98-25C
CLJ/comp

NO. 94-C-2110-2

JOHNNY B. AARON, ET AL.	§	IN THE DISTRICT COURT OF
	§	
	§	
	§	
	§	
	§	
VS.	§	BRAZORIA COUNTY, TEXAS
	§	
	§	
	§	
	§	
	§	
ABEX CORPORATION, ET AL.	§	23RD JUDICIAL DISTRICT

TELEPHONIC DEPOSITION OF:

LOUIS KILIAN

JANUARY 9, 1998

COPY

DUPLICATE
FILE COPY

WORLDWIDE COURT REPORTERS, INC.

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City Place Center
2711 N. Haskell Ave., Ste. 410
Dallas, TX 75204
Tel: (214) 824-2011
Fax: (214) 824-1609

1-800-745-1101

Q. (By Mr. Lanier) I just thought he was making the joke, he said as best as I can tell it.

MR. RUBEN: No, sir. He's just answering your question. Shall he continue?

Q. (By Mr. Lanier) Yeah. I thought he was making a pun off asbestos. I was going to compliment it. As best as I could tell the story.

MR. RUBEN: No, not at all. He's just trying to answer your questions.

A. To tell you the truth, I wish I had thought of it.

Q. (By Mr. Lanier) My apology. I thought it was clever. I was going to compliment you on it. I didn't mean to interrupt. Go ahead, sir.

MR. RUBEN: Go ahead, Mr. Kilian. We have limited time and I want you to give full and complete answers.

A. My understanding of the history of the company is that it began, oh, I think, before 1930, but let's say 1919 or something by a man named Wert Quigley. So the company got the name from an individual whose last name was actually that. And I think he started the business in his

basement in Brooklyn. And I think he developed -- he had worked on boilers I think for the coal company or something and had worked on mortars or whatever to put brick together. And then Mr. Quigley at some point, I think it was around the early '30s, had bought a plant in Sayreville to go into the business of making some refractory brick. And he bought it because that plant at the time was the Old Bridge Brick and Tile Enamel Works and was just what he was looking for. I guess he wanted to go into the brick business.

Then at some point after that, really he did mostly brick making but then discovered a process for extending the roofs of open hearth furnaces and that really made Quigley Company into the monolithic refractory company that it is today in the sense that -- or what it was until 1992, in the sense that that's the business that Quigley is primarily in and that's making basic refractory materials to spray inside furnaces to extend the life of those furnaces. And so it kind of graduated into BOF furnaces and electric furnaces.

Q. (By Mr. Lanier) Okay. Hang on. I'm writing slower than I'd like.

When did you understand Quigley began using asbestos in the manufacture of any of their products?

A. From what I can tell in going through some of the Quigley files and information, I think that that probably would have started around 1935.

Q. What size of a company was Quigley when it was dissolved in 1992 or whatever?

MR. RUBEN: This is Ron Ruben. I'm not sure what you're asking him, sir. Could you rephrase that? I don't know that he told you it was dissolved. Can you clarify that?

MR. LANIER: Yeah. It's a good point.

MR. RUBEN: He'll answer it, but maybe just break it down for him.

Q. (By Mr. Lanier) In 1992 Quigley sold their assets or at least the plant that you're involved in to Minteq. Did Quigley sell basically all of their manufacturing that you understand?

A. I guess they did.

Q. Okay. Did they have any other plants other than the plant that you've referenced

THE STATE OF TEXAS
COUNTY OF HARRIS

REPORTER'S CERTIFICATION
TO THE DEPOSITION OF LOUIS KILIAN
TAKEN ON JANUARY 9, 1998

I, Carol Jenkins, Certified Shorthand Reporter in and for the State of Texas, hereby certify that this deposition transcript is a true record of the testimony given by the witness named herein, after said witness was duly sworn by me.

I further certify that I am neither attorney nor counsel for, related to, nor employed by any of the parties to the action in which this testimony was taken. Further, I am not a relative or employee of any attorney of record in this cause, nor do I have a financial interest in the action.

Further certification requirements pursuant to the Rules will be certified to after they have occurred.

SUBSCRIBED AND SWORN to on this the 9th day of January, 1998.

Carol Jenkins

Carol Jenkins
Certified Shorthand Reporter
In and for the State of Texas
Certification No. 2660
Expiration Date: 12/31/98

ORIGINAL

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MARYLAND

- - -

ANNA N. CHRISTELLO, et al	:	CIVIL ACTION
	:	NO. K-83-1255-K
vs.	:	
	:	
BETHLEHEM STEEL CORP., et al	:	

- - -

GEORGE DAVENPORT,	:	CIVIL ACTION
	:	NO. K-83-3033-K
vs.	:	
	:	
BETHLEHEM STEEL CORP., et al	:	

- - -

DORIS V. ELARDO, et al	:	CIVIL ACTION
	:	NO. K-83-3762-K
vs.	:	
	:	
BETHLEHEM STEEL CORP., et al	:	

- - -

CLAIR W. BRESSLER, et al	:	CIVIL ACTION
	:	NO. K-83-360-K
vs.	:	
	:	
BETHLEHEM STEEL CORP., et al	:	

- - -

WALTER ROYAL, et al	:	CIVIL ACTION
	:	NO. K-83-2436-K
vs.	:	
	:	
BETHLEHEM STEEL CORP., et al	:	

- - -

WILBERT R. HENSON, et al	:	CIVIL ACTION
	:	NO. K-81-2112-K
vs.		
BETHLEHEM STEEL CORP., et al		

MARINO, JOSEPH
DUPLICATE FILE
COPY
5-20-85

chemisty, acids and basics.

Q. When you say process, what you mean is the process which the refractory is being subjected to --

A. That's correct.

Q. -- and not the process of manufacturing the refractory?

A. That's correct. That's correct.

Q. Let me give you some terms, if I can, and ask you if these products were being made by Quigley when you first arrived there in 1969. Castable refractories?

A. Yes.

Q. What is a castable refractory?

A. A castable refractory is a -- is a method of installation. You -- it's like your -- like cements, you're pouring concrete on the road, you mix it up with water, mix it into some sort of a mixture and then just pour it into place.

Q. When we say --

A. It's castable.

Q. When we say it's castable, we mean a form is made up and it's poured into the form so that the shape can be cast?

A. Usually there's a form to it, yes.

Q. And how about a plastic refractory?

A. A plastic is like a clay where you would just ram it into or hammer it into its cavity or wherever you're putting it.

Q. And you mentioned you might ram it into place.

Is there a difference between something called a ramming mix and a plastic refractory?

A. It's usually -- a ramming mix you would normally mix with water first to a specific consistency and then ram it into place. A plastic is already mixed and it's already in the clay form and you would just ram it into shape.

Q. So that the plastic refractory comes to the customer already moist?

A. That's correct.

Q. Already wet, and the ramming mix normally comes dry and has water or some moisture added it to it?

A. Normally.

Q. What about lagging, what is lagging and did Quigley make a lagging in 1969?

A. Lagging is a term of insulating the outside of -- insulating or coating the outside of a particular unit or vessel.

Q. Is it a term --
A. Pipe.
Q. -- which describes a product or a term which describes the manner in which a product is installed?
A. It's more of a manner.
Q. Okay.
A. Well, it's more of -- a manner in which it's installed, a manner -- it's just a -- it's a description. I can't -- I'm not sure I can give you another -- something else that's clearer.
Q. Let me ask this. Can you tell us what the difference is, if any, between calling something an insulation product as opposed to calling it a refractory product?
A. Well, usually a refractory has to withstand the process conditions on which it's being applied to, either it be molten metal, unusual atmospheres within the vessel. An insulation does not have to normally withstand the process conditions. It's used to conserve energy and it's used as a back up to a refractory normally.
Q. Am I correct that there are products which serve to some extent both functions, products referred to as refractory insulations?

A. That's correct.

Q. And is that because they have attributes of both the refractory and the insulation?

A. That's correct.

Q. Describe for me, if you would, some of the types of products which classify as refractory insulations.

A. Well, they're normally in the alumina silicate line and their features are that they can withstand high temperatures and they are relatively light in weight.

Q. And what -- and what forms did they come in in the time when you first came to work at Quigley; and by forms I mean bricks, castables, plastic?

A. Are you asking me what forms Quigley made them in or which forms they came in period?

Q. Why don't we talk about it generally and then we'll get to Quigley specifically.

A. Generally they came in pre-shaped which are brick or some other form made, castables, gunnibles.

Q. You used the word gunnibles. What is that? What does that mean, if a refractory insulation is a gunnible?

A. It just means it can be applied via pneumatic process.

C E R T I F I C A T E

STATE OF NEW JERSEY :

:

COUNTY OF CAMDEN :

I, Mary Jane Brennan, Registered Professional Reporter-Notary Public within and for Camden County, State of New Jersey do hereby certify that the foregoing testimony of J. J. Marino was taken before me at 235 South 17th Street, Philadelphia, Pennsylvania on Monday, May 20, 1985; that the foregoing testimony was taken in shorthand by myself and reduced to typing under my direction and control, that the foregoing pages 1 to 170 contain a true and correct transcription of all of the testimony of said witness.

