



EPON ADHESIVE STUDIES

Subject No. 16500

EPON RESINS AND OTHER POLYEPOXIDES

Technical Report No. 42-55

This report is based on work through December, 1954

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Approval : D. W. Elam
Reference : Laboratory Record No. 2398,
pp. 5-24, 26-93, 101-115,
118-119, 124, 2625 pp. 9-10,
12-14, 16, 19-20, 22-23, 26,
32, 34-35, 37, 39-40, 47, 49,
57, 62, 72

PARTICIPANTS

OBJECT
OF WORK

John Zivic & Margaret Raps.

Formula
#

Compounds

WT.

CURE:

1

Tare 10.6

3-1 : 30 min. @ 240°F (116°C)

Epon 828

10.0

31.9 30 min. @ 330°F (165°C)

20.6

Ch {M-phenylene-} Re-
diamine {cavoyl-} diamine

1.5

disc. @ 110°F-130°F

22.0

asbestos

3.0

25.0

2

Tare 10.4

32.8 30 min. @ 330°F (166°C)

Epon 828

10.0

Curing code for "Z" series

20.4

F 1/2 hr @ 240°F + 1/2 hr @ 330°F

quanylurea

.6

G 1/2 hr @ 240°F

21.0

H 1 hr @ 240°F

asbestos

3.0

J 1/2 hr @ 330°F

K 1 hr @ 330°F

X 1/2 hr @ 345°F

24.0

3

Tare

10.4

33.8 1/2 hr @ 330°F

Epon 828

10.0

20.4

disc. 135°-165°F

2-6

diaminopyridine

1.5

21.9

asbestos

3.0

24.9

4

Tare

10.4

34.8 : 30 min @ 330°F

Epon 828

10.0

20.4

Sodium

phenylcarbamate

1.0

21.4

asbestos

3.0

24.4

12/23/53 John J. Zivic

ABS-019462

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

John Zivic and Margaret Zivic

OBJECT
OF WORKNormal
#

5

Tare

10.4

35 g: 30 min @ 240°F

Novon (2276-44)

5.0

35 g: 30 min @ 330°F

15.4

Novon (2276-56)

5.0

20.4

Dens. @ 115°-135°F

CL

1.5

21.9

Asbestos

3.0

24.9

6

Tare

10.2

36 g: 30 min @ 240°F

Novon (2276-74)

10.0

36 g: 30 min @ 330°F

20.2

Dens. 115°-135°F

CL

1.5

21.7

Asbestos

3.0

24.7

7

Tare

10.8

37 30 min @ 240°F

Novon (2276-52)

5.0

37-1/2 hr @ 330°F

15.8

Epon 834

5.0

Dens. 120°F-

20.8

140°F

CL

1.5

22.3

Asbestos

3.0

25.3

12/23/53

John Zivic

ABS-019463

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO 2398

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

7

PARTICIPANTS

John Zure and Margaret Zure

OBJECT
OF WORKFormula
#

Tare

10.4

conc: 3.8 g: 1/2 lb @ 165°C (330°F)

8

Norton

2276-
74

10.0

20.4

Dicey

.6

21.0

Asbestos

3.0

24.0

9

Tare

10.5

Norton 2276-
74

10.0

20.5

Sodium phenyl-
cyanamide

1.0

21.5

Asbestos

3.0

24.5

John S. Zure 12/30/53

ABS-019464

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

OBJECT
OF WORK

John S. Zure and Margaret Hape

Formed
+

13

Tare

10.3

Cure: Z13J : 1/2 hr @ 330°F

Novon

2276-72

10.0

Z13K 1 hr @ 330°F

20.3

Dicy

1.0

21.3

Asbestos

3.0

24.3

14

Tare

~~10.3~~ 10.1

Z14X 1/2 hr @ 345°F (175°C)

Novon

2276-72

~~8.0~~ 6.0~~14.3~~ 16.1

Dicy

1.0

17.1

Asbestos

3.0

20.1

4:00-4:15 - sample is very tacky while working on panel.

15

Tare

10.4

Z15J 1/2 hr @ 330°F

Novon

2276-72

6.0

16.4

Epon 834

4.0

20.4

Dicy

1.0

21.4

Asbestos

3.0

24.4

16

Tare

10.5

Z16J : 1/2 hr @ 330°F

Epon 834

4.0

Dummen

14.5

1.5

Novon 2276-72

16.0

Asbestos

22.0

Dicy

3.0

25.0

1.0

26.0

Tacky after 24 hrs.

ABS-019465

John S. Zure 1/4/54

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO

2398

PARTICIPANTS

OBJECT
OF WORK

John S. Zirc and Margaret Trapp

17

Tare

10.4

cure: 3 17 1/2 hr @ 240°F

Epon 828 }
Epon 834 }

10.0

3 17 1/2 hr @ 330°F

20.4

CL

1.5

10:00-12:00 good spread; 2:00 stiff open

21.9

sample did not set up after 24 hrs.

asbestos

3.0

24.9

CL soluble in H₂O.

18

Tare

10.5

cure: 3 18 1/2 hr @ 330°F

Epon 828 }
Epon 834 }

10.0

20.5

SPREAD Tackness Stamps

10:00 good none none

10:30 " " "

11:00 fair some some

11:30 " " "

12:00 " EXTENSIVE CORROSION

1:00 POOR IN RIB

2,6
Dianinopyridine

1.5

22.0

asbestos

3.0

25.0

1:30 stiff stiff stiff

spreadable after 24 hrs.

19

Tare

10.4

1) 3 19F: 1/2 hr @ 240°F + 1/2 hr @ 330°F

Epon 834 }
Epon 828 }

10.0

2) 3 19F 1/2 hr @ 330°F

20.4

squeeze and tacky on panel (1)

Diex

.6

additional cure 1/2 hr @ 330°F

21.0

asbestos

3.0

24.0

spreadable after 24 hrs.

John S. Zirc 1/5/54

ABS-019466

John S. Zivic and Margaret Raper

OBJECT OF WORK

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

NO.		54-16500		REFERENCE		11	
PARTICIPANTS		John S. Zivic and M. Rapp					
OBJECT OF WORK							
Formaldehyde							
23	Tare	10.5		Cure: 323 F, 1/2 hr @ 240°F			
	Epon 828	11.0		323 F, 1/2 hr @ 240°F + 1/2 hr			
	Epon 1009	21.5		at 330°F			
	CL	1.5		TIME	SPREAD	Tack	Strings
		23.0		2:00	excellent	none	none
				2:30	✓	✓	✓
	Paraform 100" mesh	.2		3:00	good	some	beginning
		23.2		3:30	✓	✓	✓
				4:00	fair	definite	yes
				4:30	✓	✓	✓
	Asbestos	3.0					
		26.2					
18	Tare	10.7		Cure: 318 F, 1/2 hr @ 345°F (175°C)			
	Epon 828	10.0		TIME	SPREAD	Tack	Strings
	Epon 834	20.7		3:00	good	none	none
				4:00	✓	✓	✓
	2.6 di-aminopyridine	1.5		4:30	✓	✓	✓
		22.2		overate	✓	✓	✓
	Asbestos	3.0					
		25.2					
John S. Zivic 1/6/54							
24	Tare	28.9		Cure: 324 F, 1/2 hr @ 240°F			
	CL (phenol formaldehyde resin soln.)	1.5		324 F, 1 hr @ 240°F			
		30.4					
	LR 1537-820 phenol formaldehyde resin solution	1.5					
		31.9					
	Epon 828	10.0					
		41.9					
	Asbestos	3.0					
		44.9					

1/7/54 John Zivic

ABS-019468

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

J. Zirc and M. Raps.

OBJECT
OF WORK

Formula #				
	Tare	10.2		Cure: } 25 g 1/2 hr @ 240°F
25	Epon 828 ^(Lot 46. 58-77B)	10.0	mix in hot H ₂ O bath	3 25H 1 hr @ 240°F
	add previous Epon 828 incl.	20.2		
	CL (cure from Hopper)	1.5		
		21.7		CL (cure) went into solution
	Asbestos	3.0		readily once in H ₂ O bath.
		24.7		Some small CL particles showed on spreading - smooth spread.
26	Tare	10.3		
	Epon 828	10.0	hot H ₂ O bath	3 26 g 1/2 hr @ 240°F
		20.3		3 26H 1 hr @ 240°F
	CL (cure)	1.5		
		21.8		
	glacial acetic acid	.4	on add. of glacial ac. acid mix seemed to thicken slightly	
		22.2		
	Asbestos	3.0		
		25.2		
27	Tare	10.5		Cure: } 27 g 1/2 hr @ 240°F
	Epon 828	10.0		3 27H 1 hr @ 240°F
		20.5		
	CL (cure)	1.5		
		22.0		
	Thiolacetic acid	.5		
		22.5		
	Asbestos	3.0		
		25.5		

1/8/54

John Zirc

ABS-019469

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR N° 2398

PARTICIPANTS

John S. Zivic & Margaret Raps

OBJECT
OF WORKFormula
#

28

Tare:

10.2

Cure: 3 28H 1/2 hr @ 240°F
3 28H 1 hr @ 240°F

Epon 828

10.0

wax

20.4

H₂O
bath

CL (crude)

1.5

21.9

Boric acid

.4

22.3

Asbestos

3.0

25.3

29

Tare

10.2

Cure: 3 28H 1/2 hr @ 240°F
3 28H 1 hr @ 240°F

Epon 828

10.0

H₂O

20.2

H₂O

CL (crude)

1.5

bath

21.7

Zinc sulfide^{100°} Mesh

.4

22.1

Asbestos

3.0

25.1

30

Tare

10.2

Cure: 3 28H 1/2 hr @ 240°F
3 28H 1 hr @ 240°F

Epon 828

10.0

H₂O

20.2

H₂O

CL (crude)

1.5

bath

21.7

Thiocresol (ground)

.4

22.1

Asbestos

3.0

25.1

1/8/54 John S. Zivic

ABS-019470

PARTICIPANTS

John J. Zivic & Margaret Zivic

OBJECT
OF WORKFormula
#

31

Tare

10.5

CL (candle)

1.5

12.0

Hot
H₂O
bath

Cure: 3 31 1/2 hr @ 240°F

3 31 1 hr @ 240°F

phosphor 5023

1.5

13.5

Epon 828 ^{lot #} 58-778

10.0

23.5

Asbestos

3.0

26.5

TIME SPREAD Tack. Strings

11:30 good none none

12:00 - - -

12:30 fair little begin.

1:00 poor return ype, harden.

1:30

32

Tare

10.4

Epon 828

10.0

20.4

CL (candle)

1.5

21.9

Basic lead carbonate

.4

22.3

Asbestos

3.0

25.3

Cure: 3 32 1/2 hr @ 240°F

3 32 1 hr @ 240°F

TIME SPREAD Tack Strings

1:30 EXCELLENT NO NO

2:00 - - -

2:30 - - -

3:00 - - -

3:30 - - -

4:00 - - -

4:30 - - -

on-site not spreadable -

semi-hard.

33

Tare

10.4

Epon 828

10.0

20.4

CL crude

1.0

21.4

Asbestos

3.0

24.4

Cure: 3 33 1/2 hr @ 240°F

3 33 1 hr @ 240°F

TIME SPREAD Tack Strings

2:00 Excellent None None

2:30 - - -

3:00 - - -

3:30 - - -

4:00 - - -

4:30 - - -

5:00 - - -

✓ on-site mix. is spreadable.

11/12/54

John J. Zivic

ABS-019471

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR N° 2398

PARTICIPANTS

OBJECT
OF WORK

John S. Zivie and M. E. Hays

Formula
#

34	Tare	10.1	Cure: 334 1/2 hr @ 240°F
	Epon 828	10.0	334 1 hr @ 240°F
	ASTM 58-778	20.1	
	CL (crude)	1.2	TIME SPREAD Tack. Strings
		21.3	2:30 Excellent none none
	Asbestos	3.0	3:00 " " "
		24.3	3:30 " " "
			4:00 " " "
			4:30 " " "

overnite spreadable

35	Tare	10.3	Cure: 335 1/2 hr @ 240°F
	Epon 828	10.0	335 1 hr @ 240°F
		20.3	TIME SPREAD Tack. Strings
	CL Crude	1.4	3:00 Excellent none none
		21.7	3:30 " " "
			4:00 " " "
	Asbestos	3.0	4:30 " " "
		24.7	5:00 " " "

overnite: sample spreadable.

36	Tare	10.7	Cure: 336 1/2 hr @ 240°F
	Epon 828	10.0	336 1 hr @ 240°F
		20.7	
	CL (crude)	1.6	TIME SPREAD Tack. Strings
		22.3	3:30 Excellent none none
	Asbestos	3.0	4:00 " " "
		25.3	4:30 " " "
			5:00 " " "

overnite - spreadable

1/12/54 John S. Zivie

ABS-019472

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

OBJECT
OF WORK

John Zivic and M. Nape

Formula
#

37	Tare	10.7	Cure: 337 1/2 hr @ 240°F
	Epon 828 [58-77B]	10.0	3,37 1 hr @ 240°F
		20.7	
	CL (Cande)	1.8	TIME SPREAD Tack. strings
		22.5	9:30 excellent moderate none
	Asbestos	3.0	10:00 ✓ ✓ ✓
		25.5	10:30 ✓ ✓ ✓
			11:00 ✓ ✓ ✓
			11:30 ✓ ✓ ✓
			12:00 ✓ ✓ ✓
			1:00 ✓ ✓ ✓
			2:00 ✓ ✓ ✓
			3:00 ✓ ✓ ✓
22	Tare	10.4	
	Epon 828	11.0	Cure: 322 1 hr @ 240°F
	1009	21.4	322 1/2 hr @ 240°F + 1/2 hr @ 320°F
	CL	1.5	TIME SPREAD Tack. strings
		22.9	12:30 POOR CONSIDER. YES YES
	Formvar 9/95M	2.0	1:00 ✓ ✓ ✓
	100 Mesh	24.9	1:30 ✓ ✓ ✓
	Asbestos	3.0	
		27.9	
38	Tare	10.3	
	Epon 828 [Lat # 92-102A]	10.0	Cure: 338H 1 hr @ 240°F
		20.3	338 1/2 hr @ 240°F + 1/2 hr @ 330°F
	CL crude	1.5	
		21.8	TIME SPREAD Tack. strings
	Formvar 9/95M	2.0	3:30 POOR CONSIDER- SOME
	100 Mesh	23.8	4:00 ✓ ✓ YES
	Asbestos	3.0	
		26.8	Very poor spreading qualities

1/13/54 John S. Zivic

ABS-019473

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

IR NO

2206

INVESTIGATION
NO.CROSS
REFERENCE

PARTICIPANTS

OBJECT
OF WORK

54-16500

John J. Zure & Margaret Naps

Formula
#

42	Tare	10.5	Cure:	3 42*F 1/2 hr @ 240°F +			
	Formvar ^{9/16" E"} 200" M	.8		1/2 hr @ 330°F.			
		11.3					
	Epon 828 ^(92102 M)	2.0					
		13.3					
	CL (encl)	.3					
		13.6					
	asbestos	.1					
		13.7					
	Paraform	.04					
		13.74					
43	Tare	10.5	Cure:	3 43*F 1/2 hr @ 240°F +			
	Epon 828	10.0		1/2 hr @ 330°F.			
		20.5					
	CL (recryst)	1.5	Time	SPACED	Tack.	strings.	
		22.0	1:00	slight thickness exceeded	slight	none	Bend prop. are fair.
	bisphenol	.4	1:30	✓	✓	✓	Not life 2 1/2 hrs
		22.4	2:00	✓	✓	✓	
	Formvar ^{9/16" E"} 200" M	4.0	2:30	✓	✓	✓	
		26.4	3:00	✓	✓	✓	
	Asbestos	.5	3:30	✓	✓	✓	
		26.9	4:00	✓	✓	✓	
44	Tare	10.5	3 44*F 1/2 hr @ 240°F +				
	CL (recryst)	1.5	1/2 hr @ 330°F.				
		12.0	Time	SPREAD	Tack.	strings	
	Epon 828	10.0	2:30	Excellent	slight	none	
		22.0	3:00	✓	✓	✓	
	zinc sulfide	.4	3:30	✓	✓	✓	
		22.4	4:00	✓	✓	✓	
	Asbestos	.6					
		25.4					

1/15/54 John Giese

ABS-019475

1/15/54 John J. Zure

ABS-019475

PARTICIPANTS

OBJECT
OF WORK

54-16500

John J. Zirc and Margaret Flaps

Formula
#

456 Talc

10.7

Cum. 345°F 1/2 hr @ 240°F +

Epm 828 (92-112A)

10.0

1/2 hr @ 330°F

20.7

Liquid Hycar

4.0

Time spread Thick. Strings.

