

ANSI/HPVA HP-1-2020

# AMERICAN NATIONAL STANDARD FOR HARDWOOD AND DECORATIVE PLYWOOD

APPROVED AUGUST 17, 2020



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Excerpts from ANSI/HPVA HP-1-2020

For 2022 EPA TSCA Title VI CFR 770 Revision Public Review



# AMERICAN NATIONAL STANDARD For Hardwood and Decorative Plywood

## ABSTRACT

This voluntary American National Standard for Hardwood and Decorative Plywood establishes nationally recognized marketing classifications, quality criteria, test methods, definitions, and product marking and designation practices for plywood produced primarily from hardwoods. It is intended for voluntary use for reference in trade literature, catalogs, sales contracts, building codes, government regulations and standards of performance, and procurement specifications to describe the quality aspects of the product and the means to determine conformance.

Requirements are given for wood species, veneer face grades, back grades, inner ply grades, medium density fiberboard (MDF) core, lumber core, particleboard core, hardboard core, bond line performance, updated and revised formaldehyde emissions, panel constructions, dimensions, moisture content, sanding, and finishing. Sampling and testing provisions cover dry and cyclic-boil shear, and cyclic cold soak test methods for bond line performance determinations, and field and laboratory moisture content measuring methods. A glossary of trade terms is provided for better communication and understanding, and provisions are made for panel marking to indicate compliance with this Standard. Any “Note” appearing in this Standard is explanatory in nature and not mandatory.

Key words: Decorative plywood; hardwood plywood; plywood, hardwood and decorative; veneer grades; decorative softwood and hardwood; and formaldehyde emission requirements.

## THE METRIC SYSTEM OF MEASUREMENT

The 1975 Metric Conversion Act, as amended by the Omnibus Trade and Competitiveness Act of 1988, sets forth that the metric (SI) is the preferred system of measurement in the U.S. The publication of this Standard provides a unique opportunity to examine the metric system for a product that is predominately used in North America (less than 10% U.S. production is exported). This document contains metric units first with English (inch-pound) units in parentheses. The metric number in almost all cases is the “soft” conversion number for the accepted inch-pound system requirement. In order to make the metric number more conceptually coherent and for consistency, most conversions for less than 76 mm (3 inches) in dimension are “soft” converted to the nearest 0.1 mm. For measurements above 76 mm (3 inches), the “soft” value is converted to the nearest 1 mm.

Tables have presented a special challenge in presenting both metric and inch-pound numbers. In those cases where a limited number of conversions are necessary, both metric and inch-pound numbers appear. In other cases, two full and separate tables are provided, arranged to face each other on adjacent pages. In such cases, these tables are designated “Metric” or “Inch-Pound” and are designated as the same page number, but with a “M” or “I” suffix (5 M and 5 I, for example).

It is assumed that future “hard” conversion editions of this Standard will result in the change in length and width dimensions for some hardwood plywood products with panel thicknesses remaining virtually unchanged. For example, it is likely that the standard 4' x 8' or 48" x 96" panel will become 1200 mm x 2400 mm (47.2" x 94.4"). The timing of “hard” conversion for some products will depend, to a large extent, on the coordination among various sectors of the home building and home remodeling industries. Timing for “hard” conversion is less relevant for certain other hardwood plywood products. For example, cut-to-size panel products for furniture, cabinet, and similar applications are cut to the dimensions required by the purchaser. These dimensions can be designated in either the metric or the inch-pound systems as nominal or actual dimensions.

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## FOREWORD

(This Foreword is not part of the American National Standard for Hardwood and Decorative Plywood, ANSI/HPVA HP-1-2020.)

This Voluntary Standard supersedes the American National Standard for Hardwood and Decorative Plywood, ANSI/HPVA HP-1-2009, a standard sponsored by the Hardwood Plywood & Veneer Association (HPVA®), DBA Decorative Hardwoods Association (DHA), and developed under the HPVA Policy for the Development and Maintenance of Voluntary American National Standards.

In April 1931, the commercial standard for hardwood plywood was established and published as Commercial Standard CS35-31 by the Commodity Standards Division, National Bureau of Standards, U.S. Department of Commerce. The standard was revised in 1942, 1947, 1961, and 1971 which was designated PS-52-71. In 1983, the standard became an ANSI standard which was subsequently revised in 1992, 1993, 1994, 2000, 2004, 2016, and the current ANSI/HPVA-HP-1-2020.

Suggestions for improvement gained in the use of this Standard are welcome. They should be sent to the American National Standards Institute.

Consensus for this Standard was achieved by use of the “ANSI Essential Requirements: Due process requirements for American National Standards” and the ANSI accredited “Hardwood Plywood and Veneer Association Policy for the Development and Maintenance of Voluntary American National Standards”. The following organizations, recognized as having an interest in hardwood and decorative plywood, were contacted prior to the approval of this Standard. Inclusion in this list does not necessarily imply that the organization concurred with the proposed Standard as submitted to ANSI.

<b>Architectural Woodwork Institute (AWI)</b>	<b>Hexion, Inc.</b>
<b>Bill Groah, Independent</b>	<b>Kitchen Cabinet Manufacturers Association (KCMA)</b>
<b>Business and Institutional Furniture Manufacturers Association (BIFMA)</b>	<b>Murphy Plywood</b>
<b>Columbia Forest Products</b>	<b>National Wood Flooring Association (NWFA)</b>
<b>Canadian Hardwood Plywood and Veneer Association (CHPVA)</b>	<b>Roddis Lumber &amp; Veneer Co. LP</b>
<b>Composite Panel Association (CPA)</b>	<b>Solenis LLC</b>
<b>Franklin International</b>	<b>States Industries LLC</b>
<b>Gail Overgard, Independent</b>	<b>Timber Products Company</b>

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For 2022 EPA TSCA Title VI CFR 770 Revision Public Review

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# American National Standard for Hardwood and Decorative Plywood

(Including formaldehyde emission requirements for certain reconstituted wood wall panels)

## 1. PURPOSE AND INTENDED USE

**1.1 PURPOSE** – The purpose of this Standard is to establish an internationally recognized national standard covering the aesthetic and performance criteria for the principal types, grades, and sizes of hardwood and decorative plywood. The principal wood species used for hardwood and decorative plywood are hardwoods; however, certain softwood species and woody grasses are also used.<sup>1</sup>

**1.2 INTENDED USE** – This Standard is to apply to panels as originally manufactured. The products covered by this Standard are intended for use as: decorative wall panels; industrial panels; cut-to-size panels; made to size panels; stock panels; door skins and other applications.<sup>2</sup> The Standard is also intended to provide producers, distributors, architects, contractors, builders, and users with a common basis for understanding the characteristics of these products.

