

*Report:*

**Feasibility of Grading Lumber Produced by Independent Mills  
in the Interior West**

*Submitted to:*

Interior West Center for the Innovative Use of Small Diameter Wood

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# **Feasibility of Grading Lumber Produced by Independent Mills in the Interior West**

## ***BACKGROUND***

Lumber grading provides a standardized means of producing and marketing solid wood products for use by consumers. Grading is done for appearance (architectural or nonstructural end uses) and for structural uses (construction). Grading is typically conducted under the auspices of industry trade associations for a membership fee. Trade associations establish grading procedures and quality assurance methods; provide technical data and grade stamps; and coordinate marketing and consumer information on graded lumber. For small, independent mills in the Interior West, grading has not been viable due to technical and economic factors.

Graded lumber represents a market opportunity for wood from small diameter trees. This report addresses factors that currently prevent mills from taking advantage of this market opportunity, an opportunity that will increase as additional timber resources become available due to fire mitigation efforts throughout the interior west. Grading for structural uses was the focus of this report, but nonstructural applications were also considered.

## ***METHODOLOGY***

The goal of the project was to assess the feasibility of grading lumber produced by independent mills in the interior west. Aspects affecting large timber companies, which readily have the ability to grade lumber, were not considered.

The investigation focused on technical aspects of grading. Economic and market factors were also investigated to the extent they impact the technical issues. Questions that were addressed included:

- What infrastructure is needed at the mill to produce lumber with quality consistent with that currently available to consumers? Infrastructure requirements may include milling equipment, dry kilns, grading equipment and labor.

- What qualities do customers require of graded lumber? Can the mills produce lumber with the qualities desired by the end-users?
- What mechanism could be used to grade the lumber; i.e. what are the merits of visual grading (labor intensive) versus machine grading (capital intensive) in these mills?
- Can the mills form a liaison with industry trade associations that reflects their constraints; i.e. can a relationship be established that benefits independent mills while offering favorable public relations to the trade associations in light of the IWC's goal of reducing wildfire risks?
- Is there a means for the small mills to capitalize on trade association efforts to promote and support graded lumber? Can independent mills capitalize on the marketing efforts of the forest products industry in either broad or niche markets?
- What are the economic factors that drive the viability of a grading operation in an independent mill? If lumber grading is technically feasible in independent mills, what are the major internal cost constraints and limiting market factors?

The findings of the investigation are summarized in this report. The project consisted of meetings and discussions with mill owners, trade associations, certified lumber grading organizations, building officials, and university and government employees that work with the forest products sectors and researchers.

### ***HOW LUMBER IS GRADED***

The first known grading rules for lumber were written in Scandinavia in 1754. By 1833 local grading rules were in effect in Maine. As the timber industry progressed west, so did grading rules. Efforts to consolidate lumber grading in the U.S. had their origins with the U.S. Forest Service. In the early 1900s rules were published which dictated the permissible size of knots in beams. In 1929 the American Lumber Standard Committee published a framework for lumber grading. Trade associations used the framework to publish rules specific to timber species cut by their member companies.

The American Lumber Standard Committee dictated rules for grading structural lumber. The rules were intended to standardize lumber used in construction. The procedures for determining the grades and associated allowable design

stresses were established by the American Society for Testing and Materials (ASTM).

Over time, grading rules were modified as more technical data became available on the effects of knots, slope of grain, sawing defects and material properties. Lumber trade associations modified their own grading rules, based on the American Lumber Standards Committee framework.

The U.S. Department of Commerce, under which the American Lumber Standards Committee functions, published Voluntary Product Standard PS-20 in 1970. In conjunction with the development of PS-20, the National Grading Rule for Softwood Dimension Lumber was produced. The National Grading Rule and PS-20 provide for uniform standards for grading dimension lumber.

In the 1970s an in-grade testing program was initiated for dimension lumber. Prior to the in-grade testing program, lumber was assigned design values based on tests of small clear specimens to determine clear wood strength. The clear wood strength values were reduced by a number of factors, such as the size and location of knots and slope of grain as specified in ASTM standards. The ASTM standards and procedures are still in effect today, with numerous revisions over the years. However, tests on full-size lumber, coupled with concerns over changing forest resources, made it apparent that the small clear specimen approach did not accurately reflect the strength of full-size lumber.

The in-grade testing program conducted by the U.S. and Canadian forest products industry led to modifications in the design values assigned to a particular lumber species, or species group, based on the dimensions and defects present. The design values were coordinated through the industry trade associations. For western timber species, the Western Wood Products Association and West Coast Lumber Inspection Bureau were instrumental in the work on softwood lumber, including Ponderosa pine.

These design values are used by architects and engineers to determine the appropriate size of lumber to resist loads on a structure. The loads are due to wind, snow, people and furnishings, and the weight of the structure. The design value is known to the architect or engineer by the grade assigned to and stamped on the lumber.

