Alaska Lumber Grading Program

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On the cover: Aaren Sommer mills spruce lumber in Galena.

Photo by Jake Pogrebinsky

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Introduction

The softwoods of Alaska's interior and coastal forests, including spruce, hemlock, and yellow cedar, have excellent mechanical properties for construction applications. Yet most construction lumber for homebuilding in Alaska is imported from Canada and the Pacific Northwest. A key reason for this is that the International Residential Code (IRC) requires "grade-stamped" lumber in load-bearing applications. The IRC is the construction code most widely applied in Alaska for dwellings.

Although there are sawmill operations throughout the state, ranging from one-person owner-operators to large firms that export internationally, and everything in between, only a few operate at the economy of scale necessary to cover the costs of membership with an accredited lumber grading agency. As a result, though the homebuilding industry in the state consumes significant quantities of dimension lumber, little of it has been produced from Alaskan timber.

In recognition of these circumstances, the Alaska Legislature passed Senate Bill 87, "Lumber Grading," an amendment to AS 41.17 which establishes a dimension lumber grading training and certificate program applicable to residential construction in Alaska. The bill was signed into law by Governor Dunleavey on August 30th, 2023. (See Appendix 1.)

The Alaska Lumber Grading program (ALG) is a collaboration of the Alaska Division of Forestry and Fire Protection (DOF) and the University of Alaska Fairbanks, Cooperative Extension Service (CES).

This handbook is the user guide for individuals who are certified under the program. It contains the rules and procedures of the Alaska dimension lumber grading system; explains its relationship to the grademark infrastructure; explains the compatibility of ALG lumber with residential construction codes in Alaska; and describes important program standards and record-keeping requirements that apply in ALG lumber sales.

Purpose and Implementation

The Alaska Lumber Grading program is an alternative lumber certification system for Alaska softwood lumber. It's intended to allow under limited circumstances structural uses of local-use lumber in home construction where residential building code would otherwise require grademark lumber. ALG lumber is closely aligned with and expected to have similar performance capabilities as grademark lumber of a corresponding grade and species.

In Alaska, construction code enforcement is determined at the municipal level; there is no uniform state-wide building code. Most municipalities in Alaska have adopted the International Residential Code, including amendments for local conditions.

Much like grademark lumber, ALG lumber has standards and requirements for certifying the species, grade, moisture content and size of the lumber. These standards generally resemble industry practices, with certain adaptations for applicability to individuals and small- to medium-sized sawmill businesses in Alaska.

This section addresses program authorities and responsibilities; product traceability when the lumber is sold; species allowed for use under the program; standards for nomenclature and measurement of the product; and requirements for additional physical attributes which have implications on structural characteristics of lumber, such as moisture content, surface conditions, and size.

The Alaska Division of Forestry and Fire Protection is the administrator of the Alaska Lumber Grading program. The University of Alaska Fairbanks Cooperative Extension Service provides the certification training and provides technical assistance and supplemental education.

AS 41.17.610

Scope

This program has a narrow focus on a lumber grading system comprised of 3 substitute grades of dimension lumber and a set of adapted grading rules designed to produce comparable results to their industry counterparts. **Dimension lumber** in ALG is defined as lumber with a nominal thickness of 2"-4" and a nominal width of 2" and greater, and which is intended for structural uses in residential construction.

AS 41.17.630

ALG lumber meeting all the necessary conditions which are outlined in the training course and this handbook may be used instead of grade-stamped lumber where required by building codes for residential construction in Alaska.

Certification

Certified individuals may grade dimension lumber that they have sawn or, in the case of larger operations, that was produced by their business. In either case, the certificate is awarded to the individual who completed the training requirements, not the sawmill business. The owner of a larger operation that has more than one employee (such as a family operation, partnership, or other small company), may grade lumber that was sawn by an employee of their business. A person may not grade lumber that was sawn prior to obtaining certification or lumber that was obtained from any external source.

AS 41.17.630(d)

The completion of the training program does not allow any person to apply the grade stamp of any established lumber grading bureau, nor make any imprint onto lumber resembling an industry grade stamp.

The primary means for a manufacturer to obtain the Alaska Lumber Grading program certificate is to attend the UAF Cooperative Extension Service training course and successfully complete the proficiency requirements, which include a written test. It is a one-day training and registration is free. A participant must have a minimum age of 18 years to be eligible to earn the certificate. Typically, several trainings per year will be offered at locations in Interior, Southeast, Southcentral, or as demand warrants. The training program will be offered at a minimum once a year. The certificate is valid for 5 years after the date of issuance and can be renewed by retaking the training and passing the exam. Participants of the program have access to continued technical support and educational resources from UAF Cooperative Extension.

AS 41.17.610(b)

AS 41.17.620(a)

Selling ALG Lumber and Traceability

The lumber may be sold to an end-user, including a person who has been issued a permit to construct a dwelling or a contractor acting on that person's behalf. Participants who successfully complete the training and proficiency requirements are issued a certificate with a unique identification number and date of issue. In order to sell ALG lumber the manufacturer must provide to the purchaser a copy of their certificate of completion of the lumber grading training and documentation of specific physical attributes that pertain to lumber performance, called the "written certification." These records are a crucial part of maintaining the quality standards and traceability of ALG lumber, and as such it is strongly advised that the homeowner retain them indefinitely. Specific details for meeting this requirement are under the section "Written Certification."

Because the Alaska Lumber Grading program is not under the authority of an accredited softwood lumber grading bureau, there is no special mark to be affixed to lumber that is produced under the Alaska Lumber Grading program. Imprinting any mark that could be interpreted as imitating an industry grade stamp is prohibited. Instead, grade designations of pieces or bundles of lumber produced under the ALG system may be indicated in some other fashion such as color-coding the ends of the pieces of lumber with paint.

Authorized building inspectors at the local level have the authority to require design modifications or reject the use of ALG structural lumber in a dwelling.

AS 41.17.630(e)

Manufacturers of ALG lumber have an inherent vested interest in producing a safe and quality product.

Standards for Key Physical Attributes of ALG Lumber

Lumber Species, Grades and Design Values

Wood frame house design calculations rely on design values, which are data about the strength properties of a given species of lumber.

The Ketchikan Wood Technology Center in collaboration with the Western Wood Products Association (WWPA) conducted the industry-standard process of wood sample stress testing to establish design values for Alaska softwoods. The American Lumber Standard Committee reviewed and approved the data, resulting in the issuance of design values for three species groups: Alaska Yellow Cedar, Alaska Hemlock, and Alaska Spruce. Assigning design values to a species group rather than an individual species enables simultaneous processing and grading of different species that have similar mechanical properties, which may also be harvested and transported together. WWPA's technical services division published these design values in 2005 as WWPA Tech Notes 2005-01: "Design Values and Spans for Alaskan Species Lumber." (See Appendix 2.)

The Alaska spruce species group includes Sitka spruce (*Picea sitchensis*) and white spruce (*Picea glauca*). The Alaska hemlock species group includes Western hemlock (*Tsuga heterophylla*) and mountain hemlock (*Tsuga mertensiana*). The Alaska yellow cedar species group contains Alaska yellow cedar (*Cupressaceae Callitropsis nootkatensis*).

The five species used for ALG Dimension Lumber:

- **Alaska yellow cedar**
- **Western hemlock**
- **Mountain hemlock**
- **Sitka spruce**
- **White spruce**

Grading and use of dimension lumber under the Alaska Lumber Grading program is restricted to these five species because we have design values derived from testing of Alaska sample material which have been published by the American Lumber Standards Committee, making them readily compatible with U.S. building code specifications.

In addition to species, dimension lumber is sorted into grades based on defects such as knots and splits that displace longitudinal grain continuity and thus reduce performance. Building design calculations must use the design values for the species *and* grade of lumber to determine maximum allowable spans.

ALG Dimension Lumber Grades and Correspondence to Industry Grades

The program establishes 3 substitute grades for dimension lumber that correspond to accredited grading Bureau grades within the Structural Light Framing, Light Framing, Structural Joists and Planks, and Stud classifications of dimension lumber.

Dimension lumber that is graded in accordance with the rules of this program may be accepted in place of grade-stamped lumber to meet the requirements of residential building codes for structural lumber in Alaska.

