

Heat Treatment

Basic Principles & Protocols

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Outline

- Heat Treatment (HT)
 - Methods
 - Protocols, Procedures
 - Effect on wood properties
 - Kiln 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 needed for
some woods



Heat Treatment Methods

Current Methods

- Kilns or ovens: schedules needed for some woods



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

Kiln Heat

Current Method of Choice in U.S.

Certification is Available

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

Heat Treatment Protocols

*Wood is Treated before or after assembly
by the final assembler*

Wood Treated, stamped

- Lumber
- Dunnage
- Wedges
- Blocking



- wedges for stabilizing loads of pipe
- giant wedges for hold 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

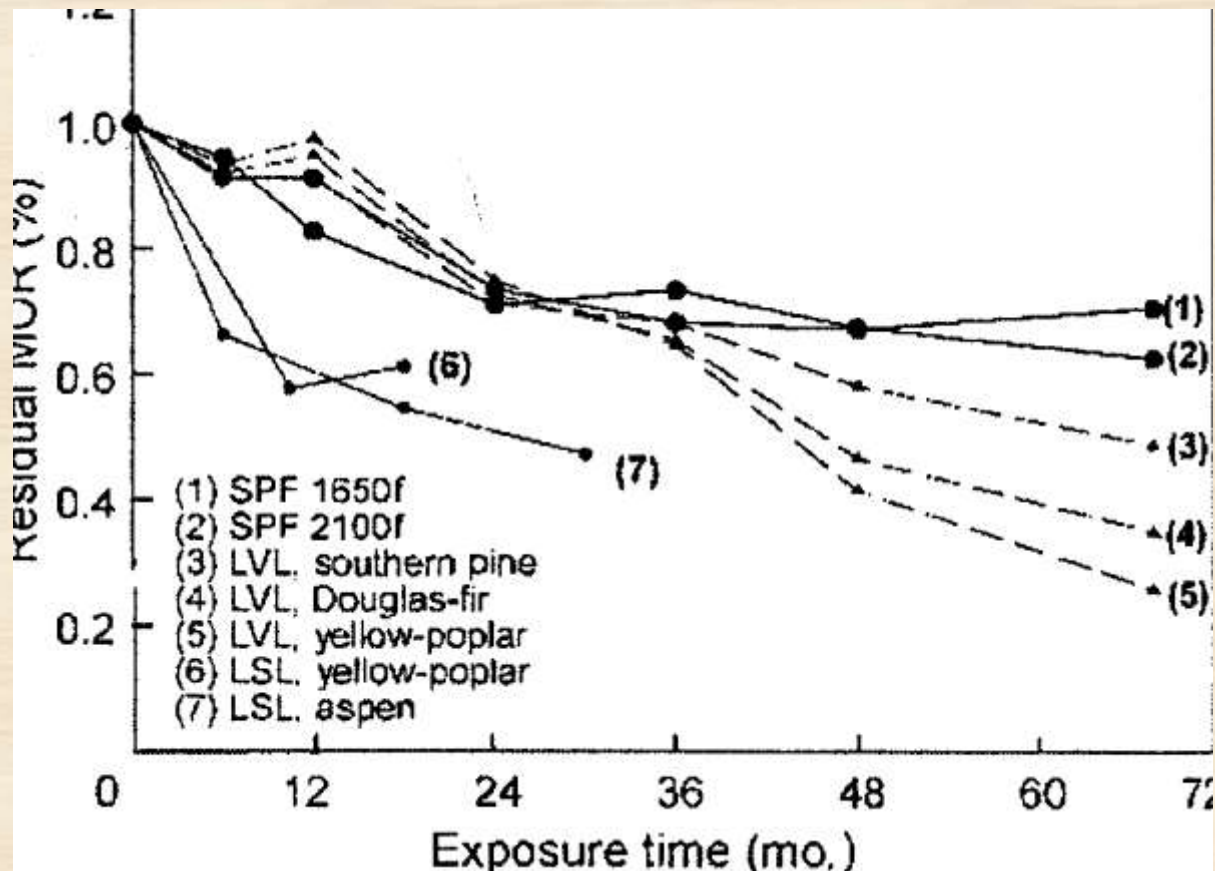
Effect of 56⁰ C for 30 min on wood properties

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

Effect of 56° C for 30 min on wood properties

Strength loss is T° and time dependent

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



No significant strength loss expected from heat sterilization

Kiln Schedules for HT

Research Developed HT Schedules

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

Research to Develop HT Schedules

Variables Affecting HT Schedules

-  Wood species
- Size
- Wood specific gravity
- Wood moisture content
- Heating T^0
- Initial T^0
- Wet or dry heat
- Specify kiln type
(see handout)

