

AN INTRODUCTION TO NHLA Lumber Grades

Presented by Dana Spessert
For More Information, Please Reach
Out To:

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STRONG ROOTS. GLOBAL REACH.



Hardwood Lumber as a Raw Material

What project is it for?

What are the sizes of the finished pieces?

Would it be possible to glue pieces together?

Are there any specific requirements for the project?





National Hardwood Lumber Association Hardwood Resources

Apps in your Apple or Android store:

Rules book, Cutting Calculator, Videos

Certifications:

Kiln Dried Certification in lieu of Phytosanitary Certificate.

Facility Grades Certification with biannual audits by National Inspectors

Sustainability Certification for all Active Members.

Purpose of NHLA

Grow and
Stabilize the
Hardwood
Industry



Rules App
&
Calculator



NHLA Rules

Established more than 125 years ago.

One of the only standard grading systems in the world.

Changed by the NHLA Membership by 2/3 majority vote.

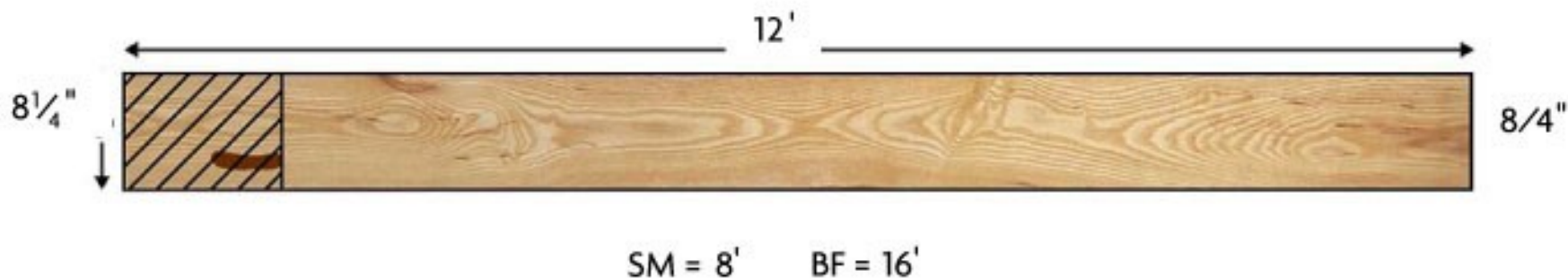
Basic Principles of Grading Hardwoods

- **Measurable Percentage of Clear Wood**
- **Determines Both Cost and Waste Factor**
- **Cuttings (Pieces)**
 - **Size**
 - **Number**

Basic Principles of Grading Hardwoods

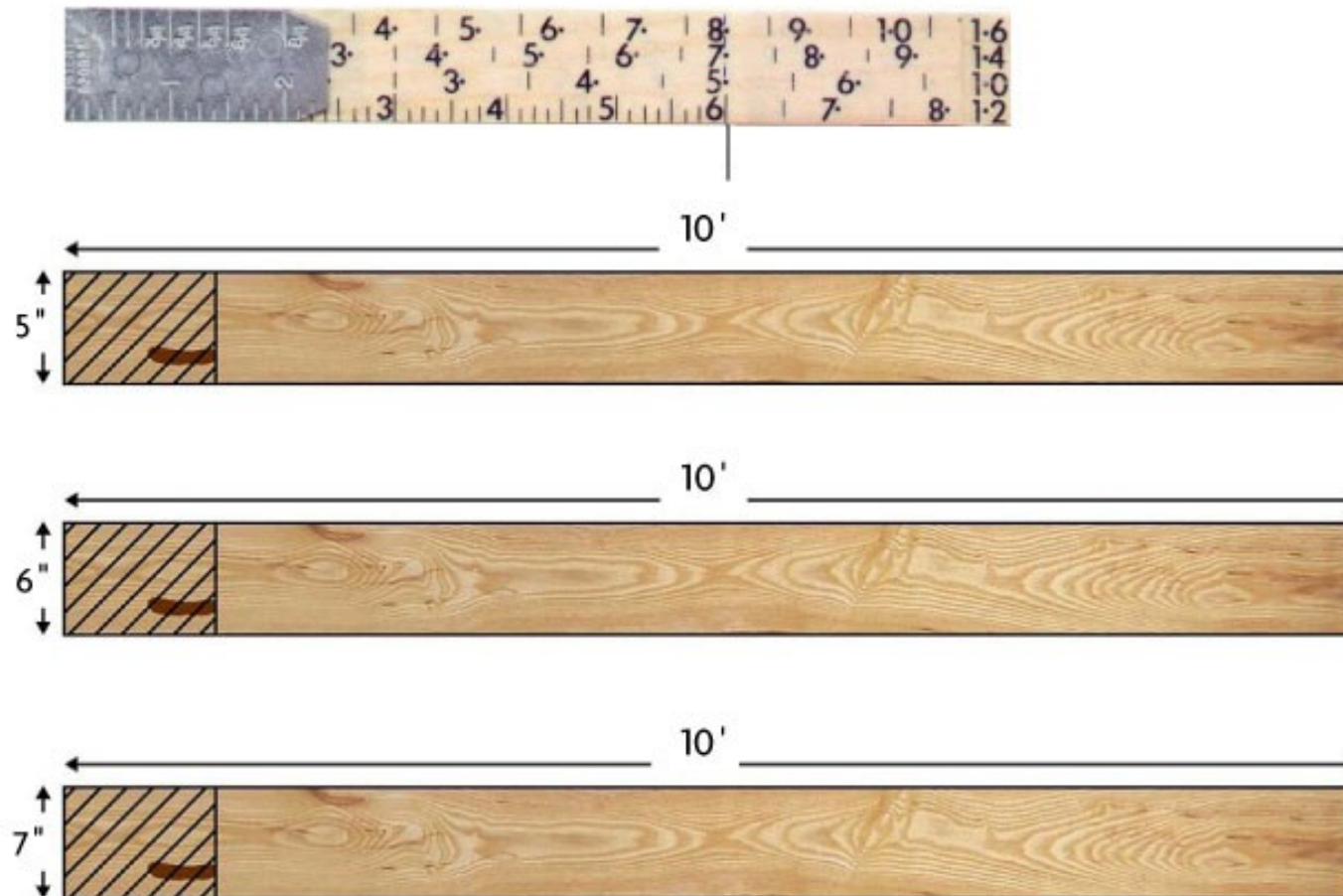
- **Grading from the poor side**
- **Each clear area of the board is measured and considered a “cutting” if large enough**
- **Clear areas of the board are valued using the Cutting Unit Method**

SURFACE MEASURE & BOARD FEET



SM = multiply the width of the board in inches by the length of the board in feet and divide the sum by 12, rounding up or down to the nearest whole number.

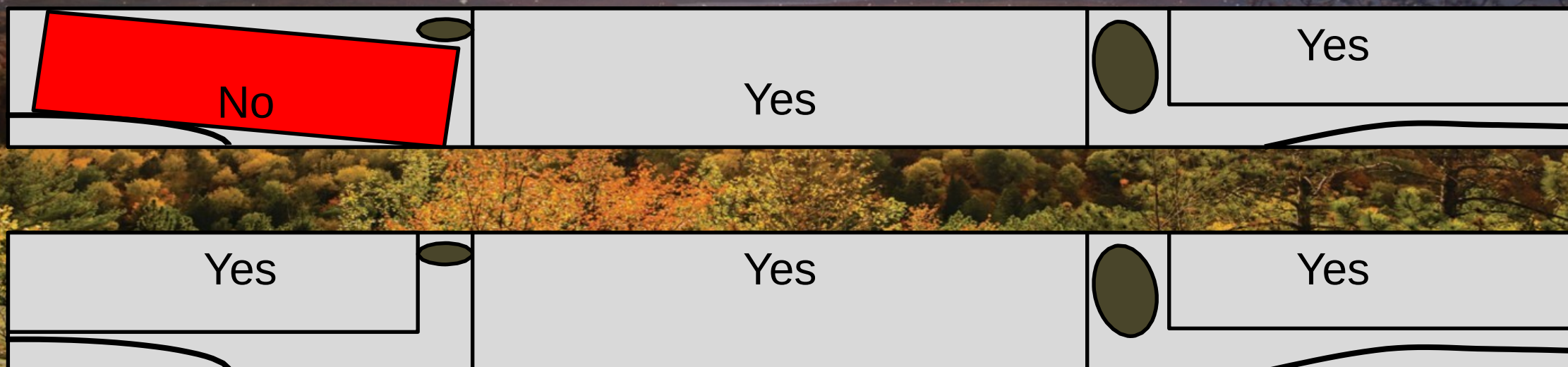
GRADING SCALE



Cuttings

Definition of Cutting - Paragraph 29.

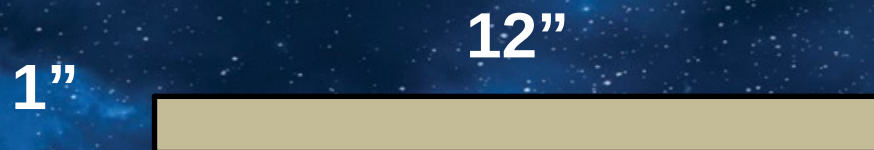
A cutting is a portion of a board of plank obtained by cross-cutting or ripping or by both... Diagonal cuttings are not permitted.



