

Architectural
Woodwork Standards

CARE & STORAGE

SECTION

2

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introductory information

INTRODUCTION

Section 2 handles one of the most important aspects of preserving a good woodworking installation. Storage, jobsite conditions and relative humidity requirements before, during and after installation are covered here.

Quality assurance can be achieved by adherence to the AWS and will provide the owner a quality product at competitive pricing. Use of a qualified Sponsor Member firm to provide your woodwork will help ensure the manufacturer's understanding of the quality level required. Illustrations in this Section are not intended to be all inclusive, other engineered solutions may be acceptable. In the absence of specifications; methods of fabrication are the manufacturer's choice. The design professional, by specifying compliance to the AWS increases the probability of receiving the product quality expected.

IMPORTANT PRODUCT ADVISORY REGARDING DIMENSIONAL CHANGE PROBLEMS IN ARCHITECTURAL MILLWORK

This advisory concerns prevention of dimensional problems in architectural woodwork products as the result of uncontrolled relative humidity. It is further intended as a reminder of the natural dimensional properties of wood and wood-based products such as plywood, particleboard, and high pressure decorative laminate (HPDL) and of the routine and necessary care and responsibilities which must be assumed by those involved.

For centuries, wood has served as a successful material for architectural woodwork, and as history has shown wood products perform with complete satisfaction when correctly designed and used. Problems directly or indirectly attributed to dimensional change of the wood are usually, in fact, the result of faulty design, or improper humidity conditions during site storage, installation, or use.

Wood is a hygroscopic material, and under normal use and conditions all wood products contain some moisture. Wood readily exchanges this molecular moisture with the water vapor in the surrounding atmosphere according to the existing relative humidity. In high humidity, wood picks up moisture and swells. In low humidity, wood releases moisture and shrinks.

As normal minor fluctuations in humidity occur, the resulting dimensional response in properly designed construction will be insignificant. To reduce humidity related problems, the appropriate recommendations from Section 2 of the AWS should be considered. Uncontrolled extremes can likely cause problems.

Together with proper design, fabrication, and installation, humidity control is obviously the important factor in preventing dimensional change problems.

Architectural woodwork products are manufactured as designed from wood that has been kiln dried to an appropriate average moisture content. Subsequent dimensional change in wood is and always has been an inherent natural property of wood. These changes cannot be the responsibility of the manufacturer or products made from it. Specifically, responsibility for dimensional change problems in wood products resulting from:

- Design rests with the designer/architect/specifier.
- Improper relative humidity exposure during site storage and installation rests with the general contractor.
- Humidity extremes after occupancy rests with engineering and maintenance.

CARE

All construction related products, regardless of material, have particular care and storage requirements. Woodwork is not unique in this respect.

Architectural woodwork should be treated like fine furniture, particularly that which is constructed of wood finished with a transparent finish system. Modern commercial finishes are durable and resistant to moisture.

- **Finish Maintenance** - With the exception of true oil-rubbed surfaces, modern finishes do not need to be polished, oiled, or waxed. In fact, applying some polishing oils, cleaning waxes, or products containing silicone may impede the effectiveness of touch-up or refinishing procedures in the future.

No abrasives, chemical or ammonia cleaners

should be used to clean woodwork surfaces. Routine cleaning is best accomplished with a soft, lint-free cloth lightly dampened with water or an inert household dust attractant. Allowing airborne dust, which is somewhat abrasive, to build up will tend to dull a finish over time.

Remove oil or grease deposits with a mild flax soap, following the directions for dilution on the container.

