MFMA Accreditation Program

- MFMA Standards and Recommendations for the Sport Floor Installer

Introduction to the MFMA Accredited Installer (AI) Program

How will I or my company benefit from the MFMA Accreditation Program?

What should I expect to learn from the MFMA Accreditation Program?

What is the purpose of the MFMA Accreditation Program?

General Purpose of the AI Program

Assist the general public in evaluating the experience and expertise of installers

Recognize professional hardwood maple sports flooring installers who have met a designated level of experience and demonstrated a standard of knowledge

Provide a means of identifying professionals who have met a standard of achievement

Raise professional standards and improving the practice of hardwood maple sports flooring construction

MFMA Accreditation Program Outline

- Section 1: Who and What is the MFMA?
- Section 2: MFMA Maple, Beech, and Birch Hardwood Flooring
- Section 3: Job Recording and Proper Documentation
- Section 4: Delivery and Storage
- Section 5 General Pre-Installation and Installation Guidelines
- Section 6: General Subfloor Configurations and Installation Guidelines
- Section 7: Sanding, Sealing, Gamelines, and Finishing
- Section 8: Maintenance
- Section 9: Call Backs
- Section 10: MFMA PUR Standards

Section 1: Who and What is the MFMA?

Who and What is the MFMA?

We are the authoritative source of technical and general information about maple flooring and related sports flooring systems.

Membership consists of maple flooring manufacturers, installation contractors, distributors and allied product manufacturers who subscribe to established quality guidelines.

Who and What is the MFMA?

Founded in 1897, the MFMA is the authoritative source of technical information about northern hard maple flooring. The association publishes grade standards, guide specifications, floor care recommendations and specifications for athletic flooring sealers and finishes. All information mentioned is available from MFMA headquarters or for download from the MFMA website, www.maplefloor.org.

MFMA Maple Flooring Manufacturers

- Aacer Sports Flooring
- Action Floor Systems
- Connor Sports
- Horner Sports Flooring
- Merrick Hardwoods
- Ort Flooring and Lumber
- Robbins Sports Surfaces

What does it mean when an architect specifies that the maple flooring be “MFMA”?

It means the maple floor is produced/manufactured by a MFMA Mill Member.

Section 2: MFMA Maple, Beech, and Birch Hardwood Flooring

This section will provide you with detailed knowledge of MFMA Maple hardwood flooring. MFMA graded Beech and Birch flooring is also available.

MFMA Maple Flooring

- Type of Wood: Sugar Maple/ Hard
- Latin Term for Sugar Maple — Acer Saccharum
- MFMA maple is grown north of the 35th parallel
- MFMA Grading Rules also apply to beech & birch flooring produced by a MFMA Maple Flooring Manufacturers

MFMA Maple Physical Properties and Characteristics

Color

Maple heartwood is creamy white to light reddish brown

Maple sapwood is light brown to white

Durability

Dense, strong, tough, stiff, excellent shock resistance, markedly wear resistant

Workability

Density makes it very difficult to saw

Sands satisfactorily

MFMA maple polishes well under friction

Although MFMA maple takes neutral finish well, maple does NOT take stain well

MFMA Maple Edge Grain Flooring

- All grades of MFMA maple contain some edge grain material
  - Edge grain flooring is flooring in which the annual growth rings range from 30 degrees to 90 degrees
  - 75% of an individual flooring strip needs to be edge grain for the entire flooring strip to be considered edge grain

MFMA Maple Flooring Quality Assurance

- MFMA Mill Manufacturer members are subject to 4 unannounced mill inspection per year
- MFMA does grading re-inspections on floors where the grade of material is questioned after installation
- During a MFMA grading or grading re-inspection a maximum of 5% of flooring is allowed to be below grade
- If more than 5% of the floor is found to be below grade the floor is considered below grade

MFMA Grading Defects

- Sticker Stain
  - Sticker stain is a discoloration from lumber stacking
  - Caused by improper lumber stacking that does not allow for evaporation of maple sap
- Pin knots
- Checks
- Bird’s eyes
- Small burls
- Bark streaks

"Sticker stain" is the common term for shadowing or discoloration that occurs randomly on milled maple flooring as a result of lumber stacking that does not allow regular and even evaporation of maple sap prior to milling.

A knot that is not more than 1/2 inch in diameter

A lengthwise separation of the wood that usually extends across the annual growth rings

A unique figure pattern giving the appearance of eyes

A discoloration of the wood from being close to the edge of the log

It is the installers responsibility to cull the bad lumber

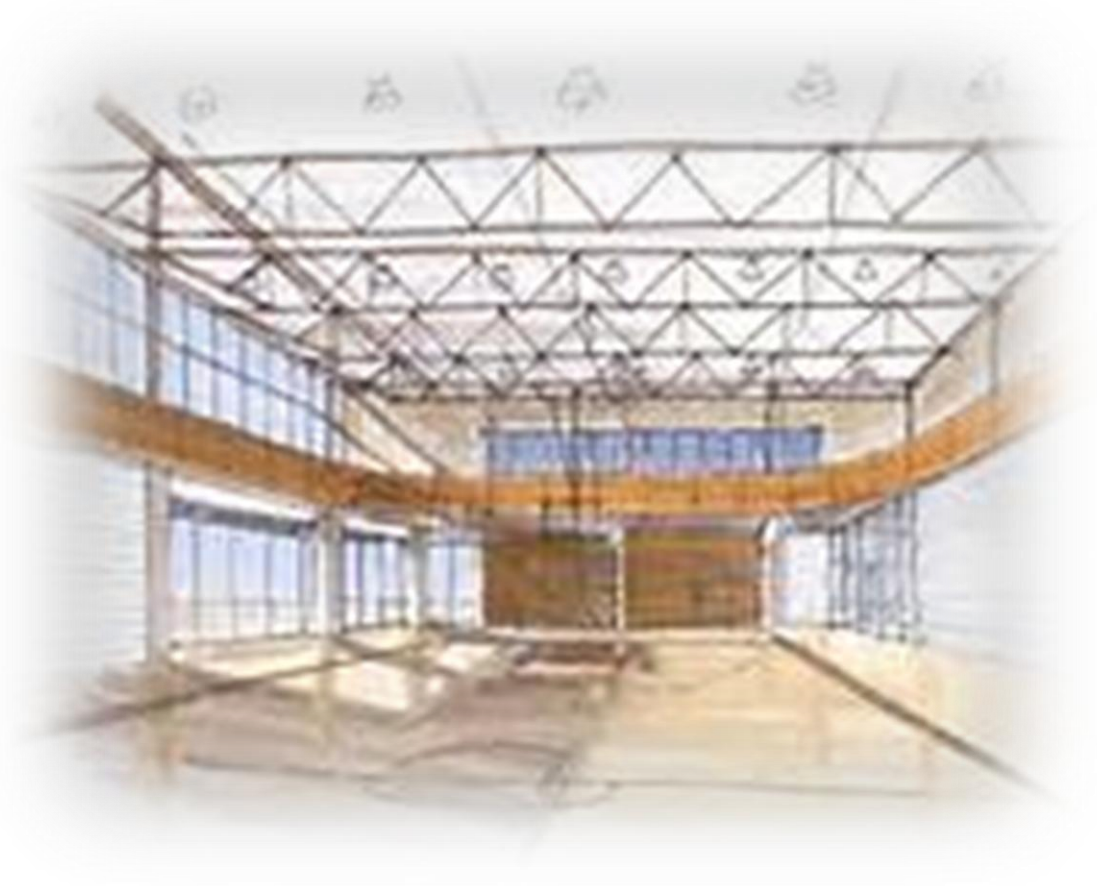
MFMA Maple Flooring Products

- Random Length Strip (MFMA-RL)
- Finger Jointed Strip (MFMA-FJ)
- Parquet (MFMA-PQ)

MFMA Random Length Strip Flooring (MFMA-RL)

- Widths
  - 1 ½”
    - 38mm
  - 2 ¼”
    - 57mm
  - 2 ½”
    - 63mm
  - 3 ¼”
    - 82mm

MFMA Random Length Strip Flooring (MFMA-RL)



- The FIVE grades of MFMA-RL
  - First Grade
  - Second and Better Grade
  - Third and Better Grade
  - Third Grade
  - Utility Grade

- Locations where floorings strips connect end to end by a single tongue and groove are referred to as “End Joints”

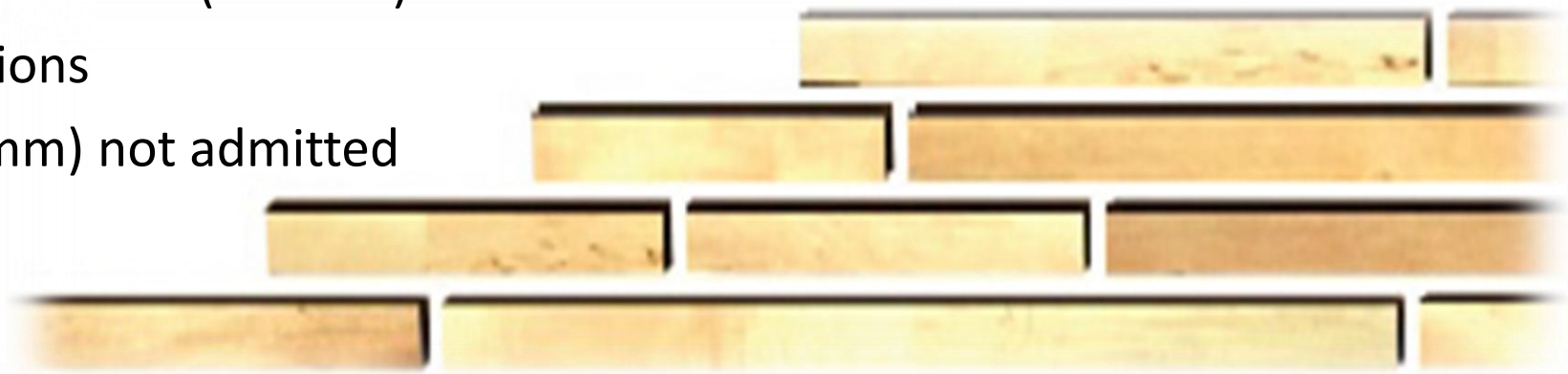
MFMA Random Length Strip Grading Rules

First Grade

- Shortest piece allowed is 9” (228mm)
- Admits natural variations in the color of the wood