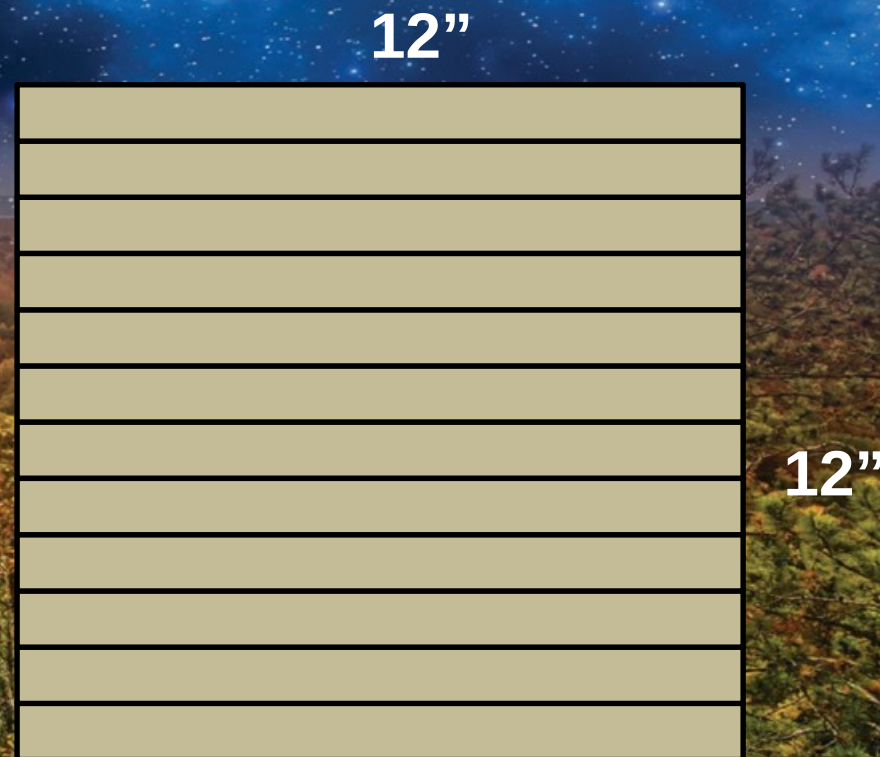


Cutting Unit Method

The percentage of cutting in a board is determined under the Cutting Unit Method. Cutting unit is 1 inch by 1 foot:



One square foot
contains 12 cutting units:

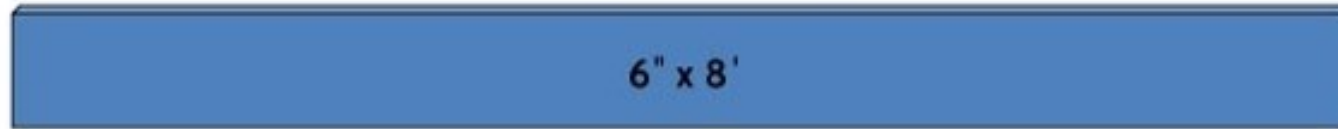


EXAMPLE OF FAS (RED OAK)

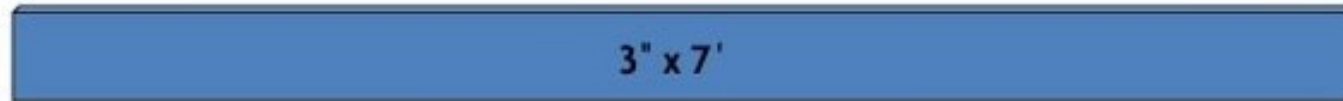
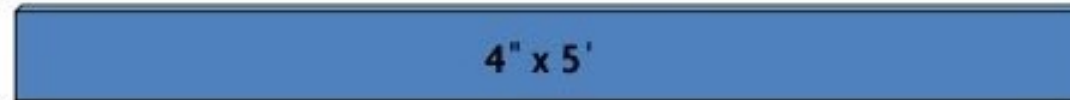


FAS REQUIREMENTS

Minimum size board



Minimum size cutting requirements



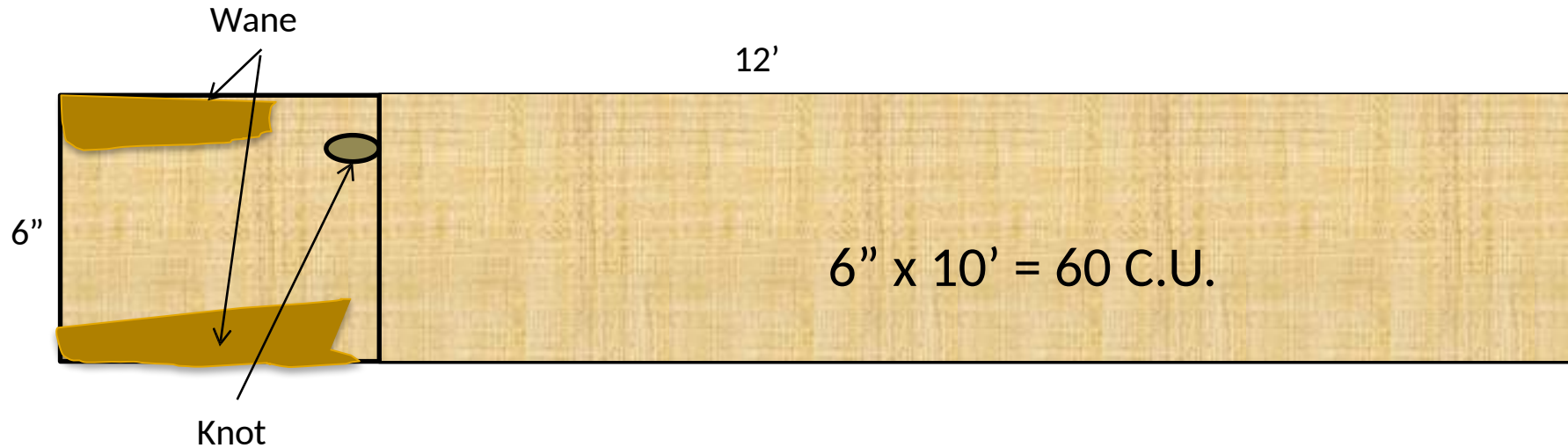
Cuttings allowed = $SM/4$

Total area required in clear cuttings

83 1/3% or 10/12 or $SM \times 10$



FAS

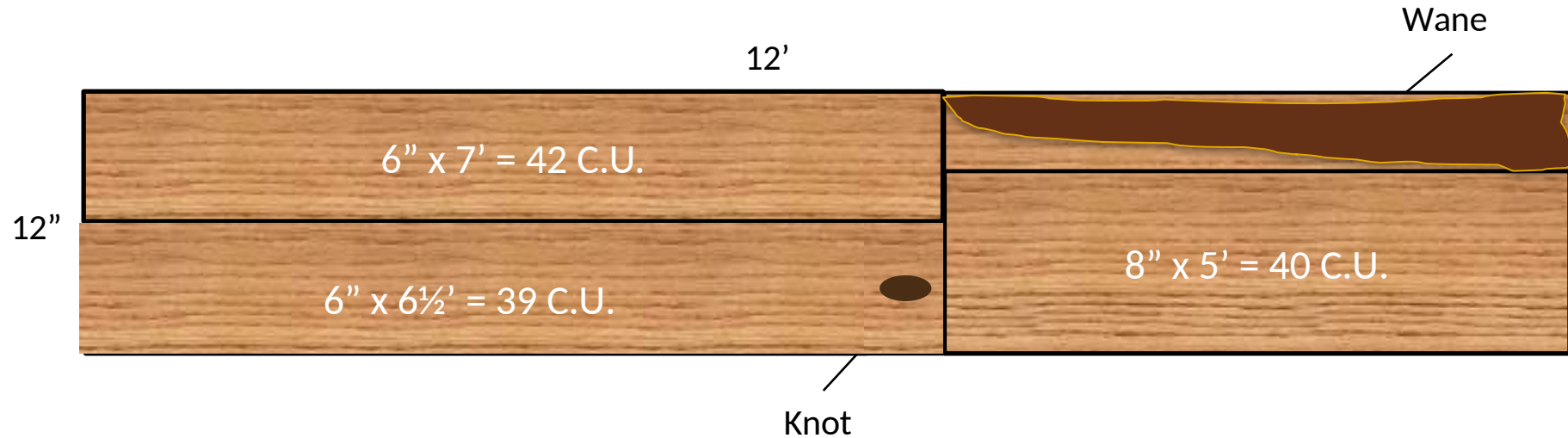


$$SM = 6'' \times 12' \div 12 = 6'$$

Number of Cuttings for FAS: $SM \div 4 = 6/4 = 1\frac{1}{2} = 1$ cutting

Cutting Units needed for FAS: $SM \times 10 = 6 \times 10 = 60$ C.U.

