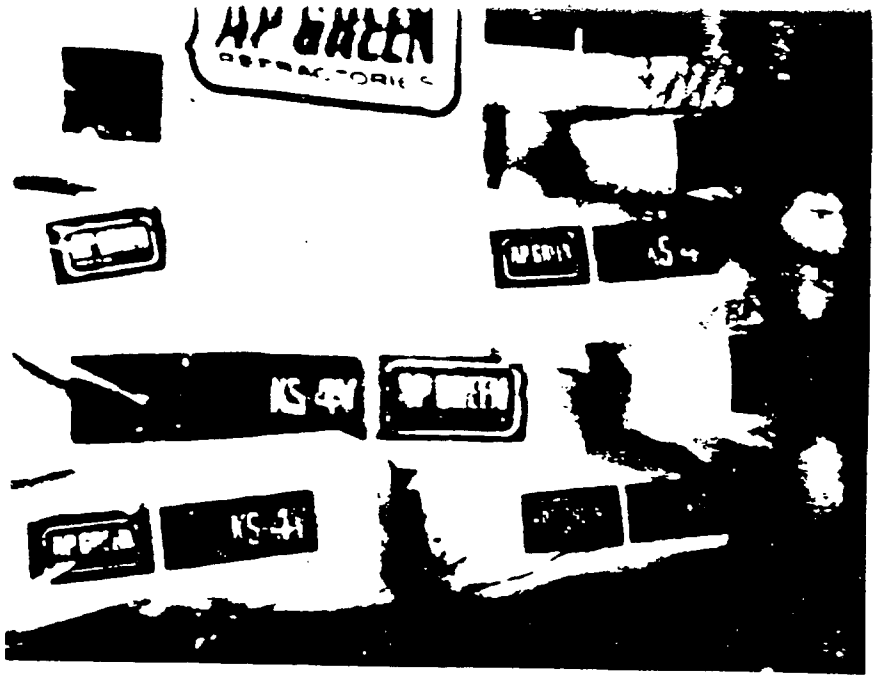



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EXHIBIT
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EXHIBIT
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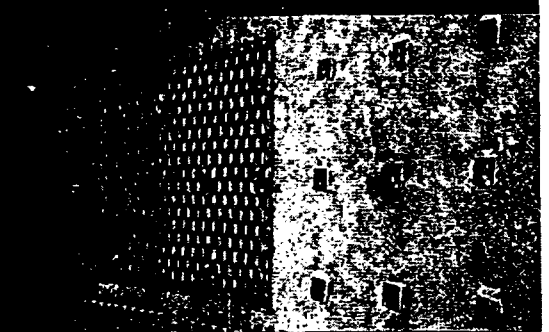
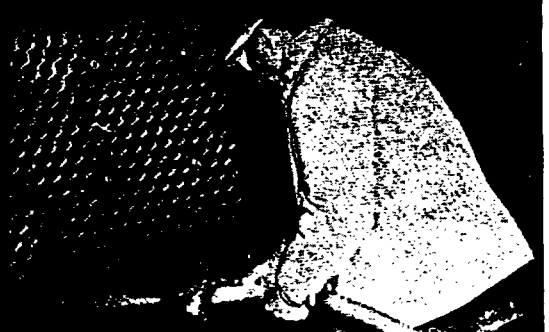
A. P. GREEN FIRE BRICK COMPANY

A. P. GREEN SK-7 and KS-4

ABLES FOR GUN APPLICATION



Gun-applied catalytic regenerator lining ... application of SK-7 completed. Steel mesh attached to studs preparatory to shooting KS-4.



KS-4 being applied by means of a cement gun. Note steel mesh which anchors KS-4 and provides abrasion resistant wearing surface for catalytic regenerator lining.



Interior of catalytic regenerator showing the completed lining with the KS-4 applied over the SK-7.

Scientifically Compounded

To Result in a Lining With Balanced Properties

A. P. Green SK-7 and KS-4 have all the advantages of ordinary mix and pour castables and, in addition, may be "gunned" in place by means of a cement gun. The fast, simple installation possible with these A. P. Green refractory castables lowers construction and maintenance costs.