## 2. SCOPE AND CLASSIFICATION

**2.1 SCOPE** – This Standard covers the principal types, face grades, back grades, inner ply grades and constructions of plywood made primarily with hardwood faces. Included are requirements for wood veneer grading; cores of veneer, lumber, particleboard, fiberboard (MDF/HDF (hardboard)), and combinations thereof, i.e., bond line performance, panel construction, moisture content; formaldehyde emissions requirements; and panel dimensional tolerances. Test procedures are provided or referenced for determining conformance with various requirements in this Standard. Definitions of trade terms, methods of ordering, and methods for identifying products that conform to this Standard are included.

Formaldehyde emission requirements are also set forth for industrial cut-to-size and stock panel plywood, and for hardwood plywood and certain reconstituted wood wall panels.<sup>3, 4</sup>

**2.2 CLASSIFICATION** – Plywood covered by this Standard is classified as follows:

**2.2.1 COMMERCIAL SPECIES AND COMMERCIAL SPECIES GROUPS** – The more commonly used species for plywood faces are listed in Table 1.

**2.2.2 GRADES OF VENEERS** – The grades of veneers are listed below with the identification symbol for each grade:

Face Grades	AA, A, B, C, D, and E
Rustic Grade	R
Specialty Grade	SP
Back Grades	1, 2, 3, and 4
Inner Ply Grades	J, K, L, and M

The veneer face thickness will vary according to the design and intended use as specified by the manufacturer. See Appendix C for more information on veneer face thicknesses.

<sup>1</sup> This Standard also includes certain softwood species for decorative uses. Construction grades of plywood (predominately softwood species) are covered in the U.S. Product Standard PS 1-19 for Construction and Industrial Plywood, or the latest edition.

<sup>2</sup> Additional product information is available from the Hardwood Plywood and Veneer Association (DBA Decorative Hardwoods Association) 42777 Trade West Drive, Sterling VA 20166

<sup>3</sup> The formaldehyde emission requirements set forth in this Standard for hardwood plywood and industrial panels are consistent with those established by Environmental Protection Agency (EPA) (40 CFR Part 770) and the California Air Resources Board (CARB) Air Toxic Control Measure (ATCM) CCR Title 17, section 93120 et seq. Formaldehyde emission requirements for reconstituted wood wall panels are consistent with those established by EPA and CARB for hardwood plywood; however, the chamber test loading rates applied to reconstituted wood wall panels in this voluntary product standard relate more to particleboard decking and underlayment than to wall panel applications in manufactured homes.

<sup>4</sup> This Standard also includes formaldehyde emission requirements for reconstituted wood wall panel products made with binders and used for decorative hardwood plywood. More extensive requirements for some reconstituted wood panel products are covered in other standards such as the latest edition of American National Standard ANSI A208.1-2016 for Particleboard, ANSI A208.2-2016 for MDF

**2.2.3 TYPES OF PLYWOOD** – The types of plywood are listed below in descending order of water-resistance of the bond line (see Table 9b).

Technical	(Exterior bond line)
Type I	(Exterior bond line)
Type II	(Interior bond line)

**2.2.4 CONSTRUCTIONS** –The constructions, based on the kinds of cores, commonly in 2-ply, 3-ply, 5-ply, and other odd or even configurations are listed below:

1. Veneer core
2. Lumber core
3. Particleboard core
4. Fiberboard (MDF & HDF (hardboard)) core
5. Combination core (multiple plies of VC and composite core)
6. Special core

**2.2.5 SIZES AND THICKNESSES** – Hardwood Plywood may be manufactured in any specified length, width, and thickness depending on the capabilities of the manufacturer. Panel sizes such as 1219 x 1829 mm (48 by 72 inches), 1219 x 2438 mm (48 by 96 inches), and 1219 x 3048 mm (48 by 120 inches) with thicknesses ranging from 3.2 mm (1/8 inch) to 38 mm (1.5 inches) are common.

**2.2.6 PANEL PERFORMANCE PROPERTIES** – Hardwood Plywood is manufactured for non-structural decorative applications consisting of faces and backs applied to a variety of cores and core types, including veneer cores, composite cores, combination cores, and other specialty cores. Each core, species, thickness, and final construction has its own range of physical performance properties and natural characteristics. A variety of adhesives are also used in manufacturing. Due to the variability inherent in the final product, an agreement between buyer and seller shall be made when performance properties are necessary for the intended use and shall reference the appropriate performance standards (MOR, MOE, screw withdrawal, water absorption, thickness swell, etc.). For additional information, see Appendix D.



