



POLYURETHANES, EPOXIES, POLYSULFIDES, ELASTOPLASTICS

APPLIED POLYMERS OF AMERICA, INC.

210 Delawanna Avenue

Clifton, N.J. 07014

TALK GIVEN BY GERALD ZAKIM, PRESIDENT OF APA AT SOCIETY FOR PLASTICS INDUSTRY MEETING HELD IN NEW YORK

BEFORE 300 ARCHITECTS, ENGINEERS, CONTRACTORS AND MANUFACTURERS.

SUBJECT:

LIQUID MEMBRANE SYSTEMS FOR WATERPROOFING

There are a number of reasons why this concept in waterproofing has been developed. To illustrate, in January 1967, we attended an architects/engineers seminar, at the University of Wisconsin engineering extension course on the waterproofing of plazas, promenades, parking decks.

We were not on the panel, however the seminar leaders were so impressed with our system they placed castings of concrete-to-concrete with our cured membrane/adhesive on the table, and mentioned the concept.

We noticed, after each session, a large number of those in attendance, handling the samples, looking at the literature and asking questions.

During the two days of the seminar, we asked many of the people who had shown interest, "Why, among the first of your questions, didn't you ask - How long has it been on the market, and where has it been used???". The answer was, "To date, nothing works". This justified our heavy involvement in the development of this concept. The need for an essentially foolproof, totally waterproof system, brought about by the major changes in building design, such as light weight decks, large plaza areas, heavier loads, parking garages, the increasing use of areas under large spaces exposed to water, ice, snow, chemicals, etc. In addition to the above, there is an apparent awareness on the part of the contractor, owner, architect-engineer, that the work force is not being enlarged to keep up with the amount and type of work coming out, and that ease of application, with subsequent lower labor cost will certainly prove more economical, despite higher material costs.

THERE ARE MANY TYPES OF WATERPROOFING MEMBRANES AVAILABLE, TO CITE THE MAJOR ONES:

HOT SYSTEM WITH FELT & GLASS -

Works well, if no cracks occur, and expansion joints are treated properly. Materials are thermoplastic, oxidizing and have cold flow. Surface must be dry.

**COLD SYSTEM WITH FELT &/OR GLASS -
NEOPRENE COATINGS -**

Multiple coats must be placed in order to obtain a functional thickness. Variations in weather, attempts to put on too thick a coating per pass, can cause solvent trap, and foreign matter at the interface can cause interface failure. Surface must be absolutely dry.

APPLIED POLYMERS OF AMERICA, INC.

BUTYL SHEET, NEOPRENE SHEET, PVC SHEET, AND OTHER PREFORMED SYSTEMS:

These systems offer excellent impermeability, give or take the preference of some manufacturers for one over the other two, or some manufacturers marketing two of these, and not the third. All, however, subject to severe problems brought about by INSTALLATION. These materials being pre-formed and of some weight must be seamed, and by sheer virtue of the weight and method of application, must trap air between the sheet and the sub-strate. These two areas of seams and trapped air provide a high potential incidence to failure and puncture, creating the greatest problem with sheet. I am sure most of you have hung wallpaper at home, and recall after the match has been made, you pull the sheet partially off the wall, and then smooth out the air bubbles. In construction, it is not practical and very unlikely this will be done.

It can be seen these two weak points and the large areas that must be placed at one time for economical installation by the contractor, are what can cause failure in sheet waterproofing. Picture the damages occurring from running concrete buggies over the seams, air pockets, & setting chairs and re-bars for the wearing course.

PRE-FORMED MASTIC BACKED WITH PLASTIC

These systems seem to have merit, except application presents a problem. I'm certain all of you have tried to hang "contact" for shelving or for a midnight snack had a hard time unwrapping "Saran Wrap." "Nuff said". The mastics used here are oxidizing, and will cold flow, bleed and burn.

The systems mentioned to this point have had several years history of installation. They can all work well, if everything is installed properly, the surfaces of contact are of the same materials, there is no movement and cracking of structural slab and/or wearing course, or in other words - "If everything goes right". Recognizing that such a Utopia does not occur in construction, our concept of MEMBRANE/ADHESIVE was developed, and the system related to the use, taking into consideration the problems experience in construction, has made us aware exist ON THE JOB, or to say it better, OUR SYSTEM IS MADE TO WORK IN SPITE OF CONSTRUCTION.

