



NARCO REFRACTORIES for Steel Making

- Maximum life between relines
- Low refractory cost per ton of steel
- Products tailored to every service need
- Superior wear resistance



higher-cost refractories can cost less...in the long run

More expensive energy sources . . . ever-rising hourly rates for masons . . . skyrocketing steel-making equipment costs . . . the need to increase productivity . . .

These factors combine to greatly increase your per-ton cost of making and processing steel. Suddenly, refractories that promise greater life expectancy are economically more attractive . . . even when they cost slightly more.

With refractories that stretch out the time between major rebuilds, you increase productive on-stream time. With refractories that stand up against the physical and metallurgical punishment of new steel-making processes, you greatly reduce the costly non-productive periods required for patching.

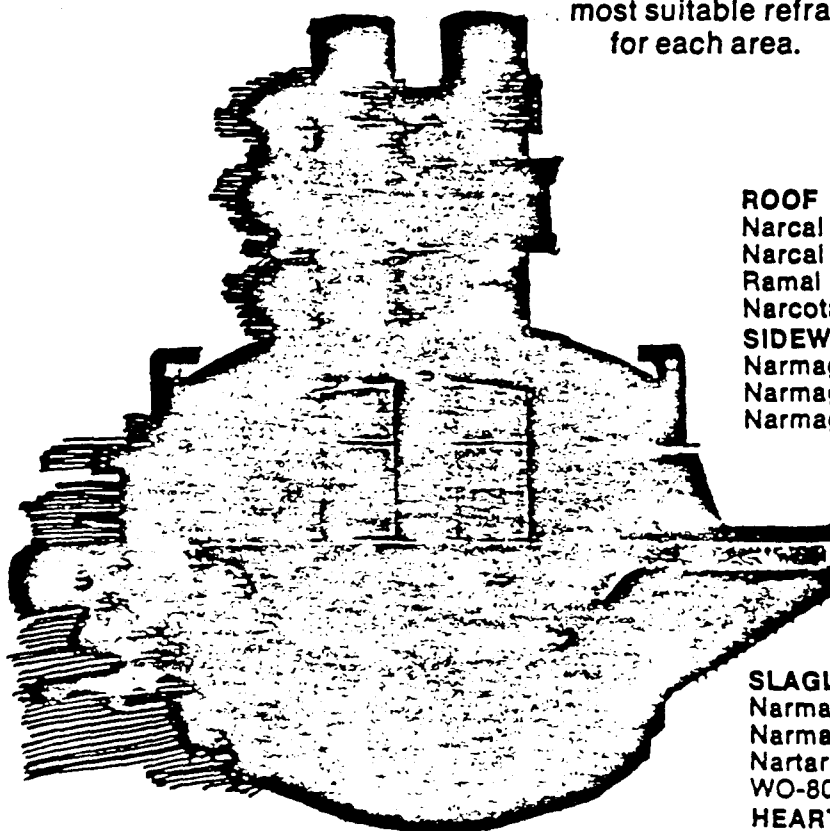
NARCO Refractories can be supplied promptly to handle any process in your steel plant. Basic or acid. Blast furnace to continuous caster. Electric furnace to AOD vessel.

refractories for electric furnaces

In the NARCO line, there are refractories for basic and acid practices in electric furnaces used for making steel.

We have developed refractories that have higher resistance to the destructive effects of basic practice. And we have developed refractories to give longer life in today's ultra-high powered electric furnaces. Properties include better strength at higher temperatures, superior resistance to impact and abrasion, thermal-shock endurance, and low porosity and permeability. Together these properties can keep your electrics on-stream longer between repairs and relining, increase your yearly tonnage . . . improve your operating ratios, and profitability.

Differences in zone-by-zone refractory service requirements call for a variety of refractories to work together in meeting all the conditions. We can supply the most suitable refractory for each area.