FAS



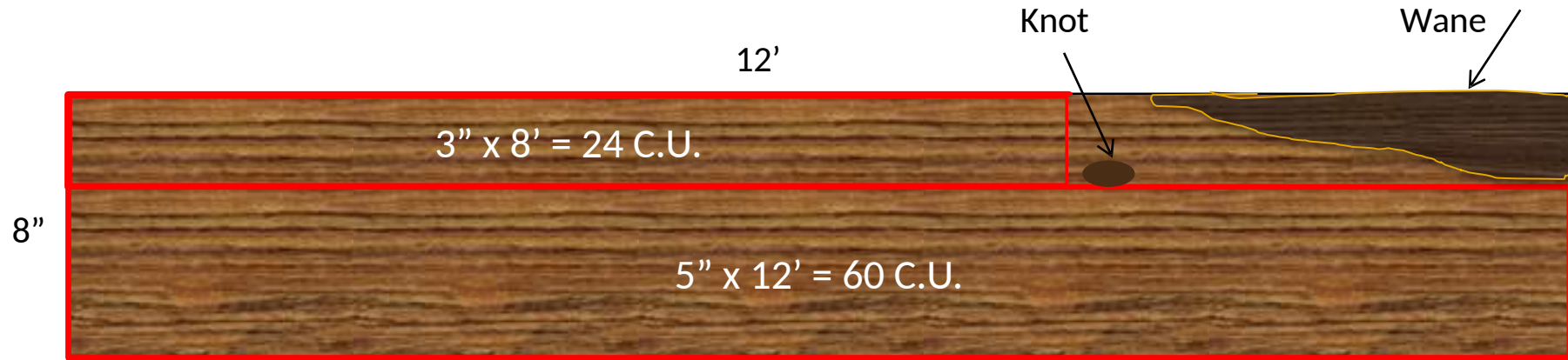
$$SM = 12'' \times 12' \div 12 = 12'$$

$$\text{Number of Cuttings for FAS: } SM \div 4 = 12/4 = 3 \text{ cuttings}$$

$$\text{Cutting Units needed for FAS: } SM \times 10 = 12 \times 10 = 120 \text{ C.U.}$$

$$42 + 39 + 40 = 121 \text{ C.U.}$$

FAS



$$SM = 8'' \times 12' \div 12 = 8'$$

$$\text{Number of Cuttings for FAS: } SM \div 4 = 8/4 = 2 \text{ cuttings}$$

$$\text{Cutting Units needed for FAS: } SM \times 10 = 8 \times 10 = 80 \text{ C.U.}$$

$$24 + 60 = 84 \text{ C.U.}$$

FAS APPLICATIONS



FAS APPLICATIONS

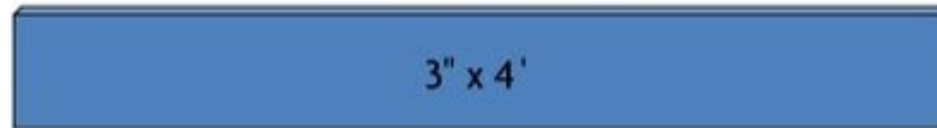


EXAMPLE OF N° 1 COMMON (RED OAK)

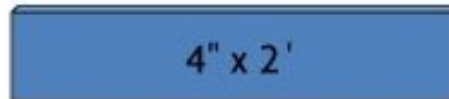
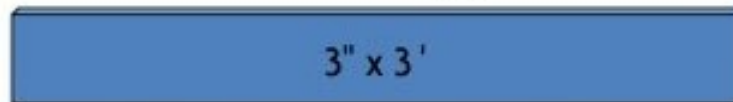


Nº 1 COMMON REQUIREMENTS

Minimum size board



Minimum size cuttings permitted



Cuttings allowed = $SM + 1 / 3$

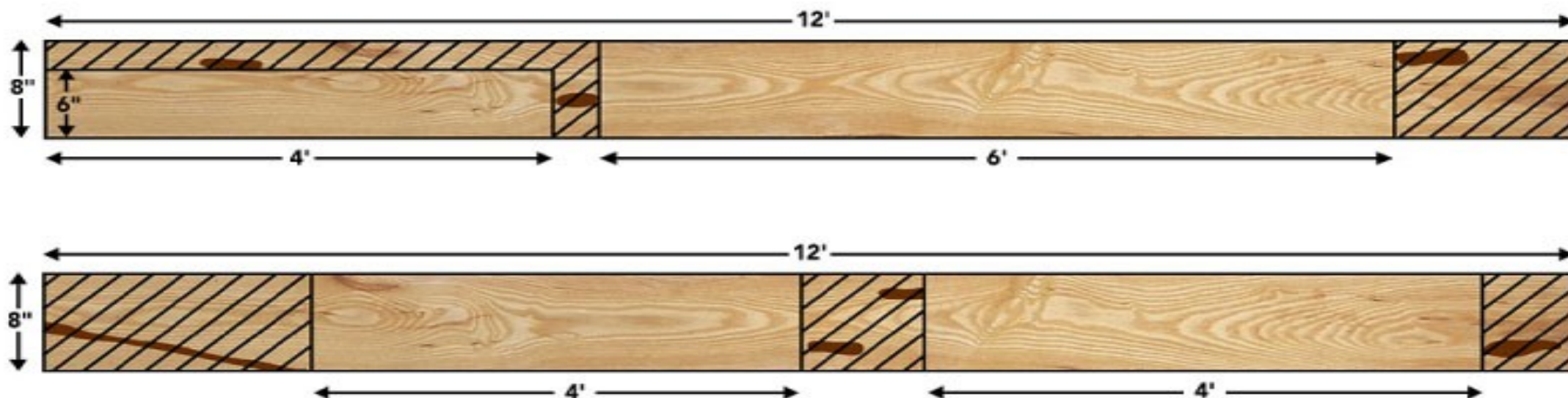
Total area required in clear cuttings

$66 \frac{2}{3}\%$ or $8/12$ or $SM \times 8$



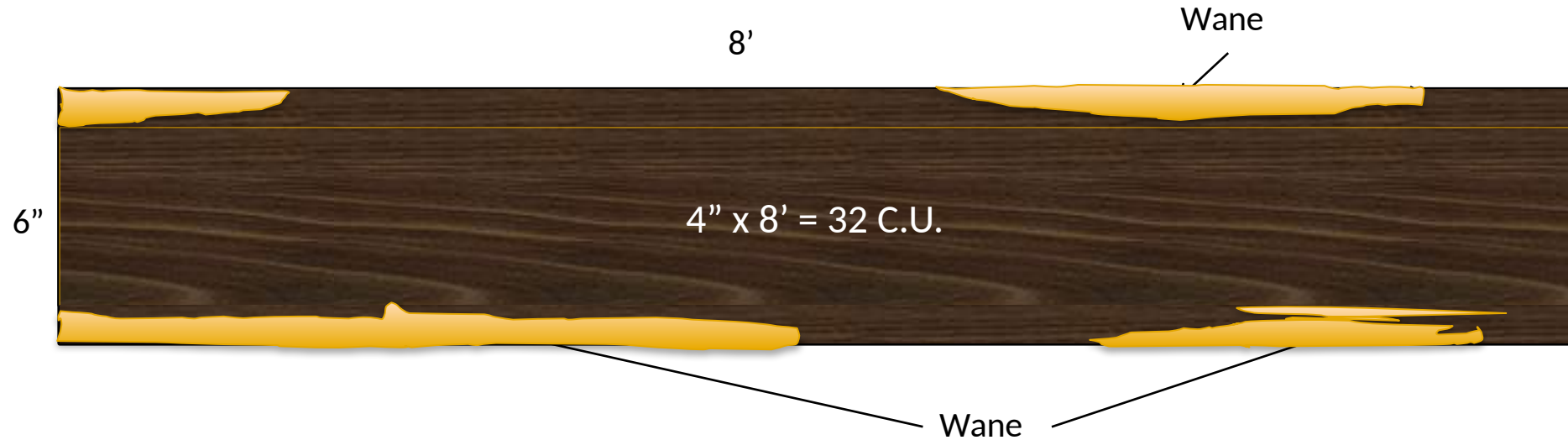
Nº 1 COMMON REQUIREMENTS

Minimum yield of 66 2/3%



If better face meets FAS and poor face makes No 1 Common the grade has potential to be F1F or selects.