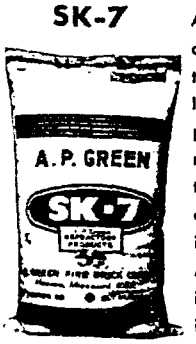
SK-7 and KS-4 are frequently used as companion products. SK-7 has excellent insulating properties and serves as a back-up material for the KS-4 high temperature wear surface, which has extra strength and abrasion resistance. Depending on the type of service conditions—SK-7 or KS-4 may be used separately as a monolithic lining.

Monolithic composite construction is the answer to the demand for a satisfactory lining for large and unusually shaped equipment ... the contour of which does not lend itself to normal pouring castables. The outstanding advantages of SK-7 and KS-4 in lining large areas by cement gun application are widely recognized in the petroleum, chemical and modern power plant fields for:

CATALYTIC CRACKING UNITS • STACK LININGS
LARGE VESSELS IN PETROLEUM AND CHEMICAL INDUSTRIES
STEAM GENERATORS (TANGENT TUBE DESIGN)
BREECHING LININGS • FLUE LININGS

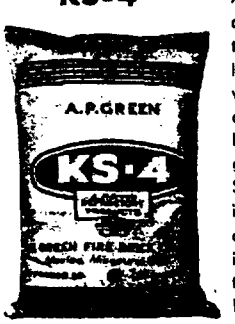
When installed with any of the accepted types of cement guns, these specially formulated products provide a heat and wear resistant lining with balanced properties. The smooth workability of SK-7 and KS-4 permits these products to be installed by the slap-trowel method, or in some special instances by poured construction using forms.

SK-7



An insulating castable recommended for service temperatures to 1800° F. It weighs only 55 pounds per cubic foot in place, resulting in low construction costs, low thermal conductivity and high operating efficiency of the unit. Also works well for troweling and pouring. Packed in 50-pound bags.

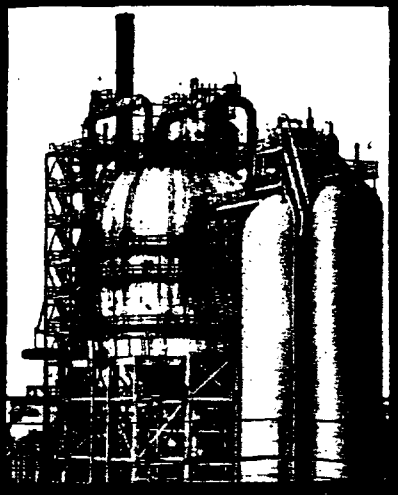
KS-4



A refractory castable recommended for service temperatures to 2550° F. It is a strong castable weighing 121 pounds per cubic foot in place, combining high strength and good erosion resistance. Splendid for withstanding the erosion by the catalyst in catalytic cracking units. May also be troweled or poured. Packed in 100-pound bags.

HIGH QUALITY FIRE-CLAY REFRACTORY PRODUCTS

3 Outstanding Advantages Through the Use of SK-7 and KS-4





1. All the desired properties of a good refractory product are retained in the gun applied lining.

2. No forms necessary—installation time and labor costs are reduced.

3. Products are packaged ready to use—no additional materials or mixing at job site.

	SK-7	KS-4
	Applied With Cement Gun	Applied With Cement Gun
Recommended for Maximum Temperature of:	1800° F.	2550° F.
Amount Required per Cu. Ft., Dry	55 Lb.	121 Lb.
Weight per Cu. Ft. in Place		
As Applied	87-92 Lb.	133-138 Lb.
Fired at 1500° F.	53-58 Lb.	118-123 Lb.
Modulus of Rupture:		
Dried at 220° F., p.s.i.	350-550	900-1400
Fired at 1000° F., p.s.i.	250-400	800-1200
Thermal Conductivity B.T.U./Sq. Ft./Hr./Deg. Fahr./Inch Thickness at Mean Temperature of:		
200° F.	1.39	4.22
600° F.	1.71	4.29
1200° F.	1.88	4.53

For detailed information concerning these castable refractories, write the Engineering Department of the A. P. Green Fire Brick Company—or call your local A. P. Green distributor.

MEXICO, MISSOURI, A. P. Green REFRACTORY PRODUCTS U. S. A.

S-116. C-540515

Printed in U.S.A.