ROOF

Narcal 70D
Narcal 85B
Ramal 85
Narcotab

SIDEWALLS

Narmag 608C
Narmag 60DBC
Narmag 60DBRC

SLAGLINE

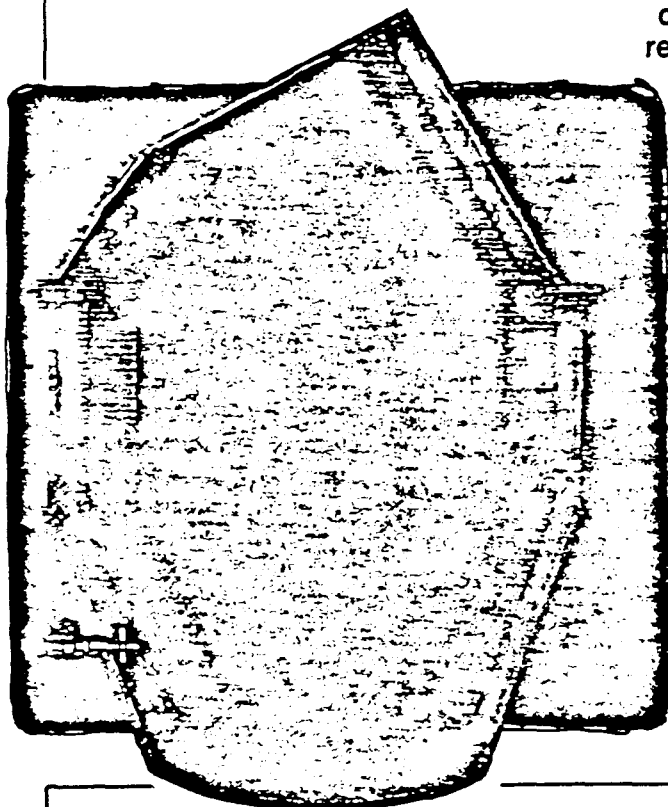
Narmag B
Narmag 608
Nartar Pad
WO-808

HEARTH

ALL-BRICK
Nartar Pad
SUBHEARTH
Narmag 90B
Narmag B

refractories for A.O.D. vessels

In argon-oxygen-decarburization reactors, unique factors cause unusual refractory wear problems. These factors are: thermal shock from temperature variations, oxidation reduction reactions caused by partial oxygen pressures during argon blowing, slag contamination at the hot face, high turbulence during gas injection, low-basicity slags. Plus some unique operating variables inherent in the A.O.D. process. Obviously, the special conditions in the A.O.D. vessel call for special refractories to meet these conditions. A number of NARCO Refractories have been created to deliver maximum refractory life in A.O.D.'s and keep your refractory cost per ton of steel low.



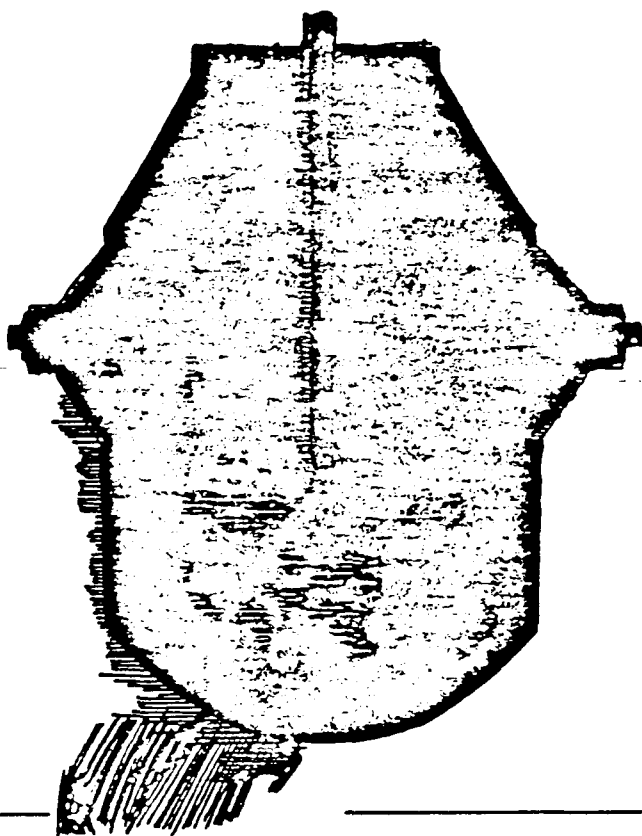
CONE
Narmag 60DB
WORKING LINING
Narmag 608
TUYERE ZONE
Narmag 608
Rebonded Fused Grain
BOTTOM
Narmag 608
SAFETY LINING
Narmag 30B
Narmag 608
SEALS
Narcal 90P (plastic)

NARCO low-porosity 60% MgO direct bonded brick (NARMAG 608) with an accessory phase of dicalcium silicate has proved highly satisfactory for use in most areas of A.O.D.'s operating in this country. Rebonded fused-grain brick may be required above the tuyeres to balance wear. NARMAG 608 has shown excellent performance in withstanding the stirring action during gas injection, gas-bubble cavitation, variations in chemistry caused by oxygen pressure variations, temperature fluctuations, and slag/metal chemistry reactions.

