



SPS 6

Special Products Standard for Structural Face-Glued Lumber



Effective: November 2015

Approved by the Canadian Lumber Standards Accreditation Board

Supersedes All Previous Editions, Revisions and Supplements



SPS 6

SPECIAL PRODUCTS STANDARD

FOR

STRUCTURAL FACE-GLUED LUMBER

EFFECTIVE: November 5, 2015

**Supersedes all Previous Editions, Revisions and
Supplements Previous to November 5, 2015**

(Approved by the CLSAB – September 17, 2010)

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PREFACE

- Below is a list of the Sections in SPS 6 that were revised since December 1, 2004.
 - a) **Revised Sections Effective December 1, 2005**
 - Section 7.1.3.
 - b) **New and Revised Sections Effective November 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”; and
 - Section 14.1 & 14.2 – Added “Spot-check” references.
 - c) **Revised Sections to Meet the ALSC Glued Lumber Policy Effective November 9, 2015**
 - Section 2.1
 - Section 2.2 – updated publication references
 - Section 3.3.1, Section 9.2.1.6 and Section 10.2

1.0 SCOPE

1.1 PART A AND PART B

This Standard consists of two parts.

PART A:

Product Specifications: specifies grade characteristics, standard sizes, visual grading and adhesive requirements, property requirements, property evaluation procedures, and grade stamping requirements for Structural Face-Glued lumber

PART B:

Qualification and Quality Control Requirements: specifies minimum qualifications and quality control requirements for a facility producing Structural Face-Glued lumber in accordance with the requirements of Part A of this Standard.

1.2 NLGA STANDARD GRADING RULES

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

1.3 IMPERIAL UNITS

In case of a dispute, the values stated in imperial units shall take precedence.

1.4 DESIGN VALUES

For use in Canada, design values are assigned to visually graded lumber of equivalent grade by the CSA Technical Committee on Engineering Design in Wood and are published in the current edition of CSA O86.

For use in the USA, design values are published in the NLGA Standard Grading Rules (Para.900).

1.5 STRUCTURAL FACE-GLUED LUMBER

This Standard applies to visually-graded face-glued lumber. The scope of products covered by this Standard shall meet the following criteria:

- i) The glue-line between each component shall run parallel to the edge;
- ii) the bonded surface shall be flat with no profile included; and
- iii) the final product shall have glue-lines only visible on the wide face of the specimen.

The quality of the components and the bonded face shall be verified by inspection and test procedures. The quality of the full-length piece of lumber containing the bonded face shall be verified by visual grading in accordance with the NLGA Standard Grading Rules.

(See Appendix I for products that fall within the scope of SPS 6)

2.0 DEFINITIONS AND REFERENCED PUBLICATIONS

2.1 DEFINITIONS

The following definitions shall apply to this Standard.

AGENCY: an organization accredited by the Canadian Lumber Standards Accreditation Board (CLSAB) and/or the American Lumber Standard Committee 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: an employee of the Agency who is approved by the Agency to inspect facilities producing Structural Face-Glued lumber.

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

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

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

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

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

COMPONENTS: lumber that is used for the lay-up of Structural Face-Glued lumber. (Candidate stock)

EVALUATION: an assessment of the manufacturing process and its quality control programs to determine whether a facility is capable of producing an item that meets the requirements of this standard.

FACILITY: is a manufacturing plant that produces Structural Face-Glued lumber and conducts visual grading and quality control sampling and testing.

GLUE-LINE: the layer of adhesive that attaches two components.

GRADE STAMP (MARK): the grade identification applied on a specimen of Structural Face-Glued lumber shall include the appropriate information under Section 10 of this Standard.

The grade stamp (mark) indicates that the Structural Face-Glued lumber process meets the requirements of the Agency's qualification and quality control procedures.

HEAT RESISTANT ADHESIVE (HRA): an adhesive that meets the elevated temperature performance requirements of ASTM D7374.

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

INSPECTION: the 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 this Standard.*

Note 2: *Two 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: a 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. Examples that may cause non-conformance: physical defects, test failures, incorrect or inadequate documentation, or deviations from prescribed processing, inspection or test procedures.

OUT-OF-CONTROL: a 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: a test procedure that provides an indication of the items ability to resist exposure conditions normally encountered during shipment, storage, or use.

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

QUALITY CONTROL MANUAL (PLANT STANDARD): a 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 Structural Face-Glued lumber.

RANDOM SAMPLING: a procedure by which a sample is generated from a population. The sample shall be representative of the 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 non-production grades for a period exceeding one year of a particular Structural Face-Glued lumber grade.

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

Each adhesive component is applied separately to one or both sides of the joint or glue-line.

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

Some separate-application adhesives require that the components be blended¹ in order for the adhesive to develop the required strength and durability. Other systems simply require the components to come into contact with each other.

¹ **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: a piece of full size Structural Face-Glued lumber randomly selected from production for purposes of quality control, quality verification testing and any subsequent analysis.

SPOT CHECK: the verification that the calibration / device / machine are still within calibration tolerances.

STRUCTURAL FACE-GLUED LUMBER: a product made by bonding together two or more components of lumber so that the grain of all laminations is essentially parallel. For the purpose of this Standard, a product that meets the requirements of this Standard, has glue-lines only visible on the wide face of the specimen and has a flat bonded surface with no profile included may be considered as “Structural Face-Glued” lumber.

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. Subsequent qualification procedures apply only to the process changes specified in this Standard. Other process changes shall be evaluated using the Initial Qualification procedures.

TEST BLOCK: a piece of Structural Face-Glued lumber cut out from a specimen selected for purposes of quality verification testing and any subsequent analysis.

TEST EQUIPMENT: equipment used by the facility to determine the shear strength of a bonded face for the purpose of determining conformance to the requirements of this Standard.

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

WOOD FAILURE: a type of failure induced on the glue bond in which the bonded face is failed by the tearing of wood fibre from one or the other of the two components that are face-glued.