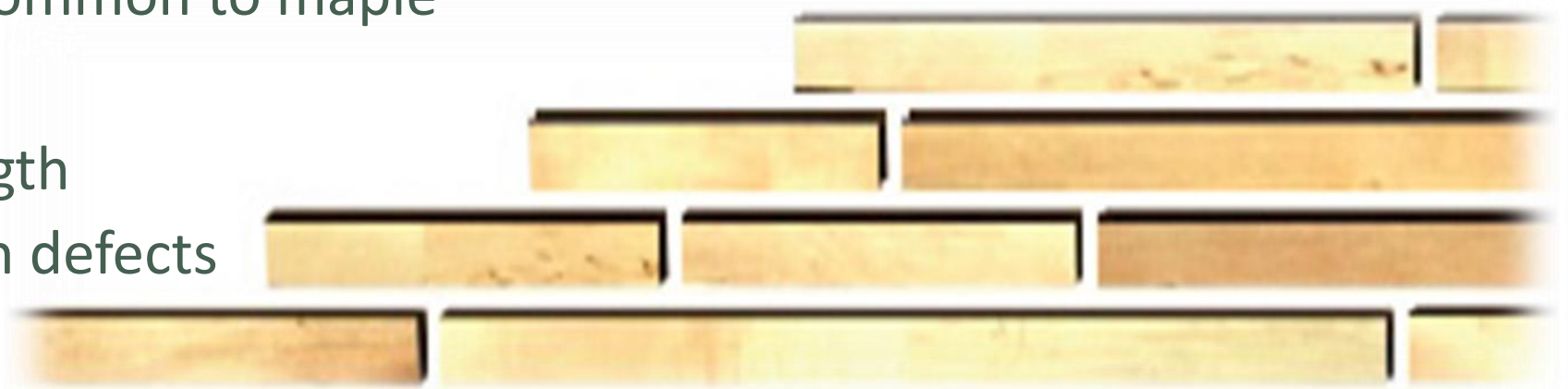
Second and Better Grade

- Shortest piece allowed is 9” (228mm)
- Distinct color variations
- Checks over 3” (76mm) not admitted



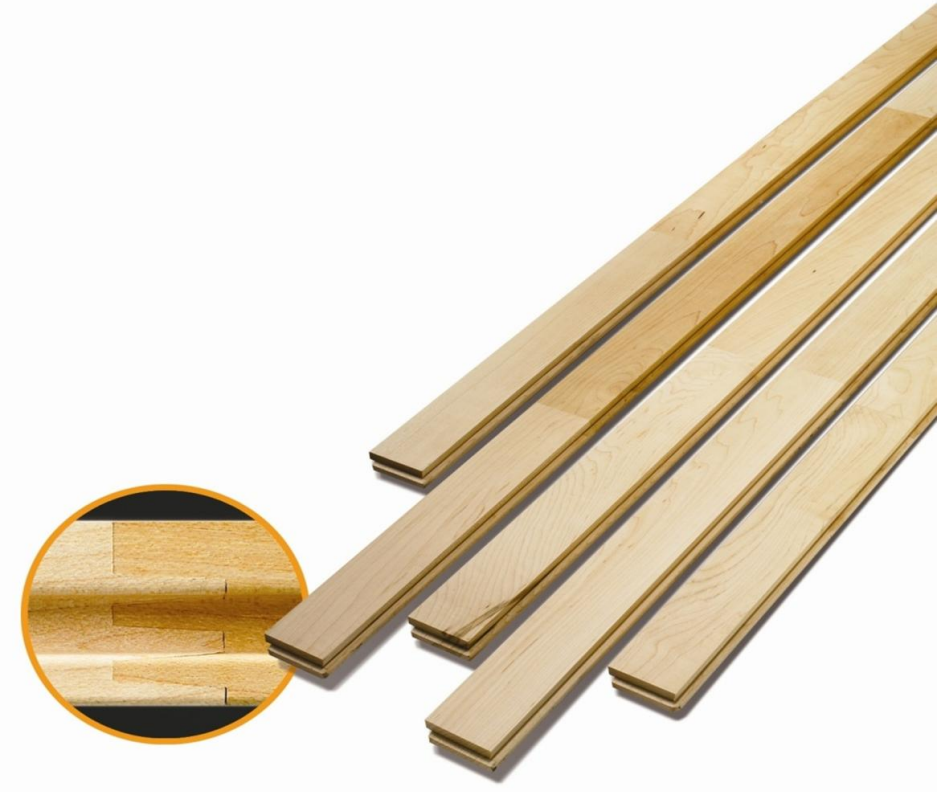
MFMA Random Length Strip Grading Rules

- Third and Better Grade
  - Shortest piece allowed is 9” (228mm)
  - 60% Second and Better and 40% Third Grade
- Third Grade
  - Shortest piece allowed is 9” (228mm)
  - Contains all defect common to maple
- Utility Grade
  - No minimum on length
  - Contains all common defects



MFMA Finger Jointed Strip Flooring (MFMA-FJ)

Longer strips usually between 6’ – 8’



Available widths

- 1 ½”
  - 38mm
- 2 ¼”
  - 57mm
- 2 ½”
  - 63mm
- 3 ¼”
  - 82mm

MFMA Finger Jointed Strip Flooring (MFMA-FJ) Grading Rules

- Five grades of MFMA-FJ
  - First Grade
  - Second and Better Grade
  - Third and Better Grade
  - Third Grade
  - Utility Grade

MFMA Finger Jointed Strip Flooring (MFMA-FJ) Grading Rules

- The random length flooring strips that are finger jointed together are called “segments”. The finger joints within the strip are called “segment joints”. They look just like “end joints”.
- The flooring strip before the first and after the last finger joint are called “end segments”.

MFMA Finger Jointed Strip Flooring (MFMA-FJ) Grading Rules

- First Grade
  - Shortest end segment allowed is 6” (152mm)
  - Admits natural variations in the color of the wood
- Second and Better Grade
  - Shortest end segment allowed is 6” (152mm)
  - Distinct color variations

MFMA Finger Jointed Strip Flooring (MFMA-FJ) Grading Rules

- Third and Better Grade
  - Shortest end segment allowed is 4” (101mm)
  - 60% Second and Better and 40% Third Grade
- Third Grade
  - Shortest end segment allowed is 4” (101mm)
  - Contains all defect common to maple
- Utility Grade
  - No minimum on segment length
  - Shortest end segment allowed is 4” (101mm)
  - Contains all defect common to maple

MFMA Parquet Flooring (MFMA-PQ)

- THREE Grades of MFMA-PQ
  - Second and Better
  - Third and Better Grade
  - Third Grade
- Individual picket widths range from 3/4” (19mm) to 1-1/8” (29mm)
- Individual picket lengths range from 5-1/2” (140mm) to 12” (305mm)
- Minimum thickness is 5/16” (8mm)
- Square and rectangular panels in a variety of dimensions
- Pickets are made of edge grain material

MFMA Parquet Maple Flooring (MFMA-PQ) Grading Rules

- Second and Better Grade
  - Shortest picket length allowed is 5-1/2” (140mm)
  - No surface defects
- Third and Better Grade
  - Shortest picket length allowed is 5-1/2” (140mm)
  - Mixture of all other grade of MFMA-PQ
- Third Grade
  - Shortest picket length allowed is 5-1/2” (140mm)
  - Contains all defect common to maple

Section 3: Job Recording and Proper Documentation

DAILY ACTIVITY LOG WORKSHEET

Date:_____

Company/Person/Address/Phone	Activity	Results/Follow Up

This section will provide you with detailed knowledge on how to document a job properly.

Why is it important to keep good job records?

It is a good business practice.

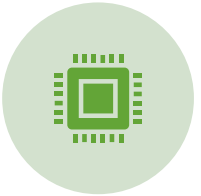
Such documentation is essential if problems arise after installation, which can protect the installer from liability.

It is a requirement to maintain your status as an MFMA Accredited Installer.

Pre-Installation Working Conditions Documentation

Is the building enclosed and weather tight?

All wet and trowel trades complete?



All overhead work complete?
Backstops installed?
Scoreboards installed?

Permanent Heat, Lights, HVAC operational?

Able to maintain 55 to 75 degrees Fahrenheit and 35 to 50% relative humidity – before, during and after installation?

Proceed with installation

Pre-Installation Concrete Documentation

Concrete Dryness

- Is the concrete dry enough to begin to install the maple athletic floor?
- What method to test the concrete moisture testing method was used?
  - Concrete Relative Humidity Test (In Situ Probe Testing) is the only MFMA recognized concrete testing method
- Record number of tests performed and results from each location.

Concrete Flatness

- Is the concrete flat to tolerance?
- Was the concrete profile sheet provided to the General Contractor?

Material Delivery and Unloading Documentation

- Record square feet of flooring unloaded
- Record at least two moisture content readings for each pallet unloaded
- Record quantity and description of other materials on the truck

Daily Job Documentation

- Date
- Temperature and Humidity Levels — Indoor and Outdoor
- Moisture Content of Flooring — Installed and not installed
- Work performed that day
- Document any issues and the resolutions that occur on a day-to-day basis

Section 4: Delivery and Storage

This section will provide detailed knowledge on delivery and storage guidelines for maple athletic floor installations.

How will the maple arrive onsite?

