On Building Felt Kim

IV B3c2 Data

Barrier Eff. 1961-1969

PLAINTIFF'S EXHIBIT
UC-994

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JENNAT CORPORATION

A SUBSIDIARY OF UNION CARBIDE CORPORATION

Quality Emulsion Polymers

2326 LONNECKER DRIVE GARLAND, TEXAS 75041

(214) 271-2451

To: Mr. J. A. Moore Date: May 8, 1974

Subject: Latex Roof Coating, Mastic, and Hi-Build Wall Coating Markets

As suggested, I have presented my thoughts about specific UCC specialty market areas, competition, and proposed development project plans.

They were reviewed by R. L. Baker and D. H. Reed who also contributed some pertinent inputs.

Mastics for Building Roofs and Storage Facilities

These are characterized as basically thick (30-60 dry mils) "waterproofing" type coating films having low moisture vapor transmission rates (less than 0.5 Perm). In most cases they are based on bitumins, as well as limited applications for extruded plastic sheetings.

Because of their good economics, asphaltic hot melts or asphaltic and coal tar emulsions are in wide use. Some are fibrated with asbestos, talcs and other fillers plus some contain aluminum flake for better heat reflection. In most instances two or more "cross" coats are applied to eliminate pin-holing and for film build. Ideally the coating retail cost should not exceed 10 to 12 cents per square foot plus an additional 5 cents per square foot for labor. This has usually been considered to be out of range for flexible Hi-Build latex high molecular weight synthetic polymers at equal dry-film thicknesses. However, Tremco (Cleveland, Ohio) has qualified UCAR 153 coatings as being competitive to coal tar-asphalt materials on an applied cost basis.

Where cost is less of a factor, then the following systems may be found:

2 pkg. Coal-Tar/Epoxy)
2 pkg. Coal-Tar/Urethane) 250% Elongation at 20 dry mils thickness
2 pkg. Polyurethanes - 100-150% elongation
Butyl rubber, Hypalon, Neoprene & Vinyls - 100-400% elongation

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Candidate coatings for this market should encompass as many of the following properties as possible:

Good Adhesion
Flexible over Wide Temperature Range
Good Durability
Water and Chemical Resistance
Mildew Resistance
Abrasion Resistance
Low Flammability
Self-Repair 120°F (Plastic reflow)

Disadvantages of Current Competitive Roof and Chemical Storage Tank Coatings

1. Asphalt types embrittle and crack after weathering

2. Cold tar types show less cracking, but fail by early chalking

3. Cold tar (urethane and epoxy modified) - exhibit poor nitric and acetic acid resistance; pot life 3-4 hours at 70°F and 5 minutes at 120°F; mixing time precautions; must recoat urethane type within 12 hours; need for immediate solvent flushing of equipment after usage; need clean dry surface and no rainfall within 24 hours.

There is need to protect many of the above "waterproofing" coatings; thus a potential market for latex topcoats. Field experience with UCAR 153 has shown excellent durability over weathered galvanized corrugated steel roofing, as well as over a freshly primed aged aluminum asphalt surface on an aircraft hangar in Knoxville, Tennessee. Gibson-Homans (Cleveland, Ohio) had planned an asphalt roof exposure with a UCAR 153 coating. South Charleston test fence durability test results confirm expected good performance over an asphalt-based coating.

Low PVC vinyl and acrylic copolymer based mastics offer 2 - 3 Perms MVTR at 30+ dry mils thickness (Water resistance as good as solvent-thinned silicone films). For comparison one can expect 7 - 10 Perms MVTR for 5+ mils dry film thickness of conventional exterior 100% exterior acrylic and vinyl/acrylic copolymer films.

Physical Characteristics and Application Requirements For Specialty Roofing, Mastic, and Hi-Build Exterior Wall Coatings

Group I - Light Duty Performance - 30-36 PVC white or light colored heat reflective coatings over fresh or aged asphaltic or cold tar

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waterproofing films. Viscosity 90-100 KU Stormer, 55-65% solids by weight and medium flexibility. Contain 3/4 to 1 lb./gal. of 325 mesh WG Mica. Dry film thickness 5-8 mils with moderate abrasion resistance. Low dirt collection is preferred. Application by brush, swabbing or spray on factory, mobile home, and apartment asphalt shingles or built-up felt roofing. Standard paint bases such as UCAR 360, 365, and 366 should be suitable.