24.3

2:30

slightly
thick -
excellent

slight none

CL (rempch)

1.5

3:00

✓

✓

✓

25.8

3:30

✓

✓

✓

S

.2

4:00

✓

✓

✓

26.0

4:30

✓

✓

✓

Curing dispersion

.3

5:00

✓

✓

✓

26.3

Creamy paste, quite dry - no
asbestos used.

asbestos

3.0

29.3

465 Talc

10.3

10.7

3 46°F 1/2 hr @ 240°F +

Epm 828

10.0

5.0

1/2 hr @ 330°F

20.3

15.7

Liquid Hycar

4.0

Creamy paste, quite dry
no asbestos used.

24.3

CL

.8

16.5

Zn S

.2

Time spread Thick. Strings

4:00

excellent

slight

none

16.7

4:30

✓

✓

✓

Hycar 5042

2.0

5:00

✓

✓

✓

18.7

1/15/54 John J. Zirc

ABS-019476

PARTICIPANTS

John Zivie and M. Taps

OBJECT
OF WORK

Form-1A

47

Tare

10.2

Cure: 347F $\frac{1}{2}$ hr @ 240°F +
 $\frac{1}{2}$ hr @ 330°F.Epon 828 ^{LATA} 92-102A

10.0

20.2

NOT IN
BATH

TIME SPREAD TACK. STIRring

CL (recryst.)

1.5

4:00 GOOD NO NO

21.7

4:30 ✓ ✓ -

Basic lead carbonate ^(9rd)

.4

5:00 - - -

22.1

Formvar ^{15/95} E*

4.0

Initially
Adhesion more fluid than
one without piperidine.
Good bend properties

26.1

piperidine

.4

1/18/54 John J. Zivie

26.5

48

Tare

10.4

Cure: 348F $\frac{3}{4}$ hr @ 240°F +
 $\frac{1}{2}$ hr @ 330°F.

Epon 828

10.0

20.4

Initially
Adhesion more fluid than
formula #47. spreading
qualities are excellent.Bisphenol ^{9rd.}

.4

20.8

CL (recryst.)

1.5

22.3

Basic lead carbonate

.4

22.7

Formvar

4.0

26.7

Piperidine

.5

27.2

TIME SPREAD TACK. STIRring

10:00 EXCELLENT STONE NONE

10:30 Thickening ✓ ✓

11:00 mod. Thickening begin beginning

11:30 ✓ ✓ Mod. Mod.

12:00 EX- EXTREME considerably

12:30 SPREADABLE -

1:00 hardened -

Pot life about 2 hours.

Very good bend properties.

1/19/54 John J. Zivie

ABS-019477

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO 2398

PARTICIPANTS

OBJECT
OF WORK

John J. Zivic and M. Hays

Formula
#

49 Tare 10.5 Cure: 349F $\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°F.
Epon 828 Lot # 92-222A 10.0

20.5 Mix turned black upon addition of pyridine.
CL (recryst) 1.5

pyridine (CNS) $\frac{1}{2}$ 22.0
2.4

asbestos 3.0

25.4

TIME SPREAD TACK STRING
11:00 thin-good none none

11:30 ✓ ✓ ✓

12:00 ✓ ✓ ✓

12:30 ✓ ✓ ✓

1:00 ✓ ✓ ✓

1:30 ✓ ✓ ✓

2:00 slight very

3:00 thickening slight ✓

3:30 ✓ ✓ ✓

Initial prep. very thin - long spread

Fair bend properties Pot life $\frac{1}{2}$ hr.

4:00 ✓ ✓ ✓

5:00 ✓ ✓ ✓

50 Tare 10.4 349F $\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°F.
Epon 828 10.0

20.4

CL (recryst) 1.5

21.9

Zn S 4

22.3

formvar $\frac{1}{15}$ 200° M/h 2.0

24.3

asbestos 2.0

26.3

Mixture is thixotropic.

Epon & CL were heated once

H₂O bath. Zn S added;

heated; Zn S dispersed

better with heat or was

hidden better in the mouth-

ing mixture.

TIME SPREAD TACK STRING
2:30 Mod. thick EXCELLENT none none

3:00 ✓ ✓ ✓

3:30 ✓ ✓ ✓

4:00 ✓ ✓ ✓

4:30 ✓ ✓ ✓

5:00 ✓ ✓ ✓

Bend properties poor.

Pot life $\frac{1}{2}$ hr.

1/19/54 John J. Zivic

ABS-019478

-PARTICIPANTS

John S. Zirc and M. Hape

OBJECT
OF WORKFormula
#

51	Tare		10.2		351KF $\frac{1}{2}$ lb @ 240°F +
	Epon 828	Lot 92-102A	10.0		$\frac{1}{2}$ lb @ 330°F
			20.2		
	CL (recryst)		1.5		Mixture is thixotropic.
			21.7		Same prep. followed as
	Zn S		.4		Formula 50. Close relation-
			22.1		ship in consistency rated.
	Formvar	15/95 $\frac{1}{2}$ " 200 mesh	3.0		
			25.1		
	Asbestos		2.0		
			27.1		

TIME	SPREAD	TACK.	STRAINGS
3:30	Med. Thick	None	None
4:00	Excellent	None	None
4:30	-	-	-
5:00	-	-	-

Bend Properties Poor 1/19/54 John S. Zirc

52	Tare		19.7	10.4	
	Epon 828	(1)	10.0	10.0	352F $\frac{1}{2}$ lb @ 240°F +
			20.7	20.4	$\frac{1}{2}$ lb @ 330°F
	CL (recryst)	(3)	1.5	1.5	
			22.2	21.9	Mixture is thixotropic.
	Bisphenol	(2)	.4	.4	Initial prep. and
			22.6	22.3	thickness - spreads well.
	basic lead Carbonate	(4)	.4	.4	
			23.0	22.7	
	Formvar	9/95 $\frac{1}{2}$ " 200 M.	4.0		
			26.7		
	glycerin Carbonate		.5		
			27.2		

TIME	SPREAD	TACKINESS	STRAINGS
11:30	Med. Thick	None	None
12:00	Excellent	-	-
12:30	-	-	-
1:00	-	-	-
1:30	-	-	-
2:00	Stiffening	init.	begin.
2:30	Stiffened	-	-
3:00	-	-	-
4:00	-	-	-
5:00	-	-	-

Bot life low - 3 1/2 hrs.

Very poor bend properties

1/20/54 John S. Zirc

ABS-019479

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO 2398

PARTICIPANTS

John Zirc & M. Nepe

OBJECT
OF WORKFormula
#

53

Tare

10.1

Epon 828

10.0

20.1

Bisphenol A (90%)

4

20.5

Water

2

20.7

basic lead Carbonate

4

21.1

CL (recryst)

1.5

22.6

Dormvac

4.0

26.6

54

Tare

10.2

Epon 828

10.0

20.2

CL (recryst)

1.5

21.7

Bisphenol A

4

22.1

Zn S

4

22.5

Dormvac

15/95 E
200" M.

2.0

24.5

Asbestos

2.0

26.5

(F with 250 - effect of BPA

Fair bend properties

1/20/54 John S. Zirc

353F 1/2 hr @ 240°F +
1/2 hr @ 330°F

TIME SPREAD Tack. Strings

1:30 Medium Thickness Good None None

2:00 - - - -

2:30 - - - -

3:00 Thickening Begun YES

3:30 - - - -

4:00 - - - -

4:30 semi-hard - -

5:00 hard - -

Mixture is thixotropic.

Initial spreading qualities
are excellent.Fair bend prop. Pot life
approx. 2 1/2 hrs.

354F 1/2 hr @ 240°F +

1/2 hr @ 330°F.

Thixotropic mixture.

Init. mixture more fluid
than For. #53 + 50. Spreading
qualities very good.

TIME SPREAD Tack. Strings

3:00 MOD. Thick None None

3:30 - - - -

4:00 - - - -

4:30 - - - -

5:00 semi-hard Yes yes

Pot life 2 1/2 hrs.

ABS-019480

PARTICIPANTS

OBJECT OF WORK

John Zivice and Marguerite Zivice

Formula #

Repeat -
O.H. (X)

55 Tare

10.1

10.4

365F 1/2 hr @ 240°

Epon 828

10.0

10.0

1/2 hr @ 230°F

20.1

20.4

Paraplex 660

.5

.5

Thixotropic - initially

20.6

20.9

spreads very good -

CL (unsp.)

1.5

1.5

smooth. Pot life is approx.

22.1

22.4

3 1/2 hours.

Basic lead
Carbonate

.46

.4

22.6

22.8

Buphenol A

.4

.4

Time SPREAD TACK. STRINGS

23.8

23.2

1:30

BPA Tack

Tack

none

2:00

2:30

2:30

Tack

Tack

none

4.0

4.0

3:00

Tack

Tack

none

27.3

27.2

4:00

THICKENING

INITIAL

beginning

5:00

Tack

Tack

12/15/54 John S. Zivice

Effect of emps listed below on Douglas peach prime coating

(1) Adhesive VIII

Cure: 90 min @ 95°C

(2) Epon 828

(3) 12g AYAF + 12g AGE 11. Elvacet 40-15/AGE

(4) Epon 828 + 8 phr DEAPA (Curing Agent A)

Tare 68.6

Tare 10.2

AYAF 12.0

Epon 828 10

80.6

20.2

SCALE
Correct 50.0

DEAPA .9

21.0

AGE 30.6

DEAPA 12.0

+2.6

1/25/54 John S. Zivice

ABS-019481

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO 2398

PARTICIPANTS

John Zivie and Margaret Hays

OBJECT
OF WORK

Format

F

Fini

56 Tare 10.2 Cure: 356F 1/2 hr @ 240°F +
Epon 828 10.0 1/2 hr @ 330°F
20.2

CL (net) 1.5

TIME

SPREAD

Tack.

Strings

✓

21.7

10:00

Thin
Very good

NONE

NONE

TAT-21 ^{Mechanical-} amine titanate .2

11:00

✓

✓

✓

21.9

12:00

✓

✓

✓

1:00

✓

✓

✓

2:00

✓

✓

✓

Asbestos 3.0

3:00

✓

✓

✓

24.9

4:00

✓

✓

✓

5:00

✓

✓

✓

Initially spreads very well - thixotropic. Good hand prop.

57 Tare 10.4

Fini

Epon 828 10.0
20.4Cure: 357F 1/2 hr @ 240°F +
1/2 hr @ 330°F

CL (net) 1.5

21.9

TIME

SPREAD

Tack.

Strings

TAT-21 .4

10:30

Med. thin

NONE

NONE

11:00

✓

✓

✓

22.3

12:00

✓

✓

✓

1:00

✓

✓

✓

2:00

✓

✓

✓

Asbestos 3.0

3:00

✓

✓

✓

25.3

4:00

✓

✓

✓

5:00

✓

✓

✓

Initially spreads very well - thixotropic. Fair hand prop.

1/28/54 John S. Zivie

ABS-019482

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO

2398

PARTICIPANTS

OBJECT
OF WORK

John S. Zivic and Marguerite Trupe

Formula
#

Final

58 Take 10.4 Cure: 758 F $\frac{1}{2}$ hr @ 240°F +
 ① Epon 828 10.0 $\frac{1}{2}$ hr @ 330°F.
 20.4

② TAT-21 .6

Time SPREAD Tack Strings

② CL (rex) 1.5

11:00 MOD. THIN
kug good none none

22.5

12:00

✓

✓

✓

Asbestos 3.0

1:00

✓

✓

✓

2:00

✓

✓

✓

25.5

3:00

✓

✓

✓

4:00

✓

✓

✓

5:00

✓

✓

✓

Initially spreads very well - thixotropic - noted
 fine clear crystals while spreading - stretched panel. (Probably
 undissolved CL) Poor bend prop.

59 Take 10.6 Cure: 759 F $\frac{1}{2}$ hr @ 240°F +
 Epon 828 10.0 $\frac{1}{2}$ hr @ 330°F.
 20.6

CL (rex) 1.5

Time SPREAD Tack Strings

22.1

1:00

glyoxal - 34% sol.

3.3

2:00

4

3:00

25.4

4:00

22.6

5:00

When glyoxal was added to Epon and CL an instant-
 aneous color reaction resulted. A dark yellow color
 first formed; fell away immediately by a black
 color. Product set up into big black lumps.
 Heat evolved from reactions (warm to touch).

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

John S. Givie and M. Hape.

OBJECT
OF WORKFormula
#

Time

60 Tare 10.3

Cure: 360F 1/2 hr @ 240°F +

Epon 828 ^{Net -} 92.102A 10.0

1/2 hr @ 330°F.

20.3

CL (net) 1.5

Time spread tack string

21.8

2:30 med thick none none

TAT-21 .4

3:00 very good - -

22.2

4:00 - - -

5:00 - - -

Formvar ^{200" M} 15/95 E 4.0

Thixotropic - spread and thick-

26.2

ness - very good.

Poor bend prop.

61 Tare 10.2

Cure: 361F 1/2 hr @ 240°F +

Epon 828 10.0

1/2 hr @ 330°F.

20.2

CL (net) 1.5

Time spread tack string

21.7

3:00 med. thick very good None None

TAT-21 .4

4:00 - - -

22.1

5:00 - - -

Pb₂(OH)₂CO₃ .4

Initially spreads very well.

22.5

Slightly better in spreading

Formvar ^{200" M} 15/95 E 4.0qualities than F. #60. Pb(OH)₂CO₃

26.5

dispenses well.

Poor bend prop.

1/28/54 John S. Givie

ABS-019484

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR NO 2398

PARTICIPANTS

OBJECT
OF WORK

John Zivic and Marguerite Naps

Formula
#

62

Tare

10.2

Cure:

362 F $\frac{1}{2}$ hr @ 240°F +
 $\frac{1}{2}$ hr @ 330°F.

Epon 828

10.0

20.2

TIME

SPREAD

TACK

STRINGS

CL (rex)

1.5

10:00

Med. Thick.

VERY GOOD

NONE

NONE

21.7

11:00

✓

✓

✓

TAT-21

.2

12:00

Beginning to
thicken

SOME

SOME

21.9

1:00

spreadable

Phenol-
ced

YES - increasing.

2:00

no spreadable

✓

✓

hardened

Bisphenol

.4

3:00

4:00

22.3

5:00

 $\text{Ph}_2(\text{OH})_2 \text{CO}_2$

.4

Initial spread very good - thixotropic. $\text{Ph}_2(\text{OH})_2 \text{CO}_2$
dispense very well. Poor bend properties.

22.7

Formvar $15/25 \text{ E} - 200$

4.0

26.7

11/29/54 John D. Zivic

63

Tare

10.5

Cure:

363 F $\frac{1}{2}$ hr @ 240°F +
 $\frac{1}{2}$ hr @ 330°F.

Epon 828

10.0

20.5

TIME

SPREAD

TACK

STRINGS

CL (Rex)

1.5

1:30

very good

Med. thick

NONE

NONE

22.0

2:00

✓

✓

✓

TAT-21

.2

3:00

slightly
thicker

begin

No

22.2

4:00

✓

slight
INCREASE

beginning

Piperidine

.4

5:00

spread-
able

✓

INCREASE

22.6

Bisphenol

.4

Initial spread very good - thixotropic
Excellent bend properties. Break @

23.0

 $\text{Ph}_2(\text{OH})_2 \text{CO}_2$

.4

1548 psi @ 300°F. (before 1500)

23.4

7724 psi @ RT.