#1 Common

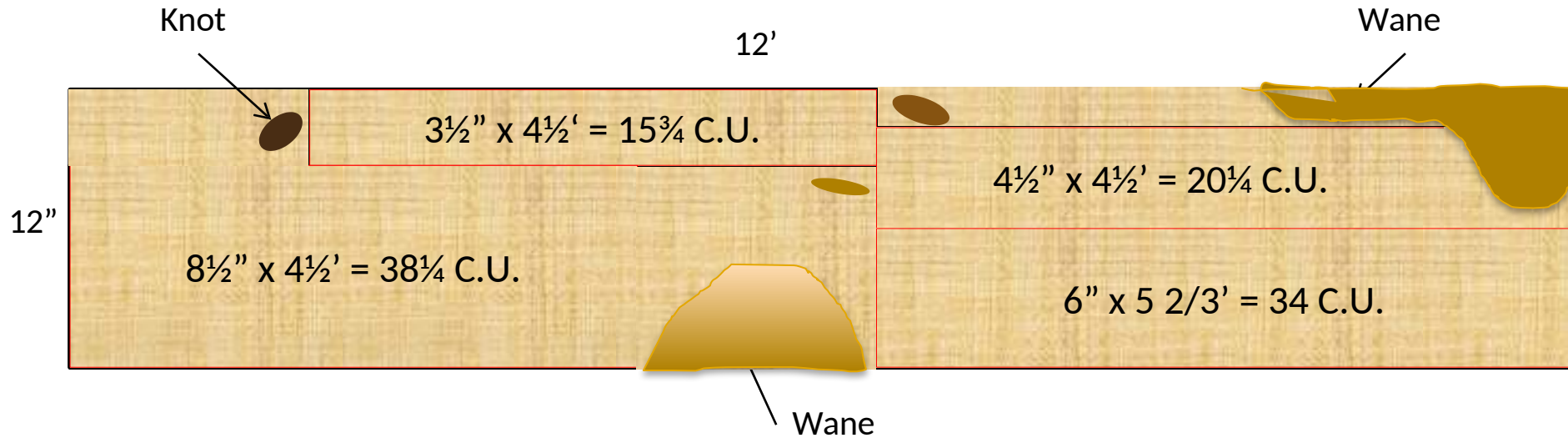


$$SM = 6" \times 8' \div 12 = 4'$$

Number of Cuttings for #1 Com: $SM + 1 \div 3 = 5 \div 3 = 1 \text{ cutting}$

Cutting Units needed for #1 Com: $SM \times 8 = 4 \times 8 = 32 \text{ C.U.}$

#1 Common



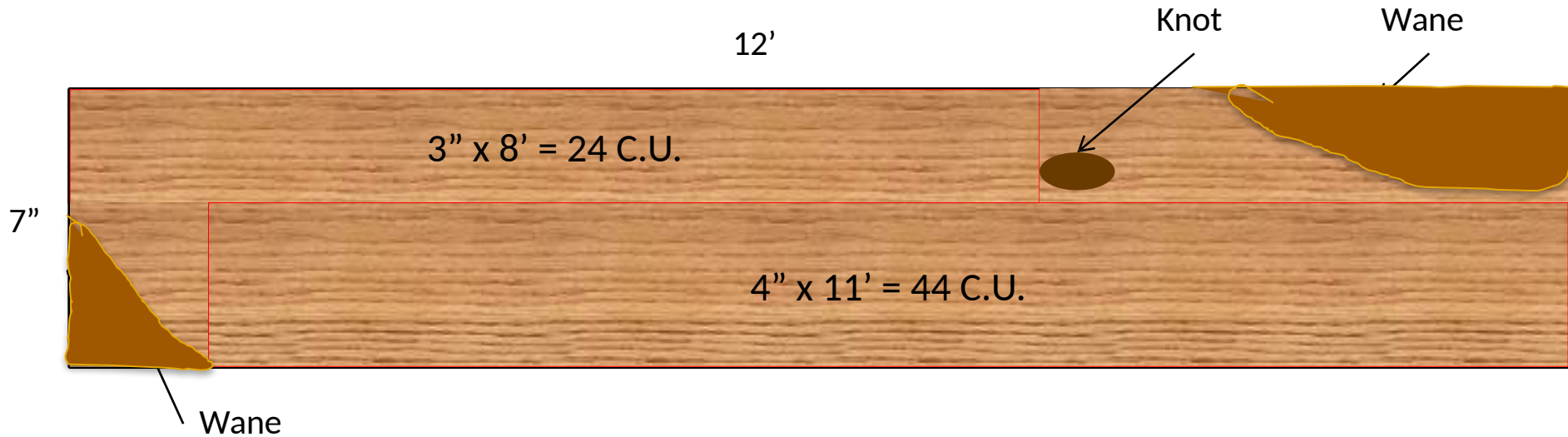
$$SM = 12" \times 12' \div 12 = 12'$$

Number of Cuttings for #1Com: $SM+1 \div 3 = 13 \div 3 = 4$ cuttings

Cutting Units needed for #1Com: $SM \times 8 = 12 \times 8 = 96 \text{ C.U.}$

$$15\frac{3}{4} + 20\frac{1}{4} + 38\frac{1}{4} + 34 = 108\frac{1}{4} \text{ C.U.}$$

#1 Common



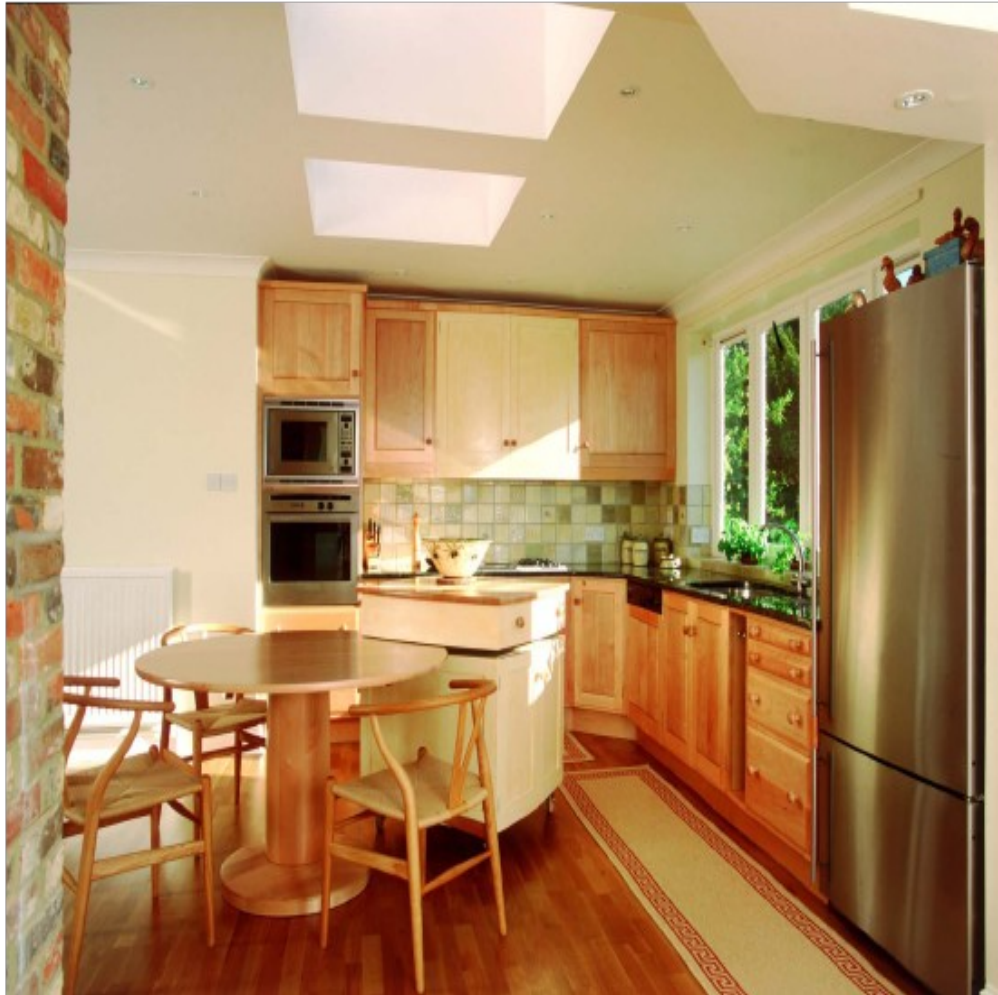
$$SM = 7'' \times 12' \div 12 = 7'$$

$$\text{Number of Cuttings for \#1 Com: } SM+1 \div 3 = 8 \div 3 = 2 \text{ Cuttings}$$

$$\text{Cutting Units needed for \#1 Com: } SM \times 8 = 7 \times 8 = 56.$$

$$24 + 44 = 68 \text{ C.U.}$$

Nº 1 COMMON APPLICATIONS



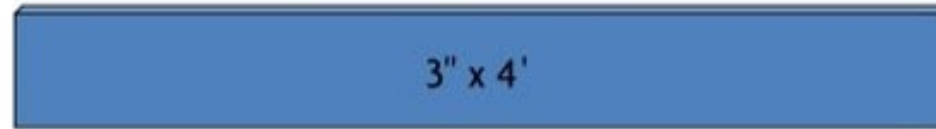
EXAMPLE OF N° 2 COMMON (RED OAK)



