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HOW TO KEEP YOUR GYM FLOORS
WORKING FOR YOU

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WHY IS HUMIDITY “SO IMPORTANT?”

Below you can see some charts that show average moisture content in certain regions of the US. You can also see how temperature/humidity % directly affects the expected moisture content of your wood surface.

For example, if your maple floor (based on 2.¼” standard size) was milled and shipped at 8% moisture content, installed at the same moisture content and took on a condition that caused it to be say, 10%, that is a 2% change in the chart below or what we would expect as a 1/64” expansion of every single board in your facility.

This is essentially why a constant environment is so important.

What will or may happen when there is too much movement caused by conditions change?

- Expansion or contraction of individual boards (Will happen for certain)
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***** All of this is ONLY controlled by the environment the flooring is within *****

MOISTURE CONTENT OF WOOD AT VARIOUS TEMPERATURE AND RELATIVE HUMIDITY

Temperature	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
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40° F	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
50° F	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
60° F	1.3	2.5	3.6	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.1	12.1	13.3	14.6	16.2	18.2	20.7	24.1	26.8
70° F	1.3	2.5	3.5	4.5	5.4	6.2	6.9	7.7	8.5	9.2	10.1	11.0	12.0	13.1	14.4	16.0	17.9	20.5	23.9	26.6
80° F	1.3	2.4	3.5	4.4	5.3	6.1	6.8	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6	26.3
90° F	1.2	2.3	3.4	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3	26.0
100° F	1.2	2.3	3.3	4.2	5.0	5.8	6.5	7.2	7.9	8.7	9.5	10.3	11.2	12.3	13.6	15.1	17.0	19.5	22.9	25.6
	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	98%

