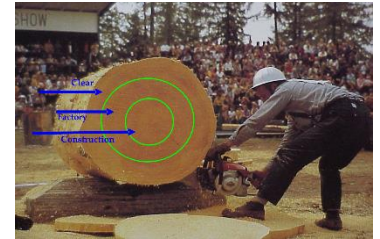


NLGA Joists and Planks - Lesson 13

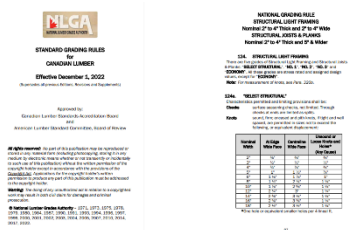
General Information

- a) **Usage:** For lumber with large knots.
- b) **Stress Grades:** Specify minimum requirements and maximum characteristics.
- c) **National Grading Rule:** Prohibits combinations that reduce strength.



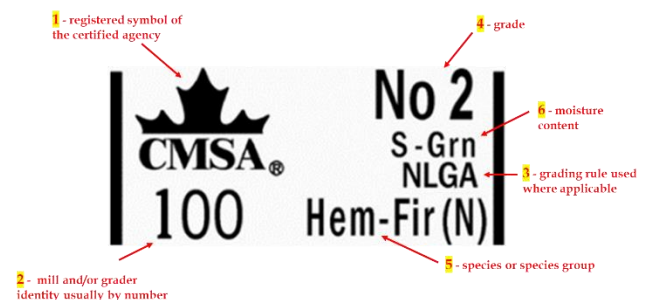
NLGA Overview

- a) **Incorporation:** January 12, 1971.
- b) **Responsibility:** Writing and maintaining Canadian lumber grading rules.
- c) **Size Classification:**
 - i. **Structural Light Framing:** 2-4 inches thick, 2-4 inches wide.
 - ii. **Joists and Planks:** 2-4 inches thick, 5 inches and wider.



Certified Grade Stamp

- a) **Assurance:** Inspected by a qualified grader.
- b) **Components:**
 - i. Registered symbol of the certified agency.
 - ii. Mill and/or grader identity.
 - iii. Grading rule used.
 - iv. Grade.
 - v. Species or species group.
 - vi. Additional indications (sizes, moisture content, heat-treatment).

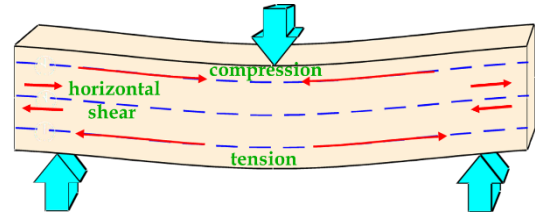


Purpose of Stress Grades

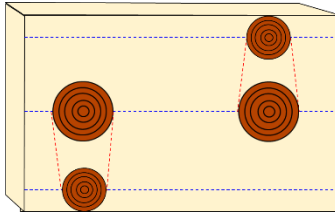
- a) **Objective:** Meet engineering requirements.
- b) **Safe Allowable Working Stresses:** Derived from tests on clear specimens.
- c) **Factors:** Include characteristics like knots to establish strength ratios.

Function of a Joist

- Compression:** Top edge shortens under load.
- Tension:** Bottom edge lengthens under load.
- Shearing Action:** Develops along the center line of the depth.



Knot Measurement



- Paragraph 710:** Defines edge and displacement.
- Displacement Method:** Measures clear wood displaced by a knot.
- Stress Grades:** Graded full length with listed knot sizes.

Grades of Structural Framing Lumber

- Grades:** Select Structural, Number One, Number Two, Number Three.
- Economy Grade:** Not stress-rated, not part of the National Grading Rule.
- Grading Considerations:** All four sides and both ends must be evaluated.

Knot Evaluation

- Factors:** Quality, form, size, and location.
- Measurement:** Average of two wide face measurements.
- Edge Knots:** Measured and compared to allowable sizes.

Knot Types



□ Select Structural and #1 specifies Firm & Tight knots.

□ Unsound and NFF knots in Select Structural and #1 are restricted to the same size as holes.

□ Knots can be any quality in the grades of #2, #3, and Economy.



