

R-2007083-00 ADDENDUM B

Appearance Matters

Glassfibre Reinforced Concrete (GRC/GFRC) is rapidly becoming the architect and designers material of choice for architectural cladding requiring the look and appearance of natural stone.

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The material is one of the most complex and advanced used within the construction environment and often this powerful image can lead to expectations of appearance which far exceed the practicalities that can be achieved in production. GRC is essentially a mix of sand, cement and admixtures reinforced with alkali resistant fibres distributed throughout the cementitious matrix. Colour and texture are achieved using the same methods used in the production of both cast stone and architectural precast.

The starting point for establishing acceptability are samples and mock ups. Initially a colour and texture should be selected using a small sample of approximately 300mmx300mm. This should not be taken as an indication of consistency and will normally be provided by manufacturers as indicative. Once a color and texture have been selected mock ups must be produced. These should replicate the expected quality that will be provided throughout the supply phase. As a minimum 5 number elements should be produced on different days at a size and shape reflective of the units to be supplied. They should feature any returns that are part of the finished design and at least one of the samples should be intentionally damaged and repaired. Once these are approved by a single responsible authority they will form a benchmark for all future



This is the tenth in a series of technical notes covering aspects of glassfibre reinforced concrete (GRC) technology.

manufacture. It is good practice to cut these samples into two sections with one being retained on the job site and one returned to the manufacturing plant to be used as part of the inspection and testing procedures.

Before any mock up the specifier must detail what can and cannot be considered acceptable. This is generally by incorporation into the performance specification used for tender purposes. The following gives some guidance as to what may and may not be considered acceptable.

Visible Fibres

In most cases fibres should not be visible at the surface of the GRC product. Dependent on the manufacturing method the fibre content will be between 2-5% of the total mix quantity. In order to provide an acceptable finish it is normal to apply a layer of cement slurry prior to the application of the structural GRC. This layer is commonly referred to as a mist or face coat and would generally be between 1-3mm. Decorative aggregates can be incorporated and these determine the thickness however it is not normal to use aggregates larger than 3mm in GRC production.

It should be noted that some manufacturers using low fibre content in Premix production may not apply face or mist coats and in these instances small amounts of fibre may be visible however should not be concentrated.

Colour

The base colour of GRC is usually an off white similar to that of Portland stone. Iron oxide pigments can be added to produce yellow and buff shades. The combination of grey cement with black and brown pigments can produce darker shades. Aggregates such as dolomite and mica can produce

pleasing finishes.

