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FOREST SERVICE

FOREST PRODUCTS LABORATORY

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TEMPERATURES NECESSARY TO KILL FUNGI IN WOOD

Work at the Forest Products Laboratory has shown that fungi in wood are killed by heat most effectively when the moisture content of the wood is above the fiber saturation point. The data in table 1 were obtained for wood infected with Lenzites sepiaria, Lentinus lepideus, and Poria incrassata,<sup>1</sup> all prominent decay fungi. The moisture content of the wood was kept above the fiber saturation point while the heat was applied.

Table 1. -- Recommended times at various temperatures to kill fungi in wood\*

Wood heated in steam or equivalent		Wood heated in air			
		90 to 97 percent relative humidity		35 to 40 percent relative humidity	
Temperature :	Time :	Temperature :	Time :	Temperature :	Time :
<u>°F.</u>	<u>Min.</u>	<u>°F.</u>	<u>Min.</u>	<u>°F.</u>	<u>Min.</u>
150	60	150	100	160	190
				165	60
170	30	170	30	170	50
180	20	180	20		
200	10				
212	5				

\*The temperature is that of the wood, not that at the surface of the wood.

<sup>1</sup>Chidester, Mae S. Temperatures Necessary to Kill Fungi in Wood. Proc. Amer. Wood-Preservers' Assn. 33:316-324. 1937.

In a later series of tests<sup>2</sup> that involved 6 fungi and 5 wood species, a similar time-temperature relationship was found.

The following is a listing of the fungi used and their source:

Fungus*	Wood and locality from which obtained
<u>Lentinus lepideus</u> Fr.	: Jack pine ( <u>Pinus banksiana</u> ) Canada
<u>Lenzites sepiaria</u> (Wulf.) Fr.	: Eastern hemlock ( <u>Tsuga canadensis</u> ) : Wisconsin
<u>Poria incrassata</u> (B. and C.) Burt.	: Southern yellow pine, Virginia
<u>Fomes roseus</u> Fr.	: Jack pine ( <u>Pinus banksiana</u> ) Canada
<u>Lenzites trabea</u> (Pers.) Fr.	: Western redcedar ( <u>Thuja plicata</u> ) : Wisconsin
<u>Trametes serialis</u> Fr.	: Douglas-fir ( <u>Pseudotsuga menziesii</u> ) : Oregon

\*The first 3 fungi are the same strains as used in the first studies.

<sup>2</sup>Chidester, Mae S. Further Studies on Temperatures Necessary to Kill Fungi in Wood. Proc. Amer. Wood-Preservers' Assn. 35:319-324. 1939.

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Table 2 presents the time-temperature relationships recommended on the basis of the second series of tests.

Table 2. --Recommended times at various temperatures to kill fungi in green wood

Wood heated in steam or an equivalent	
Temperature*	Time
<u>°F.</u>	<u>Min.</u>
150	75
170	30
180	20
200	10
212	5
:	:

\*Internal temperatures, not temperatures at the surface of the wood.

The recommended heating periods were based on the time after the wood had reached 150° F. These periods provide a margin of safety in that they are somewhat longer than the studies indicated were necessary for sterilization.

The recommendations in table 2 coincide with those in table 1 except that the heating period at 150° F. was increased from 60 to 75 minutes because of the longer time needed to kill Lenzites trabea. Work at the Forest Products Laboratory has shown<sup>3</sup> that these recommendations are easily met by ordinary commercial treatments of green wood when the preservative temperature is above 150° F.

It does not appear practical to sterilize wood at internal temperatures lower than 150° F. The most resistant fungi tested were not killed after 12 hours at 140°, 20 hours at 131°, or 24 hours at 122° F.

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<sup>3</sup>MacLean, J. D. Comments on: Temperatures Necessary to Kill Fungi in Wood. Proc. Amer. Wood-Preservers' Assn. 33: 324-326. 1937.