NATIONAL LUMBER GRADES AUTHORITY

SPS 5

Special Products Standard for Face-Glued Lumber "Vertical Use Only"

May 2026

SPS 5

SPECIAL PRODUCTS STANDARD

FOR

FACE-GLUED LUMBER

"VERTICAL USE ONLY"

EFFECTIVE: May 1, 2026

Supersedes all Previous Editions, Revisions and Supplements

Approved by the Canadian Lumber Standards Accreditation Board – March 27, 2026

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as complying with the ALSC Glued Lumber Policy – April 10, 2026

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PREFACE

This NLGA Special Products Standard for Face-Glued Lumber "Vertical Use Only" (**SPS 5**) consists of 26 pages.

This Standard, like all NLGA Standards, is subject to periodic review and may be amended from time to time. To identify or obtain the most current version of NLGA - SPS 5, or any associated Supplements or Errata, check the publication section of the NLGA website at www.nlga.org.

The following is a chronological listing of SPS 5 revisions since December 2002.

a) Revised Sections Effective December 1, 2003

- Section 7.1.3

b) Revised Sections Effective December 1, 2005

- Section 7.1.3

c) Revised Sections Effective December 1, 2006

- Sections 1.5, 3.1, 6.2, 8.3, 9.2.4, 11.2, 13.3, and 15.2.1
- Figure 2 – added

d) New and Revised Sections Effective Nov 1, 2010

- Section 2.1 – added "HRA" and Spot-Check definitions and revised the "Interchangeable" definition
- Section 2.2 – updated the "Reference Publications"
- Section 10.2 – added "HRA"
- Sections 14.1 and 14.2 – added "Spot-check" references

e) Revised Sections to Meet the ALSC Glued Lumber Policy Effective November 9, 2015

- Section 1.5.2
- Section 2.2 – updated publication references
- Sections 3.3.1, 9.2.2, 10.2, and Appendix VIII

f) Revised Sections Effective May 1, 2026

- Add changes to metric dimensions to align with PS 20 throughout the Standard
- Table 2 – update test values for S-P-F, D Fir-L (N), and North Species; revise Hem-Fir (N) test values based on approved new design values; and add 2x5 size
- Section 1.0 – edits and add Section 1.6
- Section 2.0 – add and update definitions and references
- Sections 3.4.1, new 7.1.4, 10.2 – add "HRA" requirements
- Sections 3.0 to 11.0 – add edits and clarifications
- Section 9.3.2 – revise upper testing temperature for equipment and specimens
- Section 12.0 – update QC Manual requirements
- Appendices III, IV, V, VI, VII – revise and update
- Appendix VIII – add Span-to-Depth factors

SPECIAL PRODUCTS STANDARD FOR FACE-GLUED LUMBER "VERTICAL USE ONLY"

1.0 SCOPE

1.1 PART A AND PART B

This Standard consists of two parts:

PART A - PRODUCT SPECIFICATIONS

This Part specifies grade characteristics, standard sizes, visual grading and adhesive requirements, property requirements, property evaluation procedures, and grade stamping requirements for Face-Glued Lumber "Vertical Use Only".

PART B - QUALIFICATION AND QUALITY CONTROL REQUIREMENTS

This Part specifies minimum qualifications and quality control requirements for a facility producing face-glued lumber in accordance with the requirements of **Part A**.

1.2 NLGA STANDARD GRADING RULES

This Standard shall be used in conjunction with and forms part of the National Lumber Grades Authority Standard Grading Rules for Canadian Lumber (NLGA Standard Grading Rules).

Note: *Paragraph numbers (NLGA Para. xx) referenced in this Standard refer to the numbered paragraphs in the NLGA Standard Grading Rules.*

1.3 UNITS

This Standard states values in inch-pound (imperial) units. The equivalent SI (metric) values, given in parentheses, are provided for information only. In case of discrepancy, the values stated in imperial units shall take precedence.

1.4 DESIGN VALUES

Face-glued lumber produced to the requirements of this Standard is assigned design values equivalent to the visually graded STUD grade of non-face-glued solid-sawn lumber of the same species group and size.

For use in Canada, design values are assigned to visually graded lumber of equivalent grade by the CSA Group - Technical Committee on Engineering Design in Wood and are published in NLGA Para. 851 and in CSA 086.

For use in the U.S., design values are published in NLGA Para. 904 and in the American Wood Council (AWC) National Design Specification (NDS) Supplement.

1.5 FACE-GLUED LUMBER REQUIREMENTS

1.5.1 GENERAL

This Standard applies to the manufacture and quality control of Face-Glued "Vertical Use Only" Lumber.

The scope of products covered by this Standard shall meet the following criteria:

a) Bonded surfaces between each lumber component shall run parallel to the edge,

b) Bonded surfaces shall be flat with no profile included, and

c) The final product shall have bonded surfaces that are only visible on the wide face of the full-size piece.

The quality of the components and the bonded surface(s) shall be verified by inspection and test procedures. The quality of full-size face-glued lumber shall be verified by visual grading in accordance with NLGA Para. 121a.

1.5.2 PERMITTED PRODUCT CONFIGURATIONS

The following product configurations are permitted under this Standard:

a) Face gluing of solid sawn lumber components,

b) Face gluing of solid sawn lumber components and ripping to nominal 2-inch thick lumber,

c) Face gluing of fingerjoined lumber components meeting the requirements of NLGA SPS 1 or SPS 3,

d) Face gluing of fingerjoined lumber components meeting the requirements of NLGA SPS 1 or SPS 3 and ripping to nominal 2-inch thick lumber, or

e) Fingerjoining in accordance with NLGA SPS 1 or SPS 3 of face-glued lumber components meeting the requirements of this Standard.

Note: *See APPENDIX IX for example products that fall within the scope of this Standard.*

1.6 INTERPRETATIONS

The Interpretation of the provisions in this Standard are vested in NLGA.

2.0 DEFINITIONS AND REFERENCED PUBLICATIONS

2.1 DEFINITIONS

The following definitions apply to this Standard.

AGENCY: organization accredited by the Canadian Lumber Standards Accreditation Board (CLSAB) and/or the American Lumber Standard Committee (ALSC), Board of Review engaged in the grading, grade stamping and/or certification of lumber or who certifies facilities to grade and place a grade stamp upon lumber.

AGENCY SUPERVISOR: representative of the Agency who is approved by the Agency to inspect facilities producing face-glued lumber.

AGENCY VERIFICATION: specific set of procedures used by an Agency to verify that an item of grade stamped face-glued lumber conforms to the requirements of this Standard and the NLGA Standard Grading Rules.

BONDED SURFACE: location at which two components are held together with a layer of adhesive.

BONDLINE: layer of adhesive that attaches two components.

CALIBRATION: procedure of comparing two instruments, measuring devices or standards, one of which is of known accuracy traceable to a nationally recognized standard.

CHARACTERISTIC PROPERTY VALUE: value corresponding to a percentile in the assumed statistical distribution of a particular property of the material.

Note: *For the purpose of this Standard, characteristic strength values (i.e., MOR and UTS) are defined as the population 5th percentile values obtained under a short-term test load.*

Characteristic stiffness values (i.e., E_{5th} and E) are defined as the population 5th percentile and mean value, respectively, obtained under a short-term test load.

The characteristic specific gravity is defined as the population mean value.

COMPONENTS: lumber segments that are used for the lay-up of face-glued lumber.

Note: *Also referred to as candidate stock.*

CONFORMANCE: state in which the production process meets the requirements of this Standard.

CONTROL CHARTS: reports or records used to monitor the variation between the process quality level and a predetermined conformance quality level, and to indicate when changes in the process are required to bring the process back into an "**IN-CONTROL**" state as defined by the conformance quality level.

EVALUATION: assessment of a facility's manufacturing process and its quality control programs to determine whether it is capable of producing a product that meets the requirements of this Standard.

FACE-GLUED LUMBER: product made by bonding together two or more lumber components along longitudinal flat surfaces (without profiles) so that the grain of all laminations is essentially parallel and with bondlines located only on the wide face.

FACILITY: manufacturing plant that produces face-glued lumber and conducts visual grading and quality control sampling and testing.

GRADE STAMP: grade identification applied on a piece of face-glued lumber which includes the appropriate information under Section 10.

Note: *The grade stamp (also referred to as a grade mark) indicates that the face-glued lumber manufacturing process meets the provisions of this Standard and the requirements of the Agency's qualification and quality control procedures.*

HEAT RESISTANT ADHESIVE (HRA): adhesive that meets the elevated temperature performance requirements of ASTM D7374 or ASTM D7470, and CSA O177, Annex A.2.

IN-CONTROL: state in which on-going quality control testing indicates that the production process meets the mechanical property and delamination requirements of this Standard.

INDEPENDENT CALIBRATION LABORATORY: organization that performs testing to verify and establish results for test equipment, operating in accordance with ISO/IEC 17025 and accredited by an Accreditation Body listed under the ILAC Mutual Recognition Agreement (ILAC MRA).

INSPECTION: examination, measurement and/or testing of the properties of an item to ensure they meet the quality control requirements of this Standard.

INTERCHANGEABLE: capable of being assigned the design values of another product under certain end-use conditions.

Note 1: *The specific end-use conditions are described in Section 3.3.*

Note 2: *Products are deemed to be interchangeable only to the extent established by the minimum requirements specified in this Standard. Comparability of properties not explicitly covered by this Standard may require additional assessment.*

ITEM: lumber of a given grade, size (without reference to length), species or species group, and moisture content.

NON-CONFORMANCE: deficiency in a property, documentation or procedure that renders the quality of an item not to be in adherence to specified requirements of this Standard and therefore unacceptable.