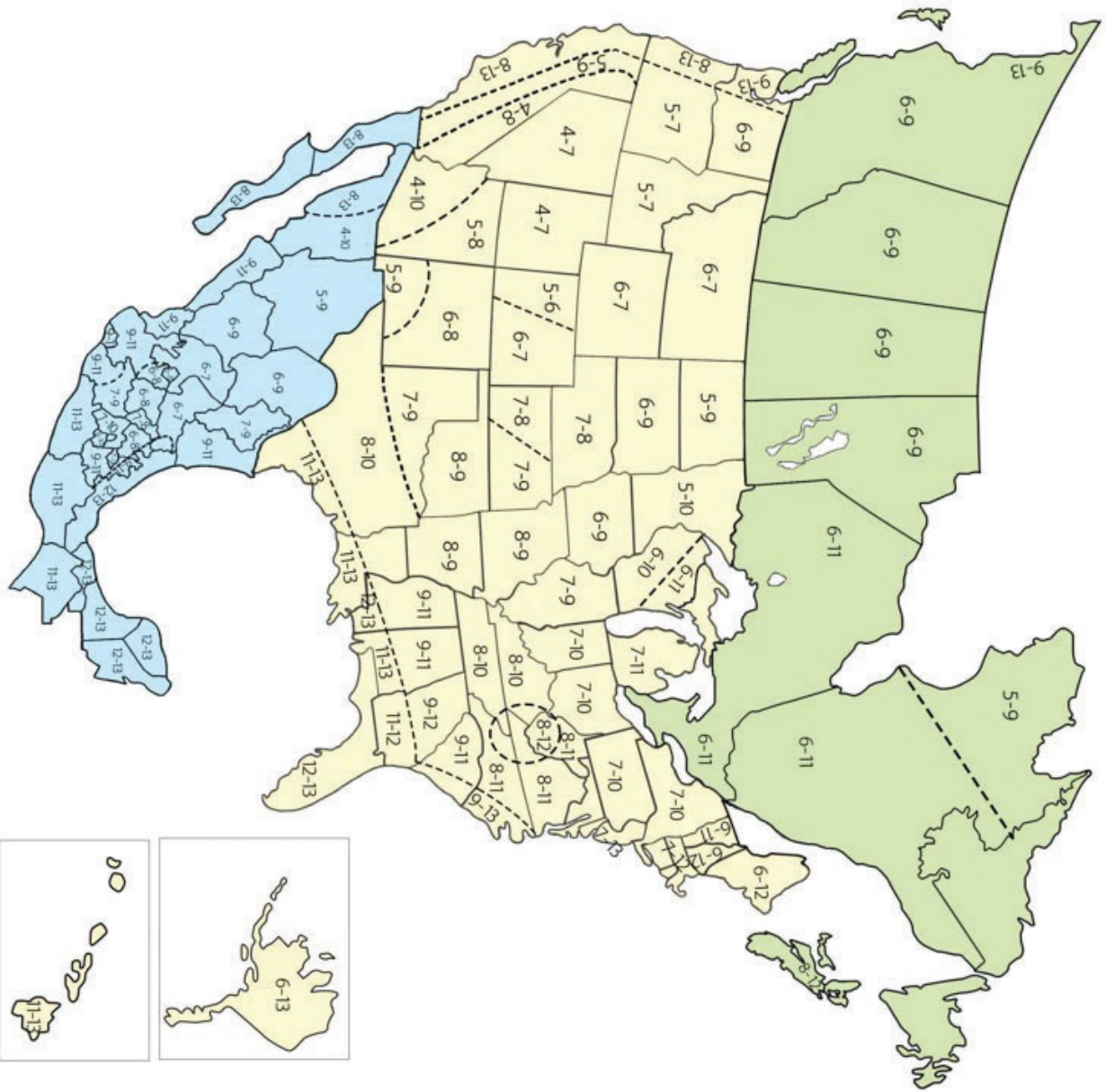
Source: USDA Forest Products Laboratory

Based on Average Possible Change in Width (Tangential Face) 2-1/4"	
A Moisture Content Difference of	May Result in an Approximate
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(The Greatest Possible Dimensional Change Occurs in the Tangential Direction)

Source: USDA Forest Products Laboratory

MOISTURE MAP OF NORTH AMERICA



The numbers on the accompanying map provide examples of how average moisture content ranges for interior use of wood products vary from one region to another, and from one season to another within a region. Actual moisture content conditions in any location may differ significantly from these numbers.

Woods Admiration



Decorative inlay work is a specialty of the woodworkers at the University of Wisconsin-Madison's Wood Shop.

Woodworkers at the University of Wisconsin-Madison's Wood Shop are proud to be part of a tradition that dates back to the founding of the university in 1848. The shop is a place where students and faculty alike can learn the art and science of woodworking. From basic carpentry to advanced joinery, the shop offers a wide range of courses and projects. The woodworkers at the shop are skilled in a variety of techniques, including hand tool work, power tool work, and finishing. They are also involved in a number of projects, including the restoration of historic buildings and the construction of new structures. The shop is a place where students can learn from experienced woodworkers and develop their own skills and creativity. It is a place where the love of wood is shared and passed on to the next generation.

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All the way to the Shop

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A diagram of a tree showing its internal structure, including the trunk, branches, and roots, with labels for different parts.

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The Maple Flooring Manufacturers Association does not recommend the use of automated power scrubbing equipment for your maple floor.

The use of power scrubbing equipment may void warranties provided by your MFMA maple flooring system manufacturer, finish manufacturer, and / or sports flooring contractor. Before incorporating the use of an automated power scrubber into your general maintenance program, the Maple Flooring Manufacturers Association strongly recommends reviewing your warranty and maintenance documentation provided by your MFMA sports floor contractor and /or MFMA maple manufacturer. The use of a power scrubber may nullify your floor's warranty.

The use of automated power scrubbing equipment may lead to the following negative effects on your maple floor:

Possible adverse effects on the maple boards and subfloor components:

- Gapping between boards due to excessive expansion followed by shrinkage
- Splintering and Shaling of boards due to repeated wetting via scrubbing
- Tripping hazard of uneven board edges caused by cupping or crowning
- Discoloration of maple flooring

Possible adverse effects on the floor finish and paint:

- Chipping and peeling of paint and finish
- Dull finish appearance
- Slip & Fall Safety due to changes in the coefficient of friction
- Premature finish wear.
- Peeling of annual recoat finish resulting from cross-contamination by maintenance products used on other floor surfaces

Possible Equipment Issues:

- Inadequate water extraction heightens potential for floor damage
- Leaky hoses, fittings, or battery
- Improperly designed or damaged deck heads may damage floors

A significant number of flooring issues found during inspections by MFMA staff have been directly attributed to the use of power scrubbers. Therefore, it is critical to verify how the use of power scrubbers may affect installer and/or manufacturers warranties. Please direct all warranty and maintenance questions to your MFMA sports flooring contractor or MFMA maple flooring manufacturer.