Formvar $15/25 \text{ E} - 200 \text{ M}$

4.0

approx. 3 hr pot life.

27.4

John D. Zivic

PARTICIPANTS

John Zieve & Marguerite Dapin

OBJECT
OF WORK

Testing effect of compounds below on Douglas panel prime
 FM 47
 Coating: Determine which could remove prime coating.

North American Aviation

COMPOUND	REMOVED PRIME COATING	TEMPERATURE	Color change	REMARKS
Adhesive III	No	90 min @ 82°C	sl. ght	light color change.
EPON 828	No	-	-	- - -
AYAFed AGE	Compound penetrated panel - No removal.	-	No	left some staining on A & panel - light red coloration
EPON 828 +		1/2 hr @ 116°C	✓	
8 ply DEAPA	YES	116°C - 1/2 hr	-	Pricked prime coat to base metal. A - cracks
Adhes. 422	YES	-	-	- - - -
ADHES. VI	YES	3/4 hr @ 200°F	No	✓ ✓ - -
LR-922- ADHES. 20D	YES	1/2 hr @ 165°C	✓	- - - -
AD. VII		1/2 hr @ 116°C	-	
Curing Agent A		1/2 hr @ 92°C	✓	
+ Polyvinyl ACETATE	YES			✓ - ✓ -
ADH. VII + Dicy	YES	1 hr @ 175°C	slight	✓ - ✓ -
PANEL (ALONE)	NO EFFECT	1 hr @ 165°C	cracked - slightly	Panel did not crack or peel - dented slightly.

1/30/54 John S. Zieve

ABS-019486

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

LR N° 2398

PARTICIPANTS

OBJECT
OF WORK

John Girc and Margarita Nape

Prel Test 0.020" 75 ST Alclad (1" width)

Formula	Compound weight	Cure	Read in #/in./lbs
Jane	10.1	4hr @ 200°F	10 1 st Sample
adh VII	13.8		11 2 nd ✓
	23.9		
Curing age "A"	.8		
	24.7		
Z63F (see p. 22)		Cure	#1 #2
Jane	10.1	1/2 hr @ 240°F + 1/2 hr @ 330°F	29.05 26
Epm 828	10.0		
CL (Rex)	1.5		
TAT-21	.2		
Piperidine	.4		
BPA	.4		
Ph ₂ (OH) ₂ CO ₂	.4		
Formvar	4.0		
15/95 E-200	27.0		
Z48F (see p. 20)		1/2 hr @ 240°F +	#1 #2
Jane	10.2	1/2 hr @ 330°F	33.2 34.1
Epm 828	10.0		
CL (Rex)	1.5		
BPA	.4		
Ph ₂ (OH) ₂ CO ₂	.4		
15/95 E-200	4.0		
FORMVAR			
piperidine	15		
	27.0		
	26.0		

2/8/54 John S. Girc

ABS-019487

NO.		54-16500		CROSS REFERENCE	
PARTICIPANTS <i>John Zivic and M. Hays</i>					
OBJECT OF WORK					
Formula					
64	Tare	10.6	- Cure:		
	Epon 828	10.0	Z64F	$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°F	
	CL (res)	1.5		SPREAD	TACK. STRINGS
	TAT-21	.2	2:00	Med. thick	
			3:00	Very good	NONE NONE
	piperidine	.4	4:00	-	-
			5:00	-	-
	Bisphenol	.4	(Thixotropic) - spreads thin - particles		
	$Ph_2(OH)_2CO_2$	.4	apparent - streaks. Sets up overnight.		
	Formvar	1.0			
	15/15 E - 200" M	24.5			
2/8/54 John Zivic					
65	Tare	10.4	Z64F	$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°F	
	Epon 828	10.0	TIME	SPREAD	TACK. STRINGS
	CL (res)	1.5	10:30	Med. thick	
			11:00	Very good	NONE NONE
	TAT-21	.2	12:00	✓	✓
			1:00	✓	✓
	piperidine	.4	2:00	✓	✓
			3:00	✓	✓
	Bisphenol	.4	4:00	Setting -	YES YES
			5:00	SPREADABLE	stiff stiff
	$Ph_2(OH)_2CO_2$	.4	Thixotropic - spreads very well.		
	Formvar	2.0			
	15/15 E 200" M	25.3			
2/8/54 John Zivic					
66	Tare	16.3	Z64F	$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°F	
	Epon 828	10.0	TIME	SPREAD	TACK. STRINGS
	CL (res)	1.5	11:30	✓	✓
			12:00	✓	✓
	TAT-21	.2	1:00	✓	✓
			2:00	✓	✓
	piperidine	.4	3:00	✓	✓
			4:00	Hardening	YES YES
	BPA (Bisphenol)	.4	5:00	stiff	stiff
	$Ph_2(OH)_2CO_2$	.4	Thixotropic - spreads very well.		
	Formvar	3.0			
	15/15 E 200" M	26.2			

ABS-019488

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

33

PARTICIPANTS

OBJECT
OF WORKJohn Zivie and M. Hape
Dial Test 0.020" 75ST Alclad (1" width)

OASIS, pgs 14

PEBL
5# 1 #2

32F Tare

10.2

 $\frac{1}{2}$ lb @ 240°F

15.5 15.0

Epon 828

10.0

 $\frac{1}{2}$ lb @ 330°F

Ck (crack)

1.5

Ph₂ (OH)₂ CO₂

.4

Asbestos

3.0

25.1

2/9/54 John S. Zivie

#1 #2

63F

OASIS pgs 31
27

F case.

29.05 26

2/11/54 John Zivie

#1 #2

48F

OASIS pgs 31
20

F case

33.2 34.1

2/11/54 John Zivie

ABS-019489

PARTICIPANTS

OBJECT
OF WORK

5 phr Phyphen 5023 vs 15 phr Phyphen 5023 (Effect on pot life)

Ct 2 op. c. r. r. 17

40 Tare 10.3

Epon 828 10.0

20.3

CL 1.5

21.8

Phyphen 5023 .5

15/15 200th
Formvar 4.0

26.3

Spreading qualities poor. Thick initially - slight increase in tack in thickness.

Time spread tack string

2:00 thick some some

3:00 incr. thick definite definite

4:00 spread - -

5:00 hardening - -

unpredictable.

67 Tare 10.4

50/50 Epon 828 10.0

20.4

piperidine .5

20.5

Dicy .6

21.5

2/11/54 John J. Zivic

367F 1/2 hr @ 240°F +

1/2 hr @ 330°F.

Time tack spread string

1:00 no med thin no

2:00 - - -

3:00 - - -

4:00 thickening - yes

5:00 yes med. thick yes

Smooth spread in cup; med thin, thickened on panel, Thixotropic.

68 Tare 10.5

50/50 Epon 828 10.0

Dicy .6

piperidine 5

15/15 200th
formvar 4.0

25.6

2/11/54 John J. Zivic

367F 1/2 hr @ 240°F +

1/2 hr @ 330°F

Time spread tack string

1:30 med thick no no

2:00 thickening - -

3:00 Thick begin- some

4:00 - -

5:00 semi-hard Definite YES

Med. thick - poor spread - tends to lump.

2/11/54 John J. Zivic

ABS-019490

PARTICIPANTS

R. Benson, M. Napa

OBJECT
OF WORK

Cleaning of panels for test work

60 panels were ~~staked~~ cleaned with trichloroethylene and etched with Douglas-Ciba formula at 155°F for 20 min

R. Benson 4-30-54

Two panels were prepared for ~~aluminum~~ mode up of

Epon 828 13.8g

Curing agent H 0.8g

Cured 45 min @ 200°F

Labeled LR-2604-7

Formula #

69 tare 10.4

Epon 828 10.0

not
acrossed chloroacetic anhydride 15.0

pyridine .1

35.5

Cure:

369-3 1/2 hr @ 330°F (165°C)

369 F 1/2 hr @ 240°F + 1/2 hr @ 330°F

369-1 1 hr @ 330°F

Poor wetting

Time	Spread	Tack	String	Tested
1:30	med thick	no	no	applied to panels
1:35	thick	yes	yes	
1:40	semi hard	"	"	
2:00	"	"	"	
4:00	"	brittle	"	

69-3 F + R, K
70 tare 10.3

Epon 828 10.0

applied
thick 140 } chloroacetic anhydride 15.0

acrossed pyridine .1

Time Spread Tack String

3:28 - thickening No no

3:35 thick spread No no

3:45 thick yes yes

better wetting

56-54 R. Benson

F, F + K tests mode

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

REBenson + M. Naps

OBJECT
OF WORK

Determine pot life of 269 without pyridine

Fast form.

tare	10.6	Time:	spread
Chloranil anhydride	15.0	10:07	moderate
Epon 828	10.0	10:30	thick , spreads well
	35.6	12:00	moderate
		1:00	mod. thick
		2:00	"
		3:00	thick, fair spread
		4:00	" "
		4:45	.. almost thixotropic

Hot ... ~~exp~~

tare	29.8	Time:	viscosity	spread
Chloranil anhydride	15.0	10:18	thin, clear	
Epon	10.0	10:20	thin	
	54.8	10:40	thick	
		10:45	semi solid	none.

Heated slowly on hot plate until melted.

Hot Mix

ABS-019492

tare	29.4	Time:	viscosity	spread
Chloranil anhydride	15.0	4:15	molten, thin	
Epon 828	10.0	4:20	thin	
	54.4	4:30	medium	good
		4:45	thick	fair

... into solution quickly.

Poured into ... bottle cover to harden.

5-7-54

REBenson

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

IR NO

2200

PARTICIPANTS

REBenson & M. Naps

OBJECT
OF WORK

Determine pot life of 769 without pyridine resin

Lot mix that was poured into milk bottle cover
was Cured in oven at 93°C for 1 hr.

above heated for an additional hour
at 93°C for 1 hr

5-10-54 REBenson
5-11-54

FORMULA

#70	Tare	10.2	TIME	Viscosity	Spread
	Epon 828	10.0	10:45	med	good
	ground neoprene (100 mesh)	3.0	12:20	"	"
	Curing agent A	0.8			
		24.0			

Cure: 90 min @ 200°F Did not Cure repeat p 38

#71	Tare	10.3	TIME	Viscosity	Spread
	Epon 828	10.0	11:00	med	good
	ground neoprene (100 mesh)	3.0	12:20	"	"
	Zinc Sulfide (ground)	0.4			
	Curing agent A	0.8			
		24.5			

Cure: 90 min @ 200°F Did not Cure - repeat p 38

#72	Tare	10.1	TIME	Viscosity	Spread
	Epon 828	10.0	11:45	thick	good
	ground neoprene (100 mesh)	3.0	12:20	"	"
	asbestos TTF2	2.0			
	Curing agent A	0.8			
		25.9			

ABS-019493

Cure 90 min @ 200°F did not cure repeat p 39
5-11-54 REBenson

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

REBenson & M. Nopel

OBJECT
OF WORK

FORMULA

#75 tare 10.4 TIME Viscosity Spread
Epoxy 828 10.0 11:40 med good
ground neoprene 4.0 12:20 " "
(100 mesh)
zinc sulfide 0.4
(ground)
Curing Agent A 0.8
25.6

Cure: 90 min @ 200°F. Repeat

5-11-54. REBenson

FORMULA

#70 tare 10.2 TIME VISCOSITY Spread
Epoxy 828 10.0 9:30 med. good
ground neoprene 3.0 10:30 " "
(100 mesh)
Curing Agent A 0.8 1:30 thick "
24.0 2:30 thixotropic "
3:30 " poor
4:30 " "

Cure: 90 min @ 200°F

#71 Tare 10.6 TIME Viscosity Spread
Epoxy 828 10.0 9:30 med good
ground neoprene 3.0 10:30 " "
(100 mesh)
zinc sulfide 0.4 1:30 thick "
(ground)
Curing Agent A 0.8 2:30 thixotropic "
24.8 3:30 " fair
4:30 " poor

Cure: 90 min @ 200°F

ABS-019494

PARTICIPANTS

RE Benson, M. Naps

OBJECT
OF WORK

Formula

#72	Tare	10.0	TIME	Viscosity	Spread
	Epon 828	10.0	9:45	med. thick	good
	Ground neoprene (100 mesh)	3.0	10:35	"	"
	Asbestos 7TF2	2.0	1:30	thixotropic	"
	Curing Agent A	0.8	2:30	"	"
		25.8	3:30	"	fair
			4:30	"	poor

Cure: 90 min. @ 200°F

#13	Tare	10.2	TIME	Viscosity	Spread
	Epon 828	10.0	9:45	med	good
	Ground neoprene (100 mesh)	4.0	10:30	"	"
	zinc powder	0.4	1:30	thick	"
	Curing Agent A	0.8	2:30	thixotropic	"
		25.4	3:30	"	fair
			4:30	"	poor

Cure: 90 min @ 200°F

5-12-54 RE Benson

#74	Tare	10.4	TIME	Viscosity	Spread
	Epon 828 + 834 (1:1)	10.0	9:30	thixotropic	fair ^{poor} wetting
	dicry (200 mesh)	0.6	10:30	"	"
	E 828-CA cured	5.16	2:30	"	"
	(269) ground (100 mesh)	26.16	3:30	"	"
			4:30	"	"

Cure: 274 K ~~90 min @ 200°F~~ 1 hr @ 330°F

PARTICIPANTS

RE Benson, M. Naps

OBJECT
OF WORK

Formula

#75	Tare	10.4	Time	Viscosity	Spread
	Epon 828	10.0	2:30	thin	good
	asbestos TTF2	3.0	3:30	"	"
	Curing agent A	0.8	4:50	"	"
		24.2			

Cure: 90 min @ 200°F (93°C)

#76	Tare	10.8	Time	Viscosity	Spread
	Epon 828	5.0	2:30	thin	good
	Epon 834	5.0	3:30	med	"
	asbestos TTF2	3.0	4:30	thick	fair
	Curing agent A	0.8			
		24.6			

Cure: 90 min @ 200°F

#77	Tare	10.4	Time	Viscosity	Spread
	Epon 828	5.0	2:30	med.	good
	Epon 834	5.0	3:30	thick	"
	ground molybdenum (100 mesh)	3.0	4:30	"	"
	Curing agent A	0.8			
		24.2			

Cure: 90 min @ 200°F (93°C)

ABS-019496

5-14-54 - RE Benson

PARTICIPANTS

REBenson, M. Nepe

OBJECT
OF WORK

Formula

#78	Tare	10.4	TIME	Viscosity	Spread
	Epon 828	5.0	2:30	Med	good
	Epon 834	5.0	3:30	thick	"
	ground neoprene (100 mesh)	3.0	4:30	"	fair
	Zn S (ground)	0.4			
	Curing agent A	0.8			
		24.6			

Cure 90 min @ 200°F

#79	Tare	10.0	TIME	Viscosity	Spread
	Epon 828	5.0	2:30	Med	good
	Epon 834	5.0	3:30	thick	"
	ground neoprene	4.0	4:30	"	fair
	Zn S	0.8			
	Curing agent A	0.8			
		25.6			

Cure 90 min @ 200°F

5-18-54 REBenson

#80	Tare	150.0	Put in screw cap bottle and		
	T.H.F Soln	30.0	put on shaker - left on		
	(100% formvar)		over night		
	chloroform	15.0			
	but screened				
	Epon 828	10.0	5-18-54 10g T.H.F Soln. added & put		
		205.0	back on shaker - went into		

ABS-019497

Solution in C 30 min

5-17-54 REBenson

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

To prepare adhesive of suitable consistency
to apply to glass cloth as a tape.