Note: *Examples that may cause non-conformance include physical defects, test failures, incorrect or inadequate documentation, and deviations from prescribed processing, inspection, or test procedures.*

OUT-OF-CONTROL: state in which on-going quality control testing indicates that the production process does not meet the mechanical property and delamination requirements of this Standard.

PRESSURE-VACUUM-DRY TREATMENT: test procedure that provides an indication of the item's ability to resist exposure conditions normally encountered during shipment, storage, and/or use.

QUALITY CONTROL: set of procedures that provide a means of measuring and regulating the performance of an item to specified requirements.

QUALITY CONTROL MANUAL: document which sets forth a specific set of instructions to describe the quality control functions and requirements to be carried out in the production of face-glued lumber at a specified facility.

Note: *Also referred to as a Plant Standard.*

RANDOM SAMPLING: procedure by which a representative sample is generated from a population.

RE-QUALIFICATION: analysis of the test results from a random sample drawn from a process that has undergone corrective action in response to an "**OUT-OF-CONTROL**" condition or re-establishing conformance of items where production has ceased for a period exceeding one year.

SEPARATE-APPLICATION ADHESIVE: multi-component adhesive that has the following characteristics:

a) Each adhesive component is applied separately to one or both sides of the bonded surface along the bondline.

b) All adhesive components are required for the bond strength to be fully developed.

c) Some separate-application adhesives require that the components be **blended** for the adhesive to develop the required strength and durability. Other systems simply require the components to contact each other.

Note: *"Blended" is defined as thoroughly mixing the adhesive components together resulting in a homogeneous mixture.*

SHIPMENT: one or more bundles, packages or units of lumber that comprise an order.

SPECIMEN: piece of full-size face-glued lumber randomly selected from production for purposes of quality control, quality verification testing and any subsequent analysis.

SPOT CHECK: verification that the test equipment is still within calibration tolerances.

SUBSEQUENT QUALIFICATION: analysis of the test results from a random sample drawn from a process whose production is in-conformance with the requirements of this Standard but has been modified for reasons other than to respond to a detection of non-conformance.

Note: *Subsequent qualification procedures apply only to the process changes specified in this Standard. Other process changes are evaluated using the Initial Qualification procedures.*

TEST BLOCK: section of face-glued lumber cut from a full-size specimen selected for purposes of quality verification testing and any subsequent analysis.

TEST EQUIPMENT: equipment used by the facility to determine the bending and shear strength properties of a specimen for the purpose of determining conformance to the specified requirements of this Standard.

TEST LOAD: load that will induce a stress that corresponds to the characteristic property value for the item under consideration.

WOOD FAILURE: failure induced at the bondline where the bonded surface fails by the tearing of wood fibre from one or both side(s) of the bondline.

2.2 REFERENCED PUBLICATIONS

AITC (American Institute of Timber Construction)

Test Methods for Structural Glued Laminated Timber: AITC Test T107 – Shear Test (2007)

ALSC (American Lumber Standard Committee, Incorporated)

Glued Lumber Policy (2024)

AWC (American Wood Council)

National Design Specification (NDS) Supplement: Design Values for Wood Construction (2024)

ASTM International

D905-08 (2021) Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading

D1101-97a (2024) Standard Test Methods for Integrity of Adhesive Joints in Structural Laminated Wood Products for Exterior Use

D2559-12a (2024) Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions

D4444-13 (2018) Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters

D5266-13 (2020) Standard Practice for Estimating the Percentage of Wood Failure in Adhesive Bonded Joints

D7374-21 Standard Practice for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber

D7438-20 Standard Practice for Field Calibration and Application of Hand-Held Moisture Meters

D7470-21 Standard Practice for Evaluating Elevated Temperature Performance of End-Jointed Lumber Studs

E4-24 Standard Practices for Force Calibration and Verification of Testing Machines

E74-18e1 Standard Practices for Calibration and Verification for Force-Measuring Instruments

CLSAB (Canadian Lumber Standards Accreditation Board)

Regulations (2024)

CSA Group

CSA O86:24 Engineering design in wood

CSA O112.7:M1977 (R2006) Resorcinol and phenol-resorcinol resin adhesives for wood

CSA O112.9:21 Evaluation of adhesives for structural wood products (exterior exposure)

CSA O122:24 Structural glued-laminated timber

CSA O141:23 Canadian standard lumber

CSA O177:23 Qualification code for manufacturers of structural glue-laminated timber

ISO

ISO/IEC 17025:2017 (c2023) General requirements for the competence of testing and calibration laboratories

ISO/IEC 17065:2012 (c2024) Conformity assessment – Requirements for bodies certifying products, processes and services

NIST (National Institute of Standards and Technology, U.S. Department of Commerce)

PS 20-25 American Softwood Lumber Standard

NLGA

Standard Grading Rules for Canadian Lumber (2022)

SPS 1 Special Products Standard for Fingerjoined Structural Lumber (2023)

SPS 3 Special Products Standard for Fingerjoined "Vertical Use Only" Lumber (2023)

PART A - PRODUCT SPECIFICATION FOR FACE-GLUED LUMBER – VERTICAL USE ONLY

3.0 PRODUCT DESCRIPTION

3.1 GENERAL

This Standard applies to visually graded Face-glued "Vertical Use Only" Lumber (herein referred to as face-glued lumber*)* to be used as a member loaded in axial compression where bending and tension design load components do not exceed the duration for wind or seismic loading as defined in the applicable engineering design standard and where the in-service moisture content of the wood will not exceed 19%.

3.2 DEMONSTRATION OF CONFORMANCE

Face-glued lumber represented as conforming to the requirements of this Standard, shall be manufactured by a process in which the quality of the bonded surface produced is continuously monitored in accordance with all the requirements specified herein. Product conformance information shall be maintained through records and charts, recording the results of the inspection and test procedures.

3.3 INTERCHANGEABILITY

Face-glued "Vertical Use Only" lumber produced to the requirements of this Standard is interchangeable with visually graded non-face-glued lumber of the same grade, size, and species or species group pursuant to the following restrictions:

a) Face-glued lumber shall only be used in applications as described in Section 3.1, and

b) Face-glued lumber shall not be visually re-graded or re-manufactured into a higher stress grade even if the quality of the lumber containing bonded surfaces could otherwise warrant such re-grading.

3.4 SPECIAL APPLICATIONS

3.4.1 HEAT RESISTANT ADHESIVES (HRA)

Face-glued "Vertical Use Only" lumber designated with "**HRA**" on the grade stamp is manufactured with a heat resistant adhesive that meets the requirements of Section 7.1.4 of this Standard.

3.4.2 REWORKING OF FACE-GLUED LUMBER

Modifications or additional manufacturing activities on face-glued lumber are outside the scope of this Standard.

Note: *Examples of modifications or further activities are alterations to the lumber cross-section such as drilling of holes or profiling.*

4.0 GRADE DESCRIPTION

This Standard applies to face-glued lumber visually graded to the STUD grade provisions as specified in the NLGA Para. 121a in any of the species or species groups as identified in Section 6.1.

5.0 STANDARD SIZES

Face-glued lumber produced in accordance with this Standard shall be manufactured in nominal sizes 2x3 through 2x6 only and in lengths not to exceed 12 feet (3.66 m).

Standard thicknesses and widths are shown in Table 1.

TABLE 1 – STANDARD THICKNESSES AND WIDTHS (FROM CSA O141 AND PS 20)

Nominal Dimension	Specified Dimension			
	inches		mm	
	Dry	Green	Dry	Green
Thickness				
2	1-1/2	1-9/16	38.1	39.7
Width				
3	2-1/2	2-9/16	63.5	65.1
4	3-1/2	3-9/16	88.9	90.5
5	4-1/2	4-5/8	114.3	117.5
6	5-1/2	5-5/8	139.7	142.9

6.0 LUMBER COMPONENT REQUIREMENTS

6.1 SPECIES

The lumber components used in the manufacture of face-glued lumber may be of any species or species groups specified in NLGA Paras. 7 and 7a.

Individual species of a species group may be combined in any combination that preserves the species group. Components from different species groups shall not be intermingled within the same production item.

6.2 LUMBER COMPONENTS

6.2.1 COMPONENT SIZE

Face-glued lumber shall be manufactured from lumber components that are not less than 1/2 inch (12.7 mm) surfaced size in thickness.

6.2.2 FINGERJOINED COMPONENTS

When fingerjoined lumber components are used for face-gluing under this Standard, the following shall apply:

6.2.2.1 COMPONENT REQUIREMENTS

The fingerjoined lumber components shall have met the qualification and quality control requirements in accordance with NLGA SPS 1 or SPS 3 requirements for strength and delamination for the STUD grade.

6.2.2.2 FINGERJOINT QUALIFICATION AND QUALITY CONTROL REQUIREMENT

The facility layout, production sequence and identification of the fingerjoined lumber components shall be described in the Quality Control Manual. Steps shall be taken to ensure that all components in the final product originate and can be verified to have originated from fingerjoined production that meets the NLGA SPS 1 or SPS 3 requirements for the STUD grade.

6.2.3 FINGERJOINING OF FACE-GLUED LUMBER

When face-glued lumber components are used for fingerjoining under NLGA SPS 1 or SPS 3, the following shall apply:

6.2.3.1 COMPONENT REQUIREMENTS

The finished face-glued lumber product including fingerjoints shall meet the requirements of this Standard, except as permitted in Section 6.2.3.2.

6.2.3.2 BONDED SURFACE EVALUATION

It is permissible to separately evaluate the bonded surface prior to fingerjoining for the shear strength parallel to grain test and wood failure in accordance with this Standard.

