

Glass Fibre Roof Condition Report Follow-Up

Meeting and Progress Assessment

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Date and time: 0940 hrs Monday 19th August 2020 at [REDACTED]

Present: Stephen Bowen (Strandek) met at 0940 with [REDACTED] joined at 1000.

Previous notes from the first meeting can be found in the original report summary, which identified numerous faults in the condition of the fibreglass flat roof. This report intends to summarise the plans, progress and condition of the repair work thus far.

Meeting Summary

An initial discussion covered most areas of concern and was followed by an inspection of repair work to date.

[REDACTED] explained that an attendance had been made by the roofing contractor and some repairs had been implemented by 2 operatives over a few days. On occasion, the weather had been either too hot or too wet and this had impeded progress. He thought that it would be at least 40 working days to complete repairs with a team of 2.

Stephen Bowen suggested that progress might be too slow to complete before running into poorer weather as months went by and a larger experienced team should be used.

[REDACTED] confirmed that all the original capping had been removed as it had not adhered correctly. New timber capping formers were then secured and then 2 x layers of 450 gm/sq.m laminate had been applied. This seemed to be satisfactory.

Stephen Bowen advised that the original tanalised treated timber prevented adhesion and correct curing of polyester resin which would have caused this problem. The new timber was confirmed as OSB 3 Sterling Board and is considered appropriate.

The replacement capping was pre-formed quality profiled plastisol treated steel and observation showed to be satisfactory and in keeping with window surrounds. Purpose made joint coverings to each length were due to be fitted in due course.

Stephen Bowen advised that the end corner sections of each elevation should be cut at 45 degrees to prevent service operatives suffering tissue damage.

The quality of patch repairs appeared robust but lacked any real due care or neatness and had been completed in a diverse grey that will give the roof a very patchy appearance. Again, bearing in mind this is a new roof. Repairs should be neatly bordered at least and completed in the original colour.

Non-Slip Surfaces

Stephen Bowen stated that the walkway areas adjacent to the glazing should be upgraded / repaired. As detailed in the prior report, these areas are already suffering considerably from splits, poor laminating, resin starvation, inconsistent laminate application, delamination, 'blown' surfaces and inadequate flow coat application. All of which when combined with a minimal 450gm/sq.m laminate as opposed to a preferred 600gm/ sq.m laminate magnify the underlying failures.

It is also worth noting that the UK HSE cite unsuitable, low-grip flooring as a common reason for slips and trips - particularly on wet surfaces. This is something employers may be liable for in the event of an employee accident (<https://www.hse.gov.uk/slips/preventing.htm>).

Primer Usage

Stephen Bowen stated that he did not believe that a suitable primer (e.g. G4 primer is well known to glass fibre industry) was used to enhance the bond between the GRP laminate and the quite smooth surface of the thin gauge substrate ply that was required to follow the curved contour shape of the bays.

This absence of primer would most certainly have contributed to separation in a lot of areas - particularly if resin starvation was present. The close timber grain would have prevented adequate saturation and penetration into the ply to establish an 'anchor'.

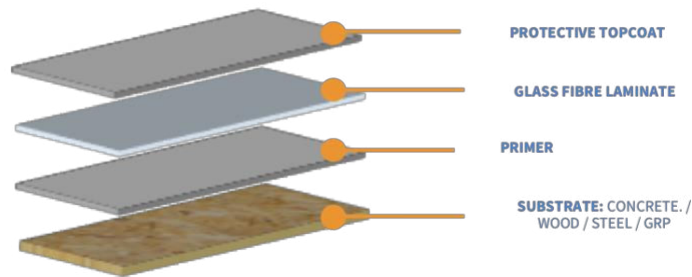
Note: the same principle applies to the varnishing process of wood. Thinned coats of primer are applied to the surface to allow subsequent coats to establish. The first resin-based primer layer penetrates pores, forms physical 'anchors' and some degree of bonding. The second layer chemically bonds to the first and so on, providing a highly adhesive surface.

Stephen Bowen stated that if Strandek had been selected, the applicators would have rejected the specification provided and would have requested modification to the walkways. Strandek would not have been able to provide an Insured Guarantee for the work otherwise.

Stephen Bowen also stated that the current installation procedure - particularly in areas where splits had occurred and were developing faults, was progressively changing from the original completed handover condition. This a little more than a year into a 20-year guarantee pledge.

