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American National Standard

Medium Density Fiberboard (MDF) For Interior Applications

Composite Panel Association
19465 Deerfield Avenue, Suite 306, Leesburg, VA 20176
Tel (703) 724-1128, Fax (703) 724-1588
Web www.compositepanel.org

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American National Standard

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Abstract

This Standard sets forth requirements and test methods for dimensional tolerances, physical and mechanical properties and formaldehyde emissions for medium density fiberboard (MDF). Methods of identifying products conforming to the Standard are specified. Property requirements are described in metric and English units.

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Composite Panel Association
19465 Deerfield Avenue, Suite 306, Leesburg, VA 20176

Foreword (This foreword is not part of ANSI A208.2-2016.)

The first American National Standard for Medium Density Fiberboard For Interior Use was published in 1980 as ANSI A208.2-1980, under combined sponsorship by the National Particleboard Association and the American Hardboard Association. It was reapproved in 1986 as Medium Density Fiberboard For Interior Use, ANSI A208.2-1986 under the sponsorship of the National Particleboard Association. The Standard was revised in 1994 as Medium Density Fiberboard (MDF), ANSI A208.2-1994 under the sponsorship of the National Particleboard Association. In 2002, the Standard was revised and titled, Medium Density Fiberboard (MDF) for Interior Applications, ANSI A208.2-2002. The Standard was revised in 2009 in an effort to harmonize with other international product standards.

In 1997 the National Particleboard Association and the Canadian Particleboard Association consolidated into the Composite Panel Association.

This Standard is the sixth revision of ANSI A208.2, Medium Density Fiberboard (MDF) for Interior Applications. It incorporates several significant modifications to the 2009 standard.

Major changes in the Standard include the following:

- moved Annex A References to the main text as Section 2 References and updated the listed standards (e.g. ASTM D1037-12 and ISO 17007);
- deleted the 0.21 ppm formaldehyde emission limit and -F21 designation in order to comply with CARB Phase 2 formaldehyde emission level for MDF and thin MDF;
- clarified the issue that a single panel average falls above or below the specification limits will mean non-compliance to properties listed in Table 1 and 2 when using a sample size of 5 panels;
- added Section 6.2.1 Dispute resolution;
- added Grade 170 (designated for laminate or engineered wood flooring) in Table 1; and
- added Annex D Bibliography (Informative).

This Standard has four Annexes. Annex A is normative and is part of this Standard. Annexes B, C and D are informative and are not part of this Standard.

Consensus for this standard was achieved by use of a canvass body and ANSI's Essential Requirements for due process. The following organizations, recognized as having an interest in the standard, were contacted prior to the approval of this Standard. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed Standard to ANSI.

American Home Furnishings Alliance (AHFA)
APA—The Engineered Wood Association
Arauco North America
Architectural Woodwork Manufacturers Association of Canada (AWMAC)
Architectural Woodwork Institute (AWI)
Business and Institutional Furniture Manufacturers Association (BIFMA)
California Air Resources Board (CARB)
Casey Industrial
Clarion Boards, Inc.
Del-Tin Fiber, LLC
Georgia-Pacific Wood Products LLC
Hardwood Plywood and Veneer Association (HPVA)
Hexion
Kimball International Inc.
Kitchen Cabinet Manufacturers Association (KCMA)
Kronospan
Maderas Conglomeradas S.A. de C.V. (MACOSA)
Marshfield DoorSystems, Inc.
Masonite Corporation
Mississippi State University
National Council for Air and Stream Improvement (NCASI)
Oregon State University
Pan Pacific Products, Inc.
Plum Creek MDF, Inc.
Roseburg
Sauder Woodworking
Uniboard
Unilin US MDF
Universite Laval
U.S. Consumer Product and Safety Commission (CPSC)
Virginia Tech
West Fraser Mills Ltd.
Wilsonart
Window and Door Manufacturers Association (WDMA)
Woodwork Institute

American National Standard Medium Density Fiberboard (MDF) For Interior Applications

1 Purpose and Scope

1.1 Purpose

The purpose of this Standard is to establish a nationally recognized voluntary consensus standard for medium density fiberboard (MDF) for interior applications which can serve as a common basis for understanding among those manufacturing, specifying or using MDF products.