Group II - Heavy Duty Usage - 20-25 PVC - White-to medium-colored coatings over unprimed wood and metal or lightly sealed aged bituminous substrates. Mastic-like consistency (over 130 KU Stormer/paste paddle), 70-80% solids, medium- to high- flexibility. Application by brush or spray for unusual exposure conditions and need for better low temperature flexibility. Usage areas include trailer roofs, refurbish aged vinyl roofs on private boats, aged galvanized steel farm and industrial roofing and for high humidity locations of docks, columns and decks (non-skid) on ocean oilwell platforms. Two-pkg. coal tar-epoxy mastics find use both above and at water level. UCAR 153, 874HS and 1234 should perform adequately above the water line.

Group III - Patching Compounds - Medium- to heavy-duty performance - offwhite- to light-gray for sealing masonry cracks, repair chimney flashing, reline aged metal gutters, and for non-skid metal stair and factory mezzanine decks. Mastic-like consistency usually applied by wide knife or trowel, and can be brushed, if thinned with water. Total solids are approximately 58 to 72 percent by weight. UCAR 153, 874HS and 1234 are suggested. Competition is Reichhold 40-141; AC-34; and AC-388 on the West Coast (strictly on a price basis).

Group IV - Lagging Cements and Sealers - Low- to medium-flexibility off-white or light colored pipe insulation adhesives. Also used as the filler-sealer coating for the open-pored lagging prior to final tocoating with conventional oil base or latex paints. Viscosity 110 to 140 KU Stormer; 35-48 PVC; and 60-65 percent solids by weight. Candidate latexes are UCAR 365 or blends with UCAR 153, 874HS and 872 for this competitively-priced market. Competition would be Everflex GT; Polytex 667 and AC 388. They are usually copolymer resin/plasticizer based compounds, and must not embrittle upon aging at 120-130°F. UCAR 153 mastics are also applicable, if costs permit.

Group V - Cement/Plywood Exterior Textured Wall Coatings - Medium flexibility, good adhesion, and water resistance at 19-25 PVC are needed; White and pastel colors at 53 to 57 percent solids by weight at 100+ KU Stormer/paste paddle consistency. Spray applied at 25-40 mils dry film thickness sometimes followed by brushing, if used as a block-filler. Used for repair of hairline cracks in stucco and to simulate stucco finish over plywood walls for modular and mobile homes. Widely used on exterior plywood walls of motel, apartment complexes and amusement park buildings to create "English Tudor" effect in buff tints.

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They are also used on interior walls and ceilings at higher PVC levels. Perlite filler is commonly included for the texture effect. Suggested binders are UCAR 874HS as is or blended with 365, 360, and combinations of 1234 with 365 and 2345. Competition would be RCI 40-141 (a 35% OA/ViOAc copolymer), and perhaps AC-34. Some Pliolite VT (solvent system) is used for texture coatings over exterior masonry.

Suggested Development Work Needed to Optimize Formulation Cost/Performance By Selection Of Best Binder Systems

Reference is made to previous five described groups. The screening tests should be conducted on a single latex performance basis first. Although resin blends are also suggested for test data, their use is intended at the coatings manufacturing level. Current Jennat plant facilities are not compatible with merchandizing latex blends due to lack of smaller blending tanks and storage facilities for blends. Justifiable larger volume blends may be accommodated at the discretion of the plant manager.

Group I - Light Duty Coatings - Use formulation E-1326 modified to include 3/4 lb./gallon of 325 mesh WG Mica and 25% alkyd at 30, 35 and 40 PVC (with and without 3/4 lb./gal. of XX503 zinc oxide). Compare 75/25 (874HS/365); 366; 508; Vace 1000 blends with 365; 75/25 (872/365). UCAR 1251 may be included solely as a control, since it will be phased out shortly. Tests should include adhesion and resistance to bleed-through stains over bituminous coatings (Run test 3 days at 120°F); 120°F stability; F/T; and 180° bend tests at 0°F over 1/2 inch diameter mandrel. Flame retardance is not a major consideration because of the low film thicknesses employed. Dry time to be one week at R.T.

Group II - Heavy Duty Roof Mastics - Use formulation E-1297 (modified 12DHR50) at 25 PVC. Compare UCAR 153 versus 872; 874HS; 1234; 1234/365 (25, 35% blends); and 874/508 (75/25). Run 10 cycle APA Boil test; run 25 cycles total on those that pass 10 cycles. UCAR 153 with Carnauba wax (patent applied for) should also be included in all tests. Georgia Pacific R & D has a qualified UCAR 153 formulation for the APA Boil Test. Other tests include wet and dry adhesion over aluminum, glass, pine wood and steel (4 hour water soak); 180° bend test at 0°F over 1/2 inch Mandrel; aluminum cup shrinkage; 1000 hours Weatherometer on aluminum panel (Shore A hardness before and after test); test fence exposure over bare and primed exterior plywood, steel, asphalt coating and rigid urethane foam. Submit test panels to 2 ft. flame tunnel tests at Jennat, Somerset. Test films should be 1/16 inch (wet films) followed by 2 weeks air dry plus 2 days at 185°F.