To determine design values for an ALG grade, use the substitute equivalent industry grade and match the species to the appropriate WWPA Alaska Species group.

The **Alaska Number 2 and Better** grade shall be the substitute equivalent of the "Number 2 grade" within the Structural Light Framing and Structural Joists and Planks classifications and at least equivalent to the "Standard grade" within the Light Framing classification within accepted bureau grade rules for grade-stamped lumber used in residential construction in Alaska.

The **Alaska Stud** grade shall be the substitute equivalent of the "Stud grade" within the Stud classification within the accepted bureau grading rules for grade-stamped lumber used in residential construction in Alaska.

The **Alaska Number 3** grade shall be the substitute equivalent of the "Number 3 grade" within the Structural Light Framing and Structural Joists and Planks classifications and at least equivalent to the "Utility grade" within the Light Framing classification within the accepted bureau grading rules for grade-stamped lumber used in residential construction in Alaska.

Example

To determine the "Extreme Fiber Stress in Bending (single member)" (Fb) base design value of Sitka Spruce lumber graded as Alaska Number 2 and Better under the ALG grading system:

1. "Alaska Number 2 and Better" is the substitute equivalent of the "No. 2" grade within the Structural Light Framing and Structural Joists and Planks classifications.
2. Sitka Spruce is in the "Alaska Spruce" species group.
3. Use the Fb base design value for No. 2 Alaska Spruce, which is 875 lbs/inch^2.

Moisture Condition

Lumber produced under the Alaska Lumber Grading Program may be sold either in the **dry** or **green** moisture condition. Both dry and green lumber are suitable for use in construction, although it is not advised to mix green and dry lumber within a horizontal framing system such as floor joists as they acclimate to ambient moisture conditions at different rates.

Dimension lumber is considered "dry" if it has been dried to a maximum **moisture content** (MC) of 19% as measured on the oven dry (OD) basis. Green lumber is lumber that is above 19%. Partially air-dried (PAD) lumber is lumber that is above 19% but the drying process has begun.

Lumber moisture content in the United States is expressed on the OD basis and reflects the weight of water in the piece expressed as a percentage of the bone-dry weight of wood (i.e., the weight of wood with no moisture whatsoever). In practice, for dimension lumber to be considered "dry" 95% of the pieces of lumber in the order are, on average, at or below 19% MC, and no more than 5% of the lumber may be at a MC more than 19% MC.

Moisture Content: The ratio of the weight of water in wood to the dry weight of the wood material.

The drying process will effectively remove all the free water (primarily water that is in the cell lumen) in the wood, and about a third of the bound water (water that is in the cell wall itself). It is this removal of bound water that causes wood to shrink and warp in the drying process. Wood is constantly exchanging water with the atmosphere to come into equilibrium with the relative humidity and temperature of the air. Lumber moisture content may be estimated in several ways, but for construction purposes it is typically measured using a handheld moisture meter. These meters do not perform well at MC extremes but perform adequately in the ranges of interest. When the wood is at or above the Fiber Saturation Point (FSP) or the wood has a MC less than 6%, these moisture meters are not accurate.

Dimension lumber can be air-dried or kiln-dried. Kiln drying is much faster and provides good control of temperature, relative humidity and air flow but requires investment into the proper equipment. Though it can expedite the drying process, if done improperly, kiln drying can lead to stresses in the wood. In contrast, air drying is slow, particularly in Alaska, where much of the year is

Green = above 19% MC.

Dry = At or below 19% MC

not well suited for air drying. Proper air drying requires covered space and best practices for stacking boards between stickers.

Two aspects that may be important are that the high temperatures normally used in kiln drying cause resin to "set" and insects and their larvae to be killed. For resinous species, it is often desirable to "set" the resin by evaporating the liquid component so it will not be sticky to handle or cause pitch to build on saws or planers. When the temperature is held for a long enough period, the resin will no longer flow.

Heat-treated lumber is a special designation for lumber specifically targeted to kill insect larvae and is regulated under the International Standards for Phytosanitary Measures No. 15 (ISPM 15). This additional designation may be included as part of the written certification only if the lumber has been treated by a certified heat treatment facility.

Surface Condition

Wood purchased in lumber yards or in retail outlets is typically dried and surfaced on all four sides to a standard thickness and width specified by the American Softwood Lumber Standard Voluntary Product Standard PS 20-05. A 2x4 that conforms to the standard is actually 1.5" by 3.5" in the dry surfaced condition. A green 2x4, on the other hand, measures 1 9/16" by 3 9/16" with the slightly larger size providing an allowance for shrinkage.

"2x4" references the nominal dimension which has historically been the size of the board cut green from the log before any surfacing or drying.

Green surfacing of dimension lumber allows the precise sizing of green lumber that will be used in construction. An alternative method of achieving the same end is to directly saw to the standard green surfaced dimension. This is called Sawn-To-Size (STS) and the practice is permitted in the Alaska Lumber Grading Program. The

Surfaced Lumber

Surfaced lumber (or dressed lumber) is generally considered lumber that has been surfaced by a machine to attain smoothness of surface and uniformity of size on one side (S1S), 2 sides (S2S), one edge (S1E), 2 edges (S2E) or a combination of sides and edges (S1S1E, S1S2E, S2S1E, S4S). Lumber that has a surfaced edge or side is classified as surfaced width or thickness on the surfaced face and classified as rough width or thickness on the unsurfaced face. The term "Surfaced Lumber" generally refers to S4S within the Alaska Lumber Grading program. The following describes the three possible surface cuts of lumber produced un the Alaska Lumber Grading program.

Sawn-To-Size Lumber

This designation is lumber uniformly sawn to the dressed size for surfaced lumber, and not planed on the faces, for use requiring a rough texture or lumber uniformly manufactured to dressed surfaced sizes that may be rough, surfaced or partially surfaced on one or more faces. Some small manufacturers producing lumber are unlikely to have planer equipment allowing them to produce S4S lumber. For these producers it is expected they would saw to an actual thickness at least equaling the required minimum thicknesses for the green conditions, which can be found under Appendix 3.

Rough Lumber

Rough lumber is lumber that has been sawed, edged, and trimmed at least to the extent of showing saw or other primary manufacturing marks. The rough lumber designation is not the same as the sawn-to-size lumber designation even though the appearance may be similar. If the rough lumber is to be sold as "dry" it needs to be at least 1/8 inch greater than the standard dry surfaced size to

allow for the removal of wood in surfacing. If it is to be sold as green, then the actual widths and thicknesses to account for both shrinkage and surfacing shall be specified on the written certification provided to the purchaser.

Size and Tally

Thickness and Width

Standard sizes (actual thickness and width) of "Surfaced Lumber" and "Sawn-To-Size Lumber" are to be considered the actual minimum sizes as specified for the Alaska dimension lumber grades and in the American Softwood Lumber Standard Voluntary Product Standard PS 20-05 for lumber that is surfaced in the dry or green conditions as appropriate (see Appendix 3). Somewhat larger sizes may be used for the nominal thickness, the nominal width, or both, but the larger size shall be clearly specified on the written certification provided by the mill to the purchaser.

If "rough lumber" is to be sold as "dry lumber" the minimum dry rough dimensions (thickness and width) must be at least 1/8th inch greater than those required for the standard minimum size for dry surfaced lumber to allow for the removal of wood in surfacing (see Appendix 3). For any "rough lumber" that is to be sold as "green lumber" the actual green target dimensions shall be specified on the written certification that the mill provides to the purchaser.

Length

The standard lengths of lumber shall be 8 feet and greater in even two-foot length multiples (8, 10, 12, 14, 16, etc.) unless the purchase agreement specifically stipulates the use of one-foot standard length multiples or any standard length less than 8 feet. Any variance from the two-foot standard length starting at 8 feet will be specified in the written certification that the mill will provide the purchaser.

Trim Requirements

The standard trim requirements (unless otherwise specified in the purchase agreement) is that the lumber shall be trimmed for the removal of excessive spur and splintered ends but the lumber does not have to be double-end-trimmed. If double-end trimmed, the minimum length of lumber sold under the Alaska Lumber Grading Program shall not be less than the nominal length. If not double-end trimmed, there shall be at least sufficient overlength to easily square-trim the lumber to nominal length. Overall length should not be more than 12 inches greater than nominal length. Any variance in trim practices shall be specified on the written certification that the mill will provide the purchaser.