2.2 REFERENCED PUBLICATIONS

ANSI/AWC

NDS[®] National Design Specification for Wood Construction (2012)

ALSC

Glued Lumber Policy (GLP) Nov 2013

ASTM

D905-08 (2013) Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading

D1101-97a (2013) Standard Test Methods for Integrity of Glue Joints in Structural Laminated Wood Products for Exterior Use

D1990-14 Standard Practice for Establishing Allowable Properties for Visually-Graded Dimension Lumber from In-grade Tests of Full-Size Specimens

D4444-13 Standard Test Methods for Laboratory Standardization and Calibration of Hand-Held Moisture Meters

D5266-13 Standard Practice for Estimating Percentage of Wood in Adhesive Bonded Joints

D7374-08 (2015) Practice for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber

D7438-13 Standard Practice for Field Calibration and Application of Hand-Held Moisture Meters

E4-2013 Practices for Load Verification of Testing Machines

CLSAB

REGULATIONS (Oct 2013)

CSA

CAN/CSA-O86-14

Engineering Design in Wood

CAN/CSA-O141-05 (R2014)

Softwood Lumber

CSA-O112.7-M1977 (R-2001)

Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood

CSA-O112.9-10 (2014)

Evaluation of Adhesives for Structural Wood Products (exterior exposure)

NLGA

Grade Rule

Standard Grading Rules for Canadian Lumber (Jan 2014)

SPS 1

Special Products Standard for Fingerjoined Structural Lumber (Nov 2014)

PART A - PRODUCT SPECIFICATIONS FOR STRUCTURAL FACE-GLUED LUMBER

3.0 PRODUCT DESCRIPTION

3.1 APPLICATIONS

Structural Face-Glued lumber produced to the requirements of SPS 6 is interchangeable with non-face-glued lumber of the same grade and length pursuant to the following restrictions:

- Structural Face-Glued lumber cannot be visually re-graded or re-manufactured into a higher stress grade even if the quality of the lumber containing glue-lines is such that would otherwise warrant such re-grading;
- Face-gluing of chemically treated lumber or chemical treatment of Structural Face-Glued lumber are not within the scope of this Standard;

Note: *This product is intended for use as a joist, rafter or stud member in a repetitive member assembly, or headers, lintels or built-up beams. Its suitability for use as a component in other products and applications should be assessed in accordance with the applicable product standard.*

3.2 DEMONSTRATION OF CONFORMANCE

Lumber represented as conforming to the requirements of this Standard shall be manufactured using a process in which the quality of the glue-lines

produced is continuously in accordance with all of the requirements specified herein. Product conformance shall be recorded by the maintenance of records and charts on the results of the inspection and test procedures.

3.3 SPECIAL APPLICATIONS

3.3.1 HEAT RESISTANT ADHESIVES

Structural Face-Glued Lumber is manufactured with a heat resistant adhesive that meets the requirements of ASTM D7374.

Note: *See ASTM D7374-08 "Practice for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber" for background on standard fire rated assembly.*

4.0 GRADE DESCRIPTION

This Standard applies to visually graded Structural Face-Glued lumber in all the species groups as defined in Section 6 for the grade classifications as specified in the NLGA Standard Grading Rules.

5.0 STANDARD SIZES

SPS 6 - Structural Face-Glued Lumber shall be in sizes 2x3 through 2x12 and in lengths not to exceed 24' (7.315m).

Standard thickness and widths for Structural Face-Glued Lumber produced in accordance with this Standard are shown in Table 1.

TABLE 1 - STANDARD THICKNESS & WIDTHS (From CSA O141)

Nominal Dimension	Actual Dimension			
	Imperial Units (inches)		Metric (mm)	
Thickness	Dry	Green	Dry	Green
2	1- ¹ / ₂	1- ⁹ / ₁₆	38	40
Width	Dry	Green	Dry	Green
2	1- ¹ / ₂	1- ⁹ / ₁₆	38	40
3	2- ¹ / ₂	2- ⁹ / ₁₆	64	65
4	3- ¹ / ₂	3- ⁹ / ₁₆	89	90
5	4- ¹ / ₂	4- ⁵ / ₈	114	117
6	5- ¹ / ₂	5- ⁵ / ₈	140	143
8	7- ¹ / ₄	7- ¹ / ₂	184	191
10	9- ¹ / ₄	9- ¹ / ₂	235	241
12	11- ¹ / ₄	11- ¹ / ₂	286	292

6.0 VISUAL REQUIREMENTS

6.1 SPECIES

The lumber used in the manufacture of Structural Face-Glued Lumber may be of any species in the species combinations specified in the NLGA rules.

These species may be combined in any combination that preserves the species combination. Species from different species combinations shall not be mixed within the same piece.

6.2 WOOD QUALITY

6.2.1 GENERAL

6.2.1.1 Component Thickness

The Structural Face-Glued lumber shall be formed from components that shall not be less than 1/2" actual size (12.5 mm) in thickness.

6.2.1.2 Structural Face-Glued lumber shall be formed in wood that meets the visual requirements of Section 6.2.2 prior to gluing.

6.2.1.3 Fingerjoined Lumber

If fingerjoined lumber is used in the assembly of Structural Face-Glued lumber as candidate lumber

stock, the fingerjoined lumber shall have met the strength and delamination requirements of NLGA SPS 1 for each size of the candidate stock for the highest SPS 6 grade to be produced.

When fingerjoined lumber is used in the assembly of Structural Face-Glued lumber as candidate lumber stock, the plant layout, production sequence and identification of the candidate stock shall be described in the Quality Control Manual and shall ensure that all segments in the final product originate and can be verified to have originated from production that meets the NLGA SPS 1 requirements for the grade(s) being produced.

6.2.2 WOOD QUALITY FOR EACH COMPONENT

6.2.2.1 Knots or Holes: shall not occupy more than 1/4 of the cross-section in each component in order to respect the restriction of the cross section of the grade.

6.2.2.2 Wane: shall not exceed 1/3 the thickness and 1/3 of the width.

6.2.2.3 Compression wood: severe compression wood is not permitted.

6.2.2.4 Honeycomb and decay: not permitted in the glued bonded face area.

6.2.2.5 Pitch: shall not exceed half the thickness and half of the width.

6.3 FINISHED PRODUCT LUMBER QUALITY

6.3.1 Visual Grade

The finished product shall be visually graded in accordance with the provisions of the NLGA Standard Grading Rules for Canadian Lumber except as provided in Sections 6.3.2, 6.3.3 and 6.3.4.

6.3.2 White Specks (NO. 2, NO. 3 and Studs)

White specks are unlimited if only occurring on one side of the bonded face. White specks are not permitted to overlap in the same cross-section on the 2-bonded faces. White speck to white speck shall not be bonded in the same cross-section.

6.3.3 Offset (Studs)

Offset between surfaces of the lumber must not exceed 1/16" (1.6 mm) on occasional pieces.

6.3.4 Wane

Wherever possible, wane on the two components forming the face-glued lumber shall not be placed at the bonded face.

6.4 MOISTURE CONTENT

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

7.0 ADHESIVE REQUIREMENTS

7.1 ADHESIVE SPECIFICATION

7.1.1 GENERAL

The adhesive used for face gluing shall meet either Section 7.1.2 or Section 7.1.3 of this Standard.

7.1.2 RESORCINOL AND PHENOL RESORCINOL ADHESIVES

The adhesive used for face gluing shall meet the requirements of CSA O112.7-M1977, *Resorcinol and Phenol-Resorcinol Adhesives for Wood*. 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 the requirements of CSA O112.9-10 when evaluated for one of the softwood species specified in the Standard.