TABLE 1 – A COMPARISON OF THE PHYSICAL PROPERTIES OF SOME POPULAR SPECIES

<u>Species</u>		Average Dried Weight (lb./ft <sup>3</sup> )	Category See § 3.7	Hardness (lb./f)	Specific Gravity	Modulus of Elasticity (million PSI)
Ash, White Avg. of 4 Species	<i>Fraxinus spp.</i>	42	A	1,320	0.60	1.17
Beech, American	<i>Fagus grandifolia</i>	45	A	5,800	0.64	1.72
Birch, Sweet	<i>Betula lenta</i>	44	A	1,470	0.65	2.17
Birch, Yellow	<i>Betula allghnaiensis</i>	43	A	1,260	0.62	2.01
Bubinga	<i>Guibourtia demeusil</i>	49	A	2,690	0.8	2.48
Hickories, True Average of 4 Species	<i>Carya spp.</i>	51	A	1,574	0.75	2.2
Oaks, Commercial Red Average of 9 Species	<i>Quercus spp.</i>	43	A	1,290	0.63	1.82
Oaks, Commercial White Average of 6 Species	<i>Quercus spp.</i>	47	A	1,360	0.68	1.78
Pecan	<i>Caraya illinoensis</i>	46	A	1,820	0.66	1.73
Rosewood, Brazilian	<i>Dalbergia nigra</i>	54	A	2,720	0.87	1.88
Rosewood, Indian	<i>Dalbergia latifolia</i>	54	A	3,170	0.75	1.78
Rosewood, Santos*	<i>Machaerium spp.</i>	54	A	1,690	0.70	1.85
Sapele	<i>Entandrophragma cylindricum</i>	39	A	1,510	0.62	1.82
Anegre	<i>Aningeria spp.</i>	33	B	995	0.44	1.17
Elm, Rock	<i>Ulmus thomasii</i>	38	B	1,320	0.63	1.54
Cherry, Black	<i>Prunus serotina</i>	35	B	950	0.50	1.49
Cypress (Baldycypress)	<i>Taxodium distichum</i>	28	B	510	0.46	1.44
Douglas Fir	<i>Pseudotsuga menziesii</i>	30	B	710	0.48	1.95
Gum	<i>Liquidambar styraciflua</i>	34	B	850	0.52	1.64
Hemlock, Western	<i>Tsuga Heterophylla</i>	28	B	540	0.50	1.63
Mahogany, African	<i>Khaya ivorensis</i>	34	B	830	0.55	1.4
Mahogany, Honduran ("True")	<i>Swietenia macrophylla</i>	35	B	830	0.45	1.5
Maple, Hard	<i>A. nigrum</i>	43	B	1,450	0.63	1.83
Maple, Soft	<i>Acer rubrum, A saccharinum</i>	38	B	950	0.54	1.64
Poplar, Yellow	<i>Liriodendron Tulipifera</i>	29	B	540	0.45	1.58
Sycamore	<i>Plantas occidentalis</i>	34	B	770	0.49	1.42
Teak	<i>Tecona grandis</i>	40	B	1,000	0.65	1.55
Walnut (Black), American	<i>Juglans nigra</i>	38	B	1,010	0.55	1.68
Alder, Red	<i>Alnus rubra</i>	28	C	590	0.41	1.38

<u>Species</u>		Average Dried Weight (lb./ft <sup>3</sup> )	Category See § 3.7	Hardness (lb./f)	Specific Gravity	Modulus of Elasticity (million PSI)
Basswood	<i>Tilia americana</i>	26	C	410	0.37	1.46
Butternut	<i>Juglans cinerea</i>	23	C	490	0.38	1.18
Elm, American	<i>Ulmus americana</i>	35	C	830	0.5	1.34
Elm, Slippery	<i>Ulmus rubra</i>	37	C	860	0.53	1.49
Makore	<i>Tieghemella heckelii</i>	40	C	1,110	0.64	1.46
Meranti, Light Red	<i>Shorea spp.</i>	34	C	460	0.55	1.23
Meranti, Yellow	<i>Shorea spp.</i>	40	C	770	0.65	1.55
Meranti, Dark Red	<i>Shorea spp.</i>	44	C	780	0.71	1.77
Meranti, White	<i>Shorea spp.</i>	41	C	1,140	0.67	1.49
Pine, Southern Yellow	<i>Pinus spp.</i>	32	C	690	0.51	1.79
Pine, White	<i>Pinus spp.</i>	22	C	380	0.35	1.24
Tupelo, Black	<i>Nyssa sylvatica</i>	34	C	810	0.5	1.2
Tupelo, Water	<i>Nyssa aquatica</i>	34	C	880	0.5	1.26
Aspen, Quaking	<i>Populus Tremuloides</i>	26	D	350	0.42	1.18
Cedar, Western Red	<i>Thuja plicata</i>	22	D	350	0.32	1.11

**Notes:** For species marked with an asterisk (\*), the value for hardness has been estimated using formulas found in the Wood Handbook.

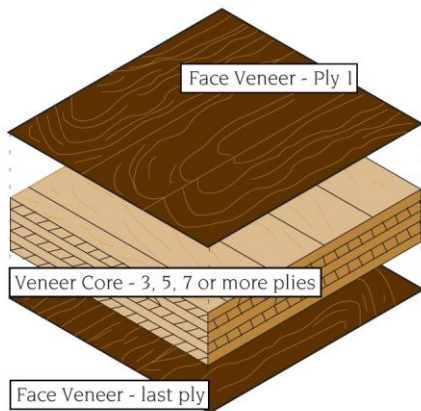
Physical Properties values are given for wood at 12% moisture content.

Hardness represents the relative toughness of wood and its ability to withstand marks and wear. The numerical value represents the force needed to embed a 0.444-inch ball one-half its diameter in the wood.