Mary Jane Brennan

MARY JANE BRENNAN
Notary Public

My commission expires

MARY JANE BRENNAN
Notary Public of New Jersey
My Commission Expires Feb. 20, 1988

IN THE UNITED STATES DISTRICT COURT

FOR THE EASTERN DISTRICT OF TEXAS

MARSHALL DIVISION

HANNAH WEAVER, as Personal Representative of the Estate and Survivors of CHARLES D. WEAVER, Deceased,	)	
Plaintiff	)	
Versus	)	CIVIL ACTION NO. M-86-0112-CA
THE CELOTEX CORPORATION, ET AL,	)	
Defendants	)	

QUIGLEY COMPANY, INC.'S ANSWERS TO PLAINTIFF'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

TO: Plaintiff and her counsel of record.

Defendant QUIGLEY COMPANY, INC. ("Quigley"), by its undersigned attorney, hereby answers PLAINTIFF'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS (hereinafter "Requests") as follows:

GENERAL OBJECTIONS

1. Quigley objects to Plaintiff's Requests on the grounds that they are burdensome, not relevant and not reasonably calculated to lead to the discovery of admissible evidence and that Quigley has only limited records of ever having sold any products to the Plaintiff or Plaintiff's employers. Without

Insurance Company and published in the Public Health Report, Vol. 50, no. 1, dated January 4, 1935?

ANSWER: No.

66. When was your company first aware of the above mentioned Lanza report?

ANSWER: See General Objection No. 5.

67. Please state whether the defendant, defendant's predecessors, or defendant's subsidiary companies at any time have been members of any "trade organization" or "trade association" composed of other manufacturers, miners and/or sellers of asbestos products and, if so, please identify the name and address of each such association or organization, the dates of membership, and the names of any publications issued or written by such association or organization.

ANSWER: Quigley was a member of the following associations:

American Society for Testing Materials

American Institute of Metalurgical and Petroleum Engineers

American Ceramic Society

Refractory Institute

American Iron and Steel Institute

While Quigley has no records indicating that it was ever a member of the Industrial Hygiene Foundation of America, Inc., or its successor, the Industrial Health Foundation, Quigley is aware that records in the possession of the Industrial Health Foundation tend to indicate that Quigley

THE [illegible] INSTITUTE

STATEMENT OF INCOME, EXPENSE, AND FUND BALANCE

Years Ended March 31, 1980 and 1979

	1980	1979
Income:		
Members' dues	$451,284.50	$383,022.50
Interest income	38,577.22	23,983.70
Sale of publications	13,774.70	22,500.89
Factory Operators' Meeting registration	21,610.00	11,617.50
Grants	54,000.00	
Miscellaneous	6.24	181.65
	579,252.66	441,306.24
Expense:		
Staff payroll and related expenses:		
Salaries and temporary help	126,885.95	88,116.43
Payroll taxes	6,038.55	2,836.68
Retirement benefits	32,695.58	3,170.58
Insurance benefits	4,320.57	3,338.78
	169,940.65	97,462.47
Office expenses:		
Stationery and supplies	4,783.81	5,325.49
Office equipment maintenance and rental	436.28	855.97
Other office expense	11,381.03	909.96
Postage	7,864.11	8,022.56
Rent	17,501.58	13,930.03
Telephone	9,661.85	4,188.74
Insurance and taxes	1,398.97	1,144.65
	53,027.63	34,377.40
Institute activities:		
Staff expenses	16,898.70	7,860.71
Meetings	54,163.00	30,258.21
	71,061.70	38,118.92
Publications:		
Printing	10,273.70	10,634.05
Census Bureau statistics	10,080.00	9,560.00
Dues and subscriptions	4,555.82	3,998.66
	24,909.52	24,192.71

(Continued)

STATEMENT OF INCOME, EXPENSE, AND FUND BALANCE
(Continued)

Years Ended March 31, 1980 and 1979

	1980	1979
Expense (Continued):		
Professional services:		
Auditing and accounting	$ 3,875.00	$ 3,750.00
Legal	53,309.60	70,945.35
Reimbursed expenses	10,015.32	11,769.75
Special surveys and projects:		
Impact study, silica		14,147.91
Others	10,494.20	29,910.16
OSHA study	54,992.41	
	132,686.53	130,523.17
Grants:		
Ohio State University Testing and Research Programs	37,508.00	31,796.54
Contest awards		468.75
Foundation in Refractories Education (FIRE)	23,000.00	23,000.00
	60,508.00	55,265.29
	512,134.03	379,939.96
Excess of income over expense before depreciation	67,118.63	61,366.28
Depreciation	888.00	836.02
Excess of income over expense	66,230.63	60,530.26
Fund balance, beginning of year	335,422.33	274,892.07
Fund balance, end of year	$401,652.96	$335,422.33

BOARD OF DIRECTORS

THE REFRACTORIES INSTITUTE

1980 - 1981

Roger G. Ackerman	Corhart Refractories Co.
A. M. (Tony) Caito	Basic Incorporated
Henry P. Day	Valley Mineral Products Corp.
Donald R. DeVeaux	Harbison-Walker Refractories
Wm. A. France, Jr.	J. H. France Refractories Co.
Raymond T. Hageman	C-E Refractories
Donald Herzfeld	Interpace Corporation
Howard E. Konrad	Johns-Manville Sales Corp.
Francis H. Laube	Freeport Brick Co.
Ralph V. Lawrence	General Refractories Co.
John G. Matchulat	Ferro Corp., Electro Division
Robert E. McIntosh	A. P. Green Refractories Co.
Richard B. McNamara	Norton Co.
Howard M. Nelson, Jr.	Kaiser Refractories
Harvey R. Pedersen	Chicago Fire Brick Co.
Richard J. Puricelli	The Carborundum Co.
William W. Raleigh	Didier Taylor Refractories Corp.
Paul H. Reed	New Castle Refractories Co.
Robert H. Rook	Martin Marietta Chemicals
Robert W. Schaefer	Plibrico Company
Richard C. Smith	Lava Crucible-Refractories Co.
Robert P. Stuntz	Babcock & Wilcox Co.
Dean R. Thacker	Quigley Co., Inc.
William T. Tredennick	Resco Products, Inc.
E. Avery Williams, Jr.	North American Refractories Co.

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION – ALUMINA-SILICA (Graphited P.. .STIC MIX, PRINCIPALLY FOR BLAST FURNACE RUNNERS

REASON FOR CHANGE – TEMPORARY SUBSTITUTION OF A. P. GREEN CLAY FOR #1 BLUE CLAY

DATE ISSUED 12/16/80

SUPERSEDES —

F- 357

NAME Q-CLASSIC

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2302	MULCOA 45	6x18m	26.5
2303	MULCOA 45	-18m	14.6
2304	MULCOA 45	Pulv.	13.4
1025	KYANITE, 100m Raw	--	14.3
1019	GRAPHITE, -20M	--	9.0
	A. P. GREEN CLAY	Dried	2.7
1008	BENTONITE	--	2.7
1126	CERAMIC FORMING ACID (1)	--	0.067
1081	PHOSPHORIC ACID, 75%	--	10.5
1109	WATER (2)	--	6.2
	COLUMN TOTAL –		100.00

Special Manufacturing Instructions and/or General Comments:

(1) – TO BE PRE-WEIGHED BY LABORATORY

(2) – MIXER OPERATOR ADJUSTED FOR DESIRED CONSISTENCY.

ISSUED BY – [signature]

APPROVED BY – J. D. Ruch

REVIEWED BY QUALITY CONTROL – [signature]

QUALITY CONTROL PARAMETERS

		USS MESH	PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
		-325		1/hr.	33.5	29-41		
MOISTURE (%)				1/hr.		8-13%		
FLOW (lbs./sec.)								
QUIGLEY								
BRU								
CUP TEST	GMS							
	cc							
SET TIME	INITIAL							
	FINAL							
BATCH PREP.	lbs.							
	cc							
BARS	C/C							
°F	pcf							
BRICKS	C/C							
	MOR							
°F	pcf							
SHELF LIFE								
PENETROMETER				1/hr.		0.5 - 2.0		
WORKABILITY INDEX				X				

PLAINTIFF'S EXHIBIT

06092

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION – Alumina-Silica aphite) plastic mix, principally for B.F. runners.

REASON FOR CHANGE – Transfer to new formula card.