6.2.3.3 BONDED SURFACE QUALIFICATION AND QUALITY CONTROL REQUIREMENT

The plant layout, production sequence and identification of the face-glued lumber components to be fingerjoined shall be described in the Quality Control Manual. Steps shall be taken to ensure that all components in the final product originate and can be verified to have originated from production that meets the bonded surface requirements of this Standard.

6.2.4 COMPONENT WOOD QUALITY

Face-glued lumber shall be manufactured with lumber components that meet or exceed the visual grading requirements of the STUD grade as specified in NLGA Para. 121a, except as follows:

a) Knots or holes are permitted to occupy up to 3/4 of the cross-section in each component.

Note: *Although this component allowance exceeds the visual grade restrictions of the "STUD" grade, the finished face-glued product must still meet the "STUD" visual grading rules as per Section 6.3.1.*

b) Wane shall not exceed half the thickness and half the width of the component.

Note: *Wherever possible, wane on adjacent lumber components should not be located along the same section of the bondline.*

c) Severe compression wood is not permitted.

d) Honeycomb and decay are not permitted in the bonded surface area.

e) Pitch shall not exceed half the thickness and half the width of the component.

6.2.5 MOISTURE CONTENT

Green and dry lumber components shall not be mixed within the same piece.

6.3 FINISHED PRODUCT LUMBER QUALITY

6.3.1 VISUAL GRADE

The finished face-glued product shall be visually graded in accordance with the STUD grade provisions of NLGA Para. 121a except as provided in Sections 6.3.2 and 6.3.3.

6.3.2 WHITE SPECKS

White specks are unlimited if only occurring on one side of the bond line. White specks occurring along both sides of the bond line are not permitted to overlap in the same cross-section.

6.3.3 OFFSET

Offset between bonded surfaces of the finished face-glued lumber shall not exceed 1/16 inch (1.6 mm) on occasional pieces.

7.0 ADHESIVE REQUIREMENTS

7.1 ADHESIVE SPECIFICATION

7.1.1 GENERAL

The adhesive used for face gluing shall meet the following requirements:

a) The adhesive shall meet either Section 7.1.2 or Section 7.1.3.

b) Face-glued lumber that is grade stamped "**HRA**" shall use heat resistant adhesives that meets the requirements of Section 7.1.4. Otherwise, face-glued lumber shall be grade stamped "**Non-HRA**".

7.1.2 RESORCINOL AND PHENOL RESORCINOL ADHESIVES

The adhesive used for face gluing shall meet the requirements of CSA O112.7

Note: *The adhesive may be mixed with the minimum amount of inert fillers required for its performance in the particular process being used.*

7.1.3 ALTERNATE ADHESIVES

The adhesive used for face gluing shall meet either the requirements of CSA O112.9 or meet the requirements of ASTM D2559 and the high temperature requirements of CSA O112.9 when evaluated for one of the softwood species specified in that Standard.

7.1.4 ELEVATED TEMPERATURE ADHESIVES

The heat resistant adhesive (HRA) used for face gluing shall meet the requirements of either ASTM D7374 or D7470, and also CSA O177, Annex A.2.

If fingerjoined lumber components were utilized in the manufacture of the "**HRA**" grade stamped face-glued product, the adhesive used in fingerjoining shall have met the requirements of ASTM D7374 as per NLGA SPS 1 or SPS 3.

7.2 SEPARATE APPLICATION ADHESIVES

Separate application adhesives are not permitted.

7.3 ADHESIVE MIXING

Mixing of the adhesive shall be performed in accordance with the instructions provided by the adhesive supplier.

7.4 BONDED SURFACE FABRICATION

7.4.1 ADHESIVE APPLICATION

The adhesive shall be applied in a manner that ensures that all the gluing surface between the faces receives enough adhesive resulting in squeeze out of excess adhesive when assembling pressure is applied.

Note: *The adhesive may be applied to one or both faces forming the bonded surface.*

7.4.2 HEAT DAMAGE

Where a procedure is used to apply heat to the bonded surface, it shall be such as to ensure that neither the wood faces in the bonded surface nor the surrounding wood are damaged by excess heat.

Note: *In Radio Frequency (RF) curing, wood damage may result from excessively long exposure of the bonded surface to the RF field.*

In either situation both the strength and the long-term durability of the bonded surface may be impaired.

7.4.3 ASSEMBLY PRESSURE

The pressure applied during the bonded surface assembly process, and while the bondline is being cured, shall be that required for the lumber size, species group, and gluing process used.

Pressure shall be applied uniformly over the entire bonding surface.

8.0 PROPERTY REQUIREMENTS FOR FACE-GLUED LUMBER

The following property requirements are based on the test values listed in Table 2.

8.1 MODULUS OF RUPTURE (MOR)

The process lower fifth percentile for edge-wise bending modulus of rupture (MOR_{5th}) shall equal or exceed the MOR test value for the size and species group as provided in Table 2 when subjected to a short-term test load and tested in accordance with Section 9.1.

$$\mathbf{MOR_{5th} \geq MOR}$$

8.2 SHEAR STRENGTH PARALLEL TO GRAIN (Fv)

The process lower fifth percentile for shear strength parallel to grain (Fv_{5th}) shall equal or exceed the Fv test value for the species group as provided in Table 2 when subjected to a short-term test load and tested in accordance with Section 9.2.

$$\mathbf{Fv_{5th} \geq Fv}$$

TABLE 2 – PROPERTY TEST VALUES FOR SPS 5 FACE-GLUED LUMBER

Species Group and Nominal Size		MOR [Modulus of Rupture] (psi)	Fv [Shear Strength Parallel to Grain] (psi)
S-P-F	2x3/2x4	1650	285
	2x5	1470	
	2x6	1370	
Hem-Fir (N)	2x3/2x4	1810	305
	2x5	1690	
	2x6	1570	
D Fir-L (N)	2x3/2x4	1510	380
	2x5	1410	
	2x6	1310	
North Species	2x3/2x4	1100	230
	2x5	1030	
	2x6	960	

Note: *Test values are derived from the published design values of the AWC NDS Supplement or the CSA O86 – Engineering design in wood, whichever is a higher property value for a given species group and/or size.*

8.3 WOOD FAILURE

8.3.1 GENERAL

Wood failure shall be assessed in accordance with Section 9.2.4. Any separation of the bondline in the final product shall be investigated. If necessary, additional physical testing shall be undertaken.

Note: *See APPENDIX VI for commentary on wood failure assessment.*

8.3.2 AVERAGE WOOD FAILURE

The "**Average**" wood failure of the test results shall equal or exceed 80% wood failure.

8.3.3 MINIMUM WOOD FAILURE

"**All**" of the wood failure test results shall equal or exceed 60% wood failure.

8.4 FINAL GRADE

The final grade of face-glued lumber shall be determined by the lower of the visual grade of the lumber or the stress grade determined by strength tests on the bonded surfaces.

9.0 FACE-GLUED LUMBER PROPERTY EVALUATION PROCEDURES

9.1 BENDING STRENGTH (MOR)

MOR shall be determined by applying a test load to a full-size specimen that will induce a maximum stress not less than the MOR test value for the size and species group under consideration (see Table 2).

Specimens shall be tested on edge using third point loading and a span to depth ratio of 21 whenever possible. The specimen depth is the surfaced dry width as provided in Table 1. If a span to depth ratio of 21 cannot be achieved, the span shall be the maximum span possible and the MOR test value in Table 2 shall be adjusted for a shorter span (see the correction factors or equation found in APPENDIX VIII).

The maximum strength-reducing characteristic as determined by visual grading shall be located in the middle third of the test span, or as close to the middle third as possible.

For test equipment where the load is applied vertically and where there is more than 5 inches (127.0 mm) of length overhanging beyond either of the reaction supports, the calculated MOR shall be corrected for the weight of the overhanging portions.

Corrections are not required provided it can be demonstrated that neglecting the correction ensures a lower MOR value or where specimens are tested with the load applied in a horizontal direction.

9.2 SHEAR STRENGTH PARALLEL TO GRAIN (Fv)

9.2.1 TEST BLOCK PREPARATION

Shear block test specimens shall be randomly selected from normal production.

One block shall be sawn from each specimen in clear wood with no apparent strength-reducing characteristics. Care shall be taken in preparing the test blocks to make loaded surfaces smooth and parallel to each other and perpendicular to height.

The test blocks shall be prepared in accordance with AITC Test T107 as illustrated in APPENDIX I, Figure 1. After test block preparation, test blocks shall be subjected to the pressure-vacuum-dry treatment as specified in APPENDIX II.

The shear area dimensions shall be measured to the nearest 0.004 inch (0.10 mm) at the bondline after the pressure-vacuum-dry treatment and prior to testing.

9.2.2 SHEAR STRENGTH PARALLEL TO GRAIN TEST PROCEDURE

Each test block shall be tested in accordance with ASTM D905.

Note: *An example of a shear test jig is shown in APPENDIX I, Figure 2.*

Crosshead movement shall provide approximately a uniform rate of loading not to exceed 0.50 inch (12.7 mm) per minute.

9.2.3 MULTIPLE BONDED SURFACE TEST BLOCKS

For test blocks having multiple bonded surfaces, repeat the test procedure defined in Section 9.2.2 to evaluate every bonded surface present in the test block. Report the shear strength value and the wood failure from the bondline with the lowest shear strength value from each test block with multiple bonded surfaces.

9.2.4 WOOD FAILURE READING PROCEDURE

Trained personnel shall read wood failure.

Note: *ASTM D5266 has been found useful in estimating the percentage of wood failure in adhesive bonded surfaces.*

9.2.5 CALCULATION AND REPORT

Shear strength shall be calculated from the recorded failing load and the measured shear area. The percentage of wood failure shall be determined on this area.

The specimen shear strength value shall be taken from the lowest test block value.