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 supplied by the adhesive supplier for the particular adhesive.

7.4 BONDED FACE FABRICATION

7.4.1 ADHESIVE APPLICATION

The adhesive shall be applied to the bonded face profiles in a manner that will ensure that all of the gluing surfaces between the surfaces receive sufficient amount of adhesive resulting in squeeze out of excess glue when the gluing pressure is applied.

7.4.2 HEAT DAMAGE

The procedure used to apply heat to the bonded face shall be such as to ensure that neither the wood surfaces in the gluelines nor the wood itself are damaged by excess heat.

Note: *In Radio Frequency (RF) curing, wood damage may result from excessively long exposure of the bonded face to the RF field. When the wood is pre-dried in a kiln, excessive drying temperatures (above 350°F or 175°C) may reduce the strength of the wood. In either situation both the strength and the long-term durability of the bonded face may be impaired.*

7.4.3 ASSEMBLY PRESSURE

The pressure applied during the bonded face assembly process, and while the glueline is being cured, shall be that required for the particular lumber size, species, bonded face design and process used.

8.0 PROPERTY REQUIREMENTS FOR STRUCTURAL FACE-GLUED LUMBER

8.1 MODULUS OF RUPTURE (MOR)

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

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

8.2 SHEAR PARALLEL TO GRAIN (Fv)

The process lower fifth percentile for shear strength parallel to grain (Fv_{5th}), shall equal or exceed the shear strength parallel to grain (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.

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

8.3 WOOD FAILURE

8.3.1 GENERAL

Any separation of the glueline in the final product shall be investigated. If necessary, additional physical testing shall be undertaken.

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

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 test results shall equal or exceed 60% wood failure.

8.4 FINAL GRADE

The final grade of the Structural 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 faces.

9.0 STRUCTURAL FACE-GLUED LUMBER PROPERTY EVALUATION PROCEDURES

9.1 MODULUS OF RUPTURE (MOR)

Modulus of rupture (MOR) shall be determined by applying a test load that will induce a maximum stress not less than the characteristic bending strength value for the grade under consideration.

TABLE 2 - TEST VALUES FOR STRUCTURAL FACE-GLUED LUMBER

Size	Grade	MOR (psi)	Shear Strength (psi)	Size	Grade	MOR (psi)	Shear Strength (psi)
S-P-F				D Fir-L (N)			
2x3	Sel Str	4730	285	2x3	Sel Str	4970	380
	No. 1 / No. 2	3340			No. 1 / No. 2	3060	
	No. 3 / Stud	2290			No. 3 / Stud	2030	
	Stand & Btr	1560			Stand & Btr	1320	
2x4	Sel Str	4730		2x4	Sel Str	4970	
	No. 1 / No. 2	3340			No. 1 / No. 2	3060	
	No. 3 / Stud	2290			No. 3 / Stud	2030	
	Stand & Btr	1560			Stand & Btr	1320	
2x6	Sel Str	3900		2x6	Sel Str	4090	
	No. 1 / No. 2	2750			No. 1 / No. 2	2520	
	No. 3 / Stud	1880			No. 3 / Stud	1680	
2x8	Sel Str	3340		2x8	Sel Str	3500	
	No. 1 / No. 2	2360			No. 1 / No. 2	2160	
	No. 3	1610			No. 3	1440	
2x10	Sel Str	3060		2x10	Sel Str	3210	
	No. 1 / No. 2	2160			No. 1 / No. 2	1980	
	No. 3	1480			No. 3	1320	
2x12	Sel Str	2790		2x12	Sel Str	2920	
	No. 1 / No. 2	1960			No. 1 / No. 2	1800	
	No. 3	1350			No. 3	1200	
Hem-Fir (N)				Northern Species			
2x3	Sel Str	5000	305	2x3	Sel Str	3180	230
	No. 1 / No. 2	3540			No. 1 / No. 2	2300	
	No. 3 / Stud	2610			No. 3 / Stud	1690	
	Stand & Btr	1450			Stand & Btr	1000	
2x4	Sel Str	5000		2x4	Sel Str	3180	
	No. 1 / No. 2	3540			No. 1 / No. 2	2300	
	No. 3 / Stud	2610			No. 3 / Stud	1690	
	Stand & Btr	1450			Stand & Btr	1000	
2x6	Sel Str	4110		2x6	Sel Str	2730 *	
	No. 1 / No. 2	2910			No. 1 / No. 2	1890	
	No. 3 / Stud	2150			No. 3 / Stud	1390	
2x8	Sel Str	3360		2x8	Sel Str	2520 *	
	No. 1 / No. 2	2520 *			No. 1 / No. 2	1620	
	No. 3	1840			No. 3	1190	
2x10	Sel Str	3080		2x10	Sel Str	2310 *	
	No. 1 / No. 2	2310 *			No. 1 / No. 2	1490	
	No. 3	1690			No. 3	1090	
2x12	Sel Str	2800		2x12	Sel Str	2100 *	
	No. 1 / No. 2	2100 *			No. 1 / No. 2	1350	
	No. 3	1530			No. 3	990	
• Derived from the design values of the U.S. National Design Specification for Wood Construction and CSA O86 Engineering in Wood * The asterisk identifies where U.S. design values govern.							

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 Section 5.0, Table 1. If a span to depth ratio of 21 cannot be achieved the span shall be the maximum span possible and the proof load shall be adjusted for a shorter span using the equation found in Appendix II.

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

For test equipment where the load is applied vertically, when there is more than 5 inches (127mm) of lumber 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. Corrections are not required where specimens are tested with the load applied in a horizontal direction.

9.2 SHEAR PARALLEL TO GRAIN (F_v)

9.2.1 TEST BLOCK SIZE

9.2.1.1 Shear test specimens shall be selected from normal production.

9.2.1.2 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.

9.2.1.3 The test blocks shall be prepared as illustrated in Appendix III.

9.2.1.4 After test block preparation, test blocks shall be subjected to the pressure-vacuum-dry treatment as specified in Appendix IV.

9.2.1.5 The shear area shall be measured to the nearest 0.004 in (0.1 mm) at the glue line after the pressure-vacuum-dry treatment and prior to testing.

9.2.1.6 Crosshead movement shall provide approximately a uniform rate of loading not to exceed 0.50 inch per minute.

9.2.2 SHEAR PARALLEL TO GRAIN TEST PROCEDURE

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

9.2.3 MULTIPLE BONDED FACE TEST BLOCKS

For test blocks having multiple bonded faces, repeat the test procedure defined previously to evaluate every bonded face present in the test block. Report the minimum shear value and the minimum wood failure value from each test block with multiple bonded faces.