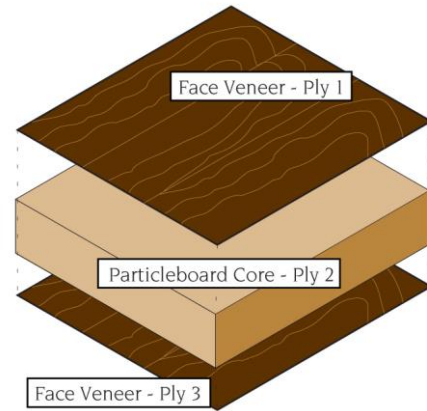


**Figure 2 – Typical Plywood Constructions\***

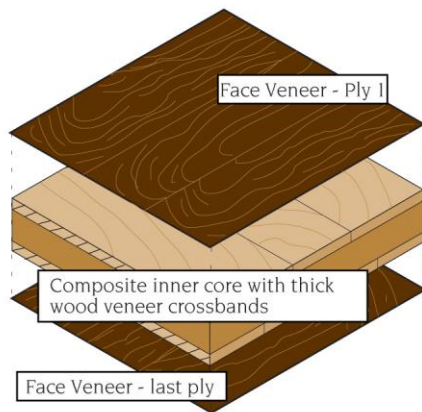
Veneer Core Plywood



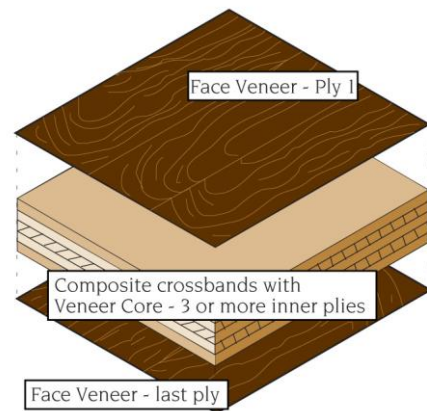
Particleboard Core Plywood



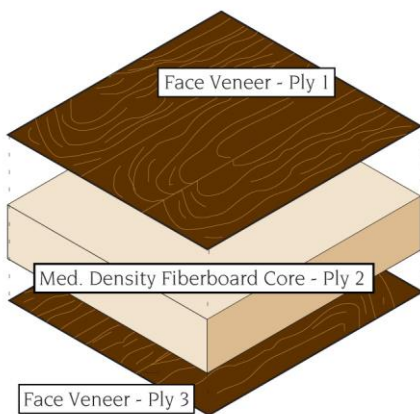
Combination Core Plywood with Composite Inner Ply



Combination Core Plywood with Composite Crossbands



Medium Density Fiberboard Core Plywood



\*Note: Not all possible constructions are represented.

**TABLE 10 – WOOD FAILURE REQUIREMENTS FOR TECHNICAL AND TYPE I PLYWOOD BOND LINES**

Average Failing Load		Minimum Wood Failure	
		Individual Specimen	Test Piece Average
Kilopascals (kPa)	(lb./ sq. inch)	Percent <sup>a</sup>	Percent <sup>a</sup>
Under 1724	(Under 250)	25	50
1724-2413	(250-350)	10	30
Over 2413	(Over 350)	10	15

<sup>a</sup> These values are the percentage of wood area remaining adhered to the fractured surface in the test area.

### 3.11 BOND LINE AND RELATED REQUIREMENTS

#### 3.11.1 CONSTRUCTION REQUIREMENTS

Construction requirements specific to plywood types are specified in tables 9a and 9b.

**3.11.2 TECHNICAL & TYPE I PLYWOOD** – The bond line of Technical & Type I plywood panels shall meet the requirements given in Table 10 when tested in accordance with 4.2, 4.3, and 4.4. **Hardwood plywood manufactured using softwood core veneers shall also meet the bond line requirements specified in PS 1-19<sup>7</sup> exterior plywood.**

**3.11.3 TYPE II PLYWOOD** – The bond line of Type II plywood shall be of such quality that specimens shall withstand the 3-cycle soak test and criteria described in 4.2.2 and 4.6.

**3.12 FORMALDEHYDE EMISSIONS** – Hardwood plywood shall be certified to or compliant with the California Air Resources Board Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products (CARB) and EPA TSCA Title VI 40 CFR Part 770 Formaldehyde Emission Standards for Composite Wood Products (TSCA). Panels or panel bundles shall be labeled in accordance with TSCA requirements, and may also be labeled in accordance with CARB at the manufacturers discretion.

Hardwood plywood manufacturers that apply veneer to a substrate (e.g. hardwood plywood, PB, MDF) and subsequently process those panels into “component parts” or “finished goods” as defined in TSCA Title VI shall comply with the TSCA requirements for “laminated product producers” and “fabricators.” Manufacturers that lay up their own hardwood plywood (e.g. line-by-line veneer core plywood construction) prior to subsequent processing into

component parts or finished goods shall require third party certification of the plywood as a “panel manufacturer” per TSCA requirements.

Prior to fabrication into component parts or finished goods, all hardwood plywood products shall comply with the CARB and TSCA formaldehyde emissions limit for hardwood plywood (0.05 ppm) and shall be tested according to the ASTM E1333<sup>8</sup> Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products using a Large Chamber, or equivalent ASTM D6007<sup>8</sup> Standard Test Method for Determining Formaldehyde Concentrations in Air from Wood Products Using a Small Scale Chamber. ASTM D6007<sup>8</sup> small chamber equivalency must be demonstrated per CARB and TSCA requirements.

**3.13 DIMENSIONS AND TOLERANCES** – The actual dimensions of hardwood plywood panels shall be as agreed upon between the buyer and the seller. The tolerances for the stated dimensions shall be as follows:

**Width:** Stated actual plus or minus 0.8 mm (1/32 inch or 0.031 inch)

**Length:** Stated actual plus or minus 0.8 mm (1/32 inch or 0.031 inch)

**Thickness:** (sanded or unsanded)

Thickness may be referred to and labeled as the “*Thickness Class*” but is not required. The *Thickness Class* designation shall NOT be expressed in terms of actual units of measurement.