The grade stamp on a piece of lumber is the means by which the end user knows how the piece can be used. It specifies wood species and grade overseen by the industry trade associations in accordance with the American Lumber Standards Committee rules. The grade stamp does not guarantee that a piece of lumber has a certain strength, only that the piece of lumber met the requirements to be

assigned that design value. The requirements would be determined by the grading rules and would include species, dimensions, knot size and location, slope of grain and manufacturing defects (such as skip and wane).

The grade stamp is recognized by architects, engineers, builders and building officials as a measure of the quality of a piece of lumber. A typical grade stamp is shown in Figure 1. The grade stamp generally has the following characteristics:

- Certification mark - indicates the supervising grading agency
- Species - identifies the wood species or species combination
- Mill identification - the number or brand of the firm that produced the board
- Grade name - indicates the grade for which the piece meets the requirements
- Moisture content - indicates the target moisture content to which the wood was dried or the moisture content at which it was surfaced (planed).



**Figure 1.** Grade stamp for No.3 lumber made of the species combination western woods.

Appearance grades are used in structures to satisfy architectural requirements (i.e. free of knots) or for peripheral industries, such as furniture manufacture. Grades for hardwood lumber, most of which is not structural, are also established by industry trade associations, such as the National Hardwood Lumber Association.

The difference between structural and non-structural grades is that structural grades are referenced in model building codes and, as such, carry a legal burden of safety. The failure to either be properly specified or to meet the grade requirements may also compromise safety. If a building collapses, the grade of the lumber may be called into question. In contrast, failure to meet an appearance grade is a matter of aesthetics, not safety.

Structural lumber is graded either visually or mechanically. Visual grading is the most common means of grading lumber and timbers in the U.S. A trained

lumber grader examines a piece and quickly assesses its characteristics, either during or after production. The characteristics examined include:

- Checks
- Grain
- Knots
- Manufacture
- Pitch and pitch streaks
- Bark
- Shakes
- Skips
- Slope of grain
- Splits
- Stains
- Unsound wood
- Wane
- Warp

Definitions of these characteristics are provided in the glossary. Measuring these characteristics, the grader examines a piece and determines the appropriate grade for the piece based on limitations specified for a particular grade and application. As an example, the limitations for these characteristics for No. 1 Structural Light Framing (WWPA Rules) are given in Table 1.

**Table 1.** Characteristics and limitations for lumber meeting the requirements for No. 1 Structural Light Framing.

**No1.**                    2" to 4" Thick                    2" to 4" Wide

**Checks** – Surface seasoning checks, not limited. Through checks at ends are limited as splits.

**Grain** – Medium.

**Knots** – Sound, firm encased, and pith knots, if tight and well spaced, are permitted in sizes not to exceed the following, or equivalent displacement:

Nominal Width	At Edge Wide Face	Centerline Wide Face	Unsound or Loose Knots& Holes
2"	1/2"	1/2"	1/2"
3"	3/4"	3/4"	3/4"
4"	1"	1 1/2 "	1"

**Manufacture** – Standard "E".

**Pitch and pitch streaks** – Not limited.

**Pockets, pitch or bark** – Not limited.

## Table 1. Continued

**Shake** – If through at ends, limited as splits. Surface shakes up to 2' long.

**Skips** – Hit and miss skips in a maximum of 10% of the pieces.

**Slope of grain** – 1 in 10.

**Splits** – Equal in length to the width of the piece.

**Stain** – Stained sapwood. Firm heart stain or firm red heart.

**Wane** – 1/4 the thickness and 1/4 the width full length, or equivalent on each face, provided that the wane not exceed 1/2 the thickness or 1/3 the width for up to 1/4 the length.

**Warp** – 1/2 of medium.

### ***TRADE ASSOCIATIONS AND ACCREDITED LUMBER INSPECTION AGENCIES***

All trade associations or lumber inspection agencies that are certified to grade lumber come under the auspices of the American Lumber Standards Committee (ALSC). The ALSC checks records of grading organizations and conducts mill surveys to verify that grading is done in accordance with ALSC requirements.

Most of the trade associations provide a range of services in return for their membership fee, including technical support on product performance, market data, lobbying for favorable positions on regulatory issues and grading verification. There are several trade associations that deal with graded lumber. The key organizations that oversee timber operations in the interior west are summarized below.

#### **Western Wood Products Association**

The Western Wood Products Association (WWPA), based in Portland, Oregon, represents producers of softwood lumber in 12 western states. They promulgate grading rules for western softwood species for structural lumber, appearance lumber and factory lumber. Structural lumber is used for construction. Appearance boards are graded based on aesthetic qualities that do not have load-bearing requirements. Factory lumber is graded as components for millwork.

WWPA provides a number of services for their members, including quality, technical, information and economic services. Quality services include developing grading rules for western species which are periodically updated as technical data become available. As a trade association, WWPA conducts mill inspections, mill grader certification, grader training and reinspection when disputes arise.



WWPA publishes design aids and technical literature for use by engineers and architects. They conduct research on structural properties of lumber and address regulatory and code issues on behalf of their members.

