POST MANUFACTURE TREATMENT OF PARALLEL STRAND LUMBER

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ABSTRACT

Parallel Strand Lumber (PSL) is an engineered, structural composite lumber product manufactured from longitudinally clipped veneer. These veneer are coated with a phenolic resin and pressed into large billets measuring up to 11" thick, 19" wide and 66 feet in length. This manufacturing process produces a product that is remarkably easy to treat using traditional pressure processes. Parallel Strand Lumber treated with CCA and yellow pine PSL treated with creosote is discussed. Data from field performance testing is reviewed and examples of successful commercial applications are presented.

INTRODUCTION:

Parallam® brand PSL is a parallel strand lumber product manufactured by Trus Joist at three sites in North America. At the Vancouver, British Columbia plant, Douglas fir is the principal species used. At the Colbert, Georgia plant, southern yellow pine along with some yellow poplar is utilized. And, at Buckhannon, West Virginia, yellow poplar is the principal species used.

The manufacturing of PSL begins with veneer peeler logs. These logs are conditioned, debarked and peeled in a process similar to most plywood manufacturing facilities. Green veneer is clipped to target widths and dried to a uniform moisture content and sorted by grade.

Dry, graded veneer is processed through weight controlled feeding stations. Multiple feeding stations assure the randomization and control of naturally occurring defects such as knots and low density fiber, thereby producing a uniform product. Veneer sheets pass through a clipping station where they are clipped longitudinally into 5/8" wide strands. These strands are coated with a waterproof, type 1, phenolic adhesive and fed into a forming trough in a longitudinally aligned manner. This feeding process is also controlled by weight scales to ensure uniform billet density.

The loose mat of strands continuously feeds into the press by means of moving top and bottom caul plates. The top caul plate is angled and, with hydraulic pressure, compresses the mat of strands down to the target thickness. Heat to cure the adhesive is provided by

microwave energy, as the strands move through the press. Extruded from the back end of the press is a billet of parallel strand lumber measuring up to 66 feet in length.

These large billets, measuring up to 11" thick, 19" wide and 66' long, are allowed to cool and then are transferred to the billet cut-up area where they are bandsawn and cross-cut to required size.

PHYSICAL PROPERTIES:

Parallel strand lumber is a composite lumber product whose physical properties have been enhanced through the manufacturing process. In the process, strands of veneer are dried to a uniform moisture content and randomized prior to laminating. This greatly reduces the effects of defects such as knots and low density (juvenile) wood.

Another enhanced property is density, but with an increase in permeability. The density of PSL is greater than that of the solid sawn species from which it was manufactured and, this density is quite uniform within and among billets. Permeability is increased through the natural incorporation of gaps between strands.

Distribution of heart and sapwood is a physical property that differs significantly from solid sawn timber. In solid sawn timbers, heartwood and sapwood are found in layers. In PSL, veneers are randomized and difficult to treat heartwood strands are typically surrounded by easy to treat sapwood strands.

AWPA TREATING STANDARDS FOR PARALLEL STRAND LUMBER:

Treating specifications for parallel strand lumber were first published by the American Wood Preservers' Association in 1993, as Standard C33. In this standard it is noted that neither incising or boultonizing are required to obtain proper treatment, even in large cross section timbers. Table 1, below, summarizes the retention requirements for each species of PSL in above ground and ground / fresh water applications. Research continues on the use of various preservative treatments for PSL in salt water splash and marine water contact applications. Data to date indicates PSL will be adequately protected using the same retentions of the various commodity treatments as specified for a similar solid sawn species. It is expected that revisions to the C33 standard will be pursued in the near future.

TABLE 1: AWPA Standard C33-00 Minimum Retentions for Parallel Strand Lumber

PSL Species Kg/m^3 (pcf)	Above Ground		Ground / Fresh Water	
	CCA	Creosote	CCA	Creosote
Southern Yellow Pine	4.0 (0.25)	128 (8.0)	6.4 (0.40)	160 (10.0)
Yellow Poplar	N/R	128 (8.0)	N/R	160 (10.0)
Douglas Fir	4.0 (0.25)	128 (8.0)	6.4 (0.40)	160 (10.0)

TREATING CYCLES FOR PARALLEL STRAND LUMBER:

The development of treating cycles optimized for the preservative treatment of parallel strand lumber were explored during the early to mid 90's. For southern yellow pine PSL treatment with CCA using the parameters laid out in Table 2 have been found to give excellent results.

TABLE 2: Basic Full Cell Treating Parameters for CCA in southern yellow pine PSL.