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Group III - Patching Compounds - Use formulation E-1314A at 19 PVC. Compare UCAR 1234 versus 153; 874HS; 874HS/365 (75/25); 872 and VACE 1000/365 blends (35, 50, 65% UCAR 365). Cast 1/16 inch wet films for the following tests: wet and dry adhesion tests over glass, aluminum, and sanded tin plated steel; 1000 hour Weatherometer tests half topcoated with 40 PVC exterior 360 latex paint; aluminum cup shrinkage; F/T at 0°F, and 120°F stability. Expose on test fence versus an RCI 40-141 patching compound.

Group IV - Lagging Cements - Use 49 PVC/66% solids formulation and compare control UCAR 1251 versus 365; 874HS/365 (75/25); and Polytex 667. Check adhesion to fibreglass tape. Check flexibility of 1/16 inch dry films (1/4" Mandrel Bend test) after heat aging coated tinned-steel panels for one week at 125°F, as well as after 2 hours at 285°F (140°C). Run 2 weeks 120-125° F stability and 5 cycles of F/T stability at 0°F.

Group V - Exterior Textured Wall Coatings - Use basic I-1329 formulation at 19 and 25 PVC to compare 1234/2345 blend (65/35) versus 153/365 (75/25); 874HS and 872/365 (75/25); 508/10% TCP; and VACE 1000/365 (75/25). Cast 50-60 wet mil films on exterior plywood for 10 cycle APA Boil Test (continue satisfactory ones for 25 cycles total). One week air dry films over tinned-steel panel must pass 1/4" Mandrel bend initial and after 1000 hours Weatherometer exposure. Tint to medium pthaloblue color prior to weathering. Check for fade (25% max.) and mud crack/pin hole resistance. Check 2 weeks 120°F stability as well as 5 cycles F/T at 0°F.

UCC experimental vehicle matches for RCI 40-141 should also be included, if available.

The better vehicle systems of the five groups should be exposed on test fences at several Jennat locations plus test buildings, if available and convenient. Probably MVTR values at several thicknesses would also be useful for discussion with accounts. Non-mercurial anti-mildew agents should be included in the final exposure studies.

Another area of interest not yet mentioned would be Interior Hi-Build Coatings. UCAR 360, 365, 366, 508, and VACE 1000 should be compared in formulation I-1323 (66.5 PVC) as a replacement for 2345. Major physicals to check are scrub resistance; sheen; leveling; mud cracking; 120°F-125°F stability; F/T; and yellowness (initial versus heat aged in can).

The program would entail the preparation of over sixty formulations. This plus the test panel preparation; acquiring of raw materials; APA Boil Tests; Weatherometer testing; and the Instron elongation peel adhesion tests are significant factors determining the project completion date.

A23357

R. C. Pierrehumbert

R. C. Pierrehumbert

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UNION CARBIDE **INTERNAL CORRESPONDENCE**

CHEMICALS AND PLASTICS • P. O. BOX 8361, SOUTH CHARLESTON, WEST VIRGINIA 25303

To (Name) Mr. E. C. Powell, Jr.
Division Building 2000
Location Technical Center

Date April 17, 1974
Originating Dept. R and D

Copy to Mr. F. P. Del Giudice
Mr. F. P. Liberti
Dr. W. P. Miller
Mr. J. A. Moore
Mr. R. J. Pierrehumbert
Dr. J. B. Saunby

Subject Testing of Weather Barrier Mastics

Dear Mr. Powell:

According to J. A. Moore's letter to W. P. Miller dated January 16, 1974, we have received and have tested eleven commercial samples and three UCC formulated mastics. Two of the suppliers samples from Longview Paint and Varnish Company were designated as roof coatings. The three UCC samples prepared in our laboratory were suggested formulation 12DHR50 as given in the UCAR Latex 153 product information bulletin of October, 1970. The samples differed only in the UCAR Latex employed.

The testing of the samples was completed in compliance with UCC Specification Standard M-Insulation-28-July 1967 under 1. Mastic Weather Barrier A (3) Properties (a) thru (d). The UCC specification limits and properties of the samples are listed in the attached table.

If I can be of further assistance, please let me know.