Market data are generated on western lumber as part of WWPA's product support. Lumber supply and demand, price information and product performance data are compiled and presented to members in seminars and proprietary reports.

Any sawmill can join the WWPA and receive its full services. Fees for membership are based on the volume of lumber produced but typically are \$300-\$400 per month for mills with less than 2 million board feet of production per year. WWPA staff do not grade lumber in the mills but certify the graders that are employed at the mill.

WWPA also addresses diverse niche markets, including material for machine stress rated lumber, guitar manufacturing, and lamination stock for glued-laminated timber. They also facilitate buyer-seller agreements where the material is produced subject to WWPA grading rules plus other criteria above the minimum standard.

#### West Coast Lumber Inspection Bureau

The West Coast Lumber Inspection Bureau (WCLIB), based in Portland, Oregon, offers services to its members similar to those offered by WWPA. They provide monthly grade supervision at member mills as well as provide on-call grading services for non-member mills. They also offer reinspection services when disputes arise and conduct mill recovery studies to assist mills in improving efficiency.

WCLIB does not provide the same level of information or economic services as does WWPA but provides essentially the same grading services. WCLIB's membership rates are based on production at the mill with \$330 per month as a flat fee. As with other trade associations that provide grading services, WCLIB requires that graders at the mills be certified and that the accuracy of their grading be checked monthly.

#### APA - The Engineered Wood Association

APA - the Engineered Wood Association (APA), based in Tacoma, Washington, does not provide grading services on solid sawn lumber. Instead, they focus on engineered wood products, such as wood composite panels, glued-laminated

timber, structural I-joists and laminated veneer lumber. APA's members include wood-products companies throughout the U.S. and Canada. Many of APA's members use solid sawn lumber in their manufacturing processes.

APA does not produce grading rules for lumber. They provide a trademark for the products manufactured in compliance with their quality assurance procedures. Much like the grade stamp on a piece of lumber, the trademark on an engineered wood product carries with it a level of confidence that the product had been manufactured to provide a known degree of service.

Although APA does not provide a direct means for small interior west mills to participate, APA members are in need of solid wood for specialty products. In 2002, manufacturers of wood I-joists on the west coast had lumber shipped from eastern Canada because of lack of suitable material. While Ponderosa pine may not have sufficient strength properties to meet I-joist manufacturers needs, other species available in the interior west may. Spruce is one such species.

Most material used in I-joists is machine graded to ensure high-quality material. This may limit the access to this market but points to the opportunity to identify manufacturers which have material needs that might be considered for small-diameter timber.

#### American Institute of Timber Construction

The American Institute of Timber Construction (AITC), based in Englewood, Colorado, is a national trade association for the glued-laminated timber industry. Formed later than the trade associations described above, AITC's purpose is to further the development, manufacture and marketing of glulam and related wood products used in construction.

AITC has member mills in the interior west. Imperial Laminators in Arizona is a member that has produced glued-laminated timber from Ponderosa pine. Since ponderosa pine has less load capacity than competing species used for glulam, attempts to penetrate existing markets for glulam were not successful. If load capacity is the primary requirement of a glulam beam then preference for smaller, stronger beams is understandable. AITC has a strong role in promoting and assisting with glulam as a structural material but is receptive to less critical applications. Architectural glulam, which is installed for aesthetics more than load capacity, is an area in which AITC has interest.

## Timber Products Inspection

Timber Products Inspection (TP) is an independently owned lumber inspection agency whose Western Regions Office is found in Vancouver, Washington. TP offers a number of services including lumber grading. TP is qualified through the American Lumber Standards Committee (ASLC) system for all North American species and also has an individual nationwide code report through the International Accreditation Service, Inc.

As with WWPA and WCLIB, TP provides grader training and periodic mill inspections for lumber grading. They also offer mill surveys and yield studies to improve mill efficiency. For mills that do not have certified lumber graders they will send a grader to grade a specific lot of lumber. This service is provided to mills on a contract basis. Monthly fees are \$200-250 per month for mills with less than 1 million board feet production. Mills that operate seasonally can subscribe to TP's services for 3-6 months; when the mills are inactive the grade stamps are recalled until production resumes.

TP also grades logs and roundwood. They have design values that have been approved by the International Conference of Building Officials. Neither the grading procedure nor the associated design values are available to the general public but only to end-users deemed qualified by TP. Subscribers to TP's services can grade roundwood and logs and place a stamp on the graded material.

TP will provide on-call grading services to production facilities or end users that do not subscribe to their services. The cost for on-call grading is typically \$250 but depends on the volume to be certified.

TP has worked with cooperatives, groups of mills that join together to have access to grading services. They are receptive to other forms of partnerships as a means to provide their services.

## ***RAW MATERIAL***

Most of the available resource throughout the interior west is Ponderosa pine with diameters less than 12 inches. The concept of small diameter trees differs between stakeholders and can range from a lower limit as small as nine inches up to logs as large as 18 inches. Nine to 12 inches is generally considered to be the size of this underutilized resource.

