



## **CASCOPHEN® LT-5210J Resin and CASCOSET® FM-6210 or FM-6210(S) Phenol-Resorcinol Adhesive System**

### **Description**

CASCOPHEN® LT-5210J is a liquid, phenol-resorcinol, timber laminating resin. The setting of this resin is obtained through reaction with a hardener containing a definite proportion of either CASCOSET® FM-6210 or FM-6210S HARDENER. This adhesive system has been developed for direct application meter-mix equipment. Both Cascophen LT-5210J Resin and Cascoset FM-6210, 6210S Hardeners have been formulated to minimize mixing and handling problems generally found in mills that are set up for liquid-liquid adhesive application. Cascoset FM-6210S is a slower setting version of FM-6210, and is designed primarily for summer weather gluing conditions.

Tests in Hexion Specialty Chemicals laboratories indicate that representative lots of LT-5210J and FM-6210, 6210S meet ASTM D-2559-03 specifications. This adhesive system is recommended for face laminating softwoods for wet-use or dry-use exposure, and will meet the requirements of ANSI/AITC A190.1-1992 (formerly PS 56-73) for gluing West Coast softwoods and Southern Pine. This adhesive is suitable for severe service exposure where post-treatment with preservatives is required. Chemically treated softwoods may offer gluing difficulties, and may require different handling. Satisfactory bonding of treated wood or post-treatment of glued members can be affected by the composition of treating solutions and differences in retentions of the treatments. It is advisable to test each specific gluing problem. LT-5210J/FM-6210, 6210S are not preferred adhesives for gluing hardwoods. The gluing of lumber treated with fire retardant salts is also difficult, and we do not recommend LT-5210J/FM-6210, 6210S for this.

### **Mixing Directions**

A supplemental page (page 5) is attached which summarizes proper mixing proportions and general directions for use. PLEASE POST IN GLUING AREA.

### **Storage Life**

CASCOPHEN® LT-5210J will remain in usable condition for about nine months at 70°F. CASCOSET® FM-6210 and FM-6210S should be stored under dry conditions, and have a usable life of about eight months at 70°F from time of manufacture. Container or shipping papers are marked to indicate the end of the usable life of these materials, and outdated materials should be re-tested before use. Since aging causes slow changes in both materials, rotate stock so that old inventory is used first.

### **Precautions with Meter Mixing**

With automatic mixing equipment that extrudes mixed glue directly onto boards without a glue reservoir, pot life is not such an important factor and resin does not have to be pre-cooled. However, in hot weather when gluing hotter lumber, pre-cooled resin will help extend assembly times. Some metering devices are sensitive to viscosity changes in the resin caused by changing resin temperature. This situation can result in mix ratio drift. It is usually best to precondition the resin to a constant temperature. This temperature might then only change seasonally to another predetermined constant temperature that is within the working range of the particular metering device.

The most reliable method for determining mix ratio involves weighing individual samples of resin and hardener collected over some time interval. The sample size must be large enough to minimize normal weighing errors. An

inspection of the Mix Ratio Calibration Chart (page 6) will show how little weight change is required in hardener weight to cause a change in mix ratio when the corresponding resin weight is small.

The mixed glue in the system should not be allowed to rise above 85°F. This adhesive temperature is dependent upon the initial resin temperature, initial hardener temperature, induced frictional heat from high pressure mixing, ambient temperature, and the length of time mixed glue sets in the mixing tube and extruder bar. Glue handling equipment will have to be cleaned during extended break periods. Activating automatic purge systems will minimize the need for cleaning during long breaks.

We recommend that the in-line hardener filter(s) be checked daily and cleared of any debris. With some automatic mixing equipment, even a partially clogged filter can affect the final mix ratio.

### Lumber Preparation and Glue Spreading

AVOID SANDING OR OTHER ABRASIVE PLANING, AS IT WILL RESULT IN LOWER STRENGTHS. A spread of 55 to 100 pounds of mixed glue per 1,000 square feet of glue joint is recommended. The heavier spreads are required for longer times and higher lumber temperatures. Knife planing lumber prior to gluing is recommended. LT-5210J/FM-6210, 6210S adhesive is miscible with water, and can be readily washed from mixing and spreading equipment by use of lukewarm water.

### Assembly Time Table when using FM6210

Maximum Assembly Period When Using On-Demand, Meter-Mix Equipment

Spread, Pounds of Glue/1,000 Square Feet of Glue Line – Total Assembly Time in minutes				
Wood Temp.	90-100 lbs	80-85 lbs	70-75 lbs	55-60 lbs
45-55°F	140'	120'	90'	80'
60-65°F	100	90	80	70
70-75°F	85	80	70	60
75-80°F	60	50	40	--

### Assembly Time Table when using FM-6210S

Maximum Assembly Period When Using On-Demand, Meter-Mix Equipment

Spread, Pounds of Glue/1,000 Square Feet of Glue Line – Total Assembly time in minutes				
Wood Temp.	90-100 lbs	80-89 lbs	70-79 lbs	60-69 lbs
65-75°F	120'	110'	110'	90'
76-85°F	90	80	70	60
86-95°F	60	50	40	--



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**Total Assembly** is the time interval from spreading the first surface to application of full pressure.