Initial Vacuum	10" (-35kPa) for 10 minutes
Pressure Applied	150 psig (1035 kPa) for 15 min.
Pressure Release	Slowly, 30 min., minimum
Final Vacuum	27" (-95kPa) for 45 minutes
Target Penetration	½ the thickness if <5" (127mm) thk. 2.5" (63mm) in material >5" (127mm)
Target Assay Retention	AWPA: 0.25 or 0.40 pcf (4 or 6.4 kg/m^3) Trus Joist: 0.60 pcf (9.6 kg/m^3)*

*this is the Trus Joist specification for product treated for inventory / distribution.

Creosote treating trials have been predominantly conducted using yellow poplar PSL, although some work has been done with Douglas fir and southern yellow pine. The schedule laid out in Table 3 was developed for yellow poplar PSL. For Douglas fir, the addition of an expansion bath is recommended.

TABLE 3: Basic Empty Cell Treating Parameters for Creosote in yellow poplar PSL.

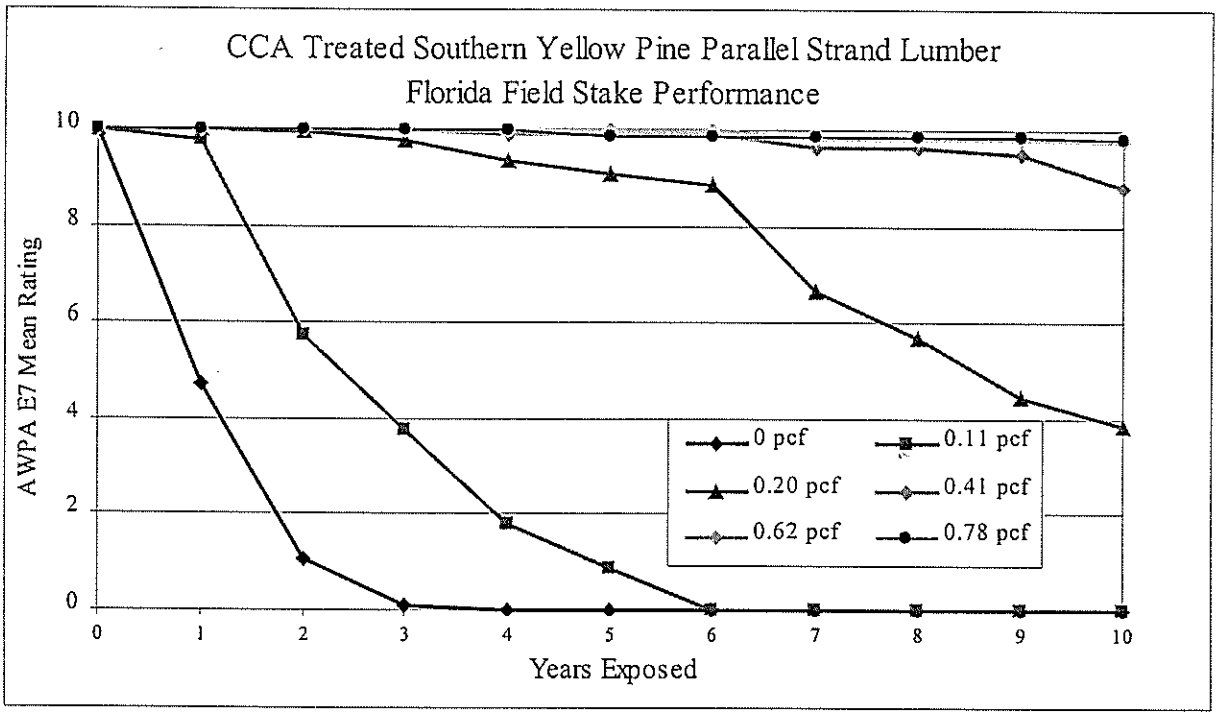
	Time (hrs.)	Setting
Heating in Preservative Bath	1.5	240°F (115°C)
Initial Air Pressure	0.5	42" (142 kPa)
Pressure Applied	1.75	180 psig (1240 kPa)
Pressure Release	0.5 (min.)	Slowly
Vacuum #1	1.0	20" (-70kPa)
Vacuum #2	1.0	20" (-70kPa)
Steam Cleaning	1.0	235°F (113°C)

*break to atmosphere between vacuum 1 & 2.