DATE ISSUED 11/16/78 — 357

SUPERSEDES 12/23/77

NAME Q-CLASSIC

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2302	Mulcoa 45	6 x 18 m	26.5
2303	"	-18 m	14.6
2304	"	Pulv.	13.4
1025	Kyanite, 100 m raw		14.3
1019	Graphite, -20 m		9.0
1066	Clay, #1 Blue	Dried	2.7
1008	Bentonite		2.7
1126	Ceramic Forming Acid[1]		0.067
1081	Phosphoric Acid 75%		10.5
1109	Water[2]		6.2
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

1 To be preweighed by laboratory.

2 Mixer operator adjusted for desired consistency.

ISSUED BY – Mike Alexander

APPROVED BY – John B. Nash

REVIEWED BY QUALITY CONTROL –

QUALITY CONTROL PARAMETERS

		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
USS MESH							
-325			1/hr.	33.5	29-41		
MOISTURE (%)			1 hr.		8-13%		
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F							
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE							
Penetrometer			1/hr		0.5-2.0		
Workability Index			x				

06093

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – Pyrophyllite Based, Hot & Cold Gunning Mix

DATE ISSUED 9/25/80

SUPERSEDES 10/22/79

F- 380

REASON FOR CHANGE – Silica addition is now received in two fractions because of segregation problems.

NAME Q-PYLAST

06100

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1085	Pyrax, 3/8" & down (1)	–	33.5
1086	Pyrax, 1/4" & down (1)	–	33.0
1122	Silica Agg. Coarse (2)	–	13.0
1160	Silica Agg. Fine (3)	–	7.0
1070	Ball Clay, Coarse	–	10.0
1043	G.D. Sod. Silicate	–	3.0
1059	Plaster of Paris	–	0.5
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

(1) The two Pyrax fractions should be adjusted to meet the % -325 mesh spec. (in Dec. 1977 the ratio was 50:50).

(2) Morie Sand Co., Blended sands Grades #2 and #3.

(3) Morie Sand Co., Grade #00N.

NOTE: If the particle size specs. cannot be met with Pyrax fraction adjustments, the Silica aggregates must then be adjusted.

ISSUED BY – W. C. Miller

APPROVED BY – John B. Koch

REVIEWED BY QUALITY CONTROL – Louis J. Kilian

FORM 3301-107 (FRONT) 1-78

QUALITY CONTROL PARAMETERS

		USS MESH	PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
		T on 8		1/hr	29	20~38	20~38	
		20		"	58	50~67	50~67	
		-325		"	18	13~21	13~21	
		MOISTURE (%)		2/shift			> 0.6%	> 0.4%
		FLOW (lbs./sec.)						
		QUIGLEY						
		BRI	Record flow time.					X
CUP TEST	GMS							
	cc							
SET TIME	INITIAL							
	FINAL							
BATCH PREP.	lbs.							
	cc							
BARS	C/C							
°F	pcf							
BRICKS	C/C							
	MOR							
°F	pcf							
GEL. (g/cc)								
SHELF LIFE								

PLAINTIFF'S EXHIBIT

Q-491

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – A Graphitic Silica-Alumin. Slurry Gunning Mix

REASON FOR CHANGE – Transfer to new card format.

DATE ISSUED 12/4/78 — F- 442

SUPERSEDES 12/29/77

NAME Q-SILSPRAY GR

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2140	Clay, Sandy #3	Dried	92.0
1019	Graphite, -20 m		5.0
1044	Silicate #6		2.0
1008	Bentonite Clay		1.0
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

Adjust gel strength by varying bentonite level.

ISSUED BY – [signature]

APPROVED BY – [signature]

REVIEWED BY QUALITY CONTROL – [signature]

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
-325 m			1/hr.	39	30-48		
MOISTURE (%)			1/hr.				X
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)			1/hr.	100	50-60 cc		
SHELF LIFE							

PLAINTIFF'S EXHIBIT

06126

QUIGLEY
PRODUCT FORMULA CA..

DESCRIPTION – Coarse grained, h[illegible]gh strength, alumina-silica gunnable (low irc with a quick setting binder.

REASON FOR CHANGE – To conform to new Mulcoa fractions.

DATE ISSUED 8/14/78 | SUPERSEDES 5/30/78 | F 167

NAME Q-GUN 30-50

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2301	Mulcoa 45	3 x 6	10.0
2302	Mulcoa 45	6 x 18	32.0
2303	Mulcoa 45	(-)18&down	18.0
2304	Mulcoa 45(1)	Pulverized	21.8
1057	Cement, CA-25	-	6.0
1116	Cement, Secar 71(2)	-	9.0
1114	Clay, Pioneer(3)	Air Floated	3.0
1059	Plaster of Paris	-	0.2
	COLUMN TOTAL –		100.00

Special Manufacturing Instructions and/or General Comments:

(1) Pulverized Mulcoa 45 should be 45-55% thru 325 M.
(2) Secar 250 may be substituted if available.
(3) Kaolex D-6 clay from J. M. Kuber Co. may be substituted.

(*) Q.C. mixing instructions: Sufficient water for ball-in-hand consistency (water ranges should be 12-14%).

ISSUED BY [signature] | APPROVED BY – J.B. Rich | REVIEWED BY QUALITY CONTROL – David D. Kilhain

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
On 6			2/hr.	7.0	4-10	4-10	
On 20			"	41.0	37-45	37-45	
Thru 325			"	27.0	24-30	24-30	
MOISTURE (%)			2/shift		0-0.4%	>0.6%	>0.4%
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL		2/shift	30-60 min.			
	FINAL			24 hr.			
BATCH PREP.	lbs.		2/shift	14		)Mix less than 60 sec	
	cc			699-953 (11-15%)		)Cast rapidly (quick	
BARS	C/C		2/shift	>1500		)setting)* <1000	<1500
60-90 °F	pcf			Monitor			Monitor
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE				<3 mo.		>1 yr.	> 6 mo.
Hold Time				24 hr.			

PLAINTIFF'S EXHIBIT

061136

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION – Coarse grained, high strength, alumina-silica gunnable (low iron) with a .ick setting binder.

DATE ISSUED 1/15/79

SUPERSEDES - 467A

REASON FOR CHANGE – T E M P O R A R Y to evaluate Secar 80 as a substitute for CA-25.

NAME ** JBK

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2301	Mulcoa 45	3 x 6	10.0
2302	"	6 x 18	32.0
2303	"	-18 & down	18.0
2304	" (1)	Pulv.	21.8
	Cement, Secar 80	-	8.0
1116	" Secar 71 (2)	-	9.0
1114	Clay, Pioneer (3)	Air Floated	3.0
1059	Plaster of Paris	-	0.2
	COLUMN TOTAL –		100.00

Special Manufacturing Instructions and/or General Comments:

(1) Pulverized Mulcoa 45 should be 45-55% thru 325 M.
(2) Secar 250 may be substituted if available.
(3) Kaolex D-6 clay from J. M. Huber Co. may be substituted.

(*) Q.C. mixing sintructions: Sufficient water for ball-in-hand consistency (water ranges should be 12-14%).

(**) Package in Q-GUN 30-50 bags. Mark skids with X designation after manufacture date.

ISSUED BY D. Konal APPROVED BY – J. B. Kirk REVISED BY QUALITY CONTROL – Dave A. Klein

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
On 6			2/hr.	7.0	4-10	4-10	
On 20			"	41.0	37-45	37-45	
Thru 325			"	27.0	24-30	24-30	
MOISTURE (%)			2/shift		0-0.4%	> 0-6%	> 0.4%
FLOW (lbs./sec.) QUIGLEY							
FLOW (lbs./sec.) BRI							
CUP TEST	GMS						
CUP TEST	cc						
SET TIME	INITIAL		2/shift	30-60 min.			
SET TIME	FINAL			24 hr.			
BATCH PREP.	lbs.		2/shift	14		Mix less than 60 sec Cast rapidly (quick setting)*	
BATCH PREP.	cc			699-953 (11-15%)			
BARS	C/C		2/shift	> 1500		<1000	< 1500
60-90 °F				Monitor			Monitor
BRICKS	C/C						
BRICKS	MOR						
°F	psi						
GEL. (g/cc)							
SHELF LIFE				< 3 mo.		> 1 yr.	> 6 mo.
Hold time				24 hr.			

06137

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – Dolomite/Magnesit ot Gunning Mix for Use in Electric Furnaces

DATE ISSUED 1/14/81

F- .79

SUPERSEDES ALL PRIOR PERM. 479 CARUS

REASON FOR CHANGE – Formula has not changed. Specifications adjusted to Reflect "Clinging" Fines to Oiled Dolomite.