"B" tore ~~63.0~~ 63.0

Chloroanhydride 15.0

Epon 828 10.0

88.0

7

above heated into solin and poured into a bottle
containing 8 g acetone

torn bottle 95.0

acetone 8.0

(18.9 total)

heated solin 22.5

125.5

bottle put on shaker over night ..

5-17-54 REBenson

Did not go into solin. 10 g acetone added
and put back on shaker.

Went into shaker after ca 30 min.

~~Solution was poured into spreading machine
and glass cloth drawn through with
blade set at .010~~

"B" + asbestos + neoprene

ABS-019498

Three batches of "B" were made up based on
the ratio of 150 Chloroanhydride + 100 Epon 828
+ 180 acetone

The three batches were combined - total wt. 262g

5-18-54 REBenson

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

Conc'd # 42

"B" + asbestos + neoprene

tare	138	
asbestos TTF2	14	(38% of Epon)
neoprene	19	" " "
sub "B"	262	
	438	

Solution was quite thin - neoprene coated unevenly on cloth - discarded

Solution put in roller applicator with blade set at .010 and pressed 1/2 fiber cloth run through. Impregnated cloth put in oven at 200°F for 10 min

"a" impregnated in 1/2 glass fiber cloth with blade set at .010. Heated in oven for 10 min @ 200°F

a piece about 4" square was cut off heated 10 more min @ 200°F

6.507	before extra heating 10 min
6.5457	after
0.0387	loss of wt.

6.5457

6.5454

.0003

after 10 min. more heating
loss of wt.

ABS-019499

5-18-54 REBenson

INVESTIGATION NO.

54-16500

CROSS REFERENCE

PARTICIPANTS

REBenson. M. Naps

OBJECT OF WORK

Formula

#80	tare	29.36	TIME	viscosity	spread
	Epon 828	10.00	11:00	med	good
	"Cl" (recrystallized)	1.5	12:45	"	"
	T.A.T. 21	.2	2:00	thixotropic	"
	Ground Neoprene (100 mesh)	3.0	3:00	"	fair 2nd panel made
	asbestos 7T-F2	1.5	4:45	thick	none
		45.56			

amount of asbestos determined by mixing until viscosity is medium thick.

Epon 828 and "Cl" were weighed and heated into sol'n. in water bath in hood.

Cure: Z80-F-1 (1/2 hr @ 240°F + 1/2 hr @ 330°F)

Z80-F-2

#81	tare	29.43	TIME	viscosity	spread
	Epon 828	10.00	11:00	med.	good
	"Cl"	1.5	12:45	"	"
	ZNS	0.4	2:00	"	"
	Ground neoprene (100 mesh)	3.0	3:00	thixotropic	" 2nd panel made
	asbestos	1.5	4:45	"	fair
		45.83			

procedure same as for #80 on "Cl" and asbestos

Cure: Z81-F-1 (1/2 hr @ 240°F + 1/2 hr @ 330°F)

Z81-F-2

ABS-019500

17-54 REBenson

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORKTo prepare adhesive of suitable consistency
to apply to glass cloth as a tape

82 tare 29.47

60% sol'n Epon 1001 16.7

~~acetone~~
Chloroform anhydrous 13.30

59.47

} based on 100 Epon 1001 +
133 Chloroform anhydrousabove sol'n. was too thick. 17g acetone
was added and all solid heated into
solution.Solution was applied to impregnated 112
glass fiber cloth with ~~roller~~ roller machine
and heated in oven (200°F) for 10 min.Layer was too thin, so a second layer
was applied and dried 10 min in
oven at 200°F. Two panels were made up
F Cure 1/2 hr @ 240°F + 1/2 hr @ 330°F - break strength from
6-1" strips cured 1/2 hr at 330°F (see) 5-20-54 REBenson

83 tare 49.35

60% sol'n Epon 1001 16.70

~~in acetone~~
Chloroform anhydrous 13.30

pyridine .10

acetone 17.00

96.45

Z-83 F Cure 1/2 hr @ 240°F

1/2 hr @ 330°F

2 pounds

ABS-019501

Solution impregnated in 112 glass cloth and
heated 10 min @ 200°F.

Cooled a second time and heated 10 min @ 200°F.

5-24-54 REBenson

PARTICIPANTS

R. Benson, M. Nopo.

OBJECT
OF WORK

Formula

#84	tare	40.0	Cure: 284°F	1/8 hr @ 240°F
	Epon 1001 soln	16.7		1/2 hr @ 330°F
	65% acetone			
	Chloroanhydride	13.3		
	10% Formvar E in THF	40.0	2 panels made	
	acetone	17.0	Bond strength poor	
		127.0		

Chloroanhydride melted into solution
Two coats applied to glass cloth 112 and
cured for 10 min @ 250°F after each
coat.

#85	tare	49.40	Cure: 285°F	1/2 hr @ 240°F
	65% Epon 1001	16.7		1/2 hr @ 330°F
	in acetone			
	Chloroanhydride	13.3	2 panels made	
	10% Formvar E in THF	40.0	Bond strength poor - broke on handling	
	acetone	10.0		
	pyridine	.1		

Chloroanhydride melted into solution
Two coats applied to glass cloth with
small Coattex machine
Cured for 10 min @ 250°F after each coat.

5-21-54 R. Benson

#44-2 Repeat of 44 for a control on #86, 87 & 88

ABS-019502

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

FORMULA

#86	Tare	39.24	Cure: 286°F 1/2 hr @ 290°F
	Epon 828	10.00	1/2 hr @ 330°F
	Cl (recrystallized)	1.50	
	ZnS	.60	TIME VISC Spread
	Asbestos TTF2	3.00	3:00 Med Good
		44.34	4:00
			4:45

Epon 828 and Cl were heated into solution in water bath

#87	Tare	29.15	Cure: 287°F 1/2 hr @ 290°F
	Epon 828	10.00	1/2 hr @ 330°F
	Cl (recrystallized)	1.50	
	ZnS	.80	TIME VISC Spread
	Asbestos TTF2	3.00	3:00 Med Good
		44.45	4:00
			4:45

Epon 828 and Cl heated into solution

#88	Tare	29.62	Cure: 288°F 1/2 hr @ 290°F
	Epon 828	10.00	1/2 hr @ 330°F
	Cl	1.50	
	ZnS	1.00	TIME VISC Spread
	Asbestos TTF2	3.00	3:00 Med Good
		45.12	4:00
			4:45

Epon 828 and Cl heated into solution

ABS-019503

52554 REBenson

PARTICIPANTS

R. Benson, M. Naps

OBJECT
OF WORK

Determine solubility of Cl, BPA mixture.

1. Cl 10.8g

H₂O 1.0

BPA 0.4

12.2

mixture went into solution
with heating and ^{H₂O back} re-crystallized
~~8-20-54~~Re-heated on hot plate - stayed in
solution c. 2 hrs then crystallized
8-20-54 in solution

2. Cl 10.0g

H₂O 1.0

BPA .27

11.27

mixture went into solution

with heating and re-crystallized
8-20-54 in solution

3. Cl 10.0g

H₂O .7

BPA .27

10.97

mixture went into solution

with heating and re-crystallized
8-20-54 in solution

4. Cl 10.0g

BPA .27

10.27

mixture went into solution

with heating and re-crystallized
re-heated on hot plate - stayed in
solution 8-20-54 in solution

5. Cl 10.0g

H₂O .7

10.7

mixture went into solution
with heating and re-crystallized
~~8-20-54~~

5-25-54 R. Benson

ABS-019504

PARTICIPANTS

REBenson, M. Napo

OBJECT
OF WORK

Formula

#89	tare	29.03 g	Cure Z89F	1/2 hr @ 240°F
	Epon 828	10.00		1/2 hr @ 330°F
		39.03		
	formvar 1 1/2 E	4.00	T.Mc	Visc.
	(500 mesh)	43.03	3:45	med
	liquid Cl (*1 p 48)	1.7	4:15	thixotropic
		44.73		"

mixture was not heated into solution

5-28-54 REBenson

#90	tare	29.45 g	Cure: Z90F	1/2 hr @ 240°F
	Epon 828	10.00		1/2 hr @ 330°F
	asbestos 77F2	3.00		
	liquid Cl (*1 p 48)	1.70	T.Mc	Visc
		44.15	9:00	thin-med
			10:00	"
			11:00	med
			1:00	thixotropic
			2:00	thixotropic
			3:00	"
			4:00	"

5-28-54 REBenson

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

Formula

#91 tare 30.58 cur 90 min @ 200°F

adhesion VIII ^{LOT} LR-1174-1380
(shell compound) 174

liquid Cl 1.70

(open cl) 45.08

(#1, #48)

Time

vis

spread

9:00

med.

good

10:00

"

"

11:00

thickening

"

12:30

"

"

1:00

"

"

2:00

"

fair

3:00

"

"

Determine how to prepare liquid Cl

Cl only

21.6 g Cl (recrystallized) was heated on the hot plate for ca 10 min @ 130°C - re-crystallized over week - end ca .1g H₂O added & heated on hot plate

*-254 - stored in solution

Cl + H₂O + BPA (Denon)

Tare 29.85

Cl (Denon) 10.8

H₂O 1.0

BPA (Denon) .4

42.05

Mixture was heated on hot plate to b.p for several minutes - stayed in liquid form

5-28-54 REBenson

ABS-019506

PARTICIPANTS

R. C. Benson, M. Noyes

OBJECT
OF WORK

Evaluation of Whitmore-Hodges powdered Hycar

FORMULA

#92 (i.e. #78)

tare 30.72 Cure 90 min @ 200°F

Epon 828 5.00

Epon 834 5.00

T.M.C. Visc. Spread

Ground Hycar 3.00

3:30 Med Good

ZnS 0.40

4:00 thixotropic "

Curing Agent A 0.8

4:45 " "

44.92

#93 (i.e. 81)

tare 29.75 Cure: 290°F 1/2 hr @ 240°F

Epon 828 10.00 1/2 hr @ 330°F

Kind? Cl (Vergine) 1.50

ZnS 0.40

T.M.C. Visc. Spread

Ground Hycar 11.11 3.00

4:00 thixotropic good

Asbestos TFFZ 1.50

4:45 " "

46.15

5-28-54 R. C. Benson

93-FZ

tare 29.45

Cure 293-FZ 1/2 hr @ 240°F

Epon 828 + Hycar } thru paint mill 13.00

1/2 hr @ 330°F

? - mixed cl (dimer) 1.7

ZnS (P 50) 0.4

TIME Visc. Spread

Asbestos 1.5

1:00 Med Good

46.01

2:00 thixotropic "

3:00 " "

4:00 " "

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

REBenson, M. Kope

OBJECT
OF WORK

94

~~94-1~~

294 F

tare 28.43

Cure ~~7-93-3~~ 1/2 hr @ 545° F

Epon 828 + Hycar 13.00

1/2 hr @ 335° F

Kind? liquid cl p50 1.70

Zn S 0.40

Time

Visc

Spread

43.53

4:00

mod

good

4:45

thixotropic

6-1-54 REBenson

~~94-1~~

2-95

77 tare 29.17

Cure: ~~2-93-4~~ 1/2 hr @ 90 min @ 200° F

95 Epon 828 + Hycar 13.00

(Epoxy resin)

Zn S 0.40

Time

Visc

Spread

Asbestos 1.5

9:30

mod

good

Curing agent H 0.8

10:00

thixotropic

"

44.87

11:00

"

"

12:00

"

"

1:00

"

"

2:00

"

fair

3:00

"

poor

6-2-54 REBenson

ABS-019508

PARTICIPANTS

RE Benson, M. J.

OBJECT
OF WORK

Preparation of

(A) Cl, H₂O solution: 100 cl + 7 H₂O

(Current
Tech.) Cl 146g
H₂O 10.22
156.22

Heated into solution in H₂O bath, then put
on the fire to boil in solution for
ca 10 min. ca 110-120°C

6-4-54 Crystallized some with eyedropper.

6-25-54 Stayed in solution - bottled

8-19-54 given to Jack Maxwell

(B) Cl, BPF (Resonance solution) 100 cl + 2.7 BPF

(Current
Tech.) Cl 224g
BPF 6.04
230.04

Heated into solution in H₂O bath, then
put on hot fire and heated to 130-138°C

for ca 10 min - crystallized, re-heated - bottled

6-4-54 Re-heated - crystallized. Re-heated to 140°C for 10 min.
6-25-54 Crystallized - re-heated 6-3-54 RE Benson
to 130°C & bottled

ABS-019509

PARTICIPANTS

R. E. Benson, M. Naps

OBJECT
OF WORK

FORMULA

96

tare

9.77

Cure: 1 1/2 hrs @ 200°F

adhesive VIII

3.8

liquid cl ($\text{Cl} + \text{H}_2\text{O}$)
p 53

23.57

1.5

25.07

T. Me

3:15

vis

spread

3:15

spread

good

4:45

adhesive appeared not
entirely cured after 1 1/2 hrs

97

tare

10.33

Cure: 1 1/2 hrs @ 200°F

adhesive VIII

13.8

liquid cl (#5, 48)

1.8

25.93

T. Me

3:20

vis

spread

spread

good

4:45

adhesive appeared not
entirely cured after 1 1/2 hrs
6-4-54 R. E. Benson

98

tare

9.88

Cure: 1 1/2 hrs @ 200°F

adhesive VIII

13.8

liquid cl ($\text{Cl} + \text{H}_2\text{O}$)
p 53

2.1

25.78

T. Me

9:00

vis

spread

spread

good

10:00

therobags

11:00

1:00

2:00

3:00

fair

good

ABS-019510

6-7-54 R. E. Benson

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

T.O.S. Mula

#99

Tare

9.90

Cure: 1 1/2 hrs. @ 200°F

adhesive VIII

13.8

liquid cl (#5 p48)

2.4

26.10

Time

Visc

Spread

9:00

med

good

10:00

thixotropic

..

11:00

..

..

1:00

..

..

2:00

..

fair

3:00

..

poor

#100

Tare

10.33

Cure: 1 1/2 hrs @ 200°F

adhesive VIII

13.8

liquid cl (#5 p48)

2.7

26.83

Time

Visc

Spread

9:00

med

good

10:00

thixotropic

..

11:00

..

..

1:00

..

..

2:00

..

fair

3:00

..

poor

6-7-54 REBenson

PARTICIPANTS

R.E. Benson, M. Nage

OBJECT
OF WORK

Formula

#63-2

tare	29.68	Cure	763 F-2	
Epoxy 828	10.00		5hr @ 240°f.	
Cl (crystalline)	1.50		5hr @ 330°f.	
JAT-21	.20			
Piperidine	.40	TIME	Visc	Spread
Bisphenol BPA	.40	2:30	Thixotropic	"
Pb-2 (200 mesh)	.40	4:00	"	"
Pb-2 (200 mesh) CO ₂	.40			
Formvar 15% F	4.00	4:45	"	poor
(500 mesh)	46.58			"

Panel had good bend strength
6-7-54 R.E. Benson

Prep Cl-BPA solution 5 ^{BPA} + 100 Cl

Tare	50.45	Heated in water bath for ca 1/3 hr
Cl	30.00	
Residual BPA	1.5	Crystallized
	81.95	6-25-54. Discarded

Prep Cl-BPA solution 10 BPA + 100 Cl

Tare	50.60	Heated in water bath for ca 1/3 hr
Cl	30.00	
Residual BPA	3.00	Stayed in solution overnight
	83.60	Crystallized

6-9-54 1.5g BPA added + re-heated
6-10-54 Crystallized
6-25-54 discarded

6-8-54 R.E. Benson

ABS-019512

PARTICIPANTS

R E Benson, M. Nepe

OBJECT
OF WORKPrep. 500 g Epon 828 + 50 g Epon 1009
10/1 EPON 828 / EPON 1009500 g Epon 828 + 50 g Epon 1009 (60 mesh) were
stirred and heated into solution @ 80°C in
water bath. Time?

