6598 E Canton S Boston Rd | Salem, IN 47167 | USA
Document ID: GEN-007

Engineering Consulting | Product Research | Field Testing and Inspections
Phone: 812.528.2743 www.asetservices.com

GEN-007: Gaps in Hardwood Sport/Dance Floors

*Gaps in finished floors have always been a cause for concern for facility owners. This document was developed as an educational piece, and has been made freely available to the public. It discusses why gaps are present **and** necessary in hardwood sport and dance applications.* It explores when gaps may be excessive, and defines 4 common types of gaps present within these applications. It also explores how gap size and frequency can by minimizing the relative humidity swings experienced throughout the year. Lastly, it presents some examples using theoretical wood moisture and climate conditions.

Why are their gaps in my hardwood sport/dance floor? - Gaps are present because wood expands and contracts in response to the environment in the facility. Wood is a hydroscopic material, meaning it absorbs and releases moisture from/to its environment. Gaps within a large sport/dance installation are normal and necessary.

Why aren't there gaps in residential floors? - First, there probably are gaps in the hardwood floor in your house, but they tend to be small and harder to see. They may even simply be covered up with furniture and rugs. Here are some of the differences between residential and sport/dance applications:

- Residential areas are typically heated and cooled year-round and have smaller humidity swings than most sports facilities.
- Residential applications do frequently have gaps that form in the winter, but they are typically smaller due to tighter humidity controls within the home.
- Many residential species and stains are darker making gaps less visible than in an un-stained Maple floor.
- Expansion voids are rarely installed in residential applications because the rigidity of the substructure in a residential application is substantially greater than on today's bio-resilient sport surfaces. Also, we tend to live in our homes all year and rarely go even a few days without using the HVAC system, this typically provides better climate control. This is also due how much lager sport/dance installations are.

Can gaps be eliminated, or completely prevented? - Practically speaking, the answer is no. Maple has to be able to expand and contract in response to its environment. Theoretically, gaps could be eliminated by precisely maintaining the environment *at all times*, and installing the Maple at exactly the right moisture content. This would require virtually no chance of a failure in the HVAC system or electric service. It would also require precise 24/7/365 environmental control to prevent the moisture content of the wood from changing, especially getting higher. However, this is simply not possible, therefore installations must account for times of higher humidity that will cause expansion.

How big of a gap is too big? Gaps larger than 1/8" (3 mm) between traditional tongue and groove flooring compromise the strength of the system. This effect is worse on system that do not have a continuous subfloor.

© 2025 ASET Services, Inc.

What kinds of gaps are there? - ASET groups the gaps in hardwood floors into 4 broad categories. The first two, shrinkage gaps and expansion voids, are normal and are not indication of damage or a problem with the floor. The second two, 'Large' gaps, and 'crush' gaps are typically indicators of an error during installation, or that some degree of damage to the floor has occurred.

- Shrinkage gaps – these occur when the wood shrinks after it is installed. These gaps are frequent and relatively small (on the order of 1/32" or less), but larger gaps (1/16") may occur. Typically, shrinkage gaps occur during heating cycles in the winter, but floors can shrink even in the summer if they are installed with elevated moisture levels.
- Expansion voids – these voids are intentionally left during the installation when the wood is expected to expand in the future. They allow the system accommodate that expansion without compromising the performance or structural integrity of the system. Expansion voids are very visible, generally on the order of 0.1", and typically occur in a repeating pattern such as every 8, 10, 12, etc. flooring rows. While these gaps are larger and more visible than shrinkage gaps, they too are required for a long-lasting installation in many environments.
- Large gaps – These gaps exceed 1/8" and often represent a problem with the installation. It is common for these gaps to occur after the floor expands and then contracts. In ASET's experience these gaps are often the result of an improperly installed subfloor. Gaps this size and larger mean that less of the tongue and groove is interacting with each other, and that the strength of the system is significantly compromised. Large gaps can also present hazards to athletes and should be addressed immediately.
- 'Crush' gaps – A floor may expand enough that it 'crushes' or permanently deforms edges of flooring boards. This 'crushing,' or permanent deformation, forms gaps that will likely be present in all but the very highest moisture levels. Often 'crush' gaps never disappear. This type of gap often occurs after a severe water event such as a roof leak, or broken pipe. They are a sign that the floor has experienced some degree of permanent damage, and inspections may be warranted to determine the extent of the damage.

Why are gaps irregularly dispersed across the floor? - Sometimes flooring behaves in a predictable manner where boards freely expand and contract individually. This allows small relatively uniform gaps to form between all rows of the flooring. Often this predictability is altered by the nailing and finishing of the flooring. Modern finishes, especially water-based finishes, can bond adjacent flooring rows together causing something called 'panelization.' Panelization is a term used to describe when larger areas, of flooring act as a panel, or area, moving together rather than as individual boards. Due to the chemistry of modern finishes and new laws placing environmental limits on finishes, panelization is more common than it used to be. Panelization may cause a relatively small number of rows (up to 8 or so) to move together, but larger areas are possible. It may cause gaps to 'zig-zag' across the floor to some degree.