Board feet calculation examples:

Example 1. Single 8-foot length of 2×4

Step 1: W × T × L

2 × 4 × 8 = 64

Step 2: Divide by 12

64/12 = 5.3 BF

Example 2. 37 boards, each 10-foot length of 2×8

Step 1: W x T x L

2 × 8 × 10 = 160

Step 2: Divide by 12

160/12 = 13.3 BF

Step 3: Multiply by number of boards

37 × 13.3 BF = 492.1 BF

Tally Reporting Requirements

Lumber sold under the Alaska Lumber Grading program that is being used in residential construction may be sold as a piece price, a price per board foot (BF) or a price per thousand board feet (MBF).

The formula for calculating the board foot contents of a piece is: the nominal width (in inches) multiplied by the nominal thickness (in inches) multiplied by the nominal (or standard) length in feet and dividing the total by 12 and rounding to the nearest 1/10th board foot, then multiplying by the number of pieces.

Board Feet (BF) = (Width × Thickness × Length) ÷12

A table of calculations for the board foot contents of common sizes of dimension lumber is provided in Appendix 8. Cubic measures of lumber shall not be permitted for sale of lumber used for residential construction.

Reference Authority for Standards Not Otherwise Specified

For anything not specified within this document and related tables and companion information developed for the instructional program under The Alaska Lumber Grading program, the Voluntary Product Standard PS 20-05 American Softwood Lumber Standard shall be the reference authority.

The ALG Dimension Lumber Grading System

Guidelines for using the ALG Dimension Lumber Grading System

The overall requirements and limitations of the Alaska lumber grading rules have been simplified in certain cases with respect to accredited lumber grading agency rules. In some cases, ALG limiting provisions are more restrictive than their industry counterpart grades (examples would be the limiting provisions for knots, holes, and unsound wood).

These grading rules apply exclusively to grading dimension lumber meeting all of the following criteria: having nominal dimensions 2 inches to 4 inches thick, and nominal 2 inches or greater in width; is one of the softwood species included in WWPA Tech Notes 2005-01: “Design Values and Spans for Alaskan Species Lumber;” and is intended for use in residential construction in Alaska.

In the ALG grading process, the entire piece of lumber must be examined, including a separate visual inspection of each wide and each narrow face. Any defect apparent on any face that exceeds the limiting provisions for the grade will exclude that piece of lumber from making the grade. Take note of whether the grading rule is based on the nominal or the actual dimensions of the piece.

Sub-sorting lumber within a grade is prohibited.

A shipment unit of graded lumber should never contain only the lowest possible grouping of pieces barely meeting grade (or only the highest possible grouping of pieces). It must include all lumber that would grade between the next higher grade (above) and the next lower grade (below). To this end, it is clearly inappropriate to sub-sort a grade, selecting the best specimens for some special market or purpose and aggregating the poorest pieces that barely make grade and then to represent (misrepresent) those pieces as being a normal grade mix of lumber.

The following pages describe the limiting provisions for various defects for the three substitute Alaska grades. Important supplemental information is found in Appendix 4, "Glossary of Lumber Defects." A summary table of the limiting characteristics for all grades appears in Appendix 5. Additional tables summarizing limiting characteristics for each defect can be found under Appendix 6.

Alaska Number 2 and Better

Nominal 2”-4” thick, 2” and wider

Characteristics permitted and limiting provisions:

Checks – Seasoning checks are not limited. Through checks at the end are limited as splits.

Holes (any cause and includes unsound wood, unsound knots, loose knots, and not firmly fixed knots) — Not to exceed the equivalent of 1/4 the nominal width of the piece (or equivalent smaller holes per 2 lineal feet).

Knots – Sound, firm, encased and pith knots if tight and well-spaced, are permitted in sizes not to exceed the equivalent of 1/4 the nominal width of the piece.

Manufacture – Manufacturing imperfections allowed – Admits heavy torn grain, heavy raised grain, heavy loosened grain; heavy machine bite; heavy machine gouge; heavy machine offset; heavy chip marks; knife and saw marks; heavy wavy dressing and sawing variation; and heavy mismatch.

Shake – Shake through at ends, limited as splits. Away from ends, shakes (including through shakes) up to 2 feet long are permitted.

Skips (or Scant) – Heavy. Lumber may be completely or partly surfaced, or entirely rough. If surfaced, may have skips in places up to 1/8 inch deep, or if rough, may be scant in places up to 1/8 inch scant. The areas of skip (or scant) are not to exceed 2 feet in length in any one occurrence.

Slope of grain – 1 in 8

Splits – Equal in length to 1 1/2 (one and one half) times the nominal width of the piece.

Unsound wood – Not permitted in nominal thicknesses over 2 inches. In 2-inch lumber to be considered as holes and included within the limiting provisions for holes.

Wane – 1/3 the actual thickness and 1/3 the actual width on each face, combined not to exceed 1/2 the thickness or 1/2 the width at any point.

Warp – Light. (See Appendix 6 for limits of crook, bow, cup and twist for different piece sizes.)

White speck and honeycomb – Considered as holes and included within the limiting provisions for holes.

Alaska Stud

Nominal 2”-4” thick, 2” and wider

Characteristics permitted and limiting provisions:

Checks – Seasoning checks not limited. Through checks at end are limited as splits.

Holes (any cause – and includes unsound wood) – Not to exceed the equivalent of 1/3 the nominal width of the piece (or equivalent smaller holes per 2 lineal feet).

Knots – Well-spaced knots of any quality are permitted in sizes not to exceed the equivalent 1/3 the nominal width of the piece.

Manufacture – Manufacturing imperfections allowed – Admits heavy torn grain, heavy raised grain, heavy loosened grain; heavy machine bite; heavy machine gouge; heavy machine off-set; heavy chip marks; knife and saw marks; heavy wavy dressing and sawing variation; and heavy mismatch.

Shake – Surface shakes permitted. If shake through at ends, limited as splits. Elsewhere through shakes permitted up to 1/3 the length, scattered along the length.

Skips (or Scant) – Heavy. (Lumber may be completely or partly surfaced, or entirely rough. If surfaced, may have skips in places up to 1/8 inch deep, or if rough, may be scant in places up to 1/8 inch scant. The areas of skip (or scant) are not to exceed 2 feet in length in any one place.)

Slope of grain –1 in 4.

Splits – Equal in length to twice the nominal width of the piece.

Unsound wood – Considered as holes and included within the limiting provisions for holes.

Wane – May equal 1/3 the thickness and one-half the width, on each face, combined not to exceed 1/2 the thickness or 3/4 the width at any point.

Warp – Light (see Appendix 6 for limit of crook, bow, cup and twist for different piece sizes.)

White speck and honeycomb – Considered as holes and included within the limiting provisions for holes.

Alaska Number 3

Nominal 2”-4” thick, 2” and wider

Characteristics permitted and limiting provisions:

Checks – Seasoning checks not limited. Through checks at end are limited as splits.

Holes – (Any cause and includes unsound wood) Not to exceed the equivalent of 1/3 the nominal width of the piece (or equivalent smaller holes per 2 lineal feet).

Knots – Well-spaced knots of any quality are permitted in sizes not to exceed the equivalent of 1/3 the nominal width of the piece.

Manufacture – Manufacturing imperfections allowed – Admits heavy torn grain, heavy raised grain, heavy loosened grain; heavy machine bite; heavy machine gouge; heavy machine offset; heavy chip marks; knife and saw marks; heavy wavy dressing and sawing variation; and heavy mismatch.

Shake – Surface shakes permitted. If shake through at ends, limited as splits. Elsewhere through shakes permitted up to 1/3 the length, scattered along the length.

Skips (or scant) – Heavy. (Lumber may be completely or partly surfaced, or entirely rough. If surfaced, may have skips in places up to 1/8 inch deep, or if rough, may be scant in places up to 1/8 inch scant. The areas of skip (or scant) are not to exceed 2 feet in length in any one place.)

Slope of grain –1 in 4.

