Science and Technology of Building Seals, Sealants, Glazing, and Waterproofing

SECOND VOLUME

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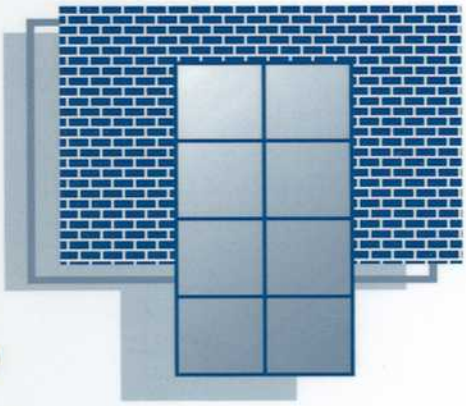
EDITOR



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Peer Review Policy

Each paper published in this volume was evaluated by three peer reviewers. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

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Foreword

This publication, *Science and Technology of Building Seals, Sealants, Glazing, and Waterproofing: Second Volume*, contains papers presented at the symposium of the same name, held in Ft. Lauderdale, FL on 5–6 Feb., 1992. The symposium was sponsored by ASTM Committee D-24 on Building Seals and Sealants. Jerome M. Klosowski of the Dow Corning Center in Midland, MI presided as symposium chairman and is the editor of the resulting publication.

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Overview

The ASTM symposium which produced the papers presented in this book (Second Symposium on Science and Technology of Building Seals, Sealants, Glazing and Waterproofing held Feb. 5-6, 1992 in Ft. Lauderdale Florida), was a landmark event . Most of these are highly significant papers which will be the stimulus for many more research projects and could be the stimulus for radical changes in the specifications for sealants.

All the papers in this book should be of some interest to those interested in sealing and waterproofing. Of particular importance is the first set of papers on durability. These papers ask one to rethink the old thoughts on what durability means and how it should be tested. The papers on adhesion are also quite unique in approach and the conclusions to some these are controversial. While the papers are controversial, they are worth reading. Each stimulates thinking about adhesion in a new way. Some of the papers on joint design are review papers but they do bring out important-to-remember concepts. There is a concept paper on insulated glass and a series of papers on new products. All of this is here for the interested reader.

The Fedor paper is one more in a series where artificial weatherometry is compared to actual outdoor exposure of sealants. The idea from the earlier paper is reinforced in this paper is that it takes in the range of 1000 hours to 1200 hours in an artificial weather machine to simulate approximately 1 year in south Florida. That it takes something less to simulate a year in more temperate climates, perhaps as little as 500 hours, can also be concluded. This data, and many of the things that can cause variations in this data, are addressed. The enormous significance of this is that some specifications in ASTM indicate that sealants that are tested and survive 150 hours or 250 hours in such weathering machines are called weather resistant, when this paper indicates such short exposures have no way of determining the long term weather resistance. Thus we expect that many will, and should, study the Fedor paper when writing new test methods and specifications which address climatic durability. With the Fedor paper in mind, perhaps the scope of several test methods could be rethought as could the significance in use sections.

The Fedor paper also gives added significance to the papers on sealant durability by Bridgewater and Carbary, and by Beech and Beasley. These papers use similar artificial weathering to study the deterioration of various sealants and both papers study the mode of deterioration of the various generic sealants. The length of time in the weathering machines in these papers extend to 4000 hours and 5000 hours and thus could be perhaps reminiscent of between 5 years and 10 years of outdoor exposure, depending on climate. Thus the papers are not to be considered as presenting extremely taxing data on the sealants studied, but perhaps representative of real life. These papers, and the Fedor paper, only test sealants in the absence of movement and all the history of sealants would indicate that even more severe deterioration would be expected if the sealants were moved (extended and compressed) while weathering. Thus from the static nature of the tests, the papers describe conditions that are actually more mild than real life.

There would seem to be a discrepancy in the two similar papers on weathering of sealants in that one shows more deterioration than the other in similar conditions of the artificial weathering, on similar sealants. In the Bridgewater - Carbary paper there is more severe deterioration of some sealants with moderate heats, in normal humidities with only UV radiation as the significant stressing mode. This editor discussed this with both sets of authors and found that they used different color sealants and that they do expect color to be significant. They expect that the black and white have significant pigmenting fillers while the concrete colors have little of these pigments to act as U.V. blockers. Thus both papers have very interesting and pertinent data and both are worth of serious study.