Can the size or frequency of expansion gaps be reduced? - Yes, but there are often trade-offs and costs. For example, the wood can be allowed more time to acclimate and expand prior to installation. This requires significantly more time during the installation period, but would allow for smaller and/or less frequent expansion voids. However, this will generally make shrinkage gaps slightly larger and more noticeable in the winter. Facilities with active humidity controls can reduce the size and frequency of expansion gaps. However, the

© 2025 ASET Services, Inc.

effects are minimal if the climate controls do not run 24/7/365. If there are large periods (such as summer break) when the controls are inactive the system must be installed to accommodate this environmental extreme.

What can facilities do to minimize shrinkage gaps and expansion voids? - First, the simple explanation is to maintain as tight of environmental controls as possible. That means limit the maximum and minimum relative humidity present in the facility. As an example, the MFMA recommends a humidity range of 35% to 50%, while the NWFA recommends a humidity range of 35% to 55%. The best method to accomplish this varies by geographic region. In many areas this involves dehumidification during the summer to minimize expansion. However, it some regions this involves humidification in the winter to minimize shrinkage. And there are certain areas where both dehumidification and humidification are required.

Specific Examples:

The calculations for these examples were made using the online *Equilibrium Moisture Content* and *Expansion* calculators in the Technical Blog at www.asetservices.com, or the equations can be found in the Wood Handbook: Wood as an Engineering Material. These examples are intended to help readers understand how different factors may require, or cause, gaps in their hardwood floors.

Example 1: Maple is installed at 7% moisture content. The facility complies with the MFMA environmental range of 35% to 50%. This example assumes all temperatures are 72 F. This represents an expected low moisture content of 6.9% and an expected high of 9.2%.

- This facility would expect virtually no shrinkage from the installation.
- The floor would be expected to expand 0.22” per 32 rows (for 2.25” wide flooring) and require a 0.09” expansion void every 15 rows. There may be valid reasons why an expansion row would be installed more frequently even under these conditions.

Example 2: Keeping the wood installation moisture at 7%, let’s assume that the environment reaches 77 F/ 65% during the summer because the HVAC is turned off. This is extremely common. The maximum wood moisture is now expected to be 11.8%.

- For a 7% to 11.8% swing there would be an estimated 0.43” of expansion for 32 rows of 2.25” flooring, and a 0.09” expansion void would need to be installed every 7 rows.

Example 3: Consider an installation in a drier region. Wood is installed at 6% moisture. There is an expected high relative humidity of 35% over an extended period, and an expected low humidity of 20% over extended periods.

- This floor would be expected to have an expected high moisture of 6.9%. It would be expected to only expand 0.08” per 32 rows, and have a suggested expansion row frequency of every 32 rows of 2.25” flooring. This floor would often be nailed without expansion voids, because shrinkage gaps are a larger concern and are present through more of the year.
- This floor would have an expected low moisture content of 4.5%. It would be expected to shrink 0.135” per 32 flooring rows (2.25” wide), or 0.004” per row. Distribution may be uneven due to nailing and finish adhesion, and shrinkage gaps could typically range anywhere from 0.004” to 0.06”.

© 2025 ASET Services, Inc.

Summary:

The biological and hydroscopic nature of Maple, and all woods, means that they will respond to moisture changes in the environment. When this response is combined with the sheer size and performance characteristics of sport and dance floors, it is impossible to eliminate gaps from hardwood sport/dance floors for all environments throughout a year.

Expansion voids are commonly needed to allow the overall system to accommodate expansion during wetter periods without compromising the performance or structural integrity of the system.

Installation and HVAC control system choices can be made which minimize the size and appearance of shrinkage gaps, and which minimize the need for expansion voids. There may be trade-offs which affect the opposite property (expansion or contraction) where the benefit was gained.

ASET defines gaps larger than 1/8" as "large" gaps. Large gaps significantly reduce the strength of the system when they occur. The reduction in strength is more significant on systems without continuous subfloors. Large gaps, especially those that do not close back up, often indicate that deeper structural problems exist within the system. Large gaps often pose injury hazards to athletes and performers in the form of splinters, and even laceration potential. Large gaps should be addressed immediately for the safety of the users. 'Crush' gaps result from high levels of humidity and dampness and indicate that some degree of permanent damage has occurred.

References:

1. Cross-Tech Maple EMC Calculator – this tool provides estimates of the Equilibrium Moisture Content of Maple for a given set of environmental conditions. https://asetservices.com/maple-equilibrium-moisture-content-calculator/
2. Cross-Tech Expansion and Contraction Calculator – this tool provides estimates for the expansion and contraction of Maple Flooring based on the given moisture levels, and flooring width. It also estimates the frequency of expansion rows based on their installed width. https://asetservices.com/expected-expansion-contraction-of-maple-due-to-environment/
3. Wood Handbook: Wood as an Engineering Material, 2021, USDA. https://www.fpl.fs.usda.gov.

This document was authored by Paul W Elliott, PhD, PE, owner and President of ASET Services. Dr Elliott has worked in the design, manufacturer, research and testing of sport surfaces for more than 30 years.

Contact ASET to discuss your project, or to request a formal proposal for service.

Phone: 1.812.528.2743
e-mail: info@asetservices.com,
web: www.asetservices.com.

Gaps In Hardwood Sport/Dance Floors © 2025 by ASET Services, Inc. is licensed under Creative Commons Attribution-NoDerivatives 4.0 International .