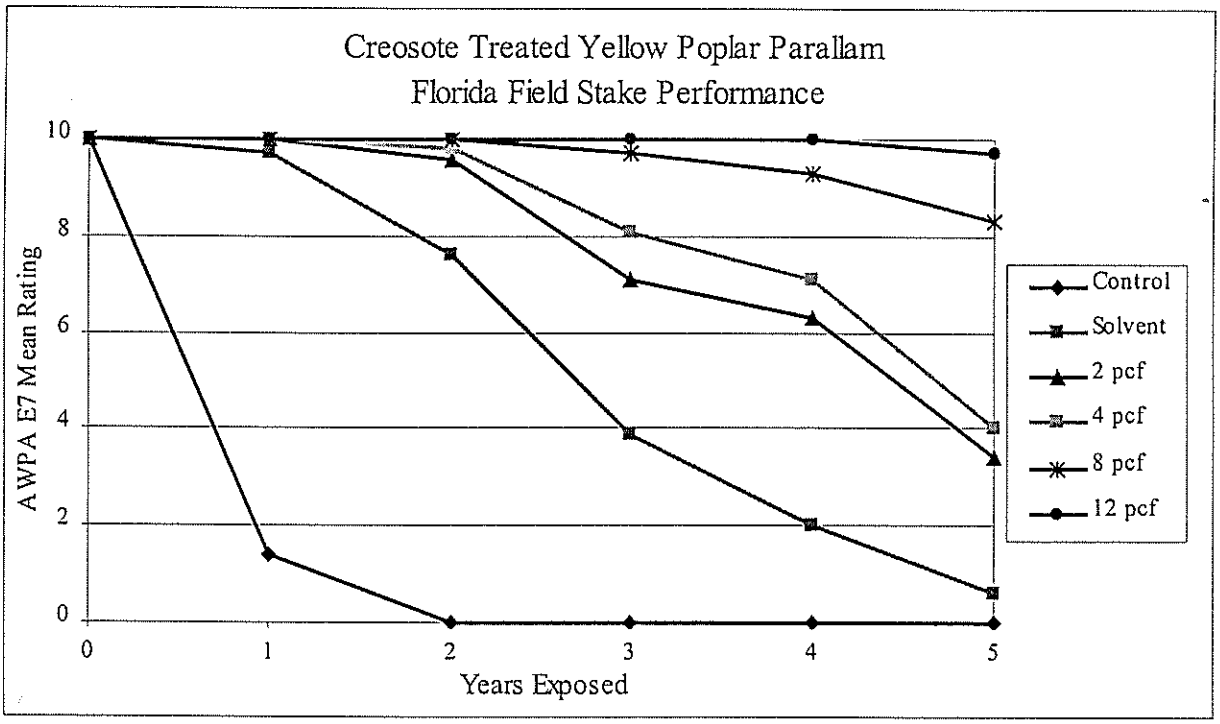
FIELD STAKE TESTING OF TREATED PARALLEL STRAND LUMBER:

Ongoing field stake testing (AWPA E7) of parallel strand lumber is conducted at a central Florida site. For southern pine PSL treated with CCA, ten years of data has been recorded. For yellow poplar PSL, treated with creosote, five years of exposure data has been recorded. Attesting to the activity of this site is the destruction of control stakes, placed with the pine PSL samples, after just 2 years. Parallel strand lumber specimens treated to AWPA recommended retentions for the respective preservatives are performing well. Graphs 1 and 2 illustrate these data.

Graph 1: Field Stake Performance for Southern Pine PSL treated with CCA.



Graph 2: Field Stake Performance for Yellow Poplar PSL treated with Creosote.



APPLICATIONS:

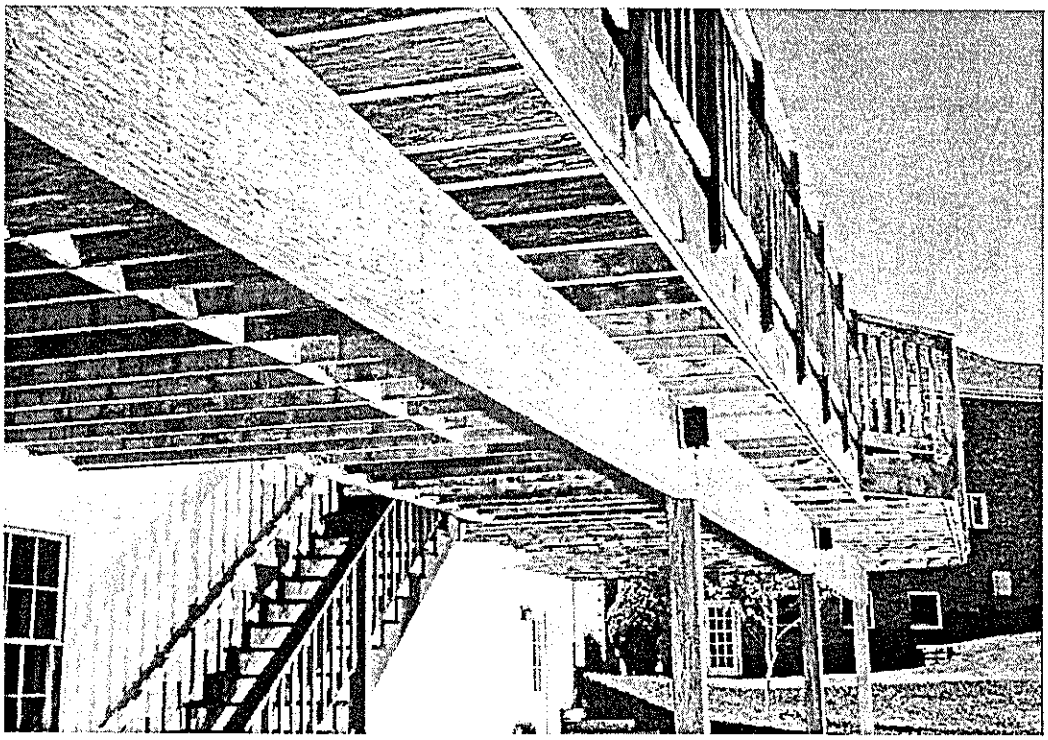


Photo 1: Southern yellow pine Parallel Strand Lumber Beam treated with CCA to a retention of 9.6 kg/m^3 (0.6 pcf).

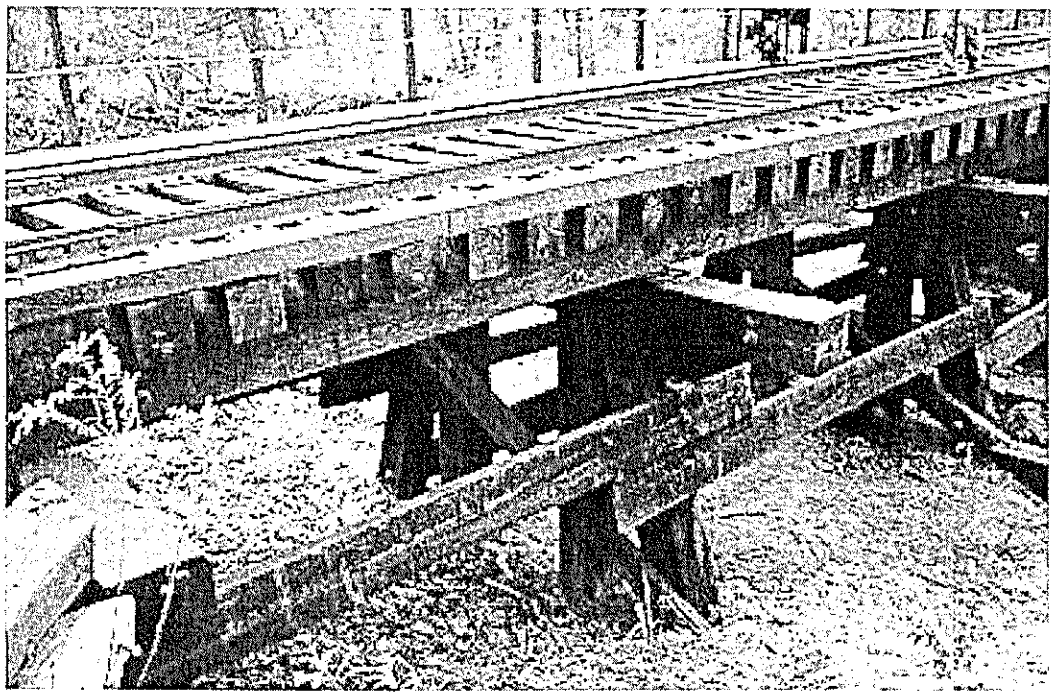


Photo 2: Yellow poplar Parallel Strand Lumber stringers treated with creosote to a retention of 128 kg/m^3 (8 pcf).

SUMMARY:
Parallel Strand Lumber possesses unique treating properties which enable it to perform in a variety of exterior heavy timber applications traditionally reserved for solid sawn timbers.

Physically, it is produced as a dry wood product which does not require months of air seasoning prior to treating. Because it is dry, it doesn't suffer from seasoning checks, twist, warp or bow. It is manufactured in large cross sections and long lengths, attributes becoming more scarce & expensive with solid sawn timbers. These attributes make it an attractive alternative for many applications, such as bridge timbers.

Parallam Strand Lumber has proved to be an excellent substrate for treating. Extensive treating trials and commercial experience has resulted in customized treating cycles designed to improve penetration and retention without increasing treating cycle times. For CCA treatment, full cross-sectional penetration of the PSL member can be achieved with a uniform retention gradient from face to core. For creosote treated PSL members, penetrations up to 3" can be achieved, easily meeting AWPA standards. Incising or boultonizing is not necessary.

REFERENCES:

1. AWPA Book of Standards. 2000. American Wood Preservers' Association. Granbury, TX. Standard C33-00.

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