How hygienic are the seams in your seamless floor?

Forbo Flooring Systems set out to test the premise that Marmoleum sheet flooring with conventional fit seams (not heat or chemically welded) provides equivalent or better hygienic performance than that of homogenous sheet vinyl flooring with heat welded seams with respect to the continued viability of bacteria on flooring in a healthcare setting.

Today homogenous sheet vinyl is installed with heat welded seams in many hospitals and clinics in North America. Vinyl manufacturers recommend heat welding of sheet vinyl for high traffic locations, floors subjected to heavy rolling loads, for healthcare installations, or areas that have sanitary requirements, and for floors exposed to excess moisture. The process of heat welding linoleum was not introduced until the late 1980's and early 1990's as a preventative measure against topical moisture with the initial introduction of water-based (100% solvent free) adhesives. Due to the developments and advancements made over the last decades with the combination of Marmoleum® TopShield™ (Forbo's factory finish for Marmoleum®) and improvements in Forbo's water-based adhesives in respect to both topical water exposures and concrete moisture vapor emissions, heat welding Marmoleum is no longer necessary when used installed with Forbo adhesives.

Forbo contracted with an independent testing authority to do a laboratory bench-scale empirical investigation. The purpose of this project was to compare flooring seam types for measurable differences in the persistence and growth of two Risk Group II, medically-relevant bacterial species, C. difficile and MRSA. The hypothesis was that there would be no difference in the survival of these two bacteria on Marmoleum sheet flooring installed with conventional fit seams as compared to a homogenous sheet vinyl installed with heat welded seams.

The influence of other factors on bacterial survival were also investigated, and included the quality of the flooring seams, the age of the flooring, and whether the flooring was decontaminated following a standard protocol typically implemented in hospitals.

Table 1. Test Variables

Flooring Composition	• Forbo's Marmoleum sheet flooring installed with conventional fit seams • Industry Standard homogeneous vinyl flooring installed with heat welded seams
Seam Quality	• Perfect (no imperfections in seam) • Industry Average (some imperfections in seam)
Simulated Ages Tested	• New (no aging) • Simulated 6-month old product
Decontamination Treatment	• No decontamination after spiking • Decontamination with typical hospital-grade floor disinfectant

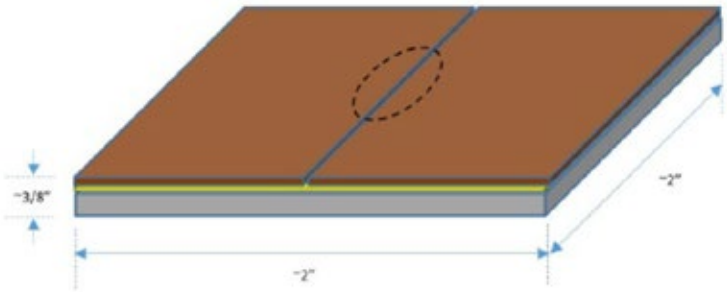


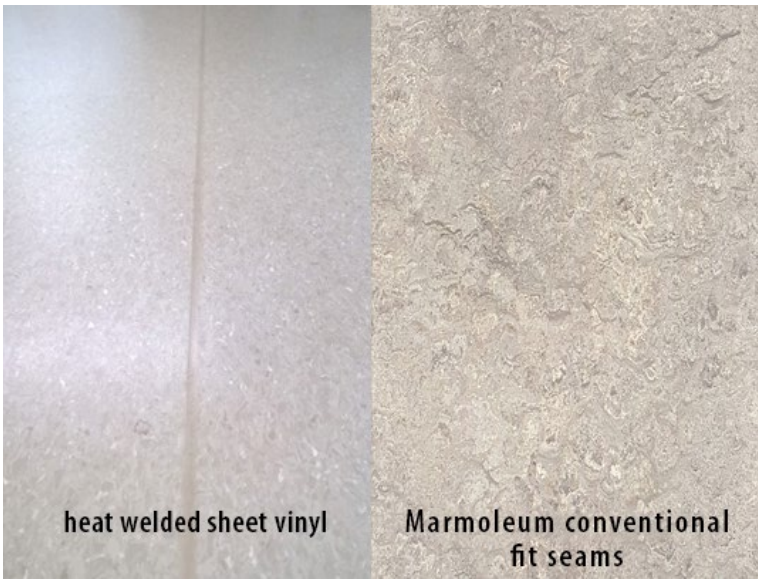
Figure 2. Approximate Coupon Dimensions and Structure for Each Tile Type (Backer board is shown in gray, adhesive in yellow, and tile segments in brown. The area shown as a dotted circle was the target location for inoculation of the two bacteria.)

Flooring coupons were spiked, incubated, and decontaminated in a single day and analyses were completed the following day so as to mimic actual use. C. di cile and MRSA strains were acquired from the American Type Culture Collection (e.g., ATCC BAA-1803 and BA-2094, respectively), propagated per ATCC recommendations, and used to generate spiking stock solutions.

Summary

In summary, more viable C. difficile was found, and MRSA was found more often, on homogeneous vinyl flooring with heat welded seams as compared to Marmoleum sheet flooring with conventional fit seams

- 4.4 times more viable C. difficile was found on homogeneous sheet vinyl flooring installed with welded seams as compared to Marmoleum sheet flooring with conventional fit seams
- 3.8 times more viable C. difficile was found on homogeneous sheet vinyl flooring installed with perfect heat welded seams as compared to industry average seams
- C. difficile was found to be less viable on flooring Marmoleum installed in real-world conditions with imperfect seams (and therefore doesn't rely on perfect installation to be effective).
- Closer inspection of the interaction between flooring and seam quality reveals that the least amount of C. difficile was found on Marmoleum with industry average seams, followed by Marmoleum with perfect seams, homogenous sheet vinyl with industry average seams, and homogenous sheet vinyl with perfect seams.
- MRSA was found more often on the homogeneous sheet vinyl installed with heat welded seams than on Marmoleum sheet flooring installed with conventional fit seams after similarly accounting for seam quality, age, and the effect of decontamination
- Decontamination was found to completely inactivate MRSA
- Decontamination was more effective at removing MRSA as compared to C. difficile consistent with differences between the bacteria.



The hypothesis investigated was that there would be no difference in the survival of the two bacteria on Marmoleum sheet flooring installed with conventional fit seams as compared to a homogenous sheet vinyl installed with heat welded seams. Forbo Flooring's Marmoleum sheet flooring installed with conventional fit seams performed better than the anticipated results.

Benefits of eliminating heat welding are:

- Reduced overall installed cost
- Improved aesthetics with no weld lines to disrupt the visual and accent the seams
- Improved environmental performance with substantial reduction in CO2 footprint by eliminating the use of a high wattage heat gun for installation of weld rods.
- Improved Indoor Environmental Quality for Installers/building occupants by elimination of emissions of melting PVC based welding rods during installation

Forbo Marmoleum provides a better looking, more cost effective, and more hygienic solution to traditional heat-welded sheet vinyl.

FLOORING SYSTEMS

For more information please contact your Forbo representative.