See also: Maintenance Recommendations; Cupping, Crowning, Compression Ridging & Compression Set; and Power Scrubbers and Weight.

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Maple Flooring Manufacturers Association

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Tape on a Maple Floor

MFMA does not recommend the use of masking, theatrical, construction, electrical, duct, adhesive or any other kind of tape to mark temporary court boundaries on the surface of a finished maple floor. It is likely that the tape, when removed, will peel away layers of the floor's surface finish. Most tapes promoted for temporary markings have a different coefficient of friction than finishes applied to the maple playing surface, and can impact a person's ability to start, stop and pivot. Removing the surface paint/finish and exposing the maple can result in additional chipping and peeling of the remaining paint/finish in adjacent areas.

In addition, most commonly available tapes contain adhesive resins that can etch or stain the floor finish or even the maple flooring below the temporary markings.

If you have additional questions, please contact MFMA's Technical Director at 888-480-9138.

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Weight from Riding Power Scrubbers

The Maple Flooring Manufacturers Association does not recommend the use of automated power scrubbing equipment for general, daily, or weekly maintenance because the use of power scrubbing equipment may void warranties administered by your MFMA maple flooring system manufacturer and/or sport floor contractor. The total weight of a riding power scrubber may have detrimental effects on your maple floor system.

Concerns: Riding power scrubbers can weigh in excess of 1,200 lbs. when all of the weight factors are accounted for. Those factors include:

- Weight of the riding power scrubber
- Weight of a fully loaded reservoir
- Weight of the operator

Riding power scrubbers can weigh in excess of 750 lbs. One gallon of water weighs 8.35 lbs. If the riding power scrubber has a 30-gallon reservoir, that can add 250 lbs. to the equipment. Figure in an average 200 lb. operator and you have reached that 1,200 lb. weight.

MFMA maple floor systems function extremely well under normal loads, however on occasion significant loads can have detrimental effects. Excessive loading like those resulting from the use of riding power scrubbers can lead to surface degradation and/or weaken structural components leading to system failure.

Solution: Stop using a power scrubber of any kind on your maple floor. Power scrubber use can damage the maple floor boards, the paint and the gymnasium finish.

Steps for Proper Daily Maintenance:

- Sweep the floor daily with a properly treated dust mop. If the floor is used heavily, sweep it up to three times per day.
- Wipe up spills and any moisture on the floor surface.
- Remove shoe marks using an approved floor cleaner applied with a soft cloth or a dust mop. Contact your floor finish manufacturer for approved cleaning products.

Before incorporating general maintenance procedures for your gym floor, the Maple Flooring Manufacturers Association strongly recommends reviewing your warranty and maintenance information provided to you by your MFMA sport floor contractor and/or MFMA maple manufacturer.

See also: [Power Scrubbers](#), [Daily Floor Care](#), [Cupping](#), [Crowning](#), [Compression Ridging & Compression Set](#)

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Moisture Infiltration

Wood flooring may have different issues that may arise after moisture infiltration has occurred. Examples of moisture infiltration would include roof leaks, large spills, burst pipe, etc. The following is a list of issues that have frequently occurred.

- **Compression Set and Associated Shrinkage**
 - Moisture infiltration may cause excessive shrinkage gaps between flooring strips that are commonly larger than normal seasonal shrinkage gaps after the wood returns to its normal moisture content range.
- **Cupping and/or Crowning**
 - Cupping and/or crowning may take place from moisture infiltration due to expansion pressure from the flooring strips taking in excessive moisture.
- **Flooring Issues**
 - Moisture infiltration may affect the integrity of the flooring and the deterioration of the flooring fasteners.
 - The most common affect on flooring from moisture infiltration is in the form of splits and end checks.
- **Finish Issues**
 - Excessive expansion and contraction of the flooring strips may cause bonding issues of the floor finish, game lines and logos.
- **Mold and Dry Rot**
 - Mold and dry rot on or below flooring strips may be a symptom of prolonged exposure to moisture.
 - Contact your local health officials for local ordinance on proper procedures when dealing with mold.
- **Continued Performance**
 - The flooring manufacturer and installing contractor cannot guarantee that floors and floor systems affected by moisture will perform as originally designed.
 - Maple wood floors that have been exposed to moisture infiltration may have ongoing performance issues, which include, but not limited to, dead spots, fractured or splintering boards, and/or uniformity concerns.