Strandek's specification would have involved: (1) G4 primer application, (2) 600 gm/ sq.m consolidated laminate, (3) flow coat finish incorporating a non-slip finish in areas likely to require service foot traffic.

GRP LINING



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Figure 1. Recommended specification provided by Strandek

Tools: The Absence of a Paddle Roller

There is a noticeable absence of the use of a paddle roller (used extensively in the GRP laminating industry) to consolidate the resin and matting. Moreover, its purpose is to drive out air bubbles trapped in the resin. Bubbles create structural defects in the laminate and open it to cracks and water ingress.

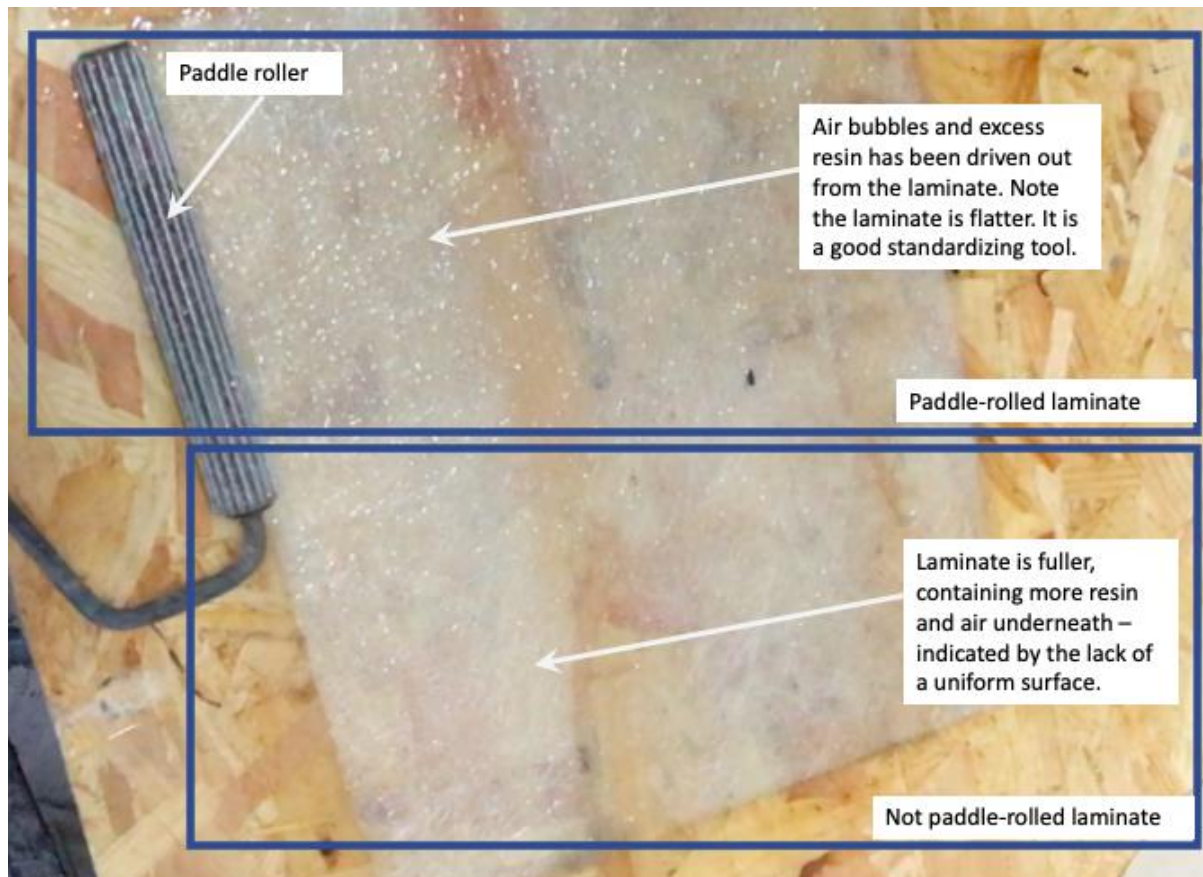


Figure 2. Comparison of with / without paddle roll usage during laminating

The resin is driven through the immediate work area assisting in eradicating any possible 'dry' areas and ultimately providing a stronger and finer finished laminate.