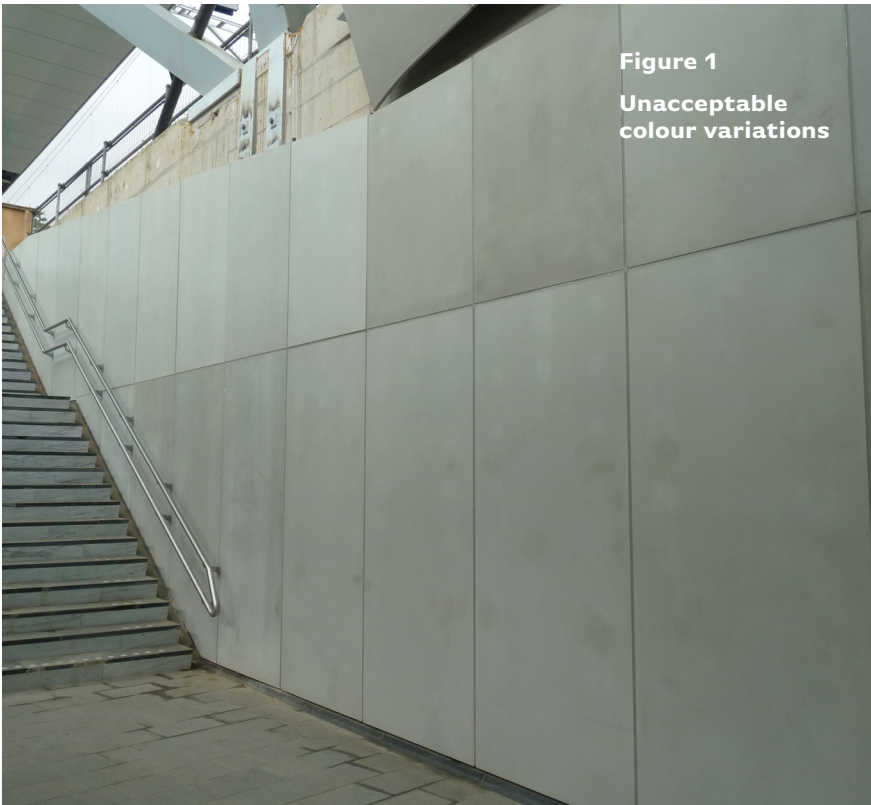


Figure 1
Unacceptable
colour variations

Whatever colour is selected it must be realized that there is considerable potential for variation. Cement has an influence as does the use of naturally occurring aggregates such as silica sand. Environmental and curing conditions also have a big influence. In simple terms it must be understood colour uniformity is not possible without a post-production applied finish.

When considering what is permissible CEN/TR 15739 is a useful reference document. This details a methodology which can be used to determine a mean colour. Acceptable deviances can then be specified using a "CIB grey scale".

Texture

GRC products are usually produced with either a smooth as cast finish or are acid washed or grit blasted to provide a slightly textured finish and/or to expose decorative aggregates. In addition to considering the amount of such washing or blasting the specifier must also decide the amount of blow or bug holes are acceptable. Again at specification stage guidance can be sought from CEN/TR 15739

Efflorescence

There are measures that can be introduced into the production process to minimise the risk of efflorescence. These include:

- The inclusion of an acrylic polymer modification agent has been shown to reduce efflorescence.
- Manufactured units should not be exposed to drying winds and rain for the first 7 days after casting.
- A suitable surface sealant may be applied at the production facility before units are taken outside.
- Air must be allowed to circulate between packed elements.
- Finished goods should not be stored flat allowing water to collect on the surface.

The phenomenon is temporary and will disappear as a result of normal weathering over time.

Repairs

A certain amount of repair work may be expected during either the production, delivery or install process. This is more likely the larger the unit. Due to the reinforcing fibres damage is generally localised and can easily be repaired using factory supplied mixes. Good repairs should not be visible at a viewing distance of 5-6 metres in good daylight.

Mould Lines/Surface Blemishes

These should be considered acceptable provided between acceptable and they are not visible at 5-6 metres viewing distance in good daylight and at right angles to the surface being inspected.

Surface Cracking

The cement rich surface of GRC products may develop a series of fine random hairline cracks and is commonly referred to as surface crazing. This phenomenon can be recognised by the fact they are barely visible to the naked eye when dry but become accentuated when wet. Over time dirt and other contaminants can build up making the crazing permanently visible. Smooth and lightly textured finishes are more prone to surface crazing and these will benefit from a treatment of a suitable surface sealant. This prevents water ingress and accumulation of dirt and contaminants. Heavily finished surfaces such as those featuring exposed larger aggregates (1-3mm) will seldom display such surface crazing.



Figure 2
An example of
efflorescence on a
dark coloured GRC

Surface crazing does not affect the structural integrity of the unit however if in any doubt professional advice should be sought.

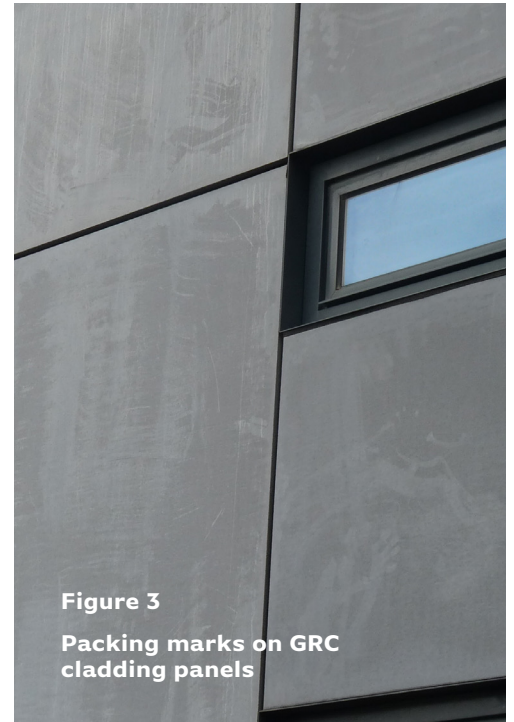


Figure 3
Packing marks on GRC
cladding panels