NATIONAL BUREAU OF STANDARDS REPORT

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PROGRESS REPORT

ON

BONDING TO TREATED CONCRETE SURFACES

by

Winthrop C. Wolfe

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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Organic Building Materials Section
Building Research Division

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U. S. DEPARTMENT OF COMMERCE

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PROGRESS REPORT

ON

BONDING TO TREATED CONCRETE SURFACES

1. INTRODUCTION

Concrete floors have been treated with chemical "hardeners" for many years. Certain other treatments are a result of changes in practice in the trade. The most important of these changes is the substitution of membrane curing for the so-called "water cure" for concrete. Another kind of treatment of concrete is essential to a comparatively new type of construction known as lift-slab or tilt-slab.

Proper curing is required for a concrete slab to develop maximum strength and a desirable surface. A concrete floor or wall should be smooth, hard, and free from cracks or "dusting". If the surface is to be painted or covered with resilient floor covering, it is essential that paints or adhesives for floor coverings adhere to it. If a concrete floor has been allowed to dry from the surface before it has been properly cured, cracks are likely to develop and the surface may become "dusty". This will interfere with the application of paint or adhesives. Sometimes the surface of improperly cured concrete is improved by applying chemical "hardeners". These "hardeners" generally consist of water solutions of magnesium or zinc fluosilicate, sodium silicate, aluminum sulfate, or zinc sulfate. However, a properly finished and cured concrete slab made from the proper mix will have a satisfactory surface and the use of such "hardeners" will not be necessary.

The standard procedure for curing concrete has been the "water cure" and is simply to supply water for curing from the outside. This may be done by sprinkling, applying wet burlap, etc., or by "ponding". However, these procedures delay construction and require expensive labor. Also, it is desirable to conserve water, especially in arid sections. There is enough water already present in the concrete mix to effect curing by hydration of the cement; hense, present day construction practice is to seal in this water.

Water may be sealed in by means of waterproof paper, polyethylene film, or some other kind of waterproof sheet material. Another method which is growing in popularity is the "membrane curing" procedure, whereby a waterproof coating is applied to the moist concrete. This practice has been known for over twenty years and a number of commercial membrane curing agents are available.

In addition to chemical "hardening" and membrane curing, a concrete treatment of interest in this study is one essential to lift-slab and tilt-slab construction. This type of construction was devised about twelve years ago to save the expense of concrete forms. In lift-slab construction, upright steel I-beams are first set in footings about 30 or 40 feet apart. Special steel "collars" are placed around these steel columns to support the concrete slabs. The ground slab is poured in the normal manner and a liquid preparation is spread on the "green" concrete. This preparation acts as a membrane curing agent and also as a "parting agent" or "bond breaker". After the ground slab has cured a sufficient length of

time, another slab is poured directly over it to serve as the second floor. This second slab is treated in the same manner as the ground slab if other slabs are to be poured over it. In this manner, a multiple sandwich structure of as many as ten or more slabs is built up. Hydraulic lifting apparatus is connected to the steel "collars" in the top slab and it is slowly lifted into position to form the roof. The parting agent enables the separation of the top slab from the one beneath it. After lifting the slab into place, the steel collars are welded to the columns. The floor slabs are likewise lifted and welded in place. In tilt-slab construction, concrete slabs for walls are poured on the ground and then lifted in place. Parting agents are used to separate these from the ground slab.

2. COMPATIBILITY OF TREATED CONCRETE SURFACES WITH RESILIENT FLOOR COVERINGS

The Asphalt and Vinyl Asbestos Tile Institute has expressed the opinion that failures in resilient flooring installations on concrete floors have been traced to membrane curing agents used on the floors. The Institute Technical Research Committee met with the Portland Cement Association in January 1961 to discuss the following problems encountered with resilient tile on concrete floors that had been treated with curing agents: adherence, oozing, softening of tile, and cupping of rubber tile. There have also been reports suggesting problems with resilient flooring which might be due to parting agents. Parting agents are compositions similar to certain types of curing agents and some preparations are advertised for both purposes. It should be realized that it is impossible to base conclusions solely on field observations. Field inspections should be backed up by laboratory research.