9.2.4 WOOD FAILURE READING PROCEDURE

Only 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.

9.2.5.1 The specimen shear stress value shall be taken from the minimum test block value.

9.2.5.2 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.

9.2.5.3 The Agency may request a facility to hold the test blocks intact for examination by the Agency.

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 joint and sufficiently back from the base of the joint 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) segment at the time of test.

9.3.2 TEMPERATURE

9.3.2.1 EQUIPMENT

The temperature of the test equipment shall, at the time of the test, be in the range of 10 to 30° C (50 to 90° F) inclusive. If the proof loading equipment is operated at temperatures below 10°C (50°F), the equipment shall be calibrated at a temperature within ±5°C (10°F) 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 ±5°C or ±10°F) as the production until the start of the Structural Face-Glued lumber property evaluation procedures.

10.0 GRADE STAMP REQUIREMENTS

10.1 GENERAL FOR STRUCTURAL FACE-GLUED LUMBER

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

All previous grade stamps shall be removed or obliterated.

10.2 GRADE STAMP REQUIREMENTS

For all Structural Face-glued lumber produced in conformance with the requirements of this Standard, the grade stamp on each piece shall contain:

- a) the grade;
- b) the species or species combination identification;

- c) the seasoning designation;
- d) the registered symbol of the agency;
- e) the facility identification;
- f) the expressions **SPS 6** and **CERT FACE-GLUED LBR**

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 ACCURACY

The test span and location of the load points shall be capable of being set to within $\pm \frac{1}{16}$ " (1mm).

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

The load shall be applied through a crosshead. The rate of the crosshead movement shall not exceed 5 inches per minute (2mm/second) during specimen testing.

11.2 SHEAR PARALLEL TO GRAIN TEST EQUIPMENT ACCURACY

The block shear test equipment shall be capable of performing shear tests in accordance with ASTM D905.

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

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 \pm 1 psi (0.7 MPa \pm 10 KPa) 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 (635mm) of mercury (at sea level), and a means of obtaining a pressure of at least 75 \pm 1 psi (0.52 MPa \pm 10 KPa) (gauge pressure). The vessel shall be equipped with a gauge(s) to register vacuum and pressure.

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 those 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 \pm 50 fpm (75 \pm 15 m/min) in the centre of the drying chamber and maintain an air temperature of 160 $^{\circ}$ \pm 5 $^{\circ}$ F (71 \pm 3 $^{\circ}$ C) should be capable of achieving the specified drying rate.

12.0 QUALITY CONTROL MANUAL (PLANT STANDARD)

12.1 GENERAL

The Quality Control Manual (Plant Standard) is a written description of the manufacturing operation, broken down by station (see Appendix VII).

12.2 QUALITY CONTROL PERSONNEL

The quality control personnel shall be directly responsible to the facility management, and not subordinated to production or sales.

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;
- c) Maintenance and interpretation of quality control records.

Also, the quality control personnel shall be responsible for carrying out and maintaining records of various inspections, and test procedures detailed in the Quality Control Manual, and for formally advising 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 PREPARATION, REVISION AND APPROVAL

Each facility shall:

- a) Prepare a Quality Control Manual in compliance with this Standard and shall submit the manual to the Agency for approval;

- b) Regularly review and update its Quality Control Manual to reflect current production practices and procedures, quality control policies and quality control program procedures and resubmit to the Agency; and
- c) Upon approval, implement the updated program in accordance with the Manual.

The contents of the Quality Control Manual must be approved by the Agency at the time of qualification. Qualification shall apply only to the manufacturing, quality control procedures and limits set forth in the Quality Control Manual.

The Agency shall be notified in advance of any changes in the Quality Control Manual that may affect product quality. Failure to have such changes approved prior to implementation, or failure to maintain the process in compliance to the requirements of the Quality Control Manual, shall be grounds for disciplinary action.

12.3.1 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 and test equipment operation and all calibration;
- b) Quality control sampling, testing and analysis;
- c) Documentation and record keeping;
- d) Identification and trace-ability;
- e) Non-conformance; and
- f) Corrective action.

12.3.2 AGENCY

The Quality Control Manual shall identify the Agency.

CLSAB and ALSC accredited agencies shall include in their certification and quality control procedures an explanation of the following:

- a) That their Structural Face-Glued lumber certification and quality control procedures comply with the ALSC Glued Lumber Policy and the CLSAB Regulations;
- b) That the responsibility for the certification and quality control procedures is that of the Agency; and
- c) That the CLSAB and the ALSC Board shall monitor whether the certification and quality control procedures are being carried out by the Agency.

13.0 QUALIFICATION AND SAMPLING REQUIREMENTS

13.1 GENERAL

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

- a) The facility is capable of operating within the requirements of its Quality Control 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 Quality Control Manual.

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 Structural Face-Glued lumber process occurs, the facility shall immediately notify the Agency.

13.2.1 NEW PRODUCTION LINE START-UP OR CHANGES REDUCING JOINT SPACING

Prior to the initial qualification testing, the plant under the supervision of the Agency shall generate or select a 28-piece sample that meets the following characteristics:

- a) The average fingerjoint spacing shall be equal to or less than the fingerjoint spacing to be used; and
- b) At least one section between the load points includes fingerjoints in adjacent laminations that are aligned in the cross-section. The fingerjoints are considered to be aligned if the tips of adjacent fingerjoints overlap.

The sample shall be tested in accordance with Section 13.2.3.

13.2.2 NEW PRODUCTION LINE START-UP OR OTHER MAJOR CHANGES

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 fifty-three (53) bending strength, fifty-three (53) shear parallel to grain, and fifty-three (53) wood failure tests.

The sample shall be tested in accordance with Section 13.2.3.

13.2.3 PLANT QUALIFICATION TEST PROCEDURE

The specimens shall be tested in accordance with Section 9 and the test results shall meet the requirements set forth in Section 13.5. The samples for these tests shall be obtained from a single size, consisting of a specific species or species combination and using a procedure, approved by the Agency that ensures the samples obtained are representative of the item to be qualified.

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

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

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

13.3.1 BENDING STRENGTH

An agency supervisor shall randomly select the following for each grade to be qualified.

53 specimens of Structural Face-Glued lumber for bending strength (MOR) evaluations to be tested in accordance with Section 9.1 of this Standard.

Additional samples to increase the total number for bending strength to **78, 102, 125** or **148** may be selected to qualify the bending strength.

13.3.2 SHEAR STRENGTH AND WOOD FAILURE ASSESSMENT

An agency supervisor shall randomly select from the highest grade to be produced **53** specimens of Structural Face-Glued lumber to be tested in accordance with Section 9.2 of this Standard for shear strength parallel to grain (Fv) and assessed for percentage wood failure.