Note 1*: A maximum of one specimen may be rejected if a grade defect is detected after the shear block test and the test block shear strength is below the minimum required shear strength.*

Note 2*: The Agency may request a facility to hold the test blocks intact for examination by the Agency supervisor.*

9.3 ENVIRONMENTAL CONDITIONS

9.3.1 MEASUREMENT OF MOISTURE CONTENT AT TIME OF TEST

For each test block, a moisture content measurement using a resistance type moisture meter shall be made on each side of the bondline and sufficiently away from the bonding surface so that the meter readings are not influenced by the presence of the adhesive. Each of the readings shall be recorded as the moisture content of the specimen's component(s) at the time of test.

9.3.2 TEMPERATURE

9.3.2.1 TEST EQUIPMENT

The temperature of the test equipment shall, at the time of the test, be in the range of 50 to 95° F (10 to 35° C) inclusive. If the test equipment is operated at temperatures below 50° F (10° C), the equipment shall be calibrated at a temperature within ±10° F (5° C) of the temperature at which the equipment will be operated.

9.3.2.2 TEST SPECIMENS

Test specimens shall be stored under the same environmental conditions (within ±10°F (±5°C)) as the production run until the start of the face-glued lumber property evaluation procedures.

10.0 GRADE STAMPING OF FACE-GLUED LUMBER

10.1 GENERAL

A grade stamp on face-glued lumber indicates that the grading process meets the requirements of the Agency's qualification and quality control procedures.

All previous grade stamps on lumber components shall be removed or obliterated.

10.2 GRADE STAMP REQUIREMENTS

Grade stamps on Face-glued "Vertical Use Only" lumber produced in conformance with the requirements of this Standard and the NLGA Standard Grading Rules shall provide the following information:

- **a)** Designation of "**STUD**" for the grade,
- **b)** Species or species group identification,
- **c)** Seasoning designation,
- **d)** Registered symbol of the Agency
- **e)** Facility identification,
- **f)** Designations of "**SPS 5**" and "**CERT FACE-GLUED LBR – VERTICAL USE ONLY**",
- **g)** Designation of "**NLGA**" to indicate the visual grading rules used, and
- **h)** Designation of "**Non-HRA**" or "**HRA**" as applicable (see Section 7.1.1).

PART B - QUALIFICATION AND QUALITY CONTROL REQUIREMENTS

11.0 EQUIPMENT

The facility's test equipment shall meet the following requirements:

11.1 MOR TEST EQUIPMENT

The bending test equipment shall provide for roller action on the reaction supports and sufficient radius on the loading points to avoid significant crushing of wood. Side supports to prevent the buckling of lumber shall also be provided.

The test span and location of the load points shall be capable of being set to within ±1/16 inch (1.6 mm).

The load-measuring device shall be accurate to within ±2% of the actual load.

The load shall be applied through a crosshead. The rate of the crosshead movement shall not exceed 5 inches/minute (2.1 mm/second) during specimen testing.

11.2 SHEAR PARALLEL TO GRAIN TEST EQUIPMENT

The test equipment shall be capable of firmly holding the specimen against a flat surface while the force is applied along each bondline.

Note: *See APPENDIX I, Figure 2 for an example shear test jig based on the requirements stated in ASTM D905.*

The load-measuring device shall be accurate to within ±2% of the actual load.

The rate of loading shall be within 0.015 to 0.5 inches (0.38 to 12.7 mm) per minute.

11.3 PRESSURE-VACUUM-DRY TREATMENT EQUIPMENT

11.3.1 PRESSURE VESSEL

An autoclave or similar pressure vessel designed to safely withstand and maintain a pressure of at least 100 psi (0.69 MPa) is required for impregnating the specimens with water. The pressure vessel shall be equipped with a means of obtaining a vacuum of at least 25 inches (635 mm) of mercury (at sea level) and a means of obtaining a pressure of at least 75 psi (0.517 MPa). The vessel shall be equipped with a gauge(s) to register vacuum and pressure.

Note: *A suitable vacuum may be obtained from an aspirator attached to the water supply, and 75 psi (0.517 MPa) can usually be obtained from a municipal water supply or a compressed air supply.*

11.3.2 DRYING OVEN

The drying oven shall be capable of maintaining the conditions necessary to dry specimens to a moisture content of 19% or less.

Note: *These drying conditions are obtainable in cross-flow, laboratory type ovens of the circulating type. They can also be obtained by using a non-circulating configuration in which air heated by a space heater is passed over the specimens and vented.*

Conditions that affect the drying rate include cross-flow air velocity, humidity, air temperature and the arrangement, size, and number of specimens in the oven.

Circulating type ovens that provide a cross-flow air velocity of 250 fpm (75 m/min) in the centre of the drying chamber and maintain an air temperature of 160^{O}F (71^{O}C) should be capable of achieving the specified drying rate.

12.0 QUALITY CONTROL MANUAL

12.1 GENERAL

The Quality Control (QC) Manual is a document outlining the requirements for maintaining quality control in the manufacturing facility.

Note: *See APPENDIX V for general commentary on the contents of a QC Manual.*

All production quality control procedures shall comply with the requirements of this Standard and the QC Manual.

12.2 PREPARATION, REVISION AND APPROVAL

Each facility shall:

a) Prepare a QC Manual in compliance with this Standard and submit the manual to the Agency for approval,

b) Regularly review and update its QC Manual to reflect current production practices and procedures, quality control policies and quality control program procedures and resubmit to the Agency for approval, and

c) Upon approval, implement the new or updated procedures in accordance with the QC Manual.

The Agency shall approve the QC Manual at the time of qualification. Qualification shall apply only to the manufacturing, quality control procedures and limits set forth in the QC Manual.

The Agency shall be notified in advance of any changes in the QC Manual that may affect product quality.

12.3 CONTENTS

12.3.1 AGENCY

The QC Manual shall identify the CLSAB and/or ALSC accredited Agency and include a summary of the following.

a) That the Agency certification and quality control procedures for face-glued lumber comply with the CLSAB Regulations and the ALSC Glued Lumber Policy,

b) That the responsibility for the certification and quality control procedures is that of the Agency, and

c) That the CLSAB and the ALSC shall monitor whether the certification and quality control procedures are being carried out by the Agency.

12.3.2 GENERAL FACILITY ADMINISTRATION

The QC Manual shall:

a) Define facility management policies, objectives, and responsibilities for quality control, including the responsibility for each division within a multi-division organization,

b) Define the responsibility and authority for those managing and performing the quality control work and of those that are confirming conformance to quality control requirements,

Note: *The facility management relationships may be shown on organization charts.*

c) Identify the Supervisor who shall report directly to management at a level to ensure that quality control requirements are not subordinated to manufacturing or sales. The QC Manual shall define the Supervisor's authority to resolve quality control matters, and

d) Define the responsibility and authority of personnel responsible for quality control and their organizational freedom to:

i) Identify and record non-conformance to quality,

ii) Recommend or provide solutions through designated positions in the organization,

iii) Confirm implementation of solutions, and

iv) Oversee further processing of a non-conforming item(s) until the deficiency or unsatisfactory condition has been corrected.

12.3.3 FACILITY QUALITY CONTROL PERSONNEL

The QC Manual shall outline the responsibilities of the quality control personnel.

Persons responsible for quality control shall possess and demonstrate to the satisfaction of the Agency that they have adequate knowledge of the manufacturing process, which shall include:

a) Inspection and test procedures used to control the process,

b) Operation and calibration of the recording and test equipment used, and

c) Maintenance and interpretation of quality control records.

In addition, the quality control personnel shall be responsible for carrying out and maintaining records of various inspections and test procedures detailed in the QC Manual.

The quality control personnel shall also formally advise the facility management of circumstances resulting from the inspections and test procedures that indicate corrective action may be necessary in the production process.

12.3.4 FACILITY QUALITY CONTROL PROCEDURES

The Quality Control Manual shall include detailed procedures specifying how each of the following is to be performed and controlled:

a) Lay-up machine operation,

b) Test equipment operation including calibration and spot-check procedures,

c) Quality control sampling, testing, and analysis,

d) Documentation and record keeping,

e) Identification and traceability,

f) Non-conformance, and

g) Corrective action.

13.0 QUALIFICATIONREQUIREMENTS

13.1 INITIAL FACILITY QUALIFICATION

A facility requesting initial qualification shall provide the Agency with evidence that all the requirements of **Part A** have been met. Upon receipt of the request, the Agency supervisor shall visit the facility to determine that:

a) The facility is capable of operating within the requirements of this Standard and its QC Manual,

b) The facility personnel possess ability to undertake the requirements described in Section 12, and

c) The calibration of the test equipment conforms to the requirements of the QC Manual.

The facility shall generate samples prior to initial qualification sampling as per Section 13.2. The Agency supervisor shall sample for initial qualification as per Section 13.3.

Each item shall be qualified before issuing grade stamps.

13.2 NEW PRODUCTION LINE START-UP OR MAJOR CHANGE REQUIREMENTS (To be performed by the Facility)

During start-up of a new production line or when a major change to the face-glued lumber process occurs, the facility shall immediately notify the Agency.

Prior to grade stamps being issued for lumber from the new production line or to continue grade stamping privileges in the case of a major change(s), the facility shall provide the Agency with test results of **53** bending strength, **53** shear strength parallel to grain, and **53** wood failure assessments.

The specimens for these tests shall be obtained from a single item, consisting of the densest species group, and using a procedure approved by the Agency that ensures the specimens are representative of the item to be qualified.

The specimens shall be tested in accordance with Section 9 and the test results shall meet the requirements set forth in Section 13.5.