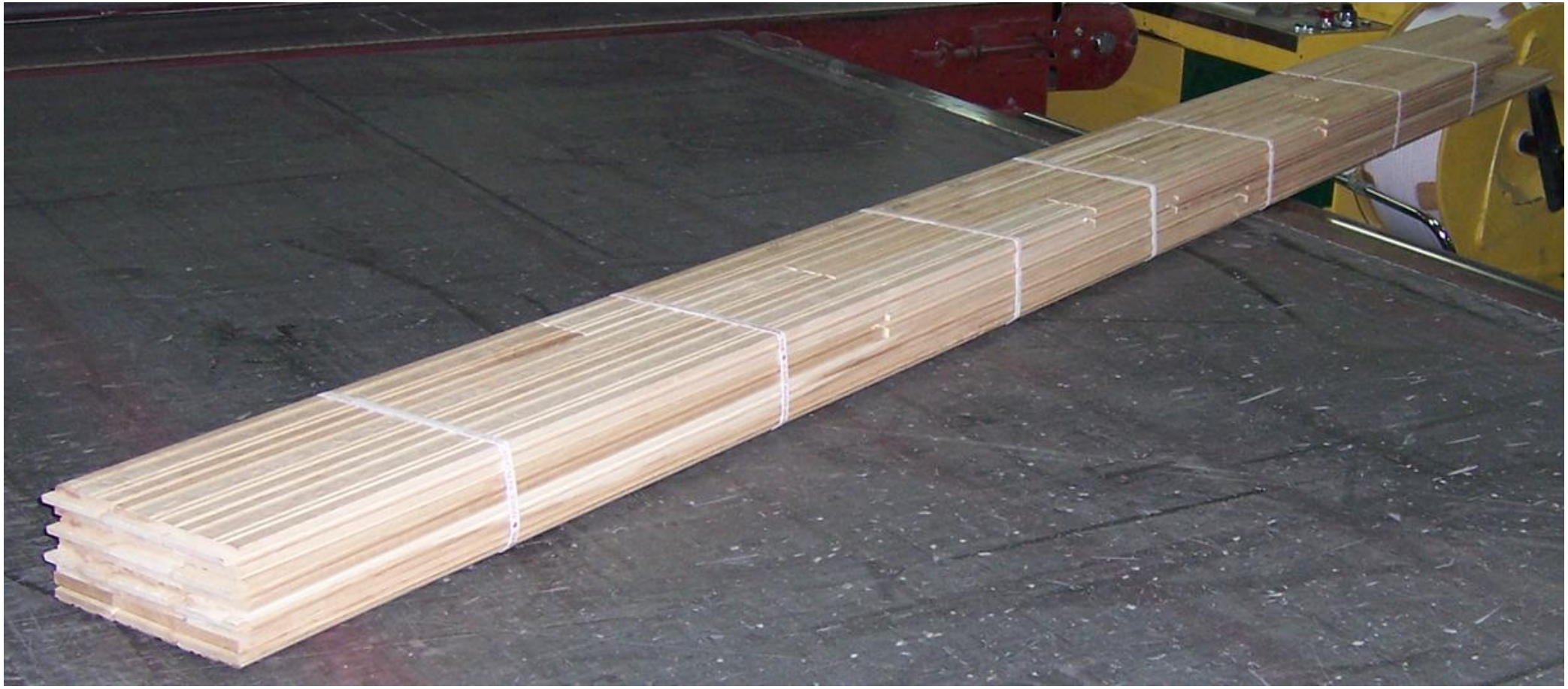
Nested Flooring

- Flooring is shipped and bundled continuously end to end in 7’ (213cm) to 8’ (244 cm) bundles

Bundled Flooring

- Bundled flooring is shipped and bundled by average length
- Flooring may include individual pieces 6” (152mm) below or 6” (152mm) above the nominal length

Nested Flooring



Bundled Flooring

Storage

- Store flooring in enclosed, weather-tight space where it is going to be installed
- Provide ventilation to keep humidity at a minimum
- Never store flooring directly on concrete slab
- Do not place flooring directly against block walls

What are the two most important tools when installing a maple athletic gym floor?

Moisture Meter

Hygrometer

Environmental Conditions

Moisture, temperature and humidity changes will cause maple to expand and contract.

MFMA recommends maintaining indoor relative humidity between 35% and 50% and air temperatures between 55- and 75-degrees year-round.

If flooring is properly acclimated, a 15% fluctuation in indoor relative humidity will not adversely affect the maple.

Excessive shrinkage and/or expansion may occur with indoor relative humidity variations in excess of 15%.

Environmental Conditions

The most important part of MFMA recommended environmental conditions is the 15% fluctuation because in dry arid geographical locations or wet, tropical geographical locations it may not be possible to maintain 35%-50% indoor relative humidity.

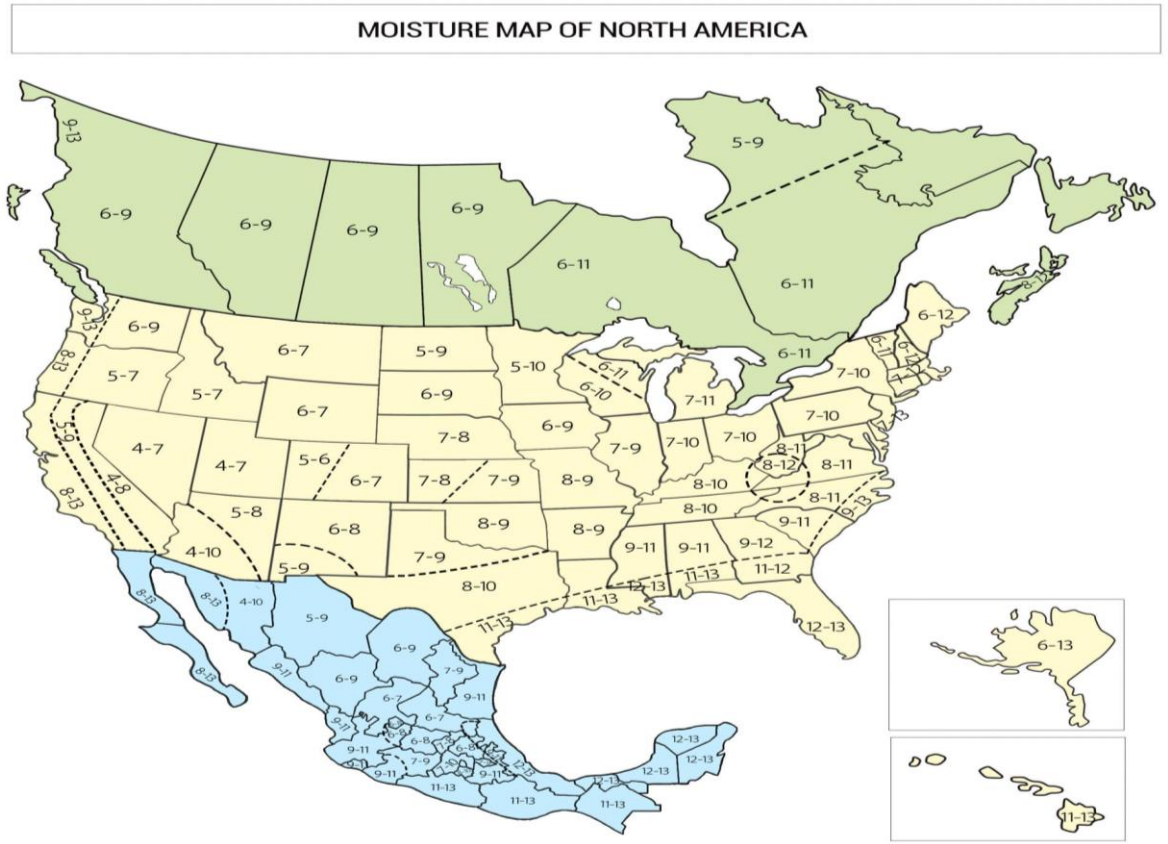
Acclimation of Delivered Flooring Material

- Flooring should be stored in the intended space prior to installation and for as long as required for acclimation. In other words, the floor should be allowed to acclimate for AS LONG AS IT TAKES to reach the proper moisture content for the floor's geographical location.

- That means the floor could be ready to install when it arrives on the job site or 2 weeks after delivery. The correct moisture content at the time of installation is what is really important.

- Please refer to the next two slides, for complete details on the recommendation moisture content for your area. Recommendations will vary based on the time of year and current environmental conditions. For further details MFMA recommends contacting your MFMA Maple Flooring Manufacturer.

U.S. Department of Agriculture
Forest Products Laboratory



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

MOISTURE CONTENT OF WOOD AT VARIOUS TEMPERATURE AND RELATIVE HUMIDITY

Temperature																				
30° 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
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%**

Relative Humidity %

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	
1%	1/128"	
2%	1/64"	Scant
3%	1/64"	Full
4%	1/32"	Scant
5%	1/32"	Full
6%	3/64"	Scant
7%	3/64"	Full
8%	1/16"	Scant
9%	1/16"	
10%	1/16"	Full
11%	5/64"	
12%	5/64"	Full
13%	3/32"	
14%	3/32"	Full
15%	7/64"	
16%	7/64"	Full
17%	1/8"	Scant
18%	1/8"	Full
19%	9/64"	Scant
20%	9/64"	Full
21%	5/32"	Scant
22%	5/32"	Full
23%	11/64"	Scant
24%	11/64"	Full

(The Greatest Possible Dimensional Change Occurs in the Tangential Direction)

Source: USDA Forest Products Laboratory

Section 5: General Pre-Installation and Installation Guidelines

This section will provide detailed knowledge on pre-installation guidelines for maple athletic floor installations.

General Installation Rules

Air conditioning is **NOT** required for the installation of a maple floor

MFMA does **NOT** recommend below grade installations

Floors with large bleacher banks should have sufficient subfloor blocking

End joint spacing in adjacent rows in a random length strip floor should be 4” (101mm)

MFMA recommended nailing schedule for maple flooring is approximately 12” (304mm) O.C.

Concrete Guidelines

4” (100mm) thickness minimum	Above and below slab moisture protection	Compressive strength 2,500 to 3,500 PSI	3,000 to 3,500 PSI for anchored and anchored resilient systems
60 day cure	Level to +/- 1/8” (10mm) in 10’ (3m) radius	Test the concrete slab for its internal relative humidity level	Concrete is a mixture of cement, air, water, sand, and gravel

Concrete Slab Evaluation

- Concrete Slab Evaluation should not commence until, at least, 30 days after pour
- Nothing should go between the below slab vapor barrier and the concrete slab

MFMA Recommended Concrete Moisture Testing Method and Procedures

- Concrete Relative Humidity Test (In Situ Probe Testing) is the only MFMA recognized concrete moisture content testing method
- This test method involves measuring relative humidity levels inside of the concrete slab
- Use a prepackaged relative humidity testing kit (ASTM F2170-11) and follow the manufacturer's instructions

What is the acceptable moisture content level for a concrete slab?