Very truly yours,

R. W. McLaughlin

RWMcL:mcb

R. W. McLaughlin

Attachment

A23358

Union Carbide trial exhibit UC-994: Compilation on Weather Barrier Mastics and Roof Coatings: Jennat, Union Carb...
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PROPERTIES OF MASTICS TESTED AND UCC SPECIFICATION LIMITS

	Total Volume Solids, %	Cup Test	Elongation, %		Flame Spread Factor	Fire Retardance		
			At 35°F	At 20°F		Heat Evolution Factor	Flame Spread Index	Burning Extent
UCC W/UCAR 153	60	Passed	132	200	2.2	4.6	9.8	9.8
UCC W/UCAR 874	60	Passed	136	143	1.5	4.0	6.4	5.4
UCC W/UCAR 1234	60	Passed	80	74	2.6	5.8	15.2	9.2
Sealfas G.P.M. BF-45-49	62.5	Passed	10	-	1.8	2.5	4.7	3.1
L and L 300	52.9	Passed	203	236	4.7	4.0	17.9	12.9
Vimasco WC-1	50.9	Passed	10	-	2.8	4.4	18.4	8.0
Vimasco AC-7	59.0	Passed	156	219	2.7	5.6	15.0	8.6
Vi-Cryl CF-10	50.3	Passed	10	-	1.2	3.4	4.2	4.8
Vi-AC 1-C551	50.7	Failed	10	-	2.5	3.4	8.8	4.5
Cadalon 500	51.8	Failed	10	-	2.8	3.0	8.9	5.0
Clowes 1530	56.8	Passed	330	263	5.1	6.3	32.9	14.3
Jaxan 600	52.4	Failed	28	-	2.0	2.9	6.0	6.9
Longview 12-W-47 (Fire Retardant)	54.4	Failed	75	34	1.0	3.2	3.2	-
Longview 12-W-41C	54.0	Passed	155	168	<— Not enough sample —>			
UCC Specification Limits	Not under 50	*	30 min.	15 min.			35 Max.	

* No cracking, splitting or pulling from lip of cup.

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JENNAT CORPORATION

A SUBSIDIARY OF UNION CARBIDE CORPORATION

Quality Emulsion Polymers

2043 STEEL DRIVE TUCKER GEORGIA 30084

404 – 939-9327

(1) (2) EPD

May 15, 1974

Mr. J. A. Moore
Union Carbide Corp.
33 rd floor
New York , New York

Copies: W. P. Miller
F. Liberti/Manzella
R. Pierrehumbert/D.H. Reed
R. W. Martin
R. D. James
C. H. Greenert

Subject: Roof Coatings

Dear Jim:

I picked up the following information last week from Lynn Carte, maintenance supervisor at the U.C.C. film plant in Cartersville, Ga. The plant has an aluminum corrugated roof and aluminum siding. An adjacent ore precessing plant emits copious quantities of sulphurous gases which had been causing considerable corrosion of the roof and leaking at the joints. In 1970, 76,000 square feet of roof area was sprayed with urethane foam and topcated with a high build latex coating supplied by Plastic Coatings Corp.(now owned by Larry Widdecombe)

The job was done by Cooper Paint Co. of Knoxville in June 1970. The total cost was $34,200 or 45¢/ square ft. for both foam and coating. The foam was applied 1 inch thick directly to the aluminum. The urethane components were supplied by Texas Urethane Co. and were supposedly Carbide materials. The topcoat over the foam was a 50 mil airless spray coating of Jaxan Insulseal 600. This material is based on UCAR-891. Harold Linville sold this job when

A23360

An additional area of new roof was coated the following year with a UCAR-153 based latex system without the foam substrate. This material was produced by Clowes Protective Coatings.

I inspected the job with Carte and can report that the foam/coating system is doing extremely well. Durability appears to be excellent and adhesion of latex to foam is good. The coating has picked up considerable surface dirt, particularly in the valleys of the corrugations. Carte said that if the systems performs well for seven years, then it's economically a winner. I predict that they will have no problems in reaching the seven year goal.

Interestingly the Clowes system based on UCAR-153, even though it's been out a year less, has picked up about twice as much dirt as the Jaxan 600. I think that this dramatically points up the inherently soft nature of the 17-DHR-50 type of formula. The problem is in the formulation and not the latex. Carte likes the performance of these coatings so well that he intends to apply some latex high build to various sections of vertical walls sometime in the near future.