Additional samples to increase the total number to **78, 102, 125** or **148** for shear and/or wood failure assessments may be selected to qualify the shear strength.

13.4 RE-QUALIFICATION SAMPLING

The Quality Control Supervisor shall randomly select the following samples for each item and for each property to be re-qualified:

13.4.1 BENDING STRENGTH

When the bending strength modulus of rupture 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 of this Standard.

Additional samples to increase the total number for bending strength to **53, 78, 102** or **148** may be selected to re-qualify the bending strength.

13.4.2 SHEAR STRENGTH AND WOOD FAILURE ASSESSMENT

a) 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 of this Standard.

b) When the wood failure is required to be re-qualified, wood failure assessment shall be performed from the **28** specimens selected in Section 13.4.2a).

For items **a)** and **b)** above, additional samples to increase the total number for bending strength or shear assessments to **53, 78, 102** or **148** may be selected to re-qualify the shear strength.

13.5 DECISION RULES

13.5.1 INITIAL QUALIFICATION RULES

Results of bending strength, shear strength and wood failure assessment shall determine whether or not grade stamps may be issued for the item being qualified.

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

13.5.1.1 BENDING STRENGTH

Not more than **1** of the **53** bending strength results shall have bending strength (MOR) value less than the species group value as provided in Table 2.

When the additional specimen sampling procedure referred to in Section 13.3 is used to qualify for bending strength, the test results shall not exceed **2** in a **78, 3** in a **102** or **4** in a **125** – specimen sample.

13.5.1.2 SHEAR STRENGTH PARALLEL TO GRAIN

Not more than **1** of the **53** shear test results shall have shear strength parallel to grain (Fv) value less than the species group value as provided in Table 2.

When the additional specimen sampling procedure referred to in Section 13.3 is used to qualify for shear strength parallel to grain, the test results shall not exceed **2** in a **78, 3** in a **102** or **4** in a **125** – specimen sample.

13.5.1.3 WOOD FAILURE

The “Average” wood failure of the test results for the specimens shall equal or exceed 80% wood failure.

“All” of the specimen test results shall equal or exceed 60% wood failure.

13.5.2 RE-QUALIFICATION RULES

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

13.5.2.1 BENDING STRENGTH

“All” of the **28** bending strength tests shall equal or exceed the bending strength (MOR) 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 qualify for bending strength, the test results shall not exceed **1** in a **53**, **2** in a **78**, **3** in a **102** or **4** in a **125** – specimen sample.

13.5.2.2 SHEAR STRENGTH PARALLEL TO GRAIN

“All” of the 28 shear tests shall equal or exceed the characteristic shear strength parallel to grain (Fv) 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 qualify for shear strength, the test results shall not exceed **1** in a **53**, **2** in a **78**, **3** in a **102** or **4** in a **125** – specimen sample.

13.5.2.3 WOOD FAILURE

The “Average” wood failure of the test results for the specimens shall equal or exceed 80% wood failure.

“All” of the specimen 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.

13.6.2 MAJOR CHANGES

The qualification procedures outlined in Section 13.2 shall be required for any major changes and/or process conditions, which in the opinion of the Agency may affect the quality of the product.

Note: Major changes may include but are not necessarily limited to: any new adhesive, a change to the bonded face profile, joining of green or green-frozen lumber and/or producing a grade(s) that has higher design values than those initially qualified. Species change to a species group with higher design values.

13.7 NON-PRODUCTION OF STRUCTURAL FACE-GLUED LUMBER

When a certified facility does not produce Structural Face-Glued lumber for a period exceeding one year, all grade qualifications for that facility shall become void. The requirements for initial qualification shall be satisfied prior to further production of Structural Face-Glued lumber.

14.0 EQUIPMENT CALIBRATION

Records of all calibration and spot check verifications shall be maintained for at least six (6) years.

14.1 TEST EQUIPMENT

The test equipment shall be certified by an independent certification organization acceptable to CLSAB 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, except that the percentage error shall not exceed $\pm 2.0\%$.

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

The test equipment shall be spot-checked in accordance with procedures set forth in the Quality Control Manual and the spot-check 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. Re-calibration of the test equipment or spot-check devices by an independent certification organisation may be required by the Agency.

TABLE 3 - TEST EQUIPMENT CALIBRATION FREQUENCY

Equipment	Minimum Spot-Check Frequency
Bending Proof Loader	At least once a week with a device acceptable to the independent certification organization
Shear Tester	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

An independent certification organisation acceptable to CLSAB shall certify and calibrate devices necessary to conduct the required spot-checks on the test equipment. This shall be done prior to initial qualification and once a year thereafter.

Procedures for the certification of calibration devices shall be consistent with the applicable sections of ASTM E4 except that the error shall not exceed $\pm 2.0\%$.

A copy of all certification documents shall be made available 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:

- i) Bending strength;
- ii) Shear strength parallel to grain; and
- iii) 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:

- i) One dealing with the quality, strength and resistance to moisture of the structural face-glued lumber bonded faces; and
- ii) One dealing with the grade of the lumber containing structural face-glued lumber bonded faces. Verification of lumber grades shall follow the grading provisions set forth in the NLGA Grading Rules.

15.2 QUALITY CONTROL SAMPLING

15.2.1 SAMPLING METHOD

The sampling method shall be approved by the Agency and documented in the Quality Control Manual.

Specimens shall be sampled from grade stamped production. The sampling method shall include procedures for selecting the structural face-glued lumber specimens for bending and shear strength tests and which portion will be tested for shear and wood failure.

15.2.2 SAMPLING FREQUENCY

15.2.2.1 BENDING STRENGTH SAMPLING

One (1) specimen per hour per shift (8 hours) with no fewer than **five (5)** specimens collected during a production shift of less than five (5) hours shall be obtained for bending strength assessment.

15.2.2.2 SHEAR STRENGTH PARALLEL TO GRAIN and WOOD FAILURE SAMPLING

Two (2) test blocks from each specimen at least 2 feet apart from each other shall be obtained during each **one (1)** hour or part thereof of operation.

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

Under exceptional circumstances, the Agency may request the facility to increase its frequency of inspection and/or testing.

15.3 QUALITY CONTROL TESTING

Testing for bending strength, shear strength parallel to grain and wood failure shall be performed in accordance with the procedures described in Part A, Section 9 of this Standard.

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 sample was drawn shall be deemed to be in compliance 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 V and VI.

When any of the process properties described in Section 15.4 goes “**OUT-OF-CONTROL**”, the item from which the quality control sample was drawn shall be held pending results of the following tests (if 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 tests or the results of **28** test blocks drawn from **14** shear / wood failure test specimens, 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 bending strength (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 Structural Face-Glued lumber.

b) SHEAR STRENGTH PARALLEL TO GRAIN

When test results indicate the process is “**IN-CONTROL**” for shear, the facility shall proceed to proceed to Section 15.4.2.1c) 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 Structural 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 Structural Face-Glued lumber.

