

NORSKREEN™ GRC  
Façade System  
Details

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# **Norskreen**

## **STANDARD TESTING & PRODUCTION QUALITY PLAN**

***“Grade 18 GRC Facade Panels using the Spray production Process –  
Spraying fibre rovings and slurry simultaneously onto a mould, by  
mechanical means”.***

## **1. Relevant Batch Material Standards:**

- 1-1 Glass Fibres:  
Alkali resistant continuous fibre. Being compliant to the GRCA specification for AR glass fibre rovings and chopped strands for reinforcement of cements and concretes. Compliance certification available upon request.
- 1-2 Cement:  
Standard to BS EN 197-1, CEM 1 Portland Cement. Compliance certification available upon request.
- 1-3 Pigments:  
Standard to BS EN 12878, Type: Powder pigments or dispersions.
- 1-4 Sand:  
Typically volume bagged washed and dried Silica Sand.
- 1-5 Mixing Water:  
Standard to BS EN 1008
- 1-6 All relevant material batch codes for release agents, mist coat fines, silica sand, cement, polymers, AR Roving / chopped strands are recorded daily
- 1-7 Compliance certificates to be stored in the main QA file.

## **2. Pre-Production QA**

- 2-1 All manufacturing requirements are collated and distributed via Wolverhampton production site and entered into manufacturing via a numerical Works Order system, consisting of fabrication and GA drawings approved as construction issue by the project team. Pre-production meetings headed by the Project Manager take place with the factory foremen and production director to ensure knowledge of the scheme is passed down the chain of command with any queries resolved prior to manufacture.
- 2-2 All moulds are carefully checked after completion against the fabrication drawings by the production manager. Checks for overall dimensions, straightness, sureness, twist and flatness are carried out as applicable.
- 2-3 All standard product mix designs are clearly on display and strictly adhered to. All materials and admixtures are volumetrically batched using weekly-calibrated digital scales or sized measuring containers. All bulk kiln dried sands and cement is bagged by volume. Any non-standard mix designs are recorded in the production managers mix design book.

## **3. Spraying process test requirements:**

- 3-1 Bag Test: BS EN 1170 Part 3  
**Tested daily.** Bag tests are carried out to ensure correct fibre ratios for backing mixes.
- 3-2 Bucket Test: BS EN 1170 Part 3  
**Tested daily.** Bucket tests are conducted to ensure material volume compliance with the bag test.
- 3-3 Fibre Length Checks:  
**Tested daily.** Fibre length checks are conducted to ensure the chopped fibre length is correct. Nominal length – 30-35mm

- 3-4 MOR (Modulus of rupture), LOP (Limit of proportionality) Testing: BS EN 1170 Parts 4 and 5  
 Historic test data to be available for each contract. Tests are undertaken at the required frequency. Generally test coupons are randomly selected from all daily coupons issued and tested on approximately every third days production / at the discretion of the test body.  
*Required test values at 28 days: (Grade 18)*  

<i>Sprayed</i>	<i>LOP</i>	<i>5-10 N/mm<sup>2</sup></i>
<i>Sprayed</i>	<i>MOR</i>	<i>18-30 N/mm<sup>2</sup></i>
- 3-5 Stored water temperature:  
**Tested daily** (Ideal Range = Min 7°C, Max 19°C)
- 3-6 Factory temperature:  
**Tested daily** (Ideal Range = Min 11°C, Max 20°C)
- 3-7 Panel Thickness Checks:  
**Tested daily**. Each panel checked in 4 places throughout the panel length / height with a pin gauge for thickness compliance.
- 3-7 Slump Test: BS EN 1170 Part 1  
**Tested daily**. Slump consistency established by the spraying foreman on each mix design. Slump tests carried out on ALL face mix batches and recorded. This test measures the consistency of the matrix.