6-8-54 R E Benson

Prep. liquid cl. 5 resorcinol + 100 cl

tare 49.85

cl 30.00

79.85

resorcinol

1.5

81.35

Heated into solution on water
bath for 1/2 hr.

6-10-54

6-11-54

6-14-54

6-25-54

9-24-54

in solution

crystallized - heated to 116°C for
10 min. - re-crystallized.

Heated with color. + re-bottled

F101 (i.e. 93 F-2)

Cure Z-101F

1/2 hr @ 240°F

1/2 hr @ 330°F

Tare

30.35

cl (re-crystallized)

1.7

32.05

- Heated into solution first.

Epon 828 + ground Hexon 13.00
w.r. (patent mill)

Zn S

0.4

asbestos

1.5

46.95

TIME

4:00

4:45

VISCID

thin drops

"

Spread

good

good

6-9-54 R E Benson

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

Formula

~~1-2~~ (i.e. 96) Adhesive VIII + Curing Agent A.

tare 99.2

Cure: 1 1/2 hrs @ 200°F

adhesive VIII 13.8

Curing Agent A .8
24.52

2 pounds made

Time	Visc	Spread
9:30	med.	good
10:00	thickening	"
11:00	"	"
1:00	"	fair
2:00	"	poor

6-10-54 REBenson

91-2

tare 10.32

Cure: 1 1/2 hrs @ 200°F

ad. VIII 13.8

liquid Cl (*1p48) 1.7
25.82

Time	Visc	Spread
9:30	med	good
10:30	thickening	"
11:30	"	"
1:00	"	fair
2:00	"	"

6-11-54 REBenson

ABS-019514

PARTICIPANTS

RE Benson, M. Naps

OBJECT
OF WORK

Formula

102

80 Novon + 20 (EPON 562)

Tare	28.85	Cure	Z102 J	1/2 hr @ 330°
Novon Resin (Schwartz)	10.00			
Diary	.8	Time	11:55	Spread
Asbestos TTF 2	3.0	3:30	med.	good
	42.65	4:30	thixotropic	"
		(did not cure hard at 11:30 over 24 hrs)		
		6-11-54 RE Benson		

103

(1.0 %)

Tare	9.87	Cure	Z-103 1/2	hrs @ 200° f
resorcinol (Schwartz)	13.8			
Liquid cl (Schwartz)	1.58	Time	11:55	Spread
PS9 (Schwartz)	25.25	10:30	med.	good
Wet 10 min		11:30	thixotropic	"
		12:30	"	"
		1:30	"	"
		2:30	"	"
		6-14-54 RE Benson		

ABS-019515

Preparation liquid cl (1 pt. resorcinol)

Tare	50.09	Heated into solution
cl (Schwartz)	30.00	in H ₂ O bath and
resorcinol	2.4	To 116°C for Ca 10 min
	82.49	6-15-54 in solution
25-54 in solution, Bottle		6-14-54 RE Benson

PARTICIPANTS

R. E. Benson, M. Naps

OBJECT
OF WORKPrep liquid cl (8 resorcinol + 7 H₂O) parts by wt.

tare	48.72
cl (Dupont)	30.00
resorcinol	2.4
H ₂ O	2.1
	<u>83.22</u>

Heated in water bath
into solution, then
heated to 116°C for
ca 10 min

6-16-54 in solution
6-23-54 in solution
6-25-54 - Crystallized
9-24-54 - heated into soln
* re-bottled

#104

Tare	10.05
ash VIII	13.8
liquid cl (p. 59)	1.5
	<u>25.35</u>

Cure: Z104-A
1 1/2 hrs @ 200°F
Cure: Z104-B
1 1/2 hrs @ 200°F
1/2 hr @ 240°F

Time	Visc	Spread
1:00	Med	good
2:00	thixotropic	
3:00	"	fair
4:00	"	poor

#105

Tare	10.1
ash VIII	13.8
liquid cl (p. 59)	1.8
	<u>25.7</u>

Cure: Z105 A
1 1/2 hrs @ 200°F
Z105 B
1 1/2 hrs @ 200°F
+ 1/2 hr @ 240°F

Time	Visc	Spread
1:00	Med	good
2:00	thixotropic	
3:00	"	fair
4:00	"	poor

ABS-019516

6-15-54 R. E. Benson

PARTICIPANTS

R. E. Benson, M. Nops

OBJECT
OF WORK

Formulation

#106

tare 10.12
ash VIII 13.8
liquid cl #59 2.1
(residual) 26.02

Cure: Z106-A 1 1/2 hrs @ 200°F
Z106-B 1 1/2 hrs @ 200°F
1/2 hr @ 240°F

Time	Visc.	Spread
8:30	med	good
9:30	thixotropic	"
10:30	"	"
11:30	"	poor

#107 tare 9.88
ash VIII 13.8
liquid cl #59 2.4
(residual) 26.08

Cure: Z107-A 1 1/2 hrs @ 200°F
Z107-B 1 1/2 hrs @ 200°F
1/2 hr @ 240°F

Time	Visc	Spread
11:00	med	good
1:00	thixotropic	"
2:00	"	poor

#108 tare 9.76
ash VIII 13.8
liquid cl #59 2.7
26.26

Cure: Z108-A 1 1/2 hrs @ 200°F
Z108-B 1 1/2 hrs @ 200°F
1/2 hr @ 240°F

Time	Visc	Spread
1:00	med	Good
2:00	thixotropic	"
3:00	"	poor

ABS-019517

6-16-54 R. E. Benson

PARTICIPANTS

REBenson. M. Daps

OBJECT
OF WORK

Fer. Mula

#109

tare

10.30

Cure. Z109A

ash VIII

13.80

1 1/2 hrs @ 200°F

liquid cl (p60)
(cl + resin + H.O.)

1.5

Z109B

25.60

1 1/2 hrs @ 200°F
1/2 hr @ 240°F

Time

Visc

Spread

9:00

Med

good

10:00

thixotropic

"

11:00

"

fair

1:00

"

poor

#110

tare

9.87

Cure. Z110A

ash VIII

13.80

1 1/2 hrs @ 200°F

liquid cl (p60)

1.8

Z110B

25.47

1 1/2 hrs @ 200°F
1/2 hr @ 240°F

Time

Visc

Spread

1:00

Med

good

2:00

thixotropic

"

3:00

"

"

4:00

"

poor

ABS-019518

6-17-54 REBenson

#105-2

Cure. ~~Z105 B-2~~
Z105 B-2

tare

10.01

1 1/2 hrs @ 200°F

ash VIII

13.8

Z105 B-2

liquid cl (100 cl + 8 resin)

1.8

1 1/2 hrs @ 200°F

25.61

1/2 hr @ 240°F

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

F&W Notes

#111

tare

9.9

Cure: Z-111A 1 1/2 hrs @ 200°F

ash VIII

13.8

1/2 hr @ 240°F

liquid cl (p6d)

2.1

Z-111B 1 1/2 hrs @ 200°F

(100 cl + 1 H₂O +
8 kearscintal)

25.8

1/2 hr @ 240°F

Time

VISC

Spread

9:30

med

good

10:30

thixotropic

fair

11:30

semi-hard

poor

#112

tare

9.8

Cure: Z-112A 1 1/2 hrs @ 200°F

ash VIII

13.8

Z-112B 1 1/2 hrs @ 200°F

liquid cl (p6d)

2.4

1/2 hr @ 240°F

(100 cl + 1 H₂O +
8 kearscintal)

26.0

Time

VISC

Spread

9:30

med

good

10:30

thixotropic

"

11:30

"

fair

12:30

"

poor

4:00

semi-hard

poor

6-21-54 REBenson

#113

tare

10.12

Cure: Z-113A 1 1/2 hrs @ 200°F

ash VIII

13.8

Z-113B 1 1/2 hrs @ 200°F

liquid cl (p6d)

2.7

1/2 hr @ 240°F

26.62

Time

VISC

Spread

9:30

med

good

10:30

thixotropic

"

11:30

"

fair

12:30

"

poor

ABS-019519

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

Test peel strength

F. T. H. 64

#114

(1)

Tare	49.53	Cure: Z114	1/2 hr @ 200°F
Epon 828	20.00		1/2 hr @ 240°F
Cl (Crystalline)	3.00		
	<u>72.53</u>		

Epon & Crystalline Cl were melted into solution in water bath and spread on two pieces 9x12" 1 mil thick brass strips 1/4" x ca 6" were used along the edge as Shim Stock (2) It was then put in the press with the others side by side. When cool they were cut in 1" strips for peel test.

#115

(2)

Tare	49.97	Cure: Z115	1/2 hr @ 200°F
Epon 828	20.00		1/2 hr @ 240°F
Cl (Crystalline)	3.00		
Asbestos 7T+2	6.00		
	<u>78.97</u>		

Prepared and Cured same as #114

#

116

(3)

Tare	50.95	Cure: Z116	1/2 hr @ 200°F
Epon 834	20.00		1/2 hr @ 240°F
Cl (Crystalline)	3		
	<u>73.95</u>		

ABS-019520

Prepared and Cured same as #114

ALL ENTRIES MUST BE SIGNED AND DATED DAILY

17.54 REBenson
LR N° 2398

PARTICIPANTS

T. E. Benson, Jr. Naps

OBJECT
OF WORK

117

④

Tare

50.57

Cure 2117 $\frac{1}{2}$ hr @ 200°F

Epon 834

30.00

 $\frac{1}{2}$ hr @ 340°FAl. dust
Asbestos 7+25
6

79.57

Epon & asbestos were heated together and Al was heated alone into solution. They were combined and rapidly applied to panels - very short pot life.

6-17-54 T.E. Benson

118

Tare

49.42

Epon 1001 + Dicy

21.2

al. dust

12.0

82.62

al. dust and Epon 1001 - Dicy mixture were ground together in a mortar and put in a test tube lined with thin al foil. The mixture was heated to melting point in a water bath, allowed to cool and the stick applied to heated strips panels.

005 brass strips were used as separators between the panels and the panels ^{was} cured at 330°F for $1\frac{1}{2}$ hr in the press. Cut in 1" strips - peel strength poor.

#443
##

(ie 44) Peel panel (one)

Tare	48.1	
Epon 828	20.0	} heated into solution in water bath
Cl (resin)	3.0	
zn S	.8	
Eibestas (7T F2)	6.0	
	77.9	

1-6"X12" panel was made - each half of panel was coated with above mixture and scraped with a #6 Dr blade. .005" Shim stock was put in between panel and panel clamped with Masonite on each side. ~~Put in large press~~

Cure: 24 hrs @ 65°C (149°F) (60°C oven)

4 hrs @ 100°C (212°F)

1 hr @ 150°C (302°F)

1/2 hr @ 200°C (392°F)

Douglas peel test - poor (cohesive failure). mv
6-23-54 REBenson

PARTICIPANTS

RE Benson, Dr. Hope

OBJECT
OF WORK

Prep liquid cl (8 pts resorcinol)

A.

tare	134	re-crystallized - heated
cl (plant receipt)	92	into solution 116°C for 10 min
resorcinol	7.36	8-20-54 Crystallized
	<u>233.36</u>	

Heated in water bath to liquid and on hot plate to 116°C for 10 min.

B. Prep liquid cl (8 pts resorcinol + 7 pts H₂O)

tare	136
cl (plant receipt)	92
resorcinol	7.36
H ₂ O	6.44
	<u>241.80</u>

Heated in water bath to liquid and on hot plate to 116°C for 10 min
6-24-54 RE Benson
8-20-54 Crystallized

#119

tare	27.05	Cure: Z119A 1 1/2 hrs @ 200°F
ash VIII	13.8	Z119B 1 1/2 hrs @ 200°F
re-crystallized cl	1.5	1/2 hr @ 240°F
	<u>44.35</u>	

Time

Visc

Spread

9:00

mod

good

10:00

thickening

11:00

1:00

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

120

Tare	49.42	Cure Z120A	1 1/2 hrs @ 200°C
re-crystallized cl	1.7	Z120B	1 1/2 hrs @ 200°C
add. VIII	13.8		1/2 hr @ 240°C
	64.92		

	T. ne	Visc	Spread
Cl was heated into solution	2:30	Prod	Good
in H ₂ O bath + add VIII	5:30	Unisotropic	"
added	4:30	"	"

7-6-54 REBenson

Prep. liquid cl (for Hopper) (100 cl + 7 H₂O)

Tare	184	Heated & melting pt.
cl (Du Pont, crude)	250	in H ₂ O bath & to 116°C
H ₂ O (top)	17.5	on hot plate for 10 min
	451.5	8-16-54 in solution - was
		used frequently & never
		crystallized
		7-1-54 REBenson

Prep. stock batch (Epon 828-AYAF) (100 Epon + 6 AYAF)

Tare	184	Heated and stirred into
Epon 828	400	solution on hot plate
AYAF	24	to 150°C for ca 4 hrs
	608	

7-8-54 REBenson

ABS-019524

PARTICIPANTS

W E Benson, M Naps

OBJECT
OF WORK

#121 (Control)

Tare 46.56

Cure Z121J-1 1/2 hr @ 165°C

Stock Batch (828-A4AF) 21.2

Z121J-2 " " "

(100 Epon 828 + 6 A4AF)

A.G.F. (allyl glycidyl ether) .4

Dicy (200 mesh) 1.2

Asbestos (TTF2) 6.0

75.36

#122 (2 phr phthalic anhydride)

Tare 44.44

Cure Z122J-1 1/2 hr @ 165°C

Stock Batch (828-A4AF) 21.2

Z122J-2 " " "

(100 Epon 828 + 6 A4AF)

phthalic anhydride (100 mesh) .4

A.G.F. .4

ground dicy (200 mesh) 1.2

Asbestos (TTF2) 6.0

73.64

} melted into solution in H₂O bath

#123 (5 phr phthalic anhydride)

Cure Z123J-1 1/2 hr @ 165°C

Tare 46.2

Z123J-2 " " "

Stock Batch (828-A4AF) 21.2

(100 Epon 828 + 6 A4AF)

Phthalic Anhydride 1.0

A.G.F. .4

Dicy (200 mesh) 1.2

Asbestos (TTF2) 6.0

76.00

ABS-019525

7/8/54

8854 W E Benson

PARTICIPANTS

RE Benson, M Nops

OBJECT
OF WORK

7/24

10 Phv Phthalic anhydride

tare

50.73

• Stock batch (828-F7FF)

21.2

Phthalic anhydride

2.0

H.G.F.

.4

Dicy (200 mesh)

1.2

Asbestos (7TF2)

6.0

81.53

heated into solution in
H₂O bath

Cure: Z124J-1 1/2 hr @ 165°C

Z124J-2 1/2 hr @ 165°C

7-9-54 RE Benson

Prep. liquid cl (100cl + 8 resorcinol + 7 H₂O)

tare

48.73

cl (DuPont
Cruiser)

30.0

resorcinol

2.4

H₂O

2.1

83.23

Prep. liquid cl 100 cl + 1 methocel (5 cps)

tare

46.65

Methocel (5 cps)

.2

cl (Cruiser)

20.0

66.85

8-10-54 heated into

soln & bottled.