See Also: *Catastrophic Moisture, Incidental Moisture, and Common Effects of a Flooded Floor.*

If you have experienced moisture infiltration, please contact your MFMA Sport Floor Contractor or contact the MFMA's Technical Director at 888/480-9138.

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Catastrophic Moisture

Catastrophic moisture is best defined as a substantial influx of free water associated with major sources such as ground related flooding, ruptured pipes, extensive roof damage, activated fire sprinklers, or other sources contributing to massive moisture migration.

It is well understood that moisture absorption in wood materials to any degree can result in the issues described herein as adverse concerns. Less well understood, is the detrimental impact that saturated wooden floors, resulting from catastrophic moisture infiltration, can have on the integrity and holding strength of flooring fasteners.

Fastener Study

Holding Value and Integrity

Results of an independent study conducted on behalf of the MFMA (Maple Flooring Manufacturers Association) shows a substantial reduction in fastener holding values when test sections of flooring are subjected to catastrophic moisture conditions.

Test sections used within this study were comprised of the various combinations of MFMA strip maple flooring, a subfloor nailing base consisting of commonly used subfloor materials known to the industry as plywood, oriented strand board and spruce-pine-fir lumber, and industry standard floor fasteners, i.e., staples and cleats.

Shown below, are the overall results of the various flooring assemblies when they are subjected to catastrophic moisture and dried back to their original wood moisture content. There was an average reduction in fastener holding value of 35.5% after one day of saturation, 38.0% after two days, and 41.5% after 3 days.

Whether it be a 1, 2, or a 3-day submersion followed by a drying phase taking each specimen back to their original wood moisture, the range of reduction of fastener holding value is 35-40%. This very substantial reduction in fastener holding value brings into question the long-term integrity and performance of a flooring system.

AVERAGE LOSS OF FASTENER HOLDING VALUE		
1-Day Saturation	2-Day Saturation	3-Day Saturation
35.5%	38.0%	42.0%

Vertical Inter-Gap

This study of the effects of catastrophic water events also revealed the effect of the expansional forces on the flooring boards relative to the subfloor material and perhaps slight fastener withdrawal. Expansional force generated by moisture absorption results in the flooring boards expanding differentially with respect to the subfloor. Hence when dried back to their original wood moisture, there is a slight separation gap between the underside of the flooring boards and the surface of the subfloor base, creating a condition referred to as 'Vertical Inter-Gap' by the scientists conducting this study. According to the same independent study, such spacing measured as much as 0.1" (nearly 1/8") and is considered to be further detrimental to the integration of the floor surface and subfloor components.

Conclusion

Independent evaluation as described above illustrates that returning to the original wood moisture content after saturation does not assure that the floor system will perform as when originally installed. Considerable negative effects of catastrophic moisture remain hidden after seemingly acceptable aesthetic appearance of the floor surface is achieved.

Potential Adverse Concerns

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 - Maple wood floors that have been exposed to moisture infiltration may have ongoing performance issues, which include, but are not limited to dead spots, squeaks, fractured or splintering boards, and/or uniformity concerns.
 - The erosion of fastener holding values and vertical inter-gapping makes a floor more susceptible to future moisture related issues and/or environmental fluctuations.

See also: *Cupping, Crowning, Compression Ridging & Compression Set, Dead Spots, Common Side Effects of a Flooded Maple Floor, and Incidental Moisture*

If you have experienced catastrophic moisture infiltration, please contact your MFMA Sport Floor Contractor or contact the MFMA's Technical Director at 888/480-9138.