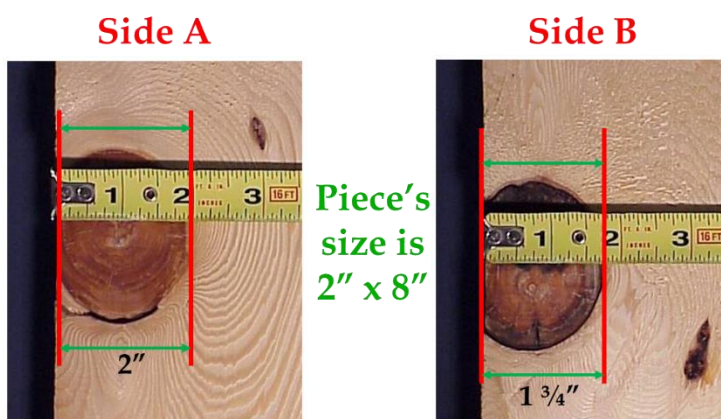
- Firm Knot:** Solid, contains incipient decay.
- Tight Knot:** Fixed by shape, growth, or position.
- Unsound Knot:** Contains decay.
- Loose Knot:** Not held tightly in place.

Measuring Displacement of Round Knots

- Use the 1-inch line on the measuring tape as the starting point.
- Ensure the measuring line is parallel to the edges of the piece.

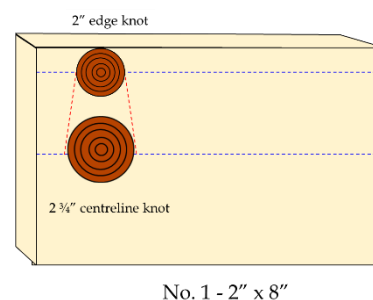
Measuring Knot Size

- Start Measurement:** From the edge of the knot to the end of the knot on Side A.
 - Example: 2 inches.
- Reverse Face Measurement:** From the end of the first measurement on Side B.
 - Example: 1.75 inches.
- Combine Measurements:** Add measurements from Side A and B.
 - Example: 2 inches + 1.75 inches = 3.75 inches.
- Average Measurement:** Divide the combined measurement by 2.
 - Example: 3.75 inches / 2 = 1.875 inches.
- Grade Determination:** Compare the average size to grade limits.
 - Example: Too big for Select Structural (1.5 inches), fits #1 grade (2 inches).

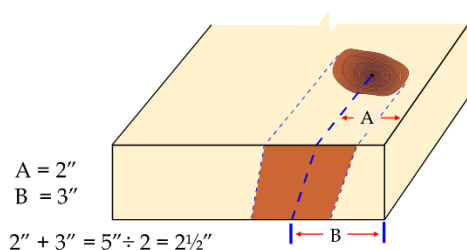


Knot Size Increase

- Wide Face Knots:** Size increases from edge to center line.
- Example:**
 - Edge: 2 inches.
 - Center line: 2.75 inches.
 - Midway: 2.375 inches.
 - 2/3 way: 2.5 inches.



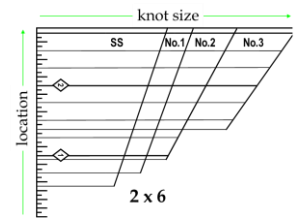
Knot Measurement Protocol



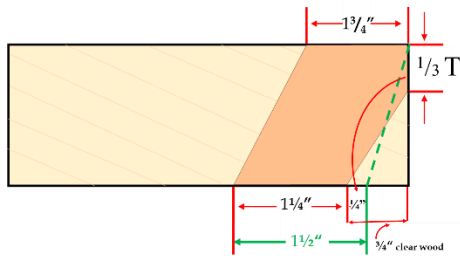
- Wide Faces:** Measure between lines parallel to the edge.
- Average Location:** Measure from the geographical center to the edge on both faces, average the sum.

Using the Knot Gauge

- Determine Knot Location:** Match to vertical look-up scale on the knot gauge.
- Determine Knot Size:** Measure horizontally from the left-hand edge of the knot gauge to fit the size in the grade slot.



Three-Face Knot Measurement



- Determine Overlap:** Estimate the fraction of the narrow face occupied by the knot.
- Apply Fraction:** Extend the knot size on the reverse face by the same fraction.
- Final Calculation:** Add and average the measurements from both faces.

Spike Knot Measurement

- Measure Spike Knot:** Across the wide face.
 - Example: 5.5 inches.
- Average Measurement:** Divide by 2.
 - Example: 5.5 inches / 2 = 2.75 inches.
- Adjust for Narrow Face:** Multiply by the fraction of the narrow face occupied.
 - Example: 2.75 inches * 75% = 2.06 inches.
- Grade Comparison:** Compare to the edge knot size allowance.

