



THE ADHESIVE AND SEALANT COUNCIL, INC.

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Office of Policy Development and Research, Room 8134  
451 Seventh Street, SW  
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SUBJECT: Progress Report – April 2007

Contract No. H-21521CA, Investigation of Adhesive Applications for Strong and More Disaster-Resistant Roof Assemblies – Phase 1

Period of Performance: 4/7/06 – 10/7/07

Contractor: The Adhesive and Sealant Council, Inc.  
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Email Attachments which Accompany this Report:

- Project presentation given at ASC Spring Conference

## **SECTION I – INTRODUCTION**

The HUD Office of Policy Development and Research has been extensively involved in supporting research and development on building technology innovations, construction systems, products, standards, regulations, and code issues which affect the affordability, safety and livability of the nation's housing. As the interrelationships of these topics become more complex, the continued need to conduct research and demonstrations becomes even more critical.

In addition to the research and demonstration efforts administered directly by the Office of Policy Development and Research, HUD administers the Partnership for Advancing Technology in Housing (PATH) program. PATH provides private and public sectors for the U.S. housing industry an unprecedented opportunity to advance state of the art practices in the design and construction of affordable housing for the public by accelerating the process of developing and introducing new and innovative technologies and new materials through demonstrations and pilot projects throughout the nation.

This cooperative agreement with the PATH program will investigate and characterize the use of adhesives to fasten roof sheathing materials to underlying roof structures in residential buildings.

This application of adhesives holds the potential for improvements in roof system durability and disaster resistance, and applies to both new and existing construction.

## **SECTION II – PROGRESS AND SCHEDULE**

Phase 1 of this project consists of 4 tasks. The status of each task is presented below.

This monthly report reflects a period of performance of 18 months as noted in the previous monthly report. Dates for several task deliverables now reflect this period of performance.

### **Task 1. Assess Performance Requirements and Develop Criteria for Adhesive Consideration**

Complete

Deliverable & Due Date: Summary of adhesive-based roofing attachment systems, relevant building code, relevant product standards, and related research programs. Submitted to GTR 8/22/06.

Progress and Deliverables:

Task 1 called for ASC and its subcontractor Newport Partners (NP) to better understand the performance requirements needed from adhesives used in roof assemblies by a) canvassing building code and product standards, and b) investigating related research and product testing. Together ASC and NP have completed this task by engaging dozens of industry stakeholders, including ASC members and non-member adhesive manufacturers, researchers from academia and private firms, industry associations, building code bodies, and international groups involved in research and testing. Findings can be grouped into the following categories:

- Similar research and product development efforts
- Findings on the most suitable applications for similar systems (e.g. retrofit of existing roofs)
- Relevant building code issues that affect the application (e.g. issues with fire blocking for foam plastics)
- Relevant building performance and installation issues which have been raised (e.g. restricting ability of sheathing panels to expand/contract with ambient humidity changes)

The results of these research efforts are presented in the Task 1 summary report submitted to HUD in August 2006.

## **Task 2: Assessment of Industry and Market Factors**

Complete

The objectives of this task are to:

- Conduct assessment of jobsite factors which are involved when using adhesive-based systems (especially in new construction). More information is needed on these issues to understand the magnitude of potential barriers.
- Investigate and characterize insurance industry programs focused on encouraging improved water resistance and uplift resistance for roof systems (new and existing) to mitigate future damages. This will improve our understanding of industry interest in applications involving adhesives.
- Determine the most feasible application(s) moving forward based on performance, building code, “constructability”, and market factors. This effort involved a roundtable discussion of adhesive manufacturers at the ASC Fall Convention to get their input.

Task 2 Deliverables:

- Summary report of jobsite factors, including assessments of different application strategies
- Summary report on insurance industry initiatives which could impact adoption of adhesive-based systems

Task 2 Progress:

In March we submitted a summary report of insurance industry incentives. While the summary report on insurance incentives is now complete, we will continue work under this area as the project moves forward and we continue to work with stakeholder groups. In fact, over the next 1-2 months we will directly engaged the following organizations to understand their role in developing mitigation-based programs and the role of adhesive-based roof systems in these programs:

- the Texas Department of Insurance (TDI), which oversees regulation of insurers in the state of Texas and works with the Texas Windstorm Insurance Association (TWIA)
- Institute for Business and Home Safety (IBHS)
- Applied Research Associates, a risk modeling firm that conducts the underlying analysis for mitigation incentive programs using insurance industry data and research on building system performance
- US DOE, who is supporting a project to work with states and the insurance industry on establishing wind damage mitigation programs
- Mississippi’s insurance commission, which will be implementing the recent legislation to set up mitigation incentives

As a second part of this task, we have assessed jobsite factors which need to be considered for the successful use of adhesives in both new and retrofit applications. These items are considerations for this application which may affect the installation of adhesive or related

materials, as well as long-term performance and maintenance. A summary of jobsite factors was submitted in the April monthly report.

