Journal of Education, Teaching and Social Studies
ISSN 2642-2336 (Print) ISSN 2642-2328 (Online)
Vol. 5, No. 2, 2023
www.scholink.org/ojs/index.php/jetss

Original Paper

Application of BIM Technology in HVAC Design

Qiansong Luo[1]

[1] Xihua University, Chengdu Sichuan Province, 610039, China

Received: May 9, 2023 Accepted: May 22, 2023 Online Published: May 25, 2023

doi:10.22158/jetss.v5n2p87 URL: http://dx.doi.org/10.22158/jetss.v5n2p87

Abstract

With the rapid development of China's construction industry, higher requirements have been placed on the design and construction of HVAC engineering. As the most critical aspect of building design, HVAC design will to some extent affect the comfort of buildings. BIM technology, as a new architectural design technology, can convert planar CAD drawings into three-dimensional models, playing a very important auxiliary role in HVAC design. This article will introduce the concept and characteristics of BIM technology, and combine with the author's practical application experience to briefly explain the application advantages and research of BIM technology in HVAC design, I hope to provide some reference for the application of BIM technology in HVAC design.

Keywords

BIM technology, HVAC, Design, Application analysis

1. Introduction

With the high development of China's construction industry in recent years, the number and scale of construction projects are constantly changing. As the foundation construction of modern architecture, HVAC engineering construction also has higher requirements. From the perspective of relevant building engineering practices, the construction of HVAC engineering is generally difficult, and traditional construction techniques cannot meet people's high requirements for HVAC. Therefore, strengthening the innovation and application of new technologies has become an inevitable trend, and only in this way can the construction quality of HVAC be continuously improved effectively. In HVAC design, HVAC pipelines are intricate and complex, especially in underground garages where they often collide with fire and electrical pipelines, posing great challenges to on-site construction. At the same time, the design of pipelines and equipment in HVAC design is also a significant workload. BIM technology can adjust and regenerate pipeline collisions into new drawings through three-dimensional visualization models, reducing construction difficulty. BIM software can directly count the number of pipes and equipment required for the built model, improving design efficiency.

2. The Concept and Characteristics of BIM Technology

2.1 Concept

BIM (Building Information Modeling) technology, commonly known as Building Information Modeling, is an architectural design applied to digital tools. By helping to achieve an integrated architecture of information, from building design, construction, operation to the entire lifecycle of the building, various types of information are always integrated into a three-dimensional information model. BIM databases are dynamic and constantly updated and improved during the application process, improving work efficiency and saving resources, Reduce costs to achieve sustainable development.

2.2 Characteristics

(1) In terms of drawing methods, planar two-dimensional design mainly expresses equipment contour lines and pipeline contour lines in the drawings through the arrangement and combination of lines, and then reflects their size and relative position through text and numerical annotation. BIM design not only uses the combination of lines, but also points and surfaces, which can more intuitively express the connection mode of equipment and pipelines and their spatial position in the building;

(2) In terms of expression, two-dimensional design expresses content through a plan view, while BIM design expresses content through a three-dimensional information model.

3. The Application Advantages of BIM Technology in HVAC Design

3.1 BIM Technology Makes Design Solutions More Vivid and Intuitive

HVAC design is an important component of architectural design, directly affecting the comfort of buildings. BIM refers to building information models. With the progress of science and technology, BIM technology has been continuously improved and optimized, and is increasingly widely used in China's construction industry. When using planar two-dimensional design, it is not possible to comprehensively display the data and parameters of HVAC pipelines and equipment. This problem can be solved by using BIM technology. By applying BIM technology in HVAC design, an intuitive three-dimensional model of HVAC can be established, allowing for a clear view of the shape of pipeline installation and the specific location of equipment. This makes the design plan more vivid and intuitive, providing owners with a more intuitive promotion and introduction, and facilitating subsequent information exchange, actual installation, and construction management.

3.2 BIM Technology can Shorten the Design Cycle

When using traditional HVAC design methods, the design cycle is extremely long due to the numerous design stages and the large amount of engineering involved in integrating data. One of the advantages of using BIM technology for design is its ability to integrate all data parameters and comprehensively display the specific spatial locations of HVAC pipelines and equipment, thereby reducing the burden on designers, improving design efficiency, and shortening design cycles.

