

22 GRC APPLICATION IN ARCHITECTURAL BUILDINGS AND RE-CREATION WORK

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SUMMARY: Founded in 1990, Nanjing Beilida has been manufacturing GRC products for 15 years in China. The products are widely used in new decoration in architectural buildings and re-creation of old buildings. It is widely used not only in the Chinese market, but also in the USA, Japan and Australia. We have worked on hundreds of GRC projects in Shanghai, Beijing, Nanjing, Changchun and most big cities in China. As an architectural product, GRC is becoming more and more accepted by architects and building contractors. As a GRC manufacturer, our responsibility is to make this material more reliable, aesthetic, practical and economical. The paper describes and illustrates several of our projects.

KEYWORDS: Aesthetic, architectural, decoration, GRC, Nanjing, re-creation.

1. BEIJING ZHUJIANG ROMAN APARTMENTS

This project is for buildings in the European style. We made use of large-size moulds and steel stud framing at the rear of the GRC components for this tall building.



Figure 1 - Beijing Zhujiang Roman Apartments

2. BEIJING ZONG LUQUAN FIRST CLASS APARTMENTS

This project is again for buildings in the European style. Some 18,000m² of architectural GRC was used in 11 tower buildings. Stud-frame GRC panels were used for the large components. The panels are storey-height, fitting between floors. We used a swinging cradle to install the components for each floor without scaffolding, and on the top of the tower we used a GRC curtain for protection.



Figure 2 - Beijing Luquan First Class Apartments

3. MALAYSIAN EMBASSY IN CHINA

These panels were required to have a smooth appearance on both faces and incorporated a grille pattern. We used flexible moulds to produce the panels.



Figure 3 - Malaysian Embassy in China

4. BEIJING JINEE INTERNATIONAL APARTMENTS

A total of 35,000m² of GRC was used in this project. The sculptured form of the panels was the key point, employing a large block-effect pattern for the main wall panels.



Figure 4 - Beijing Jinee International Apartments

5. NETWORK BUILDING OF BEIJING TV STATION

It required good design to carry through the Paris architect's intentions and the beige terrazzo GRC curtain wall achieved the requirements in dimension and color. All of the tolerances were limited to within 2mm, especially the connection; there is only one opportunity for installation in the final position as it is impossible to gain access to the back for adjustment.



Figure 5 - Network building of Beijing TV station

6. TIANJIN VILLA

A total of 45,000m² of GRC architectural panels and components were used in this big holiday hotel and villa project. This project shows our capability in sculpturing and mould manufacture.



Figure 6 - Tianjin Villa

7. NANJING BAJIAHU APARTMENTS

This is a large area for habitation with an extensive range of buildings. The exterior decoration was carried out with normal procedures without particular difficulties.



Figure 7 - Nanjing Bajiahu Apartments

8. NANJING CENTURY TOWER (SCULPTURE)

The height of this impressive sculpture is 88m; for the exterior wall panels we used curtain wall panels to achieve the result.



Figure 8 - Nanjing Century Tower

9. NANJING YUHUA DISTRICT OFFICE BUILDING

The significant feature is the use of 12m high columns on this building. This required good control of manufacture and installation.



Figure 9 - Nanjing Yuhua District Office Building

10. CHANGSHA GUOZHONG STAR CITY

With rich textures, vivid round sculptures and extravagant designs, this really represents a distillation of the international construction world. It seems that you are walking around the International Architecture Garden of a thousand countries. This project is named Changsha Guozhong Xincheng.

Our first-rate sculptors and technicians made the owners' dreams come true. All of the round sculptures, reliefs and balustrades were made using highly mouldable GRC. So the technical requirements in architectural art, mould-making and production are very strict.



Figure 10 - Changsha Guozhong Star City

11. SHANGDONG SHUANG YUEYUAN VILLAS

The project included 22 types of apartment, 122 sets of villas and 426 types of component. The maximal daily production capacity was 700m² and the key point of management was to avoid errors in production planning. The total area of 40,000m² of GRC panels was accomplished within 6 months.



Figure 11 - Shangdong Shuang Yueyuan Villas

12. SHANGHAI GOLDEN MOUNTAIN MANSION

This is an exterior decoration project to renovate a hotel building. Stud-frame panels were used in this project. The design incorporated an elegant cornice projecting 1.5m upwards at the roof line. Steel frames were fixed in each component and an independent lift facility used for erection of GRC components.