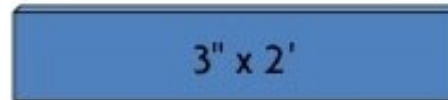
Nº 2 COMMON REQUIREMENTS



Minimum size board



Minimum size cuttings permitted



Cuttings allowed = $SM/2$

Total area required in clear cuttings

50% or 6/12 or $SM \times 6$



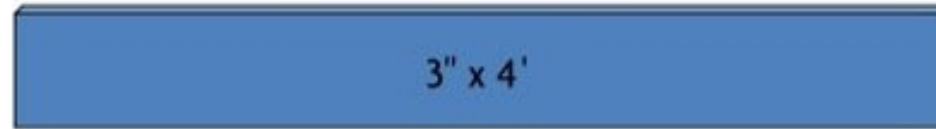
2A Common is clear cuttings

2B Common is sound

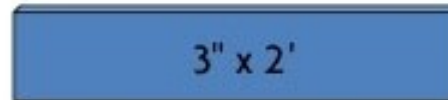
Nº 2 COMMON REQUIREMENTS



Minimum size board



Minimum size cuttings permitted



Cuttings allowed = $SM/2$

Total area required in clear cuttings

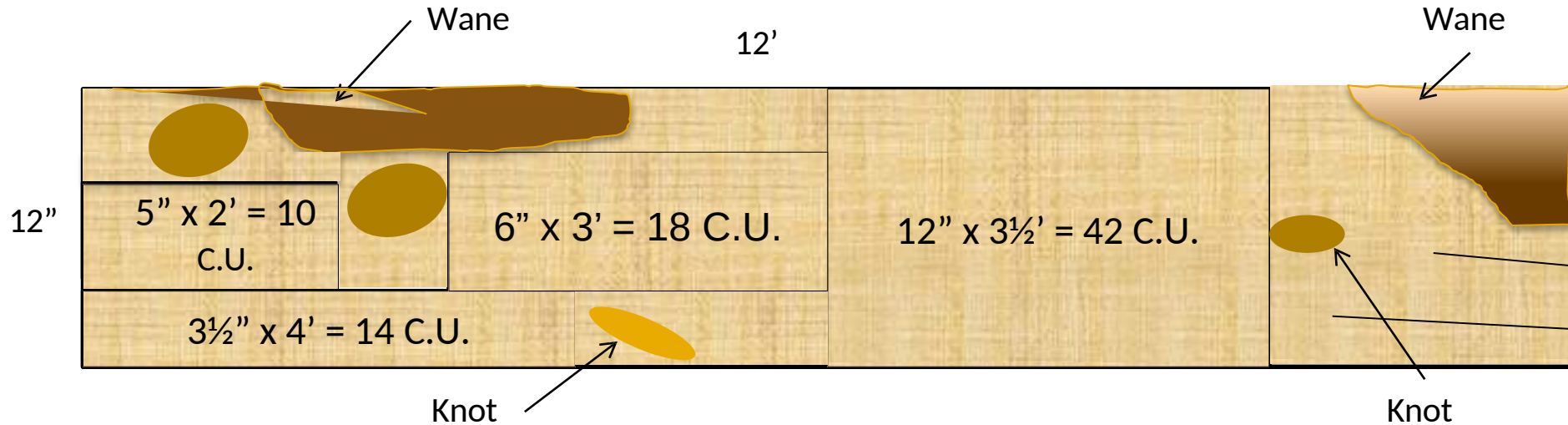
50% or 6/12 or $SM \times 6$



2A Common is clear cuttings

2B Common is sound

#2A Common



$$SM = 12'' \times 12' \div 12 = 12'$$

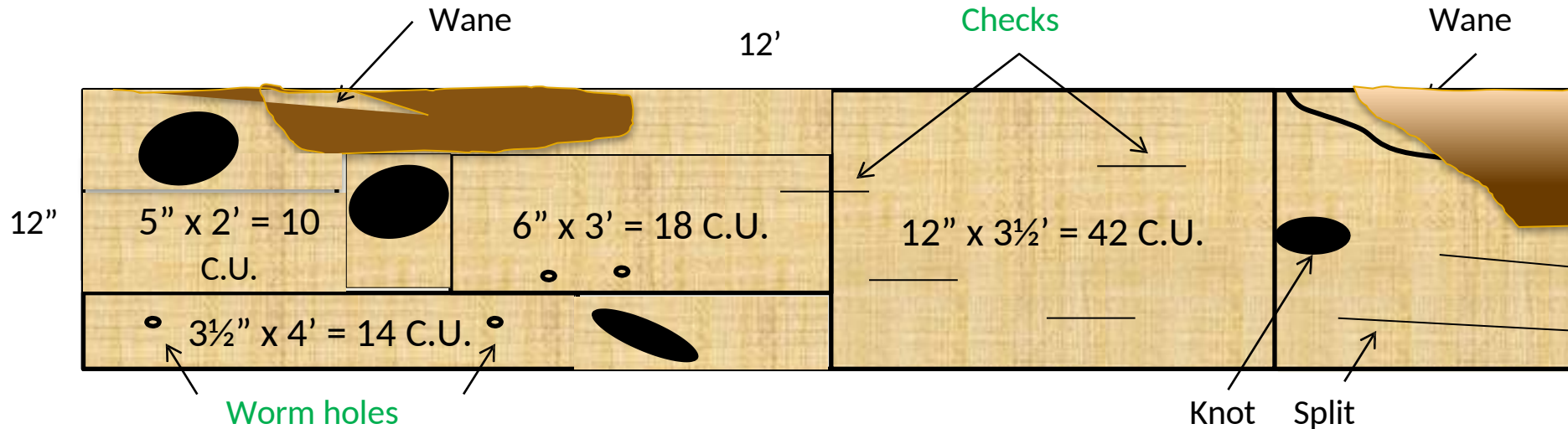
$$\text{Number of Cuttings for \#2 Com: } SM \div 2 = 12 \div 2 = 6 \text{ Cuttings}$$

$$\text{Cutting Units needed for \#2 Com: } SM \times 6 = 12 \times 6 = 72 \text{ C.U.}$$

$$10 + 18 + 14 + 42 = 84 \text{ C.U.}$$

Clear-face cuttings

#2B Common



$$SM = 12'' \times 12' \div 12 = 12'$$

Number of Cuttings for #2 Com: $SM \div 2 = 12 \div 2 = 6 \text{ Cuttings}$

Cutting Units needed for #2 Com: $SM \times 6 = 12 \times 6 = 72 \text{ C.U.}$

$$10 + 18 + 14 + 42 = 84 \text{ C.U.}$$

Sound cuttings

Nº 2 COMMON APPLICATIONS



NHLA Grading Chart

	FAS	F1F	Select	#1 Common	#2A & #2B Common	#3 A Common	#3 B Common
Minimum Board Size	6'' x 8'	6'' x 8'	4'' x 6'	3'' x 4'	3'' x 4'	3'' x 4'	3'' x 4'
Minimum Cutting Size	4''x 5' 3''x 7'	Better Face to Grade FAS Poor Face to Grade #1 Common		4''x 2' 3''x 3'	3'' x 2'	3'' x 2'	Not less than 1½"wide containing 36 square inches
Basic Yield	83% or SM x 10			66% or SM x 8	50% or SM x 6	33% or SM x 4	25% or SM x 3
Formula to Determine Number of Cuttings	$\frac{SM}{4}$ (4 max.)			$\frac{SM+1}{3}$ (5 max.)	$\frac{SM}{2}$ (7 max.)	Unlimited	Unlimited sound cuttings

Rules Changes For 2027



Amend "Lumber should" to "SHALL" be properly manufactured of good, average width and lengths, etc. (Page 5, paragraph 8).

- Current Rule:
 - Manufacture
 - Lumber *should* be properly manufactured of good, average width and lengths. It should be edged and trimmed carefully to produce the best possible appearance while conserving the usable product of the log. Shipments of rough lumber will admit 25% of surfaced lumber when it is of the specified rough thickness. Contracts for green lumber should specify dimensions required to provide for shrinkage in drying.
- New Rule:
 - Manufacture
 - Lumber *shall* be properly manufactured of good, average width and lengths. It should be edged and trimmed carefully to produce the best possible appearance while conserving the usable product of the log. Shipments of rough lumber will admit 25% of surfaced lumber when it is of the specified rough thickness. Contracts for green lumber should specify dimensions required to provide for shrinkage in drying.



**Reinstate the Original Construction Grades,
Restore the grades as previously written
before their omission in subsequent NHLA Rule
Books. Allow modifications based on
recommendations from the New Construction
Task Force later.**

- Current Rule:
 - Removed in 2007 Rules Book:
 - All pages that represented Hardwood Construction Grades.
 - Not being utilized at that time by many companies.
- New Rule:
 - To be updated by Structural Grade Hardwood Committee chaired by Trent Yoder with industry members that produce both hardwood and softwood lumber as well as others.
 - Rules will be very similar to current softwood grading rules.
 - Tests to establish strength ratings and engineering values.
 - Current uses are in crane mats, cross laminated panels and beams.
 - Suggested changes to the former Rules ---

Inspection of Cypress Lumber

Add: Pith is limited in inches, boxed or showing, to the width of the piece

- Current Rule
 - None
- New Rule
 - Selects & Better
 - Page 48, Paragraph 90 Add:
 - Pith is limited in inches, boxed or showing, to the width of the piece.



Change: Pieces 4" and 5" wide must be clear allowing slight wane on one edge (par. 80) except those pieces 12' and longer allow one medium knot

- Page 49, Paragraph 90, Selects & Better
- Current Rule
 - Defects Allowed: Pieces
 - No knots allowed on widths under 6".
- New Rule
 - Defects Allowed: Pieces
 - Pieces 4" and 5" wide must be clear allowing slight wane on one edge (par. 80) except those pieces 12' and longer allow one medium knot.



Change: Pieces 6"-9" wide allow one medium knot for 8'-10' lengths and two medium knots for pieces 12' and longer

- Page 49, Paragraph 90, Selects & Better
- Current Rule
 - Defects Allowed: Pieces
 - 6" wide – 1 medium knot
 - 7" – 9" wide - 2 medium knots
- New Rule
 - Defects Allowed: Pieces
 - Pieces 6"-9" wide allow one medium knot for 8'-10' lengths and two medium knots for pieces 12' and longer.

Add: All Grades: Sidebend shall not exceed to the extent that the piece cannot be machined to standard finished width. This applies to Selects, 1 Common and 2 Common.

- Page 43, Paragraph 15, Warp and Cup
- Current Rule
 - Entire board must be flat enough to surface both sides at 1/4" less than nominal thickness, no skip allowed.
- New Rule
 - Entire board must be flat enough to surface both sides at 1/4" less than nominal thickness, no skip allowed.
 - Sidebend shall not exceed to the extent that the piece cannot be machined to standard finished width. This applies to Selects, 1 Common and 2 Common.



