

APPLICATION OF NEG ARG FIBRE

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 Nippon Electric Glass

NEG ARG Fibre, manufactured by Nippon Electric Glass Co., Ltd. is used throughout the world as a reinforcement for cement composites, including asbestos replacement products.

Combining Ancient with Modern – A Stunning New Cathedral Dome in Ukraine



The new Patriarchal Cathedral of the Resurrection of the Lord in Kiev combines traditional design with contemporary features.

The four gilded domes represent the four evangelists. These surround the larger central dome which represents the figure of Christ.

The Cathedral has a capacity of 1,500 and when completed it will become the spiritual centre of the Ukrainian Greek Catholic Church.

Noted Ukrainian architect Mykola Levchuk designed the structure, which took the top prize for contemporary building designs for religious structures at a recent architectural design contest in Moscow.



Construction

The construction of the lower large dome was one of the major challenges during the project. The diameter was 22m and the top of this dome was 26m above ground level. It had to be water-tight and insulated and the inside surface had to be smooth enough to allow elaborate painted scenes.

The novel solution proposed by the contractor involved initially constructing a structural steel dome.



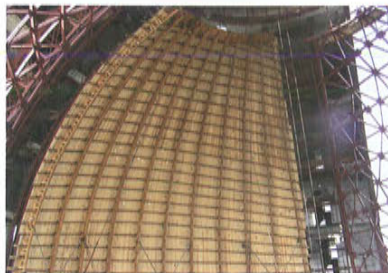
A large formwork section representing a quarter of the dome was then fabricated from timber and plywood and hoisted, with the help of two hoisting units, into position.

This formwork section was enormous, with a surface area of over

150m². The timber used had been covered with a special coating to give the required high quality finish.



Formwork under construction



Formwork assembled

Equipment and Training

The spraying of the GRC raised many problems that had to be overcome. GRC is normally sprayed under factory conditions with a trained workforce.

In this instance, the spraying took place 16-26m in the air with a work force unused to the material.

Initially, a trial section of formwork was installed at ground level, and this was used for training.

During the training, pumping trials were carried out and it was found that the Power-Sprays PS9000A Spray Station could be sited at a height of 15m above ground level and that it had the capacity to pump cementitious slurry up to the required height of 26m.

This overcame many problems, as the GRC125 Mixer, the Spray Station, and all the raw materials were easily accessible at this 15-m level.



Training

Special Fixing Design

Each dome section had been designed to weigh about 9 tonnes when completed, so it was essential for the connection between the GRC and the structural steel to be adequate in terms of safety and security.

It also had to be designed to allow sufficient movement to accommodate shrinkage and moisture movement within the GRC skin.

A special fixing was designed to achieve this, and after testing it was used in the project.



Fixing detail



Fixing detail

The Next Step

Spraying could now proceed. The high quality finish required a mist coat that was sprayed first before the GRC spraying took place.

When spraying under these conditions it is essential that the AR glass fibre runs freely through the spray gun without blocking and is easy to compact.

High Zirconia NEG ARG AR2500H103 was chosen as it met all these criteria as well as having the highest available zirconia content.

Particular attention was paid to compaction and even under these difficult site conditions the quality of the GRC produced was comparable to that produced under factory conditions.

With the quantity of GRC to be sprayed, each section took a full day to spray and the formwork was left in place a further day before the formwork was moved to the next section and the process repeated.



Spraying first coat



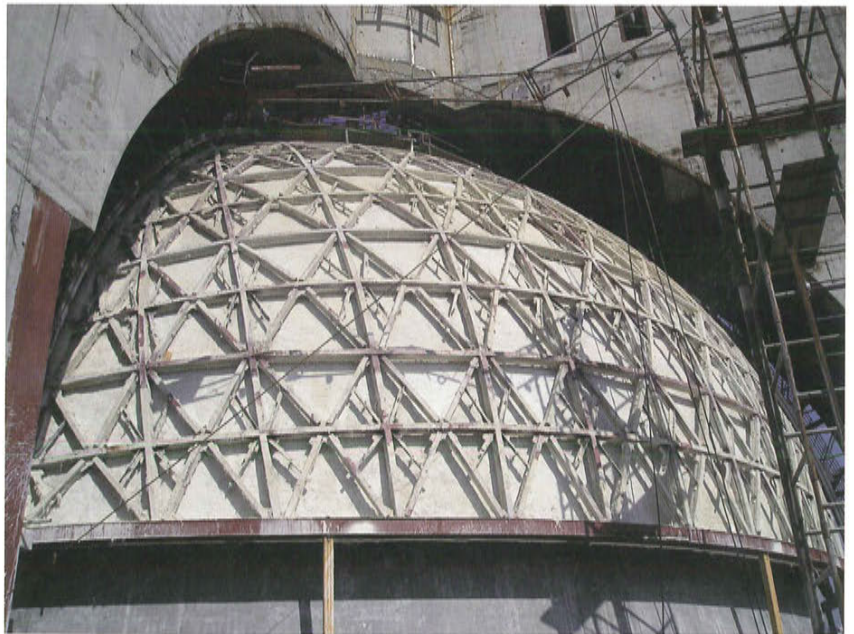
GRC spraying

Final Works

The remaining sections of the dome were then finished, which allowed the insulation and waterproofing to be completed.



Internal view of first section



External view



Nearly complete



Insulation

Building the Internal Dome

To complete the project, a smaller 8-m diameter dome was produced. This was manufactured in one piece at ground level and was a major undertaking.

The surface area was 100m² with an average GRC thickness of 18mm, giving a total weight of 3.7 tonnes.

After spraying and curing, the dome was lifted from the form-work and hoisted 47m high, passing through the opening in the top of the large dome. It was then fixed onto 8 corbels located just below the central gold dome.

The smooth internal surface of the GRC was ideal for decorative painting.



A 3.7-tonne internal dome



Completed dome and mould

Dedicated Workforce

The completion of this project was a remarkable success for all concerned, but the most credit must go to the workforce and the late project manager and author of its major engineering and technology solutions, Sergei M. Popov.



Patriarchal Cathedral of the Resurrection of the Lord

Location: Kiev, Ukraine

Architect: Mykola Levchuk

Main Contractor: Ukrmonolitspetsbud Concern

Engineer: M. Levchuk Architectural Bureau

Subcontractor and GRC Manufacturer: ZAO Ligobud

Technical Support: Fibre Technologies

International / Andrei Rumiantsev

Equipment Manufacturer: Power-Sprays Ltd.

AR Glass Supplier: NEG

Concept and Coordination: Gavriil P. Shelestian

Total Area of Deck: 3,500m²

Total Development Area: 1.97ha

GRC Area: over 1,200m²



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