### Use of Assembly Table

The assembly table is a general guide only. The lams should be brought to close contact as soon as possible to prevent excessive exposure to air.

THE MOST IMPORTANT GENERAL RULE IS THAT THE ENTIRE ASSEMBLY SHOULD BE BROUGHT UNDER FULL PRESSURE BEFORE THE FIRST SPREAD GLUE FILMS BECOME DRY TO THE TOUCH. UNDER PROPER CONDITIONS, THERE IS A SLIGHT SQUEEZE-OUT OF GLUE ALONG THE ENTIRE EDGE OF ALL THE JOINTS.

**Open Assembly** is the period between spreading the surfaces and placing them in contact with each other. During this period, the spread members are exposed to air and subject to evaporation. This causes dry-out, which is related to air temperature, circulation, and relative humidity. Because of the importance of dry-out caused by open assembly, and its dependence upon many factors, total assembly cannot be predicted precisely. In assembling arches and high-camber beams, the open assembly time is specially critical at the fanned-out ends.

**Closed Assembly** is the time from when the surfaces are just barely in contact until full pressure has been applied. During this time, the glue line is protected from losing moisture by evaporation.

### Pressure

For most conditions, recommended pressure is 100-150 lbs/square inch. For high-camber beams and for arches, use 125 to 175 psi, preferably over 150 psi.

### Minimum Pressure Period and Temperature When Using FM-6210

Initial Lumber Temperature	Final Glue Line Temperature	
	60-65°F	70-75°F
45-55°F	12 hours	9 hours
60-65°F	9 hours	7 hours
70-75°F	7 hours	5 hours

Maintain clamping pressure for as many hours as required by the table. Place thermocouples in the center of the coolest glue line to check the temperature. Heating is needed when the instrument reads below 60°F. Consider that the glue line starts curing when the temperature reaches 60°F. Two examples show the use of the table:

- a. Instrument reads 45-50°F when beam is locked up. Heating is started. When the temperature reaches 60°F, start timing. Beam is held at 60-65°F for 8 hours and heated to 70-75°F and held for 3 hours. Pressure may now be released.



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b. Same as (a) except that the heating cycle is shorter, as follows:

Beam is at 60-65°F for	3 Hours	3/12 = 25%
Beam is at 70-75°F for	6¼ Hours	6¼/ 9 = 75%

Pressure may now be released.

The above pressure period will develop substantial wood failure upon shearing adjacent laminates; generally, beams can be unclamped in this time period. With highly curved beams, where spring-back may be pronounced, some additional clamp time is necessary. Guard a fresh glue line against extreme thermal and physical shock.

### Minimum Pressure Period and Temperature When Using FM-6210S

Inner Glue Line Temperature	Minimum Clamp Time
65°F	8 hours
70°F	6 hours
80°F	4 hours
90°F	3 hours

### Use of This Bulletin

Information in this bulletin is based upon laboratory and plant experience in gluing untreated Douglas fir and hem-fir.

### Cure Time After Unclamping

See Bulletin 46 Laminating Procedures for recommendations about:

- Cure time required before beams are machined.
- Cure time required before glue bonds are tested.

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CASCOPHEN® LT-5210J AND CASCOSET® FM-6210 or FM-6210S  
DIRECTIONS FOR USE

FM-6210, FM-6210S Hardener Mix

	2 Bag	4 Bag	6 Bag
Water	200 lbs. (24.0 gal)	400 lbs. (48.0 gal)	600 lbs. (72.0 gal)
Hardener	100 lbs. (2 bags)	200 lbs. (4 bags)	300 lbs. (6 bags)
Total mix weight	300 lbs.	600 lbs.	900 lbs.

Recommended Hardener Mixing Directions:

1. Load 45-50°F water into high shear mixer.
2. Slowly add all powdered hardener.
3. Mix until uniform. This may take 15-30 minutes in a double acting mixer. For smaller batches mix about 5 minutes using a LIGHTNIN® mixer.
4. Let mixed hardener stand 20-30 minutes before using.
5. Mild continuous agitation is recommended.
6. Maximum hardener storage life at 45-60°F is 72 hours.

Final Adhesive Mix Ratio:	By Weight	By Volume
LT-5210J Resin	2.50	2.40
FM-6210/FM-6210S	1	1



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## MIX RATIO CALIBRATION CHART FOR CASCOPHEN® LT-5210J WITH CASCOSET® FM-6210, 6210S HARDENER

The recommended final mix ratio of LT-5210J resin to FM-6210 hardener is 2.5:1, by weight. The allowable adhesive mix ratio range is 2.4:1 to 2.6:1, by weight.