Note: *The bending strength, shear strength parallel to grain and wood failure tests are required in the initial start-up of a face-gluing line or when there is a major change to the gluing process. They are intended to verify the adequacy of the bonding surface and do not substitute for the test qualification requirements called for in Section 13.3.*

Grade stamping shall be contingent upon verification of the item in accordance with Section 13.3.

13.3 INITIAL QUALIFICATION SAMPLING (To be performed by the Agency)

The Agency supervisor shall randomly select the following samples for each item to be qualified:

a) **53** specimens of face-glued lumber for bending strength (MOR) property evaluations to be tested in accordance with Section 9.1.

b) **53** specimens of face-glued lumber for shear strength parallel to grain (Fv) property evaluations to be tested in accordance with Section 9.2.

c) The **53** specimens selected in Section 13.3 b) for wood failure assessment to be assessed in accordance with Section 9.2.4.

Note: *For clauses **a)** and **b)** above, additional specimens to increase the sample size to **78**, **102**, **125**, or **148** may be selected to qualify the bending or shear strength properties.*

13.4 RE-QUALIFICATION SAMPLING

Re-qualification sampling and testing are limited to those items that are deemed to be "**OUT-OF-CONTROL**".

The minimum sample size for each item and for each property to be re-qualified is as follows:

a) When the bending strength is required to be re-qualified, **28** specimens for the bending strength (MOR) evaluations shall be selected. The specimens shall be tested in accordance with Section 9.1.

b) When the shear strength parallel to grain is required to be re-qualified, **28** specimens for the shear strength parallel to grain evaluations shall be selected. The specimens shall be tested in accordance with Section 9.2.

c) When wood failure is required to be re-qualified, wood failure assessment shall be performed from the **28** specimens selected in Section 13.4 b).

Note: *For clauses **a)** and **b)** above, additional specimens to increase the sample size to **53**, **78**, **102**, or **148** may be selected to re-qualify the bending or shear strength properties.*

13.5 DECISION RULES

13.5.1 INITIAL QUALIFICATION RULES

Results of the bending strength, shear strength, and wood failure tests shall determine whether grade stamps will be issued for the item being qualified.

An item shall be considered qualified when all the following requirements are met:

13.5.1.1 BENDING STRENGTH (MOR)

Not more than **1** of the **53** bending strength test results shall have a bending strength value less than the MOR test value for the size and species group as provided in Table 2.

When the additional specimen sampling procedure referred to in Section 13.3 is used to qualify for bending strength, not more than **2** test results in a **78**; **3** in a **102**; **4** in a **125**; or **5** in a **148**-specimen sample shall have a bending strength value less than the corresponding MOR test value for the size and species group as provided in Table 2.

13.5.1.2 SHEAR STRENGTH PARALLEL TO GRAIN (Fv)

Not more than **1** of the **53** shear strength test results shall have a shear strength value less than the Fv test value for the species group as provided in Table 2.

When the additional specimen sampling procedure referred to in Section 13.3 is used to qualify for shear strength, not more than **2** test results in a **78**; **3** in a **102**; **4** in a **125**; or **5** in a **148**-specimen sample shall have a shear strength value less than the corresponding Fv test value for the species group as provided in Table 2.

13.5.1.3 WOOD FAILURE

The "**Average**" wood failure test results for the specimens shall equal or exceed 80% wood failure.

"**All**" the specimen wood failure test results shall equal or exceed 60% wood failure.

13.5.2 RE-QUALIFICATION RULES

An item shall be considered re-qualified when all the following requirements are met:

13.5.2.1 BENDING STRENGTH (MOR)

"**All**" the **28** bending strength test results shall equal or exceed the MOR test value for the size and species group as provided in Table 2.

When the additional specimen sampling procedure referred to in Section 13.4 is used to re-qualify for bending strength, not more than **1** test result in a **53**, **2** in a **78, 3** in a **102**, **4** in a **125**, or **5** in a **148**-specimen sample shall have a bending strength value less than the corresponding MOR test value for the size and species group as provided in Table 2.

13.5.2.2 SHEAR STRENGTH PARALLEL TO GRAIN (Fv)

"**All**" the **28** shear strength test results shall equal or exceed the Fv test value for the species group as provided in Table 2.

When the additional specimen sampling procedure referred to in Section 13.4 is used to re-qualify for bending strength, not more than **1** test result in a **53**, **2** in a **78, 3** in a **102, 4** in a **125**, or **5** in a **148**-specimen sample shall have a shear strength value less than the corresponding Fv test value for the species group as provided in Table 2.

13.5.2.3 WOOD FAILURE

The "**Average**" wood failure test results for the specimens shall equal or exceed 80% wood failure.

"**All**" the specimen wood failure test results shall equal or exceed 60% wood failure.

13.6 SUBSEQUENT QUALIFICATION

13.6.1 NEW ITEM

Separate qualification sampling and testing outlined in Section 13.3 is required for each new item for which a grade stamp is desired.

Note: *New items may include but are not necessarily limited to changes in size and/or species/species group.*

13.6.2 MAJOR CHANGES

When a major change and/or process condition (which, in the opinion of the Agency, may affect the quality of the product) occurs, the facility shall immediately notify the Agency.

The qualification procedures outlined in Sections 13.2 and 13.3 shall be required.

Note 1: *Major changes are production line changes which apply to all items currently being produced. Major changes may include, but are not necessarily limited to, any new adhesive, a change to the joint profile, fingerjoining of green or green-frozen lumber, and changes to the manufacturing flow process.*

Note 2: *Changes in size and/or species or species groups are not considered major changes. Requirements set forth in Section 13.6.1 are intended to deal with size and/or species changes.*

Note 3: *Reversion to a previously qualified adhesive is generally not considered to be a major change, unless considered so in the opinion of the Agency.*

Note 4: *When the major change involves a new adhesive, the Agency may require samples to be obtained from all items, if in the Agency's judgement, the different adhesive application systems, mixing systems or allowance for more extreme gluing conditions warrant an expanded evaluation.*

13.7 NON-PRODUCTION OF FACE-GLUED LUMBER

When a qualified facility does not produce face-glued lumber for a period exceeding one year, all item qualifications for that facility shall become void. The requirements for initial qualification shall be satisfied prior to renewed production of face-glued lumber.

14.0 EQUIPMENT CALIBRATION

Records of all calibrations and spot-check verifications shall be maintained for at least **6** years.

14.1 TEST EQUIPMENT AND SPOT-CHECK DEVICES

An independent calibration laboratory, acceptable to CLSAB, shall calibrate the test equipment and spot-check devices prior to initial qualification and once a year thereafter.

Procedures for calibration of the test equipment shall be consistent with the applicable sections in ASTM E4 and/or other applicable nationally recognized standards acceptable to CLSAB, except that the percentage error shall not exceed ± 2.0%.

Note: *The listed standard and any other test standards and procedures for calibrating measuring devices and equipment must be nationally recognized and acceptable to CLSAB to be deemed applicable.*

It is the responsibility of the facility to maintain the operating condition of its test equipment in accordance with the requirements set forth in their QC Manual and this Standard.

The test equipment shall be spot-checked in accordance with procedures set forth in the QC Manual, this Standard, and with the applicable sections in ASTM E4 and/or other applicable nationally recognized standards acceptable to CLSAB.

During production, spot-checks shall be performed at a frequency level listed in Table 3 and whenever there is reason to suspect the equipment may be out of calibration or damaged.

The Agency shall be notified immediately if damage to the test equipment or a spot-check device has occurred.

Note: *Re-calibration of the test equipment or spot-check devices by an independent calibration laboratory may be required by the Agency.*

TABLE 3 – TEST EQUIPMENT SPOT-CHECK FREQUENCY

Equipment	Minimum Spot-Check Frequency
Bending Test Equipment	At least once a week
Shear Test Equipment	At least once a week
Other Test Equipment	As per manufacturer's specifications, the Quality Control Manual, or this Standard, whichever period is more frequent.

14.2 CALIBRATION DEVICES

The calibration devices used by the independent calibration laboratory shall meet the applicable requirements of ASTM E74 for force-measuring devices and/or other applicable nationally recognized standards acceptable to CLSAB.

14.3 INDEPENDENT CALIBRATION LABORATORY REPORTING REQUIREMENTS

The calibration report and certificates from the independent calibration laboratory shall comply with the reporting requirements outlined in ASTM E4 and/or other applicable nationally recognized standards acceptable to CLSAB.

The report from the independent calibration laboratory shall include at least:

a) Results of the calibration of the sensors of the equipment following applicable sections of ASTM E4, ASTM E74 and/or other nationally recognized standards acceptable to CLSAB,

b) Description of the method of verification including details of the preloading, if applicable,

c) Indication if the sensitivity or point of calibration of the test equipment was changed or not,

d) Information on the Reference calibration devices used by the laboratory including the due date of calibration,

e) The average target and tolerance values to be used,

f) A statement that the test equipment is in satisfactory working condition,

g) Temperature near the test equipment at time of the calibration,

h) Whether a facility quality control person was present to confirm values, and

i) Date and location of the calibration.

A copy of the final calibration report shall be forwarded to the Agency.

15.0 QUALITY CONTROL REQUIREMENTS

Verification of bonded face quality shall be as follows:

15.1 QUALITY CONTROL PROCEDURES

The quality control procedures described herein are intended to detect non-conformance. The properties being considered are:

a) Bending strength,

b) Shear strength parallel to grain, and

c) Wood failure.

The quality control procedures adopted by the facility shall be fully documented in their Quality Control Manual.

Verification of product quality includes two independent procedures:

a) One dealing with the quality, strength, and resistance to moisture of the face-glued lumber bonded surfaces, and

b) One dealing with the grade of the lumber containing face-glued lumber bonded surfaces. Verification of the lumber grade shall follow the provisions set forth in the NLGA Standard Grading Rules.