The Pernisz - Klosowski paper shows that the radiation on a sunny day is between 15 and 21 times greater on a Southern exposure, in full sun, than on a northern exposure. This paper gives possible reasons why all sealant joints don't deteriorate at the rate suggested in the papers on weathering. Different joints, even on the same building, get different amounts of the sun's radiation. Thus with many sealants, variations in durability of the sealant are expected in the surfaces of a given building, depending on the orientation of the joints to the sun. The sidewalks and roadways are expected to be yet different, even with the same sealant installed in the same way.

The Tanzer - Frankel work shows a outdoor movement device which is easy to use and inexpensive to build. This device would be a handy evaluation means in any development lab or on an architects building (architects should indeed study the materials they use). In addition the paper shows a comparison of a variety of latex acrylic sealants and two silicone sealants which are tested in the movement device. Of special significance is the argument for the hourglass design for all sealant beads, to get the maximum movement ability and how the water borne sealants naturally shrink to achieve this while the non-water borne materials should be tooled to achieve this. All of this is interesting to almost all in the sealants area and this could and perhaps should influence our future test designs, especially if all premium quality sealants will be compared on the same test.

Professors Minkarah and Weisgerber each co-author a paper on highway sealants, which also have applicability to plaza decks and parking garage sealants. The Minkarah - Reiser paper looks at the damage to a number of highway sealants with various exposures. Their work considers 600 hours in an accelerated weather machine and with most of the sealants they consider there is already significant damage. This is especially interesting in light of the earlier mentioned Fedor paper who suggest this exposure is probably less than or equal to one year's exposure.

The Weisgerber and Wang paper discuss the stresses in highway joint sealants and helps to explain some of the stresses that cause the sealant failure.

The O'Connor - Panek paper is especially interesting to those who are involved with structurally glazed curtain walls. This paper too is a study of durability. This paper shows the deterioration, or more correctly, the lack of it in a well studied structurally glazed building. They report on the strength and adhesion of an aged silicone

system and give a great deal of confidence to those who have used such systems.

An opposite of durability is early joint failure. One aspect of this is discussed in the paper on early joint movement by Flackett. In this paper silicones are studied as a function of cure rate. This paper makes a good follow-up to papers presented at the 1991 symposium the discussed movement during cure. All of this work emphasizes the need for the completion of the ASTM C-24 committee work on exactly this topic.

Silicone sealant adhesion technology is reviewed in a series of 3 papers by Gutowski, Cerra and Russel. Their studies at an Australian national lab, study the all important property of adhesion and methods to predict this. Their conclusions are interesting and perhaps controversial, but give the silicone technologist something to think about.

The paper by Klosowski and Dent also addresses adhesion. In this paper, a modification of the constrained blister test which was first pioneered by Moet at Case Western Reserve and Dillard of VPI, the test method is detailed. In addition to the test method is a discussion of the other sealant test methods that test adhesion and these are compared to the constrained blister adhesion test.

Primers are a fundamental aspect of adhesion to some surfaces with most sealants. The paper by Berg and O'Brien discuss a new primer concept in an unusual situation where silane coupling agents are put in a silicone solvent and are shown to be useful with both silicone and non-silicone sealants.

The paper by Webb addresses yet another aspect of adhesion. In this paper the preparation of the concrete blocks and factors that lead to variable adhesion to these surfaces is detailed. This too is valuable information.

There is more to successful joint sealing than a good sealant. There is also a good design. The design aspect of unique fillet joints is detailed in the paper by Hoigard and Kudder. Several special joints designs and problems with them are described in the paper by Nicastro and a general overview of many joint designs and building designs are shown in the paper by Yanoviak.

Insulated glass sealants are also discussed in this book. A very well done, comprehensive paper by Wolf details the various factors effecting life expectancy of an insulated glass unit and prioritizes them. To those who study this paper a whole new way of considering the factors effecting longevity of an insulated glass sealant are revealed. Following this is a paper about a modified polybutadiene sealant for insulated glass by Hubin-Eschger.

New materials are addressed in papers by Elfring and Rosano on new acrylic coatings; a new elastomeric silicone wall coating that is water borne and has an anti-graffiti nature is described in the paper by Lefler; a new solvent based acrylic for bedding applications in glazing is in the paper by Potts; the formulation and performance of a new water borne silicone sealant (silicone latex) is described by by Liles, and Fiorillo describes new polysulfide sealant technology.

In essence the papers in this book touch on almost every aspect of sealing and waterproofing. While the durability papers stimulated the most discussion at the symposium, all the papers were interesting. To some, there will be other interpretations of the data than that presented. Perhaps some readers will want to do some similar studies to those presented here and report them at other symposiums or publish them in subsequent STP's. That would be a very good product from all of this work, for it's the new research and testing that furthers the science and technology of building seals and sealants and the world can only benefit from continuing research and publication of that work.

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