- **New Rules will Be in effect on January 1, 2027.**
- **New Rules Books will be available later in 2026.**
- **NHHLA Rules app will be updated later in 2026.**

Hardwood Market Development Initiatives





Structural Grade Hardwood Lumber (SGHL)



**Exploring domestic
hardwoods for
structural use**



**Adapting softwood-
style grading and
sawing systems**



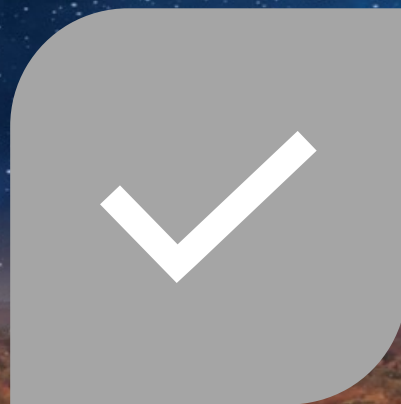
**Potential to tap
into new markets
as imported
softwoods now
exceed 40% of U.S.
supply**



Red Oak Decking Certification



**PROMOTING RED
OAK FOR OUTDOOR
APPLICATIONS**



**DEVELOPING
CERTIFICATION FOR
THERMALLY
MODIFIED OR
TREATED DECKING**



**BACKED BY
DURABILITY TESTING
AND TREATMENT
EVALUATION**



Thermally Modified Wood (TMW) Standards



STANDARD
DEVELOPMENT



MARKET GUIDANCE



CERTIFICATION
FRAMEWORK

Mechanical Testing of Hardwood Species



**TESTING BENDING,
TENSION,
COMPRESSION,
AND SHEAR
PROPERTIES**



**AIMING TO GROUP
SPECIES FOR
STRUCTURAL AND
ARCHITECTURAL
use**



**BUILDING DATA FOR
SPECIFICATION AND
DESIGN**

Mill Residue for Co-Generation



**EVALUATING BARK,
SAWDUST, AND
OFFCUTS FOR
LOCAL ENERGY
GENERATION**



**SUPPORTING COST
REDUCTION AND
SUSTAINABILITY AT
MILLS**



**FOCUSED ON
SCALABLE, MILL-
FRIENDLY
SOLUTIONS**

The background image is a landscape photograph showing a dense forest of deciduous trees in the foreground and middle ground. In the distance, a calm lake is visible, surrounded by more forested hills under a sky with scattered white clouds. The entire image is covered with a blue-to-white gradient overlay, which is most intense at the top and fades towards the bottom. A white rectangular box is centered horizontally in the lower half of the image, containing the title text.

Optimizing Operations for Yield

What is the goal of a sawmill, lumber drying operation, and/or finished goods operation?

\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$

Raw Material Costs \$\$\$

- Logs = 75-85% of total costs
- Green Lumber = 85-90% of total costs
- Kiln Dried Lumber = 85-90% of total costs



NHLA

www.nhla.com

Some Factors that Reduce Yield-Grade/Volume

- Logs
 - Stain
 - Sawing Pattern
 - Manufacturing
 - Species
 - Bucking
 - Degradation
 - Under Trained Employees
 - Improper Calibration

Some Factors that Reduce Yield-Grade/Volume

- Air/Kiln Drying
 - Stain
 - Manufacturing
 - Species
 - Inaccurate Grading
 - Degradation
 - Moisture Content
 - Warping
 - Under Trained Employees
 - Improper Calibration

Some Factors that Reduce Yield-Grade/Volume

- Finished Goods
 - Stain
 - Moisture Content
 - Species
 - Inaccurate Grading
 - Forklifts
 - Rip First/Chop First
 - Old Equipment
 - Under Trained Employees
 - Improper Calibration

Automation vs Optimization

Automation (Webster's Dictionary)

- 1: the technique of making an apparatus, a process, or a system operate automatically
- 2: the state of being operated automatically
- 3: automatically controlled operation of an apparatus, process, or system by mechanical or electronic devices that take the place of human labor

Optimization (Webster's Dictionary)

- 1: an act, process, or methodology of making something (such as a design, system, or decision) as fully perfect, functional, or effective as possible



NH L A

National Hardwood
Lumber Association

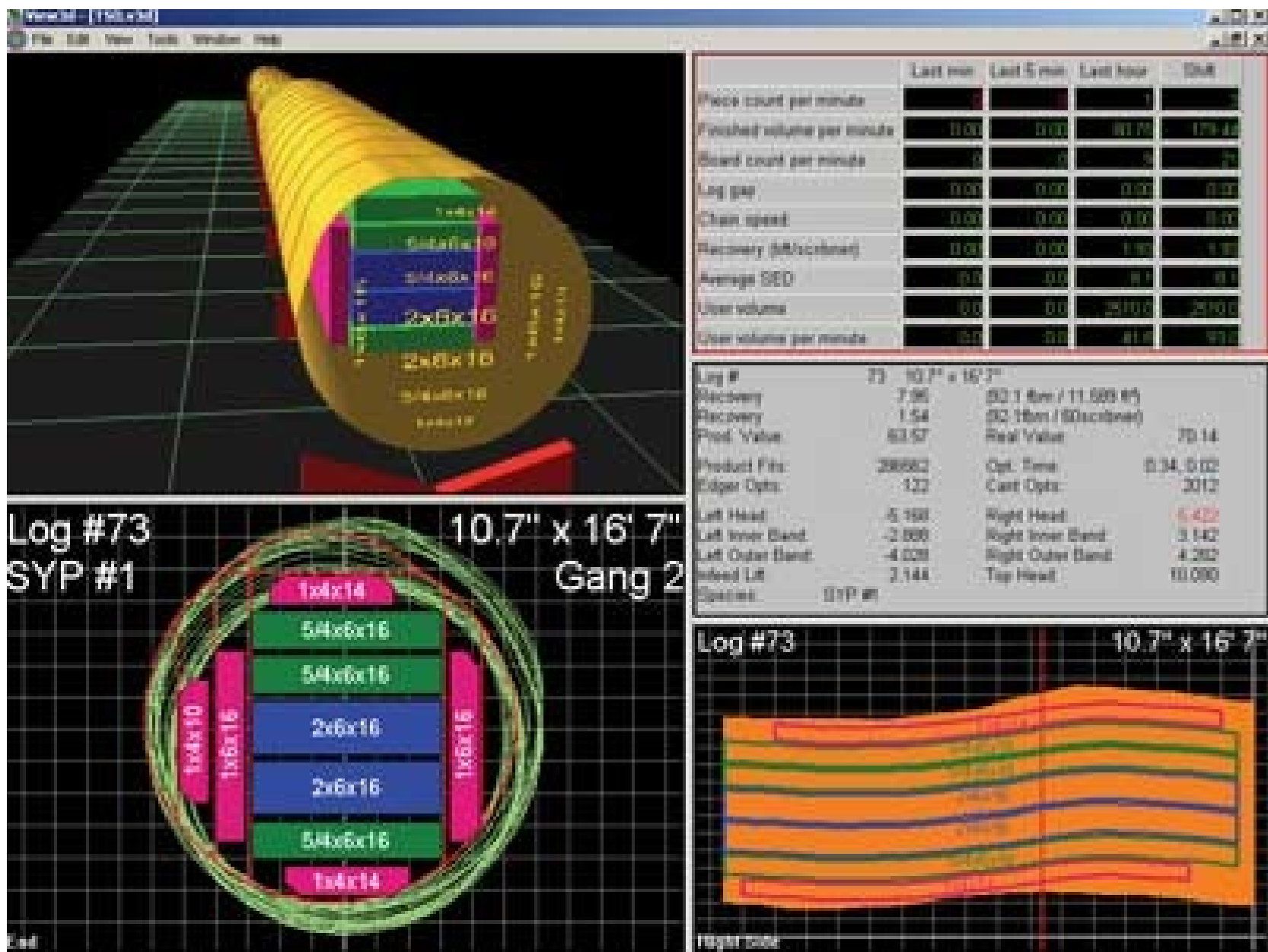
- Automation
 - Replaces Manual Labor
 - Speed
 - Possible Volume Increase
 - Consistent Performance
 - Longer Duration
 - Safer Operation

