



THE ADHESIVE AND SEALANT COUNCIL, INC.

## Summary of Field Trial of Adhesives Used to Strengthen Residential Roof Assemblies

### Introduction

The Adhesive and Sealant Council (ASC) is investigating the application of adhesives to improve the performance of residential roof assemblies under a cooperative research grant from the U.S. Department of Housing and Urban Development (HUD). As part of this effort, ASC's subcontractor Newport Partners has been investigating performance, regulatory, and constructability issues associated with using adhesives to strengthen the roof sheathing-to-roof framing connection.

On August 25, 2006 Newport staff conducted a field trial in which roofers used adhesives on the framing-to-sheathing joint on a single-family detached home under construction in Maryland. The objectives of the trial were to document constructability issues and gather insights from the roofing contractors. This report summarizes the findings.

### Overview

The house under construction is a fairly large (~3,200 sf) single family structure with a multi-plane roof line (Figure 1). While its size and roof line complexity are beyond average houses, many new houses built in the U.S. would have similar characteristics.



Figure 1 - Field Trial Site

Roof sheathing panels for the house were 19/32" plywood, which were lifted up to the roof level in small batches with a "Sky Genie" system (Figures 2 and 3). Once panels were lifted up to the roof level, they were manually transferred to an intermediate storage point on the roof framing or put directly into place.



THE ADHESIVE AND SEALANT COUNCIL, INC.



Figure 2 – Sheathing Panel Specifications



Figure 3 – Lifting Panels up to Roof Line

The adhesives used in the trial were obtained at a home improvement retailer, and 2 of the 3 products were listed at AFG-01 certified (Figure 4). We looked for this product certification based on prior research performed by Clemson University, which found that AFG-01 certified adhesives seemed to perform well in terms of uplift resistance when applied as a retrofit measure. It should be noted that the scope of this field trial did not include any provisions for uplift testing or any other structural testing.



Figure 4 - Adhesives used in Field Trial

#### Construction Sequence

Once the plywood panels were lifted to the roof line, measured, cut to fit (for non-full sheets), and positioned in the right place, the roofers would lay a bead of adhesive on the top chord of the roof truss where the sheet would be placed (Figures 5 and 6). Because these were the first sheets of roof sheathing installed on the house, the preliminary steps of lifting panels, measuring, cutting, and positioning took considerable amounts of time. Once the bead was laid, the panel would be placed onto the roof framing, adjusted to the exact position required, and then nailed in place with a pneumatic framing nailer. This process is captured in video clips recorded during the trial.



THE ADHESIVE AND SEALANT COUNCIL, INC.



Figure 5 – Applying Adhesive



Figure 6 – Applying Adhesive

### Observations

Our staff's observations and insights from the roofing installers provided several interesting findings related to the use of the adhesives:

- The adhesive application does not present a major difficulty in terms of constructability. Yes, it is an extra step – but it takes just 1-2 minutes per sheet to lay the bead and is easier and faster than many other parts of the roof decking process. Once a few sheets are laid and footing on the roof becomes easier, subsequent sheets would be even easier to install. The necessary tools and supplies were fairly easy to manage as well.
- Once adhesives are applied, it is more difficult to shift the panel into its exact position (e.g. the plywood won't slide well once it's in contact with the adhesive, and the installers often need to slide it ½" or so to get it lined up right).
- The plywood sheets definitely need to be nailed down into the truss even when adhesive is applied, because 1) this connection helps set the sheathing into the adhesive (and almost every sheet of the roof sheathing had some to it and would not sit flat by itself) and 2) the adhesive instructions require this
- A pre-applied peel-away product would probably be even better in terms of ease of installation. Another idea is pre-applied adhesive micro-capsules which are located on the top surface of the truss. When roof sheathing was fastened down on the truss the capsules would rupture and release the adhesive, creating a bond between sheathing and truss.
- Nail "misses" occur pretty frequently, which offers credibility to the value of a back-up attachment (Figure 7).

### Recommendations

This preliminary demonstration indicates that the application of adhesives may not present major difficulties in terms of constructability. However there still needs to be a clear value to this approach, since it will be used in conjunction with mechanical fasteners and viewed as an additional step to take.

The potential value gained from this technique can be shown in multiple ways:

- Adhesives add strength to roof assemblies which is especially important in high wind zones
- Adhesives provide a margin of error for fasteners which miss framing or inadequate fastener type or spacing
- Adhesives are easy to apply (especially if alternative methods to the basic caulking gun can be developed )

ASC invites its members and participating manufacturers in this project to comment on these findings and recommendations, and offer additional insights to help progress this application of adhesives.



Figure 7 – Nail Misses