Ponderosa pine is a widely used wood species throughout the wood products industry. A standard for millwork, Ponderosa pine offers qualities that are highly desirable for machining and finishing products such as windows, doors and moldings. Ponderosa pine has also been used extensively as structural material. Tremendous volumes of pine were used for ties during the construction of the railroads across the west. Use of Ponderosa pine for construction of buildings and bridges was far less common because of the more desirable features of other species, such as Douglas fir.

Construction in the early 1900s in the interior west often relied on rail shipments of Douglas fir rather than locally available Ponderosa pine. Large knots, lower strength, lower durability and a greater propensity to warp frequently resulted in lack of use. The same factors that limited use of Ponderosa pine for construction a century ago still exist. If anything, the prejudice has been exacerbated by the availability of low-cost structural material brought in by rail and truck. Familiar species or species groups dominate the market, including Douglas-fir, larch, spruce-pine-fir and southern pine.

Ponderosa pine can be graded in accordance with WWPA or WCLIB rules. The design values used by engineers are typically lower than competing species. For example, No. 1, 2 x 6 Ponderosa pine has a design value in bending of 675 pounds per square inch (psi). No. 1, 2 x 6 Douglas-fir larch has a design value in bending of 1000 psi. For an engineer, the Douglas-fir larch lumber has nearly twice the strength and allows for use of less timber at, frequently, lower cost.

In spite of the prejudice and less desirable properties of Ponderosa pine, it is suitable for use in construction. The in-grade testing program initiated in the 1970s incorporated a wide range of material quality when establishing design values for various species. Small diameter timber was included in the test program and, as such, no additional testing is required before lumber cut from small diameter Ponderosa pine or other western species can be used.

Consumers desire high quality lumber. Straightness is the most visible quality noticed by end users but strength (design values), the ability to take preservative (durability) and a steady supply are important to retailers and end users alike. Most small trees produce wood that will warp and limit durability by not being receptive to preservative treatment. Small trees have high percentages of juvenile wood and compression wood, and that results in poorer quality for the wood of small diameter trees than of wood than can be obtained from larger trees.

Steady supply is a key factor in product acceptance. Wholesalers and retailers are reluctant to commit to a product without assurances that supply will be sufficient to meet demand. For decades small mills have dealt with problems of log supply and, therefore, raise skepticism when trying to market their products to volume retailers.

### ***VISUAL GRADING VERSUS MACHINE GRADING***

The vast majority of lumber in the U.S. is visually graded using rules such as those described above. A limited volume of structural lumber is machine stress rated (MSR), primarily for niche markets, such as the glued-laminated timber industry and truss manufacturers. The technical basis behind MSR is a known correlation between a nondestructive property and the strength of the wood. Either the lumber is deflected under a known load or the stress wave velocity and density of the lumber are measured. Based on log-established statistical relationships, a prediction of lumber strength is possible with less variation than using visual grading. The ability to predict lumber strength with less variability is valuable to end users that rely on strength (the glulam industry) or operate with very limited profit margins (truss manufacturers).

Machine grading (and the associated lower strength variability) represents additional value to the producer of the lumber. In the U.S. it is common to use high-speed, high-volume grading machines to produce MSR. The equipment and installation costs can range from \$150,000 to over \$1,000,000 per mill. The cost is sufficiently high and the market is currently limited, so that no sawmills in the lower interior west, of any size, produce MSR. Lumber that is MSR is brought into the region for secondary manufacture.

In lesser-developed countries MSR is produced using low-cost, low-production machines. At a cost of less than \$20,000 it is possible to implement machine grading but at significant labor expenditure. For developing countries this is an alternative to purchasing more expensive equipment. Based on the current minimum wage it is not feasible to machine grade lumber at a single mill and compete with material produced at high-production facilities. Of course, if an operation were not required to bear the costs of grading, it is certainly technically feasible for independent mills to produce.

### ***CONSTRAINTS TO GRADING***

The primary constraints to grading are available raw material and costs associated with grading. This report does not address the issue of available raw

material but notes that all discussions with mills began and ended with questions about available supply of timber. The costs associated with grading can be summarized in three areas: technical, economic and market.

Technical aspects of grading include equipment and training needed to produce graded lumber. There is a wide range of equipment considerations. The common perception of grading is that it is done on dimension lumber that must be planed and kiln-dried. This is not true. Grading can be done on rough sawn, green lumber. As such, drying and planing is not necessary. The market for rough sawn, green graded lumber is not large but has a role in farm and ranch and custom designed structures.

Dry kilns and planers add significant production costs in low-volume mills. Use of a neutral site to dry, plane and grade lumber is attractive but generally unworkable. The distance between mills often introduces significant transportation costs, which are difficult to recover. Small mills have not traditionally cooperated with other mills, even when the outcome is mutually beneficial.

Training of graders is essential. Regardless of the level of grading used, training is needed to ensure the accuracy of the grading. Unless mills join a trade association or subscribe to a grading service, training can be costly. Courses are available where instructors provide on-site training for a few days or a week but do not generally provide any follow-up after the course. Courses can cost in excess of \$5000 which is prohibitive for a small mill but may be feasible for a workshop where several mill personnel attend.