NAME FURNACE PATCH (Electric)

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1099*	Dead Burned Syndolag	-	67.0
1138*	18 x 30 M HP Grade Dolomite	-	6.0
2088	Magnesite, Blended	Pulv.	14.0
2007	" "	-40 M & D	8.0
1069	Ball Clay, A.F.	-	2.0
1044	#6 Sodium Silicate	-	3.0
	COLUMN TOTAL –		100.00

Special Manufacturing Instructions and/or General Comments:

*Any approved grades of dolomite may be used in any combination to keep the dolomite content at 73% in order to meet control parameters. The approved grades include:

Basic Inc.	-5 M Syndolag	1099
J.E. Baker	(-5 M Dolomite	1099
	(-3/16" Jebcolite	.137
	(12 x 18 M H.P. Grade	1139
	(18 x 30 M H.P. Grade	1138
Steetley Inc.	-5 M Steetley	1099

ISSUED BY – David T. Gilbin

APPROVED BY – David T. Gilbin

REVIEWED BY QUALITY CONTROL – David T. Gilbin

QUALITY CONTROL PARAMETERS

USS MESH		PRO-CEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+8		Dry	2/hr.	14.0	9.0-28.0	9.0-28.0	
T on +20		Dry**	"	63.0	58.0-74.0	58.0-74.0	
T on -325		Wet	"	14.0	12.0-20.0	11.0-20.0	
**T on +20		Wet				56.0-71.0	
MOISTURE (%)			2/run		0.0-0.6%	> 0.6%	
FLOW (lbs./sec.)							
QUIGLEY							
BRI			1/hr.	Must flow continuously.			
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE		+1 -0					

PLAINTIFF'S EXHIBIT Q-528

06145

CIGLEY PRODUCT FORMULA CARD

DESCRIPTION – Dolomite/Magnesite Hot Gu ix for use in BOFs and Electrics

REASON FOR CHANGE – ADJUSTED COMPONENT WEIGHT PERCENTAGES & CONTROL LIMITS. NEW . T E M P O R A R Y FORMULA

DATE ISSUED 10/20/80

SUPERSEDES 8/5/80

F- 479-"I"

NAME FURNACE PATCH

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1099*	-5 MESH DOLOMITE	-	72.0
2007*	MAGNESITE, Blended	-40	4.0
2008	MAGNESITE, Blended	Pulv.	17.0
1069	BALL CLAY, A.P.	-	4.0
1044	#6 SODIUM SILICATE	-	3.0
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

* - Any approved grades of dolomite may be used in any combination to keep the dolomite content at 73% in order to meet control parameters. The approved grades include:

BASIC INC. - -5M Syndolag (1099)
J.E. BAKER - (-3/16" Jebcolite, 1137)
(12x18M H.P. GRADE, 1139)
(18x30M H.P. GRADE, 1138)

ISSUED BY P. Davis | APPROVED BY – John B. Rush | REVIEWED BY QUALITY CONTROL – David J. Klein

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+ 8			2/hr.	18	8 - 22	8 - 26	
+ 20			2/hr.	62	60 - 74	59 - 75	
-325			2/hr.	17	12 - 20	11 - 20	
-100			1/run				X
MOISTURE (%)			2/run			> 0.6 –	
FLOW (lbs./sec.)							
QUIGLEY							
BN			1/hr.	MUST FLOW CONTINUOUSLY.			
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	act						
BRICKS	C/C						
	MOR						
°F	act						
GEL (g/cc)							
SHELF LIFE							

06146

QUIGLEY
PRODUCT FORMULA CARD

DESCRIPTION – -4 MESH, MODERATELY SIZED OLIVINE-BASED HOT GUNNING MIX

DATE ISSUED 12/16/80 – 490

SUPERSEDES

REASON FOR CHANGE – TEMPORARY FORMULATION
TO ACCOUNT FOR THE COARSER 5x20M OLIVINE (i.e., 20-35% +10M Delivered vs. 2-10% Desired) & ELIMINATE THE 10% DOLOMA

NAME FURNACE PATCH-2

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1144	5 X 20M OLIVINE (1)	--	61.8
1145	-20M OLIVINE (1)	--	20.0
2008	MAGNESIA, Blended	Pulv. (2)	10.0
1069	BALL CLAY, A.F.	--	5.0
1043	G.D. SODIUM SILICATE	--	3.0
3003	FUEL OIL, GRADE #2 (3)	--	0.2
	EXPERIMENTAL		
	COLUMN TOTAL –		100.00

Special Manufacturing Instructions and/or General Comments:

(1)– NEW, "BENEFICIATED" STEWART OLIVINES.

(2)– PULV. MAGNESIA SHOULD BE BETWEEN 55-65% -325M.

(3)– OIL SHOULD BE ADDED UNIFORMLY TO THE 5x20M and -20M OLIVINE FRACTIONS BEFORE ADDING OTHER MATERIALS. (i.e., 5 lbs. to 2500 lbs./batch)

ISSUED BY – J. B. Ruch

APPROVED BY – J. B. Ruch

REVIEWED BY QUALITY CONTROL – David Schlein

QUALITY CONTROL PARAMETERS

		USS MESH	PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
		+ 8		2/hr.	8			X
		+ 10		2/hr.	11			X
		+ 20		2/hr.	60	50-65	50-70	
		+ 40		2/hr.	75			X
		-100 (wet)		2/hr.	18			X
		-325 (wet)		2/hr.	12	10-16	9-17	
		MOISTURE (%)		2/run			> 1%	X
		FLOW (lbs./sec.)						
		QUIGLEY		1/hr.	MUST FLOW	CONTINUOUSLY		X
		BRI						
CUP TEST	GMS							
	cc							
SET TIME	INITIAL							
	FINAL							
BATCH PREP.	lbs.							
	cc							
BARS	C/C							
°F								
BRICKS	C/S							
	MOR							
°F	pcf							
SHELF LIFE								

PLAINTIFF'S EXHIBIT Q-532

06152

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – ~4 MESH, MODERATELY SIZED VINE BASED HOT GUNNING MIX

REASON FOR CHANGE – SPECIFICATIONS ADJUSTED BECAUSE OF CHANGES IN THE INCOMING OLIVINE

DATE ISSUED: 12/12/80
SUPERSEDES: 11/12/80
F- 490
NAME: FURNACE PATCH-2

PRODUCT FORMULATION

CODE NUMBER	CRUDE WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1137	3/16" JEBCOLITE DOLOMITE	-	10.0
1144	5x20M OLIVINE (1)	-	51.8
1145	-20M OLIVINE (1)	-	20.0
2008	MAGNESIA, BLENDED	Pulv. (2)	10.0
1069	BALL CLAY, A.F.	-	5.0
1043	G.D. SODIUM SILICATE	-	3.0
3003	FUEL OIL, GRADE	-	0.2
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

(1) – NEW "BENEFICIATED" STEWART OLIVINES.

(2) – PULV. MAGNESIA SHOULD BE BETWEEN 55-65%.

(3) – OIL SHOULD BE ADDED UNIFORMLY TO THE 5x20M AND -20M OLIVINE FRACTIONS BEFORE ADDING OTHER MATERIALS (i.e., 5 LBS. TO 2500 LBS./BATCH).

ISSUED BY – John B Ruch
APPROVED BY – John B Ruch
REVIEWED BY QUALITY CONTROL – David J. Kilian

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+ 8			2/hr.	8			X
+ 10			"	11			X
+ 20			"	60		45-70	50-65
+ 40			"	75			X
+100 (wet)			"	18			X
-325 (wet)			"	12	10-16	9-17	
MOISTURE (%)			2/run			1%	X
FLOW (lbs./sec.)							
QUIGLEY			1/hr.	FLOW CONTINUOUSLY			X
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
SHELF LIFE							

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – -4 MESH, MODERAT * SIZED OLIVINE BASED HOT GUNNING MIX

REASON FOR CHANGE – TEMPORARY - Substitution of DB Dolomite (-5 mesh syndolag) for 3/16" Jebcolite and 5X20m Olivine

DATE ISSUED 6/23/81

SUPERSEDES All others

F- 490

NAME FURNACE PATCH - 2

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1099	DOLOMITE, DB	-	62.0
1145	-20m OLIVINE (1)	-	20.0
2008	MAGNESIA, BLENDED (2)	Pulverized	10.0
1069	BALL CLAY, AF	-	5.0
1043	G.D. SODIUM SILICATE	-	3.0
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

(1) Beneficiated Stewart Olivines
(2) Pulv. Magnesia should be between 55-65% -325 mesh

Temporary Formulation to be used until decision is made to return to use of 3/16" Jebcolite plus 5X20m Olivine