*Thickness Class designation*, if used, shall be expressed as follows:

Fractional Class designation:  
(Examples: 3/4, 5/8, 1/2, 3/8, 1/4, 3/16, or 1/8 Class)

Decimal Class designation:  
(Examples: .750, .625, .500, .375, .250, .185, or .125 Class)

Metric Class designation:  
(Examples: 19.2, 15.9, 12.7, 9.5, 6.4, 4.8, or 3.2 Class)

The actual thickness shall at minimum be provided:

For Class designations equal to or greater than 1/4, .250 or 6.4 shall have a minimum thickness of stated Class designation with minus 3/64 inch, .047 inch, or 1.2 mm allowed.

For Class designations less than 1/4, .250 or 6.4 shall have a minimum thickness of stated Class designation minus 1/32 inch, .031 inch, or 0.8 mm allowed.

Actual thickness shall be measured to the nearest 0.025 mm (0.001 inch) using a dial thickness gauge or conventional micrometer. Sufficient pressure shall be applied to ensure

<sup>8</sup> The latest issue of ASTM publications shall be used provided the requirements are applicable and consistent with the issues designated. ASTM publications may be purchased from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959 USA, [www.astm.org](http://www.astm.org)

<sup>7</sup> Later issues of this publication may be used provided the requirements are applicable and consistent with the issue designated. Copies are available from the APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).

## 5. DEFINITIONS

The terms used in this Standard are defined as follows:

**BACK** – The side reverse to the face of a panel or the poorer side of a panel in any grade of plywood calling for a face and back.

**BALANCED MATCH** – Two or more veneer components or leaves of equal size to make up a single face.

**BALANCED PANEL** – For purposes of this Standard, a balanced panel is one which is free from warp that affects serviceability for its intended use.

**BANDING** – Portion of wood extending around one or more sides of plywood panels.

**BARK POCKET** – Bark around which normal wood has grown.

**BLENDING** – Color change that is detectable at a distance of 1.8 m to 2.4 m (6 feet to 8 feet) but which does not detract from the overall appearance of the panel.

**BOOK MATCH** – Adjacent pieces of veneer from a flitch or log are opened like a book and spliced to make up the face with matching occurring at the spliced joints (see Figure 1 for illustration). The fibers of the wood, slanting in opposite directions in the adjacent sheets, create a characteristic light and dark effect when the surface is seen from an angle.

**BRASHNESS** – Condition of wood characterized by low resistance to shock and by abrupt failure across the grain without splintering.

**BURL, CONSPICUOUS** – A swirl, twist, or distortion in the grain of the wood which usually occurs near a knot or crotch. A conspicuous burl is associated with abrupt color variation and/or a cluster of small dark piths caused by a cluster of adventitious buds.

**BURL, BLENDING** – A swirl, twist, or distortion in the grain of the wood which usually occurs near a knot or crotch but does not contain a knot and does not contain abrupt color variation. A blending burl is detectable at 1.8 m to 2.4 m (6 feet to 8 feet) as a swirl or roundel.

**CATHEDRAL** – A grain appearance characterized by a series of stacked and inverted “V”, or cathedral type of springwood (earlywood) summerwood (latewood) patterns common in plain-sliced (flat-cut) veneer (See **SPLIT HEART**).

**CENTERS** – Inner plies whose grain direction runs parallel to that of the outer plies. Included as centers are parallel laminated plies.

**CENTER MATCH** – An even number of veneer components or leaves of equal size matched with a joint in the center of the panel to achieve horizontal symmetry.

**CHECKS** – Small slits running parallel to grain of wood, caused chiefly by strains produced in seasoning.

**COMBINATION CORE** – A core which includes two or more different types of wood based material, one of which

is a reconstituted wood product (See **RECONSTITUTED WOOD**).

**COMB GRAIN** – A quality of rift cut veneer with exceptionally straight grain and closely spaced growth increments resembling the appearance of long strands of combed hair.

**COMPONENT (OF FACE)** – An individual piece of veneer that is jointed to other pieces to achieve a full length and width face. Terms used interchangeably with *component* in the context of the face are *piece* and *leaf*.

**COMPRESSION FAILURE** – See **CROSS BREAK**

**CONSPICUOUS** – See **BURL, CONSPICUOUS AND KNOTS, CONSPICUOUS PIN**.

**CORE** – The inner part of plywood between face and back, usually veneer. Sawn lumber, particleboard, MDF, hardboard, or other material is also used as cores.

**CORE, BANDED** – Core that has been made with banding on one or more sides.

**CROSSBANDING** – Veneer used in the construction of plywood with five or more plies. Crossbands are placed at right angles to the grain of the faces and are typically placed adjacent to the face and back. Also refers to all inner layers of veneer whose grain direction runs perpendicular to that of the outer plies and includes parallel laminated plies.

**CROSS BAR** – Irregularity of grain resembling a dip in the grain running at right angles, or nearly so, to the length of the veneer.

**CROSS BREAK** – Separation of the wood cells, often appearing as barely distinct fine irregular lines across the grain. Such breaks are often due to internal strains resulting from unequal longitudinal shrinkage or to external forces. (See **COMPRESSION FAILURE**)

**CROSS FIGURE** – A series of naturally occurring figure effects characterized by mild or dominant patterns across the grain in some faces. For example, a washboard effect occurs in fiddle-back cross figure; and cross wrinkles occur in the mottle figure.

**DECAY** – The decomposition of wood substance by fungi. The incipient stage is characterized by discoloration and sometimes accompanied by a softening of the wood substance. The final or ultimate stage is characterized by the partial or complete collapse of the wood structure and the destruction of the wood substance.

**DEFECT, OPEN** – Checks, splits, open joints, knotholes, cracks, loose knots, wormholes, gaps, voids, or other openings interrupting the smooth continuity of the wood surface.

**DELAMINATION** – Separation of plies or layers of wood or other material through failure of the adhesive bond.

**DISCOLORATIONS** – Stains in wood substances. Common veneer stains are sap stains, blue stains, stain produced by

chemical action caused by the iron in the cutting knife coming in contact with the tannic acid of the wood, and those resulting from exposure of natural wood extractives to oxygen and light, to chemical action of vat treatments or the adhesive components, and/or to the surface finish.

