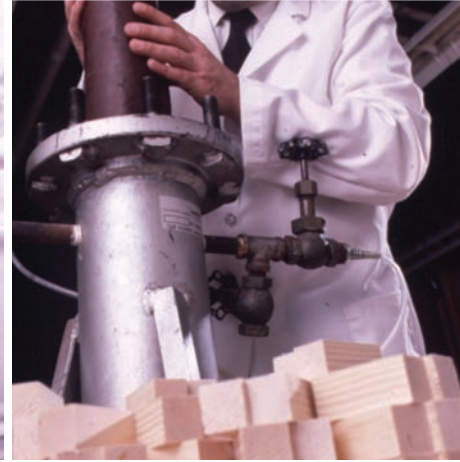


# CERTIFICATION & TESTING PROTOCOL

N-DURANCE™



## N-DURANCE™ Cross-linking Emulsion Adhesives

National Adhesives' N-DURANCE™ product line offers excellent water resistance, conforms to industry standards and demonstrates National's commitment to developing innovative solutions for our wood bonding customers.

N-DURANCE adhesives are designed to:

- adhere the toughest-to-stick imported woods and composites
- provide unprecedented water resistance and durability
- deliver all this quality at competitive market prices.

### Quality, Performance and Industry Standards

The Hallmark standard mandates specific performance requirements in order for manufacturers to carry the Hallmark label on their products.

ASTM standards D5572 and D5751 place additional emphasis on quality, and quality demands performance. The numbers tell the story; N-DURANCE adhesives consistently meet or exceed industry standards when catalyzed with 5% by volume of 42-2301 or 42-2306 catalyst. These products should be tested in specific applications to determine their level of performance.

**ASTM D5572:** Standard Specification for Adhesives Used for Finger Joints in Nonstructural Lumber Products

**ASTM D5751:** Standard Specification for Adhesives Used for Laminate Joints in Nonstructural Lumber Products

**Hallmark:** The WDMA Quality Standard

### Testing

The Hallmark Certification Program sponsored by the Window and Door Manufacturers Association (WDMA) is designed to provide builders, architects, specifiers and consumers with an easily recognizable means of identifying products that have been manufactured in accordance with the appropriate WDMA and other referenced performance standards.

Each protocol provides for dry-use (interior grade) and wet-use (exterior grade) testing. N-DURANCE adhesives are usually tested according to wet-use protocols which require four exposure conditions. Each exposure condition requires 20 samples where the joint area is free from cross-grain and knots.

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• **Dry**

Samples are tested to breaking without being subjected to any exposure conditions.

• **Boils**

Samples are boiled for four hours. They are then placed in an oven set to 145° F for twenty hours. This is followed by another four-hour boil cycle. They are then placed into running, room-temperature water for one hour to cool. Samples are tested to breaking while wet.

• **Elevated Temperature**

Samples are heated to 220° F for six hours. Samples are tested to breaking while hot.

• **Vacuum/Pressure**

Samples are placed into a pressure vessel and covered with room-temperature water. Air is evacuated from the sealed vessel to a vacuum of twenty-five inches of mercury for 30 minutes. The vessel is then pressurized to 75 psi for 30 minutes. Samples are tested to breaking while wet.

**Edge Glue Testing - ASTM D5751**

The required break pressure is a percentage of the average shear strength of the wood parallel

to the grain. The actual value changes from species to species. The percentage of clear wood strength as well as the required percent wood fiber tear are listed in the table below.

**Finger Joint Testing - ASTM D5572**

Two test methods make up this protocol: MOR and Tensile testing. The required break pressure is defined depending upon the exposure cycle as listed in the table below along with the required percent wood fiber tear.

**Additional Test Protocols**

There are many other protocols, but those listed above are the most common. Additional protocols you may encounter are:

- NWWDA I.S. 1-A-97
- ASTM D4317-94
- ANSI/HPVA HP-1-1994

N-DURANCE adhesives conform to all of these standards. Additional information regarding these standards is available upon request from your National Adhesives technical solutions professional.

**Edge Glue Testing - ASTM D5751**

	Dry		Boil		Elevated Temp		Vacuum/Pressure	
	psi	%WF	psi	%WF	psi	%WF	psi	%WF
Wood								
Soft	60%	60%	50%	50%	40%	40%	50%	50%
Hard	30%	30%	25%	25%	20%	20%	25%	25%

**Finger Joint Testing - Hallmark & ASTM D5572**

	Dry		Boil		Elevated Temp		Vacuum/Pressure	
	psi	%WF	psi	%WF	psi	%WF	psi	%WF
Tension	2,000	60%	1,600	50%	1,000	N/A	1,600	50%
MOR	2,000	N/A	1,400	N/A	N/A	N/A	1,400	N/A

For additional performance data and other information, call 1-800-797-4992.



**National Starch and Chemical Company**

10 FINDERNE AVENUE, BRIDGEWATER, NJ 08807  
1-800-797-4992 www.nationaladh.com



National Starch and Chemical Company is dedicated to meeting the needs and expectations of customers without compromising its commitment to sustainability. National Starch supports sustainability through its continuous efforts to improve the safety, health and environment of the communities in which it operates. For detailed information on National Starch's sustainability program, visit [www.nationalstarch.com](http://www.nationalstarch.com).

The information given and the recommendations made herein are based on our research and are believed to be accurate but no guarantee of their accuracy is made. In every case we urge and recommend that purchasers, before using any product in full scale production, make their own tests to determine to their own satisfaction whether the product is of acceptable quality and is suitable for their particular purposes under their own operating conditions. No representative of ours has any authority to waive or change the foregoing provisions but, subject to such provisions, our engineers are available to assist purchasers in adapting our products to their needs and to the circumstances prevailing in their business. Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute a permission, inducement or recommendation to practice any invention covered by any patent, without the authority from the owner of this patent. We also expect purchasers to use our products in accordance with the guiding principles of the American Chemistry Council's Responsible Care® program.