#### **4. Manufacture QA requirements:**

- 4.1 Face Coat – Batched as per the backing mix but without fibres with acrylic polymer included and spray applied, generally 3-4mm thick, but may be slightly thicker at corners and within intricate detailed units.
- 4.2 Backing Mix – Again, spray applied in a minimum of two coats - approximately 10-12mm thick, or greater dependent upon unit geometry of drawing specification. The production manager carries out random thickness checks on all panels on a daily basis.
- 4.3 Consolidation – Rolled and tamped between each sprayed layer before the matrix has cured.
- 4.4 Ribbing / thickened edges – constructed in accordance with fabrication drawing requirements.
- 4.5 Curing – Units dry cured for a minimum of 12 hours before de-moulding (longer dependent upon geometry and production manager's recommendations). All units to be retained within the factory above film formation temperature and cured for a further 24 hours prior to finishing and packaging.
- 4.6 Finishing – Face finish as per approved sample.
- 4.7 Marking – All units are marked and dated on non-exposed faces in line with the production order schedule and referenced GA drawing.
- 4.8 Daily Casting Logs are recorded identifying the operative to key activities. This promotes accuracy and checking of manufacture.
- 4-10.1 Rejects – Any rejects are recorded on a reject log
- 4-11 Panels are finished in accordance with the retained and approved control sample. Control samples are held by the production manager for reference during the finishing process.

## **5. Post manufacture QA.**

- 5.1.1 All units are re-checked against the fabrication drawing. All moulds are checked for overall dimensions, straightness, sureness, twist and flatness before reuse. Adjustments to the moulds are made as necessary.
- 5.2 Rejected products can only be condemned by the production manager.
- 5.3 **Packaging & Storage:**  
Units are accessed in respect of appropriate packaging requirements or specific customer needs. Generally material is placed onto suitable pallets or A frames.  
Correct packaging is essential to avoid stress, bowing and ensure suitable protection of the product. Careful placement of protection is critical to help avoid "ghosting" and bearer marks during the units early drying out stage. All pallets / A frames are heat wrapped with a schedule of contents marked on or attached. Material is stored for 28 days post production.

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Facade System  
O&M Manual Document

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## 1.0 Technical Performance Sheet



**PLANASark**

### TECHNICAL PERFORMANCE SHEET

Title: Telling GRC  
Ref: hhhh  
Issue Date: October 12<sup>th</sup> 2014  
Revision: 00

#### Characteristic Mechanical Properties Grade 18P GRC at 28 days

(MOR <sub>28</sub> )	18-30 N/mm <sup>2</sup>
(LOP <sub>28</sub> )	5-10 N/mm <sup>2</sup>
(UTS <sub>28</sub> )	8-12 N/mm <sup>2</sup>
(BOP <sub>28</sub> )	4-6 N/mm <sup>2</sup>
Interlaminar Shear	2-4 N/mm <sup>2</sup>
In-Plane Shear	7-12 N/mm <sup>2</sup>
Punching Shear	25-25 N/mm <sup>2</sup>
Charpy Impact Strength	15-25 N/mm <sup>2</sup>
Dry Bulk Density	1800-2100 Kg/m <sup>3</sup>
Water Absorption	8-13%
Apparent Porosity	16-25%

MOR - Modulus of Rupture (flexural), the ultimate bending stress obtained from the four point bend test.  
LOP - Limit of Proportionality (flexural) is the point at which the stress/strain curve deviates from a straight line.  
UTS - Ultimate Tensile Strength - Stress at which GRC fails in pure tension.  
BOP - Bend over point (tensile), namely, the stress at which the stress/strain curve deviates from a straight line variation when a sample of GRC is tested in direct tension.

The performance criteria for Grade 8P and Grade 10P are also available

#### Approvals and Accreditations

Telling Architectural GRC products are manufactured under

- ISO 9001:2008-12363-QMS-001
- BS8297-2000
- International Glassfibre Reinforced Concrete Association - Approved Manufacturers Scheme accreditation ISOQAR 026 – 9th June 2014

## **NORSKREEN GRC Rainscreen Façade System.**

**Manufacturer:**

**Supplier:**

**Tel:**  
**Fax:**  
**e-mail:**

### **Introduction**

This information sheet is intended to explain the general properties of the Norskreen GRC rainscreen system, in so far as they are relevant to the control of substances Hazardous to Health Regulations 1988.

They are not intended as an exhaustive list of all technical data, which may be relevant in assessing the appropriateness of the product for specific applications. Where specific information is necessary about properties relevant to particular uses, more information is contained within the maintenance manual as indicated at the end of this information sheet.

### **Intended uses**

Norskreen GRC Façade panels are in general uses for ventilated rainscreen façade applications.

### **Composition**

An AR resistant Glass fibre reinforced concrete composite unit. Supported on an Aluminium extruded frame anchored support system or other, as applicable.