Splits – Equal in length to twice the nominal width of the piece.

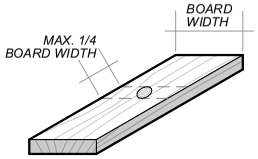
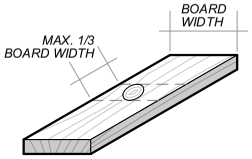
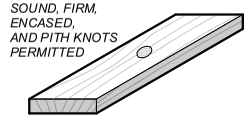
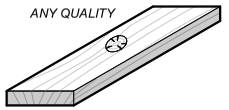
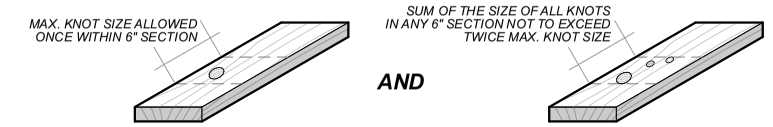
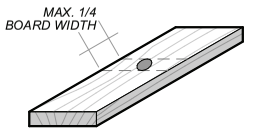
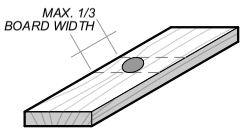
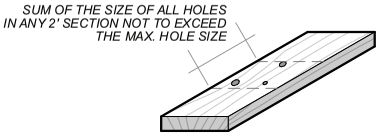
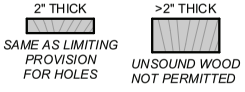
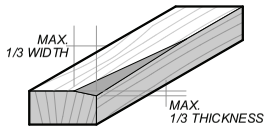
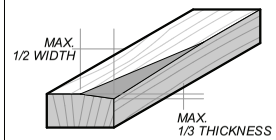
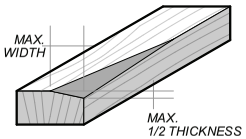
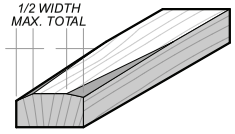
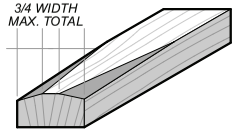
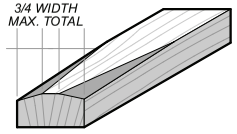
Unsound wood – Considered as holes and included within the limiting provisions for holes.

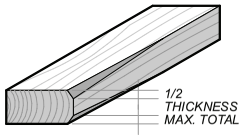
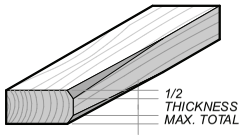
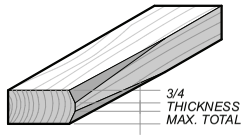
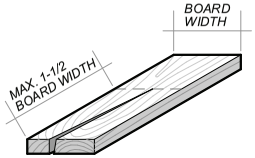
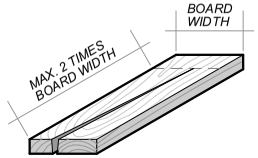
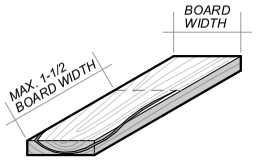
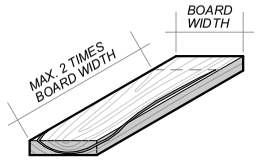
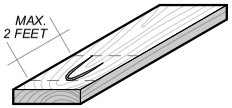
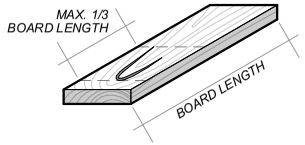
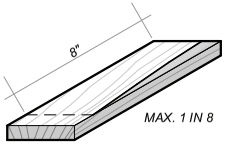
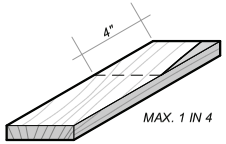
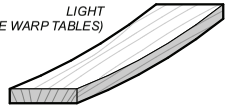
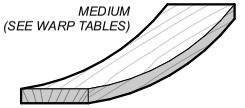
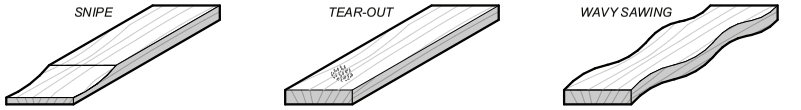
Wane – 1/2 the thickness and 1/2 the width, on each face; combined not to exceed 3/4 the thickness or 3/4 the width at any point.

Warp – Medium (Appendix 6 for limits of crook, bow, cup and twist for different piece sizes.)

White speck and honeycomb – Considered as holes and included within the limiting provisions for holes.

SUMMARY TABLE OF ALASKA DIMENSION LUMBER GRADES

Reference Dimension	Defect Type	Criteria	AK #2 & Better	Alaska Stud	Alaska #3
Nominal Width and Thickness	**Knots**	Max. Permitted Knot Size (Diameter)			
		Quality			
		Spacing	WELL SPACED 		
	Holes	Max. Size			
		Spacing			
	Unsound Wood	Size & Spacing		SAME AS LIMITING PROVISION FOR HOLES	
Width and Thickness	**Wane**	Max. from one Edge			
		Total Wane - Width			

Actual Width		Total Wane - Thickness			
Nominal Width	**Split**	Max. Length			
	Shake	End Shake - Through			
Standard Length		Shake not at End		SURFACE SHAKES PERMITTED 	
Actual	**Slope of Grain**	Deviation from Edge per Length			
Nominal	**Warp**	Severity			
	Manufacturing	Severity	IMPERFECTIONS PERMITTED UP TO 1/8" 		

Designed by Milena Levey

Written Certification

It is a requirement of the Alaska Lumber Grading program that when ALG lumber is sold the producer must provide a valid copy of their certificate of completion of the Alaska Lumber Grading training and a written certification of the milled product. The written certification is a key component of product traceability and quality assurance in the Alaska Lumber Grading program. This document must include the name of the ALG certified grader (and if applicable the name of their sawmill business). The document must also certify each of the following five physical attributes of the lumber:

AS 41.17.630(c)

1. Designation of Grade

Required: Indicate the grade of the lumber: Alaska Number 2 and Better; Alaska Stud; or Alaska Number 3.

2. Designation of Species

Required: Designate the appropriate species group of the lumber: Alaska Yellow Cedar; Alaska Hemlock; or Alaska Spruce.

Optional: Indicate the exact species of the lumber.

3. Designation of Moisture Content

Required: The lumber must be certified as being either "green" or "dry."

Optional: Additional moisture condition information may be included, such as partially air-dried (PAD), kiln-dried, or heat-treated.

4. Designation of Wood Surface Conditions

Required: The lumber must be certified as one of the following: "Surfaced Lumber," "Sawn-To-Size Lumber" or "Rough Lumber." Tables 8.1 and 8.2 provide standard minimum thicknesses and widths for lumber in each category. If lumber is sold as "green" and "rough," the actual thickness and width must be indicated.

5. Designation of Lumber Sizes and Tally

Required: There shall be a total tally of the lumber based on the number of pieces per nominal thickness, width and standard length and the total board feet.

Optional: If there are any deviations from the prescribed standard minimum thicknesses and widths for the surface condition category of the lumber (see Appendix 3) this should be explained on the form.

If a transaction of ALG lumber includes different species groups or multiple grades of lumber, a separate written certification form must be provided for each species and grade. When a mill provides a purchaser more than one grade of lumber, the lumber will be informally marked (such as color coding with a painted end) to clearly indicate the different grades, and the explanation of that differentiation will be on the written certification form that the mill provides the purchaser.

Before conducting a sale of ALG lumber, review the "Standards for Physical Attributes of Alaska Lumber Grading Program Lumber" section of this handbook, which details important program standards.

A template form for the written certification is provided as a fillable PDF form, which can be downloaded or printed from the program website: https://www.uaf.edu/ces/lumber

Appendices

Appendix 1. Senate Bill 87, "Lumber Grading Program"

SB 87: "An Act relating to a lumber grading training program and lumber grading certificates; relating to use of lumber graded and certified by a person holding a lumber grading training program certificate; and providing for an effective date."

