

Application of Glass Fiber Reinforced Cement in Exhibition Decoration Project

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Abstract. Through the study of GRC material and its application field, the aesthetic characteristics and functional characteristics of GRC materials are demonstrated. The decorative application and technology of GRC material in an art exhibition center are highlighted. The design, application and construction technology of GRC curtain wall and ceiling board in the interior and exterior decoration of art exhibition hall are discussed in detail. The unique advantages of GRC materials in exhibition engineering decoration are fully reflected. In practical design application, the application principle and method are summarized, and an application procedure is formed. The research proves that GRC materials in the art of building decoration engineering has an underrated advantage.

1. Introduction

Construction industry is an important pillar industry in our country. Building materials are important material carriers of construction industry [1]. For the construction company, the right construction material is the basis for the completion of the excellent process. For designers, the right building materials can meet the design imagination and design needs. For engineering projects, the appropriate building materials can meet the appearance and functional requirements to the maximum extent [2]. Therefore, decoration material is the material carrier of architectural engineering construction application, architectural engineering conception creation and construction project value. Nowadays, the construction industry advocates the design concept of "energy saving, environmental protection and scientific humanity", and puts forward higher requirements for the selection and application of materials [3]. There are many kinds of building materials on the market, and the construction technology has its own advantages. The texture, color, pattern and performance of each building decoration material are different, and these characteristics can help designers and construction parties to achieve different decorative purposes. Therefore, they need to have a clear understanding for the properties and characteristics of various decorative materials [4]. According to the technological method and advanced means, a suitable work works can be created to meet the needs of designers and customers.

Convention and exhibition architecture is a special art space. The selection of interior and exterior decoration materials is directly related to the visual aesthetic feeling and the actual effect of the exhibition building. Through the example study of the design and application of GRC material in an art exhibition hall decoration project, it will expand the space for the application of GRC materials, and also provide a broader platform for the artistic expression of GRC materials [5]. Thus, in the design of exhibition hall, it is necessary to understand the properties, characteristics and specifications of GRC materials more clearly and comprehensively, and also to understand its application scope and principles [6]. Mastering its application process will provide more reference for the application of



GRC materials in all kinds of decoration projects, especially in the exhibition building decoration engineering and technology.

2. Application fields and functional performance of GRC materials

2.1. Application of GRC material in building engineering

In the application of Building Decoration Engineering, the most prominent feature of GRC products is the GRC curtain wall. Among all kinds of new building boards, GRC curtain wall has become an ideal outer wall material. GRC curtain wall has the characteristics of light texture, strong impact resistance, and various facade shapes and strong adaptability. It also can choose different insulation materials for composite [7]. There is an external evaluation for curtain wall, that is, its advantages can not only meet the requirements of external wall art modeling, but also meet the needs of customers for the practical function of building. Therefore, GRC curtain wall is widely used in building engineering and has a good reputation.

Two examples of using GRC material in city building are as follow: In Jiujiang of Jiangxi province, the Jiujiang Culture and Art Center is a new landmark in this city. The building uses the outstanding shape of the GRC curtain wall. GRC hyperboloid board is used as building curtain wall material, which embodies the artistic expression of nonlinear architecture. Because of the plasticity, light, durability and high strength of GRC curtain wall, the large scale GRC curtain wall board can exercise a combination of inflexibility and yielding with the main building, and the nonlinear beauty of the building is achieved [8]. For example, the Pavilion of Urban Future of Shanghai World Expo built in 2010 has now been transformed into a contemporary art museum. Its predecessor is a Nanshi power plant with a history of more than 100 years. Because the Nanshi Power Plant ignited the first electric light in Shanghai, the chimney was reserved to memorize the symbolic moment. As a permanent building of Shanghai World Expo theme exhibition hall, curtain wall adopts GFRC stripe hanging board. The recoverable function of GRC material can be brought into full play. Natural traces and rough texture combine the old and new buildings naturally, and echo each other. This kind of architectural expression gives people a strong visual impact, and it is very iconic and characteristic.

2.2. Application of GRC material in Civil Engineering

The extensive application of GRC materials in building engineering has a great impact on the field of decorative materials in China. In the bridge engineering, the template project accounts for most of the cost of the bridge project, and the maintenance cost of the bridge project caused by cracking and deflection in the midspan is also a considerable amount. Therefore, the template engineering of bridge attracts much attention. The construction system reduces the project cost by improving the bridge formwork structure. Therefore, the GRC permanent template is used. The biggest construction difficulty of bridge engineering lies in how to construct bridge under the condition of deep water and rapid flow, and the project also needs to meet the vessel traffic in flood season [9]. These harsh natural environment and strict construction requirements have brought great challenges to bridge engineering. If using the method of support construction, it will be faced with many problems such as difficult construction and high construction costs. The introduction of GRC permanent formwork simplifies the current construction problems, which not only improves the construction efficiency, but also guarantees the construction quality. Secondly, GRC materials have been widely used in water conservancy projects. At present, a large number of concrete impervious channels are constructed in water conservancy projects. Water shortage and building materials shortage may occur in the field environment [10]. GRC plate seepage prevention can be considered. It can be produced in large quantities in different places, and then transported to the construction site for installation. The operation process is simple and convenient. At present, in China, some highway projects also give up the traditional ordinary concrete pavement and try to use GRC steel fiber concrete pavement. The pavement constructed with GRC steel fiber concrete not only has thin pavement thickness, but also has less expansion joints and longitudinal joints. More importantly, the overall performance and the

economic benefits are good. GRC steel fiber reinforced concrete is also widely used in bridge deck. GRC steel fiber reinforced concrete bridge deck perfectly demonstrates the advantages of GRC material crack resistance and wear resistance, greatly reducing the workload of the later maintenance.