### ***MEANS OF GRADING FOR SMALL INDEPENDENT MILLS***

Small independent mills in the interior west can grade lumber by joining one of the trade associations or private companies with certified graders. Traditionally, small production mills have not been members of trade associations. Perceptions that the trade associations are only for large independent mills and corporations and that high fees are required to be a member have prevented small mills from joining.

The cost of membership can be several thousand dollars per year. For mills producing less than 2 million board feet per year this represents a significant expense. There is also the expense of having a certified grader on staff. It is not unusual for mill personnel to transfer jobs frequently, which discourages the investment in training a certified grader. Some mill owners take this upon themselves but time constraints limit this option.

Grading can add \$100-\$500 in value per thousand board feet (MBF) of lumber. Values for dimension lumber are generally not increased significantly due to the low cost of dimension lumber in the market. Dominated by large retailers (such as Home Depot and Loews), dimension lumber prices are controlled by large, high-production mills and are typically lower than the production costs for small mills (e.g. it sells for less money than the small mills can produce it for).

Wood used in structural applications generally must comply with building code requirements. In the interior west, the Uniform Building Code (UBC) is the governing code in most jurisdictions. Local jurisdictions (counties and towns) may have their code but most reference the UBC or its provisions. Building officials are responsible for determining that structures are built in compliance with local building codes. While not universal throughout the interior west, most building officials require some certification that wood used in construction is able to meet the structural requirements. Typically, that requirement is satisfied through grading and placement of a grade stamp on the lumber.

The grade stamp shows the building official that the lumber has been inspected according to specified criteria. The official can determine if the lumber is suitable for the intended purpose. If the lumber does not have a grade stamp it is difficult for the official to know whether the lumber is suitable for the intended use. Some officials have considerable experience with wood and take the position that the wood is at least as good as the minimum that would be required, therefore it must be suitable. Other officials will not make such assumptions and will not consider lumber unless it has been certified.

The building officials can use their discretion when approving material so long as they believe it meets the building code requirements. If an official understands the properties of timber and how it is to be used they can approve its use. The typical means of this understanding is through a grade stamp. However, grading rules are public information and anyone that the building official believes is competent to grade lumber can provide grade information.

### Alaska Model

Mills in the interior west are not the first to face the dilemma of grading. Prior to 1998 no mills in Alaska graded any lumber, regardless of the volume of their production. All lumber for use in construction was brought into Alaska. Grading associations had not become established in Alaska due to the high cost of conducting training and of monthly certification visits to the mills.

In recognition of the benefits of value-added processing, the Alaska Science and Technology Foundation (ASTF) and the Alaska Manufacturers Association (AKMA) approached the mills about introducing grading. Unlike many of the mills throughout the interior west, the Alaska mills did not appreciate the value-added concept of grading. The initial step in the Alaska effort focused on demonstrating the benefits of grading.

As the mills began to realize the potential for grading, market opportunities were demonstrated, such as the sale of Alaska yellow cedar boards for \$700 per MBF instead of \$200 per MBF. Seven mills in Alaska currently grade a variety of lumber products under WWPA rules.

The role of ASTF in bring grading to the mills was to subsidize the cost of the grading operations. The subsidy was provided through the National Institutes of Science and Technology (NIST) Manufacturing Extension Program (MEP). The NIST MEP in Alaska is run through AKMA. To promote the benefits of grading and conduct initial training, ASTF contracted with WWPA to provide a certified grader in Alaska for approximately 18 months; i.e. ASTF paid the time and expenses to have a full-time grader available to Alaska mills. Financial support came from the MEP funds.

The mills are licensed to grade product based on species and product mix. For example, if a mill has access to small-diameter yellow cedar, they are certified to grade yellow cedar dimension lumber. This limits the need for training personnel to grade a wide range of species and products. The model has allowed mills to focus on niche markets where they can realize the financial returns for grading. The mills do not attempt to compete with high-production, low-cost mills.

Each mill that participates is a member of WWPA and has access to the technical, economic and marketing services offered by WWPA. Currently the mills pay 20 percent of the cost of being a member of WWPA. The balance of the cost is covered through MEP funds. The cost paid by the mills is approximately the same cost paid by member mills in the Pacific Northwest that do not have to bear the extreme travel costs incurred with having the WWPA grader travel to and throughout Alaska.

The mills in Alaska have found acceptance for their products. In addition to the WWPA grade stamp they place a "Made in Alaska" stamp on the graded lumber to take advantage of local pride.

Key to the success of the Alaska program was selling the concept to individual mills based on the benefits to that mill. The grading program was not promoted



as a cooperative program due to past failures to get mills to cooperate. The ASTF negotiated the contract and terms with WWPA, not the individual mills. This made for a workable structure that ASTF could manage to which WWPA was receptive. ASTF pays for WWPA's services. Payments from the mills to WWPA are reimbursed by WWPA to AKMA to reduce their cash outlay. The goal is to eventually make the grading program, and the mills, self-funding.

