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Adhesion and Cohesion Testing of Joint Sealants after Artificial Weathering – New Test Method

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Abstract

The use of construction sealants is an important area not just of the building construction. Each building requires a careful processing of all details and façades are no exception. From today´s point of view we may note that sealing of façade joints and different types of cracks, fissures or gaps is nothing unusual and, therefore, it is astonishing that there still occur defects that often cause a significant decrease of the durability of the structures and sealed structures. This paper deals with testing of a selected group of construction sealants at a so-called '*real joint*'. The real joint is a term defining a set of testing samples when the testing body contains a sealant applied in a manner corresponding to its real application. Cement bonded particleboard board was representing the façade cladding in this research since during the sealing there often occur complications with adhesion of sealants. For the presented experiment the existing testing methods that are used for verification of adhesion of cladding materials were studied and modified. According to the opinion of the authors those modified methods simulate well the parameters of the external environment and thus also the negative influences that may have a significant impact on the sealed joint in practice. The measured results prove that in the application of the sealants it is very important to follow the technology discipline and namely it is necessary upfront to verify whether the chosen materials are compatible. In most tested cases, diversion from the above-given steps resulted in failure of the sealed joint.

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1. Introduction

The use of construction sealants is an important area not only of the building construction. No matter whether it is a building or a road, each structure requires a careful processing of all details and façades, that are the main focus of the presented research case, are no exception [1, 2]. From the present perspective, we may note that sealing of façade joints, gaps or cracks is nothing unusual [3 - 6] and therefore it is surprising that there still occur defects that often cause significant decrease in the durability of the structures as well as of joined parts of structures.

According to the opinion of the authors, existing testing procedures intended for testing of bonded and sealed joints do not fully reflect the abrupt weather changes exterior surfaces are subject to [7 - 10], moreover, they also often prescribe unsuitable geometry of the testing samples [11, 12]. The aim of the authors was to create a testing sample of such a shape that would correspond as much as possible to the real implementation of the sealed joint and subsequently to put it through tests that would verify the impact of the external environment on its rheological and mechanical properties [13, 14].

Based on previous experiences [15, 16] a unique geometry of testing sample was created for this purpose allowing the testing of a so-called '*real joint*'. The real joint is a term which, according to the opinion of the authors, suitably reflects the applied geometry of testing samples as well as the procedure of their assembling. This is a sealed joint when the sealant or any other filling material is applied in a way corresponding to the real application, as can be seen in Fig. 1.

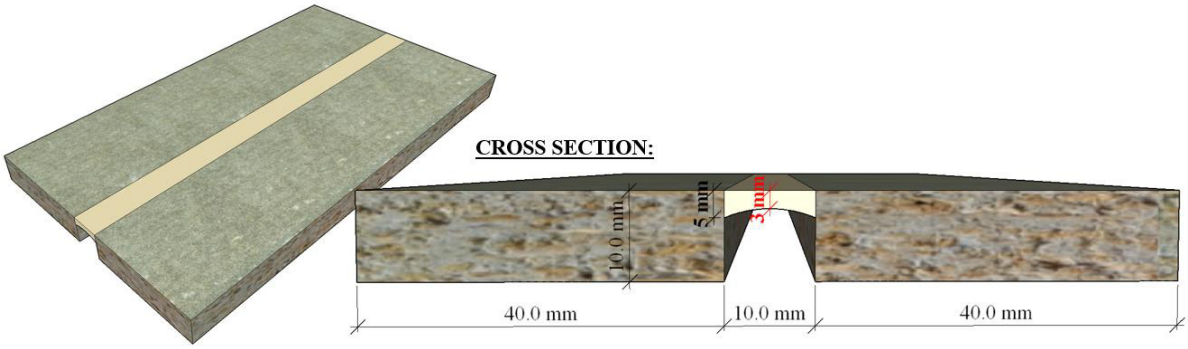

Fig. 1. Real joint design.

Since this is an entirely unique testing of the bonded joint it was necessary to create new testing equipment allowing the measuring of deformations at the maintained extension. For this purpose, testing molds were produced allowing to maintain constant extension for an arbitrarily long time. Further, it was necessary to take into account dimensional changes of the joint due to the changing temperature and the joint movement (i.e. extension or compression) and therefore, two different testing molds were designed allowing the verification of the bonded joint under different conditions at normal (i.e. tensile) and shear stress.

2. Experimental

The presented work comprised two parts. First, the maximum elongation of the tested sealants at break was evaluated by extension test. Second, the failure mode that appeared during testing was observed to express the compatibility of tested materials.

2.1. Materials

Currently, an inexhaustible quantity of materials is available on the market allowing to join, fill in and seal joints. Materials are suitable both for bonding in the interior as well as in the exterior. The selection of material for this test was based on an already completed project which was also dealing with the issue of bonded cladding of ventilated