ABS-019526

7-13-54 RE Benson

above liquid cl crystallized. 2 g H₂O added
and heated to 116°C for 10 min. re. Crystallizes
8-13-54 in solution 8-20-54 in solution

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

71

PARTICIPANTS

R E Benson, M Nape

OBJECT
OF WORK

#125

Tare

10.11

Cure Z125-F

Epon 828

10.00

 $\frac{1}{2}$ hr @ 240°F
 $\frac{1}{2}$ hr @ 330°Fliquid cl (100cl + 7H₂O)

1.8

Zn 5 (ground fine)

4

Time

VISC

Spread

Asbestos (7TF2)

3.0

11:00

Med

good

25.31

11:30

thixotropic

1:00

2:00

#126 Tare

10.15

Cure Z126 F

Epon 828

10.00

 $\frac{1}{2}$ hr @ 240°F
 $\frac{1}{2}$ hr @ 330°F

liquid cl (100cl + 8 resin)

1.8

Zn 5 (ground)

4

Time

VISC

Spread

Asbestos (7TF2)

3.0

1:00

thixotropic

good

25.35

2:00

#127 Tare

10.18

Cure Z127 F

Epon 828

10.00

 $\frac{1}{2}$ hr @ 240°F
 $\frac{1}{2}$ hr @ 330°Fliquid cl (100cl + 8R + 7H₂O)

1.8

Zn 5 (ground)

4

Time

VISC

Spread

Asbestos 7TF2

3.0

2:00

thixotropic

good

25.38

ABS-019527

8-14-54 R E Benson

7/14/54

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

Prep. liquid cl (100 cl + 1 methanol soln 5%)

tare 47.15

Heated into soln. in

Crude cl 20.00

H₂O bath and to

5% methanol soln (400ccs) 2

116°C for 10 min

67.3 5

7-15-54 On solution
216-54 Crystallized (100% yield)

8-10-54 heated into soln. + bottled.

7-13-54 REBenson

8-13-54 in solution

8-16-54 very unstable - re-crystallized
after each withdrawal of liquid

#128 tare 51.0 in solution

28.85

Cure Z-128-f

Epon 828

10.25

+ 1/2 hr @ 200°F

cl 100 cl + 1 (5% methanol)
soln.

1.8

+ 1/2 hr @ 200°F

ZnS (ground)

.4

1/2 hr @ 330°F

Asbestos (75°F)

3.0

44.05

#105-3

Cure Z105-3 1 1/2 hrs @ 300°F

tare 10.50

Z105-3f 1/2 hr @ 200°F

Cah VIII 13.8

liquid cl (100 cl + 8 resin)

1.8

26.10

8-14-54 REBenson

PARTICIPANTS

REBenson M naps

OBJECT
OF WORK

Prep liquid cl (100 cl + 1 methocel soln 5%)

Tare 91.42

5% methocel soln

1.00

cl (Du Pont
Crude)

100.00

192.42

Heated into soln

in H₂O bath and to

116°C for 10 min.

(mole sticking soln)

8-10-54 heated methocel soln + bottles
7-14-54 REBenson

Prep. liquid cl (100 cl + 1 methocel soln 2 1/2%)

Tare

46.90

methocel soln 2 1/2%

.20

cl Du Pont
Crude

20.00

67.10

8-10-54 heated into soln

8-13-54 in solution
8-30-54 7 bottles

Prep 2 1/2% methocel soln

Tare

51.8

Methocel

2.5

Water (distilled)

97.5

151.8

water was brought to

boil and methocel

added, stirred and

Cooled suddenly

under tap water -

went into solution

8-13-54 in solution

8-16-54 REBenson

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

REBenson, M. Mape

OBJECT
OF WORK

#97-2

tare	10.05
cell VIII	13.8
liquid cl	1.8
(100 cl + 7 H ₂ O)	25.65

Cure Z97-2 1 1/2 hrs @ 200°F
Z97-2 F 1/2 hr @ 240°F
1/2 hr @ 320°F

#110-2

tare	10.35
cell VIII	13.8
liquid cl	1.8
(100 cl + 8 resin + 7 H ₂ O)	25.95

Cure Z110-2 1 1/2 hrs @ 200°F
Z110-2 F 1/2 hr @ 240°F
1/2 hr @ 320°F

8-16-54 REBenson

ABS-019530

PARTICIPANTS

REBenson, M Nops

OBJECT
OF WORK

#129

tare	51.86	50.62	Curio - Z-126-L
4,4',4" Triamino	5.0	5.0	-1/2 hr @ 200° + 1/2 hr @ 240°
triphenyl methone			Z-129-H
Epon 828	37.6	(200)	1 hr @ 240° +
ZnS	7	8	Z-129-M
Asbestos (7+2)	6.0	6.0	1/2 hr @ 240° + 1/2 hr @ 300°
	101.26	82.42	-Z-129-F
			1/2 hr @ 240° + 1/2 hr @ 330°

it was attempted to melt 4,4',4" Triamino triphenyl methone
but would not stay in solution. 8-2-54 REBenson
Pot life short

Prep liquid cl 1100 crud cl + 5 2,3+2,5 diamino
pyridine

tare	2865	8-3-54 Crystallized
cl (crud)	1000	heated to 116° for 10 min
2,3+2,5 diamino pyridine	5	7-4-54 liquid
	3915	8-13-54 liquid
		8-20-54 li.

8-2-54 REBenson

Prep liquid cl 1000 crud cl + 10 2,3+2,5 diamino
pyridine

tare	2960	Heated in hot water
cl (crud)	10	boil
2,3+2,5 diamino pyridine	1	7-4-54 liquid
	4060	7-5-54 " "
		7-6-54 Crystallized
		Heated to 116°

8-2-54 REBenson

8-13-54 in solution
8-20-54 "

ABS-019531

#130

tare	51.48	128.70	after 2 1/2 hrs put life,
4,4,4-triamino	5.0	2.5	mixture was rubbery
triphenyl methan			and hard ^{impossible} to spread
adh. VIII	77.6	13.8	was hard ^{hard} to spread
	194.08	45.00	at first

Cures: Z130L

1 1/2 hrs @ 200° + 2 hrs 240°

Z130H

1 hr @ 240° +

Z130M

1/2 hr @ 240° + 1/2 hr 300°

Z130F

1/2 hr @ 240° + 1/2 hr 300°

8-3-54 RE Benson

Prep liquid cl (100 crude cl + 15 2,3 + 2,5
diaminopyridine)

tare	29.30
2,3 + 2,5	1.5
diaminopyridine	
cl (crude)	10.00
	40.80

~~7-9-54 Crystallized~~
8-13-54 in solution
8-20-54 " "

Heated in water bath for 10 min.

7-5-54 - liquid.

7-9-54 - crystallized - heated to 110°C for 10 min.

8-4-54 RE Benson

ABS-019532

PARTICIPANTS

RE Benson, W. Naps

OBJECT
OF WORK

131

Tare 29.45

Cures Z131-L

Epon 828 10.0

1 1/2 hr @ 200°F + 1/2 hr @ 240°F

Cl liquid 5 pt 2, 3 x 2.5 1.5

Z131-f

diaminopyridine

1/2 hr @ 240°F + 1/2 hr @ 240°F

Zn 5 .4

Asbestos 7TF2 3.0

44.35

Time

Visc

Spread

3:00

Thin

good

4:00

4:45

thixotropic

8-4-54 RE Benson

132 Tare 29.55

Cures Z132-L

Epon 828 10.0

1 1/2 hr @ 200°F + 1/2 hr @ 240°F

Cl, liquid (100 cl + 10 1.5

Z132-f

2, 3 x 2.5 diaminopyridine

1/2 hr @ 240°F + 1/2 hr @ 240°F

Zn 5 .4

Asbestos 7TF2 3.0

44.45

Time

Visc

Spread

9:00

thinned

good

10:00

"

"

11:00

fined

"

12:00

"

"

1:00

thixotropic

"

2:00

"

"

3:00

"

"

4:00

"

"

4:30

"

"

8-5-54 RE Benson

ABS-019533

PARTICIPANTS

REBenson, M. Nape

OBJECT
OF WORK

#133

Tare 29.0

Cures: Z133-L

Epo 828 10.0

1 1/2 hr @ 200° + 1/2 hr @ 240°

liquid cl (15 pts
2.5 + 2.5 diamino pyridine) 1.5

Z133 F

1/2 hr @ 240° + 1/2 hr @ 330°

Zn 5 .4

Asbestos (7TF2) 3.0

43.9

TIME

VISC.

Spread

1:30

met thin

Good

2:30

3:30

thixotropic

4:30

8-6-54 REBenson

#134

Tare 10.5

Cure: Z134L

ash. VIII lot LR 1173-174 13.8

1 1/2 hr @ 200° F + 1/2 hr @ 240°

liquid cl (100 cl + 3 diamino
pyridine) 1.5

Z134 F

25.8

1/2 hr @ 240° + 1/2 hr @ 330°

Time

Vis

Spread

2:30

Yrd

Good

3:30

thixotropic

4:30

4:45

ABS-019534

8-9-54 REBenson

PARTICIPANTS

OBJECT
OF WORK

R. E. Benson, M. Naps

135

tare

10.0

Curs: Z135 L

Cah VIII

105 LRJTB-174

13.8

1 1/2 hr @ 200°F + 5 hr @

liquid cl

100 cl + 10

1.5

Z135 F

25.3

1/2 hr @ 240°F + 5 hr @ 330°F

Time

Vis

Spread

3:00

Med

Good

4:00

thixotropic

..

4:45

..

..

8-9-54 R. E. Benson

136

tare

10.3

Curs: Z136 F

Cah VIII

13.8

1/2 hr @ 240°F + 5 hr @ 330°F

liquid cl

100 cl + 15

1.5

Z136 L

25.6

1/2 hr @ 240°F + 5 hr @ 330°F

Time

Vis

Spread

9:00

Med

Good

10:00

thixotropic

..

11:00

..

..

1:00

..

..

2:00

..

..

2:00

..

..

8-10-54 R. E. Benson

ABS-019535

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

R. Benson M. Naps

OBJECT
OF WORK

R. Crystallized Cl

Remaining crude Cl from two bottles was combined and benzene added while heating on a hot plate until most of solid went into solution.

Solution was filtered through a fluted filter paper while hot and left to stand over night.

8-10 54 R. Benson
above washed with benzene + filtered thru buckner funnel
#119-3

tare	5898	Curr Z119-3
add VIII	13.8	90 min @ 200° + 30 min @ 240°
Cl (Crystallized Du Pont Tech Lot # 893)	1.5	Z119-3
	44.28	1/2 hr @ 240° + 1/2 hr @ 300°

Cl was heated into	Time	Visc	Spread
Solution in water bath	1:30	Med	Good
+ beaker containing	2:30	thick drops	
resin slightly heated	3:30	"	
before adding Cl -	4:30	"	fair
no crystallization resulted.			

Z121J } These were given another 1/2 hr @
Z122J } 330° + and re. labeled Z121K and
Z122K
submitted for R. T. ^{180°} 260° F and 300° +

ABS-019536

R. Benson 8-11-54

PARTICIPANTS

RC Benson, M. Nops

OBJECT
OF WORK

Z97-3

tare 29.05

Cure Z97F-3

ash. VIII 13.8

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr 330°

liquid cl 1.8

Z97L-3

(100 cl + 7 H₂O)

44.65

 $1\frac{1}{2}$ hr @ 200° + $\frac{1}{2}$ hr 240°

TIME

VISC

Spread

3:00

med

good

4:00

thixotropic

11

4:30

11

Z125-2

tare 28.6

Cure Z125-F2

Epon 828 10.0

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr 330°liquid cl (100 cl + 7 H₂O) 1.8

Z125L-2

ZnS .4

 $1\frac{1}{2}$ hr @ 200° + $\frac{1}{2}$ hr 240°

asbestos (7TF2) 3.0

43.8

TIME

VISC

Spread

9:00

med

good

10:00

thixotropic

11

11:00

11

11

1:00

11

11

2:00

11

11

3:00

11

11

ABS-019537

8-12-54 RC Benson

RE Benson, Dr Nap

#44-4

Tare	28.65	Cure Z 44F-4
Epo 828	10.0	1/2 hr @ 240' + 1/2 hr @ 330
Cl (crystalline AnPost Lab. Lot # 893)	1.5	Z 44L-4
		1/2 hr @ 300' + 1/2 hr @ 240"
ZnS	.4	
Asbestos	3.0	
	43.55	

Crystalline Cl melted
and added to Epo 828

Time	Visc	Spread
9:30	Med.	Good
10:30	thixotropic	"
11:30	"	"
1:30	"	"
2:30	"	"
3:30	"	"
4:30	"	"

812-54 RE Benson

ABS-019538

PARTICIPANTS

RE Benson, Dr. Nape

OBJECT
OF WORK

*137

Tare	10.37	Curc Z137K
100 Epon 828 + 80 Hera.	18.00	1 hr @ 240°F
Hydrophthalic anhydride		Z137N
benzyl dimethylamine .36		1 hr @ 240°F + 1/2 hr @ 330°F
Asbestos (7r + 2)	3.00	Z137F
	31.73	1/2 hr @ 240°F + 1/2 hr @ 330°F

TIME	Visc	Spread
9:00	Thin	Not very good body
10:00	"	"
11:00	Med. thin	good
12:00	"	good
2:00	"	"
3:00	"	"
4:00	thixotropic	
8-17-54	Semi-hard	

8-16-54 RE Benson

Prep liquid cl (100 cl + 7 H₂O)

Tare	94	Heated to liquid in
cl (Epoxyline, DuPont 100)		H ₂ O bath and to 116°C
Feb # 893)		for 10 min.
H ₂ O (top)	7	
	201.9	

ABS-019539

8-17-54 RE Benson

MICROFILMED

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

RE Benson, M. Nap

OBJECT
OF WORK

#138

tare	28.45	Cure Z138F (2 ponds made)
Epon 828	10.0	1/2 hr @ 240° + 1/2 hr @ 300°
Cl (100 cl + 15% me)	1.5	
ZnS	.4	
Asbestos	3.0	
	<u>43.35</u>	

Time	Visc	Spread
9:00	med	good
10:00	thixotropic	"
11:00	"	"
1:00	"	"
2:00	"	"
3:00	"	"
4:00	"	"

#139

tare	31.45	Cure Z139F (2 ponds made)
Leah VIII	13.8	1/2 hr @ 240° + 1/2 hr @ 300°
Cl (100 cl + 15% me)	1.5	
	<u>46.75</u>	

Time	Visc	Spread
10:00	thixotropic	good
11:00	"	"
1:00	"	"
2:00	"	"
3:00	"	fair
4:00	rubbery	poor

8-18-54 RE Benson

ABS-019540

PARTICIPANTS

R. E. Benson M. Mape

OBJECT
OF WORK

#119-3

Tare 28.53

Cure: Z119 F.3 (2 pounds)

Adh. VIII 13.8

 $\frac{1}{2}$ lb @ 240°F + $\frac{1}{2}$ lb @ 230°

el (crystalline Dufont 1.5

Tech 893) 43.83

el melted in oven @ 230°

Time

VISC

Spread

Adh. VIII heated down

1:30

thixotropic

good

before el was added

2:30

"

"

to prevent re-crystallization

3:30

"

"

4:30

"

"

#128-2

Tare 10.33

Cure Z128 F.2 (2 pounds)

~~Epo 828~~

10.0

el (100 el + 1 (5% me) 1.8

ZnS .4

Asbestos (75%) 3.0

25.53

Time

VISC

Spread

2:00

med

good

3:00

thixotropic

"

4:00

"

"

4:45

"

"

8-18-54 R. E. Benson

ABS-019541

PARTICIPANTS

R. E. Benson, 27 Traps

OBJECT
OF WORK

63-3

tare	51.21	Cure Z63F-3 (2 panels)
Epon 828	10.00	1/2 hr @ 240° + 1 1/2 hr @ 300°
Cl (Epiplaine duPont Jeth #893)	1.50	
JAT-21	.20	
Piperidine	.40	
BPA (500 mesh)	.40	
Pb (OH) ₂ CO ₃	.40	
Formvar 15/5 E	4.00	
	68.11	

TIME	VISC	Spread
11.00	thixotropic	good
1.00		
3.00	heavily	poor
	not adequate	

8-19-54 R. E. Benson

Observe suspension of Formvar 15/5 E in Epon 828

tare	146	mixture was stirred with spatula and mixed on paint ^{brush} mill Material was thixotropic not stringy.
Epon 828	100	
Formvar 15/5 E	40	
500 mesh	286	
		8-23-54 about same consistency
		8-24-54 " " " "
		8-20-54 R. E. Benson
		9-24-54 about same consistency
		as 8-23-54

ABS-019542

PARTICIPANTS

R. Benson, M. Nops

OBJECT
OF WORK

#140

tare

29.4

Cure: Z140f

100 Epon 828, 40 Formvar ¹⁵/₅F

14.0

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr 330°

375

.4

Cl (crystalline, DuPont Tech
#893)

1.5

45.3

Cl melted in oven @ 93°C

Time

V.S.