Even though the mills have not formed a cooperative, they provide input to ASTF and AKMA as an advisory group. The group addresses market opportunities, such as government purchasing agents, and technical needs, such as dry kilns. Additional information on the Alaska grading program is provided in the appendix.

The interior west states do not have the level of support available through NIST that Alaska does. NIST requires that states contribute to the program to make NIST funds available for programs such as the Alaskan grading effort. Unfortunately, Colorado does not contribute to the program at a sufficient level to make similar funds available for introducing grading in the interior west.

Colorado has the Mid-America Manufacturing Technology Center (MAMTC), based in Boulder. They have funded wood projects, but are primarily limited to training seminars and marketing consulting services. As such, MAMTC is not currently a viable funding source for promoting grading. However, a change in Colorado's contribution or access to other funding programs may provide the necessary financial support to establish a program similar to that in Alaska. The Interior West Center or the Colorado State Forest Service are well positioned to assume the role of finding available funds and coordinating a grading program.

### Building Departments

Building departments are the local jurisdiction that regulates construction. Most local jurisdictions throughout the interior west adopt the Uniform Building Code (UBC) as the guide for correct building procedures. All jurisdictions have the ability to interpret the intent of the UBC and the process tends to be based on experience and personal knowledge. This is perhaps more prevalent in rural jurisdictions than in large urban jurisdictions.

Discussions with building officials reinforced this idea. Two county building departments were contacted in Colorado to determine their requirements for timber used in construction. In both cases, load-bearing timber must meet the requirements of the UBC. The UBC specifies design values for load-bearing timber based on data published through the American Forest & Paper Products Association, the APA - The Engineered Wood Association, and the American

Institute of Timber Construction. For lumber, a grade stamp by a certified grading agency is the most common means of determining that lumber meets the requirements of the code.

The question of whether a grade stamp was necessary brought similar responses. A grade stamp is not necessary, but proof that the material meets the grade required by the UBC is generally required. In one case, proof could be provided by an individual that the building official knew had adequate knowledge of lumber grades. If someone with experience or knowledge could demonstrate that they knew the grading rules for the application, that would be sufficient in one county. In another county the individual must be a certified lumber grader. To be certified implies affiliation with a trade association or certified grading agency. While affiliation is not a requirement it is practically a necessity.

These scenarios apply only to load-bearing timber as required by the UBC. Where grades or design values are not available, such as for roundwood, local jurisdictions are generally silent. For lumber used in construction, the ability to meet a grade (i.e. to conform to the requirements of a certified grading agency) can be met by establishing an understanding with the local building official that does not require a recognized grade stamp being placed on the lumber. This may be an expedient means of providing value-added products in local markets without subscribing to a grading service. What is required is that someone must be qualified to grade lumber or structural timbers and convince the local jurisdiction that the material they grade conforms to the requirements of the UBC.

### Niche Markets for Graded Lumber

Non-traditional grading opportunities exist for mills in the interior west. Competing with graded dimension lumber is not feasible without financial subsidy and identifying local or niche markets. Establishing niche markets is one of the simplest means of adding value to milled wood products. Niche markets represent close business relationships between a seller (the mill) and a buyer. The terms of the sale often include a definition of “grade”. Material meeting the grade will be purchased at a specified price. Material not meeting the grade is generally not purchased at all, or may be bought at a reduced price. The product can be structural or non-structural.

An example of a non-structural niche market is the sale of aspen paneling. The mill and its buyers have agreed on the qualities of boards that meet a self-defined grade. The qualities include features such as knot size and manufacturing defects. Material meeting the grade brings a 20 percent cost premium over

material not meeting the grade. No grading rules are cited nor is there a cost for membership or subscription to a grading service.

Another level of niche market grading is the production of material that meets a specific end use. As part of this project, a brief investigation was done on the use of small diameter timber for sound barriers along highways. Widely used in Europe, sound barriers have not enjoyed similar success in the U.S. A variety of reasons are given for the limited market, including:

- Material quality
- Lack of durability
- Lack of steady supply
- Maintenance requirements
- Lack of specifications (technical and purchasing)

Only a few producers have supplied lumber for sound barriers. Some sound barriers have been made from individual pieces of lumber, others from glued-laminated panels. Whether material quality was a priority or not is unknown but much of the lumber would warp or come loose from the supports, resulting in an unsightly appearance.

Many of the sound barriers installed were either not pressure treated or treated poorly, resulting in decay and insect attack of the barriers. Concrete and metal barriers do not suffer similar problems. The need to paint or repair wooden sound barriers added cost to their use and created perceptions that the barriers were inferior.

Unsteady supply is a typical reason for procurement operations to change materials or suppliers, even when product performance has not been questioned. Although efforts were made to promote wooden sound barriers in the U.S., the efforts appeared to be quite limited and focused on broad dissemination rather than establishing business relationships with potential users.