(Ratio) 2.4:1-2.5:1-2.6:1

Resin Weight	Hardener Weight	Resin Weight	Hardener Weight	Resin Weight	Hardener Weight
6.0	2.5-2.4-2.3	10.0	4.2-4.0-3.8	14.0	5.8-5.6-5.4
6.1	2.5-2.4-2.3	10.1	4.2-4.0-3.9	14.1	5.9-5.6-5.4
6.2	2.6-2.5-2.4	10.2	4.2-4.1-3.9	14.2	6.0-5.7-5.5
6.3	2.6-2.5-2.4	10.3	4.3-4.1-4.0	14.3	6.0-5.7-5.5
6.4	2.7-2.6-2.5	10.4	4.3-4.2-4.0	14.4	6.0-5.8-5.5
6.5	2.7-2.6-2.5	10.5	4.4-4.2-4.0	14.5	6.0-5.8-5.6
6.6	2.8-2.6-2.5	10.6	4.4-4.2-4.1	14.6	6.1-5.8-5.6
6.7	2.8-2.7-2.6	10.7	4.5-4.3-4.1	14.7	6.1-5.9-5.6
6.8	2.8-2.7-2.6	10.8	4.5-4.3-4.2	14.8	6.2-5.9-5.7
6.9	2.9-2.8-2.7	10.9	4.5-4.4-4.2	14.9	6.2-6.0-5.7
7.0	2.9-2.8-2.7	11.0	4.6-4.4-4.2	15.0	6.2-6.0-5.8
7.1	3.0-2.8-2.7	11.1	4.6-4.4-4.3	15.1	6.3-6.0-5.8
7.2	3.0-2.9-2.8	11.2	4.7-4.5-4.3	15.2	6.4-6.1-5.9
7.3	3.0-2.9-2.8	11.3	4.7-4.5-4.3	15.3	6.4-6.1-5.9
7.4	3.1-3.0-2.8	11.4	4.8-4.6-4.4	15.4	6.4-6.2-5.9
7.5	3.1-3.0-2.9	11.5	4.8-4.6-4.4	15.5	6.5-6.2-6.0
7.6	3.2-3.0-2.9	11.6	4.8-4.6-4.5	15.6	6.5-6.2-6.0
7.7	3.2-3.1-3.0	11.7	4.9-4.7-4.5	15.7	6.5-6.3-6.0
7.8	3.2-3.1-3.0	11.8	5.0-4.7-4.5	15.8	6.6-6.3-6.1
7.9	3.3-3.2-3.0	11.9	5.0-4.8-4.6	15.9	6.6-6.4-6.1
8.0	3.3-3.2-3.1	12.0	5.0-4.8-4.6	16.0	6.7-6.4-6.2
8.1	3.4-3.2-3.1	12.1	5.0-4.8-4.6	16.1	6.7-6.4-6.2
8.2	3.4-3.3-3.2	12.2	5.1-4.9-4.7	16.2	6.8-6.5-6.2
8.3	3.5-3.3-3.2	12.3	5.1-4.9-4.7	16.3	6.8-6.5-6.3
8.4	3.5-3.4-3.2	12.4	5.2-5.0-4.8	16.4	6.8-6.6-6.3
8.5	3.5-3.4-3.3	12.5	5.2-5.0-4.8	16.5	6.9-6.6-6.3
8.6	3.6-3.4-3.3	12.6	5.2-5.0-4.8	16.6	6.9-6.6-6.4
8.7	3.6-3.5-3.3	12.7	5.3-5.1-4.9	16.7	7.0-6.7-6.4
8.8	3.7-3.5-3.4	12.8	5.3-5.1-5.0	16.8	7.0-6.7-6.5
8.9	3.7-3.6-3.4	12.9	5.4-5.2-5.0	16.9	7.0-6.8-6.5
9.0	3.8-3.6-3.5	13.0	5.4-5.2-5.0	17.0	7.1-6.8-6.5
9.1	3.8-3.6-3.5	13.1	5.5-5.2-5.0	17.1	7.1-6.8-6.6
9.2	3.8-3.7-3.5	13.2	5.5-5.3-5.1	17.2	7.2-6.9-6.6
9.3	3.9-3.7-3.6	13.3	5.5-5.3-5.1	17.3	7.2-6.9-6.7
9.4	3.9-3.8-3.6	13.4	5.6-5.4-5.2	17.4	7.2-7.0-6.7
9.5	4.0-3.8-3.6	13.5	5.6-5.4-5.2	17.5	7.3-7.0-6.7
9.6	4.0-3.8-3.7	13.6	5.7-5.4-5.2	17.6	7.3-7.0-6.8
9.7	4.0-3.9-3.7	13.7	5.7-5.5-5.3	17.7	7.4-7.1-6.8
9.8	4.1-3.9-3.8	13.8	5.8-5.5-5.3	17.8	7.4-7.1-6.8
9.9	4.1-4.0-3.8	13.9	5.8-5.6-5.3	17.9	7.5-7.2-6.9



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