1.2 Scope

1.2.1 General

This Standard covers MDF for interior applications, and includes references, terms and definitions, dimensional tolerances, physical and mechanical property requirements, and a maximum formaldehyde emission level for different grades of MDF. Also included are references to test methods and means of identifying conforming products. Throughout this Standard, the metric values represent the standard and English values are offered in parentheses for informational purposes. The mechanical property requirements are not engineering design values.

1.2.2 Suitability for certification

The Standard was revised with reference to ISO/IEC 17007 and is suitable for certification purposes.

2 References

The following documents are references in this Standard and are part of the Standard as applicable.

ASTM D1037-12 Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

ASTM D6007-02 Standard Test Method for Determining Formaldehyde Concentrations in Air from Wood Products Using a Small-Scale Chamber

ASTM E1333-96(2002) Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber

California Air Resource Board (CARB) Airborne Toxic Control Measures (ATCM) to reduce formaldehyde emissions from composite wood products. California Code of Regulation (CCR) 93120 (CARB ATCM 93120)

ISO/IEC 17007:2009 Conformity assessment—Guidance for drafting normative documents suitable for use for conformity assessment

3 Terms and Definitions

3.1 Additive: A material, other than the bonding system, added during the MDF manufacturing process, which enhances desired properties or imparts other desired properties to MDF (e.g. resistance to moisture, dimensional stability, fire retardance, and resistance to fungi and insects).

3.2 Advanced bond integrity: The characteristic that allows MDF to meet the modulus of rupture (MOR) requirement after accelerated aging cycles as referenced in Subsection 4.3.5 of this Standard.

3.3 Bonding system: A system that, when added to cellulosic fibers, constitutes the primary source of inter-fiber adhesion.

3.4 Fiber: A discrete element of cellulosic material.

3.5 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^3 (31 lbs/ft^3) and 1000 kg/m^3 (62 lbs/ft^3). For formaldehyde emission limits, thin MDF is defined as MDF with a thickness less than or equal to 8 mm (0.315 inch).

3.6 Moisture resistance (MR): The term moisture resistance (MR) refers to the thickness swell and bond integrity characteristics of MDF, used in interior applications, when subjected to periodic exposure to moisture. The moisture resistance categories of MDF are identified by the following designations:

MR10 MDF that meets the reduced thickness swell criteria in Subsection 4.3.4.

MR30 MDF that meets the MOR criteria for advanced bond integrity in Subsection 4.3.5.

MR50 MDF that meets both the reduced thickness swell criteria in Subsection 4.3.4 and the MOR criteria for advanced bond integrity in Subsection 4.3.5.

3.7 Panel: A flat, rectangular piece of MDF with all trimmed edges ≥ 0.61 m (2 feet).

3.8 Panel average thickness: Average of the eight measurements taken 25.4 mm (1.0 inch) in from the edge at each panel corner and at the mid-length of each panel edge.

3.9 Panel average thickness from specified: The difference between the panel average thickness and the specified thickness.

3.10 Reduced thickness swell: The characteristic that allows MDF to meet the thickness swell requirements in Subsection 4.3.4.

3.11 Specified thickness: Thickness specified either by the manufacturer or by the purchaser.

3.12 Variance from panel average thickness: The difference between the panel average thickness and the individual thickness measurement that varies the most from that average.

4 Requirements

4.1 General

Physical and Mechanical Property Tables 1 and 2 are based on different test methods with each defining unique grades. Grades in Table 1, determined in accordance with ASTM D1037-12 Part A General Test Methods for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials, may be used to identify panels of any thickness. Grades in Table 2, determined in accordance with ASTM D1037-12 Part B Acceptance and Specification Test Methods for Hardboard, may be used to identify panels with thickness ≤ 9.5 mm (3/8 inch). Because test methods in Part A and Part B of D1037-12 use different specimen dimensions and testing speeds, property values derived from the two methods may differ for the same thickness.