- Non-glue down floor system
  - 85% or lower
- Glue down floor system
  - 75% or lower

What do you do if the slab is too wet?

Wait until its dry!

- For slabs that exceed the recommended moisture levels, contact the system manufacturer to determine the proper moisture mitigation method.

Concrete Moisture Content Pretests

- Polyethylene Film Test
- Calcium Chloride Test
- Electronic Concrete Meters

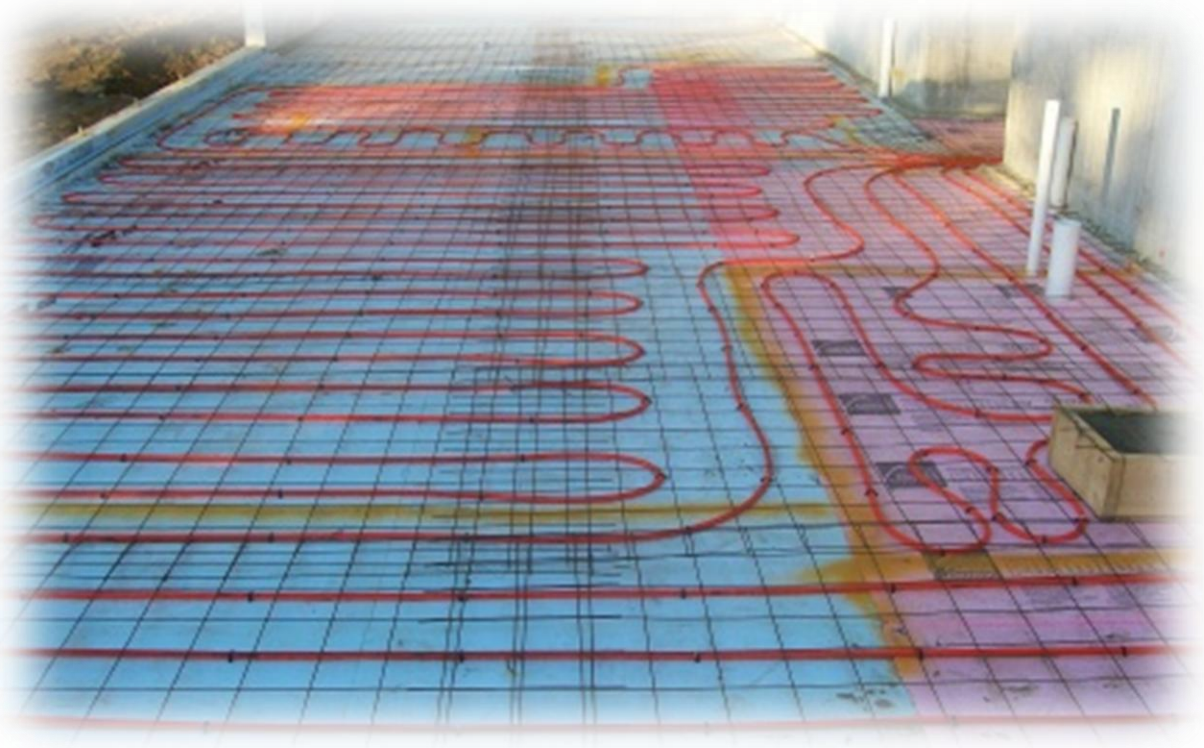
Determining the flatness of the concrete slab

- Level to +/- 1/8” (3mm) in 10’ (3m) radius
  - High spots should be ground down
  - Low spots should be filled with appropriate leveling compound
  - Correction of the slab is the responsibility of the general contractor
  - Concrete slab must be approved by the flooring contractor

- Ff/Fl numbers are not applicable for gymnasium installations!

Radiant Heat

When installing maple flooring over a concrete slab with radiant heat, MFMA recommends that the heating plant be activated 4 to 5 days prior to installation in order to drive excessive moisture out of the slab. Radiant Heating is not allowed in Anchored Resilient Floor Systems.



Concrete Substrate Vapor Proofing (All Installations)

Cover entire concrete slab with surface vapor retarder, lapping joints a minimum of 6” (152mm) or as specified by the flooring system manufacturer.

Expansion Voids

Expansion voids are areas in a maple sports flooring system where no flooring or subflooring components are installed, specifically to provide space for system movement. Expansion voids are usually found at the perimeter of a floor and at all vertical obstructions (bleacher anchors, volleyball inserts, floor electrical outlets and audio box hookups, etc.) within the borders of the floor. Expansion voids are also placed at the sides of maple floor systems to provide ventilation for the maple athletic floor system.

Expansion Voids

- As a general rule, MFMA recommends that no fixtures, equipment or bleachers be anchored through "floating" maple sports flooring systems into the concrete subfloor without first cutting surface maple and wood subfloor components away from lag bases and permanent in-floor fixtures to provide proper space for normal system movement.
- Provide 2” (50mm) expansion voids at the perimeter and all vertical obstructions.

Intermediate Expansion Rows – aka Washer Rows

Intermediate expansion rows (washer rows) are installed to allow for expansion within the floor system as normal seasonal changes dictate.

MFMA does not publish set expansion row schedules and recommends contacting your MFMA Maple Mill Manufacturer for their recommendation.

Installation of the Maple Flooring Strips

The maple flooring shall be installed parallel to main playing court by nailing or stapling per manufacturer’s instructions.

MFMA recommends a general fastening schedule of approximately 12” O.C. with a fastener placed within 2” of each end joint, or as per manufacturer’s instructions.

Base and Threshold Installation

- Install base by anchoring to walls with base cement, screws or anchors. Miter all inside joints at a 45° angles and use pre molded outside corners.
- Do not use a continuous bead of adhesive to install your vented cove base!
- Install thresholds as required, anchoring firmly in concrete floor beyond limits of wood flooring.
- Never anchor the thresholds to the maple athletic floor.

Section 6: Generic Subfloor Configurations and Installation Guidelines

This section will provide you with the general knowledge needed to help identify and install generic subfloor systems.

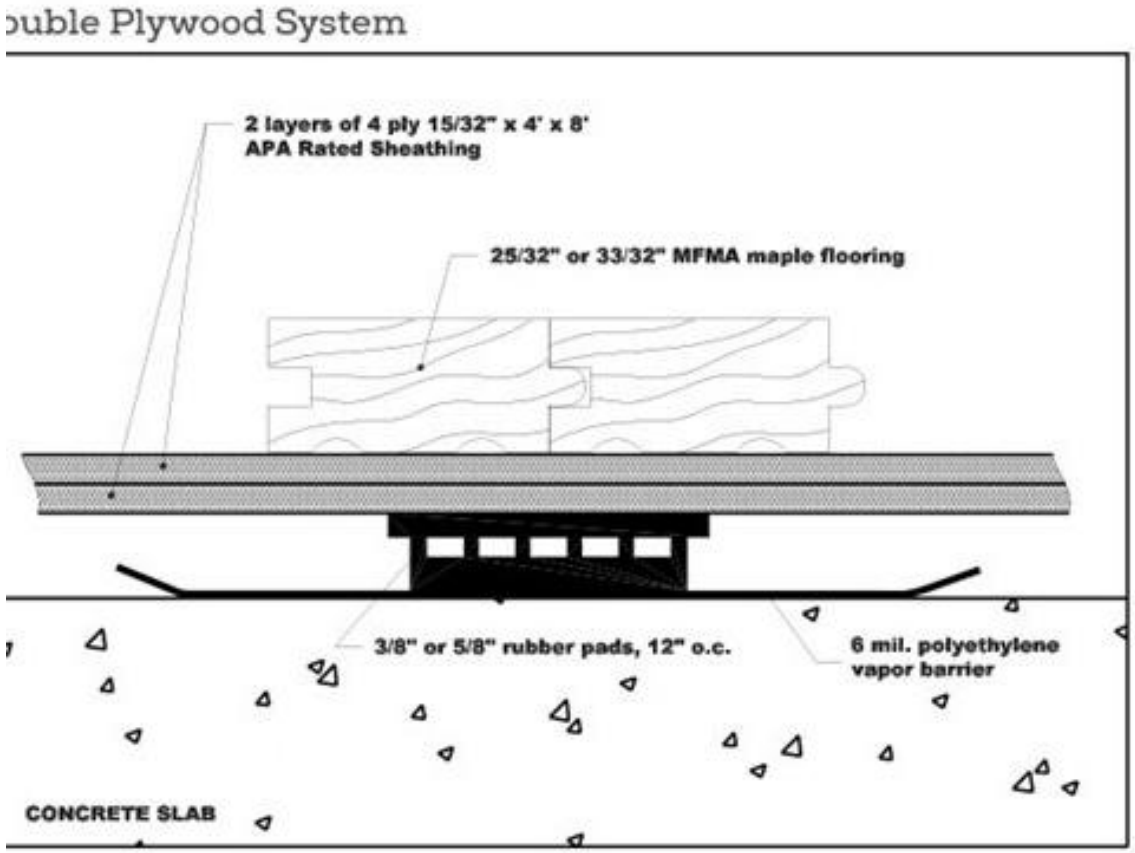
Types of Generic Subfloor Systems

- Floating
- Anchored Resilient

Floating Athletic Subfloor Systems

- Double Plywood System
- Sleeper System
- Sleeper with Plywood System
- Basket Weave System
- Basket weave with Pad System

Double Plywood System



Double Plywood – Subfloor Materials

Cushioning/Pads shall be supplied by your MFMA Maple Flooring Manufacturer

Subfloor shall be 15/32" x 4' x 8', minimum 4 ply, APA (or flooring manufacturers approved rated equivalent) Rated Sheathing, Exposure 1, or per MFMA flooring manufacturer design.

