

Cascophen™ 4001 & Cascoset™ 5830 S

Phenol Resorcinol Formaldehyde Adhesive for Engineered Wood Products

Description

Cascophen™ 4001 / 5830S phenol resorcinol formaldehyde adhesive is an exterior, durable liquid-liquid system that is recommended for the manufacture of glued laminated beams in applications that require exceptional resistance to pre-cure and dryout. Properly cured, this adhesive produces a waterproof bond that meets wet use (exterior) specifications. 5830S hardener is a pre-mixed, ready-to-use hardener developed for use with automatic meter mix equipment and direct application extrusion. 4001 resin with hardener 5830S is specifically formulated to tolerate long assembly times. To meet the gel and cure speed requirements of each individual mill, the 4001 resin series is offered in nine incremental versions ranging from 4001 to 4001-8. The gel speed increases with increasing extension number (e.g., 4001 is the slowest while 4001-8 is the fastest).

Third Party Test Methods

4001 / 5830 has been independently tested and demonstrated to meet the requirements of the following methods.

- ASTM D2559 (Douglas-fir, Southern yellow pine, hard maple)
- CSA O112.7-M1977
- CSA O112.9-10 (CCMC # xxxxx-L)
- EN 301/302 and DIN 68141
- ASTM D7247-07a according to the specifications of ASTM D5055-07

Mixing Instructions

The recommended adhesive mix ratio is 2.5 parts resin to 1 part hardener by weight. The allowable range for the mix ratio is 2.2 to 2.7. The determination of this ratio is critical and should be performed periodically (e.g., at the start of each shift) using a sample that is large enough to minimize errors in the sampling procedure.

Density

4001:	9.60 lbs/gallon (SG = 1.151)
4001-4:	9.72 lbs/gallon (SG = 1.165)
4001-8:	9.85 lbs/gallon (SG = 1.181)
5830S:	10.08 lbs/gallon (SG = 1.209)

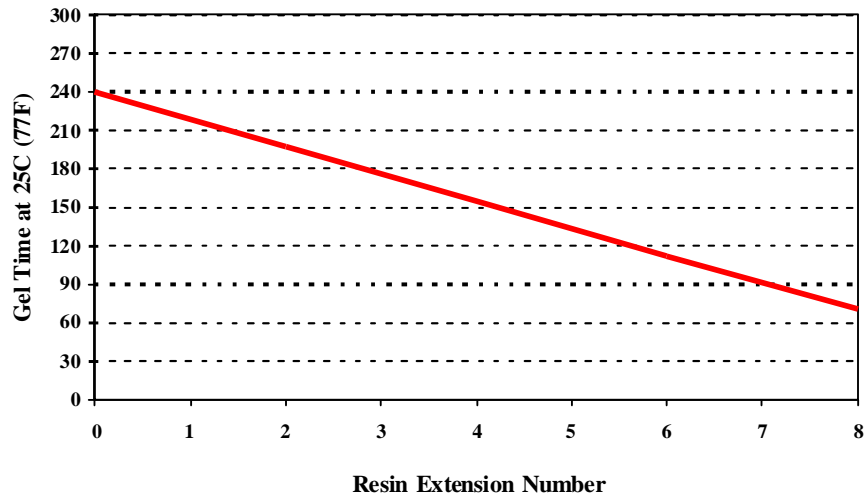
Gel Time of Mixed Adhesive

The gel time of the mixed adhesive is shown in Figure 1 as a function of the resin extension number (i.e., 4001 to 4001-8) and in Figure 2 as a function of the mixed adhesive temperature. In both cases, the adhesive exotherm was controlled so that the temperature was constant throughout the duration of the test.

PRF adhesives are exothermic, meaning that heat is generated as the resin and hardener react together, increasing the temperature and reducing the observed pot life. The actual pot life, or working life, of the adhesive will be considerably shorter than the value presented in Figure 2 because the exotherm is uncontrolled and the temperature steadily increases. Figure 3 provides an estimate of the adhesive pot life as a function of the initial temperature. **Please note the dramatic effect of temperature on the adhesive gel time and pot life.** Resins with higher extension number (i.e., adhesives with faster gel times) will have a greater exotherm and shorter pot life.

The adhesive gel time provides a good indication of assembly time tolerance or cure speed, while the pot life provides an indication of how frequently the meter mix system should be purged.

Figure 1 - Gel Time vs. Resin Extension Number



Hexion Inc.
180 East Broad Street
Columbus, OH 43215
+ 1 614 225 4000

For worldwide locations visit
Hexion.com

© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.