Spread

beaker with Epon-Formvar

9:00

thixotropic

good

heated ca 1 min in oven

10:00

"

"

before adding melted Cl

11:00

"

"

1:00

"

"

2:00

"

"

#141

Cure: Z141F

tare

28.85

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr 330°100 Epon, 40 Formvar ¹⁵/₅F

14.0

salicigenin

.4

Cl (crystalline, DuPont Tech
#893)

1.5

44.75

Time

V.S.

Spread

9:30

thixotropic

good

10:30

"

"

11:30

"

"

1:30

"

fair

2:30

"

poor

ABS-019543

8-24-54 R. Benson

PARTICIPANTS

OBJECT
OF WORK

REBenson M. Nape

Prep. liquid cl (100 cl + 7 H₂O)

Tare 142

cl (Crystalline, DuPont 200

Isch. #893)

H₂O (top)14
356Heated into solution in
H₂O bath.

Heated 10 min @ 116°C

8-26 Crystallized

8-27 heated 10 min @ 116°C

8-24-54 REBenson

#142

Tare

26.85 - Tare 2.142 F

Epon 828

~~38.5~~ 10.0liquid cl (100 cl +
diaminopyridine)~~10.0~~ 1.5

ZnS

.4

Formvar '45 E

'100 mesh"

3.0

Asbestos 7TF2

2.0

45.72

Mixture was thick and hard to spread - No
blade could not be used.

1 pencil mode Manual bend test fair-good

1 free strip mode 12-15 lbs "C" bend

8-25-54 REBenson

Post cured 4 strips 3 hrs @ 330°F

Manual bend test very good

ABS-019544

PARTICIPANTS

RE Benson, JN Nops

OBJECT
OF WORK

#142-2

tare

28.77

Cure Z142F

Epon 828

10.0

5 lbs @ 330° + 5 lbs @ 330°

liquid (160 cl + 5 diamine)
epoxide

1.5

Z142F + P.C. 3/330°

JN-5

.4

Z142F. peel strip

Formvar 15/5 E (200 mesh)

3.0

2 lbs "C" brush

Asbestos 7TF2

2.0

45.67

Spread was much

Time

Visc

Spread

better than #142

9:00

thixotropic fair

Dr. blade was used.

1:30

2:30

Med thick poor

#143 tare

10.5

2 panels

100 Epon 828 + 80 hex-

18.0

Cure Z143K

polyepoxide anhydride

1 hr @ 330°

Formvar 15/5 E (200 mesh)

4.0

1-panel P.C. 5-330°

Asbestos 7TF2

3.0

benzyl dimethylamine .36

35.86

Time

Visc

Spread

9:30

thixotropic

Good

1:30

"

fair

2:30

Med thick

poor

Y 27-54 RE Benson

ABS-019545

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

PARTICIPANTS

R E Benson, M. Naps

OBJECT
OF WORK

#144

	tare	10.18	Cure:
anhydride 1:1 mix	Epon 828	10.0	Z144K
	33 1/3% wt hexahydrophthalic anhydride		1 hr @ 330°f
	33 1/3% wt 3:4 chlorophthalic anhydride	10.0	Z144F
	33 1/3% wt 3:4 chlorophthalic anhydride		1/2 hr @ 240 + 1/2 hr 330
	33 1/3% wt chloroendic anhydride		
	asbestos 7TF2	3.0	
	benzyl dimethylamine	.2	
		33.38	

T. Me

VISC

Spread

3.00

thin

good

4.00

Med.

4:15

8:30-54 Has not completely hardened at R.T.

#145

	tare	10.02	Cure	Z145K
	Epon 828	10.0		1 hr @ 330°f
anhydride 1:1 mix	33 1/3% wt hexahydrophthalic anhydride			Z145F
	33 1/3% wt 3:4 chlorophthalic anhydride	10.0		1/2 hr @ 240 + 1/2 hr 330°f
	33 1/3% wt chloroendic anhydride			
	asbestos 7TF2	3.0		
	Dicy (microcapsules)	.2		
		33.22		

T. Me

VISC

Spread

3.00

thin

good

4.00

Med.

4:15

ABS-019546

8:57-54 R E Benson

PARTICIPANTS

RE Benson, M. Tug

OBJECT
OF WORK

Prep. liquid cl (100 cl + 5(2,3+2,5-diamino
pyridine

tare 92.20

cl (Crystalline Dubois 100.0
Jch # 893)

mixture heated to
116°C for 10 min

2,3+2,5-diaminopyridine 5.0

107.20

a portion of this taken
by elem.

anhydride 1:1:1 mix - 33 1/3% by wt hexahydrophthalic
anhydride

crystallized 8-3054
heated to 170°C for

15 min. and trans-
ferred to a clean
erlenmeyer flask

33 1/3% by wt 3+4 chlorophthalic
anhydride

33 1/3% by wt chloroaniline or-
hydride

H. Macey 8-26-54

above mixture crystallized
after sitting - hard to get
back into solution - Cause
thought to be formation of acid

#146

tare

10.12

Cure Z146 F

Epoxy 828

10.0

1/2 hr @ 240 + 1/2 hr @ 320

anhydride 1:1:1 mix

10.0

Z146 F + PC 3-330

Formvar 1/5 E (200 mesh)

6.0

1/2 hr @ 240 + 1/2 hr @ 320

asbestos TFE2

2.0

+ 30 @ 330°F

benzyltrimethylammonium

.2

38.32

TIME

VISC

SP. T. CO.

2:30

Photolysis

Good film

ABS-019547

2:30

..

fair

8-30-54

RE Benson

4

INVESTIGATION
NO.

54.16500

CROSS
REFERENCE

PARTICIPANTS

REBenson, W. Hayes

OBJECT
OF WORK

142-3

tare	10.16	Cure: Z 142-F 3 + P.C. 3-330
Epon 828	10.0	1-double lap joint
liquid cl (diaminopyridine)	1.5	Z 142-F 3 + P.C. 3-330
Zn 5 (ground fine)	.4	1-heel strip
Formvar 1/5 F (200 mesh)	3.0	20-22 lbs "C" break
Asbestos TTF ₂	2.0	
	27.06	

Time	Vis	Spread
3:00	thick	good
4:00	"	"
4:45	"	"

8-30-54 REBenson

Prep 142 adhesive (H.P. 11) for Elom

tare	904	Stirred with mech-
Epon 828 (H+92-102A)	1000	anical stirrer
Formvar 1/5 F	300	1146 g. given to Elom
Zn 5	40	remainder kept for
Asbestos	200	future use.
	2444	

ABS-019548

Prep liquid cl (100 cl + 5 (2.3 + 2.5 diaminopyridine) for Elom.

215 g. above liquid cl was prepared by heating above parts to 116°C for 10 min (10 pls of liquid cl per 100 pls of H.P. 11 adhesive recommended on label) 9-2-54 REBenson

PARTICIPANTS

R. E. Benson, M. Trap

OBJECT
OF WORK

Trap liquid Cl (100 cl + 5 (2, 3 + 2.5 diamine-pyridine))

tare 141

Cl (crystalline DuPont 100
Lab. # 893)

Heated in water bath to liquid
and to 116°C for 10 min
crystallized - re-heated

2, 3 + 2.5 diamine 5

pyridine 246

" 12.4

tare

2930

Cure: Z142-F4 + PC-3-320

ash 142 (P92)

15.4

1-double joint

liquid Cl (100 cl + 5
diamine-pyridine) 1.5

46.2 g

Z142-F4 + PC-3-320

1 peel strip

20-25 lbs pressure

"C" break

Note: difficulty was had with Cl crystallizing
in bath 142 even though it was to do so fast

9-4-54 R. E. Benson

adhesive VIII panels

4-panels prepared, Cured and given to Klute
Prepared from 40 g ash VIII Lot # 2604-24-3
and 2.4 g fresh curing agent A (Lot # 177229)
Cured 90 min @ 200°F

4-panels prepared and Cured. Prepared from
40 g ash VIII Lot # 2604-24-3 + 2.4 g curing
agent A

Cured 90 min @ 200°F

ABS-019549

Labeled Adh VIII 1, 2, 3 + 4

Coupons from each panel labeled Adh. VIII 1-1
2-3 etc for coupons in each panel

9-7-54 R. E. Benson

PARTICIPANTS

RE Benson, M. Nopa

OBJECT
OF WORK

viscosity of formula 142 (LR 2398-92)

Brookfield #416

spindle #7

Temp. 77°C

2 R.P.M.

10 R.P.M.

1/6 (500 scale)

210 (500 scale)

3,712,000 cps

1,344,000 cps

viscosity to be checked ca 1 month later
allowing to stand in C.T. room 48 hr before
checking. checked 11-1-54 (LR 2398-112)

#142-6

Tare

28.55

Pencils:
Cure: Z142F-6

cal. 142 (p. 92)

15.4

1/2 hr @ 240°F + 1/2 hr @ 330°F

Cl (Vigint-1000)

1.5

Z142F-6 + PC 3-330

+ 5 (23 + 2.2)

diomeropipidine 15.45

1/2 hr @ 240°F + 1/2 hr @ 330°F

+ 3 hrs @ 330°F

Peel Strips

5 lbs PSI

"A" break

Z142F-6

1/2 hr @ 240°F + 1/2 hr @ 330°F

18 lbs PSI

"C" break

Z142F-6 + PC 3-330

1/2 hr @ 240°F + 1/2 hr @ 330°F

+ 3 hrs @ 330°F

9-27-54 RE Benson

6 coupons each of Z33, Z34, Z36 + Z37 were fast cured
3 hrs @ 330°F. also Z35, Z35G, Z33G, Z34G, Z36G
and Z37G

ABS-019550

INVESTIGATION
NO.

54-16500

GROSS
REFERENCE

PARTICIPANTS

REBenson M. Top

OBJECT
OF WORK

#142-7

tare

28.20

Cure: Z142F-7

Formula 142 (p92)

15.4

el (liquid - 100 el +

1.5

5 (2.3 + 2.5 diomina
pyridine)

45.10

1 pond strip

1/2 hr @ 240 + 1/2 hr @ 330

Z142F-7 + R

1/2 hr @ 240 + 1/2 hr @ 330

on canyon was broken apart

state of 8 PSI
2 and 6 PSI

and all thickness & all + glue

25 PSI thru

Z142F-7 + R 330

line measured.

Most of strip
is break

1/2 hr @ 240 + 1/2 hr @ 330

P.C. Strip #1 .0627"

.1409" total thickness

+ 3 hr @ 330°F

" #2 .0616"

.0865"

total glue line 1/2 pond to 1/2 hr @ 330°F

" #3 .0622"

.0865"

9 28.54 REBenson

.1865"

Prep Formula 142

tare

900

Epon 828 (Lot 92-102A)

1000

Formvar 1/5 E (1000 ml)

300

Zn 5 (ground)

40

Asbestos 7 + f2

200

2440

Prepared in 2 l glass jar with mechanical stirrer. Each added slowly to Epon 828 in order as on left.

9-29-54 REBenson

#134F2

tare

28.40

Cure: Z134F2

adh VIII (Lot 92-102A)

13.8

liquid el 100 el + 5

1.5

pyridine

43.75

1- Double log joint

1/2 pond + Cure

1/2 pond + Cure +

P.C. 3 hrs @ 330°F

ABS-019551

10-4-54 REBenson

ALL ENTRIES MUST BE SIGNED AND DATED DAILY. LR NO 2398

PARTICIPANTS

RE Benson, W. Naps

OBJECT
OF WORK

134 F-2

Peel strips

Tare

28.6

Add VIII (Lot 92-629) 13.8

Liquid Cl 12.3135 1.5

Dumene
pyrexia 4391 peel strip "C" Break
Z 134 F-2 (Lot 15 lb)

2 hr @ 240 + 1/2 hr @ 330

1 peel strip

Z 134 F-2 + P.C. 3-330

2 hr @ 240 + 1/2 hr @ 330

P.C. 3 hrs @ 330

Tested - 12 lbs

"C" Break

10-6-54 RE Benson

131 F-2

Tare

47.45

Epoxy 828

30.0

3 - single leg joint panels

Z 131 F-2

Z 131 F-2 + P.C. 3-330

Cl. liquid (100 cl + 5 4.5

23 + 2.5
Dumene
pyrexia

1/2 - Z 131 F-2

1/2 - Z 131 F-2 + P.C. 3-330

ZnS (ground)

1.2

2 - double leg joint panels

Z 131 F-2

Asbestos

9.0

Z 131 F-2 + P.C. 3-330

92.15

2 - peel strips "C" Break

Z 131 F-2 (Lot 10 lb)

Z 131 F-2 + P.C. 3-330

Tested 8 lb "C" Break

10-7-54 RE Benson

PARTICIPANTS

R. C. Benson, TX Maps

OBJECT
OF WORK

Prep liquid cl (100 cl + 5(2,3+2,5 diamino pyridine

Tare	94.	Heated into soln in water bath and to 116°C for 10 min on hot plate.
cl (Crytoline, Du Pont Tech # 893)	100.0	
2,3+2,5 diamino-pyridine	5.0	
	199.0	

Prep liquid cl (100 cl + 5(2,6 diamino 4-methyl pyridine

Tare	51.67	Heated into soln in water bath + to 116°C for 10 min on hot plate.
cl (Crytoline, Du Pont Tech # 893)	20.0	
2,6-diamino-4-methyl pyridine	1.0	
	72.67	

10-7-54 R. C. Benson

Prep liquid cl (100 cl + 10(2,6 diamino 4-methyl pyridine

Tare	46.9	Heated into soln in water bath + to 116°C for 10 min on hot plate
cl (Crytoline, Du Pont Tech # 893)	20.0	
2,6-diamino-4-methyl pyridine	2.0	
	68.9	

Prep liquid cl (100 cl + 15(2,6 diamino 4-methyl pyridine

Tare	47.15	ABS-019553
cl (Crytoline, Du Pont # 893)	20.0	
2,6-diamino-4-methyl pyridine	3.0	
	70.15	

10-8-54 R. C. Benson

PARTICIPANTS

RE Benson, M. Nape

OBJECT
OF WORK

Z 147

Tare

46.62

Area: Z 147f

Epon 828

30.

 $\frac{1}{2}$ lb @ 240 + $\frac{1}{2}$ lb @ 330°

Zn S

1.2

P.C. 3-330 + f

Asbestos

9.0

 $\frac{1}{2}$ lb @ 240 + $\frac{1}{2}$ lb @ 330°

4-sec. butyl-nitr.

phenylene diamine

6.3

+ 3 lb @ 330° f

93.22

~~(tested 6 PSI)~~

2 panels single "2" lap joint F cure

2 panels " " " " F cure + P.C. 3-330° f

1 panel double " " " " $\frac{1}{2}$ @ 7 cure $\frac{1}{2}$ P.C. 3-330

1 peel strip 1" wide F cure (tested 10 PSI)

1 " " " " F cure + P.C. 3-330° f.
(tested 6 PSI)

" @ break

T.M.

Visc

Spread

9:00

thixotropic good

10:00

2:00

3:00

4:00

4:45

fair

10-11-54 RE Benson

INVESTIGATION
NO.