00 SENATE BILL NO. 87

"An Act relating to a lumber grading training program and lumber grading certificates; relating to use of lumber graded and certified by a person holding a lumber grading training program certificate; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

*** Section 1.** AS 41.17 is amended by adding new sections to read:

Article 6A. Lumber Grading.

Sec. 41.17.610. Lumber grading training program. (a) The division shall establish a lumber grading training program to train mill operators to grade lumber.

(b) The training program must be offered at least once each year.

(c) The division shall prescribe the

(1) content of the training program;

(2) qualifications for instructors; and

(3) requirements for completing the training program, including requirements for issuing and renewing lumber grading certificates.

(page 2)

Sec. 41.17.620. Lumber grading certificates. (a) The division shall issue a lumber grading certificate to an individual who successfully completes the lumber grading training program established under AS 41.17.610. A certificate expires five years after the date of issuance. A certificate must include the date of issuance and expiration.

(b) The division may issue an initial lumber grading certificate to an individual who has not completed the lumber grading training program if the individual provides proof to the division that the individual

(1) holds a current certification from a lumber grading agency accredited by the American Lumber Standard Committee, Incorporated; or

(2) has a bachelor's or postgraduate degree in forest products or wood science and technology, or an equivalent degree as determined by the division.

(c) An individual holding a certificate, including an individual who received an initial certificate under (b) of this section, must successfully complete the lumber grading training program to renew the individual's lumber grading certificate.

(d) The division may revoke a lumber grading certificate for good cause, after giving the certificate holder notice of the reason for revocation and an opportunity for hearing. A certificate holder may appeal a revocation in writing to the state forester within 10 days after revocation.

Sec. 41.17.630. Use of graded and certified lumber. (a) Load-bearing dimensional lumber graded and certified in accordance with this section may be used in one-, two-, and three-family dwellings in this state.

(b) Load-bearing dimensional lumber graded and certified under this section must be milled in a manner that meets or exceeds the requirements of the applicable building code adopted for one-, two-, and three-family dwellings for the location where the lumber will be used or, if a building code for that location has not been adopted, the building code most broadly used in the state, as determined by the division.

(c) An individual holding a lumber grading certificate issued under AS 41.17.620 may grade load-bearing dimensional lumber that the individual holding the lumber grading certificate mills. The individual shall provide written certification

(page 3)

that the lumber meets the requirements of (b) of this section. The certification must be

(1) on a form prescribed by the division;

(2) accompanied by a copy of the individual's lumber grading certificate.

(d) Load-bearing dimensional lumber graded and certified under this section may be used in a dwelling only if the individual holding the lumber grading certificate sells the lumber directly to a building contractor, the owner of the dwelling, or a person acting on behalf of the owner of the dwelling.

(e) Upon receiving written certification required by (c) of this section, an inspector authorized to review plans or inspect the dwelling under applicable local building codes may authorize the use of the lumber, reject the use of the lumber, or authorize the use of the lumber subject to more restrictive construction requirements, including requirements as to size, spacing, length of spans, and design.

*** Sec. 2.** This Act takes effect immediately under AS 01.10.070(c).

Appendix 2. Size-adjusted Design Values for Alaskan Species Lumber

Table 2.1, Alaska Yellow Cedar, size adjusted values for dimension lumber

Alaska Yellow Cedar									
Size 2” to 4” thick by	Grade	Extreme Fiber Stress in Bending, Fb			Tension Parallel to Grain	Horizontal Shear	Compression		Modulus of Elasticity
		2’&3” Thick		4” thick		Perpendicular to grain		Paral-lel to Grain	
		single	repetitive	single	Ft	Fv	Fc-Perp	Fc	E
2”-4” wide (2x2, 2X3,2X4, 3X3, 3X4, 4X4)	No. 2	1200	1380	1200	675	225	510	1150	1,300,000
	No. 3	715	820	715	375	225	510	660	1,200,000
	Stud	690	790	690	385	225	510	655	1,200,000
6” Wide (2X6, 3X6, 4X6)	No. 2	1040	1195	1040	585	225	510	1100	1,300,000
	No. 3	620	710	620	325	225	510	635	1,200,000
	Stud	625	720	625	350	225	510	625	1,200,000
(8” Wide 2X8, 3X8, 4X8)	No. 2	960	1105	1040	540	225	510	1050	1,300,000
	No. 3 / Stud	570	655	620	300	225	510	605	1,200,000
10" Wide (2X10, 3X10, 4X10)	No. 2	880	1010	960	495	225	510	1000	1,300,000
	No. 3 / Stud	525	600	570	275	225	510	575	1,200,000
12” Wide (2X12, 3X12, 4X12)	No. 2	800	920	880	450	225	510	1000	1,300,000
	No. 3 / Stud	475	545	525	250	225	510	575	1,200,000
14" & Wider (2x14 wider, 3X14 & wider, 4X14 & wider)	No. 2	720	830	800	405	225	510	900	1,300,000
	No. 3 / Stud	430	490	475	225	225	510	520	1,200,000

Information from the Western Wood Products Association “Tech Notes 20015-01”

Appendix 2. Size-adjusted Design Values for Alaskan Species Lumber

Table 2.2, Alaska Hemlock, size adjusted values for dimension lumber

Alaska Hemlock									
Size 2” to 4” thick by	Grade	Extreme Fiber Stress in Bending, Fb			Tension Parallel to Grain	Horizontal Shear	Compression		Modulus of Elasticity
		2’&3” Thick		4" thick			Perpen-dicular to grain	Parallel to Grain	
		single	repetitive	single	Ft	Fv	Fc-Perp	Fc	E
2”-4” wide (2x2, 2X3,2X4, 3X3, 3X4, 4X4)	No. 2	1240	1425	1240	715	185	440	1210	1,500,000
	No. 3	715	820	715	415	185	440	690	1,400,000
	Stud	715	820	715	415	185	440	685	1,400,000
6" Wide (2X6, 3X6, 4X6)	No. 2	1070	1235	1075	620	185	440	1155	1,500,000
	No. 3	620	710	620	360	185	440	660	1,400,000
	Stud	650	750	650	375	185	440	650	1,400,000
8" Wide (2X8, 3X8, 4X8)	No. 2	990	1140	1075	570	185	440	1105	1,500,000
	No. 3 / Stud	570	655	620	330	185	440	630	1,400,000
10" Wide (2X10, 3X10, 4X10)	No. 2	910	1045	990	525	185	440	1050	1,500,000
	No. 3 / Stud	525	600	570	305	185	440	600	1,400,000
12” Wide (2X12, 3X12, 4X12)	No. 2	825	950	910	475	185	440	1050	1,500,000
	No. 3 / Stud	475	545	525	275	185	440	600	1,400,000
14" & wider (2X14 & wider, 3X14 & wider, 4X14 & wider)	No. 2	745	855	825	430	185	440	945	1,500,000
	No. 3 / Stud	430	490	475	250	185	440	540	1,400,000

Information from the Western Wood Products Association “Tech Notes 20015-01”

Appendix 2. Size-adjusted Design Values for Alaskan Species Lumber

Table 2.3, Alaska Spruce, size adjusted values for dimension lumber

Alaska Spruce									
Size 2” to 4” thick by	Grade	Extreme Fiber Stress in Bending, Fb			Tension Parallel to Grain	Horizontal Shear	Compression		Modulus of elasticity
		2’&3” Thick		4" thick			Perpendicular to Grain	Parallel to Grain	
		single	repetitive	single	Ft	Fv	Fc-Perp	Fc	E
2”-4” wide (2x2, 2X3,2X4, 3X3, 3X4, 4X4)	No. 2	1315	1510	1315	750	160	330	1210	1400000
	No. 3	750	865	750	450	160	330	690	1300000
	Stud	745	855	745	440	160	330	710	1300000
6” Wide (2X6, 3X6, 4X6)	No. 2	1140	1310	1140	650	160	330	1155	1400000
	No. 3	650	750	650	390	160	330	660	1300000
	Stud	675	775	675	400	160	330	675	1300000
8” Wide (2X8, 3X8, 4X8)	No. 2	1050	1210	1140	600	160	330	1105	1400000
	No. 3 / Stud	600	690	650	360	160	330	630	1300000
10” Wide (2X10, 3X10, 4X10)	No. 2	965	1105	1050	550	160	330	1050	1400000
	No. 3 / Stud	550	635	600	330	160	330	600	1300000
12” Wide (2X12, 3X12, 4X12)	No. 2	875	1005	965	500	160	330	1050	1400000
	No. 3 / Stud	500	575	550	300	160	330	600	1300000
14” & Wider (2X14 & wider, 3X14 & wider, 4X14 & wider)	No. 2	790	905	875	450	160	330	945	1400000
	No. 3 / Stud	450	520	500	270	160	330	540	1300000