Very truly yours,

M. O. Robinson

A23361

RECEIVED
APR - 3 1972
W. A. MOORE

PROPOSAL TO: UNION CARBIDE CORPORATION

PROPOSAL NO. 1-5840 DATE: March 28, 1972

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Arthur D. Little, Inc. ACORN PARK · CAMBRIDGE MASSACHUSETTS 02140 · (617) 864-5770

March 28, 1972

Mr. E. C. Powell, Jr.
Union Carbide Corporation
Chemicals and Plastics
P. O. Box 8361
South Charleston, West Virginia 25303

Dear Mr. Powell: 1-5840

As the result of my telephone conversation with you on March 13, 1972, we are pleased to submit this proposal covering a program to evaluate the aging characteristics of your new acrylic mastic coating.

BACKGROUND

In 1966 Arthur D. Little, Inc., conducted a study for you to develop a method for evaluating the performance capabilities of your weather barrier coatings. As a result of this study, Union Carbide then set up a standard control test procedure for batches of mastic. In this test, samples were subjected to accelerated aging at elevated temperatures to give an aging equivalent to five years of normal exposure. These test procedures were established for polyvinyl acetate compositions. Since that time acrylic compositions have been developed that have better elongation and aging characteristics. However, every material ages in a different fashion and the relationships previously established do not necessarily apply. Therefore, you now desire to establish new test procedures as well as confirm that the new material is superior to vinyl acetate based products in aging characteristics.

PURPOSE AND SCOPE

The purpose of the program outlined in this proposal is to establish accelerated aging test procedures for your acrylic weather barrier coating and to compare its weathering properties with your polyvinyl acetate systems.

The program will involve subjecting samples of the acrylic coatings to accelerated aging, followed by a determination of the loss of elongation with time. This information will be used to predict the life expectancy of the coatings under normal aging conditions and relative aging rates of the acrylic and polyvinyl acetate systems can then be established.

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Mr. E. C. Powell, Jr.
Union Carbide Corporation

APPROACH

We will prepare dried films from acrylic mastics by casting techniques. The films will then be aged at 250 and 300°F. Samples will be removed at appropriate intervals and the elongation determined at 30°F. Heat aging will be continued until we feel that the films are no longer acceptable for their intended use and the elongation measured at this point. Rates of deterioration as measured by loss of elongation will be plotted against time at each temperature and related to normal aging. Our experience in these matters indicates that aging at normal ambient conditions can be related to accelerated aging as follows:

Accelerated Aging	Equivalent Normal Aging
1/2 hour at 250°F	20 weeks (5 months)
1/2 hour at 350°F	200 weeks (4 years)

The results obtained, together with an estimation of the service life of the acrylic mastic, and recommendations for test procedures, will be presented to you in a summary memorandum report.

STAFF RESPONSIBILITY

I will be in charge of the program here and understand that I should look to you for direction and coordination of your company's interests.

COST AND DURATION

For the work outlined above, we propose that you authorize for professional services a budget not to exceed $3000 (exclusive of expenses) without prior written approval. Expenses, such as for travel, communications, report production, and directly related costs, will be billed in addition to the professional service charges and shown as a separate item. Invoices will be submitted monthly and are payable upon receipt.

GENERAL PROVISIONS

In the past we have carried out a considerable amount of research in the fields covered by this proposal. This experience helps to qualify us to undertake the assignment defined above and we expect to continue such work in the future.

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Arthur D Little Inc

March 28, 1972

Mr. E. C. Powell, Jr.
Union Carbide Corporation

To protect your interests, we agree that any confidential information we may develop or have furnished to us by you during the work will be safeguarded in accordance with our established professional standards.

It is understood that neither party will use the name of the other for advertising or promotional purposes without prior permission in writing. Reports resulting from this assignment become your property; however, our authorization in writing is required if our reports are reproduced in whole or in part for use outside your organization.

ACCEPTANCE

For the purpose of staff scheduling, this proposal is made subject to acceptance within thirty days. If you wish us to consider an extension of this acceptance period, will you please advise us in writing prior to April 27, 1972.

We look forward with great interest to working with you on this project and will devote our best efforts to accomplishing the program outlined above. If this proposal is acceptable, would you please sign and return the enclosed copy as authorization for us to proceed with the work.

Very truly yours,

John T Howarth

John T. Howarth

/lml

Letter in duplicate

Approved for
ARTHUR D. LITTLE, INC.

By_____

Accepted for
UNION CARBIDE CORPORATION

By_____

Title_____

Date_____

cc: Mr. J. A. Moore,
Market Manager
Coatings Intermediates
Union Carbide Corporation
270 Park Avenue
New York City 10017

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