MDF panels represented as conforming to any grade in this Standard at the time of shipment from the manufacturer shall meet the requirements specified for that grade when tested in accordance with the provisions of this section. After shipment from the manufacturer, MDF that has been subjected to varying conditions of environment, storage, handling, or manufacture, may not continue to conform to the Standard when subsequently tested.

4.2 Dimensional tolerances

4.2.1 Width and length. The trimmed width and length tolerance of MDF panels shall not exceed ± 2.0 mm (0.080 inch) for panel dimensions ≥ 0.61 m (2 feet) as specified in Tables 1 and 2. Width and length shall be determined in accordance with Section 8 *Size, Physical Properties and Appearance of Panels* of ASTM D 1037-12.

4.2.2 Thickness. Panel average from specified thickness shall not exceed ± 0.125 mm (0.005 inch) as specified in Tables 1 and 2. Variance from panel average thickness shall not exceed ± 0.125 mm (0.005 inch) as specified in Tables 1 and 2. Thickness tolerance values only apply to sanded panels.

4.2.3 Squareness. The two diagonal measurements of a trimmed panel shall not differ more than 3 mm per meter (0.036 inch per foot) of panel width (shortest edge) when trimmed to finished length and width.

4.2.4 Edge straightness. A trimmed edge of a panel ≥ 0.61 m (2 feet) shall not deviate more than 1 mm per 1.5 meters (0.016 inch per 2 feet) of panel length or width. Edge straightness shall be determined by measuring to the nearest 0.5 mm (0.020 inch) the maximum deviation from a straight line extending from corner to corner on the same trimmed panel edge.

4.3 Physical and mechanical properties

Physical and mechanical properties are listed in Tables 1 and 2.

Values in Subsections 4.3.2, 4.3.3 and 4.3.4 represent an upper specification limit. The 95th percentile value, calculated in accordance with Annex A, shall be equal to or less than the upper specification limit in the Tables (refer to Section 6.2 for sampling).

For the properties in Subsections 4.3.5 through 4.3.9, values represent lower specification limits. The 5th percentile values, calculated in accordance with Annex A, shall be equal to or greater than the lower specification limits in the Tables (refer to Section 6.2 for sampling).

4.3.1 Moisture content. The average moisture content at time of shipment from the manufacturer shall not exceed nine percent. The moisture content of a panel shall be determined in accordance with Section 8.4 *Moisture Content*, using Note 5, of ASTM D 1037-12, by averaging the test results from two specimens per panel.

4.3.2 Linear expansion (LE). The LE between 50% and 80% relative humidity (RH) shall be determined in accordance with Section 24 *Linear Expansion with Change in Moisture Content* and Notes 48 through 50 of ASTM D1037-12. One specimen shall be cut parallel to the length of each panel to be tested, and one shall be cut

perpendicular to the length of the same panel. The results of the two tests shall be averaged to determine the LE for the panel.

4.3.3 Thickness swell (TS). The TS shall be determined in accordance with Section 23 *Water Absorption and Thickness Swelling* of ASTM D 1037-12 after 24-hour submersion. Two specimens per panel shall be cut and the test results averaged to determine the TS for the panel.

4.3.4 Reduced thickness swell. MDF represented as having a reduced TS characteristic (MR10) shall have a TS ≤ 50% of the TS requirement listed for a particular grade in Table 1 or 2. TS shall be measured according to Subsection 4.3.3.

4.3.5 Advanced bond integrity. MDF represented as having advanced bond integrity (MR30), when tested in accordance with Section 7 *Accelerated Aging* of ASTM D 1037-12, shall have an average MOR after the accelerated aging cycles of at least 50 percent of the applicable MOR requirement of a particular grade in Table 1 or 2. The MOR shall be calculated using the original sample thickness before the accelerated aging test cycles.