Figure 2 - Gel Time vs. Temperature

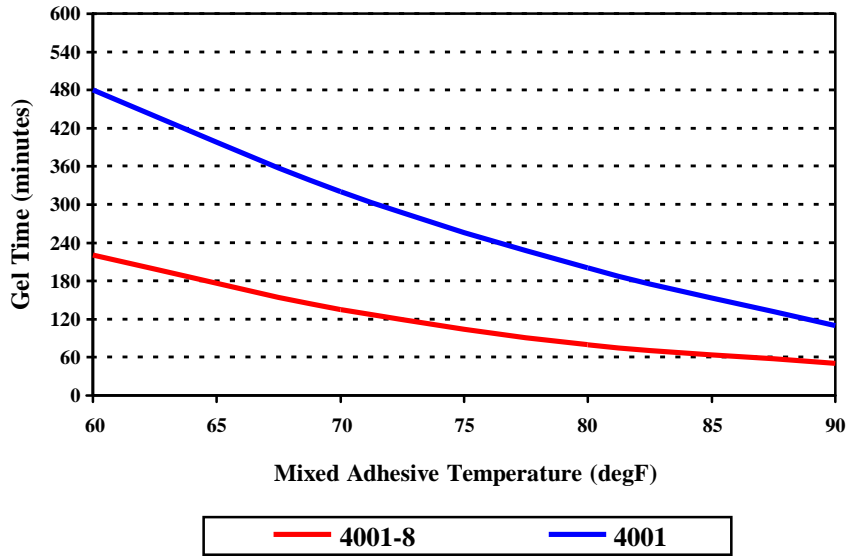
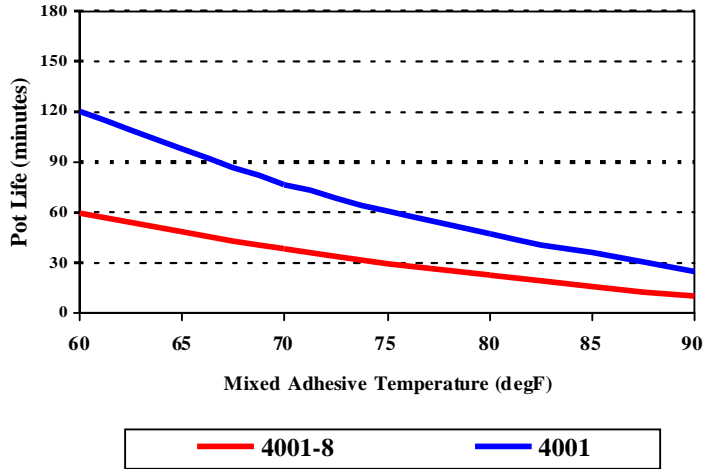


Figure 3 – Pot Life vs. Temperature



Hexion Inc.
 180 East Broad Street
 Columbus, OH 43215
 + 1 614 225 4000

For worldwide locations visit
Hexion.com

© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.

When using a cup test to check the adhesive gel time, it is critical to use the same amount of adhesive on each test because of the heat (exotherm) that is generated as the two components react together. A larger sample size will generate more heat and result in a shorter observed gel time.

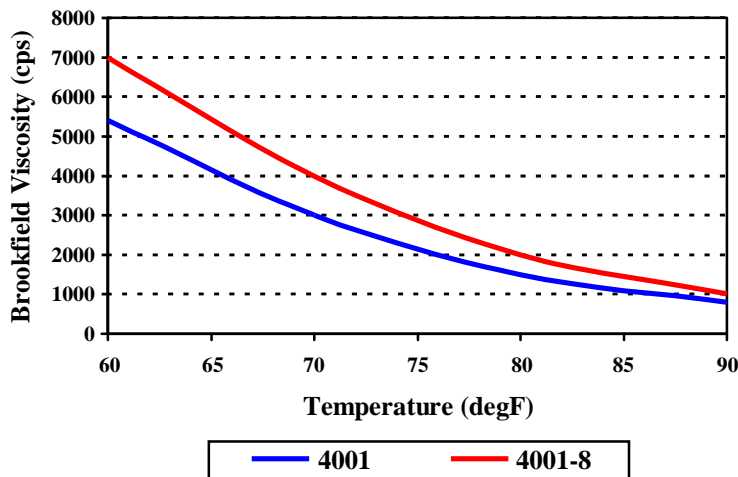
It is not recommended that the mixed adhesive ratio be changed in an effort to lengthen or shorten the gel time. Changing the mix ratio does not impact the gel time enough to justify the risk of adversely bond quality.