ISSUED BY – Erwin Peltzer

APPROVED BY – David J. Weis

REVIEWED BY QUALITY CONTROL – Kenneth C. Kestell

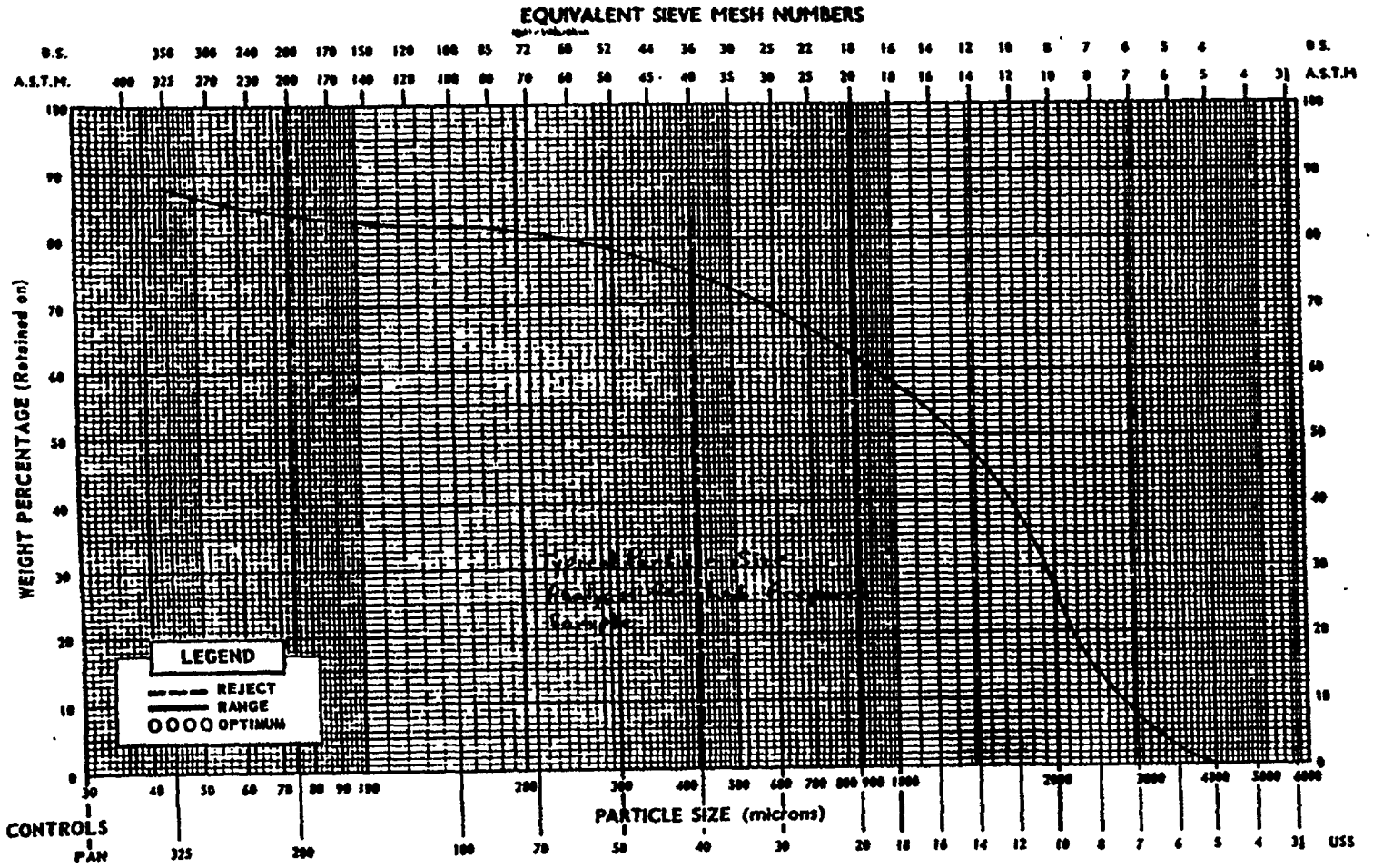
QUALITY CONTROL PARAMETERS

USS MESH		PRO-CEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+8			2/hr.	14			X
+10			2/hr.	27			X
+20			2/hr.	60	50-65	50-70	
+40			2/hr.	75			X
-100 (wet)			2/hr.	18			X
-325 (wet)			2/hr.	12	10-16	9-17	
MOISTURE (%)			2/run			> 1%	X
FLOW (lbs./sec.)							
QUIGLEY			1/hr.	MUST FLOW	CONTINUOUSLY		X
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS °F	C/C						
	pcf						
BRICKS °F	C/C						
	MOR						
	pcf						
SHELF LIFE							

061154

PRODUCT SIZE DISTRIBUTION CONTROLS

F— 490



FORM 3301-107 (BACK) 11-80

06155

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION – A 40% MgO, DOLOMA-OLIVINE BONDED, SILICATE BONDED HOT GUNNING MIX.

REASON FOR CHANGE – UPDATE OF FORMULATION TO UTILIZE ONLY ONE DOLOMA FRACTION.

DATE ISSUED 12/29/80 | SUPERSEDES 5/19/80 | F-462

NAME FURNACE PATCH-462

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1099	DOLOMA, -5M(1)	--	72.2
1138	DOLOMA, HP GRADE, 18x30M(1)	--	0.1
1129	#200 OLIVINE FLOUR(1)	--	23.4
1044	#6 SODIUM SILICATE	--	2.6
1069	BALL CLAY, A.F.	--	1.7
	COLUMN TOTAL –		100.00

Special Manufacturing Instructions and/or General Comments:

(1) MAINLY -5M DOLOMA AND #200 OLIVINE FLOUR ARE TO BE UTILIZED TO MAINTAIN LOW COST AT BOTH OLD BRIDGE & GIBSONBURG. THE MINIMUM AMOUNT OF 18X30M DOLOMA IS TO BE USED (PREFERABLY NONE) SINCE ITS USE WILL INCREASE COST.

(2) +20 WET TEST IS TO BE RUN TO DETERMINE TRUE VALUE, BY ELIMINATING FINES ADHERING TO THE OILED DOLOMA.

ISSUED BY – Kenneth A. Frestel | APPROVED BY – J. B. Koch | REVIEWED BY QUALITY CONTROL –

QUALITY CONTROL PARAMETERS

USS MESH		PRO-CEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+ 8		DRY	2/hr.	16		10-30	
+ 20		DRY	2/hr.	69		62-78	
-325		WET	2/hr.	17		14-24	
+20(2)		WET	2/run		64-74		X
MOISTURE (%)			2/run		0-0.4	> 0.6	
FLOW (lbs./sec.)							
QUIGLEY			1/hr.		CONTINUOUS FLOW		X
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
SHELF LIFE							

PLAINTIFF'S EXHIBIT Q59

July 28, 1980

TO: ALL FORMULA CARD HOLDERS

FROM: J. P. Zitelli

RE: FORMULA CARDS - CORRECTIONS

The attached Formula Cards (F-406, F-417, F-491) have been revised in order to conform to Raw Material Specification Sheets.

Please destroy the corresponding cards previously issued to you and replace them with these in your files.

The Wollastonite in F-406 and F-417 now has code number 1123 as per the raw material book and computer files. Also, the Secar Cement in F-491 is now designated, 'Secar 71'.

J. P. ZITELLI

JPZ:dc
Enclosures

PLAINTIFF'S EXHIBIT

Q-534

06157

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION - COARSE GRAINED, HIGH STRENGT HIGH PURITY, ALUMINA-SILICA GUNNABLE FOR LOWER STACK AREA OF BLAST FURNACE

DATE ISSUED 04/22/81

SUPERSEDES - -

F- 491

REASON FOR CHANGE - - TEMPORARY - Work off 18 tons of CA-25 GG Cement before expiration date.

NAME LABELED AS PER ORDER LABEL

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2301	Mulcoa 47	-3 X 6m	10.0
2302	Mulcoa 47	-6 X18m	32.0
2303	Mulcoa 47	-18m	20.8
2304	Mulcoa 47	Pulverized	14.0
1057	CA-25 Cement	-	3.0
1116	Secar 250 Cement*	-	9.0
1114	Pioneer AF Clay	-	3.0
1023	-35m Virginia, Raw Kyanite	-	5.0
1052	Plaster of Paris	-	0.2
1150	CA-25 GG Cement	-	3.0
	EXPERIMENTAL		
		COLUMN TOTAL -	100.00

Special Manufacturing Instructions and/or General Comments:

*Secar 71 may be used as a replacement for Secar 250. when following production runs of other than cement bonded castables.