For example, a 4-story building in Rockville was constructed a little over a year ago by the lift-slab procedure. Thompson's Water Seal was used as the parting agent on the concrete slabs. About six months after the slabs were lifted, vinyl asbestos tile was laid in most of the building. Most of the tile was laid using asphalt emulsion adhesive, but some was put down with an asphalt cut-back type mastic. A few months after the tile was laid, asphalt mastic started to ooze through the seams. Some of the tile was removed and it was observed that the adhesive was soft underneath. Most of the adhesive was scraped off and new tile installed without using any more mastic. A few months later, mastic started to ooze between the seams of the new tile. Again the tile was removed, the wet mastic scraped off and new tile installed. A few months later, mastic was still oozing between the seams of the tile. It is known in the industry that certain "hot" plasticizers in vinyl asbestos tile will cause softening and oozing of the mastic. Also, the oozing might be due to the parting agent, Thompson's Water Seal. This is a subject for laboratory investigation.

On the other hand, a number of buildings were inspected which were known to have concrete floors treated with a product known as "West Concrete Floor Treatment", manufactured by West Chemical Products, Inc. Resilient tile laid on such treated floors appeared to be in perfect condition after periods of from one to three years. The particular product used was said to be a solution of chlorinated rubber in xylene.

3. COMMERCIAL CURING AND PARTING AGENTS

Table 1 is a list of manufacturers of curing and parting agents. Part of the list was obtained from Sweet's Architectural Catalog File for 1962 and part from a recent survey disclosed in a letter to Mr. Thomas H. Boone of the Bureau from Mr. C. B. Whittelsey, Jr., Managing Director, Asphalt and Vinyl Asbestos Tile Institute. Table 2 is a list of commercial curing and parting agents, compiled from the above sources, from manufacturers' sales literature and technical data and from representatives of the manufacturers. It cannot be too strongly emphasized that these tables are based solely on information from the manufacturers and that the National Bureau of Standards is not responsible for any errors or misinformation contained therein.

TABLE 1. MANUFACTURERS OF CURING AND PARTING AGENTS
(Materials are curing agents unless otherwise specified)

The Aquabar Company Commercial Trust Building Philadelphia 2, Pennsylvania	AQUABAR DURO-SEAL CONCRETE FLOOR TREATMENT
Brown & Brown P. O. Drawer 269 Mobile, Alabama	A-500
Calbar, Incorporated 2626 N. Martha Street Philadelphia 25, Pennsylvania	CRETE-SEAL
Ceresit Corporation 3227 S. Shields Avenue Chicago 16, Illinois	CEROSEAL, COLOCURE, INDURITE, LETS GO (parting agent), SURESEAL
Chemex Industries, Inc. P. O. Box 5072 Tampa, Florida	CLEAR-TREET
Concrete Service Company 2134 Cherry Street Philadelphia 3, Pennsylvania	C-H-S FLOOR TREATMENT, CURE-SEAL
Creto Company of America, Inc. 11613 South Western Avenue Los Angeles 47, California	CRETO

Dewey & Almy Chemical Division W. R. Grace & Company 62 Whittemore Avenue Cambridge 40, Massachusetts	DARAFILM
The Euclid Chemical Company 19218 Redwood Road Cleveland 10, Ohio	EUCO FLOOR COAT, EUCO KUREZ
Guardian Chemical Company 708 Jefferson Street, N.W. Atlanta 1, Georgia Representative: Thomas E. Turner 9218 Fisk Road Richmond 29, Virginia	CLEAR BOND
A. C. Horn Companies Sun Chemical Corporation Building Materials Division East 2133 85th Street North Bergen, New Jersey Washington representative: Mr. Lee Groff JE4-3626	HORN CLEAR SEAL, HORN CURE CONCRETE CURING COMPOUNDS
Hunt Process Company, Inc. 7012 Stanford Avenue Los Angeles 1, California	HUNT PROCESS 112-TU
Imperial Chemical Company 1460 W. Hubbard Street Chicago 22, Illinois	LIFT-A-PART (parting agent)
Johnson-March Corporation 3018 Market Street Philadelphia 4, Pennsylvania	RITECURE CLEAR, RITECURE SPECIAL RITECURE WP
Kedmont Waterproofing Company 53 W. Jackson Boulevard Chicago 4, Illinois	PRESERVA-KURE-SEAL