15.2 QUALITY CONTROL SAMPLING

15.2.1 SAMPLING METHOD

The random sampling method shall be approved by the Agency and documented in the QC Manual.

Specimens shall be collected from grade stamped production, except as permitted in Section 6.2.3.2. The sampling method shall include procedures for selecting the face-glued lumber specimens for bending and shear strength tests and which portion will be tested for wood failure.

15.2.2 SAMPLING FREQUENCY

The sampling frequency requirements are dependent on the test being carried out as follows:

Note: *Under special circumstances, such as to accommodate the facility's production schedule, the Agency may request the facility to increase its quality control sampling frequency.*

15.2.2.1 BENDING STRENGTH SAMPLING

Bending strength test specimens shall be collected at a rate of **1** specimen per production hour, or part thereof, with no fewer than **5** specimens collected during a production shift of less than 5 hours.

15.2.2.2 SHEAR STRENGTH PARALLEL TO GRAIN and WOOD FAILURE SAMPLING

Shear strength test specimens shall be collected at a rate of **1** per production hour, or part thereof, with no fewer than **5** specimens collected during a production shift of less than 5 hours.

Each specimen shall yield **2** test blocks (located at least 2 feet apart from each other).

Wood failure evaluations shall be determined from the same test blocks.

15.3 QUALITY CONTROL TESTING

Testing for bending strength, shear strength, and wood failure shall be performed in accordance with the procedures described in Section 9.

15.4 ANALYSIS OF QUALITY CONTROL TESTS

All production from a shift, or part thereof, shall be held in inventory pending the results of the quality control evaluation of Sections 6, 7, and 8 of this Standard for that production period.

Test results shall be entered on Agency approved control forms. The control forms shall be designed so that the process properties qualified under Sections 13.3 and 13.5.1 are recorded and "**IN-CONTROL**" and "**OUT-OF-CONTROL**" situations shall be readily detectable.

15.4.1 IN-CONTROL

When all of the process properties referred to in Section 15.4 remain "**IN-CONTROL**", the item from which the quality control samples were drawn shall be deemed to comply with the property requirements of this Standard.

15.4.2 OUT-OF-CONTROL

The requirements of this Section relate to the conditions described in APPENDICES III and IV.

When any of the process properties described in Section 15.4 becomes "**OUT-OF-CONTROL**", the item from which the quality control sample were drawn shall be held pending results of the following tests (as applicable):

a) An examination of the test procedures, calibration and/or calculations shall be made to determine whether there were errors,

b) If no such errors are identified, proceed to Section 15.4.2.1,

c) Held production deemed to be "**OUT-OF-CONTROL**" after evaluations in accordance with Section 15.4.2.1 shall be rejected. The grade stamps shall be obliterated or removed.

15.4.2.1 BENDING STRENGTH, SHEAR STRENGTH PARALLEL TO GRAIN AND / OR WOOD FAILURE

When the production represented by a specific time frame from which the quality control sample was drawn fails to meet the bending strength, shear strength or wood failure requirements prescribed in Sections 8.1, 8.2 and 8.3, production from this time frame shall be held pending the results of a **28**-specimen bending test sample or the results of a **14**-specimen shear strength / wood failure test sample (yielding **28** test blocks), for whichever of the test(s) that went "**OUT OF CONTROL**".

These confirmation samples shall be randomly selected and tested in accordance with Section 13.4.

a) BENDING STRENGTH

When the test results for MOR fail to meet requirements of Section 13.5.2.1, the held item shall be deemed to be in non-compliance with the requirements of this Standard and all grade stamps shall be obliterated from the face-glued lumber.

b) SHEAR STRENGTH PARALLEL TO GRAIN

When test results indicate the process is "**IN-CONTROL**" for shear strength, the facility shall proceed to Section 15.4.2.1 c) for wood failure evaluation.

When the test results for shear strength parallel to grain (Fv) fail to meet requirements of Section 13.5.2.2, the held item shall be deemed to be in non-compliance with the requirements of this Standard and all grade stamps shall be obliterated from the face-glued lumber.

c) WOOD FAILURE

When shear test results indicate the process is "**IN-CONTROL**" and the wood failure test results confirm that the "**IN-CONTROL**" requirements have been regained, the held item shall be deemed to comply with the wood failure requirements of this Standard.

When the test results for wood failure fail to meet requirements of Section 13.5.2.3, the held item shall be deemed to be in non-compliance with the requirements of this Standard and all grade stamps shall be obliterated from the face-glued lumber.

Note: *The Agency may request a facility to hold the wood failure test specimens for examination.*

15.5 IDENTIFICATION AND TRACEABILITY

Each package of face-glued lumber leaving the facility production line shall be identified with the time and date it left the production line.

Note: *This requirement is to allow for traceability of an item if further testing is required or in the event of a non-conformance or an "**OUT-OF-CONTROL**" condition.*

15.6 QUALITY CONTROL RECORDS

Facility control records shall include but are not necessarily limited to:

a) Test equipment calibration, spot-check, and maintenance records,

b) Quality control test data, and

c) All face-glued lumber production stoppages as a result of quality control requirements and reports of the corrective actions taken.

Separate records shall be maintained for each item produced.

All records shall include the date when they are performed and shall be retained for at least 6 years. These records shall be made available to the Agency upon request.

16.0 REINSPECTION PROVISIONS

16.1 GENERAL

Response to complaints on face-glued lumber involving visual grade, size, moisture content, tally, bondline strength or assigned design values, shall be based on the applicable requirements within this section of the Standard and by the requirements set forth in NLGA Para. 400.

Sample selection and testing for reinspection shall be performed by the Agency whose logo appears on the lumber (or by an independent accredited testing organization approved by the original grading Agency). Only certified test equipment calibrated to a national standard and using a process mutually agreed upon by the Agency, the seller, and the buyer shall be used.

16.2 BENDING STRENGTH AND/OR SHEAR STRENGTH PARALLEL TO GRAIN SAMPLING AND EVALUATION

In the case of a dispute pertaining to bending strength, shear strength parallel to grain or assigned design values, a random sample of the item under complaint shall be obtained as follows:

a) **80** specimens for the bending strength property evaluation to be tested in accordance with Section 9.1 of this Standard in such a way that the compression face is randomly generated, and/or

b) **80** specimens for the shear strength parallel to grain evaluation to be tested in accordance with Section 9.2 of this Standard.

Testing shall be undertaken in accordance with procedures set forth in Section 9.1 and 9.2 of this Standard using test equipment calibrated to a national standard and certified by an independent calibration laboratory.

Test results of the lumber in dispute shall be assessed as follows:

a) For the bending MOR, not more than **6** specimens out of **80** shall have an MOR value that is less than the corresponding **MOR** test value for the size and species group as provided in Table 2.

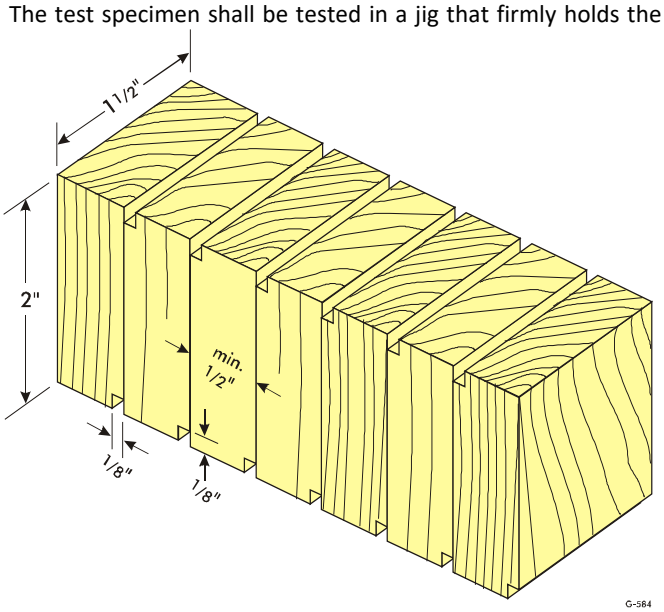
b) For the shear strength parallel to grain, not more than **6** specimens out of **80** shall have a shear parallel to grain strength value that is less than the corresponding **Fv** test value for the size and species group as provided in Table 2.

APPENDICES (INFORMATIVE)

APPENDIX I - BLOCK SHEAR TEST SPECIMEN

The shear strength test block is prepared as shown in Figure 1.

FIGURE 1 - SHEAR BLOCK WITH SAW KERF



The test specimen shall be tested in a jig that firmly holds the specimen against a flat surface while the shear force is applied along each bondline with the saw kerfs as positioned as shown in Figure 2 - CROSS-SECTION OF TYPICAL SHEAR BLOCK TEST EQUIPMENT SETUP.

***Note**: The ASTM D905 shear test jig may be used, provided the specimen is suitably supported on the underside.*

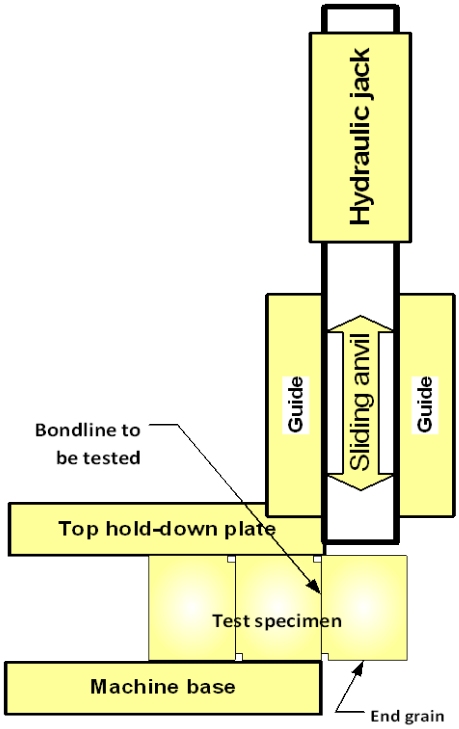


FIGURE 2 - CROSS-SECTION OF TYPICAL SHEAR BLOCK TEST EQUIPMENT SETUP

APPENDIX II - PRESSURE-VACUUM-DRY TREATMENT

Specimens are subjected to the following pressure-vacuum-dry treatment, which is a modification of Method B of ASTM D1101.