The Agency may request a facility to hold the wood failure test samples for examination.

15.5 IDENTIFICATION AND TRACEABILITY

Each package of Structural Face-Glued lumber leaving the facility production line shall be identified with the time and date it left the production line. The reason for this is traceability of an item in the event that further testing is required or in the event of a non-conformance situation.

15.6 QUALITY CONTROL RECORDS

Facility control records shall include:

- a) Equipment calibration and maintenance data;
- b) Quality control tests; and
- c) All Structural Face-Glued lumber production stoppages as a result of quality control requirements and a report of the corrective actions taken.

Separate records shall be maintained for each item produced.

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

16.0 REINSPECTION PROVISIONS

16.1 GENERAL

Response to complaints on Structural Face-Glued lumber involving visual grade, size, moisture content, tally, bond-line 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 the NLGA Standard Grading Rules for Canadian Lumber (See Section 1.2) of this Standard.

Sample selection and testing 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 or 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 modulus of rupture property evaluations to be tested in accordance with Section 9.1 of this Standard in such a way that the compression face is randomly generated;
- b) 80 specimens for the shear strength parallel to grain evaluations 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 accredited testing organization.

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

- a) For the bending modulus of rupture, not more than 6 specimens out of 80 shall have an MOR value that is less than the corresponding MOR test value as provided in Table 2 for the grade and size.
- b) For the shear strength parallel to grain, not more than 6 specimens out of 80 shall have a shear strength parallel to grain value that is less than the corresponding shear strength test value as provided in Table 2 for the grade and size.

