

Heat Treatments

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Outline

- Heat Treatment (HT)
 - Methods
 - Procedures
 - Effect on wood properties
 - HT schedules
 - U.S. Softwoods and Hardwoods

Heat Treatment Methods

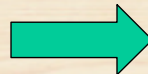
ISPM-15
56° C (133° F)
at the core
for 30 min



Heat Treatment Methods

ISPM-15
56° C (133° F)
at the core
for 30 min

Requirement
Scientifically valid
experiments that prove
efficacy of method



U.S. Industry uses Fahrenheit

Heat Treatment Methods

Current Methods

- Kilns or ovens: schedules determined



- Solar kilns: practical ?
Crafts only

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Research on Alternative Heating Methods

- Hot water bath
- High powered radio frequency heating
- Microwave

Kiln Heat
Current Method of Choice in U.S.
Certification is Available

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Kiln Drying

- Temperatures higher
- Times long
- <19% moisture
- Typically higher value wood

Kiln Heating

- Lower temperatures
- Short time
- Moisture not a factor
- Typically low value wood

Both are compliant with ISPM 15

Kiln Schedules for HT

Research Developed HT Schedules

- Softwoods
 - *easier to kiln dry
 - *HT easier
- Hardwoods
 - *harder to kiln dry
 - *HT harder

Heat Treatment Protocols

Wood Treated Before or After Assembly

Wood Treated, stamped

- Lumber
- Dunnage
- Wedges
- Blocking



- wedges for stabilizing loads of pipe
- giant wedges for holding a 767 jet in place

Assembled Products

Example:
7,000
cubic foot
HT oven

- Pallets
- Containers, Boxes
- Crates
- High End Cases
 - Military, Medical, Art
- Reels



Treated and Stamped

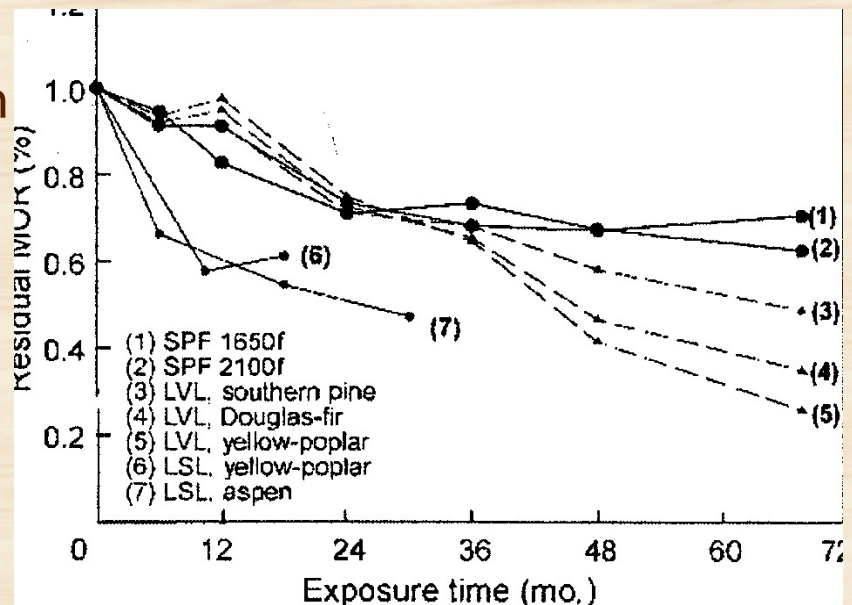
Effect of 56⁰ C for 30 min on wood properties

- Bending strength
- Splitting strength
- Dimensional stability
- Hardness
 - Compression
 - Elasticity

Effect of 56° C for 30 min on wood properties


Strength loss is T^0 and time dependent

- Bending strength
- Splitting strength
- Dimensional stability
- Hardness
 - Compression
 - Elasticity




No significant strength loss expected from heat sterilization

Variables Affecting HT Schedules

-  Wood species
- Size
- Wood specific gravity
- Wood moisture content
- Heating T^0
- Initial T^0
- Wet or dry heat:
 - wet bulb or dry bulb
- Specify kiln type

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Thermocouples to record T^0

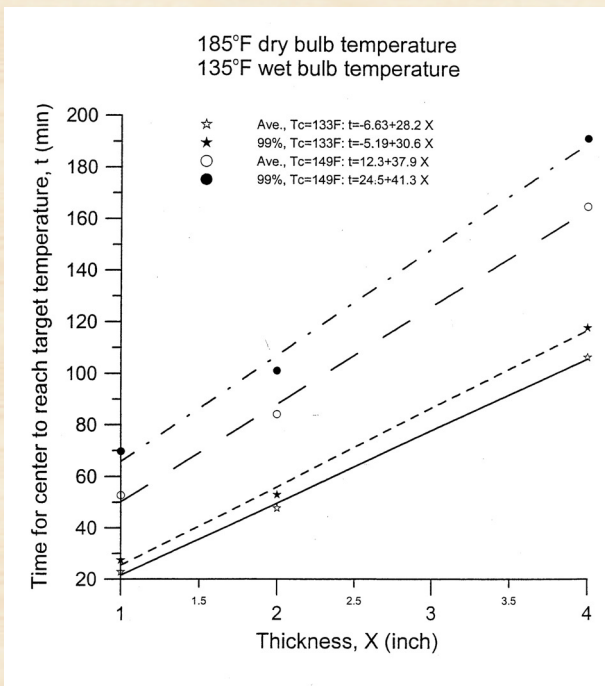


Monitoring heat treatment

Summary of HT Research

- *Size: Cross-sectional dimensions
- **Adding steam vs. dry heat
- Higher T^0 at start decreases time to get to 56^0
- Species of conifers have about same requirements
- Species of hardwoods have same requirements

HT Schedules for Industry



For wood species - size
HT Tables - Formula

- Initial T^0
- Kiln T^0 to maintain 56°
- Total kiln run time
- Moisture added

Kilns: software

Many companies are treating at T^0 above 56°

Free Information

Publications in .pdf

<http://www.fpl.fs.fed.us>