There are ideal NARCO refractories for each zone . . . vessel liners, hoods, tuyere area, and safety linings. Ask us for recommendations that have been proved in service in nearly all the A.O.D. shops around the country.

refractories for BOF's

NARCO has developed a complete family of refractories to meet the special needs and tougher environment of the BOF. We have also accelerated our production and delivery of these special refractories to make the most of the shorter downtime periods required for relining a BOF. Our production schedules and local warehousing for all NARCO refractories for BOF's can provide all your needs promptly.



CONE

Nartar BT
Super Nartar AT
Super Nartar AT-M

BARREL

Super Nartar AT
Super Nartar AT-M
Nartar Pad
Nartar 7

CHARGE PAD

Nartar Pad
Nartar 7

BOTTOM

Nartar BT
Super Nartar AT
Super Nartar AT-M

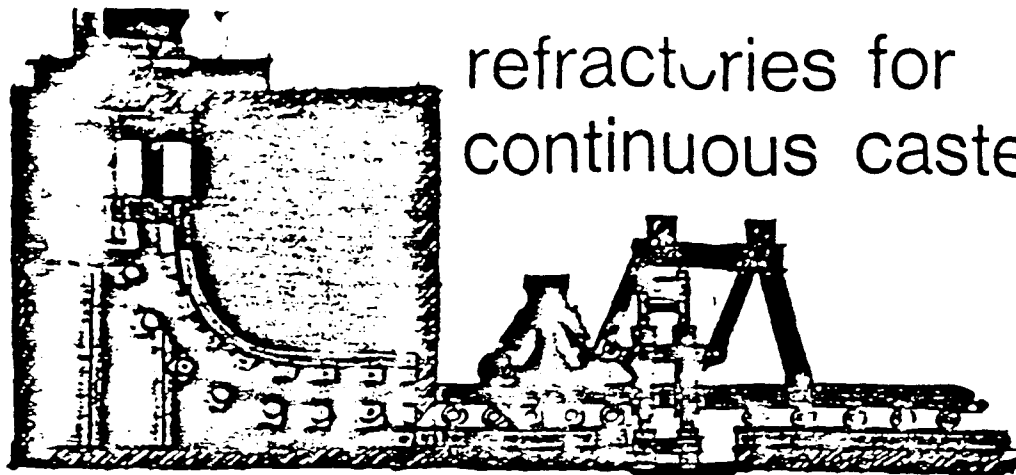
SAFETY LINING

Narmag 90B
Narmag B
Nartar Pad

Brick dimensional uniformity is quite critical in the life expectancy and endurance of a BOF lining. NARCO shapes are true to size and free from warped surfaces to simplify lay-up and deliver maximum service on extended BOF schedules.

For the newer Q-BOP furnaces, we have adapted certain NARCO refractories originally compounded for BOF's. Presently NARCO refractory materials are used in all Q-BOP's in North America.

The performance and cost of refractory/ton of steel, of NARCO materials for the BOF's and Q-BOP's are highly satisfactory both technically and costwise to steel makers throughout the Western hemisphere.

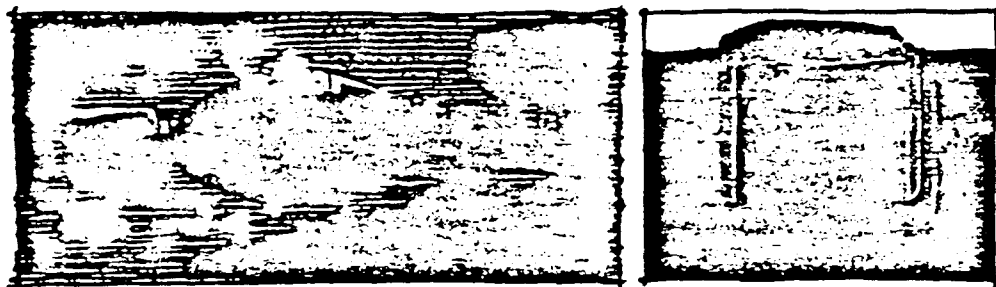


refractories for continuous casters

Two major applications for NARCO refractories in continuous casters are the ladle and the tundish.