Resin Viscosity and Mixed Adhesive Viscosity

Typical ranges for the 4001 / 5830S adhesive include 1500-2500 cps resin viscosity, 3000-6000 cps slurry viscosity, and 3000-8000 cps mixed adhesive viscosity. Resins with higher extension number tend to have higher resin viscosity and lower mixed adhesive viscosity. Temperature has a very strong influence on both resin viscosity (Figure 4) and mixed adhesive viscosity (Figure 5). Temperatures higher than 85°F cause the adhesive to become thin and runny, while temperatures below 70°F may cause pumping problems due to the high viscosity.

All viscosity measurements are made using a Brookfield RVT viscometer at 20 rpm. Resin viscosity is recorded using a #3 spindle after 1 minute and mixed adhesive viscosity using a #4 spindle after 5 minutes.

Figure 4 - Resin Viscosity vs. Temperature



Hexion Inc.
180 East Broad Street
Columbus, OH 43215
+ 1 614 225 4000

For worldwide locations visit
Hexion.com

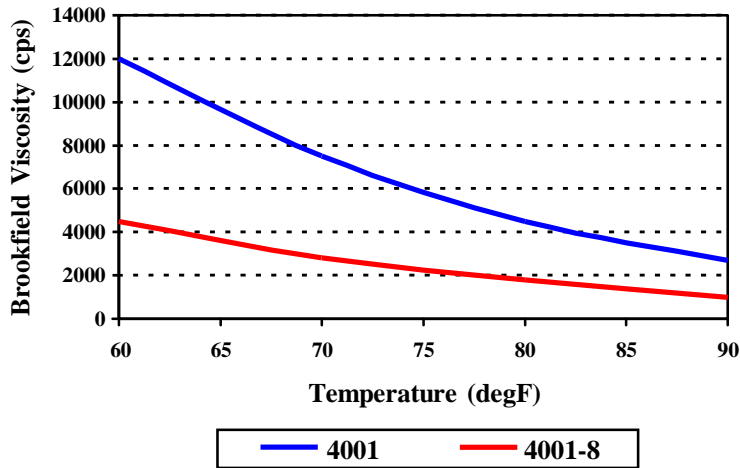
© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.

Figure 5 – Mixed Adhesive Viscosity vs. Temperature



Lumber Moisture Content

The lumber should be between 5% and 18%* moisture content to produce satisfactory bonding. Pockets of high moisture content, especially during RF cure, will result in a starved glueline due to excessive squeeze-out and/or over-penetration of the adhesive.

* Note: Moisture content refers to an allowable range (minimum and maximum that is acceptable) and not an average.

Lumber Surfacing

Lumber should be free of dirt and other foreign materials prior to gluing. Southern yellow pine lumber should always be freshly surfaced prior to gluing. While it is not always necessary for Douglas-fir lumber, fresh surfacing is recommended for best results.

All lumber should have a maximum thickness variation of 0.008 inches across the width, with best results achieved at less than 0.005 inches. It is especially important to control lumber tolerances when using RF cure. As with all PRF adhesives that are not specifically formulated, 4001 / 5830S has a marginal gap filling characteristic.

Hexion Inc.
 180 East Broad Street
 Columbus, OH 43215
 + 1 614 225 4000

For worldwide locations visit
 Hexion.com

© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.

Pressure

A clamping pressure between 90-150 psi is recommended for face bonding softwood lumber, with the preferred pressure 125 psi.

Assembly Time (Definitions)

- *Open Assembly Time:* The time interval in which the surface has been spread but the adhesive remains exposed to the air and subject to evaporation.
- *Closed Assembly Time:* The time period that the spread surface is in close contact with another surface but not under pressure. Evaporation is minimized during this period.
- *Total Assembly Time:* The time interval from the spreading of the first surface until the package is under full pressure.

Assembly time (Cold Set)

For best results, open assembly time should be kept as short as possible, while a closed assembly time of 20-30 minutes is generally beneficial. Maximum allowable assembly times are provided in the following tables.

