

POLYURETHANES IN HOME CONSTRUCTION

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Polyurethane adhesives and sealants are well positioned to find increasing usage within the housing construction industry due to a variety of reasons. Polyurethanes, themselves, offer good adhesion to a number of substrates such as concrete, wood, plastic and glass due to their elasticity and structural properties. These features, with the continued technological improvements in polyurethane, have widened the number of applications and may even further deepen their penetration into the housing construction market.

Originally, polyurethanes found use in the manufactured housing market and modular homes. The elasticity of the polyurethane provided the flexibility as well as the structural integrity of allowing the manufactured home to be moved onto site without nail popping or breaking of the joint. Currently, a two-part polyurethane is the predominant adhesive used for attaching the ceiling drywall to the truss rafters. In volume units, this is one of the larger applications for two-part polyurethane adhesives in the housing construction market.

A hidden advantage of the two-part system is that it allows for a multiple cure system. For instance, one catalyst can work nearly instantly in order to build viscosity so as to resist slumping on vertical surfaces while a slower secondary curative will allow for longer, open time and then final cure. Thus, the two-part urethane system can be custom formulated to fit the desired working environment.

Adhesives applications and advantages

One type of project where polyurethane adhesives are employed is modular construction, which is built on the same lines as manufactured housing, using the same bonding systems. Modular housing represents less than 3% of all housing in the U.S. The large majority of modular buildings are used for classrooms, day care centers and field offices.

Moisture curable polyurethane adhesives find considerable use in home construction.. Its usage joins sub-flooring to floor joists in combination with nails. This type of adhesive bonding also is used in manufactured housing for both floors and exterior walls.

More recent uses for moisture cure polyurethane adhesives are in finish carpentry. Finish carpenters use this type of adhesive for adhering the corner joints of trim framing of doors and windows. This adhesive application prevents the expansion and contraction



of humidity and temperature of the corner joints, thus eliminating call backs to the builder/contractor.

Finish carpenters have continued to find more uses for this type of adhesive, such as on building staircases that command stronger, non-squeeze steps and railing systems. There are also a number of incidental uses for this adhesive in the installation of various cabinetries and other finish trimming. An example would be the need to place decorative spacer boards between cabinets or between a cabinet and wall. The polyurethane adhesive avoids separation cracks in the cabinet facing due to seasonal changes in the wood as it contracts and expands.

The focus of this article has been on adhesives, but polyurethane sealants have been a mainstay in the construction industry. The more recent silyl-terminated polyurethanes have enhanced the properties and usefulness of one component moisture cured, paintable urethane sealants to fit the energy efficient trends of the public.

Forecasting future functions

So what does the future hold for polyurethanes? An analysis of today's trends in the housing construction market will provide a basis for adhesive usage. The major trends in the construction industry that may impact this usage are:

1. Continued increase in energy efficiency;
2. Older generations demanding low maintenance and high quality;
3. Warranties on new homes plus the costly call-backs have made the builder more aware of the benefits of using adhesives;
4. Increased use of various types of engineered lumber and joists;
5. Prefabrication of components built off-site;
6. Greater demand to build homes that can withstand the elements of "mother nature" including the strength to withstand earthquakes. In some coastal regions, building codes have begun to embrace higher standards.

While none of these trends directly promotes the use of adhesives, most are likely to indirectly advance the use of adhesives and sealants within the housing industry. In many residential construction applications, it is expected some type of mechanical fastener will continue to be used, but adhesives could be a new



source for application. For instance, controlled studies have demonstrated adhesives used with mechanical fasteners in the framing of a house can provide strong resistance to the damaging high winds of hurricanes and tornados.¹ The flexibility of the adhesive is the key to providing greater resiliency against these exterior forces. In fact, some builders in the Pacific Northwest already use adhesives for joining the roof sheathing to the roof rafters, so as to help stabilize the roof against high winds.

Wrapped or bent lumber that must be pulled into position requires a mechanical fastener to hold it in shape, but engineered lumber can be more conducive to using adhesives because it is dimensionally stable and flat. Composite lumber used in building decks will benefit easily from the use of structural urethane adhesives, as these materials can eliminate the need for hole-drilling and/or special mechanical fasteners. In this case, the adhesives can prevent surface damage caused by the use of a screw or nail.

More stringent building codes, increased use of prefabrication, engineered lumber, energy efficiency and higher warranties all will play key roles in even newer applications for adhesives. Particularly, polyurethanes are expected to benefit greatly due to their structural - yet flexible - properties and the potential ease of application.

Design professionals looking for more information on current – and potential – uses of polyurethane sealants and adhesives in both housing and non-residential construction can seek out the Adhesive and Sealant Council (ASC). For more information, visit www.ascouncil.org

The Adhesive and Sealant Council (ASC) is the only North American trade association dedicated to representing the adhesive and sealant industry. Incorporated in 1958, ASC strives to improve the industry operating environment and strengthen its member companies through collective action. ASC members account for more than 75% of the aggregate industry revenues, exceeding some \$6 billion annually.

¹ For more information, see the Virginia Polytechnic Institute and State University's (Virginia Tech's) *Acrylic PSA Tapes in Structural Applications in Housing Construction* by William P. Jacobs V, J. Daniel Dolan, Don Ohanehi, David A. Dillard, Virginia Polytechnic Institute, Blacksburg, VA 24061



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Roger joined The ChemQuest Group at its inception where he served as Senior Analyst. Prior to ChemQuest, he held senior technical positions including Technical Director for a unit of Ashland Chemical and Technical Director for Buckeye Products. As the manager of the ChemQuest databases and information services, clients constantly rely on Roger to answer difficult market and application questions. He holds a B. S. degree from Xavier University.

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