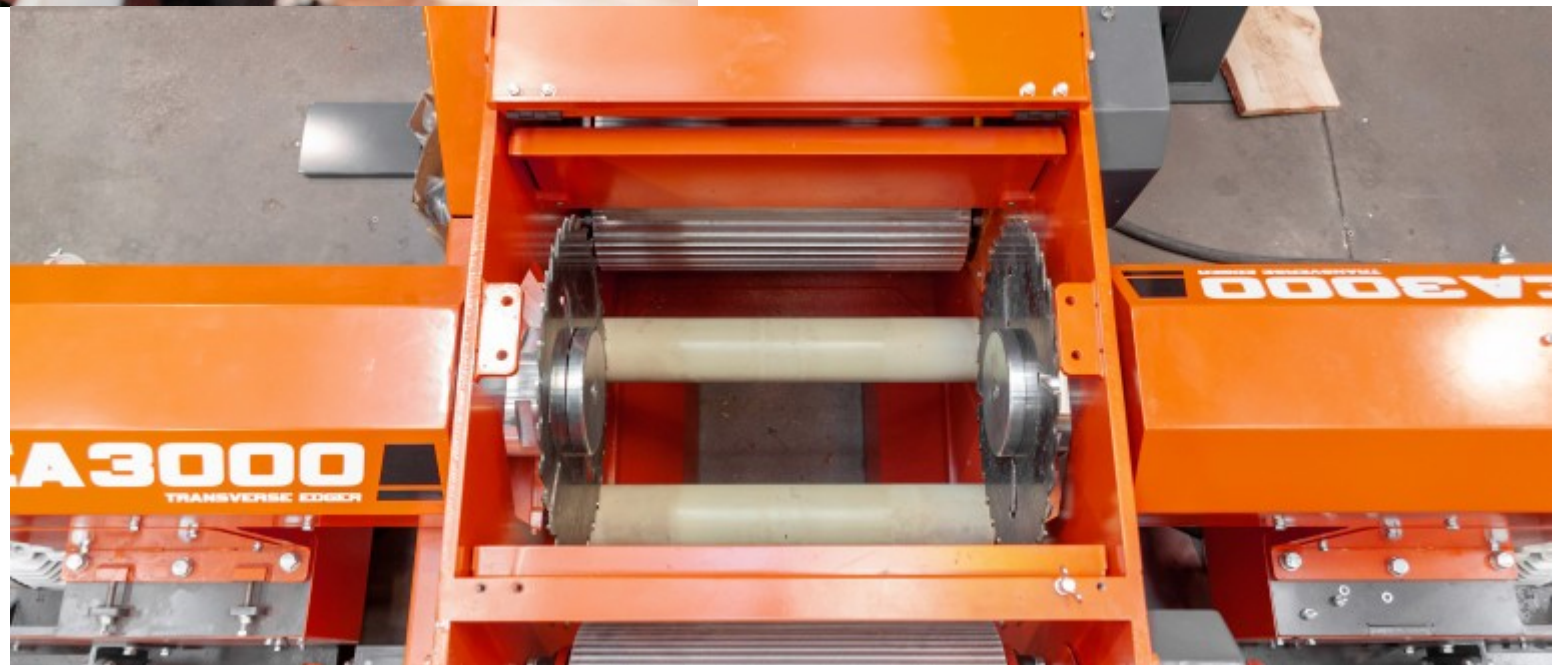
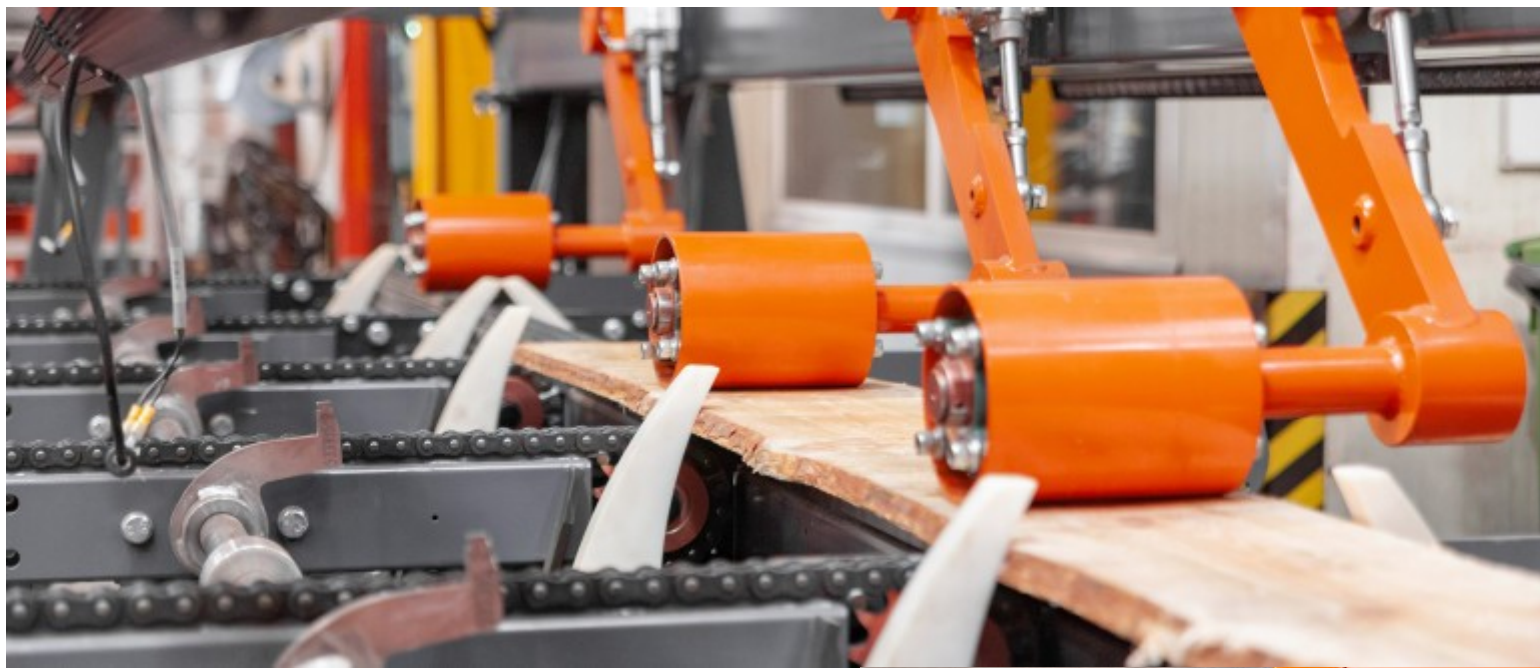
- Optimization
 - Accuracy
 - Repetition
 - Higher Yields
 - Less Operator Error



NH L A

National Hardwood
Lumber Association







Statistical Process Control

Defined as the use of statistical techniques to control a process or production method.

SPC tools and procedures can help you monitor process behavior, discover issues in internal systems, and find solutions for production issues.





NHLA Quality Control/Yield Recovery

- Highly Skilled Employees
 - Combined 200+ Years
 - Sawmills
 - Kiln Drying
 - Air Drying
 - Logging
 - Lumber Inspection
 - Trouble Shooting



NHLA Quality Control/Yield Recovery

- Assist our members:
 - To be competitive
 - To become more attractive to a younger workforce
 - To utilize technology efficiently
 - To Be More Profitable! \$\$\$\$

NHLA Quality Control/Yield Recovery

- Real Time Data Collection
 - Immediate Feed-back to Operators
 - History
 - Targets

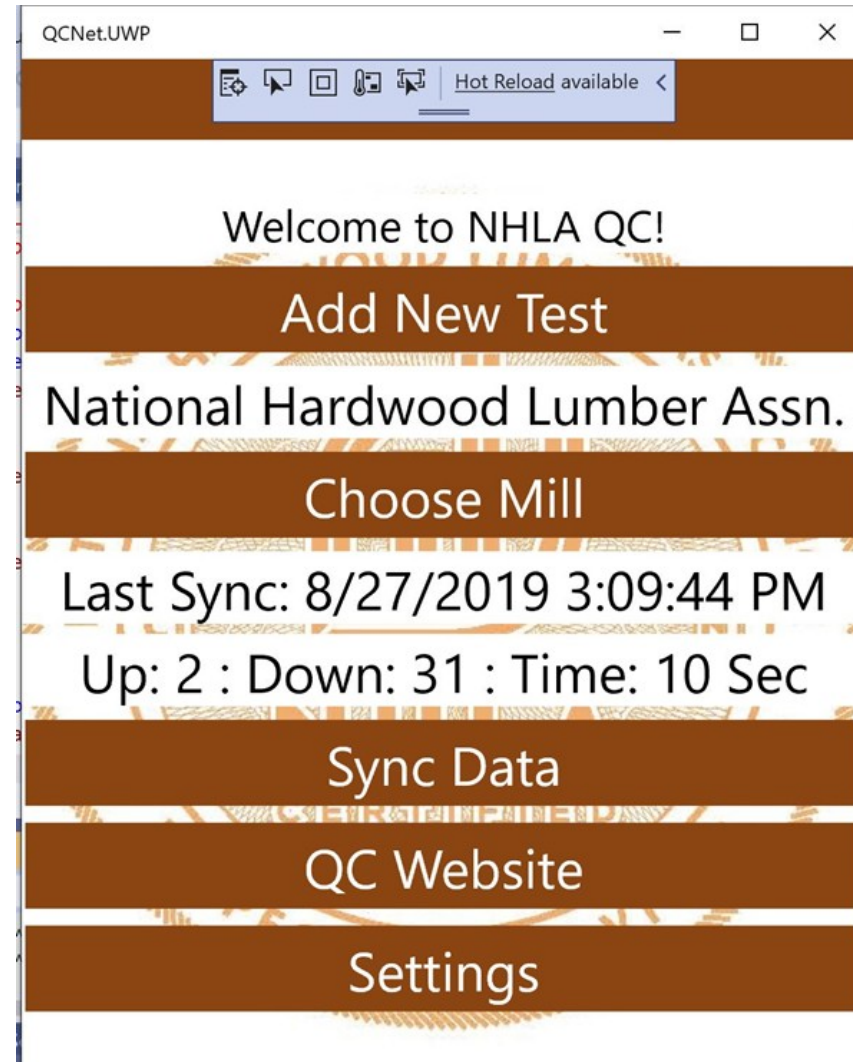
NHLA Quality Control/Yield Recovery

- Process Measurements
 - Log Scale/Grading/Bucking
 - Debarker
 - Minimum Opening Face
 - Lumber Size Control
 - Lumber Inspection
 - Accuracy
 - Value Recovery
 - Machine Defects

NHLA Quality Control/Yield Recovery

- Process Measurements
 - Dip Tank
 - Air Dry Yard
 - Stacker
 - Forklifts
 - Air Flow
 - Kiln Drying
 - Lumber Recovery

NHLA Quality Control/Yield Recovery





Lumber Size Control

Mill: National Hardwood
Lumber Assn.

Sawyer: Byers,
Thomas

Species: S. Maple

Date: 6/20/2019 2:50:23
PM

Saw Filer: Evilsizer,
Kevin

Thickness: 4/4

Key #:

Feed Speed:

Run Time:

Target: 1.093

Machine: H. Saw R.H.

Width Avg	Length Avg	Std Dev	Avg Thick	WB Std Dev	WB Thick
6.556	12.0	0.012	1.118	0.005	1.118

Average Board Measurements

Lead Top	Middle Top	Trail Top
1.125	1.118	1.112

Lead Bottom	Middle Bottom	Trail Bottom
1.118	1.118	1.116

Impact on Yield

Variation From Target	* Est. % Yield Loss
0.025	-2.5%

* Estimated Yield Loss based on studies performed by Dr. Joe Denig. Average 1% for every .010" over thickness.