Lambert Corporation P. O. Box 151 Houston, Texas	LAMBCO CONCRETE CURE No. 64 RESIN BASE CONCRETE CURE No. 64RB WHITE PIGMENTED CURE No. 64W BITUMINOUS BLACK CURE No. 64B NO-BOND CURE No. 64NB (Curing and parting agent)
The Master Builders Co., Division of American-Marietta Company 2490 Lee Boulevard Cleveland 18, Ohip Representative: Mr. W. E. Teuscher 6229 N. Charles Street Baltimore 12, Maryland DRexel 7-7400	MASTERKURE
McMillan Products Division The Hausman Steel Company 2411 Vinewood Avenue Detroit 16, Michigan	DEMICON CURE-HARD
W. R. Meadows, Incorporated 2 - 18 Kemball Street Elgin, Illinois	SEALTIGHT V-167-30, SEALTIGHT GILSONITE BLACK ASPHALT, SEALTIGHT CURE-HARD
Permiteco, Incorporated 1110 E. Monument Avenue Dayton 2, Ohio	PERMITE V160
The Peters Company, Div., Toledo Paint & Chemical Company 33 Blucher Street Toledo 1, Ohio	CURE-CRETE No. 200
Philadelphia Quartz Company Public Ledger Building Philadelphia 6, Pennsylvania	"O" SODIUM SILICATE
Presstite Division American-Marietta Company St. Louis 10, Missouri Write to: 600 Lairport Street El Segundo, California	TECHKOTE ANTI-BOND 200

Reardon Industries, Inc. 2837 Stanton Avenue Cincinnati 6, Ohio	DUSCURE, SURE-CURE
Sika Chemical Corporation 35 Gregory Avenue Passaic, New Jersey Tidewater District Office, Mr. Douglas Fox, District Manager 1221 Leadenhall Street Baltimore, Maryland SAratoga 7-3932	ANTISOL, SIKA HARDENER
Sonneborn Chemical and Refining Corp. 300 Park Avenue South New York 10, New York Building Products Division Washington representative: Mr. S. B. Rosenfeld 4953 St. Elmo Avenue Washington, D. C. OL2-2022, TA9-5045	HYDROCIDE CURING COMPOUND RESIN X KURE-N-SEAL
E. A. Thompson Company, Inc. (formerly By-Chemical Products Co.) Western Merchandise Mart San Francisco 3, California	THOMPSON'S WATER SEAL
Toch Bros., Inc. 521 Fifth Avenue New York 17, New York Washington representative: Mr. Tillson 4953 St. Elmo Avenue Washington 14, D. C. 652-4141	RIW CURETOX LIQUID, FLINTOX LIQUID, SEALKURE, TOXKURE
The Tremco Manufacturing Company 10701 Shaker Boulevard Cleveland 4, Ohio	TREMCRETE
Tretol, Inc., Division of Servicised Products Corporation 7252 West 66th Street Chicago 38, Illinois	DEKOTE T130

Truscon Laboratories
Industrial Maintenance Division
Devoe & Raynolds Company, Inc.
1700 Caniff Street
Detroit 11, Michigan
P. O. Box 9263, Rosslyn Station
Arlington 9, Virginia
Sales representative:
Frank J. Hasse
RE7-2374

AGATEX, TRU-SEAL, TRU-CURE

The Upco Company
4801-17 Lexington Avenue
Cleveland 3, Ohio
Manufacturer's agent:
A. Albert Pack, Jr.
14800 Maydale Court
Silver Spring, Maryland
EVergreen 4-9474