**DOZE** – (SYNONYMOUS WITH DOTE) – A form of incipient decay characterized by a dull and lifeless appearance of the wood, accompanied by a loss of strength and softening of the wood substance.

**EMISSION LEVEL** – The formaldehyde concentration in testing wood panel products using ASTM E1333, *Standard Test Method for Determining Formaldehyde Levels From Wood Products Under Defined Test Conditions Using A Large Chamber* or equivalent ASTM D6007, *Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products using a Small Chamber*.

**ENGINEERED VENEER** – Veneers that are first peeled, normally from obeche or poplar logs. The peeled veneer leaves are dyed to a specified color, and then glued together in a mold to produce a large laminated block. The shape of the mold determines the final grain configuration. The block is then sliced into leaves of veneer with a designed appearance that is highly repeatable.

**FACE** – The better side of any plywood panel in which the outer plies are of different veneer grades. Also either side of a panel in which there is no difference in the veneer grade of the outer plies.

**FEW** – A small number of characteristics without regard to their arrangement in the panel.

**FIGURE** – The pattern produced in a wood surface by annual growth rings, rays, knots, deviations from natural grain such as interlocked, curly and wavy grain, and irregular coloration.

**FINGER JOINT** – A series of fingers machined on the ends of two pieces of wood to be joined, which mesh together and are held firmly in position with an adhesive.

**FLAKE** – See **FLECK, RAY**.

**FLAT-CUT** – See **PLAIN-SLICED**.

**FLECK, RAY** – Portion of a ray as it appears on the quartered or rift-cut surface. Fleck is often a dominant appearance feature in oak.

**FLITCH** – A complete bundle of veneer sheets laid together in sequence as they are cut from a given log or section of a log.

**GAP** – Open slits in the inner plies or improperly joined veneers.

**GRAIN** – The direction, size, arrangement, and appearance of the fibers in wood or veneer.

**GRAIN SLOPE** – Expression of the angle of the grain to the long edges of the veneer component.

**GRAIN SWEEP** – Expression of the angle of the grain to the long edges of the veneer component over the area extending one-eighth of the length of the piece from the ends.

**GUM POCKETS** – Well-defined openings between rings of annual growth, containing gum or evidence of prior gum accumulations.

**GUM SPOTS AND STREAKS** – Gum or resinous material or color spots and streaks caused by prior resin accumulations sometimes found on panel surfaces.

**HAIRLINE** – A thin, perceptible line showing at the joint of two pieces of wood.

**HALF-ROUND** – A method of veneer cutting similar to rotary cutting, except that the piece being cut is secured to a “stay log,” a device that permits the cutting of the log on a wider sweep than when mounted with its center secured in the lathe to produce rotary sliced veneer. A type of half-round cutting is used to achieve plain-sliced or flat-cut veneer.

**HARDBOARD** – A panel manufactured primarily from inter-felted lignocellulosic fibers consolidated under heat and pressure in a hot press to a density of 500 kg/m<sup>3</sup> (31 lbs./ft<sup>3</sup>) or greater by: A) a wet process, or; B) a dry process that uses a phenolic resin, or a resin system in which there is no added formaldehyde as part of the resin cross-linking structure, or; C) a wet formed/dry pressed process. Other materials may be added to improve certain properties, such as stiffness, hardness, finishing properties, resistance to abrasion and moisture, as well as to increase strength, durability, and utility.

**HARDWOOD** – General term used to designate the renewable resource of lumber or veneer produced from temperate zone deciduous or tropical broad-leaved trees in contrast to softwood, which is produced from trees which are usually needle bearing or coniferous. The term does not infer hardness in its physical sense.

**HEARTWOOD** – The non-active or dormant center of a tree, generally distinguishable from the outer portion (sapwood) by its darker color, sometime referred to as heart.

**HIGH DENSITY FIBREBOARD** – See **HARDBOARD**.

**INCONSPICUOUS** – Barely detectable with the naked eye at a distance of 1.8 m to 2.4 m (6 feet to 8 feet) (See **BLENDING**).

**INDUSTRIAL PANELS** – Generally unfinished multi-ply products which consist of various combinations of hardwood or decorative veneer faces and inner ply materials (e.g., veneer, particleboard, MDF, and hardboard). These are generally cut-to-size and stock panels used in making cabinets, furniture, laminated block flooring, and panels for other non-structural applications.

**INNER PLYS** – Plies other than face or back plies in a panel construction. Crossbands and centers are classed as inner plies (See **CORE**).



**JOINT** – The common edge between two adjacent materials in the same plane.

**JOINT, EDGE** – Joint running parallel to the grain of the wood.

**JOINT, OPEN** – Joint in which two adjacent pieces of veneer in the same plane do not fit tightly together.

**KNOT** – Cross section of tree branch or limb with grain usually running at right angles to that of the piece of wood in which it occurs.

**KNOT, OPEN** – Opening produced when a portion of the wood substance of a knot has dropped out or where cross checks have occurred to produce an opening.

**KNOTHOLES** – Openings produced when knots drop from the wood in which they were embedded.

**KNOTS, BLENDING PIN** – Sound knots 6.4 mm (1/4 inch) or less that generally do not contain dark centers. Blending pin knots are barely detectable at a distance of 1.8m to 2.4m (6 feet to 8 feet), do not detract from the overall appearance of the panel, and are not prohibited from appearing in all grades.

**KNOTS, CONSPICUOUS PIN** – Sound knots 6.4 mm (1/4 inch) or less in diameter containing dark centers.

**KNOTS, SOUND, TIGHT** – Knots that are solid across their face and fixed by growth to retain their place.

**KNOTS, SPIKE** – Knots cut from 0° to 45° to the long axis of limbs.

**LAP** – A condition where one piece of veneer in the same ply overlaps another piece.

**LAYER** – A single veneer ply or two or more plies laminated with grain direction parallel (See **PLY**). Two or more plies laminated with grain direction parallel is a parallel laminated layer.