The lack of knowledge about specifications, or lack of the specifications themselves, makes it difficult to promote a niche product, particularly to a corporate or government buyer. Specifications may be technical (how a product works and what it will do) or for purchasing (how the product is known to meet the requirements). Discussions with the Colorado Department of Transportation (CDOT) revealed that specifications for wooden sound barriers are not readily accessible to CDOT staff.

Guardrail posts represents another market opportunity for small diameter timber. Imperial Laminators has produced glued-laminated guardrail posts of

Ponderosa pine that meet highway specification requirements. Roundwood for vigas in columns in southwest-style structures is yet another application. Each of these has had some success for producers in the interior west and reinforces the importance of niche market opportunities.

A key to successful niche markets is the relationship established between buyer and seller. Unless overriding standards exist that determine whether a product can be used (such as specifications for guardrail posts), the increase in value is established by agreement between the buyer and seller. The basis of these agreements, while not meeting a strict definition of grading, is, in fact, grading. The material requirements are specified and any material meeting the specifications warrants the contract price; any material that does not meet the specifications does not and is worth less or has no value to the buyer.

## *CONCLUSIONS*

In summarizing the issues on the feasibility of grading lumber produced by mills in the interior west, we go back to the questions posed at the beginning of the study.

1. What infrastructure is needed at the mills? For visual grading, no additional equipment is needed. The expense of machine grading can likely not be justified for any single operation, and not likely for any cooperative facility. Adding a dry kiln and planer would provide more grading opportunities provided the investment costs can be justified (not likely based on grading alone).
2. What qualities do customers require? Customers require appearance first. Lumber that is straight, without significant warp, is much more desirable than lumber that is crooked. Perhaps that simplifies the issue but it points out that mills producing lumber with unappealing appearance will have difficulty selling their products, whether it is graded or not. Steady supply and material properties are required by customers seeking alternative sources of material, such as I-joist or glulam producers. For dimension lumber, cost is a factor with which the mills in the interior west cannot compete based on economies of scale.
3. What mechanism can be used to grade the lumber? Visual grading is the best means of grading for mills in the interior west. Machine grading cannot be justified due to the expense, limited market and well-established competition.
4. Can the mills form a liaison with industry trade associations that reflect their constraints? Yes. Although individual mills can join or subscribe, the

Alaska model of having an outside group contract with a trade association removes much of the financial and logistical constraints that may inhibit a small mill from subscribing directly.

5. Is there a means for the small mills to capitalize on trade association efforts to promote and support graded lumber? The Alaska model for bringing grading to mills should be considered. Beyond the benefits of grading, links to a trade association that offers marketing and technical services provide the means for small mills to receive assistance in these areas as part of their subscription.

6. What are the economic factors that drive the viability of a grading operation in an independent mill? The cost of becoming a certified grader and maintaining certified grader status may limit the ability of some mills to institute grading. If grading is viewed as a means of using additional timber and thereby reducing fuel loads in the forest, assistance to the mills can be achieved through rural development funds and assistance programs rather than self-sufficient business ventures.

Grading could likely be achieved for small, independent mills of the interior west by adopting an approach similar to the Alaska model. Within Colorado, the Colorado State Forest Service has qualified staff and is well placed to provide technical assistance to mills. Organizations such as the Four Corners Partnership have a proven track record of coordinating programs similar to the Alaska model. To succeed, the model should have the cooperation and participation of the lumber producers, as well as have solid technical, organizational and financial support.

***GRADING RULES FOR SPECIES OF THE INTERIOR WEST***

West Coast Lumber Inspection Bureau. Standard No. 17, Grading Rules for West Coast Lumber. West Coast Lumber Inspection Bureau, Portland OR.

Western Wood Products Association. Western Lumber Grading Rules 98. Western Wood Products Association, Portland, OR.

## GLOSSARY<sup>1</sup>

Checks – A separation of the wood normally occurring across or through the rings of annual growth and usually as a result of seasoning.

Grain – The fibers in wood and their direction, size, arrangement, appearance or quality.

Knots – A portion of a branch or limb that has become incorporated in a piece of lumber. In lumber, knots are classified as to form, size, quality and occurrence.

Pitch – An accumulation of resinous material.

Pitch streaks – A well-defined accumulation of pitch in the wood cells in a streak.

Shake – A lengthwise separation of the wood which occurs between or through the rings of annual growth.

Skips - Areas on a piece that failed to surface clean.

Slope of grain - The deviation of the line of fibers from a straight line parallel to the sides of the piece.

Split – A separation of the wood through the piece to the opposite surface or to an adjoining surface due to the tearing apart of the wood cells.

Stain - A marked variation from the natural color.

Unsound wood (decay) - A disintegration of the wood substance due to action of wood-destroying fungi, also known as dote or rot.

Wane – Bark or lack of wood from any cause, except eased edges, on the edge or corner of a piece of lumber.

Warp – Any deviation from a true or plane surface, including bow, crook, cup, and twist or any combination thereof.