- **Impact** - Avoid excessive or repetitive impact, however lightly applied. The cellular structure of the wood will compact under pressure. Many modern finishes are flexible, and will show evidence of impact and pressure applied to them.
- **Heat** - Avoid localized high heat, such as a hot pan or plate, or a hot light source, close to or in contact with the finished surface. Exposure to direct sunlight will alter the appearance of woodwork over time.
- **Humidity** - Maintain the relative humidity around the woodwork in accordance with the guidelines published in these standards, every hour of every day, to minimize wood movement.
- **Moisture** - Architectural woodwork, when properly finished, is relatively durable and resistant to moisture. Prevent direct contact with moisture, and wipe it dry immediately should any occur. Allowing moisture to accumulate on, or stay in contact with, any wood surface, no matter how well finished, will cause damage.
- **Oxidation** - Is a reaction of acids in wood (e.g., tannic acid), with iron, oxygen, and moisture, whether this be relative humidity or direct moisture. Control of moisture is a simple way to protect wood products from stains as a result of oxidation.
- **Abuse** - Use the trims, cabinets and fixtures, paneling, shelving, ornamental work, stairs, frames, windows, and doors as they were intended. Abuse of cabinet doors and drawers, for example, may result in damage to them as well as to the cabinet parts to which they are joined.
- **Refinishing** - Contact a local Sponsor Association member, to explore the options for repair or refinishing. It is often cost effective to replace damaged woodwork elements rather than attempting large scale, on site refinishing.

RELATIVE HUMIDITY AND MOISTURE CONTENT

The space in which architectural woodwork is to be installed should be engineered with appropriate humidity controls to maintain its optimum relative humidity. Wood for architectural woodwork manufacturing use needs a moisture content within an optimum range.

A major cause for failure in architectural woodwork

is the lack of controls for maintaining a consistent, year round, appropriate relative humidity in a building or building space. Wood is susceptible to movement, shrinkage, expansion and warpage when exposed to air that has not been humidified. Without considerations made to properly regulate the relative humidity in any space containing architectural woodwork, some degree of failure of the woodwork can be expected.

The range of relative humidity change should not exceed 30 percentage points. Relative humidity

outside the range shown on Table 2-001 below for the respective region is particularly harmful to wood and wood products.

The table and map that follow (adapted from USDA's The Wood Handbook (latest edition), published by their Forest Products Laboratory) shows the Optimum Moisture Content and the Indoor Relative Humidity required to hold such MC within the general areas of the United States and Canada.

Some of these areas have additional micro-climates not shown or referenced.

TABLE: 2-001 - RELATIVE HUMIDITY and OPTIMUM MOISTURE CONTENT

Geographical Location	Optimum Moisture Content		Optimum Climate Controlled Relative Humidity
	Non-Climate Controlled Interior or Exterior Environment	Climate Controlled Environment	
Most of U.S. and Canada	9-15%	5-10%	25-55%
Damp Southern Coastal areas of the U.S. and Canadian Eastern Coastal Provinces	10-15%	8-13%	43-70%
Dry Southwestern U.S.	7-12%	4-9%	20-50%
Alberta, Saskatchewan, and Manitoba in Canada	10-15%	4-9%	20-50%



introductory information

TABLE: 2-002 - EQUILIBRIUM MOISTURE CONTENT VALUES AT VARIOUS TEMPERATURES AND HUMIDITIES

The following table indicates relative humidity must average between 25% and 55% to maintain wood moisture content between 5-10%. This range is best suited for most of the U.S. and Canada. While temperature has an impact on relative humidity, temperature alone has little effect on wood products if the relative humidity is maintained within recommended ranges.

