GA-235-2023
GYPSUM BOARD TYPICAL MECHANICAL AND PHYSICAL PROPERTIES

The properties described herein were either obtained from laboratory tests conducted under controlled test conditions as set forth in appropriate standards, compiled from manufacturers' literature, or taken from the minimum requirements of appropriate ASTM Standard Specifications. The values reported below are provided for information and convenience only. Consult manufacturer for more specific values.

MECHANICAL PROPERTIES

Flexural Strength (minimums)
ASTM C473 *Standard Test Methods for Physical Testing of Gypsum Panel Products*

Type of Gypsum Board (Note 1)	Thickness in. (mm)	Method A (Note 2)				Method B (Note 2)			
		Bearing Edges Perpendicular to Length		Bearing Edges Parallel to Length		Bearing Edges Perpendicular to Length		Bearing Edges Parallel to Length	
		lbf	N	lbf	N	lbf	N	lbf	N
a, b	¼ (6.4)	50	220	20	89	46	205	16	71
a	5⁄16 (7.9)	65	289	25	111	62	276	21	93
g	⅜ (9.5)	60	267	25	111	56	249	21	93
a, b, e, f	⅜ (9.5)	80	356	30	113	77	343	26	116
g	½ (12.7)	100	445	35	156	97	431	31	138
a, b, c, d, e, f, h	½ (12.7)	110	489	40	178	107	476	36	160
a, c, d, e, f	⅝ (15.9)	150	667	50	222	147	654	46	205
b	⅝ (15.9)	140	622	50	222	137	609	46	205
a	¾ (19.0)	170	756	60	267	167	743	56	249
b	1 (25.4)	230	1020	80	356	228	1010	77	343

[1] ASTM C1396 Standard Specification for Gypsum Board:
a = Gypsum Wallboard and Predecorated Gypsum Board
b = Gypsum Backing Board, Gypsum Coreboard and Gypsum Shaftliner Board
c = Water-Resistant Gypsum Backing Board
d = Exterior Gypsum Soffit Board
e = Gypsum Sheathing Board
f = Gypsum Base for Veneer Plaster
g = Gypsum Lath
h = Gypsum Ceiling Board

[2] See ASTM C473 for a description of Methods A and B

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Effective Stiffness (EI)* (typical range)		
Thickness in. (mm)	**lb•in²/in. of width**	**kN•mm²/mm of width**
½ (12.7)	1500 to 4000	220 to 580
⅝ (15.9)	3000 to 8000	440 to 1160

* EI is dependent on board density, relative humidity, type of board, paper type, direction of board during testing and the amount of handling prior to measurement. In general, the value of EI follows the following relationships:

Type X Gypsum Board > Regular Gypsum Board
Denser Gypsum Board > Less Dense Gypsum Board
Machine Direction > Cross Direction
Low Relative Humidity > High Relative Humidity

Effective Modulus of Rupture (MOR) (minimums) Based on Flexural Strengths per ASTM C1396 *Standard Specification for Gypsum Board*				
Thickness in. (mm)	**Machine Direction**		**Cross Direction**	
	psi	**MPa**	**psi**	**MPa**
⅜ (9.5)	970	6.7	350	2.4
½ (12.7)	750	5.2	260	1.8
⅝ (15.9)	660	4.6	220	1.5

Core, End, and Edge Hardness (minimums) ASTM C473 *Standard Test Methods for Physical Testing of Gypsum Panel Products*	
Method A*	**Method B***
15 lbf (67 N)	11 lbf (49 N)

* See ASTM C473 for a description of Methods A and B.

Compressive Strength (typical)

Ultimate compressive strength at 70°F (21°C) and 50% Relative Humidity (RH)

Determinations were made from 2 in. × 2 in. (50 × 50 mm) or 4 in. × 4 in. (100 × 100 mm) samples cut from across the full board width (excluding taper). Samples were conditioned for a minimum of 24 hours and tested in compressive strength machines. Load was applied at a uniform rate until the end point was reached.

Thickness in. (mm)	Board Type	psi	kPa
5/16 (7.9)	Gypsum Board	400	2750
½ (12.7)	Regular Gypsum Board	350	2400
⅝ (15.9)	Type X Gypsum Board	400	2750

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Nail Pull Resistance (minimums) ASTM C473 *Standard Test Methods for Physical Testing of Gypsum Panel Products*				
Thickness in. (mm)	**Method A***		**Method B***	
	lbf	**N**	**lbf**	**N**
¼ (6.4)	40	178	36	160
5⁄16 (7.9)	50	222	46	205
⅜ (9.5)	60	267	56	249
½ (12.7)	80	356	77	343
⅝ (15.9)	90	400	87	387
¾ (19.0)	100	445	94	432
1 (25.4)	not required		not required	
* See ASTM C473 for a description of Methods A and B.				