One notable finding from the summary were two relevant standards are referenced which have been referenced in prior testing of adhesives used in roof systems: AFG-01 Adhesives for Field-Gluing Plywood to Wood and ASTM C557-03: Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing, and how well their requirements for adhesive properties correlate to conditions in a residential attic environment. ASTM D3498-03: Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems is also relevant to this application.

Feedback from manufacturers also indicates that these standards may not fully permit the use of all types of adhesives which could be effectively used in this application. The “California White Wood Glue” test standard has also been suggested as a product standard we should investigate. We will pursue this activity in May.

### **Task 3: Code Evaluation and Preliminary Tests**

Complete by August 1, 2007 (changed from June 1, 2007)

The objectives of this task are to:

- Explore solutions to code issues for the chosen applications: including the fire protection issue and the pathway for meeting performance-based suction load requirements.
- Conduct preliminary testing (in conjunction with ASC members or other manufacturers) to evaluate system performance and assess potential solutions to constructability issues. For example, testing of mocked-up new construction roof systems might employ a pre-applied adhesive tape applied to the top surface of the truss.

Task 3 Deliverables:

- Summary of relevant code issues and strategies for compliance
- Summary of preliminary testing – including test design, findings, and recommendations

During April we developed a strategy for Phase I and Phase II testing and demonstration of this application. These activities are laid out below. Phase I activities allow us to better understand the application and potential market segments where it would provide the most value for housing durability. Phase II testing needs, which are subject to additional project funding by HUD, will provide more complete technical performance data, which will enhance the likelihood of integrating this application into regulatory and insurance programs.

### Phase I Testing & Evaluation

1. Field Trial of Applying Adhesives in Site Built Single-Family Housing (complete)
2. Explore potential applications in the factory-built housing segment
  - Conduct in-house factory trial using adhesives in roof systems
  - Assess performance enhancements (e.g. reduced damage during transport) and product implications
3. Research of traditional construction techniques
  - Conduct background research and preliminary field testing as deemed necessary on the reliability of typical roof deck installations (e.g. nail misses, adherence to spacing requirements)
4. National demonstration of enhanced roof systems using adhesives
  - Conduct planning and manufacturer coordination leading to demonstration of adhesive-based roof system in a national demonstration house in the Southeast US

### Phase II Testing (Subject to Additional HUD Funding)

5. Conduct technology demonstration from Item #4
  - Conduct time & motion studies of the application of multiple types of adhesive systems (e.g. tapes, caulk gun applied adhesives)
  - Capture field installation on video for education/outreach
6. Examine one or more of the following technical performance issues. Funding levels and manufacturer input will help form final priorities:
  - Long-term performance of adhesives in an attic environment. What are the impacts on uplift resistance from temperature and humidity cycling?
  - Effectiveness as a redundant system to make up for inconsistent fastener application. How effective are adhesives, used in either new or existing construction, in mitigating the reduction in uplift strength caused by nail misses or other shortcomings of standard installations?
  - Improved tooling for retrofit installations. Explore tooling solutions that allow installation of adhesives all the way out to the edges of the roof?
  - Investigation of adhesives applied at roof deck seams for waterproofing as well as improved uplift. Is there a minimum deck thickness required to prevent warping of deck panels as moisture content of framing and panels equilibrates? What happens to seam-applied adhesives when the adjacent wood becomes saturated?

## **Task 4 : Analysis and Outreach**

Complete by October 30, 2007

The objectives of this task are to:

- Summarize, based on results of Task 3, current “gaps” in adhesive-based roof sheathing attachment systems in three core areas: 1) performance testing, 2) codes, and 3) solutions to constructability issues.
- Develop a primer on using adhesives to strengthen roof systems. Guidance document would be aimed at the appropriate audience, e.g. if the application is new construction the audience would be builders and contractors; for retrofit applications the audience would be contractors, roofers, and DIY homeowners. The short (~ 2 page) primer will explain the benefits of using an adhesive-based system, the intended application, and recommendations for materials.

Deliverables:

- Report on findings and remaining information gaps
- Primer on using adhesives to strengthen roof systems

Task 4 Progress:

In April we presented the project and its current findings at the ASC Spring Convention in Savannah, Georgia. A copy of the presentation is being submitted to HUD along with this monthly report. The presentation was well received by more than 60+ people connected to the adhesives and sealants industry. Questions on the project tended to focus on how the use of adhesives in residential roof systems related to building code requirements, and how this application might work in the factory-built housing segment.

Once the project moves forward it is also likely we will have an article appear in ASI magazine, which reaches a similar audience.

## **SECTION III – PLANNED EFFORT**

Activity for May 2007 will focus on the field testing with the manufactured housing segment, researching field surveys of the reliability of traditional roof deck installations, investigating the applicability of California product standards for this application, and communicating with stakeholders involved with wind mitigation incentive programs (e.g. TDI).