		Wet bulb lowering in degrees Fahrenheit																													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
Dry bulb temperature in degrees Fahrenheit	40	83 17.6	75 14.8	68 12.9	60 11.2	52 9.9	45 8.6	37 7.4	29 6.2	22 5.0	15 3.5	8 1.9																			
	45	85 18.3	78 15.6	72 13.7	64 12.0	58 10.7	51 9.5	44 8.5	37 7.5	31 6.5	25 5.3	19 4.2	12 2.9	6 1.5																	
	50	86 19.0	80 16.3	74 14.4	68 12.7	62 11.5	56 10.3	50 9.4	44 8.5	38 7.6	32 6.7	27 5.7	21 4.8	16 3.9	10 2.8	5 1.5															
	55	88 19.5	82 16.9	76 15.1	70 13.4	65 12.2	60 11.0	55 10.1	49 9.3	44 8.4	39 7.6	34 6.8	28 6.0	24 5.3	19 4.5	14 3.6	9 2.5	5 1.3													
	60	89 19.9	83 17.4	78 15.6	73 13.9	68 12.7	63 11.6	58 10.7	53 9.9	48 9.1	43 8.3	39 7.6	34 6.9	30 6.3	26 5.6	21 4.9	17 4.1	13 3.2	9 2.3	5 1.3	1 0.2										
	65	90 20.3	84 17.8	80 16.1	75 14.4	70 13.3	66 12.1	61 11.2	56 10.4	52 9.7	48 8.9	44 8.3	39 7.7	36 7.1	32 6.5	27 5.8	24 5.2	20 4.5	16 3.8	13 3.0	8 2.3	6 1.4	2 0.4								
	70	91 20.9	86 18.2	81 16.5	77 14.9	72 13.7	68 12.5	64 11.6	59 10.9	55 10.1	51 9.4	48 8.8	44 8.3	40 7.7	36 7.2	33 6.6	29 6.0	25 5.5	22 5.0	19 4.3	15 3.7	12 2.9	9 2.3	6 1.5	3 0.7						
	75	91 21.0	86 18.5	82 16.8	78 15.2	74 14.0	70 12.9	66 12.0	62 11.2	58 10.5	54 9.8	51 9.3	47 8.7	44 8.2	41 7.7	37 7.2	34 6.7	31 6.2	28 5.6	25 5.1	21 4.7	18 4.1	15 3.5	12 2.9	10 2.3	7 1.7	4 0.9	1 0.2			
	80	92 21.2	87 18.7	83 17.0	79 15.5	75 14.3	72 13.2	68 12.3	64 11.5	61 10.9	57 10.1	54 9.7	50 9.1	47 8.6	44 8.1	41 7.7	38 7.2	35 6.8	32 6.3	29 5.8	26 5.4	23 5.0	20 4.5	18 4.0	15 3.5	12 3.0	10 2.4	7 1.8	5 1.1		
	85	92 21.3	88 18.8	84 17.2	80 15.7	76 14.5	73 13.5	70 12.5	66 11.8	63 11.2	59 10.5	56 10.0	53 9.5	50 9.0	47 8.5	44 8.1	41 7.6	38 7.2	36 6.7	33 6.3	30 6.0	28 5.6	25 5.2	23 4.8	20 4.3	18 3.9	15 3.4	13 3.0	11 2.4		
	90	92 21.3	89 18.9	85 17.3	81 15.9	78 14.7	74 13.7	71 12.8	68 12.0	65 11.4	61 10.7	58 10.2	55 9.7	52 9.3	49 8.8	47 8.4	44 8.0	41 7.6	39 7.2	36 6.8	34 6.5	31 6.1	29 5.7	26 5.3	24 4.9	22 4.6	19 4.2	17 3.8	15 3.3		
	95	92 21.3	89 19.0	85 17.4	82 16.1	79 14.9	75 13.9	72 12.9	69 12.2	66 11.6	63 11.0	60 10.5	57 10.0	55 9.5	52 9.1	49 8.7	46 8.2	44 7.9	42 7.5	39 7.1	37 6.8	34 6.4	32 6.1	30 5.7	28 5.3	26 5.1	23 4.8	22 4.4	20 4.0		
	100	93 21.3	89 19.0	86 17.5	83 16.1	80 15.0	77 13.9	73 13.1	70 12.4	68 11.8	65 11.2	62 10.6	59 10.1	56 9.6	54 9.2	51 8.9	49 8.5	46 8.1	44 7.8	41 7.4	39 7.0	37 6.7	35 6.4	33 6.1	30 5.7	28 5.4	26 5.2	24 4.9	22 4.6		
110	93 21.4	90 19.0	87 17.5	84 16.2	81 15.1	78 14.1	75 13.3	73 12.6	70 12.0	67 11.4	65 10.8	62 10.4	60 9.9	57 9.5	55 9.2	52 8.8	50 8.4	48 8.1	46 7.7	44 7.5	42 7.2	40 6.8	38 6.6	36 6.3	34 6.0	32 5.7	30 5.4	28 5.2	26 4.9		
120	94 21.3	91 19.0	88 17.4	85 16.2	82 15.1	80 14.1	77 13.4	74 12.7	72 12.1	69 11.5	67 11.0	65 10.5	63 10.1	60 9.7	58 9.4	55 9.0	53 8.7	51 8.3	49 7.9	47 7.7	45 7.4	43 7.2	41 6.8	40 6.6	38 6.3	36 6.1	34 5.8	33 5.6			
		13% moisture										10% moisture										5% moisture									