Information from the Western Wood Products Association “Tech Notes 20015-01”

Appendix 3. Nominal and Standard required thickness and width for the Alaska Lumber Grading Program

Table 3.1, Standards for Minimum Thicknesses According to Surface Condition

Minimum thickness (inches)				
Nominal Thickness	Minimum Dry Lumber Standard	Minimum Green Lumber Standard*	Minimum Standard	Minimum suggested*
	Surfaced or Sawn-to-size	Surfaced or Sawn-to-size	Dry Rough Lumber	Green Rough Lumber
2	1-1/2	1-9/16	1-5/8	1-11/16
2-1/2	2	2-1/16	2-1/8	2-3/16
3	2-1/2	2-9/16	2-5/8	2-3/4
3-1/2	3	3-1/16	3-1/8	3-1/4
4	3-1/2	3-9/16	3-5/8	3-13/16

*Note: For green sawn-to-size and green rough lumber, these minimum suggested dimensions may not be adequate starting points. Based on species, the initial moisture content of the wood and other factors, larger initial dimensions may be required to reach the target thickness after shrinkage due to drying.

Table 3.2, Standards for Minimum Widths According to Surface Condition

Minimum width (inches)				
	Minimum Dry Lumber Standard	Minimum Green Lumber Standard*	Minimum Standard	Suggested Minimum*
Nominal Width	Surfaced or Sawn-to-size	Surfaced or Sawn-to-size	Dry Rough Lumber	Green Rough Lumber
In inches	In inches	In inches	In inches	In inches
2	1-1/2	1-9/16	1-5/8	1-11/16
2-1/2	2	2-1/16	2-1/8	2-3/16
3	2-1/2	2-9/16	2-5/8	2-3/4
3-1/2	3	3-1/16	3-1/8	3-1/4
4	3-1/2	3-9/16	3-5/8	3-13/16
4-1/2	4	4-1/16	4-1/8	4-5/16
5	4-1/2	4-10/16	4-5/8	4-7/8
6	5-1/2	5-10/16	5-5/8	5-7/8
8	7-1/4	7-1/2	7-3/8	7-11/16
10	9-1/4	9-1/2	9-3/8	9-3/4
12	11-1/4	11-1/2	11-3/8	11-7/8
14	13-1/4	13-1/2	13-3/8	13-15/16
16	15-1/4	15-1/2	15-3/8	16

*Note: For green sawn-to-size and green rough lumber, these minimum suggested dimensions may not be adequate starting points. Based on the initial moisture content of the wood and other factors, larger initial dimensions may be required to reach the target width after shrinkage due to drying.

Appendix 4. Glossary of Lumber Defects

Checks

A check is a separation of the wood that normally occurs across or through the wood growth rings (i.e., normally in the tangential or radial dimension). Usually a result of the drying process.

a. A surface check occurs on a width or thickness face of a piece.

b. A through check will extend from one surface face to an opposite or adjoining surface (e.g., completely through from one wide face to another, or from a wide face to an edge face).

Holes

A hole may extend completely or partially through the piece. A hole may result from various causes including mechanical actions, insects (in the case of smaller holes), and the sloughing of loose (black) knots. The sizes of holes are measured in the same fashion as knots. Size classification of holes are as follows:

a. A pin hole is not more than 1/16 inch in diameter.

b. A medium hole is larger than a pin hole but not more than ¼ inch in diameter.

c. A large hole is larger than a medium hole but not more than 1 inch in diameter.

d. A very large hole is more than 1 inch in diameter.

Knots

A knot is a portion of a branch or a limb that is overgrown by the tree and has become incorporated into the piece of lumber, that is further classified as to occurrence, form, quality and size as being:

a. A **sound knot** contains no decay while an **unsound knot** contains decay

b. A **firm knot** is solid across its face but contains incipient decay

c. An **encased knot** is a knot that is not intergrown with the growth rings of the surrounding wood.

d. A **pith knot** is sound in all respects except that it contains a pith hole that is not more than 0.25 inches in diameter.

e. A **tight knot** is so fixed (by growth, shape or position) that it retains its place, or is held in place in the piece while a **loose knot** or a **not firmly fixed knot** is one which is not so fixed by growth shape or position such that it will not be held tightly in place in the piece.

f. **Well-spaced knots** means that the sum of the sizes of all knots in any 6-inch length cannot exceed twice the size of the largest permitted knot, more than one knot of maximum size cannot be in any 6-inch piece and the combination of knots must not be serious. The presence of knot clusters where two or more knots are grouped together as a single unit (i.e. knots adjacent to each other) with the fibers of wood deflected around the entire unit should be considered as serious (in meeting the requirement for well-spaced knots) if the area of the knot cluster contained within a surrounding wood area would begin to approach the size limit for well-spaced knots within a six-inch piece.

g. **Well-scattered knots** are not in clusters and occur where each knot is separated from another knot by at least a distance equal to the diameter of the smaller of the two knots.

h. A **round knot** occurs as the result of the limb being cut in the manufacture of the board such that the limb is approximately at right angles to the long axis of the board (and the knot will appear as a cross-section on the face that is more or less “round”). A **spike knot** occurs as a result of the limb being cut either lengthwise or diagonally and the limb will appear as a cross-section on the face that resembles a “spike” that is significantly greater in one dimension than in the other. An **oval knot** is something

between these two extremes, which occurs as the limb is cut in the manufacture of the board such that the limb is slightly more than a right angle to the long axis of the board and the knot will appear as a cross-section on the face, as more or less "oval."

i. A **red knot** occurs as the result of the tree overgrowing a living branch and is intergrown with the surrounding wood. An **intergrown knot** is one where growth rings are partially or completely intergrown on at least one side with the surrounding wood. A **watertight knot** is one where growth rings are completely intergrown on one surface of the piece and the knot is sound on that surface. In contrast, a **black knot** occurs as the result of the tree overgrowing a dead branch and is consequently not intergrown with the surrounding wood.

j. A **star-checked knot** has radial checks.

k. The **size of a knot** is measured directly as the diameter (in inches) for a round knot. For other than round knots the equivalent diameter size is calculated by averaging the measurements of the maximum width of the knot, in inches, on its narrow axis and the maximum length on its long axis.

l. A **pin knot** is not over 0.5 inches in diameter. A **small knot** is not over 0.75 inches in diameter. A **medium knot** is not over 1.5 inches in diameter. A **large knot** is over 1.5 inches in diameter.

Manufacture

All of the ALG grades allow manufacturing imperfections of a modified Standard "F" which is to say that it is a modified version of the least restrictive of the standards accepted by accredited grading bureaus. This recognizes that sawn-to-size lumber in the green condition and other lumber that has not been kiln-dried and that has not been surfaced four sides will be used and sold under this program. This also recognizes that the nature of the mills that will likely produce such lumber will be limited with regard to machine centers and simplifies the limitations for manufacturing imperfections.