Negative Wind Load Resistance (typical) ASTM E330 *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference,* Procedure A (Based on tests conducted on single specimens, nominal 4 ft. (1.2 m) wide × 8 ft. (2.4 m) high. Each specimen constructed of a single 4 ft. (1.2 m) × 8 ft. (2.4 m) panel of treated core gypsum sheathing, with no joints, applied parallel to studs spaced 16 in. (406 mm) o.c. with fasteners spaced 8 in. (203 mm) o.c. at edges, ends, and intermediate framing members.)			
Thickness in. (mm)	**Framing**	**Fasteners**	**Negative Wind Load psf (kPa)**
½ (12.7)	43 mil steel	1 in. (25 mm) Type S-12 screws	60 (2.9)
⅝ (15.9)	43 mil steel	1-½ in. (38 mm) Type S-12 screws	100 (4.8)
½ (12.7)	2 × 4 wood	1-½ in. (38 mm) long 11 gauge galvanized roofing nails	80 (3.8)
⅝ (15.9)	2 × 4 wood	1-¾ in. (44 mm) long 11 gauge galvanized roofing nails	130 (6.2)

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MOISTURE & HUMIDITY RELATED PROPERTIES

Humidified Deflection (maximums) ASTM C473 *Standard Test Methods for Physical Testing of Gypsum Panel Products*					
Gypsum Board (except exterior gypsum soffit board)			**Exterior Gypsum Soffit Board**		
Thickness in. (mm)	**Deflection**		**Thickness in. (mm)**	**Deflection**	
	Eighths of an Inch	**mm**		**Eighths of an Inch**	**mm**
¼ (6.4)	Not Applicable	Not Applicable	½ (12.7)	7	22
5⁄16 (7.9)	Not Applicable	Not Applicable	5⁄8 (15.9)	4	13
3⁄8 (9.5)	15	48	**Gypsum Ceiling Board**		
½ (12.7)	10	32			
5⁄8 (15.9)	5	16	**Thickness in. (mm)**	**Deflection**	
¾ (19.0)	5	16		**Eighths of an Inch**	**mm**
1 (25.4)	Not Applicable	Not Applicable	½ (12.7)	2.5	8

Water Absorption (maximums) ASTM C473 *Standard Test Methods for Physical Testing of Gypsum Panel Products* – following 2-hours immersion
Gypsum Sheathing Board - 10 weight %
Water-Resistant Gypsum Backing Board - 5 weight %

DIMENSIONAL STABILITY

Thermal Coefficient of Linear Expansion (typical) Unrestrained 38º- 90ºF (3.3º- 32ºC)
9.3×10^{-6} in./in.ºF (16.7×10^{-6} mm/mmºC)
Hygrometric Coefficient of Expansion (typical) Unrestrained (10% to 90% RH)
6.5×10^{-6} in./in./%RH (11.7×10^{-6} mm/mm/%RH)

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FIRE PROPERTIES

Typical Surface Burning Characteristics (Independent of Thickness - Typical) ASTM E84 *Standard Test Method for Surface Burning Characteristics of Building Materials* - CAN/ULC-S102 *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*		
Board Type	**Flame Spread**	**Smoke Developed**
Gypsum Board	15	0

Fire Resistance
ASTM E119 *Standard Test Methods for Fire Tests of Building Construction and Materials* -
CAN/ULC-S101 *Standard Methods of Fire Endurance Tests of Building Construction and Materials*

Noncombustibility (core)
ASTM E136 *Standard Test Method for Assessing Combustibility of Materials in a Vertical Tube Furnace at 750°C – CAN/ULC-S114 Standard Method of Test for Determination of Non-Combustibility in Building Materials*

Potential Heat
From NFPA 259 *Standard Test Method for Potential Heat of Building Materials,* Annex C

Thickness in. (mm)	**Board Type**	**Potential Heat, Weight Basis**	
		(Btu/lb)	**(kJ/kg)**
⅜ (9.5)	Gypsum Lath	310	721
⅜ (9.5)	Gypsum Board	760	1770
½ (12.7)	Gypsum Board	650	1512

MISCELLANEOUS

Thermal Properties (typical)
R and C values developed using ASTM C177 *Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus* at 75°F (24°C) mean temperature; Specific Heat from ASHRAE *Handbook of Fundamentals*.

Thickness in. (mm)	**Resistance (R)**		**Conductance (C)**		**Specific Heat**	
	°F•ft²•hr/Btu	**K•m²/W**	**Btu/hr•ft²•°F**	**W/m²•K**	**Btu/lb•°F**	**J/kg•K**
⅜ (9.5)	0.33	0.058	3.03	17.2	0.26	1090
½ (12.7)	0.45	0.079	2.22	12.6	0.26	1090
⅝ (15.9)	0.48	0.085	2.08	11.8	0.26	1090
¾ (19.0)	0.64	0.12	1.67	8.3	0.26	1090
1 (25.4)	0.83	0.16	1.20	6.3	0.26	1090

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Weight per Unit Area (for use in calculating dead loads)		
Thickness in. (mm)	**Weight**	
	psf	**kg/m²**
¼ (6.4)	1.2	6.0
5⁄16 (7.9)	1.3	6.4
⅜ (9.5)	1.4	6.8
½ (12.7)	2.0	9.8
⅝ (15.9)	2.5	12
1 (25.4)	4.0	20

Permeance (typical) ASTM E96 *Standard Test Methods for Water Vapor Transmission of Materials*				
Board Type and Thickness in. (mm)	**Permeance, Method A**		**Permeance, Method B**	
	Perms	**ng/Pa•s•m²**	**Perms**	**ng/Pa•s•m²**
⅜ (9.5) Gypsum Board	31	1774	49	2803
½ (12.7) Gypsum Board	27	1545	45	2575
⅝ (15.9) Gypsum Board	25	1430	37	2117
Foil-Backed Gypsum Board (from ASHRAE *Handbook,* 1989)	0.30	17	N/A	N/A

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