Figure 12 - Shanghai Golden Mountain Mansion

13. SHANGHAI TANGCHEN GOLF VILLA

A requirement of the owner was that the connections between GRC components be made without any sign of joints and any water penetration. This was achieved successfully.



Figure 13 - Shanghai Tangchen Golf Villa

14. SHANGHAI SHENDE HOSPITAL

The combination of columns of 2m diameter, 12m height and the incorporation of artistic old-style cast iron elements made the project a distinctive architectural example in this area.



Figure 14 - Shanghai Shende Hospital

15. SHANGHAI WESTERN SUBURBS MANOR VILLA

On these impressive villas all GRC components were installed by bolts.



Figure 15 - Shanghai Western Suburbs Manor Villa

16. SHANGHAI SONGJIANG COLLEGE TOWN

The detailed design and column decoration made the need for quality control more important.



Figure 16 - Shanghai Songjiang College Town

17. ZHEJIANG SUN PALACE HOTEL

In this project, a circus-style architectural profile was used on the GRC. The surface is treated by acid washing to give the texture of laterite from South Africa. Because of this special design, the hotel has become well known in the city, and the business has flourished. The hotel received good feedback because of this decoration.



Figure 17 - Zhejiang Sun Palace Hotel

18. HANGZHOU VENICE HOTEL

The success of the Sun Palace project brought us a new project in Hangzhou. This project is a redevelopment of an old building. A total of 15,000m² of GRC architectural panels was used in this project. The GRC finish was treated with an acid wash, which resulted in a surface texture like real rocks.



Figure 18 - Hangzhou Venice Hotel

19. CHANGCHUN CENTURY CINEMA CITY

Changchun Century Cinema City, famed as the Eastern Hollywood, is located in the eastern part of Jing Yuelin Garden in the south suburb, Changchun, with an area of 290,000m². With a total investment of 1.5 billion Yuan, it is the first international standard entertainment garden joining the cinematic and travel fields, blending features of American Hollywood and Disney amusement parks. It has the twin characteristics of the most advanced technology in the world and artistic GRC: the sculptural decoration covered nearly 70,000m², all using GRC materials.

Among them, famous sights such as the Volcano Breaking Forth, the Eight Diagrams Movie Hall, the Forest Ancient Castle, Maya Restaurant, 5D Cinema, Pyramid, Plaza Deiform Column, Man-made Lake etc, show the concept of international ancient culture and as well as modern thought.



Figure 19 - Changchun Century Cinema City

In this project, direct spray-up, premix spray-up and premix processing were all used in manufacturing. In terms of moulds, many materials including FRP, GRC, GRG, PU and steel were used. Some production was carried out on site with steel frames made on the job site. In this case, we first made a theodolite reference frame by welding the contour lines, then added 4 × 4 steel net on the reinforcing steel bars, making the steel net follow closely the reinforcing steel in order to form sunken and protruding shapes, as specified by the shop drawings. Spraying of the GRC materials was then done on both sides of the steel net to improve the effects and save the costs of moulds. This also avoided joints between the components, and the Inner Volcano Drainage Rock and Outside Chute used this technology. Among them, No. 4 District of the Volcano illustrates the ancient period, when the volcano was erupting, the molten rock passing through the ancient mountains, the grotto being completely destroyed, landslide and land crack, showing the ancient culture being destroyed at a stroke. The height of each sculpture is 14m, the width is 2.5m, and the area of one piece is 500m² formed by spray.

The other way to achieve components similar to the above is to divide a large element into several pieces, to enable manufacture in the factory. GRC mouldings are made, delivered to the job site and then installed, such as the volcano, the eight diagrams, the ancient castle, the cinema etc, all by using this kind of workmanship.

The methods of 'Cut and Spray' and 'Pre-cast Spray' GRC production is used to form pieces within the moulds. These products are used mainly as external and inner wall panels and all kinds of visual sculptures such as the Maya Restaurant, Pyramid, the Center Fountain in the downtown of Changchun and all kinds of art sculptures.

The pre-cast moulding method is being used mainly to manufacture vase balustrades, bridge balustrades, riverside rocks, egg-shaped rocks, etc.

All the above-mentioned projects result from 15 years of hard work and 90% of these projects were made during the last three years. Not all of these projects brought plenty of fortune. What is left for us is plenty of moulds and all we can show you is these pictures. But GRC is full of artistic charm; we will always pursue this aim and do more research in this exciting GRC field.