3.3 BIM Technology can Optimize Design Solutions

In the process of HVAC design, collisions between pipes are inevitable. When using planar two-dimensional design, if there are pipe collisions during the actual installation process, the designer needs to redesign the position of the pipes on the drawings, and at the same time, modify the position of the pipes in the section and elevation drawings. This is a heavy workload and prone to errors, which brings inconvenience to installation and inspection. If BIM technology is used, collision detection can be performed on the 3D model before pipeline installation. If there is a collision, the model and drawings can be modified in a timely manner. At the same time, BIM technology can optimize the design plan, calculate the approximate quantity of required pipes and equipment, and avoid unnecessary waste.

4. Research on the Application of BIM Technology in HVAC Design

4.1 Application of BIM Technology in Cold and Heat Source Design

The use of BIM technology in cold and heat source design can improve the quality of cold and heat source design. Usually, in public areas where the flow of people varies significantly over time, there are significant differences in temperature and humidity control over time and seasons. Therefore, in the design process of cold and heat sources, it is necessary to calculate the cooling and heating loads for different seasons and time periods. Software like Dest can accurately calculate the cooling and heating loads of different building areas at different time periods, determine the load differences between different building areas, and provide a reliable foundation for subsequent design work.

4.2 Application of BIM Technology in Construction Drawing Drawing

The drawing of construction drawings is a very important part of HVAC design. When drawing construction drawings, designers need to draw HVAC equipment and operating diagrams. By using BIM technology, models in the BIM model library can be directly applied to drawing according to design requirements, improving drawing efficiency. At the same time, various equipment and pipeline type parameters can be numbered, and statistical charts can be generated to improve construction efficiency.

5. Conclusion

In summary, using BIM technology for HVAC design can establish a three-dimensional information model, making it more convenient to analyze and optimize the design of HVAC systems. At the same time, BIM technology can provide more vivid and intuitive design solutions for cold and heat sources, shorten design cycles, and improve design quality and efficiency. The above is the author's exploration of the application of BIM technology in HVAC design.

References

Cai, L. Q. (2020). Research on the Application of BIM Technology in HVAC Design. *Residential and Real Estate*, (21), 44.

Dong, X. R. (2021). Research on the Application of BIM Technology in HVAC Construction Design. *Residential and Real Estate*, (31), 105-106.

Huang, Y. (2019). Application of BIM Technology in HVAC Design. *Building Materials and Decoration*, (33), 95-96.

Janina. (2022). Research on the Application of BIM Technology in HVAC Engineering Design. *Real Estate World*, (10), 40-42.

Lin, J. J., & Lin, X. N. (2021). Explore the application of BIM technology in HVAC design. *Metallurgical Management*, (07), 41-42.

Liu, F. Y. (2019). Application Analysis of BIM Technology in HVAC Design. *Green and environmentally friendly building materials*, (04), 107.

Lu, L., & Zong, T. (2019). Application Analysis of BIM Technology in HVAC Design. *Green and environmentally friendly building materials*, (07), 79.

Qi, H. C. (2019). Analysis of the Application of BIM Technology in HVAC Design. *Information Record Materials*, (12), 78-79.

Song, D. H. (2020). Discussion on the Application of BIM Technology in HVAC Design. *Digital Technology and Applications*, (02), 85-86.

Wang, W. L., Zhou, G. M., Yao, H. Z., & Yuan, C. S. (2021). Analysis of the Application of BIM Technology in HVAC System Design. *China High tech*, (21), 99-100.

Xie, L. L. (2020). Application of BIM Technology in HVAC Design. *Smart City*, (02), 32-33.

Xu, Li. L. (2020). Application of BIM Technology in HVAC Design Residence, (12), 65.

Yu, H. L. (2019). Application of BIM Technology in HVAC Design. *Residential and Real Estate*, (22), 177.

Zhang, K. F. (2019). Application of BIM Technology in HVAC Design. *Jushe*, (27), 84.

Zhang, T. (2019). Discussion on the Application of BIM Technology in HVAC Design. *Journal of Huainan Vocational and Technical College*, (04), 7-8.

Zhang, Y. Y. (2019). Application of BIM Technology in HVAC Design. *Electronic Technology and Software Engineering*, (10), 138.

Zhong, Y. F. (2022). Preliminary Study on the Application of BIM Technology in HVAC Design. *Jiangsu Building Materials*, (04), 35-37.

Zhou, S. J. (2020). Research on the Application of BIM Technology in HVAC Design. *Green and environmentally friendly building materials*, (03), 100-102.

Zhu, J. X. (2019). Application of BIM Technology in HVAC Design. *Residential and Real Estate*, (16), 92-128.

Zhu, L. Q. (2023). Application of BIM Technology in Building Plumbing and HVAC Design. *Technological Innovation and Application*, (08), 185-188.