**LOOSE SIDE** – In knife-cut veneer, that side of the sheet that was in contact with the knife as the veneer was being cut, and cutting checks (lathe checks) because of the bending of the wood at the knife edge.

**MANUFACTURER** – A producer of hardwood and/or decorative plywood.

**MEDIUM DENSITY FIBERBOARD (MDF)** – A composite panel product composed primarily of cellulosic fibers and a bonding system cured under heat and pressure. MDF density is typically between 500 kg/m<sup>3</sup> (31 lbs. /ft<sup>3</sup>) and 1000 kg/m<sup>3</sup> (62 lbs. /ft<sup>3</sup>). For formaldehyde emission limits, thin MDF is defined as MDF with a thickness less than or equal to 8 mm (0.315 inches).

**MILL RUN** – A defined lot of panels which may include SHOP panels up to the amount agreed to between buyer and seller. Alternately referred to as BLENDED SHOP (see **SHOP**).

**MINERAL** – See **STREAKS, MINERAL**.

**NATURAL** – When referring to color and matching, veneers containing any amount of sapwood and/or heartwood.

**NO ADDED FORMALDEHYDE (NAF)** – A resin formulated with no added formaldehyde as part of the resin crosslinking structure in a composite wood product that meets the emission standards in Section 770.17(c) of the EPA TSCA Title VI regulation and Section 93120.3(d) of the CARB regulation.

**NOMINAL** – A term that designates a stated dimension as being approximate and subject to allowances for variation.

**OCCASIONAL** – A small number of characteristics that are arranged somewhat diversely within the panel face.

**PARTICLEBOARD** – A generic term for a composite panel primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers, bonded together with a bonding system, and which may contain additives.

**PECKY** – Pockets of disintegrated wood caused by localized decay or wood areas with abrupt color change related to localized injury such as bird peck. Peck is sometimes considered as a decorative effect, such as bird peck in pecan and hickory or pecky in cypress.

**PLAIN-SLICED (FLAT-CUT)** – Veneer sliced parallel to the pith of the log and approximately tangent to the growth rings to achieve flat-cut veneer. Plain-sliced veneer is cut using either a horizontal or vertical slicing machine or by the half-round method using a rotary lathe.

**PLANK MATCHED** – A panel having the face made up of specially selected and assembled dissimilar (in color, or grain, or width) veneer strips of the same species, and sometimes grooved at the joints between strips to simulate lumber planking.

**PLEASING MATCHED** – A face containing components which provides a pleasing overall appearance. The grain of the various components need not be matched at the joints. Sharp color contrasts at the joints of the components are not permitted.

**PLY** – A single sheet of veneer or several strips laid with adjoining edges that may or may not be glued, which forms one veneer lamina in a glued panel (see **LAYER**). In some constructions, a ply is used to refer to other wood components such as particleboard or MDF.

**PLYWOOD, HARDWOOD or DECORATIVE** – A bonded assembly intended for interior use with at least one decorative veneer surface with a core consisting of an assembly of layers or plies of veneer, or veneers in combination with lumber, particleboard, MDF, hardboard, or special core in which the adjacent layers or plies are at approximately right angles.

**QUARTER-SLICED (QUARTER-CUT)** – A straight grain appearance achieved through the process of quarter-slicing or through the use of veneer cut in any fashion that produces a straight grain effect. Cut is radial to the pith to

the extent that ray fleck is produced, and the amount of fleck is not limited.

**RANDOM MATCHED (MISMATCHED)** – A panel having a face made up of veneer strips of the same species which are selected and assembled without regard to color or grain, resulting in variations, contrasts and patterns of color and grain. Pleasing appearance is not required.

**RAY FLECK** – See **FLECK**.

**RECONSTITUTED WOOD** – A generic term for panel products made with strands, wafers, particles, or fibers of wood. Individual products include hardboard, insulation board, particleboard, MDF, and oriented strand board (OSB) / waferboard. Particleboard and MDF normally use urea-formaldehyde resin as the binding agent. OSB / waferboard normally use phenol-formaldehyde as the binding agent. Most hardboard and insulation board use the lignin from the processed wood as the binding agent. Most dry-process hardboards contain phenol-formaldehyde to increase bonding strength.

**RECONSTITUTED BLOCK** – A generic term for cellulosic bio-materials re-assembled into a resource for veneer production.

**RED/BROWN** – When referring to color and matching, veneers containing all heartwood, ranging in color from light to dark.

**REPAIRS** – A patch, shim, or filler material inserted and/or glued into veneer or a panel to achieve a sound surface.

**REPAIRS, BLENDING** – Wood or filler insertions similar in color to adjacent wood so as to blend well.

**RIFT-CUT** – A straight grain appearance achieved through the process of cutting at a slight angle to the radial on the half-round stay log or through the use of veneer cut in any fashion that produces a straight grain with minimal ray fleck.

**ROTARY-CUT** – Veneer produced by centering the log in a lathe and turning it against a broad cutting knife which is set into the log at a slight angle.

**ROUGH CUT** – Irregular shaped areas of generally uneven corrugation on the surface of veneer, differing from the surrounding smooth veneer and occurring as the veneer is cut by the lathe or slicer.

**RUNNING MATCH** – The panel face is made from components running through the flitch consecutively. Any portion of a component left over from a face is used as the beginning component or leaf in starting the next panel.

**RUPTURED GRAIN** – A break or breaks in the grain or between springwood and summerwood caused or aggravated by excessive pressure on the wood by seasoning, manufacturing, or natural processes. Ruptured grain appears as a single or series of distinct separations in the wood such as when springwood is crushed leaving the summerwood to separate in one or more growth increments.

