completed version of the BIM interface management model has characteristics that are highly compatible with reality. The problems or parameters it reflects are all real and effective. In order to deal with fraud, an assessment mechanism should be established to deal with it seriously. The application of BIM technology in the interface management process has limitations. Therefore, the current interface management cannot be completely separated from the traditional interface management mode. The management of hardware interfaces depends on BIM technology, while software, data, and logical interfaces are still Rely on traditional management methods. Regardless of the traditional management method or BIM technology, the two are not independent of each other, but rely on each other and complement each other.

5. Conclusion

Electromechanical interface management is an important part of interface electromechanical engineering construction management. During the period, a large number of management and technical interface problems are management tasks that need to be promoted by the construction unit as a focus. In view of the complexity and arduousness of interface management of urban rail transit, it is difficult to adopt the traditional management mode to meet the needs of interface management of electromechanical engineering with a large system, many professions, and technology intensive. Interface management strategy is the soul and core of interface management. At present, it is urgent to adopt advanced interface management strategies to solve the long-standing problems existing in the interface management of electromechanical engineering for a long time and improve the interface management level.

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