NARCO refractories with special characteristics have been developed for the tundish applications. These refractories are compounded to have high resistance to: impact wear from the ladle outflow, slagging, gassing, and the chemical/metallurgical effects of special continuous-caster-grade alloys.

Ladle linings used with continuous casters are laid up with NARCO high-alumina, expanding-type ladle brick. These bricks have greater resistance to higher tapping temperatures and extended holding times common in this type of service. Their expansion characteristics provide tighter joints and greater freedom from rat-holing.



other applications in steel making

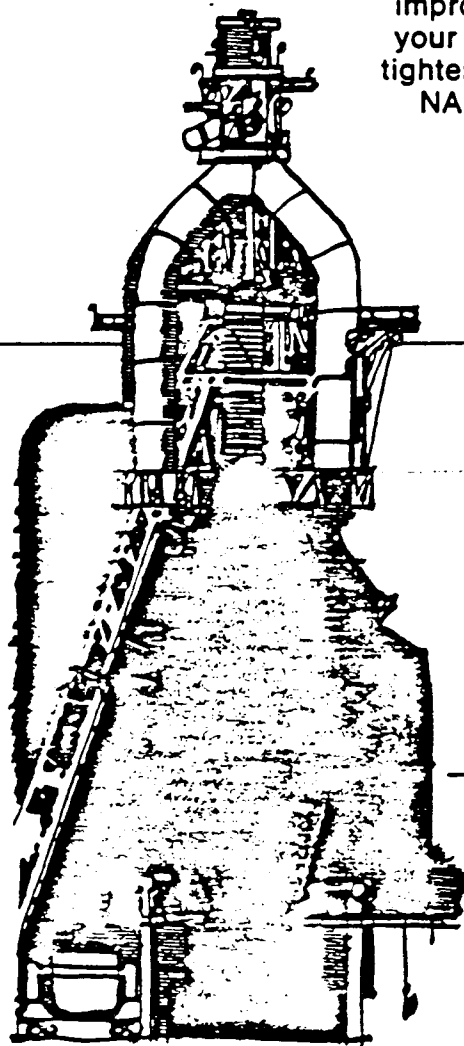
There are job-proved NARCO Refractories for every spot in the steel plant. In addition to the ones already discussed, NARCO Refractories are used in hot-metal cars, and other places where minimum downtime, maximum time between scheduled repairs, and low refractory cost to steel tonnage are important.

Ladle slide gates and nozzles in chemistries to withstand any combination of chemical attack, erosion, and physical opening and shutting of the gates are supplied by NARCO. We can provide shapes and sizes to work perfectly with any ladle gating system.

Call your NARCO man, or write us for technical advice, specification help, and refractory data.

refractories for blast furnaces

Demands for greater blast furnace availability and a decision by many steel makers to eliminate stand-by furnace capacity have greatly increased the importance of top-quality refractories that will stay on the job longer. NARCO researchers have developed improved grades of refractories to meet your demands. To help your masons lay tighter bottoms and walls, we can supply NARCO brick of all grades true to size and free from warpage.



STOCKLINE

Mohawk BF
Farber BF
Narcal 606

UPPER INWALL

Farber BF
Mohawk BF

LOWER INWALL

Farber BF
Mohawk BF
Narcal 606
Narcal 606I

BOSH

Mohawk BF
Narcal 606
Narcal 606I

BOTTOM

Mohawk
Farber BF

GUN REPAIRS

Narco Blast Furnace
Castable

Our NARCO line contains a full range of refractories to operate longer, minimize wear in all blast furnace zones under greatly extended operation periods, and reduce your refractory cost per ton of steel. These refractories have higher resistance to CO disintegration, thermal shock, alkali attack, impact and abrasion, and slag attack.