**SAPWOOD** – The living wood of lighter color occurring in the outer portion of a tree, sometimes referred to as sap.

**SHAKE** – A separation or rupture along the grain of wood in which the greater part occurs between the rings of annual growth (see **RUPTURED GRAIN**).

**SHARP CONTRASTS** – For purposes of this Standard, this term means that face veneer of lighter than average color shall not be joined at the edges with veneer of darker than average color and that two adjacent pieces of veneer shall not be widely dissimilar in grain, figure, and other natural character markings.

**SHOP** – A common industry term defined as a panel which has marks, characteristics and manufacturing defects not described in applicable requirements for a designated HP-1 outer ply grade, or a panel which is not designated as any specific HP-1 outer ply grade. Specific characteristics agreed to between buyer and seller.

**SLICED** – Veneer produced by thrusting a log or sawed flitch into a slicing machine which shears off the veneer in sheets.

**SLIGHT** – Visible on observation, but does not interfere with the overall aesthetic appearance with consideration of the applicable grade and common species characteristics of the panel.

**SLIP MATCHED** – A sheet from a flitch is slid across the sheet beneath and, without turning, spliced at the joints (see Figure 1 for illustration).

**SMOOTH, TIGHT CUT** – Veneer cut to minimize lathe checks.

**SOFTWOOD** – General term used to designate the renewable resource of lumber or veneer produced from needle and/or cone bearing trees (See **HARDWOOD**).

**SOLID CORE** – Plywood panels in which all inner plies are grade J or better. Splits up to 3.2 mm (1/8 inch) are allowed.

**SPECIES (COMMERCIAL SPECIES GROUPS)** – Species generally grouped for marketing convenience and identified with a single commercial name. (See ASTM D 1165, Standard Nomenclature of Domestic Hardwoods and Softwoods, for commercial practice in the United States and Canada.)

**SPECIES (TREES)** – An internationally established Latin botanical classification of trees.

**SPECIFIC GRAVITY** – The ratio of the weight of a certain volume of a substance to the weight of an equal volume of water, the temperature of which is 4°C (39.2°F).

**SPLIT HEART** – A method of achieving an inverted “V” or cathedral type of springwood (earlywood)/summerwood (latewood), plain-sliced (flat-cut) figure by joining two face components of similar color and grain. A cathedral type figure must be achieved by a single component in “AA” grade; the split heart method is allowed in grades “A” through “E”. Each half of a split heart shall be subject to

the minimum component width requirements for grade “A” and “B” faces.

**SPLITS** – Separations of wood fiber running parallel to the grain.

**STREAKS, MINERAL** – Sharply contrasting elongated discolorations of the wood substance.

**SUGAR** – See **WORM TRACKS**.

**ULTRA LOW EMITTING FORMALDEHYDE (ULEF)** – A resin in a composite wood product that meets the emission standards in Section 770.18(c) of the EPA TSCA Title VI regulation and Section 93120.3(c) of the CARB regulation.

**TAPE** – Strips of gummed paper or cloth sometimes placed across the grain of large veneer sheets to facilitate handling and sometimes used to hold the edges of veneer together at the joint prior to gluing.

**TIGHT SIDE** – In knife-cut veneer, that side of the sheet that was farthest from the knife as the sheet was being cut and containing no cutting checks (lathe checks).

**VENEER, CORE** – A layer of softwood, hardwood, or woody grass which is rotary cut, sliced, or sawed from a log, cant, or block, used below the face or back in the construction of hardwood plywood.

**VENEER, DECORATIVE** – A layer of softwood, hardwood, reconstituted block, or woody grass which is rotary cut, sliced, or sawed from a log, cant, or block, used as the face or back in hardwood plywood.

**VINE MARK** – Bands of irregular grain running across or diagonally to the grain which are caused by the growth of climbing vines around the tree.

**V-GROOVED** – Narrow and shallow V- or U-shaped channels machined on the plywood face surface to achieve a decorative effect. V-grooving is most commonly encountered in plank matched wall panels as the grooves fall on the edge joints of the pieces of veneer making the face appear as planking.

**WALL PANELS** – Generally up to 5-ply grooved or ungrooved plywood or reconstituted wood panels, generally in thicknesses of 12.7mm (1/2 inch) or less, with at least one surface decorated and protected with a liquid applied or film overlay finish.

**WHITE** – When referring to color and matching, veneers containing all sapwood, ranging in color from pink to yellow.

**WOOD FAILURE (PERCENTAGE)** – The area of wood fiber adhering at the glue line following completion of the specified shear test. Determination is by visual examination. The value is expressed as an estimated percentage of the wood area remaining adhered to the fractured surface in the test area.

**WOOD FILLER** – An aggregate of resin and strands, shreds, or flour of wood which is used to fill openings in wood and provide a smooth, durable surface.

**WOODY GRASS** – A fast growing member of the grass family utilized with commercial applications as a wood substitute due to its rapidly renewable properties.

**WORMHOLES** – Holes resulting from infestation of worms.

**WORM TRACKS** – Marks caused by various types of wood attacking larvae. Often appear as sound discolorations running with or across the grain in straight to wavy streaks. Sometimes referred to as “pith flecks” in certain species of maple, birch and other hardwoods because of a resemblance to the color of pith.

## 6. IDENTIFICATION

In order that purchasers are able to identify products conforming to all requirements of this Standard, producers and distributors shall be permitted to include a statement of compliance in conjunction with their name and address on invoices, sales literature, and the like. When space is available the following statement shall appear:

This plywood conforms to all of the requirements established in ANSI/HPVA HP-1-2020 developed cooperatively with the industry and published by the Hardwood Plywood and Veneer Association. Full responsibility for the conformance of this product to the Standard is assumed by (name and address of producer or distributor).

When space is not available for the full statement, the following abbreviated statement shall appear:

Conforms to ANSI/HPVA HP-1-2020 (name and address of producer or distributor).