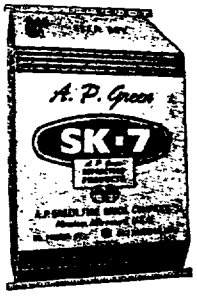
castables for gun application

With a complete line of hydraulic-setting castables for gun application, A. P. Green can furnish a product tailored to fit your particular refractory requirements. The fast, simple installation possible with these gun-applied castables lowers construction costs. No forms are necessary — installation time and labor costs are reduced. All these A. P. Green castables are scientifically compounded for application with a cement gun . . . your assurance of a refractory lining with balanced properties. Packaged ready to use — no additional materials or mixing at the job site.

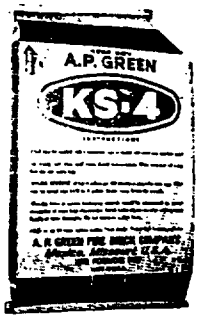
The A. P. Green Engineering Department will be glad to work with you on your specific problems and make recommendations for the most economical refractory materials to use.

SK-7

SK-7 is an 1800° F. castable insulation with excellent strength. Its light weight (55 lb./cu. ft.) and low thermal conductivity are a combination which reduces both construction and operating costs. Though developed for cement gun application, SK-7 may be troweled or poured. Packed in 50 pound bags.



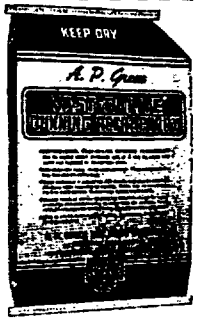
KS-4



KS-4 is a dense, high strength refractory castable for temperatures as high as 2550° F. It weighs approximately 121 pounds per cubic foot in place. This product was also developed for gun application, but may be troweled or poured. Packed in 100 pound bags.

Over the past 10 years, KS-4 and its companion product SK-7 have been used successfully in hundreds of petrochemical installations throughout the world.

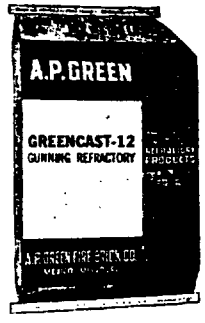
KAST-O-LITE GUNNING REFRACTORY



KAST-O-LITE GUNNING REFRACTORY is a 2500° F. insulating refractory developed specifically for gun application. It combines insulating properties with sufficient abrasion resistance to be used as "one-shot" linings for vessels in the petroleum industry and for linings of ducts, breechings, and stacks. With excellent adhesiveness and plasticity, rebound losses are reduced to a minimum. It also has good workability for troweling applications. Weight—97 lb. per cubic foot in place. Shipped in 100 pound bags.

GREENCAST-12 GUNNING REFRACTORY

With outstanding abrasion resistance and strength at temperatures up to 1200° F., GREENCAST-12 GUNNING REFRACTORY is an excellent product for gun application or troweling in applications with severe abrasive conditions. It is used successfully in transport lines and stacks of fluid catalytic cracking units. Also, it has good resistance to carbon monoxide disintegration and corrosion. Weight — 122 lb. per cubic foot. Shipped in 100 pound bags.



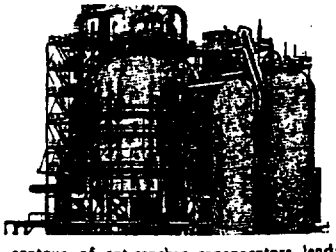
TECHNICAL DATA

The table below shows average properties of A. P. Green castables when applied with a cement gun.