**Test 2 sets of bars (1) 1st skid (2) composite

ISSUED BY - J. M. Wood

APPROVED BY - David D. Lilien

REVIEWED BY QUALITY CONTROL - K. A. Seelig

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
T on 6m			2/hr.	7%	4-10%	4-10%	
T on 20m			2/hr.	41	37-45	37-45	
-325m			2/hr.	25	22-28	22-28	
MOISTURE (%)			2/shift			>0.6%	>0.4%
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL		2/shift		30-45min		30-45min.
BATCH PREP.	lbs.			10	add sufficient water to obtain ball-in-hand consistency		
	cc		2/shift	450-590cc			
BARS	C/C		**			<1000 psi	
°F	pcf		2/shift	Monitor			
BRICKS	C/C						
	MOR						
°F	pcf						
SHELF LIFE				<3 mos.		>1 year	>6 mos.
Hold Time				24 hours			

061158

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION – Coarse grained, high strength, alumina-silica gunnable (low iron) with a ·ck setting binder

REASON FOR CHANGE – TEMPORARY to evaluate Secar 80 as a substitute for CA-25
DO NOT USE FOR BLAST FURNACE STACK ORDERS

DATE ISSUED 10/22/79 | SUPERSEDES – | 491A

NAME Labeled as per order

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2301	Mulcoa 47	3 x 6	10.0
2302	"	6 x 18	32.0
2303	"	-18 & down	20.8
2304	" (1)	Pulv.	14.0
	Cement, Secar 80	–	6.0
1116	Cement Secar 71 (2)	–	9.0
1114	Clay, Pioneer (3) A.F.	–	3.0
1059	Plaster of Paris	–	0.2
1023	-35 m Virginia Raw Kyanite	–	5.0
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

(1) Pulverized Mulcoa 47 should be 45-55% thru 325 M.
(2) Secar 250 may be substituted if available.
(3) Kaolex D-6 clay from J. M. Huber Co. may be substituted.

* Q.C. mixing instructions: Sufficient water for ball-in-hand consistency (water ranges should be 12-14%).

** Test two sets of bars: (1) 1st skid
(2) composite when following production runs of other than cement bonced products

ISSUED BY [signature] APPROVED BY J. B. Ward REVIEWED BY QUALITY CONTROL [signature]

QUALITY CONTROL PARAMETERS

		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
USS MESH							
On 6			2/hr.	7.0	4-10	4-10	–
On 20			"	41.0	37-45	37-45	–
Thru 325			"	25.0	22-28	22-28	–
							–
							–
							–
MOISTURE (%)			2/shift		0-0.4%	> 0-6%	> 0-4%
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL		** 2/shift	30-60 min.			
	FINAL			24 hr.			
BATCH PREP.	lbs.		** 2/shift	14		} Mix less than 60 sec.	
	cc			699-953 (11-15%)		} Cast rapidly (quick setting)*	
BARS	C/C		** 2/shift	> 1500		< 1000	
60-90 °F	pcf			Monitor			
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE				< 3 mo.		> 1 yr.	> 6 mo.
Hold Time				24 hr.			

061159

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION: 70% Al_2O_3, phosphate bonde hot gunning mix

DATE: 6/8/79

SUPERSEDES: 10/1/78

NAME: 1.37

REASON FOR CHANGE – Change to coarser sizing for improvement in gunning and physical properties

.92

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2312	Mulcoa 70	-6 x 18 m	37.0
2313	"	-18 m	17.0
2314	"	Pulv.*	13.5
1114	Pioneer Clay AP**	-	7.0
1002	Alumina A-2	-	3.0
1130	Diammonium Phosphate (gran.)	-	4.0
1133	Cr_2O_3 Pigment (powder)	-	1.0
2008	Magnesite	Pulv.	0.5
2311	Mulcoa 70	3 x 6 m	17.0

EXPERIMENTAL

COLUMN TOTAL – 100.00

Special Manufacturing Instructions and/or General Comments:

* Pulv. Mulcoa 70 should be 45-55% thru 325 mesh.

** Kaolex D-6 Clay may be substituted.

This product contains DiAmmonium Phosphate. Do not make any cement bonded products immediately after this one.

Particle size distribution curves will be generated as per plant production.

ISSUED BY – J. Kowal

APPROVED BY – John B. Koch

REVIEWED BY QUALITY CONTROL – Louis D. Klein

QUALITY CONTROL PARAMETERS

		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
USS MESH							
T on 20 m			1/hr.	51.0	47-55%	47-55%	47-55%
-325 m			"	21.0	18-24	18-24	18-24
6 m			"	13.0	8-17	8-17	8-17
MOISTURE (%)			2/shift			> 0.6%	> 0.4%
FLOW (lbs./)							
QUIGLEY			1/hr.				
BRI							
CUP TEST	GMS		2/shift	500			
	cc			50	NH_3 odor must be apparent		
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE							

06160

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – A 50% Al_2O_3 TYPE AGGREGATE, CALCIUM SILICATE CEMENT BONDED CASTABLE/GUNNING MIX

REASON FOR CHANGE – IMPROVED VARIATION OF ORIGINAL FORMULA

DATE ISSUED 7/23/81

SUPERSEDES 6/26/79

493

NAME AEK

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2302	Mulcoa 47	6 X 18m	35.0
2303	Mulcoa 47	-18m	25.0
2304	Mulcoa 47	Pulverized	6.9
1064	Portland White Cement	-	30.0
1114	Kaolin Clay - AF	-	3.0
1165	Mighty 100*	-	0.1
	"EXPERIMENTAL"		
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

* To be pre-weighed

** Test 2 sets of bars: (1) 1st skid
(2) composite

*** Cast to "ball-in-hand" consistency (ASTM Procedure C-860)

(4) Test after 48 hours if product does not obtain minimum strength after 24 hours.