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<sup>1</sup> All definitions taken from *Western Lumber Grading Rules* 98

**APPENDIX A: INFORMATION ON TRADE ASSOCIATIONS AND ACCREDITED GRADING AGENCIES**

Name: American Lumber Standard Committee, Inc.  
Address: P. O. Box 210  
Germantown, MD 20875-0210  
Telephone: (301) 972-1700  
Fax: (301) 540- 8004  
Web Site: [www.alsc.org](http://www.alsc.org)  
E-mail: [alsc@alsc.org](mailto:alsc@alsc.org)

Name: American Institute of Timber Construction  
Address: 7012 South Revere Parkway, Suite 140  
Englewood, CO 80112  
Telephone: (303) 792-9559  
Fax: (303) 792-0669  
Web Site: [www.aitc-glulam.org](http://www.aitc-glulam.org)  
E-mail: [info@aitc-glulam.org](mailto:info@aitc-glulam.org)

Name: APA – the Engineered Wood Association  
Address: P. O. Box 11700  
Tacoma, WA 98411-0700  
Telephone: (253) 565-6600  
Fax: (253) 565-7265  
Web Site: [www.apawood.org](http://www.apawood.org)  
E-mail: [help@apawood.org](mailto:help@apawood.org)

Name: Timber Products Inspection (Western Regions Office)  
Address: 105 S. E. 124<sup>th</sup> Avenue  
Vancouver, WA 98684  
Telephone: (360) 449-3138  
Fax: (360) 449-3953  
Web Site: [www.tpinspection.com](http://www.tpinspection.com)  
E-mail: [info-west@tpinspection.com](mailto:info-west@tpinspection.com)

Name: West Coast Lumber Inspection Bureau  
Address: P. O. Box 23145  
Tigard, OR 97281  
Telephone: (503) 639-0651  
Fax: (503) 684-8928  
Web Site: [www.wclib.org](http://www.wclib.org)  
E-mail: [info@wclib.org](mailto:info@wclib.org)



Name: Western Wood Products Association  
Address: 522 S. W. Fifth Avenue, Suite 500  
Portland, OR 97204-2122  
Telephone: (503) 224-3930  
Fax: (503) 224-3934  
Web Site: [www.wwpa.org](http://www.wwpa.org)  
E-mail: [info@wwpa.org](mailto:info@wwpa.org)

## ***APPENDIX B: SUPPLEMENTAL INFORMATION ON THE ALASKA MODEL<sup>2</sup>***

Until this project, there was no graded lumber produced in Alaska. Thus, all the lumber to build a house came from the lower 48 or Canada. Because of the small size and remote locations of Alaska's mills, no wood-grading agency was willing to provide grading service at the same cost as for mills in the lower 48. Because the owners and operators of Alaska mills were not yet convinced of the value of producing graded lumber, Alaska Science and Technology Foundation (ASTF) and AKMA agreed to initially subsidize a project to remove the Alaska cost penalty, demonstrate the value of grading and help mills increase their financial strength.

Mike MGuigan of Western Wood Products Association, Portland, Oregon, is a grader under contract to AKMA who is performing wood grading services. Mike makes a regular monthly swing around Alaska visiting participating sawmills helping them with their grading, and visits non-participating mills to explain the program and offer help. In addition, he does some spot grading of lumber for mills that are not certified to grade lumber themselves. Mike also provides some general technical services for mills. For example, he taught one mill the difference between clear and tight knots in yellow cedar enabling them to get \$700 per feet instead of \$200 per feet. There are now 7 mills in Alaska grading their own lumber. Participating mills are producing and grading about 80,000,000 board feet per year. This is about 90% of all the lumber that is being produced in Alaska. The impact of grading on the participating mills has been huge.

One company helped by this project is Northland Lumber in Fairbanks. AKMA provided technical assistance in drying of lumber which helped them win approval by the Borough of Fairbanks to use their graded and dried White Spruce in Borough construction. This has expanded the use and value of white spruce (previously considered a junk wood) considerably in the Fairbanks area.

The Wood Grading Project is creating new markets for Alaska Sawmills. It has enabled sawmills to find new markets and receive a higher price for their yellow cedar. The Ketchikan and Thorne Bay Ranger District is now using yellow cedar for above ground applications on trail projects. This market was previously unavailable because of the requirement that stock be grade stamped. The now graded yellow cedar is coming out of a pulp log which previously had little or no value. There is an additional environmental benefit in that the yellow cedar replaces pressure treated lumber. Yellow cedar has natural insecticides and rot

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<sup>2</sup> Taken from the AKMA website at [www.akma.com](http://www.akma.com)

retardants, and does not require pressure treating to delay decay. For the mills involved, this has had a positive impact on job creation and increased profitability. Luthier Forest Products of Wrangell, now able to grade stamp their yellow cedar, has increased their annual production by 80,000 board feet. Last Chance Enterprises went from 0 to 30,000 board feet. The economic impact of the grade stamping project is reflected in the fact that over 100,000 board feet is now selling at \$800 \$1000 per 1000 board feet compared to its price of \$200 per 1000 board feet prior to grading.