Our concept of membrane/adhesive, unlike any other, heretofore, has the advantages of application to damp and dry surfaces, is self-priming, full thickness in one application to horizontal and vertical surfaces, is self-flashing to perimeter walls, drains, pipe sleeves, conduits. Bonds to most building materials, forming a seamless, flexible seal with the unique properties of low modulus/adhesion top slab to bottom slabs, permitting each to move thermally in its own plane, at its own rate. The property of low modulus/adhesion prevents the pumping of water interface in the event of cracks in the wearing course, which, as we are all aware, will occur. Thus, when a crack does occur, the shock absorbing property (quality) of the membrane/adhesive will prevent the crack translating from one course to the other, except in the case of severe deflection. This property prevents the crack occurring in the same place, the adhesion property prevents the pumping of water along the bottom of the slab, therefore, for water to enter the structure, the cracking would

APPLIED POLYMERS OF AMERICA, INC.

have to be a the same place in wearing course and structural slab. The amount of movement would have to be beyond the elastic limits of the material, and should this occur, the source of the leak would be confined to that area, and thus could be repaired from underneath, without concern about entering at another point elsewhere.

The property of adhesion with the low modulus of elasticity also carries the answer to theoretical questions such as, What about variations in thickness, What happens at a high spot, a low spot, at "burs" in concrete, and what happens if there is a miss or holiday in application.

The answer to all these questions, is, of course, the method of isolation to contiguous areas obtained by the property of adhesion to adjoining surfaces. There can be no question as to the long number of advantages this concept provides by its seamless, continuous, flexible, low modulus, adhesion, free of seams, free of air pockets, and treatment of expansion joints with the same material during application of membrane.

Please keep in mind that adhesion in our systems are to CURED or UNCURED membrane by the wearing course is attained immediately or after weeks.

The property of intimate contact with the substrate by virtue of the liquid, fluid application, assures the freedom of air pockets, while the seamless, resilient, flexible, tough membrane/adhesive overcome by elimination, most of the problems and weak points of sheet or other type membrane systems. In addition, the intimate totally adhered contact with the substrate assures the most resistant membrane to damage and puncture caused by methods of construction, exposure, sharp objects, setting-re-bars, chairs, etc.

We make no mention of self-healing, as if rupture were to occur because of severe movement, it is apparent that water would be present, thus eliminating the property alluded to by others. However, if nails or sharp objects, anchors for protection board etc., are placed into it, this membrane will seal right to them.

Our concept has been installed in over forty million square feet, without a leak as yet, and none expected. These installations have been on both new and remedial work, some of them requiring the removal of the existing wearing course. The removal of the existing membrane, (in some cases, application directly to it,) and applying a new wearing course.

We have chosen polyurethanes as our approach to the composition of material. As some of you are aware, we had heavy involvement in the basic development and marketing of the original polysulfide/coal-tar material for use as membrane/adhesive waterproofing systems, and although pleased to a degree with the performance of this system, we were unhappy with the extremely soft cure and weak film formed by that system and its subsequent susceptibility to damage curing construction. The ability of these polyurethanes to upgrade film integrity, obtain higher abrasion and tear resistance at a low modulus of elasticity.

APPLIED POLYMERS OF AMERICA, INC.

The ability to cure at cold temperatures as low as 10 deg. F., to be able to vary the film hardness as required, without loss of the property of adhesion of top slab, as well as the other advantages of this membrane/adhesive, was key to our decision to select polyurethanes.

The additional plus factor was development of our one part, ready-to-use, no mixing, composition, which we have been, and are marketing very successfully, with properties superior to the two part, with the obvious advantages of no mixing, no waste, no error, finalized our decision.

It can be seen that the original concept has indeed been upgraded by our polyurethane/bitumen approach. This one part system provides gains in adhesion and properties to surfaces both damp and dry. This urethane/bitumen system is compatible with all known insulations and will not stain through.

There has been and is a substantial market for these systems, not only as suggested above for conventional waterproofing, but to be used in planters, in laminar panel construction, pool construction and many other uses.

There has been no attempt to cover other polyurethane membrane types and uses, such as in parking deck wearing coatings, pool area coatings, and in uses as roof coatings, where again these high solids, economical and functional polymer systems have proven successful in millions of square feet of installation. The technical considerations in design recommendations are too extensive to cover properly in a paper of this limited scope. We will be pleased to answer any questions as to design, composition, function, etc., at the question and answer period, or privately.

I want to thank the committee for including this paper in the meeting.

Gerald Zakim is President of Applied Polymers of America, Clifton, New Jersey 07470. *He has a B.S. degree from Clemson University. Mr. Zakim's experience has included publishing of papers in Adhesives Age Magazine and Glass Digest. He has served as Chairman of the Sealant Committee of Construction Specifications Institute (CSI), Secretary of the Vitreous Committee of that same group, has been active in Building Research Institute (BRI,) ASTM, National Association of Corrosion Engineers (NACE,) Institute of Sanitation Management (ISM.) His industry experience includes the founding and presidency of Jay Zee Protective Coatings, Inc., which was merged with Toch Bros., Inc., where Mr. Zakim was Vice-President for Sales, prior to the founding of Applied Polymers of America (APA.)*
