

IBP-REPORT

562 E

46 (2019) NEW RESEARCH RESULTS IN BRIEF

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This project was funded by the Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) – Research code: SWD-10.08.18.7-16.22.

Literature

[1] Umweltbundesamt, Innenraumlufthygiene-Kommission des Umweltbundesamtes: Leitfaden zur Vorbeugung, Erfassung und Sanierung von Schimmelbefall in Gebäuden, 2017 Dessau-Roßlau.

[2] VDI 4300 Blatt 10: Messen von Innenraumluftverunreinigungen – Messstrategien zum Nachweis von Schimmelpilzen im Innenraum.

[3] DIN EN ISO 16000-7:2007-11: Innenraumluftverunreinigungen – Teil 7: Probenahmestrategie zur Bestimmung luftgetragener Asbestfaserkonzentrationen.

[4] Research report available under: <https://www.baufachinformation.de/applikation-eines-raumschleusen-systems-zur-abtrennung-bei-schimmelpilzarbeiten/fb/251847>

APPLICATIONS FOR PARTITION IN MOULD DAMAGE REFURBISHMENT

BACKGROUND

The Indoor Air Hygiene Commission of the Umweltbundesamt demands a separation of contaminated from not contaminated work areas during mould damage refurbishment. 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.

AIM

In order to compare and rate different air lock and passage systems for site partition required during refurbishment of mould damages the security and performance of various saleable systems was investigated. Possibilities for further improvement and optimization were highlighted.

An assessment 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. Recommenda-

tions 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 [1].

An adjusted setup, assembled in cooperation with the project partner, comprising of two rooms identical in construction, allowed the simultaneous investigation of two different partitioning systems at a time. 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 (table 1).

Table 1: Fungal taxa, chosen for the trials

Fungal species	Characteristics
<i>Eurotium rubrum</i>	Abundant in connection to drying water damages, <i>Aspergillus</i> -type spores
<i>Penicillium roquefortii</i>	A strain used in food production; morphologically representing frequent <i>Penicillium</i> -species
<i>Cladosporium cladosporioides</i>	Very abundant air germ, spores more complex than <i>Aspergillus</i> / <i>Penicillium</i>



After each measurement and at the end of the complete campaign the whole setup was sanitized. A plastic foil partition, two prefabricated double door systems, and a modular air lock system with incorporated exhaust were chosen as representative systems.

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. Additionally 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 [2] and DIN EN ISO 16000-17 [3]. 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.

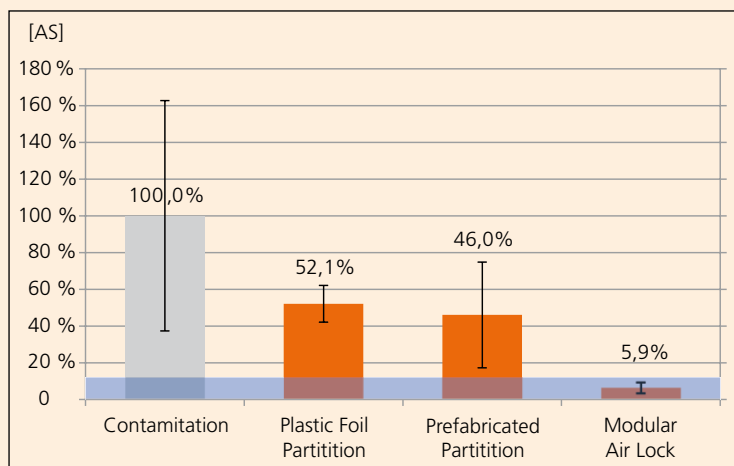
Eventually the investigated systems were compared, taken as a whole and according to their ability to prevent the contamination of adjacent rooms. The investigations reveal considerable differences between the different systems regarding their efficiency to reduce the spread of spore contamination. As 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.

CONCLUSION

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; they cannot absolutely prevent a spore contamination (diagram 1). 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.

In modular air lock systems the utilization of a measuring device displaying low pressure would comprise a recommendable enhancement. This was already achieved by the mounting of a manometer with a LED display [4].

Diagram 1: Comparison of the concentration of mould spores in the locked zone.



Different partitioning systems, ordered according to the contamination in the black zone (= 100 %).
Blue colored area: average background concentration.;
Black bars: standard deviation.

1 Example for a modular air lock system (Company HS Schwengels, with kind permission), exhaust not yet attached.

2 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.