2.3. Functional performance of GRC materials

As a new type decorative material with high density, GRC material has a variety of characteristics, such as strong modeling ability, light weight, high strength, fire protection, sound-absorbing, environmental protection, economic and practical characteristics. Therefore, the material has become the first choice for designers and owners in all kinds of decorative materials. The diversified products of GRC play their respective decorative roles in different engineering fields, and enhance the art effect. In the old building restoration and renovation project, GRC material reflects the high imitation ability. It can imitate the shape, color and texture of the building facades perfectly. Due to its light weight, the old building does not produce too much weight bearing, reflecting its strong practical performance.

Table 1. Comparison of GRC materials and conventional hanging plate materials

Hanging plate materials	Format	Areal density (kg/m ²)	Surface modeling	Decorative effect	Manufacturing cost (¥/m ²) (excluding installation quantity)
GRC board	0.8-5.0	50-70	Free and rich in style	Colourful	600-800
Stone board	0.5-1.0	60-100	Difficult	Dull	200-1000
Precast concrete hanging board	1.0-6.0	100-300	Colourful	Colourful	500-1500
Metal plate	1.0-2.0	10-15	Colourful	Colourful	400-3000

3. Application and process technology of GRC material in art exhibition hall

3.1. Application of GRC curtain wall in decoration engineering of art exhibition hall

In the investigation of a new material company in Nanjing, it is found that GRC material is an important modeling building material. GRC curtain wall has achieved the ever-changing decorative effect in the application of modern building exterior wall decoration. GRC curtain wall has the characteristics of light weight, high strength, fire prevention, waterproof, sound insulation, insulation and durability. It can be molded into any shape and designed for any finishing effect. When they are flexibly docking with the main building, the designers have created the imagination of the architectural space. The design can meet all the needs of the exhibition building decoration project. The application of GRC curtain wall in the exterior decoration of convention and exhibition building can not only realize the landmark characteristics of the exterior image of exhibition building, but also realize the decorative originality of the designer.

In the exterior decoration of the art exhibition hall, GRC curtain wall material can be selected. It is made of special decorative layer, high performance GRC layer, GRC rib or steel frame and other materials. This product has overcome some shortcomings of traditional GRC materials, achieved technical breakthroughs in cracking prevention. It also improves the self-decoration effect and precise shape and size, greatly improving its application performance. Compared with stone, glass curtain wall materials, high performance GRC wall also has several advantages: In the aspect of modeling, the high performance GRC curtain wall has very strong modulus. With its advanced manufacturing technology, it can create different styles, shapes, cultural characteristics of curtain wall materials. Secondly, in the aspect of format, high performance GRC curtain wall panel meets the large size of GRC curtain wall plate through scientific product design, unique production technology and advanced connection technology.

3.2. *Application and construction technology of GRC ceiling board in art exhibition hall*

GRC ceiling board has the advantages of thin wall, light weight, high strength, good rigidity and flexibility. It can meet the designer's requirements for ceiling molding. The art exhibition hall adopts GRC ceiling board in the exhibition hall, conference hall and theater. The GRC light flat plate has the advantages of stable performance, easy modeling, no deformation, green environmental protection, short processing cycle, convenient and flexible construction, good acoustic effect, light weight, high strength, refractory, smooth and delicate material surface. These characteristics meet the aesthetic and functional requirements of the art exhibition hall.

The design of the art exhibition hall uses a large size and texture effect ceiling plate. This design not only highlights the interior decoration of the exhibition hall and theater, but also meets the needs of consumers. The weight of GRC ceiling board is lighter, and its safety performance is stronger. At the same time, GRC ceiling board can also adjust the indoor humidity temperature to achieve a comfortable visit and enjoy the environment. The ceiling of the GRC ceiling is used in the interior of Dubai Ligger Hotel and Australia Sydney Opera House. According to the interior layout of the art exhibition hall, it is divided into exhibition area, theater, conference area, service management area and toilet. Designers consider the use of GRC ceiling panels in exhibition areas, conference halls and theaters. The design of large area irregular curved surface can make the interior space of the building very mobile and modern, which makes different space fields show different rhythm and form different rhythm of space.

4. Conclusion

The interior and exterior decoration design project of the art exhibition hall is the centralized application of GRC materials in the same architectural decoration project. It shows the outstanding product performance and application process of GRC material. From GRC curtain wall, GRC ceiling board, GRC partition board to GRC component, GRC material reflects its unique advantages. The uniqueness of the art exhibition hall also provides a stage for CTRC to display its talent. GRC products have many advantages, such as diversity, plasticity, green environmental protection, light, high energy and so on. Through the study, it is found that GRC material has become a new building decoration material with creativity, spiritual motivation and vitality, and is an ideal material for interior and exterior decoration of art buildings. Most of the art buildings are one of the most important cultural facilities for urban art exhibitions, academic exchanges and cultural experiences. Its cultural needs and artistic needs are expected to break through the architectural style. New shape design, atmospheric and practical building materials all have certain requirements for decorative materials. The powerful random modeling function of GRC satisfies the imagination of design.

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