### **Chemical Properties**

Inert concrete composite panel manufactured from sand, cement, water, Glass fibre reinforcement and admixtures [super plasticisers-polymer]

Aluminium support system manufactured to 6063 & 6082 grade aluminium in accordance with BS8118 for structural use of extruded aluminium sections.

Fixings for the support system are project specific.

## **Storage & Transport**

No special precautions are necessary for the GRC product, however it is recommended to handle the panels with due diligence as they are hard concrete product but in thin walled format.

## **Appearance**

Generally GRC panel units are delivered to site in a palletised form. Panel units will be manufactured to an exact production schedule, however panels can be site cut if necessary to create a specific interface size using water cooled diamond tipped masonry circular disc saw.

## **Packaging**

The panel units will be packaged on a project specific basis as the shape, size and format of GRC façade panels available is extensive.

## **Health Aspects of Norskreen GRC Products.**

As a concrete composite product there are no respiratory problems with the installation or use of the panels under the COSHH Regulations under normal site activities.

Although there are no known 'carcinogenic' problems with the production or cutting of the panels it is prudent to minimise exposure to the dust while cutting elements by the use of respiratory protection and cutting the tiles in a well ventilated environment (albeit dust is reduced by use of the suggested water cooling of the tile saw blade).

## **Handling Precautions**

### **Clothing**

Most operators find it best to wear loose clothing, especially avoiding tight constrictions at neck and wrist, etc.

### **Eye Protection**

When cutting the material and installing the material above head height, eye protection is recommended.

### **Respiratory Protection**

When cutting panels, dust may be generated and a face mask should be worn.

Dust masks complying with BS6016 should be chosen.

### **Personal Hygiene**

In all of the above the need for adequate standards of personal hygiene should be recognised.

### **Waste Disposal**

Waste products are not hazardous and their disposal should be in accordance with local regulations.

### **Emergency Action**

If irritation to the eyes or throat occurs, consult a doctor.

### **Additional information**

Please read additional guidance notes and coshh statements with regards to the other products which are used and combined on the façade through wall construction.

## **Maintenance Regime**

### **Graffiti Removal – spray paint**

1. Apply AGS Graffi Clean 300.
2. Allow to dwell for 15-45 minutes.
3. Pressure wash clean, preferably with hot water.

If 'ghosting' remains,

4. Apply AGS Graffi Ghost.
5. Allow to dwell for 3-5 minutes.
6. Pressure wash clean, preferably with hot water.

### **Graffiti removal – if ghosting remains**

If 'ghosting' remains after the use of AGS Graffi Ghost

7. Apply AGS Graffi Ghost Rinse or PROSOCO Limestone Afterwash.
8. Allow to dwell for 3-5 minutes.
9. Pressure wash clean preferably with hot water.
10. Repeat steps 4-9.

### **Graffiti Removal – marker pen**

11. Carry out procedures 1-10
12. After application and washing of AGS Graffi Ghost Rinse or PROSOCO Limestone Afterwash apply AGS Graffi Ghost Poultice – liquid component.
13. Allow to dwell for 5-10 minutes.
14. Pressure wash clean preferably with hot water.
15. Repeat steps 7-14 for 3 to 4 cycles.

### **Panel Repair Details**

Where a particular facade panel is damaged it will be reviewed by an appointed agent of Telling. If a replacement panel is required full details will be supplied regarding how to replace the unit for that particular façade system.

The replacement unit shall be manufactured by Telling and the new unit installed by an appointed agent of Telling.

Where a particular façade panel shall be repaired on site full details and a complete repair kit containing the relevant materials, colour matching agents and instructions shall be sent to an appointed agent of Telling to carry out the prior agreed repair schedule

# SPECIMEN WARRANTY

The company hereby warrants the quality of the GRC [glass fibre reinforced concrete] facade panels and aluminium/stainless steel support systems manufactured and supplied from our factory in .....

- Integrity of the designed support system within the performance parameters advised to us but excluding fasteners to the structure for which the installer is responsible for selection and fixing.
- Performance of the GRC facade panel elements in relation to live and dead loads imposed during the design life of the panels
- Durability/breaking strength including cracking due to manufacturing defect.
- Water absorption which could lead to deterioration of the panel face.
- Staining resulting from corrosion of support and fixing system components.

This warranty Is effective for a period of 12 years from the above date.

A claim upon defects must be received in writing within this period. This warranty does not extend to physical damage [e.g. caused by vandalism, improper use or accidental impact).