Evidence of the lack of use of this tool is general throughout the installation and subsequent repairs. This was illustrated by glass fibres protruding from the laminate and the lack of a homogenous surface. The resultant appearance is as if the resin has been applied by a soft roller only as a time-saving procedure.

Further Detail on Repair Procedures

Stephen Bowen asked Michael if the procedure for repair had been correctly adhered to from the original report that detailed the intended repair methods. (The repair specification previously documented by the main contractor was professionally presented).

██████ confirmed that he would check this with the roofing contractor. Stephen Bowen also requested confirmation that the repairs had been flow coated and not left in just a grey pigmented resin.

Substantial quantities of splits, perforation, resin starvation still remain, particularly in the walkways. Water was seen to eject from one location indicating a build-up within. This was subsequently videoed by Michael and such examples had been illustrated in the prior report.

Stephen Bowen stated that it is imperative to repair all obvious splits or sources of immediate water ingress to prevent further or secondary damage to the roof structure or building internals.

A discussion between all parties took place regarding the lower level gutters and it was decided to adopt the existing plan of venting and assessing progressively.

Stephen Bowen discussed the matter of cosmetic detail prior to departure with David. In general, the overall finish of the roof is cosmetically sub-standard and one which we as a company would be most dissatisfied with. Strandek most certainly would not wish to include as part of a portfolio of such a highly prestigious project.

The image below demonstrates the sub-standard laminating detail to elevations in the public eye. The vertical clad area displays unsightly rippled and blown laminate that does not compliment the structure.

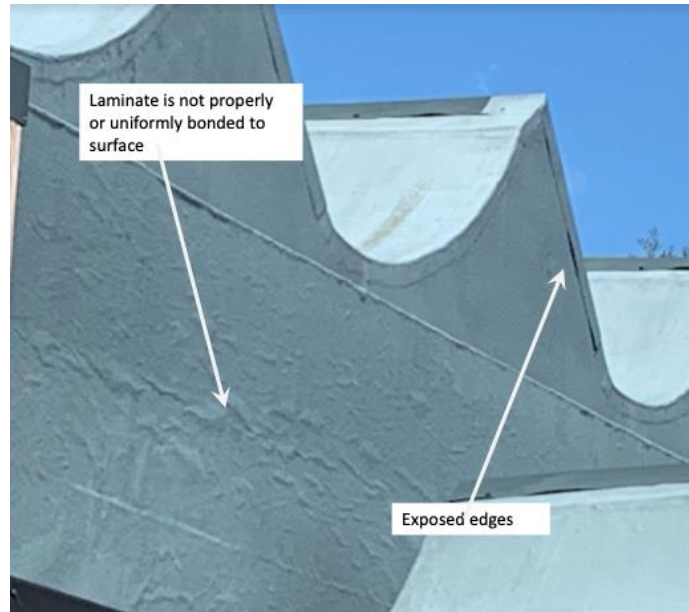


Figure 3. Poor quality laminate showing signs of poor adhesion and air underneath the surface. This could be due to the absence of a paddle roller during application.

Likewise, beneath the Cafe side elevation very untidy partially detached laminate is present with adjacent vertical edge trims displaying flow coat runs. Unfortunately, this represents an example of very poor laminating skills and understanding of the use of the material.

Concluding Remarks & Recommendations

In general, these items are correctable but require skilled application and understanding.

Some progress has been made in regard to capping replacement and localised repairs. These should address some of the defects previously outlined in the prior report.

The rate of progress remains to be a subject of concern, with only two laminators on the project and a projected timeline of 40 days, delays are to be expected. This could expose areas of the roof to water ingress. It is recommended that additional team members are brought on to speed up the repair process of defective areas in light of the winter months and associated bad weather.

In terms of the quality of repairs, there is some evidence that incorrect laminating procedures are being used to undertake the repair works, consistent with the prior roofing work. Furthermore, it is apparent that a different colour was used in the topcoat, deviating from the original agreed specification.

It is also recommended that reinforcements to the walkways are made to tolerate foot traffic as there is evidence of breakdown, and that the final surface has a non-slip finish to minimise slips in wet weather. Slips and trips are common occurrences and at height, the consequences are compounded.

Stephen Bowen
Managing Director
Strandek GRP Systems