SIZE DISTRIBUTION CURVES DETERMINED AS PER LAB-MADE SAMPLES

ISSUED BY – J. M. Rond

APPROVED BY –

REVIEWED BY QUALITY CONTROL – Kenneth C. Scalet

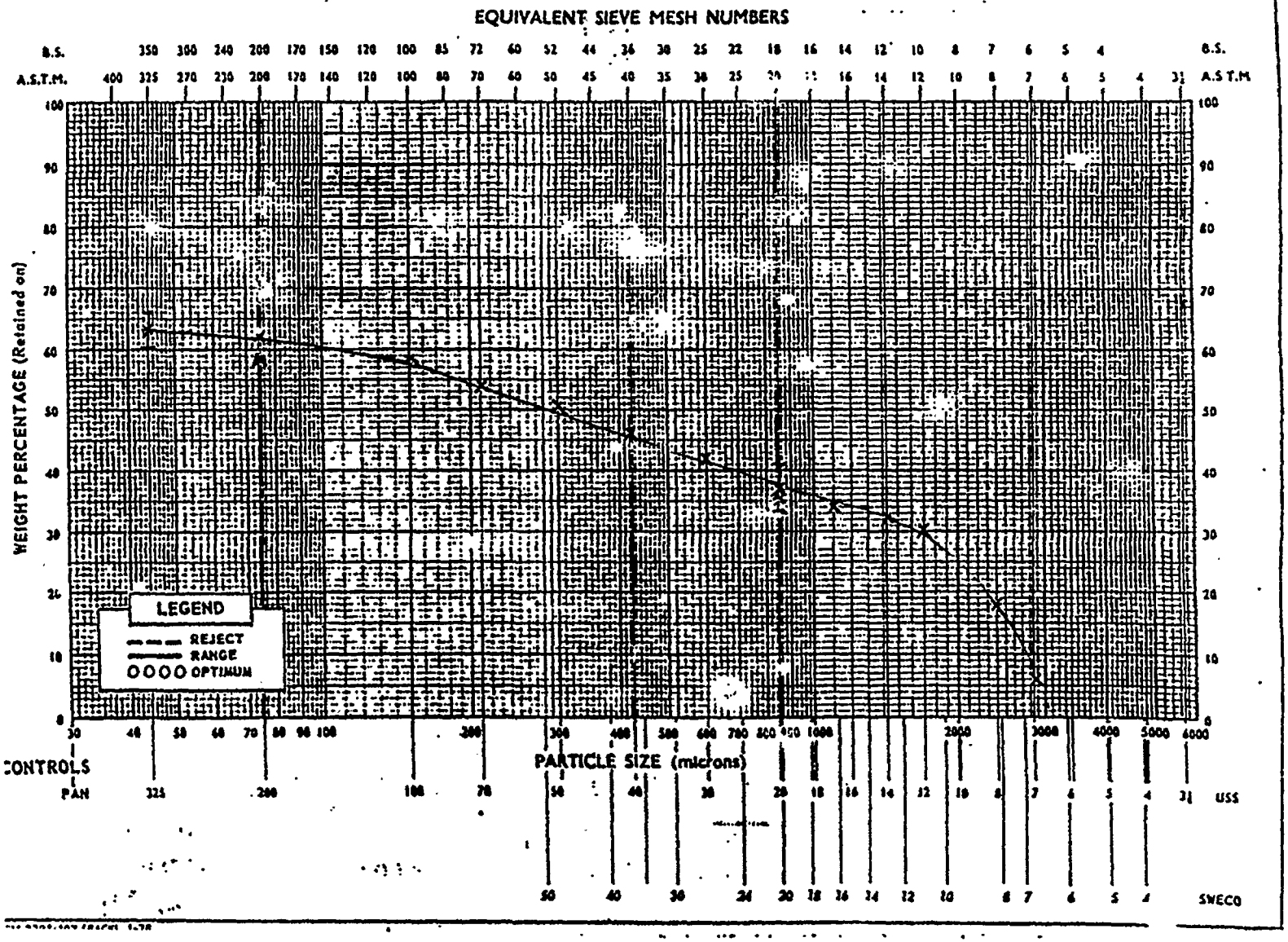
FORM 5501-107 (FRONT) 11-80

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
T on 20m			2/hr.	37.0	33-41%	33-41%	
-325m			2/hr.	37.0	34-40	34-40	
MOISTURE (%)			2/shift			> 0.6%	>0.4%
FLOW (lbs./sec.)							
QUIGLEY							
	BRI						
CUP TEST	GMS						
	cc						
SET TIME	INITIAL		** 2/shift				
	FINAL						60-120min
BATCH PREP.	lbs.		** 2/shift	10 450-540***			
	cc						
BARS 60-90 °F	C/C		** 2/shift	>4000 psi		<3000 psi (4)	<3500 psi
	✓						
BRICKS	C/C						
	MOR						
°F	psi						
SHELF LIFE							>1 year

06161

PRODUCT SIZE DISTRIBUTION CONTROLS



QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – 50% Al_2O_3, phosph bonded hot gunning mix

DATE ISSUED 8/15/78

SUPERSEDES 10/5/76

F- 494

REASON FOR CHANGE – Pulverized MgO addition for improved hot gunning performance

NAME

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
2302	Mulcoa 47	-6 x 18 m	43.0
2303	"	-18	28.0
2304	" *	Pulv.	13.5
1114	Pioneer Clay AF**	-	7.0
1002	Alumina A-2	-	3.0
1130	DiAmmonium Phosphate	-	4.0
1133	Cr_2O_3 Pigment	-	1.0
2008	Magnesia	Pulv.	0.5
	*Pulv. Mulcoa 47 should be		
	45-55% thru 325 m.		
	**Kaolex D-6 Clay may be		
	substituted.		
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

EXPERIMENTAL

ISSUED BY – | APPROVED BY – J. B. Rich | REVIEWED BY QUALITY CONTROL –

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
T on 20			2/hr.	41%	37-45%	37-45%	
-325			"	21	18-24	18-24	
MOISTURE (%)						> 0.6%	> 0.4%
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.	10	1/shift				
	cc	450					
BARS	C/C						
220 °F	pcf				125-130		125-130
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE							
Odor Test		Ammonia odor should be detected when mixed with water					

06163

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – A minus 5-mesh, moderately gapped sized, olivine based, fast set gunning mix.

DATE ISSUED 9/28/78

SUPERSEDES –

NAME REBEL 500

REASON FOR CHANGE – 5 x 8 MgO added to meet +10 mesh spec in cases where 5 x 20 olivine is low on +10 mesh

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1144	-5 x 20 m Olivine	–	58.0
1145	-20 m Olivine	–	19.8
2008	Magnesia, Blended (2)	Pulv.	12.0
1069	Clay, Ball A.F. (K-T Co.)	–	2.5
1043	Silicate, G.D.	–	3.0
1059	Plaster of Paris (U.S. Gypsum, Champion) (3)	–	1.0
1008	Bentonite Clay (Volclay, #200)	–	1.5
3003	Fuel Oil, Grade #2 (4)	–	0.2
2002	Magnesia, Blended	5 x 8 m	2.0
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

1. Product must be made only on B-10 machine or on a mixer which will simulate this mixing action. Mixing time is 3 minutes.
2. Pulv. magnesia cannot go below 10% and it should be in the 55-65% -325 M range.
3. Plaster of Paris must be pre-weighed (i.e. 15 lb. per 1500 lb. batch).
4. Oil must be uniformly added only to olivine portion (i.e. 3 lb./1500 lb. batch).

ISSUED BY – Douglas Person | APPROVED BY – Lin B.V. | REVIEWED BY QUALITY CONTROL – P. Johnson

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+10			2/hr.	22.0		17-27	
+20			"	55.0	53-58	51-59	
+40			"	72.0			70-74
+100			"	80.0			78-82
-325			"	15.0	13-17	12-17	
MOISTURE (%)			2/shift		0-0.4	> 0.6	
FLOW (lbs./sec.)							
QUIGLEY							
BRI			1/hr.	Must flow continuously.			
CUP TEST	gm/						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE				Pending results of shelf life study.			

06164

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – -5 mesh, [illegible]ate gapped sized olivine based, gunning mix

DATE ISSUED 1/24/80

SUPERSEDES 9/25/79

500

REASON FOR CHANGE – Eliminate plaster from formulation. This is now the permanent card. Remove F-500 (11/21/78) & F-500-H (9/25/79) from your active file.

NAME REBEL 500

PRODUCT FORMULATION

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1144	-5 x 20 m Olivine	–	60.7
1145	-20 m Olivine	–	20.0
2008	Magnesia, Blended(2)	Pulv.	12.1
1069	Clay, Ball A.F. (K-T Co.)	–	2.5
1043	Silicate, G.D.	–	3.0
1008	Bentonite Clay (Volclay, #200)	–	1.5
3003	Fuel Oil, Grade #2(3)	–	0.2
		COLUMN TOTAL –	100.00

EXPERIMENTAL

Special Manufacturing Instructions and/or General Comments:

1. Product must be made only on B-10 machine or on a mixer which will similate this mixing action. Mixing time is 3 minutes.
2. Pulv. magnesia cannot go below 10% and it should be in the 55-65% -325 M range.
3. Oil must be uniformly added only to 5 x 20 M olivine aggregate portion (i.e. 3 lb/1500 lb. batch), then add -20 M olivine and finally bonds.

ISSUED BY – [signature]

APPROVED BY – [signature]

REVIEWED BY QUALITY CONTROL – [signature]

QUALITY CONTROL PARAMETERS

		PRO-CEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
USS MESH +10			2/hr.	22.0		17-27	
+20			"	55.0	51-59	50-60	
+40			"	72.0			70-74
+100			"	80.0			78-82
-325			"	15.0	13-17.5	12-18	
MOISTURE (%)			2/shift			> 1%	
FLOW (lbs./sec.) QUIGLEY							
	BRI		1/hr.	Must flow continously.			x
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
GEL. (g/cc)							
SHELF LIFE		Pending results of shelf life study.					

06165

9/25/79

To All Formulation Card Holders:

Please note that this formulation - F-500 "H" - does not supersede F-500 "F" and is only a variation that we will be looking at in Gary Works as per specific sales orders.

J. B. Kuch

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – -5 mesh, moderately gapped sized olivine based, gunning mix

REASON FOR CHANGE – eliminate plaster from formulation

ISSUED 9/25/79

SUPERSEDES –

500 H

NAME REBEL 500

PRODUCT FORMULATION (1)

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1144	-5 x 20 m Olivine	-	60.7
1145	-20 m Olivine	-	20.0
2008	Magnesia, Blended (2)	Pulv.	12.1
1069	Clay, Ball A.F. (K-T Co.)	-	2.5
1043	Silicate, G.D.	-	3.0
1008	Bentonite Clay (Volclay,		
	#200)	-	1.5
3003	Fuel Oil, Grade #2 (3)	-	0.2
	EXPERIMENTAL		
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

1. Product must be made only on B-10 machine or on a mixer which will similate this mixing action. Mixing time is 3 minutes.
2. Pulv. magnesia cannot go below 10% and it should be in the 55-65% -325 M range.
3. Oil must be uniformly added only to 5 x 20 M olivine aggregate portion (i.e. 3 lb/1500 lb. batch), then add -20 M olivine and finally bonds.

