

## Abstract

Ventilation ducts made of polymer materials (HD-PE, PP, EPP) are typically used in mechanical ventilation of domestic spaces. The present research project investigated five ventilation ducts and one sealing tape in terms of their emission of volatile organic compound (VOCs). Since no procedures have been specified for emissions testing performed on members of this product group, test chamber investigations were performed in accordance with the AgBB (German Committee for Health-Related Evaluation of Building Products) scheme and with DIN EN 16516. In addition, thermal extraction tests were performed in a micro-chamber. Emission evaluation in accordance with the AgBB scheme required assumptions regarding the duct lengths through which fresh air was introduced into the reference room. In the investigations performed it was assumed that a) the overall air input to the reference room, at an air exchange rate of  $0.5 \text{ h}^{-1}$ , took place through a ventilation duct and b) this air input duct had a length of 7 m.

Two of the air distribution pipes featured a coating on their inside surface. These pipes were installed in the test chamber in such a way that the VOC emissions could be measured separately at the inner and outer surfaces of the pipes. The investigation period was extended to 84 days for one product in order to evaluate the long-term behavior of the VOC emissions. All six products investigated in the test chamber tests exhibited very low emission levels that allow unrestricted use in interior rooms in the case of an evaluation according to the AgBB scheme.

A length-specific load factor of  $0.23 \text{ m} \cdot \text{m}^{-3}$  is recommended for emissions testing for ventilation ducts. Depending on the diameter, with a smooth pipe and considering only one pipe surface (either the inner or outer surface) the following load factors result:

Load factor	Length reference without consideration of the diameter
	$0.23 \text{ m} \cdot \text{m}^{-3}$
	Surface reference, only one smooth surface considered
	DN 75 $0.06 \text{ m}^2 \text{ m}^{-3}$
	DN 125 $0.1 \text{ m}^2 \text{ m}^{-3}$
	DN 160 $0.12 \text{ m}^2 \text{ m}^{-3}$

Adoption of the specification from DIN EN 16516 for very small surface areas with a load factor of  $0.007 \text{ m}^2 \cdot \text{m}^{-3}$  is recommended for sealing tapes. These two methods can be recommended to the responsible product TC for the formulation of a harmonized product standard.

Ventilation valves or air outlet valves as well as air distributors can only be tested as a whole when they are composed of combinations of materials. Because of the freely emitting surface and the fact that a maximum of 2 ventilation valves (air intake and air exhaust) can be installed in the reference room, a calculated air exchange rate of  $7.5 \text{ m}^3 \cdot \text{h}^{-1}$  per valve results. Air distributors cannot be directly allocated to a room. Definitions for testing these system components should be made by the responsible product TC in coordination with the regulators.

Active system components (heat exchangers, heating coils and ventilation equipment) were not investigated as a part of the present research project. These elements should be investigated in a subsequent investigation program in terms of their VOC emissions while operating. Based on the results, a decision can then be made as to whether or not evidence of the emission behavior of these system components must be required.