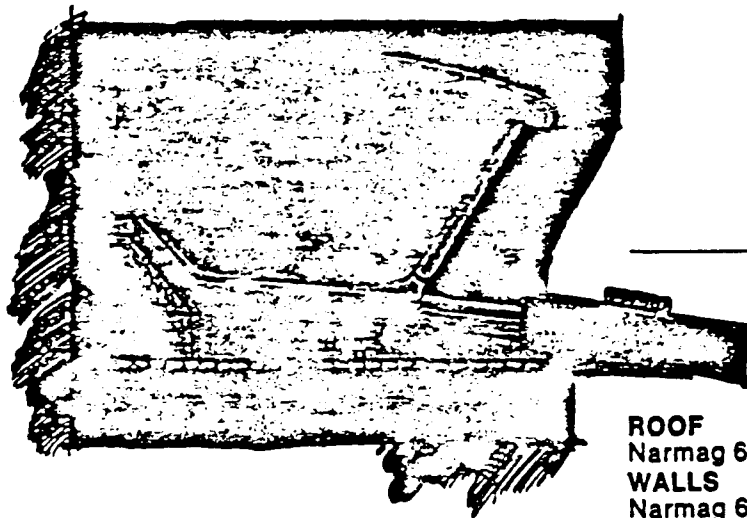
The NARCO line includes brick shapes, castables, gun mixes, and a variety of mortars. Stoves are also an application where NARCO refractories have an enviable record of life, low cost, and maximum operating service time, top temperatures approaching 2800°F. We also supply special silica brick for the new European-type stoves.

open hearth and Narco Refractories

Stepped-up demand for steel has also stepped up the service requirements for refractories in existing open hearths. And has placed a large premium on longer time between open hearth relining.

NARCO Refractories for open hearths can be supplied in a number of chemistries to give extended life in the bottom, along the slag line and in the roof where gases and high-impingement flames corrode and erode the lining.

There are NARCO brick and shapes to expedite relining any type, size, and shape of open hearth. Close control of dimensions assures that NARCO refractories can be laid up at top economic speed. And that the refractories will stay firmly in place for many more heats between shut-downs.



ROOF
Narmag 60DBRC
WALLS
Narmag 608C
Narmag 60DBC
Narmag 60DBRC
SUBHEARTH
Narmag 90B
Narmag B

