Zukunft Bau

Summary

Title

Full title: „Applikation eines Raumschleusen-Systems zur Abtrennung bei Schimmelpilzarbeiten“ –”Application of an air lock system for partition in mould damage refurbishment“

Motive / Initial situation

During refurbishment of extensive mould damage a separation of a contaminated working area (black zone) from an un-contaminated area (white zone) is required. Particularly promising in sense of protection of personnel and adjacent rooms from contamination seem modular air lock systems. For comparison and optimization purposes different partition systems have been investigated.

Object of the research project

Within the present research project different air lock and passage systems for site partition required during refurbishment of mould damages have been investigated and assessed. Particular emphasis was put on security and efficiency of the investigated systems and on possibilities or indications for optimization.
Results from the initially conducted research of the current state of the art showed that the presently used systems may be arranged into three groups: site manufactured plastic foil partitions, prefabricated partitions and double door systems of different complexity, and modular air lock systems with the additional possibility to attach an exhaust.
Relevant standards, guidelines and studies dealing with the fundamental requirements for partitions and their needs for application were assessed in a broadly based internet and literature research. Recommendations depend on the risk assessment and the spatial extension of mould damage. In medium and big mould damages the refurbished area generally has to be separated and adjacent rooms must be protected against contamination. The protective effect and the efficiency of selected standard systems were assessed in a measuring program.
A plastic foil partition, two prefabricated double door systems, and a modular air lock system with incorporated exhaust were chosen as representative systems. An adjusted setup, comprising of two rooms identical in construction, allowed the simultaneous investigation of two different partitioning systems at a time. After each measurement and at the end of the complete campaign the whole setup was cleaned and sterilized. For microbiological testing model germs were chosen, which were appropriate to simulate a typical air germ load during refurbishment according to their ecology and their „spore flight characteristics“ but which did not expose personnel to an unnecessary high sanitary risk. Prior to the actual test runs the setup was checked according to its functionality and stability. The temporal sequence of the trials was synchronized with the requirements of the analytic laboratory. In compliance with security guidelines mould damage was simulated and the air germ concentration measured at different locations of the investigated systems, using agitated spores of previously cultured reference fungi. Also the background concentration of the test rooms was assessed. Relative air humidity and air temperature were recorded at the beginning of the measurements and randomly during the measurements at different reading points in order to ensure constant conditions. For the assessment of the microbial contamination standard measuring systems utilizing the filtration principle were chosen according to VDI 4300-10 and DIN EN ISO 16000-17. Overall 156 individual measurements of the air germ concentration were conducted in the ready for use setup. The captured spores were incubated on selective media and from the count of the grown colonies the air spore concentration at the different reading points and measured times was calculated. The different partitioning systems were compared on the basis of the assessed spore concentrations. Thus important data for the assessment of the efficiency of the different partitioning and air lock systems were gained.
Eventually the investigated systems were compared, taken as a whole and according to their ability to prevent the contamination of adjacent rooms. The investigations reveal considerable differences between the different systems regarding their efficiency to reduce the spread of spore contamination. As far as possible suggestions for improvement and advice for the application of partitions and double doors utilized in course of the refurbishment of mould damages in general and for the use of modular air locks in special were determined.

Result

The efficiency of double door systems, air locks and partition systems for refurbishment of mould damages has been investigated. In doing so a particular emphasis was put on several properties: hygienic security of application, ergonomic traits and sustainability. Plastic foil partitions and prefabricated double door systems offer working alternatives in cases where no extensive mould damage is involved. In terms of handling, protective effect and sustainability air lock systems with attached exhaust show explicit advantages if extensive mould damages and complex cross section are involved. In all systems the correct application is mandatory; therefore a prior instruction is useful.

Key features

Acronym: Anti Schimmel Schleuse
Researcher / Project management: Dr. Wolfgang Karl Hofbauer, Fraunhofer Institute for Building Physics IBP
Overall costs: 70.207,66 €
Federal government grant: 45.207,66 €
Project term: 12 months

FIGURES:

Figure 1: Total experimental setup with view at the anterooms; behind the test rooms with different partitions / double doors can be recognized on the right hand side.

Figure 2: View through the anteroom of the setup at a prefabricated partition with zip.

Figure 3: Example for a modular air lock system (Fa. HS Schwengels, with kind permission), exhaust not yet attached.

Figure 4: Ventilation system together with sporulating fungal cultures in a test room.

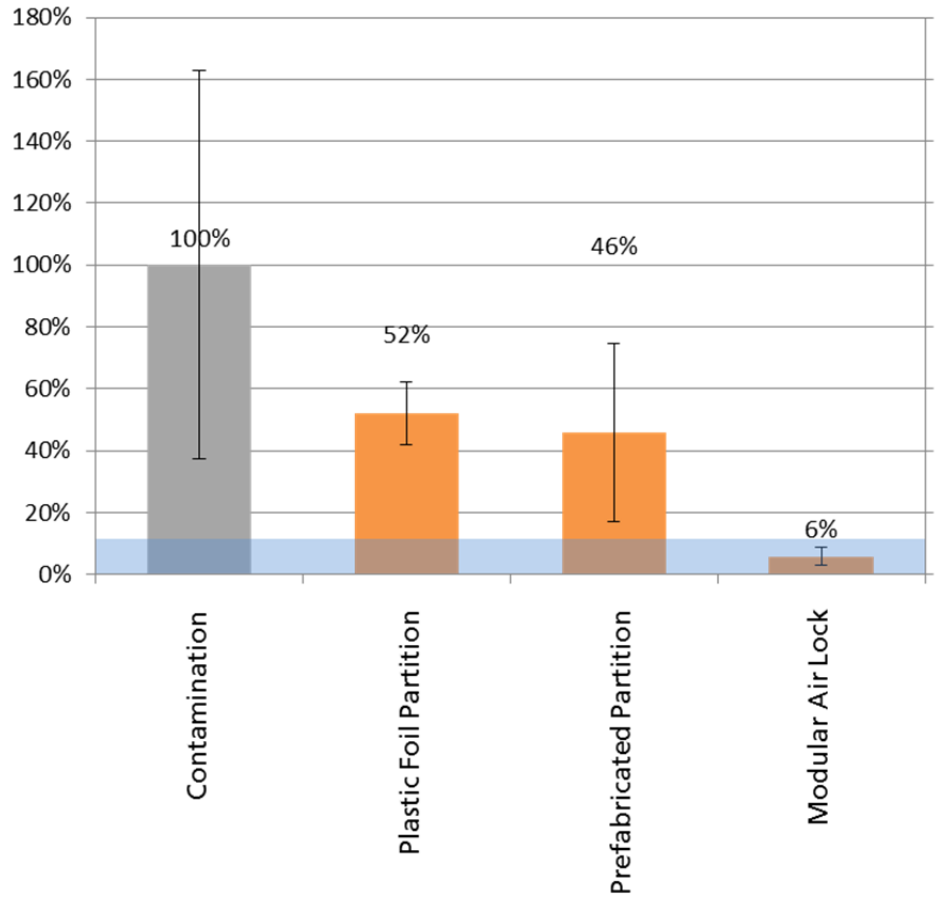

Figure 5: Comparison of the concentration of mould spores measured with the different partitioning systems, ordered according to the contamination in the black zone (= 100 %). Blue coloured area: average background concentration. Black bars: standard deviation.