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EXAMPLES OF MOISTURE EQUILIBRIUM TABLE USE

The above may be used as a guide in determining whether or not the conditions in a construction area are suitable for receiving woodwork. For example: if woodwork with an 8% average moisture content is to be installed and the average temperature in the building will be maintained at 70°F, it can be determined by following the 70°F column horizontally to the right until the lower moisture content figures of 8.3% and 7.7% are reached.

Here the upper figures in the same squares show that ideally a relative humidity of between 44% and 40% should be maintained in order to achieve dimensional equilibrium. After the woodwork is painted or finished, moisture changes in the wood are retarded so that maintenance of relative humidity between the practical limits shown on the curve (between 5%-10% m.c.) of the humidity table, i.e., 25%-55% relative humidity, is usually satisfactory.

TO USE TABLE

Obtain wet and dry bulb readings. Subtract wet bulb reading from dry bulb reading. Find dry bulb on left margin of table and follow across to the column where the value at the top corresponds with the difference between wet and dry readings. At point of intersection, the upper figure in the square gives relative humidity in percent and the lower figure gives equilibrium moisture content of the woodwork.

RECOMMENDATIONS

- **CLIMATE CONTROL MAINTENANCE** of relative humidity every hour of every day, within the ranges shown previously in this section is important. Uncontrolled extremes such as those listed below will likely cause problems:
 - Relative humidity, above or below the ranges shown previously in this section.
 - Sudden changes in the allowable relative humidity, especially when it is repetitive.
- **CLEANING** should be routine and accomplished with a soft, lint-free cloth lightly dampened with water or an inert household dust attractant. Allowing airborne dust, which is somewhat abrasive, to build up will tend to dull a finish over time.
 - Remove oil or grease deposits with a mild flax soap, following its directions for dilution.
 - Do not use abrasives, chemical or ammonia cleaners on fine architectural woodwork surfaces.
- **AVOID:**
 - Excessive or repetitive impact, however lightly applied. The cellular structure of the wood will compact under pressure. Many modern finishes are flexible and will show evidence of impact and pressure applied to them.
 - Localized high heat, such as a hot pan or plate, or a hot light source, close to or in contact with the finished surface. Exposure to direct sunlight will alter the appearance of fine woodwork over time.
- **USE** trims, cabinets and fixtures, paneling, shelving, ornamental work, stairs, frames, windows, and doors as they were intended.
 - Abuse of cabinet doors and drawers, for example, may result in damage to them as well as to the cabinet parts to which they are joined.

compliance requirements

Including: Care and Moisture Considerations Before,
During, and After Installation**2.1 BASIC CONSIDERATIONS****1 GRADES - None**

1.1 Care and storage requirements are the same for all architectural woodwork projects, regardless of Grade specified or required.

2.1 DIMENSIONAL CHANGE RESPONSIBILITY in wood products resulting from:

2.1.1 Improper design rests with the design professional.

2.1.2 Improper relative humidity exposure during site storage and installation rests with the contractor.

2.1.3 Humidity extremes after occupancy rests with the owner.

3 INDUSTRY PRACTICES

3.1 **OFF GAS REDUCTION** by raising the temperature in a building for a sustained period is unacceptable and will negatively affect the appearance and performance of architectural millwork.