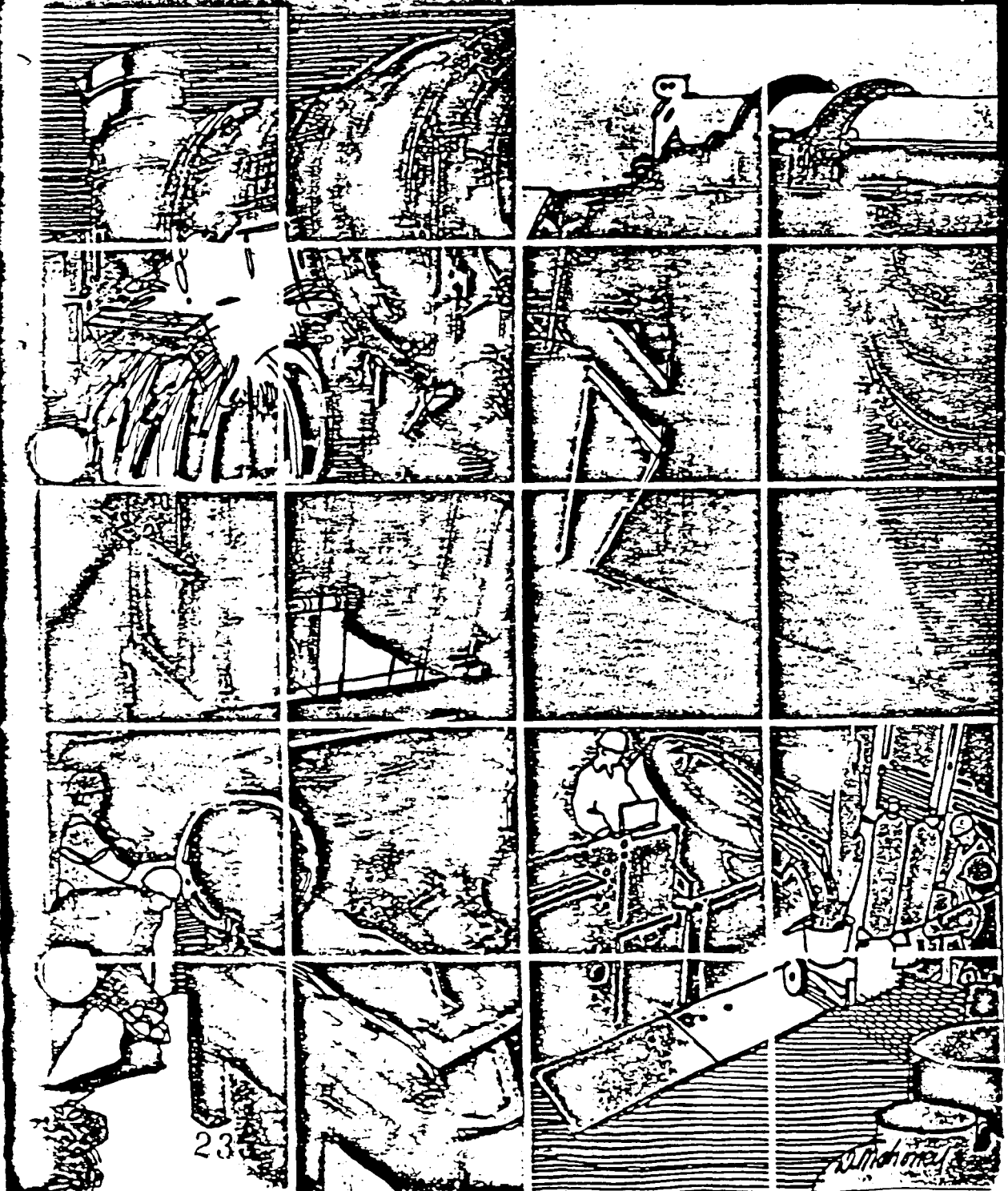


NORTH AMERICAN REFRACTORIES CO.

National City/East Sixth Bldg.
Cleveland, Ohio 44114
Phone: 216/621-5200

an **Eltra** company

NARCO REFRACTORIES for Foundries

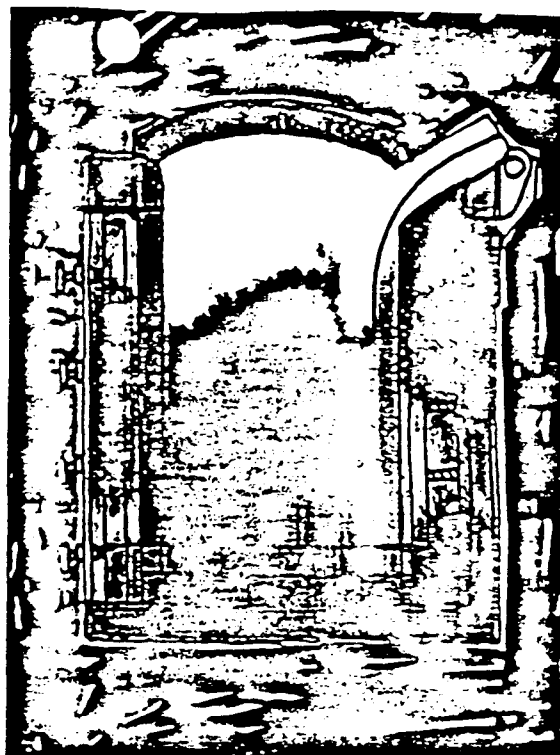
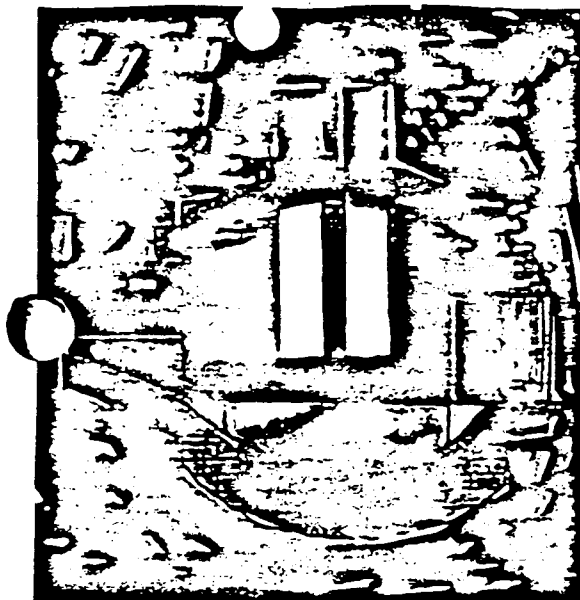


