

This series of Good Practice Notes covers issues which users and specifiers may wish to consider when working on projects featuring cladding products manufactured from glass fibre reinforced concrete (commonly referred to as GRC or GFRC)

MANUFACTURING PROCESS

Virtually all GRC/GFRC that is used in cladding applications is manufactured from Spray Process GRC as defined in BS EN 1169 ¹ BS EN 15191² and the International Glassfibre Reinforced Concrete Association (GRCA) Specification ³

Whilst these standards cover all manufacturing processes the disposition of GRC/GFRC to moulds by a simultaneous spray process is by far the most labour intensive and most complex. It also requires skills and experience significantly different to those to manufacture precast concrete.

The things that can and do go wrong on the shop floor are:

- Incorrect calibration of the spray pump resulting in inconsistent slurry and fibre ratios
- Failure to control facing coat thickness which has a direct influence on the thickness and performance of the structural GRC/GFRC.
- Allowing facing coats to start their initial set creating potential for facing coat delamination
- Not applying the structural material in thin enough layers between compaction cycles
- Insufficient attention when creating fixing points resulting in significant works required on-site
- Lack of manufacturing consistency compared to that used to manufacture samples for testing.
- Incorrect demoulding which can stress the young GRC/GFRC beyond its design limits
- Noncompliant post demoulding repairs
- Incorrect application of surface sealants
- Bad packing practices which can again introduce undue stresses to the product.

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GOOD PRACTICE GUIDE 2 INDEPENDENT CONFORMITY ASSESSMENTS

It's for this reason that PCI-MNL130-09 ⁴ strongly recommends that quality control personal do not directly report to production management.

This is very difficult in today's cost and time driven construction industry.

It should also be noted that most GRC/GFRC manufacturers carry out their own in-house testing or it is carried out for them by supply chain partners

With this approach there is little or no validation of methodology, competency or impartiality as required under ISO 17025:2017 ⁵ which is the international standards for testing laboratories.



Application of facing coat

ISO 9001/GRCA ASSESSMENTS

Assessments by either an ISO 9001 conformity assessment body or the International Glassfibre Reinforced Concrete Association (GRCA) should not be taken as a guarantee of finished product quality.

ISO 9001 assessments are based around the principle of assessing an organisations quality management system and do not provide evidence of technical competence or the validity of manufacturing or testing processes

In the case of the GRCA, assessments are more industry specific however are still not detailed and do not include any physical visits to the plant by experienced GRC/GFRC professionals.

To clarify the GRCA's role in providing evidence of conformity the association publishes on it's website *"GRCA Full Member status is not a guarantee of quality, and specifiers and users of GRC from any GRCA Full Members must satisfy themselves that the GRC manufacturing Full Member has sufficient resources in plant, equipment and labour to consistently design and manufacture high quality GRC in accordance with the requirements of the GRCA Specification, Methods of Testing and Practical Design Guide."*

INDEPENDENT CONFORMITY ASSESSMENTS

Conformity assessments should be carried out by individuals or organisations who are independent of the manufacturer and can demonstrate complete impartiality thus ensuring no conflict of interest.

Assessments should be carried out against documented Inspection and Testing Plans which cover every aspect of the design, manufacture, testing and shipping processes. For further details on Inspection and Testing Plans please refer to The GRC/GFRC Good Practice Guide 1 ⁶

Ideally such inspections should be carried out at least twice across a project manufacturing period and be unannounced. Such requirements should form part of any order or sub-contract.

These assessments must be physically carried out by personsel who have demonstrable experience in the manufacture of GRC/GFRC products. This is essential in order all aspects of the involved processes can be evaluated.

SUMMARY

Independent conformity assessments by experienced GRC/GFRC professionals should be encouraged and supported by manufacturers who follow best practice and appropriate standards.

Such assessments allow rapid corrective actions of issues which otherwise would cost both supplier and purchaser both time and money.

More importantly they provide a "golden thread" trail of quality auditing through the project delivery cy



Karla Tower Gothenburg. Scandinavia's tallest tower

Façade Contractor: Yuanda Europe

GRC Cladding: Polycon

Conformity Assessments: PBS Synergies Group

References

- 1 BS EN 1169. Precast concrete products – General rules for factory production control of glass-fibre reinforced cement. Publication Date November 1999
- 2 BS EN 15191. Precast concrete products – Classification of glassfibre reinforced concrete performance. Publication Date December 2009
- 3 GRCA Specification for the Manufacture, Curing & Testing of Glassfibre Reinforced Concrete (GRC) Products. Publication Date February 2021
- 4 PCI Manual for Quality Control for Plants and production of Glass Fiber Reinforced Concrete Products. Second Edition. Publication Date 2009
- 5 BS EN ISO/IEC 17025 incorporating corrigendum. General requirements for the competence of testing and calibration laboratories. Publication Date March 2018
- 6 The GRC Centre Good Practice Guide 1. Specifications & Inspection and Testing Plans. Publication Date September 2023