Specifics for the characteristics of manufacturing imperfections permitted under the Alaska Lumber Grading program modified Standard "F" are as follows:

a. Heavy torn grain allowed not more than 1/8 inch (0.125 inch) in deep (torn grain is a surface irregularity where wood has been torn or broken out by surfacing).

b. Heavy raised grain allowed not more than 1/8 inch (0.125 inch) high (raised grain is a surface irregularity where latewood (or summerwood) rises above the earlywood (or springwood)).

c. Heavy loosened grain allowed not more than 1/8-inch (0.125 inch) separation (loosened grain is a grain separation or loosening between latewood and earlywood). Heavy machine bite allowed not more than 1/8 inch (0.125 inch) deep (machine bite is a depressed cut of the machine knives at the end of the piece).

d. Heavy machine gouge allowed not more than 1/8 inch (0.125 inch) deep (machine gouge is a groove cut by the machine below the desired line). Heavy machine offset allowed not more than 1/8 inch (0.125 inch) deep (machine offset is an abrupt dressing variation in the edge of the piece, usually near the end of the piece, that does not reduce the width of the wide surface).

e. Heavy chip marks allowed not more than 1/8 inch (0.125 inch) deep (chip marks are shallow depressions typically caused by shavings (i.e. "chips") getting imbedded in the surface during the surfacing process).

f. Knife marks and saw marks allowed as readily visible and uneven to the touch (knife marks

and saw marks are imprints of machine knives or saw blades on the surface of the piece).

g. Heavy wavy dressing and sawing variation allowed not more than 1/8 inch (0.125 inch) deep (wavy dressing is uneven dressing and sawing variation is thickness variation in a piece resulting from the variation of the saw and other elements of the machine centers within the sawmill).

h. Heavy mismatch allowed not more than 1/8 inch (0.125 inch) deep (mismatch is an uneven fi t in worked lumber when adjoining pieces do not meet tightly at all points of contact, and also where the surfaces of adjoining pieces are not in the same plane).

Scant

Scant may occur in green or dry and in rough or surfaced lumber where the lumber is slightly less than the standard or required size. Within the Alaska Lumber Grades for "rough" dry or green lumber that is intended to be sawn-to-size for use without surfacing, some scant undersize may occur in some places on the piece and it is allowed in the same fashion and to the same degree (i.e., not to exceed 1/8 inch in depth and not to exceed 2 feet in length in any one place) for which skip is allowed in surfaced lumber.

Shake

Shake is a lengthwise separation of the wood (primarily along the longitudinal axis) that occurs commonly between or sometimes across the growth rings (i.e. separation along the long axis between or across the annual growth rings).

a. A **surface shake** occurs on only one surface of the piece of lumber.

A **through shake** will extend from one surface face to an opposite or adjoining surface (e.g., completely through from one wide face to another or from a wide face to an edge face).

Skips

Skips occur in surfaced lumber in areas where the piece has failed to surface cleanly. A **heavy skip** is a skip that is not more than 1/8 inch deep.

Slope of Grain

Slope of grain is the deviation of the wood fiber from a line that is parallel to the edges of the piece (i.e. the grain of the wood is not parallel to the edge of the piece). The slope of grain deviation is expressed as a ratio, such as 1 in 8, representing there is 1 inch in deviation between the grain of the wood and the line parallel for every 8 inches of length.

Splits

A split is a separation of the wood due to the tearing apart of the wood cells that occurs through the piece to the opposite or an adjacent surface.

Unsound wood (decay)

Results from the attack of wood by any of a number of wood-destroying fungi that leave wood in a disintegrated condition. This is typically reflected by a loss of hardness and the softening of the wood fibers. Some examples

include:

a. Heart center decay: Forms in the vicinity of the pith in a living tree, does not progress further after the tree is cut.

b. White speck is small white or sometimes brown spots caused by a fungus that forms in the living tree, and does not progress further in wood in service.

c. Honeycomb is similar to white speck but larger.

d. Incipient decay is the very early state of decay where disintegration of the fibers has just begun and the wood has discolored but has not yet disintegrated to the point that it is significantly softened. Incipient decay may be difficult to distinguish from stain, and if sound and not expected to advance or progress to a more disintegrated state, it is not considered as unsound for purposes of grading classification within the Alaska Local Use Lumber Grades. In contrast, the onset of decay of any kind that leaves wood in a disintegrated condition, which typically presents as a loss of hardness and the softening of the wood fibers, must be considered as unsound wood.

Wane

Bark or the absence of wood from any cause but commonly at what would be the absence of wood due to the cambium layer being included on the edge or a face of a piece of lumber. Wane extended up to full width is allowed in an occasional piece in any Alaska Local Use Lumber Grade if it does not exceed the 1/8-inch depth limits for skips/scant, is away from the ends, and is less than one foot in length.

Warp

Warp is any deviation from a true (or flat plane) surface. It includes twists, crook, bow and cup, separately or in combination. Warp restrictions are based on average form as it normally occurs, and variations from the average form (such as short kinks) should be considered and appraised according to equivalent effect. Two or more forms of warp in a single piece should be appraised according to combined effect. The Alaska Local Use Lumber Grades allow different amounts of warp for different types between the different grades and sizes of dimension lumber. Depending on the Alaska Lumber Grade, warp that is termed as “Light" or “Medium” may be allowed, for the Number 2 and Better and the Stud Grades as compared to the Number 3 Grade. But what is allowed as “Light” warp for the Number 2 and Better and the Stud Grades, as compared to “Medium” warp for the Number 3 Grade, varies according to type of warp and lumber dimensions. Allowed limits for twist vary according to Grade and lumber length and width; allowed limits for crook vary according to Grade and limber length and width; allowed limits for bow vary according to Grade, lumber length and thickness; and allowed limits for cup vary according to width. These specific warp limits are included in Section 4 of the tables below. The different types of warp considered within the Alaska Lumber Grading program are as follows.

a. Twist is a deviation flatwise or a combination of flatwise and edgewise, in the form of a curve or spiral. It is measured as the point of distance that the edge of a piece is raised above a flat surface where both edges of the opposite end of the same piece are resting against the same flat surface.

b. Crook is a deviation edgewise from a straight line drawn from end to end of the piece (i.e., a straight line from end to end along an edge or a thickness face.) It is measured as the point of greatest distance from the straight line.

c. Bow is a deviation flatwise from a straight line drawn from end to end of the piece (i.e. a straight line from end to end along a wide face). It is measured as the point of greatest distance from the straight line.

d. Cup is a deviation in the face of a piece, from a straight line drawn from edge to edge of the piece (i.e., a straight line from edge to edge across the wide face). It is measured as the point of greatest distance from the straight line.

Appendix 5. Summary of limits of 8 characteristics permitted for the three Alaska Lumber Grades

Defect limits for the three Alaska lumber grades				
Defect Type		AK Number 2 and Better	AK Stud	AK #3
Knots	Max knot size	1/4th board width	1/3rd board width	
	Quality	Sound, fixed, Encased; no advanced decay	Any quality but not a hole	
	Spacing	Allowed 2 times maximum knot size within 6-inch section		
Holes or non-wane unsound wood	Max size	1/4 board width	1/3 board width	
	Spacing	Allowed equivalent of maximum hole size within 2 lineal feet		
Wane	Max from one edge	1/3rd width, 1/3rd thickness	½ width, 1/3rd thickness	½ width, ½ thickness
	Total wane	½ width, ½ thickness	¾ width, ½ thickness	¾ width, ¾ thickness
Split	Max length	1½ times board width	2 times board width	
Shake	End shake	Limited as splits		
	Through shake not at end	Allowed maximum 2' long	Allowed maximum 1/3 board length	
Slope of Grain	Deviation per length	1 in 8	1 in 4	
Warp	Severity	Light		Medium
Manufacturing	Severity	Heavy		

Appendix 6. Summary of Knots, Hole Size, Wane, Slope of Grain and Splits Limiting Provisions for Alaska Local Use Dimension Lumber

Table 6.1, Maximum Knot Size (or equivalent)

Maximum Knot Size (or equivalent)			
	AK Number 2 and Better	AK Stud Grade	AK Number 3
Nominal Width	Sound firm encased and pith knots if tight and well-spaced	Any quality permitted if well-spaced	Any quality permitted if well-spaced
Inches	Inches	Inches	Inches
2	1/2	2/3	2/3
2.5	5/8	5/6	5/6
3	3/4	1	1
3.5	7/8	1 1/6	1 1/6
4	1	1 1/3	1 1/3
4.5	1 1/8	1 1/2	1 1/2
5	1 1/4	1 2/3	1 2/3
6	1 1/2	2	2
8	2	2 2/3	2 2/3
10	2 1/2	3 1/3	3 1/3
12	3	4	4
14	3 1/2	4 2/3	4 2/3
16	4	5 1/3	5 1/3

Appendix 6 (continued). Summary of Knots, Hole Size, Wane, Slope of Grain and Splits Limiting Provisions for Alaska Local Use Dimension Lumber

Table 6.2 Maximum hole size (or equivalent) per 2 linear feet for the three Alaska Local Use Lumber Grades (all unsound wood except wane included in "hole" limits, including unsound, loose and not firmly fixed knots).