NHLA Green Lbr Inspection

Company: Acme wood Products

6/12/2019

Species: Poplar Thickness: 4/4

QC Tech: Bear, Mark

Pack Grade: 1C

Pack Length: 12'

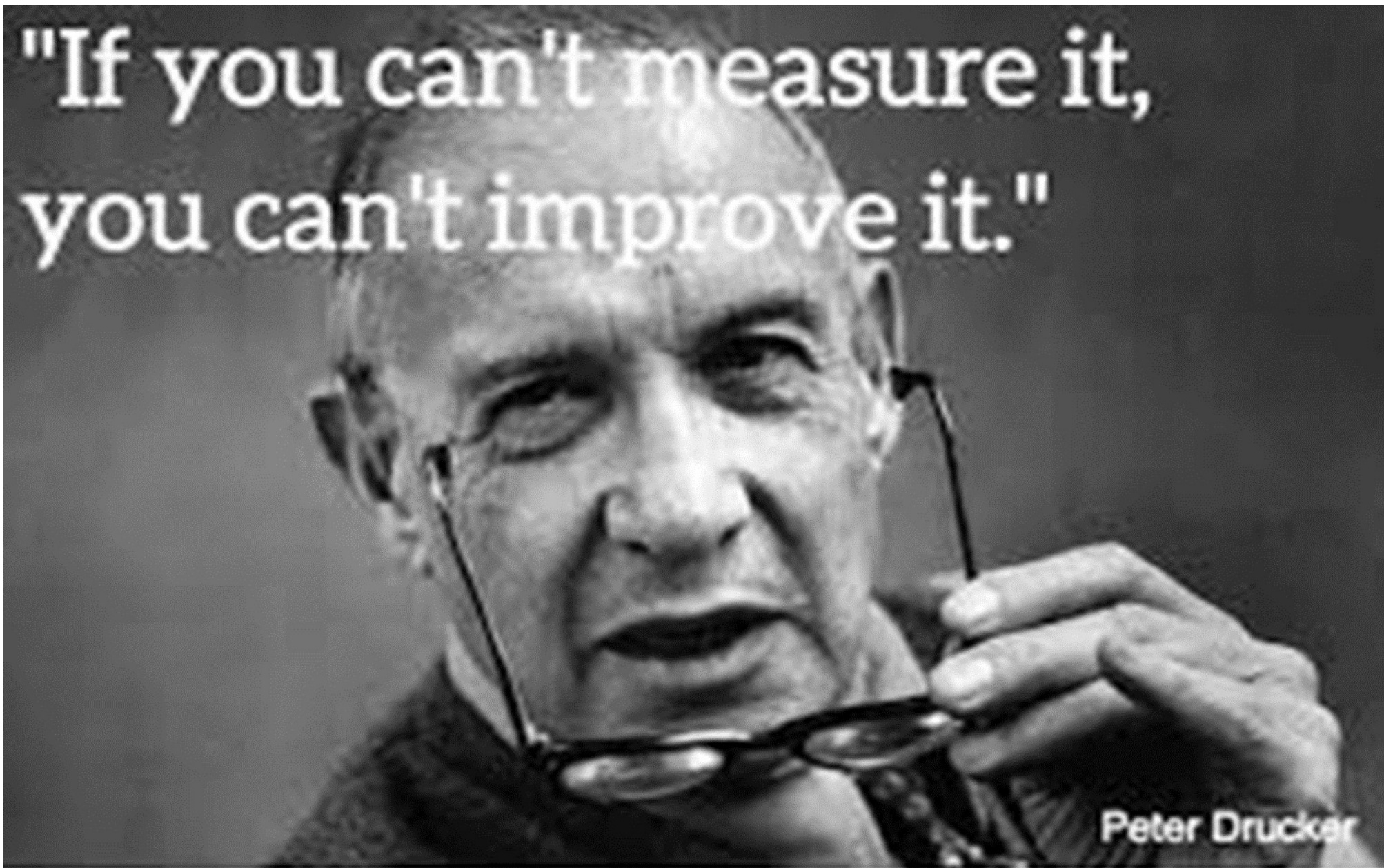
Layer Count:26

Inspector	Grade QC	Grade Act	BdFtg.	Pieces	% Pack
	FAS	1C	14	2	1%
	F1F	1C	187	25	18%
	1C	1C	731	114	72%
	2aC	1C	59	9	6%
	2bC	1C	6	1	1%
	Miscut	1C	17	3	2%
		Insp Totals	1014	154	100%
			% On Grade	% Above	% Below
		Inspector %	72.1%	19.8%	6.4%
		Pack Totals	1014	154	100%
		Pack %	72.1%	19.8%	6.4%
Layer Ftg Avg:	39.0	Mill Pack Ftg	1071	1014	5.6%

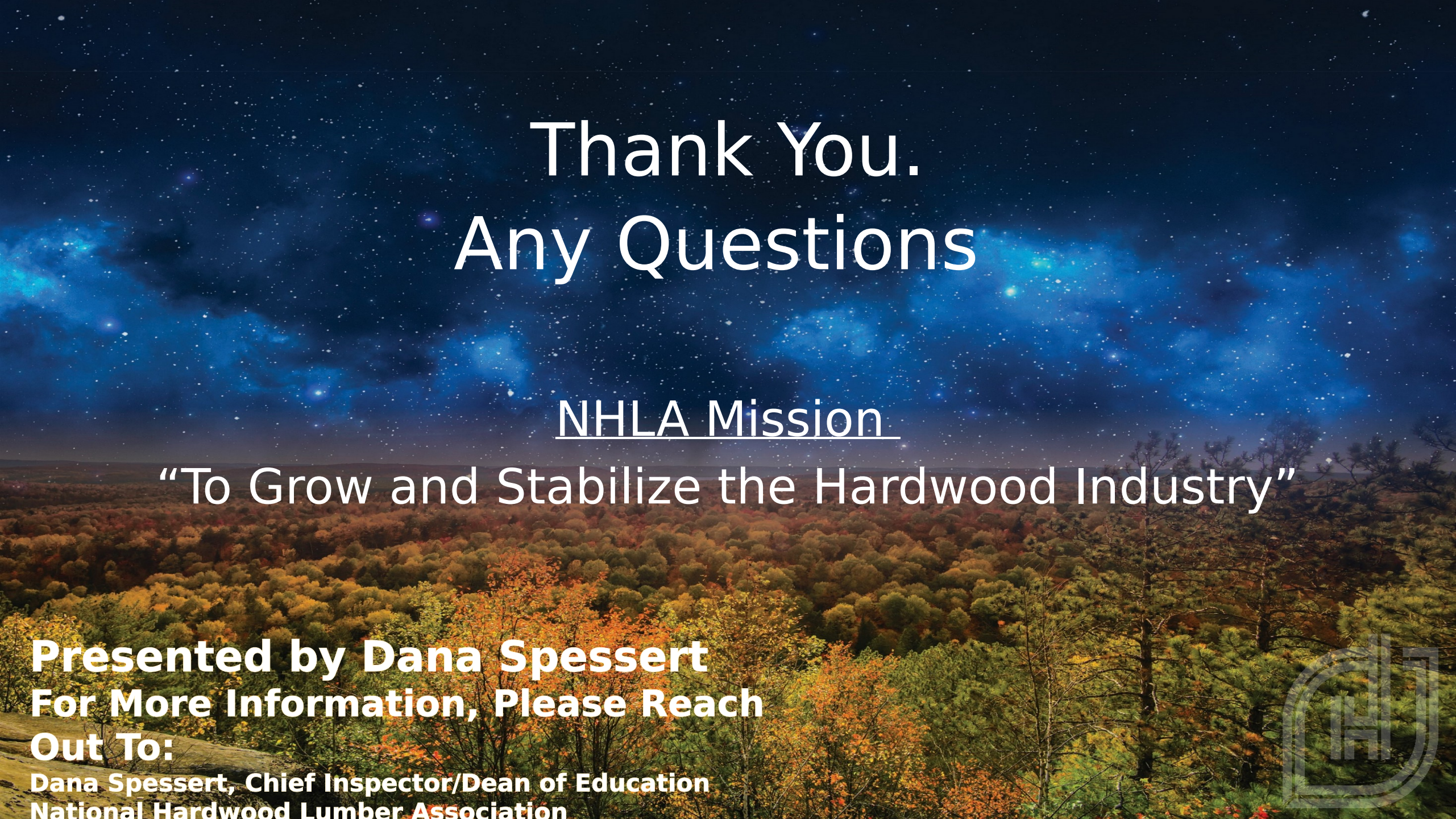
Inspector	Grade QC	BdFtg Before	Up-Grade To	Upgrde BdFtg
	1C	16	F1F	14
	1C	5	FAS	4
	1C	42	F1F	36
		63	6.2%	54

Defects	Bd Ftg	Pieces	% of Pack
Edge Wane	25	3	2.5%
Marks	6	1	0.6%
Split	22	3	2.2%
Stain	99	15	9.8%
Trim Wane	9	1	0.9%
Total	161	23	15.9%

"If you can't measure it,
you can't improve it."



Peter Drucker



Thank You.
Any Questions

NHLA Mission

“To Grow and Stabilize the Hardwood Industry”

Presented by Dana Spessert
For More Information, Please Reach
Out To:

Dana Spessert, Chief Inspector/Dean of Education
National Hardwood Lumber Association