4.3.6 Modulus of rupture (MOR) and modulus of elasticity (MOE). The MOR and MOE values in Table 1 shall be determined in accordance with Sections 9 *Static Bending* of ASTM D 1037-12 Part A.

The MOR values in Table 2 shall be determined in accordance with Section 33 *Modulus of Rupture* of ASTM D 1037-12 Part B.

Three specimens shall be cut parallel to the length of the panel and three specimens shall be cut perpendicular to the length of the same panel. The results of the six tests shall be averaged to determine the MOR and MOE of the panel.

4.3.7 Internal bond (IB). The IB values in Table 1 shall be determined in accordance with Section 11 *Tension Perpendicular to Surface (Internal Bond)* of ASTM D 1037-12 Part A. The IB values in Table 2 shall be determined in accordance with Section 35 *Tension Perpendicular to Surface* of ASTM D 1037-12 Part B. Five specimens per panel shall be cut and the test results averaged to determine the IB for the panel.

4.3.8 Face screw-holding capacity. The face screw-holding values in Table 1 shall be determined in accordance with Section 16 *Direct Screw Withdrawal,* and Notes 34 and 35 of ASTM D 1037-12 Part A, except that: (1) Section 16.4 shall not apply; (2) if the panel is less than 19 mm (0.750 inch) thick, the specimen shall be made up of two thicknesses bonded together with an adhesive; (3) lead holes shall be predrilled a minimum of 19 mm (0.750 inch) deep, using a bit 3.2 mm (0.125 inch) in diameter; and (4) the speed of testing shall be 0.6 inch per minute. Four specimens per panel shall be cut and the test results averaged to determine the face screw-holding for the panel.

Panels of thickness less than 9.5 mm (0.375 inch) shall not be tested for face screw-holding.

4.3.9 Edge screw-holding capacity. The edge screw-holding values in Table 1 shall be determined in accordance with Section 16 *Direct Screw Withdrawal*, and Notes 34 through 36 of ASTM D 1037-12, except that: (1) Section 16.4 shall not apply; (2) lead holes shall be predrilled a minimum of 19 mm (0.750 inch) deep, using a bit 3.2 mm (0.125 inch) in diameter; and (3) the speed of testing shall be 0.6 inch per minute. Four specimens per panel shall be cut and the test results averaged to determine the edge screw-holding for the panel.

Panels of thicknesses less than 16 mm (0.625 inch) shall not be tested for edge screw-holding.

4.4 Formaldehyde emissions provisions

Formaldehyde emissions from MDF shall be tested in accordance with ASTM E1333-96(2002). ASTM E1333-96(2002) shall be used when Sampling for Acceptance as required in Section 6.2.

As an alternative to ASTM E1333-96(2002), the average of three test results using the ASTM D6007-02 can be used for on-going compliance testing as described in Section 93120.9 of CARB ATCM 93120. ASTM D6007-02 shall not be used when Sampling for Acceptance under Section 6.2.

The loading ratio for MDF shall be 0.260 m^2/m^3 (0.08 ft^2/ft^3). Formaldehyde emissions shall not exceed the maximum limit of 0.11 ppm for MDF with a minimum thickness greater than 8 mm. Emissions shall not exceed the maximum limit of 0.13 ppm for thin MDF with a maximum thickness ≤ 8 mm. Products shall be labeled in accordance to Section 5.1 Grade designation.

5 Identification

5.1 Grade designation

The MDF grades in this Standard are identified by a three digit number followed by the formaldehyde emission level. Table 1 grades are designated by 100 series numbers and Table 2 grades are designated by 200 series numbers. The grade number designates the property value level first based on MOR and secondarily on IB.

5.2 Formaldehyde emission designation

The maximum formaldehyde emission level is designated immediately after the grade with a hyphen and "-F11" for MDF with a minimum thickness greater than 8 mm or "-F13" for thin MDF (≤ 8 mm). These designations correspond to emission limits of 0.11 ppm and 0.13 ppm, respectively.