CURECOTE (CURECOAT), POLYCLEAR,
UPCO PARAFILM

Wall Products, Inc.
6 Honiss Street
Belleville 7, New Jersey
(See Tretol, Inc., parent company)

KLEARCURE #10 and #30

West Chemical Products, Inc.
42-16 West Street
Long Island City 1, New York
Washington representative:
Don E. Killgore
412 Fifth Street, N.W.
NA8-1820

WEST CONCRETE FLOOR TREATMENT
WESTCURE
WEST BOND BREAKER (Parting agent)

George W. Whiteside Company
31st and Michigan Drive
Louisville 12, Kentucky

AQUASTATIC CONCRETE CURING COMPOUND

TABLE 2.

CURING AND PARTING AGENTS, 6 April 1962.

(Materials are membrane-forming curing agents unless otherwise specified)

Trade Name	Manufacturer	Type	Compatible with Paints	Compatible with Floor Covering
A-500	Brown & Brown	Unknown	Unknown	Yes
AGATEX	Truscon Laboratories	Unknown	Unknown	Unknown
ANTI-BOND (TECHKOTE ANTI-BOND)				
ANTISOL	Sika Chemical Corp.	Unknown	Disintegrates	
AQUABAR DURO-SEAL	The Aquabar Company	Rubber Base	Unknown	Yes
AQUASTATIC CONCRETE CURING COMPOUND	George W. Whiteside Co.	Resin Base	with non-aqueous adhesives probably not	
CEROSEAL	Ceresit Corporation	Sodium silicate hardener		
C-H-S FLOOR TREATMENT	Concrete Service Co.	Synthetic Rubber Base	Unknown	Yes
CLEAR BOND	Guardian Chemical Co.	Resin Base	Yes	Yes
CLEAR SEAL (HORN CLEAR SEAL)				
CLEAR-TREET	Chemex Industries, Inc.	Unknown	Yes	Yes
COLOCURE	Ceresit Corporation	Rubber Base	Unknown	Yes
CRETO	Creto Co. of America, Inc.	Unknown	Unknown	
CRETE-SEAL	Calbar, Inc.	Probably Resin Base	Disintegrates	
CURECOTE (CURECOAT)	The Upco Company	Resin and Wax Base	Disintegrates	
CURE-CRETE No. 200	The Peters Company	Contains no waxes	Yes	Yes
CURE-HARD (DEMICON CURE-HARD)				
CURE-SEAL	Concrete Service Co.	Synthetic Resin	Yes	Yes
CURETOX LIQUID (RIW CURETOX LIQUID)				
DARAFILM	Dewey & Almy	Resin and Wax Base	Must be removed	
		Resin Base	Unknown	
DEKOTE T130	Tretol, Inc.	Chlorinated Rubber Base	Yes	
DEMICON CURE-HARD	McMillan Products Div.	Sodium silicate hardener	Probably not	
DURO-SEAL (AQUABAR DURO-SEAL)				
DUSCURE	Reardon Industries, Inc.	Powder	Must be swept off	
EUCO FLOOR COAT	The Euclid Chemical Co.	Chlorinated rubber, Chlorinated resins, and plasticizers	Unknown	Yes