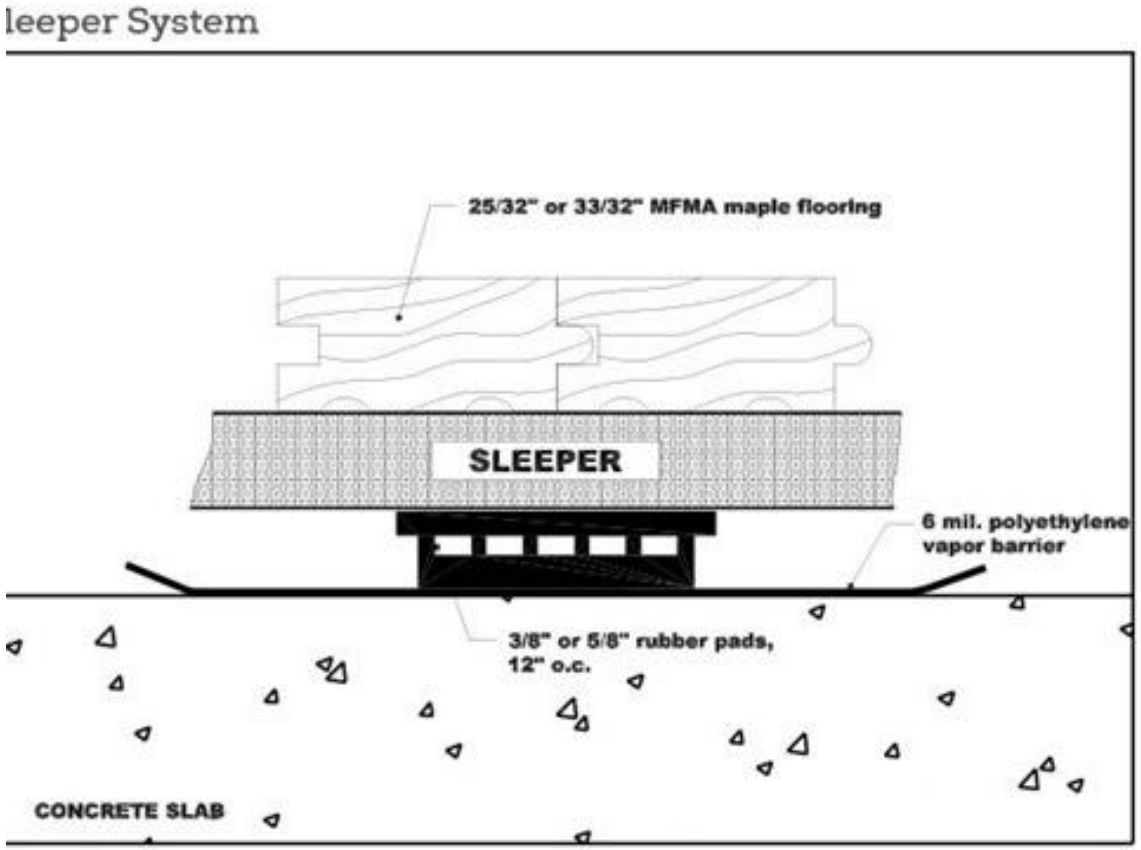
Double Plywood- Installation Procedures

On the bottom of the first layer of plywood panels attach 32 pads 12” (304mm) O.C. and 6” (152mm) from the edges.

Install the first layer of panels opposite direction or at a 45° angle to the maple flooring. Space all edges ¼” (6mm) breaking all joints 4’ (1.2m).

Install the second layer of plywood panels at a 45° angle. Space all edges ¼” (6mm) breaking all joints 4’ (1.2m). Nail or staple panels to each other 12” (304mm) O.C. and 6” from edges.

Sleeper System



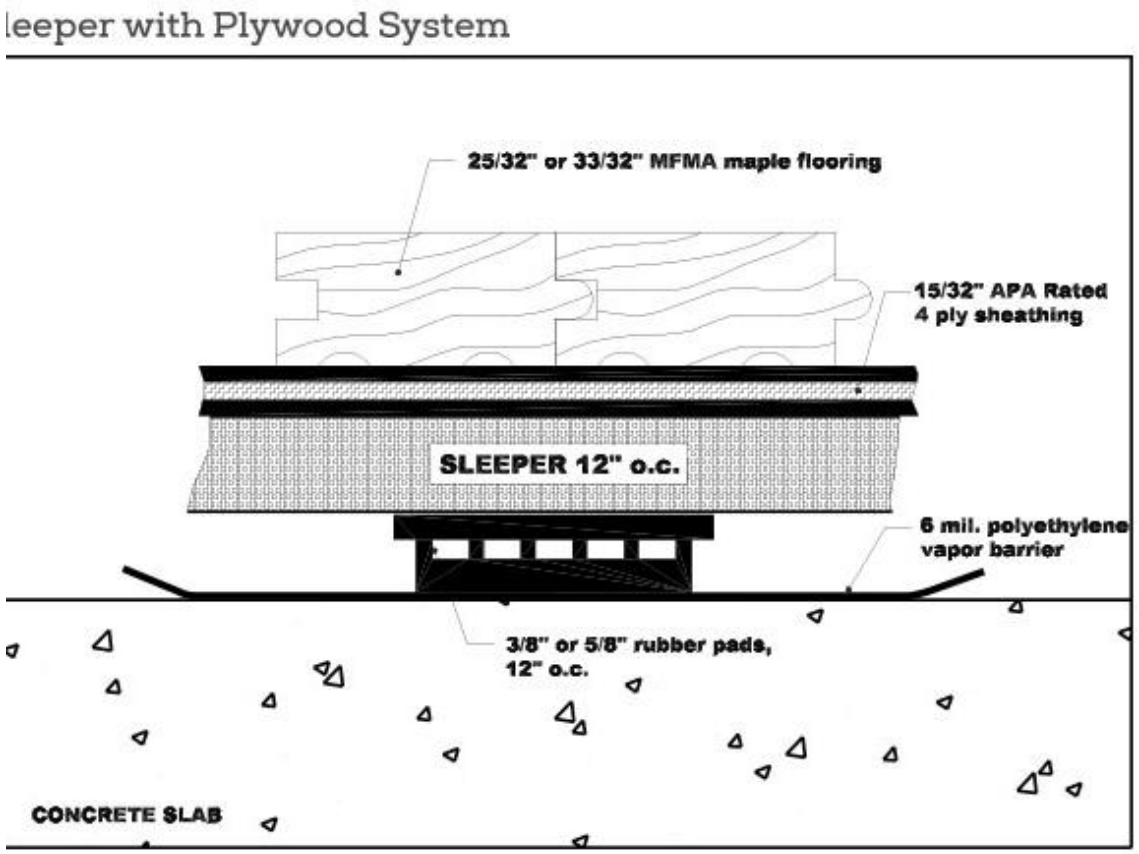
Sleeper System- Subfloor Material

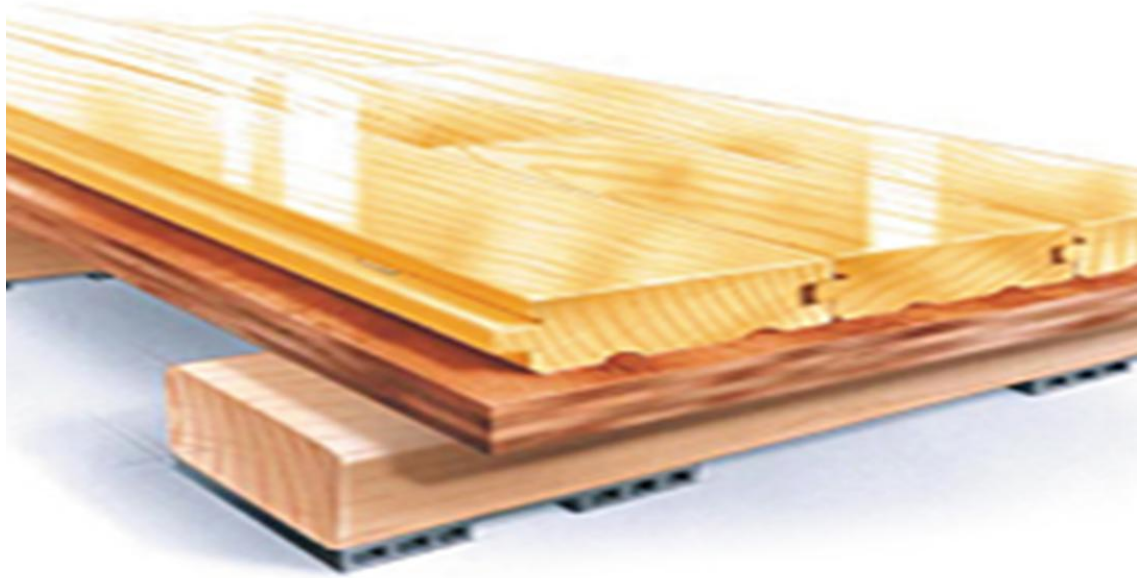
Cushioned Sleepers shall be 2" x 3" x 4' nominal KD Hemlock, Spruce, Pine or Fir with pads as supplied by your MFMA Maple Flooring Manufacturer.

Sleeper System- Installation Procedures

- Install SLEEPERS end to end at right angles to the direction of the playing floor, stagger ends at least 24” (608 mm)
- Your general fastening schedule will be dictated spacing of the sleepers outlined below
- Space sleepers
  - 12” (304mm) O.C. for 33/32” (26mm)
  - 9” (228mm) O.C. for 25/32” (20mm)
  - 8” (203mm) O.C. for Third and Third & Better grade flooring

Sleeper with Plywood System





Sleeper with Plywood System- Subfloor Material

Cushioned Sleepers shall be 2" x 3" x 4' nominal KD Hemlock, Spruce, Pine or Fir with pads as supplied by flooring manufacturer.

Plywood subfloor shall be 15/32" x 4' x 8' APA (or flooring manufacturer approved equivalent) Rated Sheathing, Exposure 1, minimum 4 ply or per MFMA flooring manufacturer design.