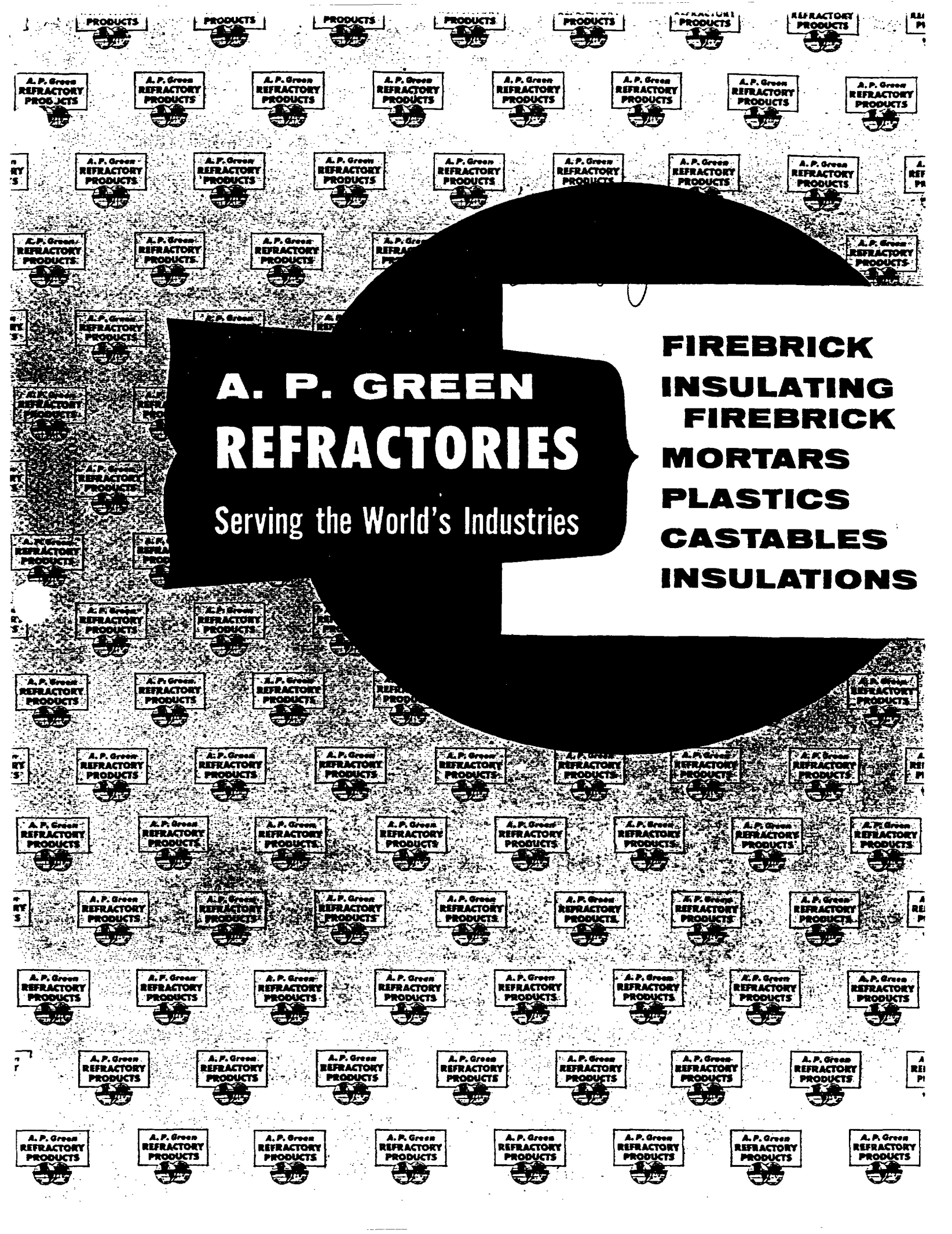
	SK-7	KS-4	KAST-O-LITE GUNNING REFRACTORY	GREENCAST-12 GUNNING REFRACTORY
Recommended for Maximum Temperature of:	1800° F.	2550° F.	2500° F.	1200° F.
Amount Required per Cu. Ft., Dry	55 Lb.	121 Lb.	97 Lb.	122 Lb.
Modulus of Rupture				
Dried at 220° F., p.s.i.	350-550	900-1400	450-700	1400-2100
Fired at 1000° F., p.s.i.	250-400	800-1200	400-600	1300-2000
1500° F., p.s.i.	150-225	800-1200	400-600	900-1400
2300° F., p.s.i.	..	1000-1500	450-700	..
Cold Crushing Strength				
Dried at 220° F., p.s.i.	500-750	3000-4500	1500-2300	6000-9000
Fired at 1000° F., p.s.i.	400-600	2200-3500	1000-1500	5000-7500
1500° F., p.s.i.	250-400	2200-3500	1000-1500	3000-4500
Thermal Conductivity B.T.U./Sq. Ft./Hr./Deg. Fahr./Inch At Mean Temperature of:				
400° F.	1.60	4.24	1.96	4.14
800° F.	1.81	4.35	2.23	4.33
1200° F.	1.88	4.53	2.58	4.53



Cement gun application of a refractory castable showing the steel mesh that anchors the lining and provides abrasion resistance. This particular installation shows the application of KS-4 in a catalytic regenerator.



The contour of cat-cracker regenerators lends itself to the use of these specially designed and engineered gun-applicable refractory castables.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