Trade Name	Manufacturer	Type	Compatible with Paints	Compatible with Floor Coverings
EUCO FLOOR HARDENER CRYSTALS (OXALIN)				
EUCO KUREZ	The Euclid Chemical Co.	Resin Base	Yes	Yes
		Paraffin Base	No	
		Wax-resin Base	No	
		White pigmented (wax, resin; pigment)	No	
FLINTOX LIQUID (RIW FLINTOX LIQUID)				
HORN CLEAR SEAL	A. C. Horn Chemical Cos.	Unknown	Yes	Yes
HORNCURE 30D and C	A. C. Horn Chemical Cos.	100% Resin Base	Must be removed by floor machine	
40W - White Pigmented Curing Compound		Wax, Resin, Pigment	No	
50D and C; 60D and C		Wax and Resin Base	No	
HUNT PROCESS #112-TU	Hunt Process Co., Inc.	Unknown	Disintegrates	
HYDROCIDE CURING COMPOUND RESIN X	Sonneborn Chemical and Refining Corp.	Plasticized Resin Base	Must wear off or be removed with stiff brush	
INDURITE	Ceresit Corporation	Chemical hardener Mg + Zn fluosilicate	Unknown	
KLEARCURE #10 and #30	Wall Products, Inc.	Resin Base	Unknown	Yes
KUREZ (EUCO KUREZ)				
KURE-N-SEAL	Sonneborn Chemical and Refining Corp.	Chlorinated Rubber Base	Yes	Yes
LAMBCO	Lambert Corporation			
BITUMINOUS BLACK CURE No. 64B		Asphalt Basé and organic solvent	For asphalt coatings or adhesives	
CONCRETE CURE No. 64		Wax and Resin Base	Disintegrates	
NO-BOND CURE No. 64NB (Curing and Parting Agent)		Probably wax and Resin Base - Unknown	Disintegrates	
RESIN BASE CONCRETE CURE No. 64RB		Resin Base	Yes	Yes
WHITE PIGMENTED CURE No. 64W		Wax, Resin, and Pigment Base	Disintegrates	
LETS GO (parting agent)	Ceresit Corporation	Wax-free	Must be removed by washing	

Trade Name	Manufacturer	Type	Compatible with Paints	Compatible with Floor Coverings
LIFT-A-PART (parting agent)	Imperial Chemical Co.	Unknown	Must be removed	
MASTERKURE	The Master Builders Co.	Resin Base	Not recommended	
"O" SODIUM SILICATE	Philadelphia Quartz Co.	Sodium silicate hardener	Probably not	
OXALIN	The Euclid Chemical Co.	Unknown	Unknown	
PARAFILM (UPCO PARAFILM)				
PERMITE V160	Permiteco, Inc.	Unknown		Unknown
POLYCLEAR	The Upco Company	Resin and Plasticizer	Yes	Yes
PRESERVA-KURE SEAL	Kedmont Waterproofing Co.	Synthetic Resin Base		Unknown
RESIN X (HYDROCIDE CURING COMPOUND RESIN X)				
RITECURE CLEAR	Johnson-March Corp.	No wax	Unknown	Yes
SPECIAL		No wax	Unknown	Yes
WP		No wax	Unknown	Yes
RIW CURETOX LIQUID	Toch Bros., Inc.	Unknown Membrane Curing Compound	Unknown	Yes
FLINTOX LIQUID		Chemical Hardener containing "Fluorox"		Unknown
SEALKURE		Chlorinated Rubber Base	Unknown	Yes
TOXKURE		Unknown		Unknown
SEALKURE (RIW SEALKURE)				
SEALTIGHT CURE-HARD	W. R. Meadows Co.	Sodium silicate hardener	Probably not	
GILSONITE BLACK ASPHALT		Asphaltic curing compound	For asphalt coatings	
V167-30		100% Resin Base		Unknown
SIKA HARDENER	Sika Chemical Corp.	Fluosilicate hardener		Unknown
SURE-CURE	Reardon Industries, Inc.	Pure Resin	Unknown	Yes
SURESEAL	Ceresit Corp.	Pure Resin	Must be removed	
		Wax Resin	Probably not	
		White pigmented wax-resin	Probably not	
TECHKOTE ANTI-BOND	Presstite Div.	Wax-free	Yes	Yes
THOMPSON'S WATER SEAL (curing and parting agent)	E. A. Thompson Co., Inc.	Unknown	Probably not although claimed to be	
TOXKURE (RIW TOXKURE)				
TREMCRETE	The Tremco Mfg. Co.	Chlorinated natural rubber, alkyd-type resin, and plasticizer	Unknown	If mastic does not contain a solvent which softens the Tremcrete film
TRUCURE	Truscon Laboratories	Unknown	No	No

Trade Name	Manufacturer	Type	Compatible with Paints	Compatible with Floor Coverings
TRU-SEAL	Truscon Laboratories	Unknown	Yes	Yes
UPCO PARAFILM	The Upco Company	Rubber Base	Unknown	Unknown
WATER SEAL (THOMPSON'S WATER SEAL)				
WEST BOND BREAKER (parting agent)	West Chemical Products, Inc.	No waxes or silicones		Probably not
WEST CONCRETE FLOOR TREATMENT	West Chemical Products, Inc.	Chlorinated rubber in xylene	Yes	Yes
WESTCURE	West Chemical Products, Inc.	Plasticized resin base	Yes	Yes

While the information in Table 2 is incomplete, a study of this table leads to Tables 3, 4, 5 and 6.

