Canadian Lumber Design Values Monitoring Challenges and Teamwork

for over 50 yrs



Maritime Lumber Bureau AGM, Halifax, NS, May 2025 **Richard Desjardins,** ing. P.Eng M.Sc. President, NLGA

Canadian Lumber – Quality Assurance from Manufacture to Use

When lumber is used in structural applications, it must perform appropriately to ensure the finished building is safe for public use. In Canada, this assurance is achieved via a complex system of product standards, engineering design standards and building codes; which are put into effect through grading oversight, technical support and a regulatory framework.



INTRONTY



The NLGA Grade Rule incorporates the National Grading Rule for Dimension Lumber (NGR)

The NGR establishes standard lumber grades and grade names for all commercial species of dimension lumber, thus assuring lumber users of uniform design criteria and performance throughout Canada and the U.S.







NLGA establishes and monitors structural lumber design values of Canadian species

These lumber design values are approved by the CSA O86 Technical Committee on Engineering Design in Wood for use in Canada and by the ALSC Board of Review for use in the U.S.



REVISED APRIL 20





The challenge for use in construction: Establish properties based on known relationships

« The point being made is that there is an abundance of strong material, we are simply unable to identify the strong pieces" (Madsen 1992)

MOE-Fb, MOE-Ft, Fb-Ft, SG-MOE









Source: Dr. Siegfried F. Stiemer UBC - via CW



Lumber grading techniques

Exploit a relationship between

a predictor and design values

- Visual grading
 - NLGA Standard Grading Rules for Canadian Lumber
- Machine Graded Lumber (NLGA SPS2)

95% of the data will fall above the line



Figure 1—Prediction of strength by regression analysis.





Design values - 1980 - 2000

North-American In-Grade Program

- Full size specimen testing
 - "we test what is being produced"
- Different sizes and Grades
- National Sampling
- Complete ASTM D1990 matrix (approx. 70 000 pieces)

Use	Bending						Tension			Compression		
Grade	Sel.Str.	1+BTR ¹	No. 2	No. 3	No. 2⁵	LF	Sel.Str.	1+BTR	No. 2	Sel.Str.	1+BTR	No. 2
2x4 ²	360	360	360	120		120	360	360	360	360	360	360
2x8 ³	360	360	360	120	500		360	360	360	360	360	360
2x10⁴	360	360	360	120			360	360	360	360	360	360

1 "No. 1 and better" includes Select Structural and No. 1 grades.

2 For bending and compression tests, specimens were 8 th long. For tension tests, specimens were 12 th long.

- 3 For bending and compression tests, specimens were 12 ft long. For tension tests, specimens were 16 ft long.
- 4 For bending and compression tests, specimens were 14 ft long. For tension tests, specimens were 16 ft long.
- 5 Augmented sample for Spruce-Pine-Fir only.
- 6 Light Framing Grades.

Adopted In-Grade Design Values USA: ALSC BoR Canada: CSA 086





Results used for about 20yrs without change



Various challenges for our industry



Potential impact on lumber quality and design values

Changes in timber supply?

- Species mix- stable proportions?
 - Current % vs 1990 In-grade sampling

• Species separation during manufacturing?

Log yard, Drying, etc

Climate change

- Resource changes?
- Fire-killed lumber







Design values - Monitoring

NLGA monitoring programs since late 1990's:



- 1. ASTM D1990 5yrs mandatory
- 2. Long Term Monitoring Annual sampling







Design values - Monitoring

On the 3 major Species Groups

- S-P-F
- D Fir-L(N)
- Hem-Fir(N)

М	S-P-F No. 1 KD-HT					
®						
L						
В	99 NLGA					

Referenced back to In-Grade results





Design values - Monitoring

S-P-F et D Fir-L(N) monitoring confirmed that there was

no significant downward shift in the MOE and MOR properties

ALSC BoR has reviewed and accepted the conclusions Next ASTM D1990 mandatory monitoring S-P-F (July 2026) and D Fir-L(N) (2028)





Design Values - Monitoring

In 2022, NLGA initiated a D1990 reassessment for Hem-Fir(N)



2025 Updated Published Design Values in

- CSA O86 (Canada)
- NDS (USA)

Updates ensure continued structural reliability while maintaining confidence for builders and designers



Reassessment of Design Values for Hem-Fir (N) Dimension Lumber

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Effective April 1, 2025

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Design Values - Monitoring

ASTM D1990 Monitoring required over time ALSC and ASTM – 5yrs

Questions raised

- 1. What Resource changes, Process changes?
- 2. When Continuous, 5yrs, 3yrs?
- 3. Changes in products manufacturing and their segregation?
- 4. Do we maintain published design values in various codes ?
- 5. What is a significant change?
- 6. If a change is detected, How many pieces need to be evaluated?
- 7. Where? (Agencies, Mills, lab, etc)
- 8. What property? (bending, tension, other, etc)





Next Steps for use in Canada – CSA 0141-23

- 5th species group in O86 and National Building Code Canada
 - Cdn Norway Spruce, Hem-Tam, Yellow Cedar, etc.
- New equivalences for Species groups under the NGR
 - SPF-s, SYP, others?
 - European Lumber?
 - Visual vs MSR grading?





Next Steps for use in Canada

- Introduction of a Strength Class System
 - Simplify designer's options
 - e.g. Trying not to replicate the NDS numerous categories
 - Producers' greater flexibility
 - e.g. EC5
- Keep the use of lumber simple to designers





Canadian quality system

A global teamwork

- Mills producers
- 10 Canadian agencies





Canadian Universities