Procedures

If the initial moisture content of the test specimens is 20% or more, dry the specimens using air at a temperature of 160^{O} F ± 5^{O} (71^{O} C ± 3^{O}) to an initial moisture content of 19% or less.

Place the test specimens in the pressure vessel and weight them down. Admit sufficient water at a temperature of 65 to 85^{O} F (18.3 to 29.4^{O} C), so that the test specimens are completely submerged.

Separate the test specimens by stickering, wire screens or other means so that all end grain surfaces are freely exposed to water.

Draw a vacuum of 20 to 25 inches (508 to 635 mm) of mercury and hold it for 30 minutes, then release the vacuum and apply a pressure of 75 ± 5 psi (0.520 ± 0.034 MPa) for a period of two hours.

Dry the test specimens using air at a temperature of 160^{O} F ± 5^{O} (71^{O} C ± 3^{O}). The air circulation and number of specimens in the oven at any time shall be selected such that the specimens are dried to moisture content of 19% or less.

During drying, place the specimens at least 2 inches (50.8 mm) apart, with the end grain surfaces and bonded face orientation parallel to the direction of airflow.

Dry the specimens until the moisture content of each specimen has reached 19% or less.

APPENDIX III - FLOW CHART FOR "OUT-OF-CONTROL" IN BENDING STRENGTH

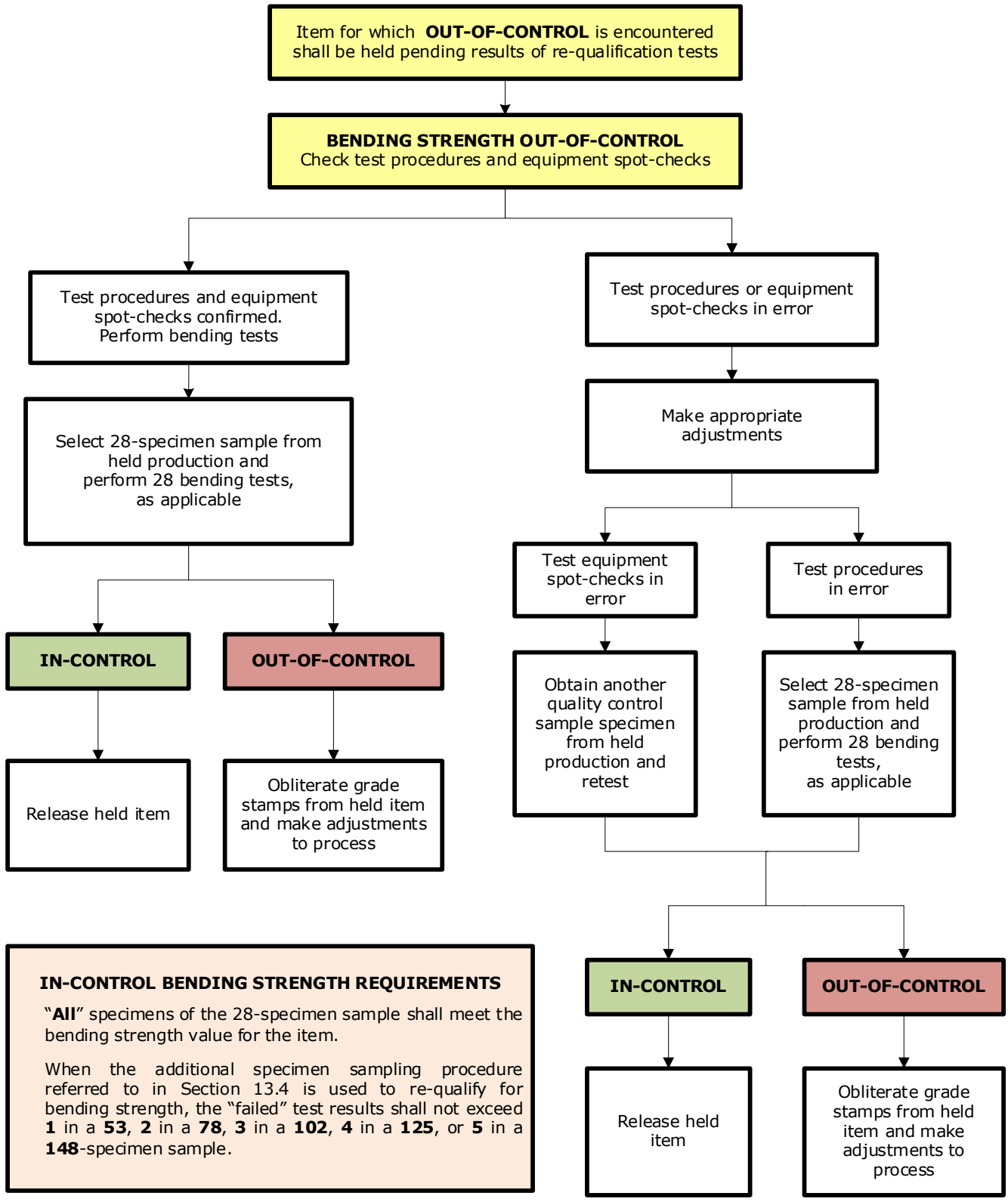
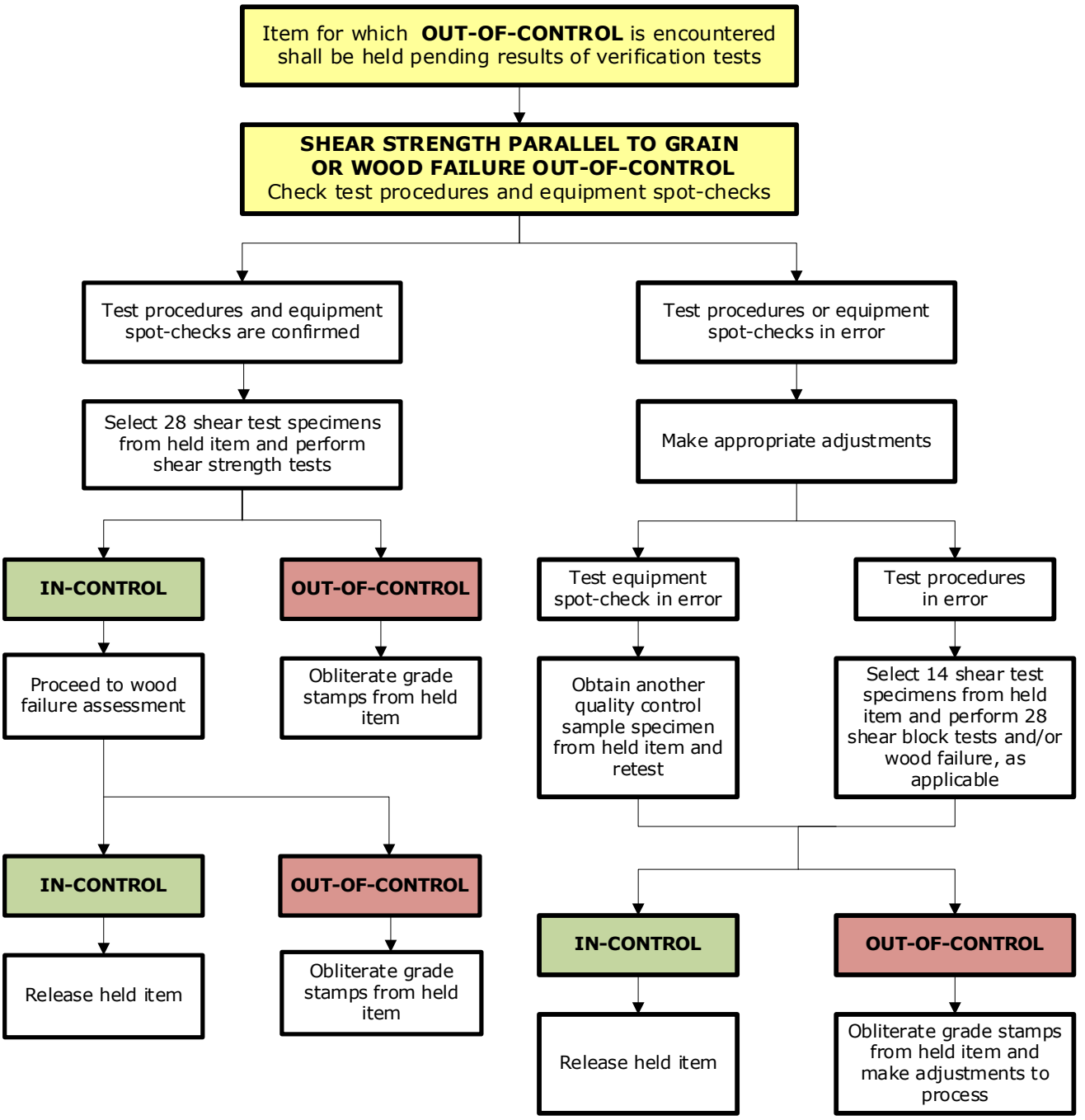


FIGURE 3 - BENDING STRENGTH FAILURE RE-QUALIFICATION FLOW CHART

APPENDIX IV - FLOW CHART FOR "OUT-OF-CONTROL" SHEAR STRENGTH PARALLEL TO GRAIN AND/OR WOOD FAILURE



IN-CONTROL SHEAR PARALLEL TO GRAIN REQUIREMENTS

"**All**" of the 28 shear block tests shall meet or exceed the characteristic shear strength (Fv) value for the species combination as provided in Table 2. When the additional specimen sampling procedure referred to in Section 13.4 is used to re-qualify for shear strength, the "failed" test results shall not exceed **1** in a **53**, **2** in a **78**, **3** in a **102**, **4** in a **125,** or **5** in a **148**-specimen sample.