It is the responsibility of the vendor to check materials upon delivery. The installation of the panels is deemed to be an acceptance of the product.

The warranty is valid only if the panels are fixed, supported, and maintained in accordance with the recommendations of the manufacturer and the approved construction issue details supplied by the appointed system design team.

The warranty is limited to the replacement of panels found to be defective, and does not cover installation or consequential loss

# Handling, Lifting and Maintenance: GRC Panels

## Formats

- Max panel sizes of 4.5 x 2.0 m (up to 9 m<sup>2</sup>), can weigh up to 1000kg and should be lifted carefully and safely.

## Storage

- The panels are loaded in to returnable timber crates with spacers between the panels to prevent abrasion during transport and demounting
- Depending on the panel size these and for stability of the crates these can be vertically or horizontally packed and occasionally flat
- Packing of the panels is such that they can be picked in isolation without the risk of other panels falling over.
- The open side of the crate is clearly marked as are any mechanical anchors in to the side of the panels
- Pallets are shrink wrapped to protect against water and dirt staining on site
- Protection again extreme weather and saturation should apply
- Protect panels so that they are not scratched or chipped during handling and hoisting on weaker edge conditions

## Panel Lifting

In all cases unless specifically notated or instructed otherwise, spreaders must be used for lifting points at all times.

When lifting/installing panels care should be taken that lifting measures equally distribute the load so as not unduly stress the panel or lift Methods include suction pads, soft straps, clamps, lifting eyes etc to make sure that the surfaces is not scratched or chipped.

Textured GRC cannot be installed using suction lift methods and if mechanised suction lifting equipment is planned to be used we recommend trials are undertaken tithe the plant company to establish if a continuous air pressure type is proposed.

It is recommended that with panels being lifted by suction methods, a drop hazard secondary method such as a strap or lifting eye connection is

### **Handling and Site Care**

- Do not place panels down across return edges
- Place panel on a soft base such as insulation in preparation for lifting
- Edge protectors are recommended
- Do not stack panels nor allow materials to be placed on the face before installation. This can cause staining and discolouration.
- It is recommended that operatives wear clean gloves to prevent staining.

## **Installing the panels**

- Refer to system drawings to establish the type of panel
- Brackets and clips to support the GRC panels are mounted on the substructure and designed according to the load and panel profile.
- The selection and testing of the fixings for the mounting brackets/clips are the responsibility of the installer. The type, gauge, number per bracket etc will be specified by our engineers on the drawings
- It is recommended a safety method statement is prepared and that we are consulted upon the proposed method of lifting.

## **Joints – if applicable**

- Low modulus elastomeric sealant suitable for use with porous surfaces – example Dow Corning 756
- Joint backing strip

## **Cleaning the façade**

- Dust: Wash and brush off with clean water either manually or a low pressure washer
- Stain/Oil/Grease: Contact manufacturer with regard to type and severity of the soiling
- Anti-graffiti protection is not normal but recommended manufacturers can be provided.

# Tolerances – refer to BS8297-2000

- Width/Length: 3mm < 3 metres in length  
5mm > 3 metres in length
- Thickness: 3mm
- Flatness/Bow tolerance: 6mm <3 metres in length  
9mm >3 metres in length
- Squareness 3mm per 2 metres – max 9mm
- Twist 6mm < 3 metres in length  
Max 9mm
- Supporting structure: The tolerances of the supporting structure must be such that the panels can be installed without undue stress.
- Colour/Structure: Variations in colour and texture occur in this material created from natural minerals
- Minimum joint width: 6mm
- Limebloom is a naturally occurring phenomenon which will occur on panels that are exposed to humidity early in their life. It is not a defect and it will weather away over time. If acidic cleansers are used to remove this there may be a requirement to reapply the hydrophobic sealer.

## Cutting

- If site cutting is required you must consult Telling Architectural unless the field cut position has been identified on the drawings.
- The GRC panels must be cut with a stone saws using diamond wheels in a dry or wet cutting process.
- The cut edges must be coated with the hydrophobic sealant that was applied during manufacture

### NOTE

Nothing in the recommendations above shall be deemed as placing responsibility upon ..... for the safe use of its GRC products. The installer should prepare their own safe working methods, practices and procedures. The company regularly updates its production information and the installer should check that the document in their possession is current.