Research to Develop HT Schedules

Variables Affecting HT Schedules

-  Wood species
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- Wood specific gravity
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(see handout)

Thermocouples to record T^0



Monitoring heat treatment

Research to Develop HT Schedules

- *Size: Cross-sectional dimensions
- Higher T^0 at start decreases time to get to desired T^0
- **Add steam
- Species of conifers have about same requirements

Research to Develop HT Schedules

Example

Pine board

Initial 71° C gets
center to 56° C

- *Size: Cross-sectional dimensions
- Higher T^0 at start decreases time to get to desired T^0
- **Add steam
- Species of conifers have about same requirements

1 x 4 inch thick
takes less than 1 hour

12 x 12 inch thick
takes 24 hours

Kiln Schedule for Industry

For each wood species
and size

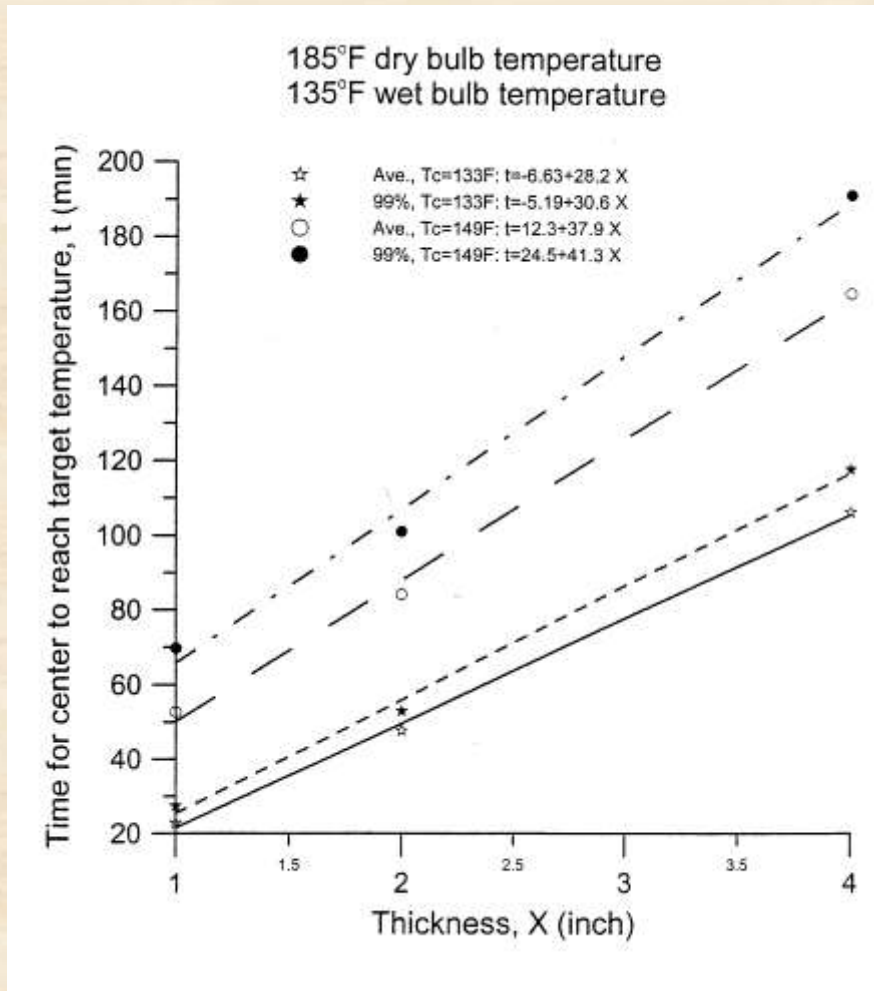
- Initial T^0
- Kiln T^0 to maintain 56^0
- Total kiln run time
- Time and amount:
of moisture added

Many companies are treating at T^0 **above** 56^0

Kiln Schedule for Industry

For each wood species and size

- Initial T^0
- Kiln T^0 to maintain 56^0
- Total kiln run time
- Time and amount: of moisture added



Many companies are treating at T^0 above 56^0

Kiln Schedules for Softwoods

- Many labs completed schedules

Simpson & Illman, Forest Products Journal, Pine schedules.
December 2004

Kiln Schedules for Softwoods

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Kiln Schedules for Hardwoods

- Prepared at Forest Products Lab
 - 5 northern species, Simpson et al.
 - 5 southern species, Illman et al.

Research to Support ISPM 15

Biology of Fungi
New Treatments
Detection Methods



Information

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



QUESTIONS?



End of Presentation

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