5.3 Moisture resistance designation

MDF with moisture resistant characteristics shall be identified by using a grade designation followed by a hyphen and a moisture resistance designation in Subsection 3.6. Using grade 130 and a maximum emission level of 0.13 ppm for example: 130-F13-MR10; 130-F13-MR30; 130-F13-MR50.

5.4 Product identification

All MDF which is represented as conforming to this American National Standard shall be identified with at least the following information:

a) ANSI A208.2-2016

b) Thickness

c) Grade

d) Formaldehyde emission limit

e) Other applicable designations

MR10 for products meeting the requirements of Subsection 4.3.4

MR30 for products meeting the requirements of Subsection 4.3.5

MR50 for products meeting both requirements of Subsection 4.3.4 and Subsection 4.3.5

5.5 Identification methods

The information required by Subsection 5.4 shall be provided either by:

a) a shipping or package label with the conforming product(s), or

b) an invoice or other commercial document, or

c) stamping or labeling each conforming panel.

6 Conformity Assessment

6.1 Manufacturers' inspection and testing. Each manufacturer who represents products as conforming to this Standard shall utilize statistically-based sampling plans and appropriate quality control procedures to assure compliance with this Standard.

6.2 Sampling for acceptance. Should a buyer or third party desire to perform the inspections and tests specified in this Standard, five panels for physical and mechanical testing and two panels for formaldehyde emission testing of each grade and thickness, selected at random from the shipment, shall be used as the sample. This Standard cannot be used to properly evaluate single panels, but as an approximation, the upper or lower specification limits may be taken as maximum or minimum values. In the five panels sampling for Table 1 and 2 properties, note that statistically if any single panel average falls above or below the specification limits, the calculated $U_{95\%}$ percentile or $L_{5\%}$ percentile value will not be in compliance. Annex A provides the statistical equations required to perform the compliance calculation.

ASTM E1333-96(2002) test method for formaldehyde emissions shall be used for Sampling for Acceptance.

Panels which have been allowed to exceed the specified moisture content after shipment may not conform to the physical and mechanical property requirements of the Standard when subsequently tested.

Should a dispute arise, the metric values, not the English unit values, shall be used as the standard.

6.2.1 Dispute resolution

If there is a dispute between the supplier and buyer regarding the lot acceptance, then an additional 15 samples will be collected randomly from the entire lot and tested to approximate the $L_{5\%}$ or $U_{95\%}$ values for the lot. The acceptance will be based on the following:

- No more than 1 panel of the 20 being outside the Table 1 specifications.
- The new 20-panel sample $L_{5\%}$ or $U_{95\%}$ shall meet the Table 1 specification limits.

Table 1

Physical and Mechanical Property Requirements for MDF When Determined in Accordance with ASTM D1037-12 Part A General Test Methods for Evaluating the Basic Properties of Wood-Base Fiber and Particle Panel Materials[1,2]

	Physical and Mechanical Properties												
											Maximum Thickness Swell (TS)		
							Screw-holding[4]				Panel Thickness		
	Modulus of Rupture (MOR)		Modulus of Elasticity (MOE)		Internal Bond (IB)		Face		Edge		≤15 mm		>15mm
Grade	N/mm²	(psi)	N/mm²	(psi)	N/mm²	(psi)	N	(pounds)	N	(pounds)	mm	(inch)	percent
115	12.4	(1800)	1241	(180000)	0.47	(68)	703	(158)	601	(135)	1.65	(0.065)	11%
130	21.6	(3130)	2160	(313000)	0.54	(78)	988	(222)	787	(177)	1.65	(0.065)	11%
155	27.9	(4050)	2792	(405000)	0.81	(117)	1201	(270)	1001	(225)	1.65	(0.065)	11%
											Panel Thickness		
											≤8 mm		>8 mm
170[5]	30.0	(4351)	3000	(435113)	1.20	(174)	N/A	N/A	N/A	N/A	1.77	(0.070)	25%