IN-CONTROL WOOD FAILURE REQUIREMENTS

A. The "**Average**" wood failure of the test results for the 28 specimens shall equal or exceed 80% wood failure.

B. "**All**" of the 28 specimen test results shall equal or exceed 60% wood failure

FIGURE 4 - SHEAR PARALLEL TO GRAIN AND WOOD FAILURE RE-QUALIFICATION FLOW CHART

APPENDIX V - COMMENTARY ON QUALITY CONTROL MANUAL CONTENTS

The Quality Control (QC) Manual specifies, in writing, one or more sets of facility operating conditions that are known to result in a product that is in continuous conformance with the requirements of this Standard. The qualification applies only to product(s) produced within the specified limits of the QC Manual.

The details of the QC Manual will vary with the process used. Some aspects of it may be common to all lumber sizes and species combinations, while other aspects may vary with size and species. The QC Manual provides details of all test procedures used, the wood failure criteria used, and the records to be kept of in-process checks that are made.

The QC Manual describes the manufacturing operation, broken down by station. For each station in the sequence of manufacture, a description is required of the function performed by the equipment, the skills the operator requires, the responsibility of the operator in charge of that station, and (if required) what checks are instituted to ensure that the equipment and operator are performing within the desired limits. Procedures must be outlined for the absence of any operator with specialized skills essential to the process.

Examples of typical stations are:

Input grading: station where defects are removed from the ends of the lumber prior to machining of the fingerjoint (if applicable),

Machining of the fingerjoints (if applicable) and the bonded surface: station where set-up tolerances are monitored and where cutter heads are changed,

Glue mixing: station concerned with ensuring the prescribed proportions of adhesive and hardener are thoroughly blended at the prescribed temperature levels,

Make-up station(s): fingerjoining station (if applicable) consisting of top dead rolls mounted above the in-feed table (ahead of the crowder and retard system) which assists the operator with assembly of the joint. Face-gluing station where glue is applied to component surfaces.

Off-line QC test equipment: station where quality control specimens are tested.

The QC Manual should include special provisions for the shut-down and start-up of the gluing line, particularly during temporary stoppages. The latter is particularly significant in preheat processes, in which the glue may be spread on heated wood and must be put under gluing pressure within a limited time to avoid pre-cure of the glue.

APPENDIX VI - COMMENTARY ON WOOD FAILURE ASSESSMENT

In this Standard, wood failure means that the face-glued surface fails in a shallow layer of wood next to the bondline. The significance of wood failure is that it correlates inversely with delamination resistance. If a high degree of wood failure develops, the face-glued bondline should be resistant to delamination. Conversely, any area in the face-glued bondline that shows no wood failure may be prone to delaminating.

Wood failure assessment is a mandatory requirement of this Standard.

Trained personnel should be able to read single blocks from a standard set with a reproducibility of ±15% and be within ±5% of the average for the set.

APPENDIX VII - AGENCY ADMINISTRATION

The accredited Agency is required to administer this Standard. Agency approval of a facility to grade stamp face-glued lumber must be contingent upon the facility's compliance with the procedures and requirements of this Standard.

Agency inspections should include, at a minimum, reporting on the following:

a) Examination of production samples from the facility's inventory, the facility's records, and procedures to verify compliance to the requirements of **Part A** and the QC Manual.

b) Examination of the bending and shear test equipment including observations on:
- **i)** wear and damage,
- **ii)** lubrication and operations of moveable parts, and
- **iii)** record of weekly calibration

c) Examination of the pressure-vacuum-dry treatment equipment, including the apparatus for measuring temperature, pressure and time, and the drying chamber.

d) Inspection of the glue mixing equipment and procedures, including the accuracy of the weighing equipment, mixing proportions, and cleanliness of the facility.

e) Verification of the wood failure measurement and procedures.

f) Examination of the control system used to prevent overheating of the wood on the gluing surfaces.

APPENDIX VIII - SPAN-TO-DEPTH ADJUSTMENT FACTORS

In cases where the length of the test specimen is such that only a span to depth ratio of less than 21 is possible, the following correction factors should be applied to the MOR test value shown in Table 2.

TABLE 4 - CORRECTION FACTORS FOR EDGE-WISE BENDING MOR

Span to Depth Ratio	MOR Test Value Multiplier (1)
20	1.0069
18	1.0218
17	1.0300
16	1.0388
15	1.0482
14	1.0584
13	1.0694
12	1.0815
11	1.0948
10	1.1095

(1) Values adapted from ASTM D1990. Alternatively, the multiplier, k, may be calculated from the following equation:

$$k = 21^{0.14} S^{-0.14}$$

where

S = span-to-depth ratio used

APPENDIX IX - EXAMPLES OF LUMBER CROSS-SECTIONS FALLING WITHIN THE SCOPE OF SPS 5

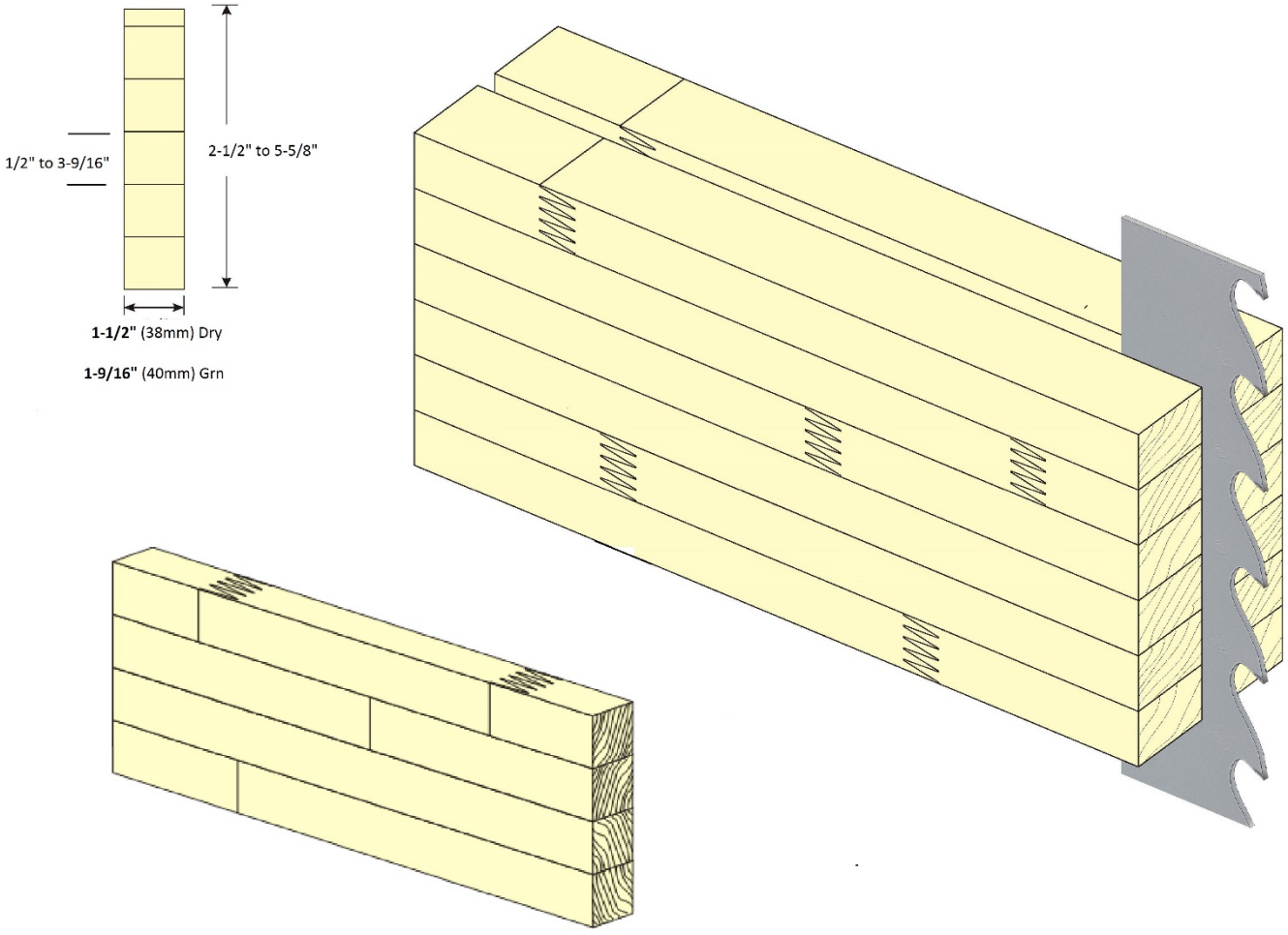


FIGURE 5 - EXAMPLES OF SPS 5 FACE-GLUED LUMBER PRODUCT

NLGA - SPS 5

May 1, 2026

This NLGA Special Products Standard for Face-Glued Lumber “Vertical Use Only” (**SPS 5**) consists of 27 pages.

This Standard, like all NLGA Standards, is subject to periodic review and may be amended from time to time.

To identify or obtain the most current version of NLGA – SPS 5, or any associated Supplements or Errata, check the publication section of the NLGA website at www.nlga.org.