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80° F	1.3	2.4	3.5	4.4	5.3	6.1	6.8	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6	26.3
90° F	1.2	2.3	3.4	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3	26.0
100° F	1.2	2.3	3.3	4.2	5.0	5.8	6.5	7.2	7.9	8.7	9.5	10.3	11.2	12.3	13.6	15.1	17.0	19.5	22.9	25.6

Relative Humidity %

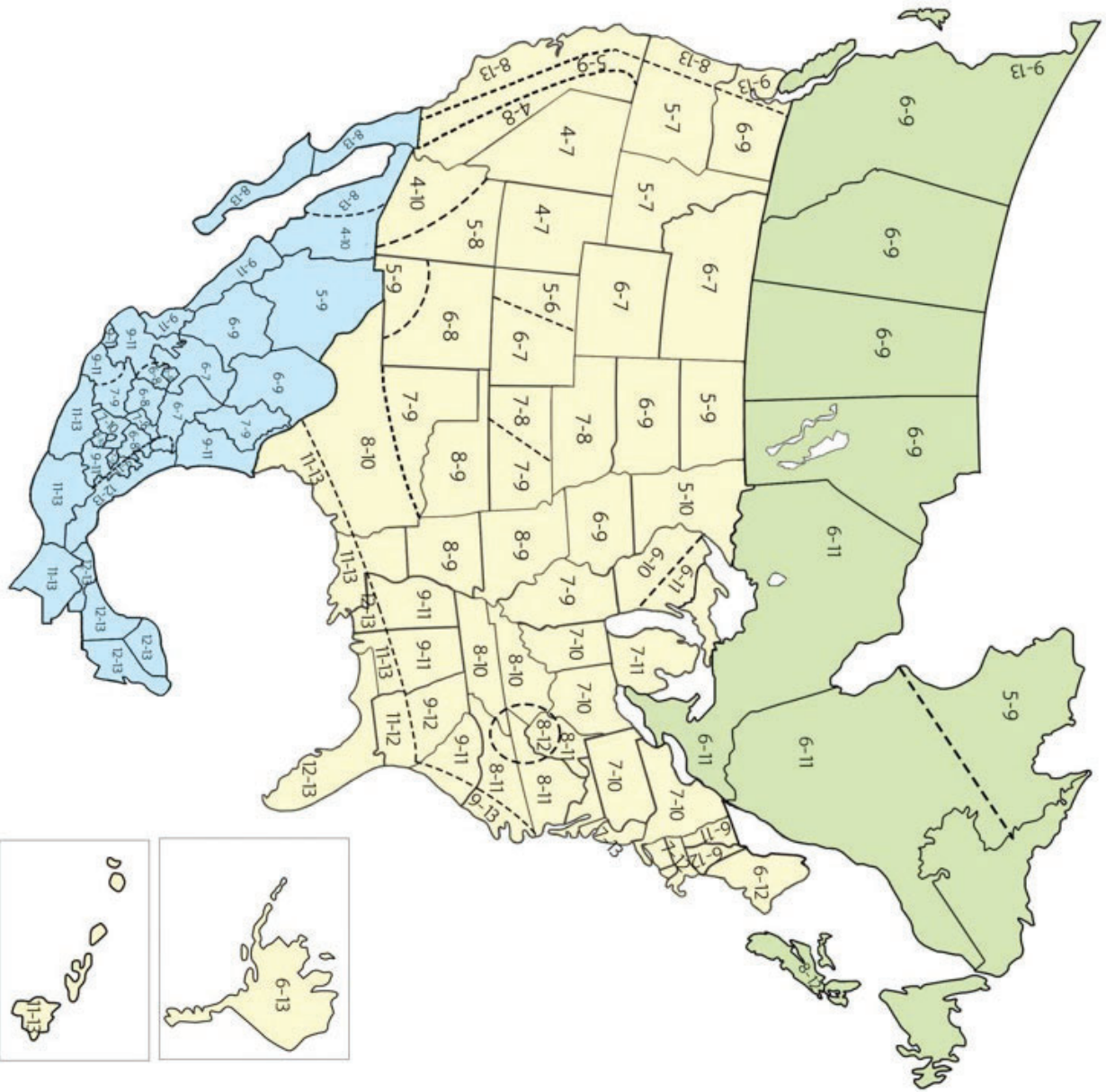
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