APPENDICES

APPENDIX I – EXAMPLES OF CROSS-SECTIONS FALLING WITHIN THE SCOPE OF SPS 6

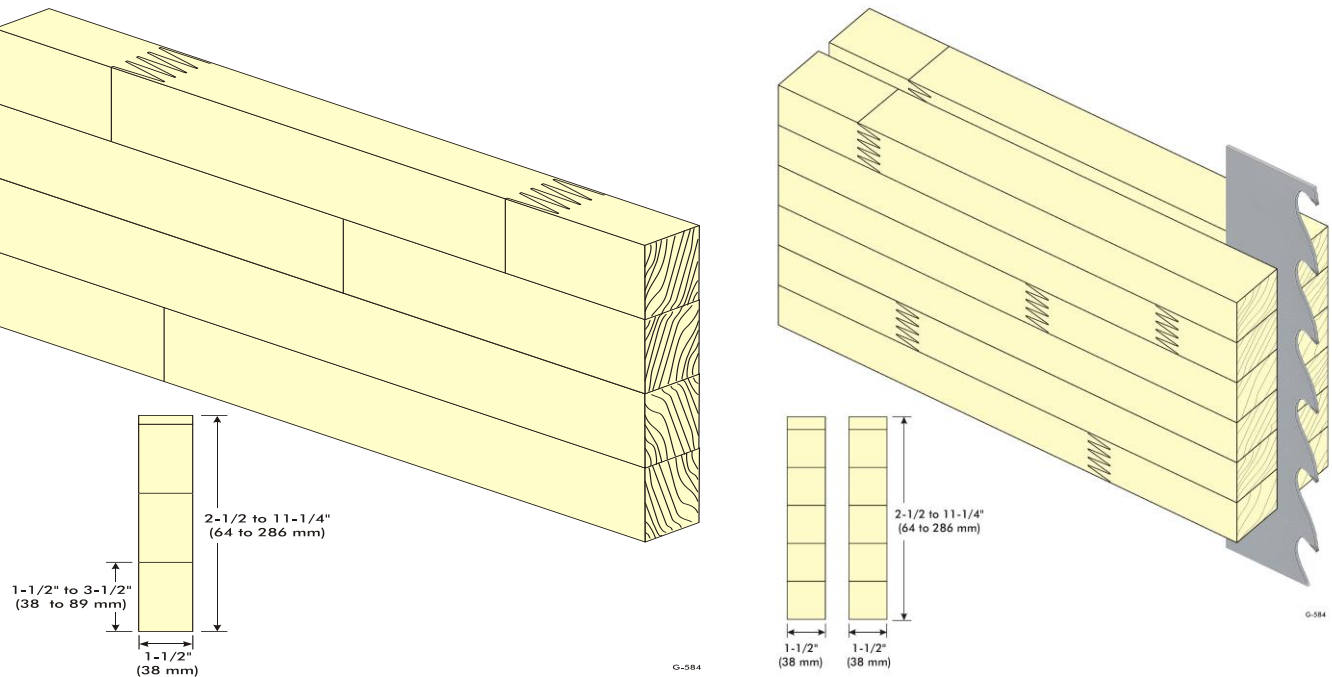


FIGURE 1 - EXAMPLES OF CROSS-SECTIONS

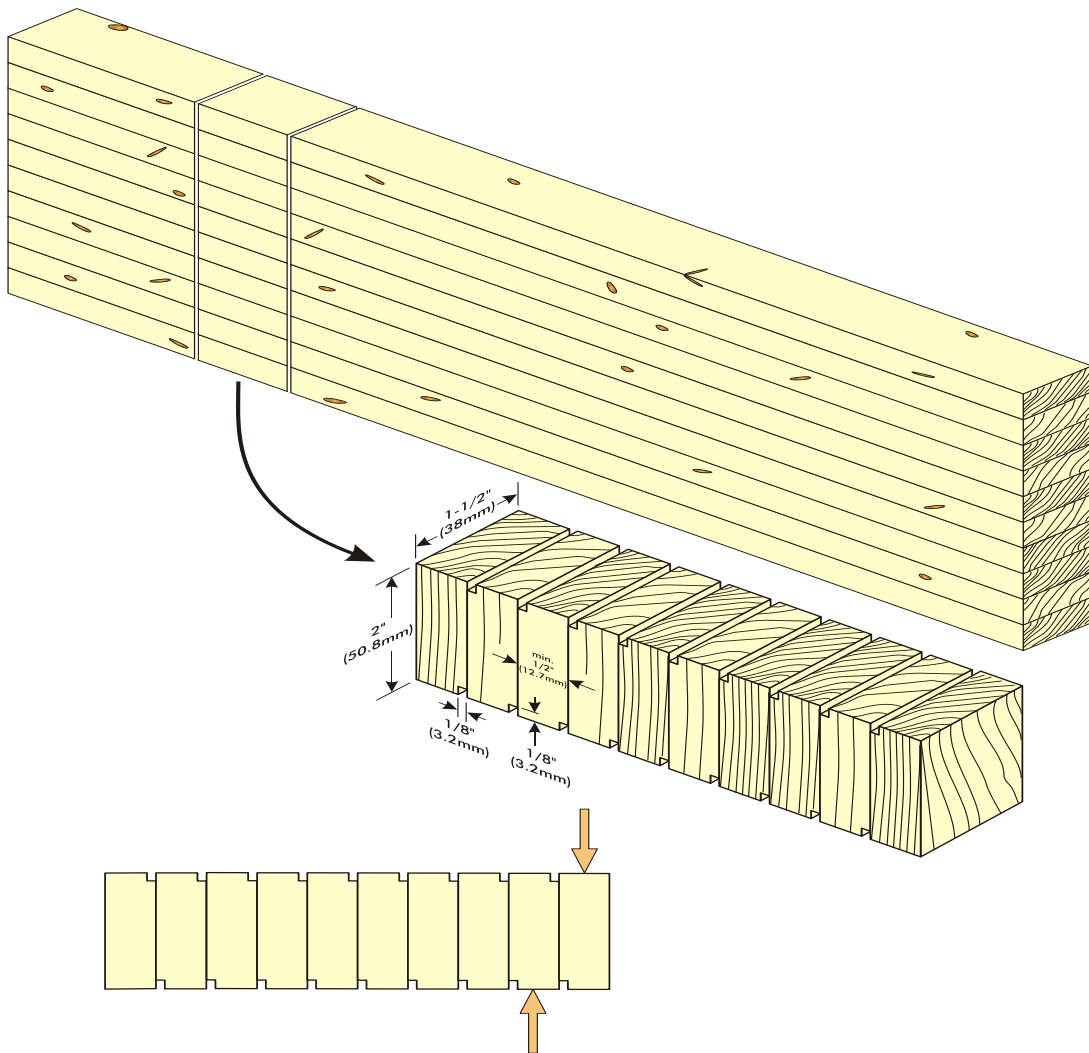
APPENDIX II – SPAN-TO-DEPTH ADJUSTMENT FACTORS

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 shall be applied to the MOR test value shown in Table 2.

TABLE 4 - CORRECTION FACTORS FOR EDGE BENDING MOR

Correction Factors For Edge Bending MOR	
Span to Depth Ratio	Multiply MOR Value by: ⁽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 III - BLOCK SHEAR TEST SPECIMEN SIZE



G-584

FIGURE 2 - STRAIGHT BLOCK WITH SAW KERF

APPENDIX IV - PRESSURE-VACUUM-DRY TREATMENT

Specimens shall be 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 $160^{\circ}\text{F} \pm 5^{\circ}$ ($71^{\circ}\text{C} \pm 3^{\circ}$) 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°F (18.3° to 29.4°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" (508 to 635mm) 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 $160^{\circ} \pm 5^{\circ}\text{F}$ ($71^{\circ} \pm 3^{\circ}\text{C}$). 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" (50mm) apart, with the end grain surfaces and bonded face orientation parallel to the direction of airflow.

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

APPENDIX V – “OUT-OF-CONTROL” FLOW CHART FOR “BENDING STRENGTH”