Tolerance Limits for Dimensions and Formaldehyde Emissions

Properties	115, 130, 155 and 170
Panel Length or Width ≥ 0.61 m (2 feet)	± 2.0 mm (± 0.080 inch)
Panel Average from Specified Thickness[3,6]	± 0.125 mm (± 0.005 inch)
Variance from Panel Average Thickness[3,6]	± 0.125 mm (± 0.005 inch)
Linear Expansion (LE)[3,7]	≤ 0.33%
Formaldehyde Emissions	≤ 0.11 ppm (>8 mm thick) ≤ 0.13 ppm (≤8 mm thick)

[1] Grades shall also meet the requirements listed in Section 4 of this Standard.

[2] Refer to Section 5 Identification, for grade, formaldehyde emission, moisture resistance and product identification.

[3] Physical and mechanical property values represent a minimum or maximum value representing 5 (lower) or 95 (upper) percentile expressions; respectively.

[4] Panels of thickness less than 9.5 mm (3/8 inch) shall not be tested for face screw-holding. Panels of thickness less than 16 mm (5/8 inch) shall not be tested for edge screw-holding.

[5] Grade commonly designated for MDF to be used for laminate or engineered wood flooring.

[6] Thickness tolerance values only apply to sanded panels.

[7] Linear expansion shall be measured between 50% and 80% RH in accordance to ASTM D 1037-12.

Table 2

Physical and Mechanical Property Requirements for MDF (≤9.5 mm (0.375 inch) Thick) When Determined in Accordance with ASTM D1037-12 Part B Acceptance and Specification Test Methods for Hardboard[1,2]

	Physical and Mechanical Properties[3]					
	Modulus of Rupture (MOR)[4]		Internal Bond (IB)[4]		Maximum Thickness Swell (TS)	
Grade	N/mm^2	(psi)	N/mm^2	(psi)	mm	(inch)
210	18.9	(2741)	0.32	(46)	2.2	(0.087)
220	28.9	(4192)	0.54	(78)	2.2	(0.087)
230	28.9	(4192)	0.90	(131)	2.2	(0.087)

Tolerance Limits for Dimensions and Formaldehyde Emissions

Properties	Tolerance Limits
Panel Length or Width ≥ 0.61 m (2 feet)	± 2.0 mm (± 0.080 inch)
Panel Average Thickness from Specified [3,5]	± 0.125 mm (± 0.005 inch)
Variance from Panel Average Thickness[3,5]	± 0.125 mm (± 0.005 inch)
Linear Expansion (LE)[3,6]	≤ 0.33%
Formaldehyde Emissions	≤ 0.11 ppm (>8 mm thick) ≤ 0.13 ppm (≤8 mm thick)

[1] Grades shall also meet the requirements listed in Section 3 of this Standard.

[2] Refer to Section 5 Identification, for grade, formaldehyde emission, moisture resistance and product identification.

[3] Physical and mechanical property values represent a minimum or maximum value representing 5 (lower) or 95 (upper) percentile expressions; respectively.

[4] MOR and IB shall be tested in accordance with Part B of ASTM D 1037-12.

[5] Thickness tolerance values only apply to sanded panels.

[6] Linear expansion shall be measured between 50% and 80% RH in accordance to ASTM D 1037-12.