3.1.1 Open joints, warped paneling/doors, and other defects caused by such are not to be considered a defect.

SECTION 2

Care & Storage

GENERAL/PRODUCT

compliance requirements

2

2.2 SCOPE

1 All materials and products covered under the scope of these standards.

2.3 DEFAULT STIPULATION

1 Not used or applicable for this section.

2.4 RULES

- 1 The following rules shall govern unless a project's contract documents require otherwise.
- 2 These rules are intended to provide a well-defined degree of control over a project's quality of finishing.
- 3 **ERRATA**, published on the Sponsor Associations' websites at www.awinet.org, www.awmac.com, or www.aws-errata.com, **shall take precedence over these rules**, subject to their date of posting and a project's bid date.

2.4.4. Basic Rules

1 DELIVERY shall be:

- 1 1 Made in accordance with a progress schedule furnished by the contractor, and:
- 1 1 1 For climate controlled applications, in an area in which:
- 1 1 1 1 Wet work is dry.
- 1 1 1 2 Overhead work is complete.
- 1 1 1 3 Area is room clean.
- 1 1 2 For non-climate controlled interior or exterior applications, in an area which is:
- 1 1 2 1 Clean.
- 1 1 2 2 Protected from direct moisture.
- 1 1 2 3 Protected from direct sunlight.

2 HANDLING shall:

- 2 1 Be with clean hands or gloves.
- 2 2 Include protection from marks or damage.

3 STORAGE shall be:

- 3 1 Flat on a level surface.
- 3 2 Clean.
- 3 3 At least 4" (101.6 mm) off the floor or ground.
- 3 4 Protected from:
- 3 4 1 Sunlight, wide swings in relative humidity, and/or abnormal heat or cold.
- 3 4 2 Moisture.

Continues next column ▼

2.4.4. Basic Rules

▲ From previous column

3 STORAGE (continued)

- 3 5 For climate controlled applications:
- 3 5 1 In a clean, closed building or area with operational HVAC system, and:
- 3 5 1 1 Relative humidity between 25-55% inclusive.
- 3 5 1 2 Maintained Optimum Moisture Content between 5 - 10% inclusive, except in:
- 3 5 1 2 1 The damp Southern Coastal areas of the U.S. and Canadian Eastern Coastal Provinces shall be between 8 - 13% inclusive.
- 3 5 1 2 2 The dry Southwestern U.S., and Alberta, Saskatchewan, and Manitoba in Canada shall be between 4 - 9% inclusive.

4 INSTALLATION shall only occur after materials have been acclimatized for a minimum of 72 hours, and:

- 4 1 For climate controlled applications, that:
- 4 1 1 Is between 60 - 90 degrees Fahrenheit (15.5 - 32 degrees Celsius) inclusive.
- 4 1 2 Has a maintained Relative Humidity between 25 - 55% inclusive, except in:
- 4 1 2 1 The damp Southern Coastal areas of the U.S. and Canadian Eastern Coastal Provinces shall be between 43 - 70% inclusive.
- 4 1 2 2 The dry Southwestern U.S., and Alberta, Saskatchewan, and Manitoba in Canada shall be between 20 - 50% inclusive.

5 AFTER INSTALL and ACCEPTANCE:

- 5 1 At climate controlled applications:
- 5 1 1 Woodwork shall be maintained in the same environmental conditions as during its storage and/or installation.
- 5 1 2 Temperature in a building or area of a building shall not be raised or lowered for a sustained period (more than 24 hours) for any reason as it may negatively affect the appearance and performance of architectural woodwork.
- 5 2 At non-climatic controlled interior or exterior applications woodwork shall:
- 5 2 1 Have its finish maintained, refinishing as necessary (especially oiled finishes).
- 5 2 2 Be protected from excessive moisture and standing water.

6 SEVERE DAMAGE can result from not adhering to the above rules:

- 6 1 Fabricator/Installer shall not be held responsible for the damage caused by not adhering to the above.