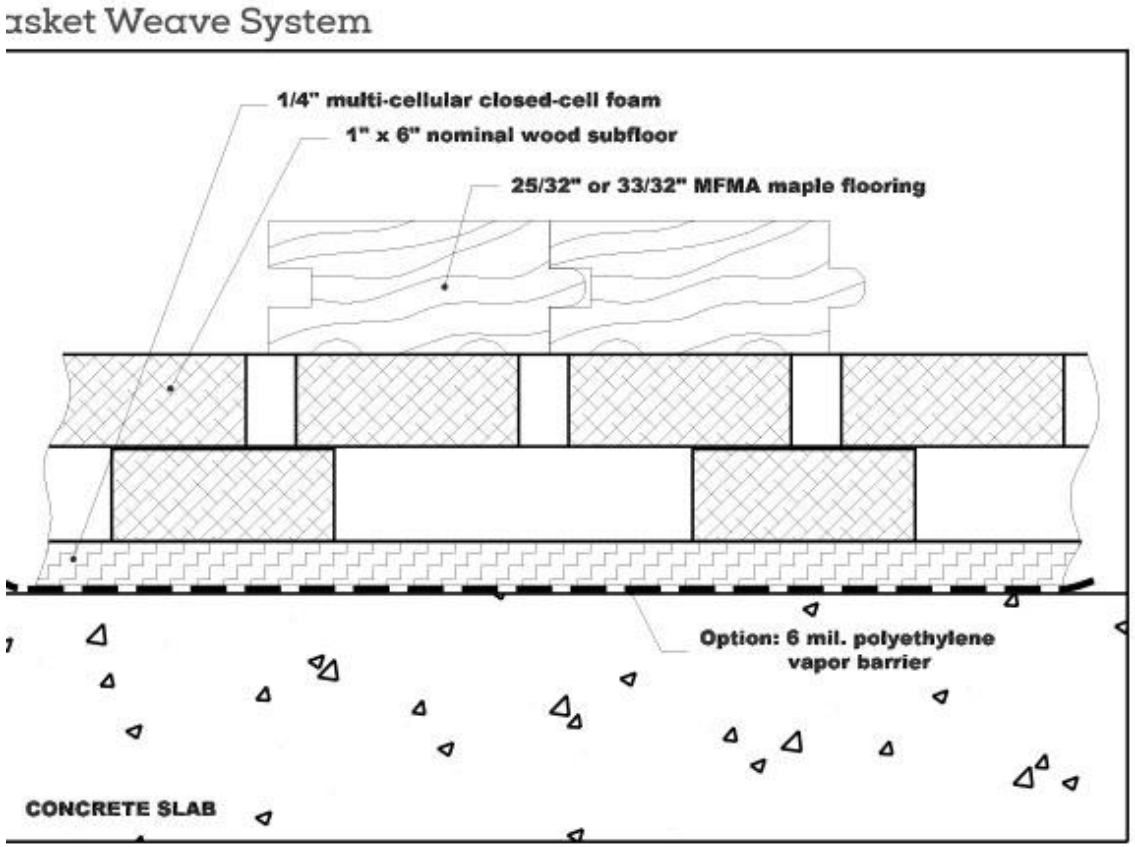
Sleeper with Plywood System- Installation Procedures

Install SLEEPERS end to end at right angles to the direction of the playing floor, stagger ends at least 24” (608mm)

Since there is a continuous layer of plywood, sleepers are spaced 12” (304mm) O.C.

Install the plywood sub floor at a 90 degree angle to the finished flooring. Space all edges ¼” (6mm) breaking all joints 4’(1.2m). Nail or staple panels to sleepers 12” (304mm) O.C.

Basket Weave System



Basket Weave System- Subfloor Materials

Wooden subfloor shall be 1" x 6" nominal KD Gym Grade Hemlock, Spruce, Pine or Fir, S2S or S4S as supplied by MFMA Maple Flooring Manufacturer.

Basket Weave System- Installation Procedures

Install the bottom layer of 1”(25mm) x 6”(152mm) subfloor diagonally to the long dimension of the room at a 25° angle or 45° angle

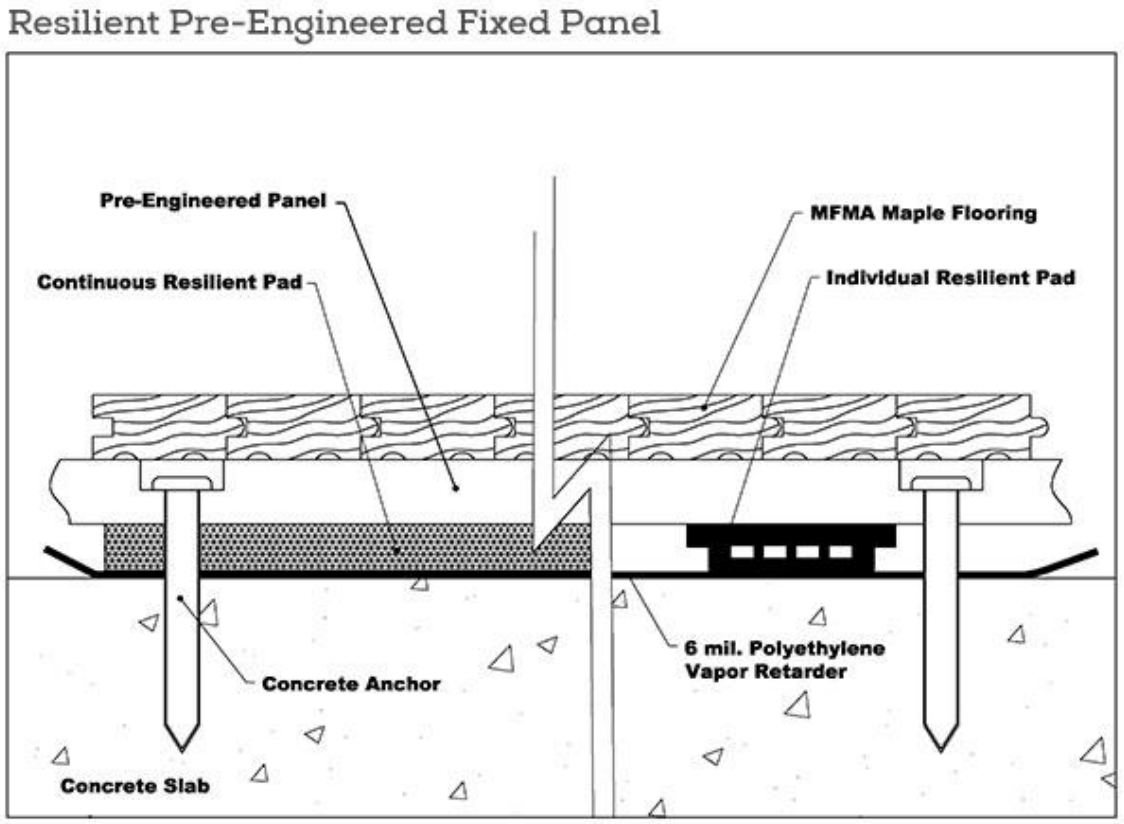
The subfloor shall be butted and spaced per manufacturers instructions

Install the top layer opposite to the first layer as above except the spacing side to side is 2” (50mm)

Anchored Resilient Athletic Floor Systems

- Resilient Pre-Engineered Fixed Panel System
- Resilient Fixed Plywood Sleeper with Continuous Subfloor System

Resilient Pre-Engineered Fixed Panel System



Resilient Pre-Engineered Fixed Panel System- Concrete Slab

- Concrete shall have NO washed river gravel, slag aggregates or radiant heating tubes
- Concrete strength shall be between 3000 PSI and 3500 PSI.
- No lightweight concrete
- Concrete Slab Depression will vary by manufacturer and subfloor system

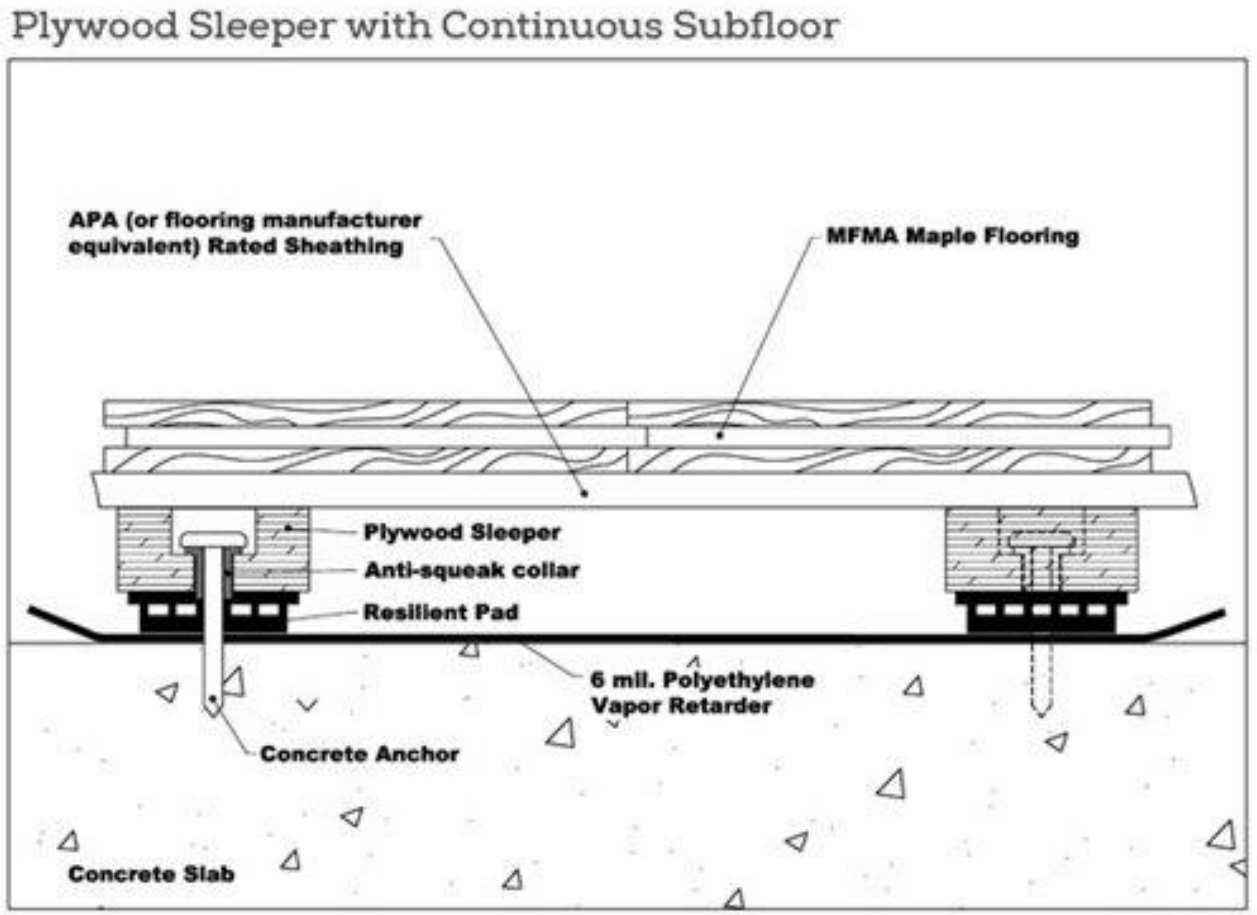
Resilient Pre-Engineered Fixed Panel System- Subfloor Material