TABLE I

Maximum Total Assembly Time Using 4001-2 / 5830S

Lumber Temperature	GLUE SPREAD RATE				
	70 lbs/ 1000 ft. ²	80 lbs/ 1000 ft. ²	90 lbs/ 1000 ft. ²	100 lbs/ 1000 ft. ²	110 lbs/ 1000 ft. ²
60°F	80 min.	100 min.	120 min.	150 min.	180 min.
70°F	60 min.	80 min.	100 min.	110 min.	120 min.
80°F	45 min.	60 min.	80 min.	85 min.	90 min.
90°F	30 min.	40 min.	50 min.	55 min.	60 min.

Hexion Inc.
180 East Broad Street
Columbus, OH 43215
+ 1 614 225 4000

For worldwide locations visit
Hexion.com

© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.

TABLE II**Maximum Total Assembly Time Using 4001 / 5830S**

Lumber Temperature	GLUE SPREAD RATE				
	70 lbs/ 1000 ft. ²	80 lbs/ 1000 ft. ²	90 lbs/ 1000 ft. ²	100 lbs/ 1000 ft. ²	110 lbs/ 1000 ft. ²
60°F	100 min.	120 min.	150 min.	180 min.	180 min.
70°F	80 min.	100 min.	120 min.	135 min.	150 min.
80°F	60 min.	80 min.	90 min.	100 min.	110 min.
90°F	40 min.	50 min.	60 min.	65 min.	70 min.

Cure Time

Cascophen™ 4001-2 / 5830S adhesive will not properly cure at temperatures below 65°F. If cold wood is used the entire package must be heated so that the glueline reaches at least 65°F for the required amount of time.

TABLE III**Minimum Clamp Time Using 4001-2 / 5830S**

Minimum Clamp Time	65°F	70°F	75°F	80°F
		12 hours	9 hours	7 hours

TABLE IV**Minimum Clamp Time Using 4001 / 5830S**

Minimum Clamp Time	65°F	70°F	75°F	80°F
		14 hours	10 hours	8 hours

Hexion Inc.
180 East Broad Street
Columbus, OH 43215
+ 1 614 225 4000

For worldwide locations visit
Hexion.com

© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.

Storage Life

The storage life of 4001 resin is at least one year at 70-80°F. Storage life may be extended by storing in a cool place and sealed to prevent evaporation. 5830S hardener should be used within 2 months to prevent excessive fuming from the mixed adhesive. Rotate stock regularly, using the oldest material first.

CAUTION: 5830S hardener should be stored in a cold atmosphere (<50°F) and agitated periodically. Storage at higher temperature will increase fuming from the mixed adhesive, although performance characteristics remain unaffected. Without efficient agitation, 5830S will stratify and solids can settle to the bottom of the container. Solids that have settled can be re-dispersed by thorough agitation prior to use. Totes and drums that have not been agitated while in storage should be thoroughly agitated prior to use.

Storage, Handling, and Cleaning

- Storage tanks, pipes, fittings, etc. for both 4001 resin and 5830S hardener can be made from mild steel, stainless steel, or most common plastics (polyethylene, polypropylene, PVC, Teflon). Avoid extended contact when possible with magnesium, aluminum, zinc, tin, chromium, brass, and bronze.
- We recommend placing a filter between the bulk holding tank(s) and day use tank(s) or meter mix unit. If utilizing a day use tank, we also recommend a filter between it and the meter mix unit. Lastly, in-line filters should be used at the meter mix unit itself prior to the static mix tube. We recommend 20 mesh filters.
- We recommend that the in-line slurry filter at the meter mix unit be removed and cleaned of any debris on a daily basis.
- Rubber gloves and safety glasses/goggles/face shield should be worn whenever the resin, slurry, or mixed adhesive is handled.
- Adequate ventilation should be provided in areas where the adhesive or its components are stored, mixed/applied, or cured.
- Warm water (110-130°F) is used for clean-up of the mixed adhesive while it is still wet. The adhesive becomes brittle when fully cured and can be scraped away.

March 14, 2011

Before using any Hexion Inc. product, please be sure to read the Safety Data Sheet which was included with the shipment.

For more information contact your local Hexion Sales Representative or Customer Service Center (866)443-9466.

Hexion Inc.
180 East Broad Street
Columbus, OH 43215
+ 1 614 225 4000

For worldwide locations visit
Hexion.com

© 2011 Hexion Inc.

Printed in U.S.A.

® and ™ Licensed trademarks of Hexion Inc.

The information provided herein was believed by Hexion Inc ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by HEXION are subject to Hexion's terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion's specifications. Nothing contained herein constitutes an offer for the sale of any product.