Maximum size or equivalent smaller holes per 2 linear feet			
Nominal Width	AK Number 2 and Better	AK Stud Grade	AK Number 3
Inches	Inches	Inches	Inches
2	1/2	2/3	2/3
2.5	5/8	5/6	5/6
3	3/4	1	1
3.5	7/8	1 1/6	1 1/6
4	1	1 1/3	1 1/3
4.5	1 1/8	1 1/2	1 1/2
5	1 1/4	1 2/3	1 2/3
6	1 1/2	2	2
8	2	2 2/3	2 2/3
10	2 1/2	3 1/3	3 1/3
12	3	4	4
14	3 1/2	4 2/3	4 2/3
16	4	5 1/3	5 1/3

Appendix 6 (continued). Summary of Knots, Hole Size, Wane, Slope of Grain and Splits Limiting Provisions for Alaska Local Use Dimension Lumber

Table 6.3 Maximum Wane (or equivalent) for three Alaska Local Use Lumber Grades

Maximum wane			
	AK Number 2 and Better	AK Stud	AK Number 3
Each Face	1/3 Thickness full length	1/3 Thickness full length	1/2 Thickness full length
Each Face	1/3 width full length	1/2 width full length	1/2 width full length
Combined Faces	Maximum 1/2 thickness any point	Maximum 1/2 thickness any point	Maximum 3/4 thickness any point
Combined Faces	Maximum 1/2 width any point	Maximum 3/4 width any point	Maximum 3/4 width any point

Table 6.4 Maximum Slope of Grain on three Alaska Local Use Lumber Grades

Maximum slope of grain		
AK Number 2 and Better	AK Stud	AK Number 3
1 in 8	1 in 4	1 in 4

Table 6.5 Maximum Splits for three Alaska Local Use Lumber Grades

Maximum splits		
AK Number 2 and Better	AK Stud	AK Number 3
Length equal to 1.5 times width of piece	Length equal to 2 times width of piece	Length equal to 2 times width of piece

Appendix 7. Twist, Crook, Bow and Cup Tables for Alaska Local Use Lumber

Table 7.1, Twist limits by length and width.

Twist limits by length and width							
Width in inches (nominal)							
Length in Feet	Twist	2 inch	3 &4 inch	5 & 6 inch	8 inch	10 inch	12 inch & <
4 foot	Light	1/8	1/4	3/8	1/2	5/8	3/4
	Medium	3/16	3/8	1/2	3/4	7/8	1 1/8
6 foot	Light	3/16	3/8	1/2	3/4	7/8	1 1/8
	Medium	9/32	1/2	3/4	1 1/8	1 3/8	1 5/8
8 foot	Light	1/4	1/2	3/4	1	1 1/4	1 1/2
	Medium	3/8	3/4	1 1/8	1 1/2	1 7/8	2 1/4
10 foot	Light	5/16	5/8	7/8	1 1/4	1 1/2	1 7/8
	Medium	1/2	7/8	1 3/8	1 7/8	2 3/8	2 3/4
12 foot	Light	3/8	3/4	1 1/8	1 1/2	1 7/8	2 1/4
	Medium	9/16	1 1/8	1 5/8	2 1/4	2 3/4	3 3/8
14 foot	Light	7/16	7/8	1 1/4	1 3/4	2 1/8	2 5/8
	Medium	5/8	1 1/4	1 7/8	2 5/8	3 1/4	3 7/8
16 foot	Light	1/2	1	1 1/2	2	2 1/2	3
	Medium	3/4	1 1/2	2 1/4	3	3 3/4	4 1/2
18 foot	Light	9/16	1 1/8	1 5/8	2 1/4	2 3/4	3 3/8
	Medium	7/8	1 5/8	2 1/2	3 3/8	4 1/4	5
20 foot and greater	Light	5/8	1 1/4	1 7/8	2 1/2	3 1/8	3 3/4
	Medium	1	1 7/8	2 3/4	3 3/4	4 5/8	5 5/8

Appendix 7 (continued). Twist, Crook, Bow and Cup Tables for Alaska Local Use Lumber

Table 7.2, Crook limits by length and width.

Crook limits by length and width								
Length	CROOK	2 inch	3 inch	4 inch	5 - 6 inch	8 inch	10 inch	≥ 12 inches
4 foot	Light	1/4	1/4	1/4	3/16	1/8	1/16	1/16
	Medium	3/8	3/8	3/8	1/4	3/16	1/8	1/8
6 foot	Light	1/4	1/4	1/4	3/16	1/8	1/16	1/16
	Medium	3/8	3/8	3/8	1/4	3/16	1/8	1/8
8 foot	Light	3/8	3/8	3/8	5/16	1/4	3/16	1/8
	Medium	1/2	1/2	1/2	1/2	3/8	1/4	3/16
10 foot	Light	3/4	5/8	1/2	7/16	3/8	¼	3/16
	Medium	1 3/8	1	3/4	5/8	1/2	7/16	3/8
12 foot	Light	1	3/4	11/16	5/8	1/2	7/16	3/8
	Medium	1 1/2	1 1/8	1	7/8	13/16	¾	9/16
14 foot	Light	1 1/4	1	7/8	3/4	5/8	1/2	3/8
	Medium	2	1 1/2	1 1/4	1 1/8	1	7/8	3/4
16 foot	Light	1 5/8	1 1/4	1	7/8	3/4	5/8	1/2
	Medium	2 1/2	1 7/8	1 1/2	1 3/8	1 1/8	1	7/8
18 foot	Light	2	1 3/8	1 1/8	1	7/8	3/4	5/8
	Medium	3	2 1/16	1 5/8	1 1/2	1 1/4	1 1/8	1
20 foot	Light	2 1/4	1 1/2	1 3/8	1 1/4	1	7/8	3/4
	Medium	3 3/8	2 1/4	2 1/16	1 7/8	1 1/2	1 5/16	1 1/8
22 foot	Light	2 1/2	1 3/4	1 5/8	1 1/2	1 1/4	1	7/8
	Medium	3 3/4	2 5/8	2 7/16	2 1/4	1 7/8	1 1/2	1 1/4
24 foot and longer	Light	3	2	1 7/8	1 3/4	1 1/2	1 1/4	1
	Medium	4 1/2	3	2 3/4	2 5/8	2 1/4	1 7/8	1 5/8

Appendix 7 (continued). Twist, Crook, Bow and Cup Tables for Alaska Local Use Lumber

Table 7.3, Bow limits

Bow limits by length and thickness			
	Thickness in inches (nominal)		
Length in Feet	BOW	2 inch	3 and 4 inch
4 & 6 foot	Light	1/2	1/4
	Medium	3/4	3/8
8 foot	Light	3/4	3/8
	Medium	1	1/2
10 foot	Light	1 1/2	3/4
	Medium	2 3/4	1 3/8
12 foot	Light	2	1
	Medium	3	1 1/2
14 foot	Light	2 1/2	1 1/4
	Medium	4	2
16 foot and greater	Light	3 1/4	1 5/8
	Medium	5	2 1/2

Table 7.4, Cup limits

Cup limits by length and width						
	Width in inches (nominal)					
CUP	2 & 3 inch	4 inch	5 & 6 inch	8 inch	10 inch	12 inch
Light	1/32	1/32	1/16	1/8	3/16	1/4
Medium	1/32	1/16	1/8	3/16	1/4	3/8

Appendix 8. Board Feet of 2” thick lumber of varying width and length

Table 8, Board feet of 2" thick lumber pieces

Board feet for 2" thick lumber					
Width (inches)	Length of board (feet)				
	8 foot	10 foot	12 foot	16 foot	20 foot
2 inch	2.7	3.3	4	5.3	6.7
4 inch	5.3	6.7	8	10.7	13.3
6 inch	8	10	12	16	20
8 inch	10.7	13.3	16	21.3	26.7
10 inch	13.3	16.7	20	26.7	33.3
12 inch	16	20	24	32	40