- Cushioning shall be supplied and installed per manufacturer's instructions
- Subfloor anchoring system shall be per MFMA flooring manufacturer design
- The wooden subfloor shall be pre-engineered panels manufactured by and supplied by an MFMA flooring manufacturer

Resilient Pre-Engineered Fixed Panel System- Installation Procedures

- Install pre-engineered subfloor panels per MFMA manufacturer's instructions, perpendicular or diagonal to the finished flooring in a brick pattern
- Space subfloor panels according to MFMA flooring manufacturer's recommendation
- Install subfloor system using concrete anchors per maple flooring manufacturer's instructions

Resilient Fixed Plywood Sleeper with Continuous Subfloor System



Resilient Fixed Plywood Sleeper with Continuous Subfloor System-Concrete Slab

- Concrete shall have NO washed river gravel, slag aggregates or radiant heating tubes
- Concrete strength shall be between 3000 PSI and 3500 PSI
- No lightweight concrete
- Concrete Slab Depression will vary by manufacturer and subfloor system

Resilient Fixed Plywood Sleeper with Continuous Subfloor System- Subfloor Material

- Cushioning shall be supplied and installed per manufacturer's instructions
- Subfloor sleepers shall be factory-drilled engineered sleepers with resilient pads spaced per MFMA flooring manufacturers design
- Subfloor sleeper anchoring system shall be per MFMA manufacturer design
- Subfloor panels shall be 15/32" x 4' x 8' APA (or flooring manufacturer approved equivalent) Rated Sheathing, Exposure 1, minimum 4 ply or per MFMA flooring manufacturer design.

Resilient Fixed Plywood Sleeper with Continuous Subfloor System- Installation Procedures

- Install subfloor sleepers perpendicular to the finished flooring staggering joints, spacing subfloor panels according to manufacturer's recommendation
- Install subfloor system using concrete anchors per maple flooring manufacturer's instructions
- Attached subfloor panels to the sleepers using 1-1/4" (31mm) nails or staples 12" (304mm) O.C., spacing plywood ¼" (6mm) on all sides and edges, end joints staggered 4' (1.2m) and breaking on the sleepers

Section 7: Sanding, Sealing, Gamelines, and Finishing

This section will provide you with knowledge on sanding, sealing, game lines, and finishing.

Staining a Maple Floor

- The Maple Flooring Manufacturers Association defines staining as the act of changing the appearance of a maple floor through the application of dyes or chemicals. Stains are often used to outline details or highlight specific areas within maple sport floors and are commonly used for decorative and design purposes in commercial and residential applications.

- Due to the extremely tight cellular structure and variable grain patterns inherent in northern hard maple, stains may sometimes absorb minimally or unevenly resulting in a mottled appearance. MFMA recommends consulting with your stain manufacturer on products and proper application methods.

Sanding

- MFMA recommends a minimum of 3 cuts when sanding a maple floor
- MFMA recommends the use of Coarse, Medium and Fine grit sandpapers

Sanding Issues

- Stop Marks
  - In a very moderate form, are fairly common in new maple installations
- Chatter Marks
  - There can be a number of causes of chatter marks but the most common is from the use of drum or riding sanders on a maple surface with a degree of built-in "give“
  - Chatter marks are considered unacceptable if close-up inspection yields uneven or gouged areas
- Shiners
  - A low spot in the floor missed by the sander

Game Markings

- Apply game markings using paint compatible with the sealer and the finish
- MFMA recommends the use of a precision taping machine or striping tools
- When using masking tape pull the tape as soon as the paint begins to dry or set
- After the game markings have thoroughly dried, lightly abrade as recommended by the finish manufacturer

Game Markings Manual

- MFMA Game Markings Manual is now on the MFMA Website
- MFMA does not produce hard copies of the Game Markings Manual
- All Game Markings are directly from that sports governing association
- For example: According the NCAA the outside edge of the free throw lane should be 13’9” from the center of the basketball goal

Floor Sealer and Finish Application Procedures

- MFMA recommends that the sealer and finish applied be MFMA Approved and currently on the MFMA Finish List

- Most common types of floor sealers and finishes used in sports flooring applications
  - Oil based sealers
  - Oil based finishes
  - Water based sealers
  - Water based finishes

- Oil based sealers and finishes amber with age. Water based finishes do not amber.

- Multiple layers of sealers, finish and paint slow down the rate of vapor transfer.

Floor Finish

- MFMA recommends that the sealer and finish be applied per the finish manufacturer's instructions
- MFMA does NOT recommend the use of wood filler at the side joints of a maple strip. Wood filler may be used at the end joints of maple strips and to fill knot holes
- The use of disk sanders can occasionally cause swirl marks. Swirl marks are not damaging to the surface of a maple floor

Section 8: Maintenance

- This section will provide you with the knowledge needed to properly maintain your maple gymnasium floor.

MFMA's Six Steps for Proper Daily Maintenance

1. Sweep the floor daily
2. Wipe up spills
3. Make sure the heating/ventilating/air conditioning system is functioning properly
4. Remove heel marks
5. Inspect floor for tightening or shrinkage
6. Always protect the floor

Taking Care of Your MFMA Maple Sports Floor

- Wood is naturally porous and can absorb and release moisture. If the humidity in your facility rises, your wood floor will absorb that moisture, causing it to expand. If the humidity falls, your wood floor will release moisture, causing it to shrink.
- Many installations include expansion voids around the perimeter and around columns or floor inserts, plus expansion joints built into the floor surface. These features permit natural, normal expansion and contraction without damage to the floor. Too much moisture causes abnormal expansion which can lead to cupping or buckling of your floor. In abnormally dry conditions the wood will contract, leaving separations between flooring strips.

Six Steps For Proper Daily Maintenance:

1. **SWEEP THE FLOOR DAILY** with a properly treated dust mop. If the floor is used heavily, sweep it up to three times per day.
2. **WIPE UP SPILLS** and any moisture on the floor surface.
3. **MAKE SURE THE HEATING/VENTILATING/AIR CONDITIONING SYSTEM IS FUNCTIONING PROPERLY** and set to maintain indoor relative humidities between 35% and 50% year round. In areas of consistently high or low outside humidity, a 15% fluctuation will not adversely affect the maple.
4. **REMOVE HEEL MARKS** using an approved floor cleaner applied with a soft cloth or a dust mop. Contact your floor finish manufacturer for approved cleaning products.
5. **INSPECT FLOOR FOR TIGHTENING OR SHRINKAGE.** During wet weather, check for water leakage around doors and windows. Remove debris from expansion voids.
6. **ALWAYS PROTECT THE FLOOR** when moving heavy portable equipment or lifts. Ensure portable equipment does NOT have crowned wheels or wheels that include center ridges remaining from the molding process. These types of wheels can create very significant point loads.

Never Do the Following:

1. **NEVER** shut down the ventilation system in your facility for a prolonged period of time.
2. **NEVER** use household cleaning products or procedures. They can be harmful to the floor finish and to the wood and may also leave floors sticky or slippery, and potentially harmful to athletes. Your MFMA finish manufacturer will recommend the proper cleaning and maintenance materials for your MFMA sports floor.
3. **NEVER** clean your MFMA floor using scrubbing machinery or power scrubbers that use water. Water is your floor's worst enemy!
4. **NEVER** attempt to modify or repair your MFMA sports floor without first consulting your MFMA contractor.

DIRECT ALL QUESTIONS ABOUT YOUR MFMA MAPLE SPORTS FLOOR TO YOUR MFMA SPORT FLOOR CONTRACTOR:

Installation Company: _____

Phone Number: _____

MFMA The Sports Flooring Authority

Maple Flooring Manufacturers Association
+1-888-480-9138
maplefloor.org
mfma@maplefloor.org

What never to do to your MFMA Maple Athletic Floor

- NEVER shut down the ventilation system for a prolonged period of time
- NEVER use household cleaning products or procedures
- NEVER clean the floor using scrubbing machinery or power scrubbers that use water
- Never Roller Skate or Rollerblade on your Maple Athletic Floor, unless the facility was designed to be a roller rink.
  - These activities can shorten the life of the floor's finish
  - Roller skates and blades can damage the maple flooring during falls

Annual Maintenance

- Refinishing the floor
  - Facility use, abuse and maintenance will determine the appropriate refinishing schedule
  - Most gymnasium floors should be recoated annually
  - Screening the existing finish prepares it for a new coat of finish

Complete Resurfacing/Resanding

- MFMA recommends a maple floor be resurfaced/resanded every eight to ten years
- Resurfacing/resanding an older gym floor restores the luster
- When an older floor is resurfaced/resanded it is possible that the decrease in the layers of protective coating can lead to some expansion/contraction due to an increase in the vapor transmission rate

Complete Resurfacing/Resanding - Before

Complete Resurfacing/Resanding - After

Section 9: Call Backs

This section will provide knowledge on common call backs within the industry.

Common Call Backs

- Cupping
  - Cupping is caused by a moisture imbalance through the thickness of the maple -- moisture contents in each strip of flooring are higher at the bottom than on the surface.
- Crowning
  - Crowning is most likely caused by sanding a cupped floor before the maple has returned to a normal moisture content
- Finish Peeling
  - Finish peeling over painted areas (i.e. Solid painted basketball keys) of a maple floor often experience finish peeling when the floor is subjected to large swings in humidity levels
- Floor squeaks
  - Most floor squeaks are sometimes considered normal and part of the acclimatization period of the floor system, but some squeaks could indicate a problem with the subfloor
- Dead spots
  - Dead spots are locations where ball return is considerably less than in other areas of the floor.
  - Most people think sound variations heard when a basketball is bounced on the floor is an indication of a dead spot. Sound variation are not indication of a dead spot. Only lack of ball return indicates a dead spot.