TABLE 3. MEMBRANE CURING AGENTS COMPATIBLE WITH PAINTS, WITHOUT REMOVAL

Chlorinated rubber base materials: KURE-N-SEAL, WEST CONCRETE FLOOR TREATMENT.

Resin base materials: CLEAR BOND, CURE-SEAL, EUCO KUREZ, LAMBCO RESIN BASE CONCRETE CURE No. 64RB, POLYCLEAR, WESTCURE

Composition not revealed by manufacturer ("unknown"): CLEAR-TREET, CURE-CRETE (contains no waxes), HORN CLEAR SEAL, TECHKOTE ANTI-BOND (contains no waxes), TRU-SEAL.

TABLE 4. MEMBRANE CURING AGENTS COMPATIBLE WITH RESILIENT FLOOR COVERING WITHOUT REMOVAL.

Chlorinated rubber base: AQUABAR DURO-SEAL, C-H-S FLOOR TREATMENT, KURE-N-SEAL, RIW SEALKURE, and WEST CONCRETE FLOOR TREATMENT

Resin base: CLEAR BOND, CURE-SEAL, EUCO KUREZ, LAMBCO RESIN BASE CONCRETE CURE No. 64RB, POLYCLEAR, SURE-CURE, and WESTCURE

Composition not revealed by manufacturer ("unknown"): CLEAR-TREET, CURE-CRETE No. 200 (contains no waxes), HORN CLEAR SEAL, RITECURE CLEAR, SPECIAL, and WP (contains no waxes), TECHKOTE ANTI-BOND (contains no waxes), and TRU-SEAL.

TABLE 5. MEMBRANE CURING AGENTS NOT COMPATIBLE WITH PAINTS OR WITH RESILIENT FLOOR COVERINGS.

Paraffin base: EUCO KUREZ (paraffin base)

Wax-resin base: EUCO KUREZ (wax-resin or white pigmented base), HORNCURE 40W, 50D and C, 60D and C

TABLE 6. MEMBRANE CURING AGENTS WHICH DISINTEGRATE OR WHICH MUST BE REMOVED BEFORE APPLYING PAINTS OR RESILIENT FLOOR COVERINGS.

Resin base: CRETE-SEAL, HORNCURE 30D and C, HYDROCIDE CURING COMPOUND RESIN X

Wax-resin base: CURECOTE, DARAFILM, LAMBCO CONCRETE CURE No. 64, LAMBCO WHITE PIGMENTED CURE No. 64W, SURESEAL

4. CONCLUSIONS

From the information obtained from the manufacturers of curing and parting compounds, it seems obvious that paints and resilient floor coverings cannot be applied over any such compounds which contain waxes. However, it is claimed that some wax-resin compositions will disintegrate or can be removed without sandblasting or grinding. Some resin base curing agents are compatible with paints and resilient floor coverings and some are not. Chlorinated rubber base membrane curing compounds appear to be satisfactory as a base for paints or resilient floor coverings.

The compatibility of chlorinated rubber base membrane curing agents with paints and resilient tile is corroborated by the inspection of buildings mentioned earlier in this report and also on information from the Research and Development Laboratories of Armstrong Cork Company. Armstrong Cork Company also have observed the incompatibility of agents containing waxes. However, according to adhesion tests by Armstrong Cork Company, asphaltic adhesives can be used with any type of curing compound.

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U. S. DEPARTMENT OF COMMERCE
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NATIONAL BUREAU OF STANDARDS
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