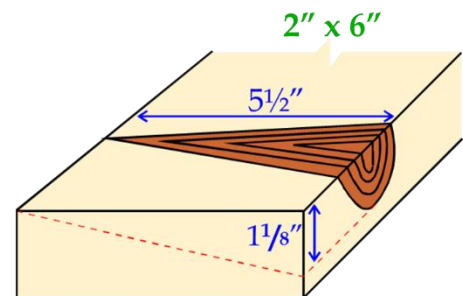


Fig. 1 - simple

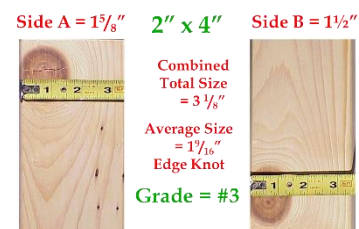
Grade = #3

Definitions of Edge

- Narrow face of rectangular pieces.
- Corner at the intersection of two faces.
- Part of the wide face nearest the corner.

Edge Knots

- Criteria:** Knots touching the corner on both wide faces, spike knots, four-face knots, and three-face knots occupying more than 1/2 the thickness.



Measuring Spike Knots

- a) **Initial Measurement:** Measure the spike knot across the entire wide face.
 - I. Example: 7.25 inches.
- b) **Average Measurement:** Divide the initial measurement by 2.
 - I. Example: $7.25 \text{ inches} / 2 = 3.625 \text{ inches}$ ($3 \frac{5}{8}$ inches).
- c) **Calculate Occupied Thickness:** Add the fractions of the knot occupying both narrow faces.
 - I. Example: $\frac{1}{4}$ thickness on each narrow face = $\frac{1}{2}$ thickness total.
- d) **Final Calculation:** Multiply the average measurement by the occupied thickness fraction.
 - I. Example: $3.625 \text{ inches} * 0.5 = 1.8125 \text{ inches}$ ($1 \frac{13}{16}$ inches).
 - II. Compare to grade limits: Fits #1 Structural (2 inches), not Select Structural (1.5 inches).

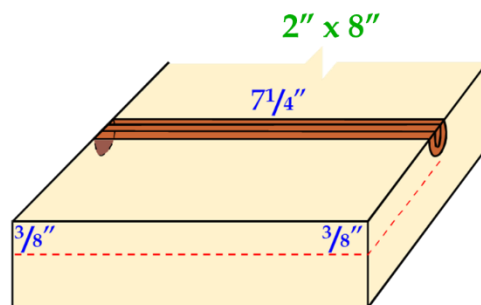
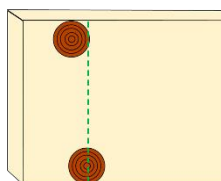


Fig. 2 - complex
Grade = #1

Multiple Knots in Cross Section

- a) **Sum of Sizes:** Should not exceed the maximum size for the center-line knot size.



Measuring Holes

- a) **Measurement Method:** Same as round knots.
- b) **Appearance Restriction:** Smaller size than knots listed in each grade.
- c) **Three-Face Holes:** Ignore the third face, average the size on both wide faces.
- d) **Example:** Hole size fits #1 Structural (1.25 inches).

2" x 6" - Side A

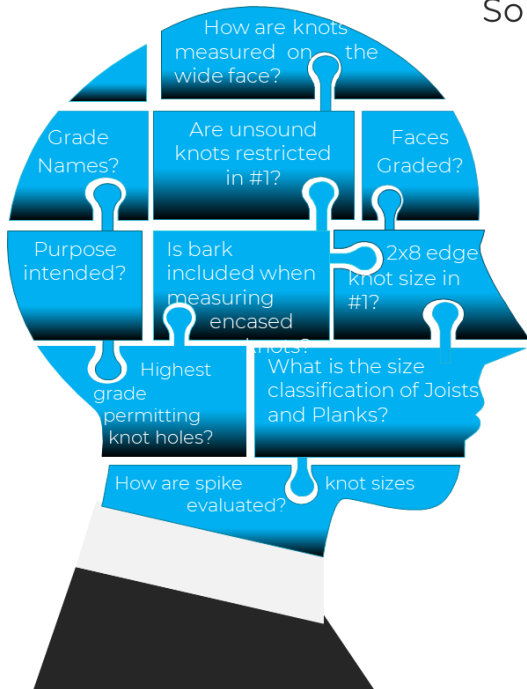


2" x 6" - Side B



NLGA Joists and Planks Knots ONLY Review

Some Thought-Provoking Concepts



- 1 Knots measured on the wide face?
Between lines parallel to the edges
- 2 Grade Names?
Select Structural, #1, #2, #3, and economy
- 3 Faces Graded?
Worst face
- 4 Are unsound knots restricted in #1?
Yes – same size as holes
- 5 Purpose Intended?
Strength
- 6 Is bark included in the measurement of encased knots?
Yes
- 7 Highest grade permitting knot holes?
Select Structural
- 8 What is the size classification of Joists and Planks?
2" to 4" thick, 5" & wider
- 9 What is the allowable edge knot size permitted in a 2x8 in #1?
2"
- 10 How are spike knots evaluated?
Equivalent to edge knots