Section 10: MFMA PUR Standards

The section will provide you with detailed knowledge of the MFMA PUR Standards.

MFMA PUR Standards- Introduction

- The MFMA PUR Standards were developed by the MFMA Technical Committee in Gurnee, Illinois.

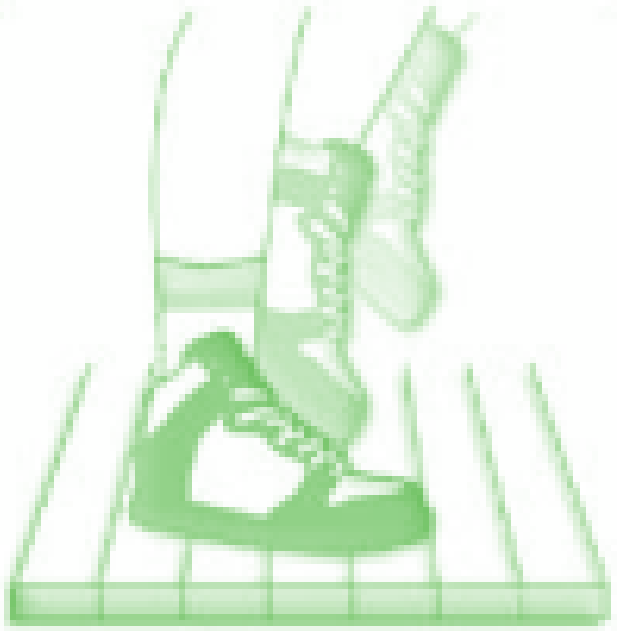
MFMA's PUR Standards focus on:

- Shock Absorption
- Vertical Deflection
- Area of Deflection
- Ball Bounce
- Surface Friction

MFMA PUR Standards

Individual Performance Characteristics

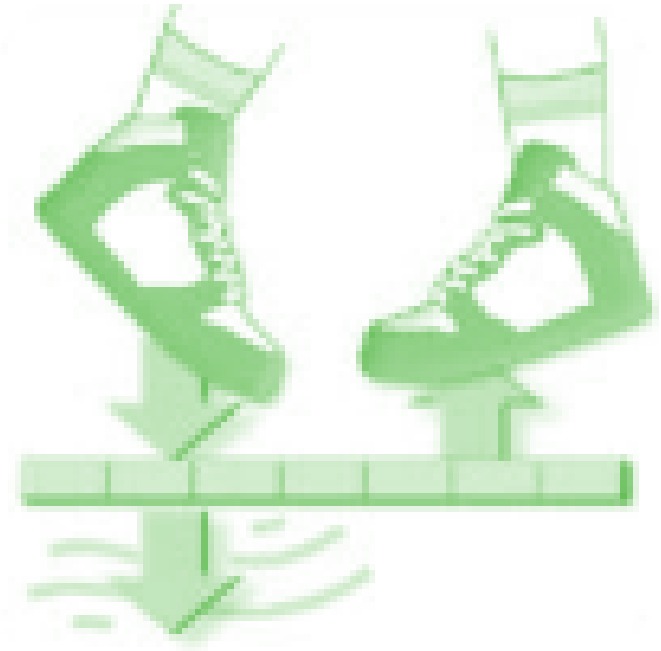
- Shock Absorption
  - Measures the flooring system's ability to absorb impact forces generated by the athlete.
  - As an athlete impacts a sports surface, the impacting force is translated into two resultant forces: one absorbed by the floor and the other absorbed by the athlete. While hard surfaces such as concrete and asphalt provide little or no force reduction for the athlete upon impact due to running, jumping or falling, MFMA sports floor systems absorb these impact forces (shock) and are rated by the percentage of force reduction they provide as compared to hard surfaces. In general, a sports floor with a force reduction value of 60% will absorb 60% of the impact force and the remaining 40% is absorbed by the athlete.



MFMA PUR Standards

Individual Performance Characteristics

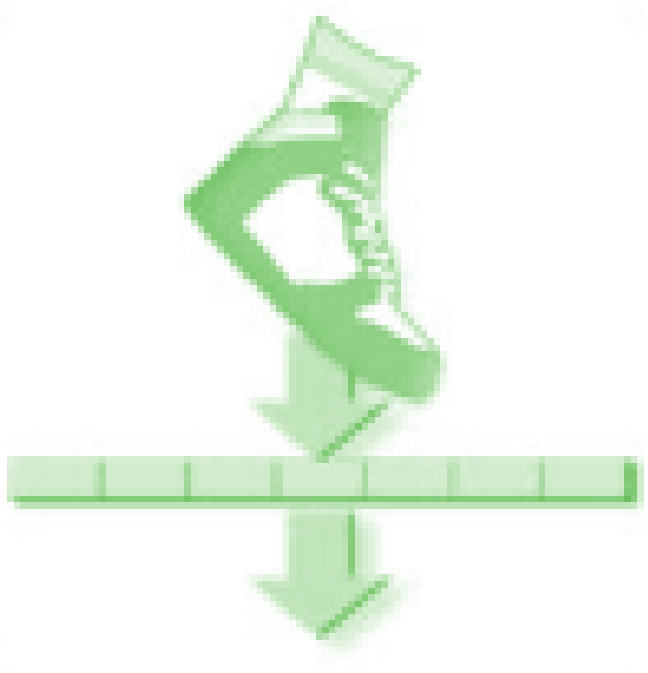
- Area of Deflection
  - Measures the floor system's ability to contain the deflected area under an athlete's impact, measured at 20" (500 mm) from the point of impact.
  - The area of deflection is a measurement of the surface of the floor that is deflected during impact. Area of deflection is based on the relationship between vertical deflection at the point of impact and the deflection at 20" (500 mm). A person jumping on a trampoline, for example, creates a very wide area of deflection. Someone jumping on sand creates a very limited area of deflection.



MFMA PUR Standards

Individual Performance Characteristics

- Vertical Deflection
  - Measures the floor system's downward movement during the impact of an athlete landing on the surface.
  - This characteristic is the measure of the floor system's ability to provide vertical displacement at the point of impact. For example, a person jumping on a concrete floor would result in zero vertical deflection, while that same person jumping on a trampoline would create a vertical deflection of many inches.



MFMA PUR Standards

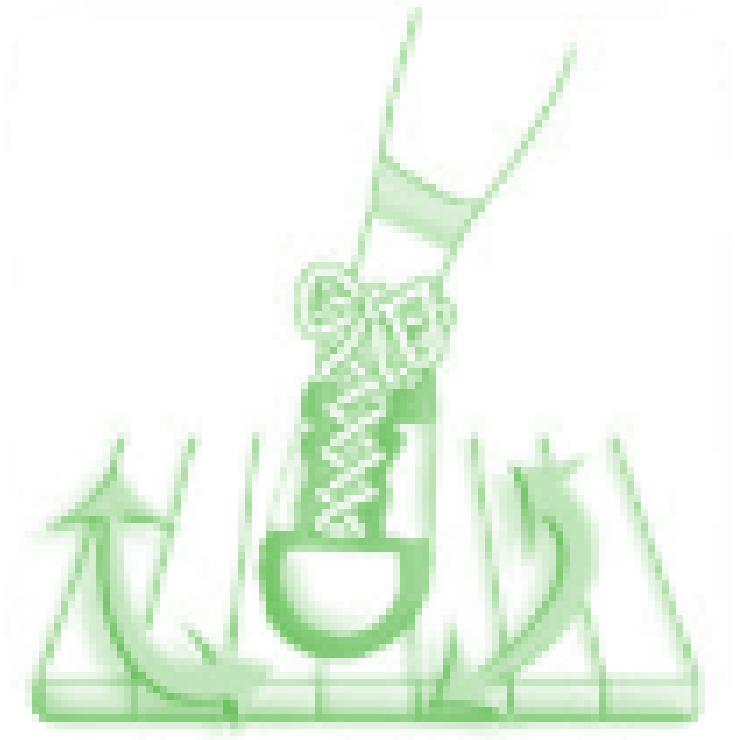
Individual Performance Characteristics

- Basketball Rebound
  - Measures the basketball's rebound response off the sports floor system as compared to the ball's rebound response off concrete.
  - At 100% rebound, the basketball returns to a height equal to its rebound off concrete. Obviously, ball bounce may not apply to all sports activities.

MFMA PUR Standards

Individual Performance Characteristics

- Surface Friction
  - Measures an athletic flooring finish's ability to control the sliding of athletes on a sports surface.
  - The surface friction must be low enough to permit sliding when a large amount of horizontal force is applied to the floor surface and high enough to prevent uncontrollable sliding.
  - Surface friction is a function of the specified floor finish.



MFMA PUR Standards
Performance Standards

Shock Absorption	50% minimum average	Shock absorption measures the ability of a system to reduce impact forces felt by the athlete.
Area of Deflection	20% maximum at all test points	Measures a floor systems ability to isolate movement of an athlete's impact.
Basketball Rebound	93% minimum average	Measures the basketball response off a floor system.
Vertical Deflection	2.3 mm minimum average	Measures a floor systems ability to yield under foot during game play activities.
Surface Friction	0.6 minimum	Measures the slip slide characteristics of a finished floor system.

MFMA PUR Standards
Uniformity Standards

Shock Absorption	+/- 5%	Uniformity of shock absorption provides consistent dissipation of force by the floor system assuring uniform reduction of impact forces encountered by athletes.
Area of Deflection	≤20%	Uniformity in Area of Deflection ensures the same isolation of movement from one athlete to another at all locations.
Basketball Rebound	+/- 3%	Requiring Basketball rebound consistency assures even ball return throughout the floor system.
Vertical Deflection	+/- 0.5 mm	Uniformity in Vertical Deflection assures player confidence in predictable response to an athlete's movement on the floor system.
Surface Friction	+/- 0.1	Uniformity of surface friction is vital to the safety of the athletes.

Conclusion

Thank you for taking the time to listen to this presentation. You are now ready to take the MFMA Accredited Installers exam.