ISSUED BY – E. Pettyjohn

APPROVED BY – J. B. Rush

REVIEWED BY QUALITY CONTROL – Dawn J. Klein

QUALITY CONTROL PARAMETERS

USS MESH	PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+10		2/hr.	22.0		17-27	
+20		"	55.0	51-59	50-60	
+40		"	22.0			70-74
+100		"	80.0			78-82
-325		"	15.0	13-17.5	12-18	
MOISTURE (%)		2/shift			> 1%	
FLOW (lbs./sec.)						
QUIGLEY						
BRI		1/hr.	Must flow	continuously.		X
CUP TEST GMS						
CUP TEST cc						
SET TIME INITIAL						
SET TIME FINAL						
BATCH PREP. lbs.						
BATCH PREP. cc						
BARS c/c						
BARS °F						
BRICKS c/c						
BRICKS MOR						
BRICKS °F pcf						
GEL. (g/cc)						
SHELF LIFE		Pending results of shelf life study				

06167

QUIGLEY

PRODUCT FORMULA CARD

DESCRIPTION – -5 mesh, moderat gapped sized olivine based, gunning mix

REASON FOR CHANGE – Eliminate plaster from formulation, and utilizing the F-500 bond

DATE ISSUED 1/16/80

SUPERSEDES 9/8/78

F- 501

NAME

PRODUCT FORMULATION (1)

CODE NUMBER	CRUDE/WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
1144	-5 x 20 m Olivine	-	60.0
1145	-20 m Olivine	-	14.3
2007	Magnesia, Blended	-40 m	8.0
2008	Magnesia, Blended(2)	Pulv.	11.0
1043	Silicate, G.D.	-	3.0
1008	Bentonite Clay (Volclay, #200)	-	1.5
3003	Fuel Oil, Grade #2(3)	-	0.2
1069	Ball Clay, A.F.	-	2.0
	EXPERIMENTAL		
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

1. Product must be made only on B-10 machine or on a mixer which will similate this mixing action. Mixing time is 3 minutes.
2. Notify Prod. Dev. if pulv. goes below 10%.
3. Oil must be uniformly added only to 5 x 20 M olivine aggregate portion (i.e. 3 lb/1500 lb. batch), then add -20 M olivine and finally bonds.

ISSUED BY G. Lettano

APPROVED BY – J. B. Ruch

REVIEWED BY QUALITY CONTROL – D. A. Wallace

QUALITY CONTROL PARAMETERS

		USS MESH	PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
		+10		2/hr.	22.0		17-27	
		+20		"	55.0	51-59	50-60	
		+40		"	72.0			70-74
		+100		"	80.0			78-82
		-325		"	15.0	13-17.5	12-18	
		MOISTURE (%)		2/shift		0-0.4	>1.0%	
		FLOW (lbs./sec.)						
		QUIGLEY						
		BRI		1/hr.	Must flow continuously.			x
CUP TEST	GMS		!					
	cc							
SET TIME	INITIAL							
	FINAL							
BATCH PREP.	lbs.							
	cc							
BARS	C/C							
°F	pcf							
BRICKS	C/C							
	MOR							
°F	pcf							
GEL. (g/cc)								
SHELF LIFE			Pending results of shelf life study.					

06168

QUIGLEY PRODUCT FORMULA CARD

DESCRIPTION – FINE CHROME ORE BASED PLASTIC MIX

REASON FOR CHANGE – CHANGE TO LARGE CARD FORMAT

DATE ISSUED 10/07/81 | SUPERSEDES ALL OTHERS | 503

NAME Q-PLASTIBATCH HEL

PRODUCT FORMULATION

CODE NUMBER	CRUDE WIP NAME	CRUDE/WIP DESCRIPTION	WEIGHT % IN PRODUCT
	* PORTION I (WET)		
1109	SILICATE, RU BRAND		7.5
1042	WATER		4.2
1104	VERSENE 100		0.4
1008	BENTONITE		1.5
	PORTION II (DRY)		
2209	CHROME ORE	14m	40.86
2210	CHROME ORE	Pulv.	42.0
1008	BENTONITE	–	3.5
1126	CERAMIC FORMING AID	–	0.04
		COLUMN TOTAL –	100.00

Special Manufacturing Instructions and/or General Comments:

Combine components of PORTION I in holding tank. Add components in specified order with continuous mixing (water-silicate solution should be 33.5 Baume). Supply heat in winter as necessary to prevent freezing. Combine components of PORTION II and mix. While mixing add PORTION I solution. Consistency may be varied as necessary by adjusting liquids content.

* NOTE: PORTION I of this product is the same as that used for regular Chromix F-17.

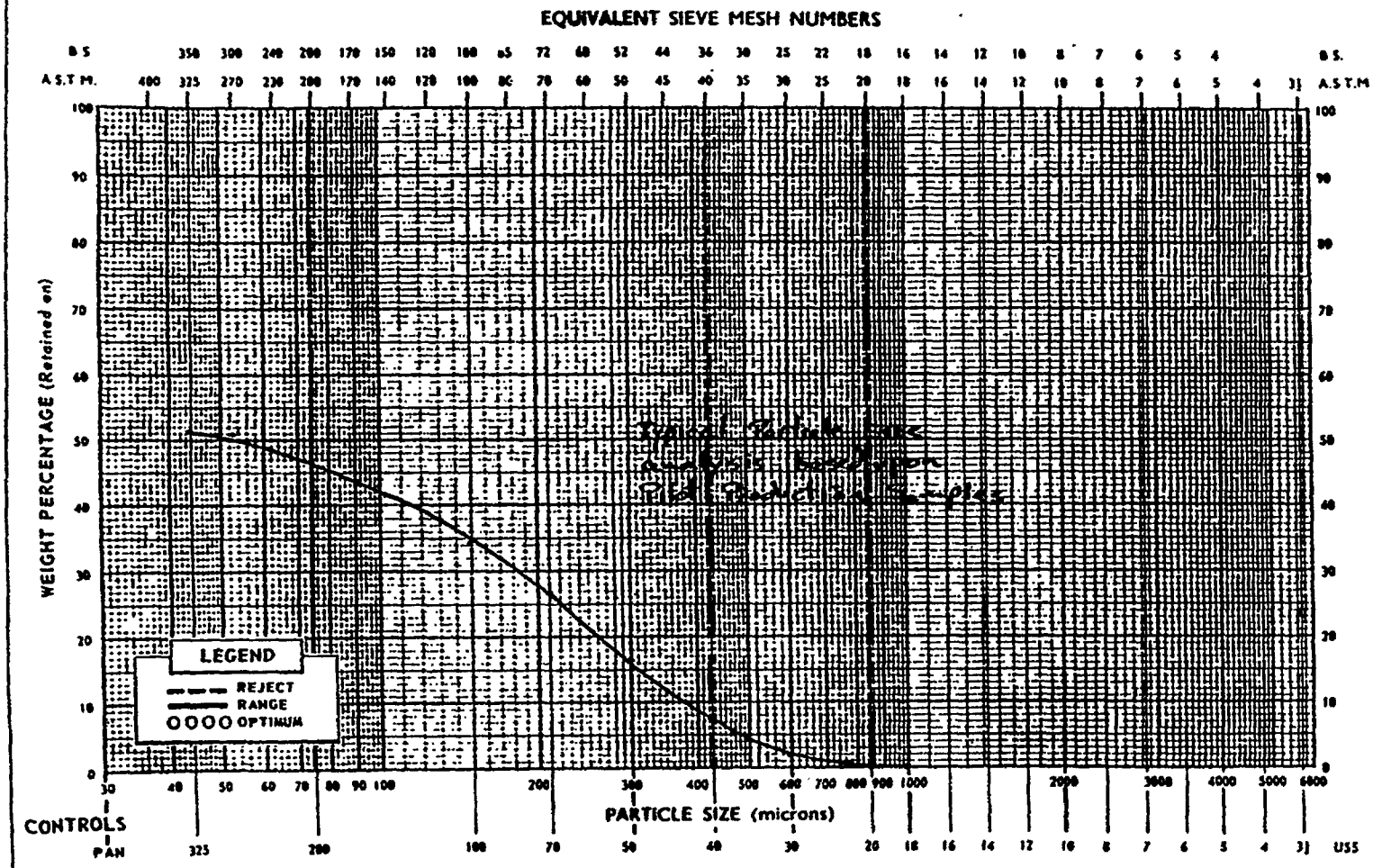
ISSUED BY	APPROVED BY	REVIEWED BY QUALITY CONTROL
E Pettyjohn		

QUALITY CONTROL PARAMETERS

USS MESH		PROCEDURE NUMBER	FREQ.	CONTROL LIMITS OPTIMUM	RANGE	REJECT	MONITOR
+70			2/hr.	30			X
-325			2/hr.	45 – 55			X
MOISTURE (%)			2/run				X
FLOW (lbs./sec.)							
QUIGLEY							
BRI							
CUP TEST	GMS						
	cc						
SET TIME	INITIAL						
	FINAL						
BATCH PREP.	lbs.						
	cc						
BARS	C/C						
°F	pcf						
BRICKS	C/C						
	MOR						
°F	pcf						
SHELF LIFE			TO BE DETERMINED				
SLUMP			2/hr.	23-32		<20, >34	

PRODUCT SIZE DISTRIBUTION CONTROLS

F— 503



06170