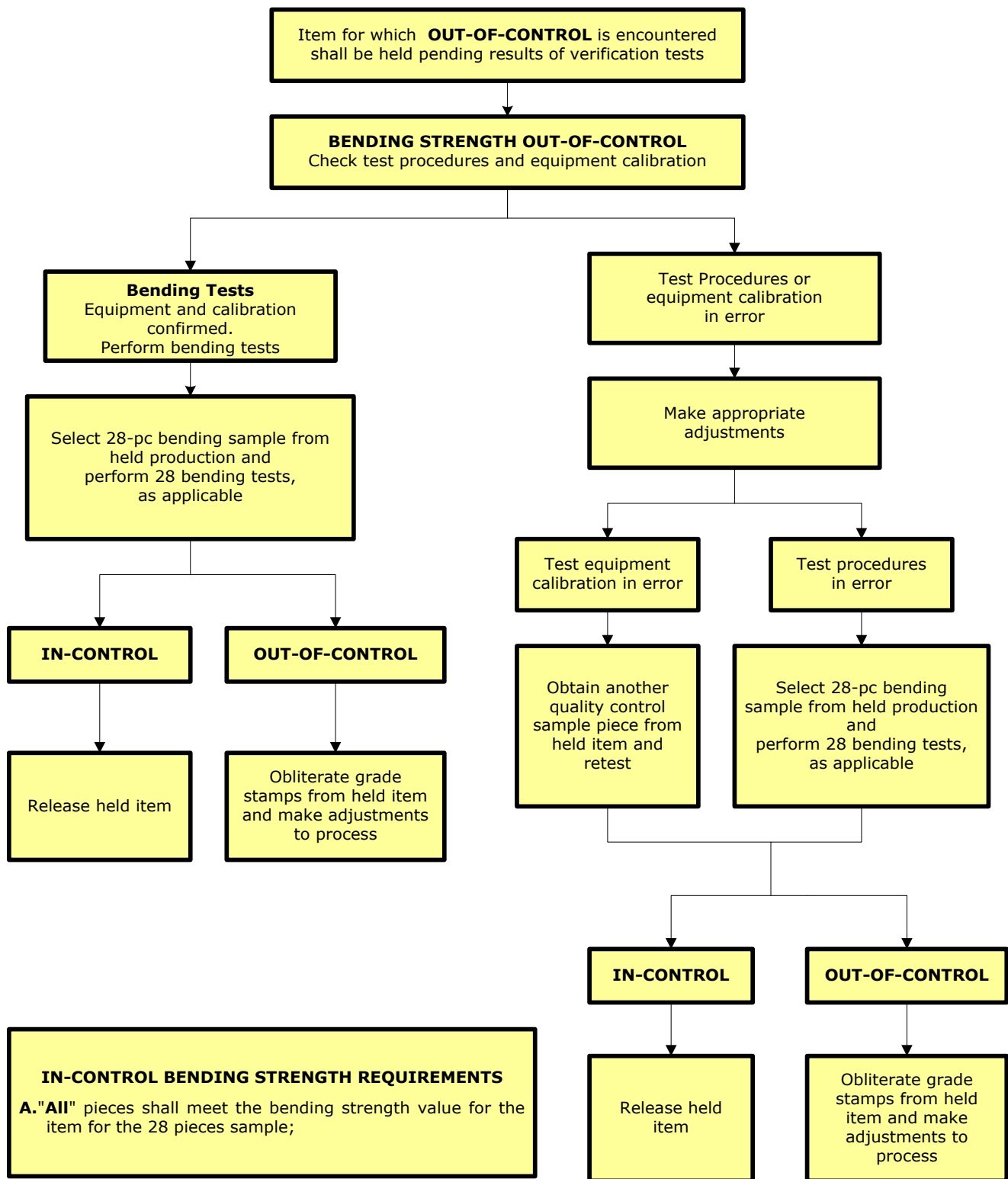


FIGURE 3 - BENDING STRENGTH FAILURE VERIFICATION FLOW CHART

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

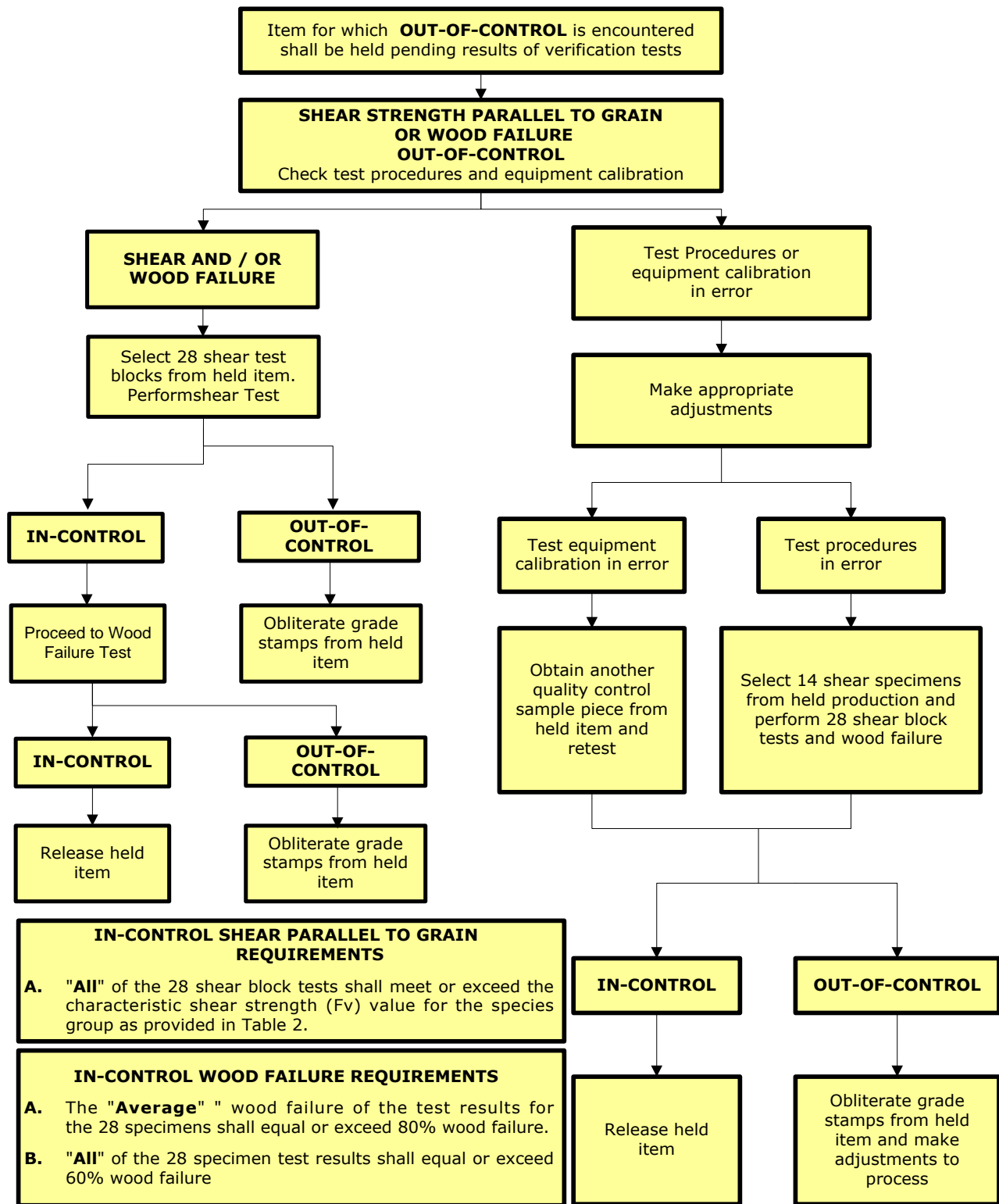


FIGURE 4 - SHEAR PARALLEL TO GRAIN AND WOOD FAILURE VERIFICATION FLOW CHART

APPENDIX VII - QUALITY CONTROL MANUAL CONTENTS

The Quality Control Manual (Plant Standard) is a written description of 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.

Examples of typical stations are:

- a) **Input grading:** a station where defects are removed from the ends of the lumber prior to machining of the fingerjoint;
- b) **Machining of the fingerjoints and/or the bonded face:** this station would be concerned primarily with set-up tolerances and criteria for changing cutter heads;
- c) **Glue mixing:** this station would be concerned with measuring the prescribed proportions of adhesive and hardener, ensuring thorough blending at the prescribed temperature levels;
- d) **Make-up station:** this station may consist of top dead rolls mounted above the in-feed table (ahead of the crowder and retard system). It provides assistance to the operator with assembly of the joint.

The Quality Control 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. For example, procedures should be provided to ensure that uniform and adequate pressure is being applied to the face bond surfaces as the adhesive is curing.

The details of the Quality Control Manual will vary with the process used. Some aspects of it may be common to all lumber sizes, grades and species groupings, while other aspects may vary with size, grade and species.

An important part in the Quality Control Manual is special provisions for shut down and start-up of the gluing line, particularly during temporary stoppages. The latter is of particular significance in preheat processes, in which the glue may be spread on heated wood, and has to be put under gluing pressure within a limited time to avoid pre-cure of the glue.

Another important section covers the provisions made for the absence of any operator with specialized skills essential to the process.

In general, the Quality Control 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 Quality Control Manual.

APPENDIX VIII – THE USE OF WOOD FAILURE ASSESSMENT IN PROCESS CONTROL

Wood failure is a mandatory requirement of this Standard.

Trained personnel should be able to read single blocks from a standard set with an accuracy of $\pm 15\%$, and be within $\pm 5\%$ of the average for the set.

APPENDIX IX – AGENCY ADMINISTRATION

This Standard shall be administered by an accredited Agency. Agency approval of a facility to grade stamp Structural Face-Glued lumber shall be contingent upon the facility's compliance with the procedures and requirements of this Standard.

Inspections shall include amongst other things reporting on the following:

- a) Examination of samples from the facility's inventory, the facility's records and procedures, to verify compliance to the requirements of Part A of this Standard and the Plant Standard.
- b) Examination of the shear test equipment including observations on:
 - i) wear and damage;
 - ii) lubrication and operations of moveable parts;
 - iii) record of weekly calibration
- c) Examination of the test 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 in the gluing surface.

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

Check the publication section of our website (www.nlga.org) for the latest edition date of NLGA SPS 6.