Annex A
Calculation of Lower 5th Percentile ($L_{5\%}$) and Upper 95th Percentile ($U_{95\%}$) Values
(Normative)

A.1 Mean value of each individual panel (panel mean)

$$\bar{x}_i = \frac{\sum x_n}{n}$$

$\bar{x}_i$ = panel mean (mean value of the *n* single test values)

x_n = single test value

n = number of test pieces cut from each individual panel

A.2 Grand mean (mean of panel means)

$$\bar{\bar{x}}_j = \frac{\sum \bar{x}_i}{j}$$

$\bar{\bar{x}}_j$ = 5 or 20-panel average (grand mean of panel means)

j = number of panels (i.e. 5 or 20)

A.3 Standard deviation of panel means

$$S_{\bar{x}} = \sqrt{\frac{\sum (\bar{x}_i - \bar{\bar{x}}_j)^2}{j-1}}$$

$S_{\bar{x}}$ = standard deviation between panel means

A.4 Lower 5th Percentile ($L_{5\%}$) of a normally distributed panel property

$$L_{5\%} = \bar{\bar{x}}_j - t_j (S_{\bar{x}})$$

A.5 Upper 95th Percentile ($U_{95\%}$) of a normally distributed panel property

$$U_{95\%} = \bar{\bar{x}}_j + t_j (S_{\bar{x}})$$

t_j = single-sided 5% t-value of a normally distributed sample

t_5 = 2.13

t_{20} = 1.73

Annex B
Conversion Values
(Informative)

The dimensional, physical and mechanical property requirements of this Standard are expressed in metric units with English units shown in parentheses for informational purposes. English values, in most circumstances, are rounded to a practical degree of precision.

The conversion factors for the units found in this Standard are as follows:

Dimensions	
1 inch	= 0.0254 meter (m)
1 inch	= 25.4 millimeters (mm)
1 m	= 39.370 inch
Mass	
1 gram (g)	= 0.0022046 pound (lb)
1 lb	= 453.5924 g
Force (newtons)	
1 newton (N)	= 101.9716 g
1 N	= 0.2248089 lb
1 g	= 0.0098067 N
1 lb	= 4.448222 N
Stress (force/area)	
1 pascal (Pa)	= 1 N/m^2
1 kilopascal (kPa)	= 0.001 N/mm^2
1 megapascal (MPa)	= 1 N/mm^2
1 N/mm^2	= 145.0377 pounds per square inch (psi)
1 psi	= 0.0068948 N/mm^2

Metric Values

Conversions for:		**Rounded to:**
Dimensions	less than 50 mm	nearest 0.025 mm
	between 50 and 500 mm	nearest 0.1 mm
	greater than 500 mm	nearest 1 mm
Force (newtons)	less than 100 N	nearest 1 N
	greater than 100 N	nearest 10 N
Stress (force/area) (N/mm^2)	less than 2 N/mm^2	nearest 0.01 N/mm^2
	between 2 and 30 N/mm^2	nearest 0.1 N/mm^2
	greater than 30 N/mm^2	nearest 1 N/mm^2

Annex C
Cut-up Pattern
(Informative)

Sample cut-up pattern[1]

IB — Internal bond
LE — Linear expansion
MOR — MOR/MOE[2, 3]
SH — Screw holding (edge and face)
TS — Thickness swell
⊗ — Discard/Extra

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[1] Refer to the appropriate ASTM D 1037-12 test procedure for information on specimen size requirements.

[2] The exact dimensions of MOR/MOE specimens is dependent on specimen thickness.

[3] Moisture content samples may be cut from the MOR, density or other specimens.

Annex D
Bibliography
(Informative)

Composite Panel Association (CPA). 2016. Standard Method for Measurement of Warp in Composite Panels.

CPA. 2000. Storage and Handling of Particleboard and MDF. Technical Bulletin.

COMPOSITE PANEL ASSOCIATION

Founded in 1960, the Composite Panel Association (CPA) is dedicated to advancing the North American wood–based panel and decorative surfacing industries. CPA represents both industries on technical, regulatory, quality assurance and product acceptance issues. CPA General Members include the leading manufacturers of particleboard, medium density fiberboard (MDF) and hardboard, representing about 95% of North American manufacturing capacity.

CPA Associate Members include manufacturers of decorative surfaces, furniture, cabinets, mouldings, doors and equipment, along with laminators, distributors, industry media and adhesive suppliers. All are committed to product advancement and industry competitiveness.