54-16500

CROSS
REFERENCE

ABS-019555

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

#148

• Tare	46.8	Cure
Formula 142	30.8	Z148-f
4 sec. - butyl m-phenylene diamine	4.2	$\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°
(See PONT)	81.8	Z148-f PC 3-330
		$\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°
		+ 3 hr @ 330° +
2 panels single $\frac{1}{2}$ " lap joint		F Cure
2 " " " "		F Cure + P.C. 3 hr @ 330°
1 " double $\frac{1}{2}$ " lap joint		$\frac{1}{2}$ panel F Cure
		$\frac{1}{2}$ panel F Cure + P.C.
1 peel strip 1" wide		F Cure (tested 20 PSI) "C" break
1 " " " "		F Cure + P.C. 3 hr @ 330°
		tested 18 PSI "C" break

10-12-54 REBenson

#149

Tare	42.65	Cure
App. VIII (J-42-102A)	37.5	Z149-f
4 sec. - butyl m-phenylene diamine	4.2	$\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°
(See PONT)	74.35	Z149-f + P.C. 3-330
		$\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°
		+ 3 hr @ 330° +
2 panels single $\frac{1}{2}$ " lap joint		F Cure
2 " " " "		F Cure + P.C. 3 hr @ 330°
1 " double $\frac{1}{2}$ " lap joint		$\frac{1}{2}$ panel + Cure
		$\frac{1}{2}$ panel F Cure + P.C. 3-330
1 peel strip 1" wide		F Cure (tested 14 PSI) "C" break
1 " " " "		F Cure + P.C. 3 hr @ 330° (tested 10 PSI) "C" break

10-13-54 REBenson

PARTICIPANTS

RC Benson, DC. Topp.

OBJECT
OF WORK

#150

tari	46.25	Cure Z150f
Epon 828	30.0 16.25	1/2 hr @ 240 + 1/2 hr @ 330
3m5	1.2	Z148F P.C. 3-330
Asbestos 7TF2	9.0	1/2 hr @ 240 + 1/2 hr @ 330
liquid el (100el + 5)	45	+ 3 hrs @ 330°F
2 1/2 - dimensions 4 - mesh (pyridine)	90.95	
2 panels single 1/2" lap joint		F cure
2 " " " " " "		F cure P.C. 3 hrs @ 330°F
1 panel double 1/2" lap joint		
1/2 panel F cure		
1/2 panel F cure + P.C. 3 hrs @ 330°F		
1 peel strip 1" wide	F cure	(tested 15 PSI)
1 " " " " " "	F cure	(tested 15 PSI)
	F cure	1 hr @ 330°F

Note: apparently was hot with el + at life (tested 15 PSI) C break

10-14-51 RC Benson

#151

tari	43.86	Cure Z150f
Formula 142	30.8	1/2 hr @ 240 + 1/2 hr @ 330
liquid el (100el + 10)	3.0	Z148F R. 3-330
2 1/2 - dimensions 4 - mesh (pyridine)	77.66	1/2 hr @ 240 + 1/2 hr @ 330
		+ P.C. 3 hrs @ 330°F

2 panels single 1/2" lap joint	F cure
2 panels " " " "	F cure + P.C. 3-330

ABS-019556

10-20-54 RC Benson

PARTICIPANTS

REBenson; M. Naps

OBJECT
OF WORK

Z151 Cont'd

1 panel double $\frac{1}{2}$ " lap joint $\frac{1}{2}$ panel F Cure $\frac{1}{2}$ panel F Cure + 3 hrs @ 330° f~~1 panel strip 1" wide F Cure~~

1 " " " " F Cure + P.C. 3-330 (resin 1440)

Note: Cl did not Crystallize in taking from bottle.
Pot life ca 5 hrs

10-20-54 REBenson

#152

tare

44.9

Cure:

Epoxy 828

20.0

Z152 f

Cl (Crystalline-Resist

3.0

 $\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°

Tech #893)

6.0

Z152 f + P.C. 3-330

Asbestos T7T2

73.9

 $\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°

+ P.C. 3 hr @ 330° f

2 panels F Cure

2 " " " " + P.C. 3 hrs @ 330° f.

Pot life ca 6 hrs.

10-21-54 REBenson

ABS-019557

PARTICIPANTS

R. Benson, M. Naps

OBJECT OF WORK

#153

tare 47.04

Cure: Z 153F

Epon 828 20.0

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°

liquid (100 cl + 10-2,3+25 3.0

Z 153F + P.C. 3-330

diarrhiza pyridine

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°

asbestos 7TF2 6.0

+ P.C. 3 hrs @ 330°

76.04

2 panels F Cure

2 " " " + P.C. 3 hrs. @ 330°

Pot life ca 6 hrs.

#154

Cure: Z 154F

tare 44.25

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°

Epon 828 20.0

Z 154F + P.C. 3-330

liquid cl (100 cl + 10-2,6 3.0

 $\frac{1}{2}$ hr @ 240° + $\frac{1}{2}$ hr @ 330°diarrhiza-4-methyl
pyridine

+ P.C. 3 hrs @ 330°

asbestos 7TF2 6.0

73.25

2 panels F Cure

2 panels F Cure + P.C. 3-330

Pot life 4 hrs +

10-22-54 R. Benson

PARTICIPANTS

R. Benson, M. Noppe

OBJECT OF WORK

#155

Tare	45.32	Cure: Z155F
Epon 828	20.	$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°
4sec butyl-meth	4.2	Z155F + P.C. 3-330
phenylamine diimine		$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°
Asbestos 7TF2	6.0	+ P.C. 3 hrs @ 330°F
	<u>75.52</u>	

2 panels F Cure
 2 panels F Cure + P.C. 3-330
 Pot life: 6 hrs +

10-25-54 R. Benson

Formula 142 adhesive (LR 2398-92) put in
 C.T. room. Viscosity to be taken 48 hrs later

Formula 142 adhesive (LR 2398-102) put in
 C.T. room. Viscosity to be taken 48 hrs later
 10-26-54 R. Benson

#32-2

Tare	29.1	Cure: Z32 F-2
Epon 828	10.0	$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°
Cl (crystalline - DuPont Tech. #893)	1.5	Z 32 F-2 + P.C. 330°
Lead Carbonate, basic (200 mesh)	.4	$\frac{1}{2}$ hr @ 240°F + $\frac{1}{2}$ hr @ 330°
		+ P.C. 3 hrs @ 330°F
Asbestos 7TF2	3.0	
	<u>44.0</u>	

ABS-019559

PARTICIPANTS

OBJECT
OF WORK

R.E. Benson, M. Naps

Z32 2 Cont'd.

1 panel F Cure single lay
 1 " F Cure + P.C. 3-330
 1 " double lay } F Cure 1/2 panel
 (F Cure + P.C. 3-330 1/2 panel)

10-27-54 R.E. Benson

6 Coupons, Z142 F-4 P.C. 3-330 were re-labeled
 H.P. 11 and mailed to North American

10-28-54 R.E. Benson

#156

tare	45.68	Cure: Z156 F
Epon 828	10.0	1/2 lb @ 240 + 1/2 lb 330
Cl, liquid (100% + 10- 2.3 + 2.5 diaminos pyridine)	1.5	Z156 F + P.C. 3-330
lead carbonate, basic	.4	1/2 lb @ 240 + 1/2 lb 330
asbestos #7	3.0	+ P.C. 3 lb @ 330 F
	60.58	

1 panel 1/2" single lay F Cure
 1 " " " F Cure + P.C. 3-330
 1 " 1/2" double lay 1/2 panel F Cure
 1/2 panel F Cure + P.C. 3-330

Pot life in hrs

ABS-019560

11-1-54 R.E. Benson

INVESTIGATION
NO.

54-16560

CROSS
REFERENCE

PARTICIPANTS

R. P. Benson, W. M. Naps

OBJECT
OF WORK

*157

Tar	29.65	Cure Z157F
Epon 828	10.0	5 lb @ 240 + 1/2 lb @
Liquid el (1000) + 10.0	1.5	Z157F + P.C. 3330
2.6 Lecumex		5 lb @ 240 + 1/2 lb @
4-methyl piperidine		+ P.C. 3 lb @ 330 +
lead Carbonate, basic	.4	
asbestos TTF2	3.0	
	44.55	

1 panel 1/2" single layer 5 cure
 1 " " " " " " + P.C. 3-330
 1 " double layer 1/2 panel 5 cure
 1/2 panel 5 cure + P.C. 3-330
 Put life on 7 hrs.

viscosity of formula 142 (LR 2398-92)
 Brookfield #4416 spindle #7 Temp. 77°C

2 R.P.M.

114 (500 scale)

3,648,000 cps

10 R.P.M.

232 (500 scale)

1,484,800 cps

viscosity of formula 142 (LR 2398-102)

2 R.P.M.

144 (500 scale)

4,608,000 cps

10 R.P.M.

280 (500 scale)

1,792,000 cps

ABS-019561

11-1-54 R. P. Benson

PARTICIPANTS

R. C. Benson, M. Naps

OBJECT
OF WORK

#142-8 (all panels from North American)

Tare: 29.38

Cure: 2142 F + P.C. 3-33

Formula 142 154
(LR 2398-92)1-1/2" double lap
panelLiquid 2 (100 el + 5- 1.5
2,342.5 decans
pipetting) 46.28

11-2-54 R. C. Benson

#158

Tare 28.60

Cure 2158 F

Epon 828 10.0

1/2 hr @ 240° + 1/2 hr @ 330°

4-sec-butyl 2.1

2158 F + P.C. 3-330

m-phenylene diamine

1/2 hr @ 240° + 1/2 hr @ 330°

basic lead carbonate 4

+ P.C. 3 hr @ 330° F

asbestos 3.0

44.15

1 panel F cure

1 panel F cure + P.C. 3-330

1 panel ~~F cure + P.C. 3-330~~ double lap joint

1/2 panel F cure

1/2 panel F cure + 3 hr @ 330° F

11-3-54 R. C. Benson

1 peel strip using Douglas-Ciba etched strip
and 422 run 607-409 was used.

Cure 30 min @ 330° F

Tested 8 psi "C" break

ABS-019562

PARTICIPANTS

REBenson, M. Naps

OBJECT
OF WORK

154

Tar:	98.87	Cure: Z159-f
Epon 828	10.0	1/2 hr @ 240 + 1/2 hr @ 330
cl (Crystalline DuPont Tech #893)	1.5	Z159f + P.C. 3330
basic lead Carboxylate	.4	1/2 hr @ 240 + 1/2 hr @ 330
Formvar ^{1/2} GF	3.0	+ P.C. 3 hrs @ 330 f
^(200 mesh) Asbestos	2.0	
	45.77	

- 1 panel F Cure
- 1 panel F Cure + P.C. 3-330
- 1 panel double layer
- 1/2 panel F Cure
- 1/2 panel F Cure + 3-330

Pot life ca 6 hrs.

Prep liquid cl (100 cl, Crude Du Pont Tech #893 +
10 - 2.3 + 2.5 diamines pyridine)

Tar	47.30	heated into soln. in
cl (Crystalline)	20.0	water bath and
2.3 + 2.5 diamines pyridine	2.0	to 116°C on hot plate
	69.30	for 10 min.

10-4-54 REBenson

ABS-019563

PARTICIPANTS

REBenson, M. Nape

OBJECT
OF WORK

Z160

Tare

28.62

Cure Z160 F

Epon 828

10.0

3 hr @ 240 + 1/2 hr @ 330°F

Liquid Cl 100 cl + 10-
2, 3 + 2.5 diamine 1.5
pyridine)
(p 114)

Z160 F + P.C. 3-330

3 hr @ 240 + 1/2 hr @ 330°F

Basic lead carbonate .4

+ P.C. 3 hr @ 330°F

Formvar 15/5E
(200 mesh)

3.0

Asbestos 7T52

2.0

45.52

1 panel F cure

1 panel F cure + P.C. 3-330

1 panel 5" double lap

1/2 panel F cure

1/2 panel F cure + P.C. 3 hr @ 330°F

pot life ca. 10 hrs

11-5-54 REBenson

PH. 284E

3 panels (Douglas-Liba Tech) were made
with ash TH Rem LR 2292-155.

Cured 90 min @ 177°C

11-8-54 REBenson

ABS-019564

PARTICIPANTS

R. Benson, M. Nops

OBJECT
OF WORK

#161

tare	59.5	Z161F
Epon 828	10.0	$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°f
liquid cl (100 cl + 10- 2.5 + 5.26 diomins 4 mang pyridine	1.5	Z161F + P.C.
basic lead Carbonate	.4	$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°f
Formvar $\frac{1}{4}$ F (200 mesh)	3.0	423 hr @ 330°f
Asbestos 7TF2	2.0	
	46.4	

1 panel F cure
 1 panel F cure + P.C.
 1 panel double lap (Panel not sent to
 test lab as it is a test)
 $\frac{1}{2}$ panel F cure
 $\frac{1}{2}$ panel F cure + P.C.

11-10-54 R. Benson

#162

tare	29.28	Cure
Epon 828	10.0	Z161F
4 sec butyl m. phenylene diamine	2.1	$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°f
basic lead Carbonate	.4	Z161F + P.C.
Formvar $\frac{1}{4}$ F (200 mesh)	3.0	$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°f
Asbestos	2.0	+ P.C. 3 hr @ 330°f
	46.78	

1 panel F cure
 1 panel F cure + P.C. 3 @ 330

ABS-019565

11-12-54 R. Benson

PARTICIPANTS

REBenson, M. Nops

OBJECT
OF WORK

#163

tare

28.33

Cure: Z163F

ash VIII

27.6

1/2 hr @ 240 + 1/2 hr @ 330 f

liquid @

(2.6 decimino)

3.0

Z163F + P.C.

58.93

1/2 hr @ 240 + 1/2 hr @ 330
+ P.C. 3 hr @ 330 f

2 panels single 1/2" lap joint

F cure

F cure + P.C. 3-330

1 peel strip

F cure

(tested 10 PSI) "C" Break

1

F Cure + P.C. 3-330

(tested 10 PSI)
"C-Break"

11-15-54 REBenson

3-10" panels were made up using ^{Shells} Bell's Id
with ash 422 strips.one strip had been aged at R.T., one in the
refrigerator and one in an oven at 40°CPanels were cured in Hydrol-air press at
40 lbs pressure by gauge, 178°C for 30 min
Panels were put in cold press and 3 min
allowed for press to come to temperature

See LR 2625-99 B2, C2, & D2

11-15-54 REBenson

INVESTIGATION NO.		CROSS REFERENCE		PARTICIPANTS		OBJECT OF WORK	
54-16500				REBenson, M. Naps		ABS-019567	
#44-5							
tare		29.25		Cure		Z144F-5	
Epoxy 828		10.0				$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°	
Q (Capitane-DuPont)		1.5				Z144F-5 + P.C.	
SILH #893						$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°	
Zps 5 (ground)		.4				+ P.C. 3 hrs @ 330°	
asbestos 7T52		3.0					
		44.15					
1 panel F Cure							
1 panel F Cure + P.C.							
						11-26-54 REBenson	
#134-5							
tare		28.35		Cure		Z134F-5	
adhesive (Lot 2604-24-3)		13.8				$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°	
liquid el 1100 @ 5 + 2.3						Z134F-5 + P.C.	
2.5 diamine		1.5				$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°	
pipidum						+ 3 hrs @ 330°	
R2348-93)		43.65					
1 panel F Cure							
1 panel F Cure + P.C.							
						11-26-54 REBenson	
#149-2							
tare		28.75		Cure		Z149F-2	
adhesive (Lot 2604-24-3)		13.8				$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°	
4-sec. Butyl-m. phenol		2.1				Z149F-2 + P.C.	
diamine		44.65				$\frac{1}{2}$ hr @ 240 + $\frac{1}{2}$ hr @ 330°	
1 panel F Cure						+ 3 hrs @ 330°	
1 panel F Cure + P.C.						11-29-54 REBenson	