A Narco Refractory for every place in the foundry

As the operating objectives of modern foundries continue to focus on profitability and quality assurance, NARCO continues to develop new refractories and improve time-tested ones to help meet those requirements.

Close contact with foundry melt room supervisors lets NARCO sales and technical people keep abreast of foundry progress in two areas: the industry state-of-the-art and upgraded equipment and techniques in individual foundries.

This close contact with the users, plus the intensive research and development programs at the NARCO Research Center, gives us a lead position in all types, chemistries and forms of foundry refractories.



Refractories for Electric Furnaces

Induction and direct-arc electric furnace linings must resist the mechanical impact of scrap charging, torsions set up in tilting, arcing, as well as chemical attack by metal and slag constituents.

Melting temperatures can be especially high and spotty. These hot spots increase localized wear and need for repair.

For all types and capacities of electric furnaces, there's a family of NARCO Refractories that will improve productivity, reduce downtime and cut annual refractory costs.

Direct Arc Furnaces

Roofs

NARCAL 606
NARCAL 70D

Sidewalls

MTU-R (Silica)
NARCAL 606 (High Alumina)
NARCAL 70D (High Alumina)
Basic: NARMAG 608 (Direct Bonded)
NARMAG 60DBR (Direct Bonded)
NARMAG 60P (Phos Bonded)
CARMAG (Carbon Magnesite)

Induction Furnaces

Working Linings

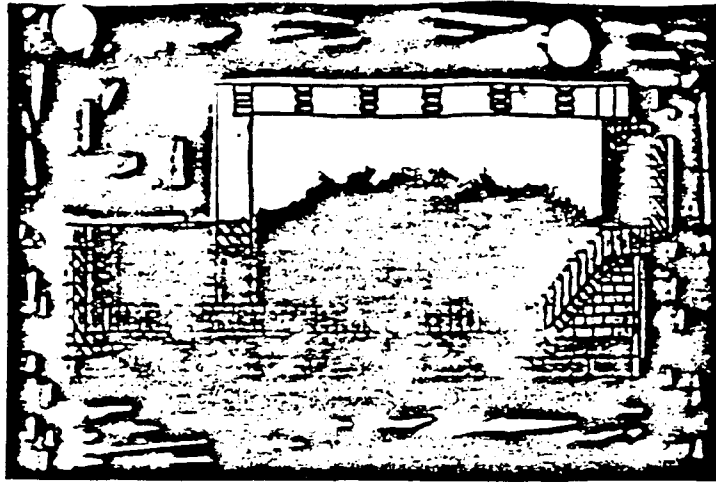
NARCAL 85B
RAMAL 85
RAMAL 90

Back up Linings

NARCAL 85B
NARCAL 70D
NARCAL 606

Spouts & Patching

NARCAL 90P
NARCAL 90TP
NARCAL 85P
NARCAL 85TP



Refractories for Aluminum Furnaces

NARCO brick, castable, and plastic refractories have excellent service and performance records in the melting furnaces of many aluminum foundries, both jobbing and captive.

NARCO bricks are especially recommended for their outstanding life under these conditions: Mechanical abuse during charging and skimming, Aggressive fluxes, Reactive alloys and additives, Intermittent furnace operation.

They especially show excellent life and economy in the sidewalls and hearths exposed to molten aluminum.

NARCO plastic and castable materials have the rugged properties needed for upper walls and roofs. Their service life, of course, is based on the care used in installation so that a tight and leak proof lining is obtained. Positive anchorage is also a must.

Combinations of NARCO brick, castable, and plastic refractories are operating with high success in many types of aluminum melting furnaces under varying operating conditions.

Recommended NARCO Refractories:

Lower Sidewalls & Hearth

NARCAL 85B and 85C brick for metal contact areas.

NARCAL 85P Plastic and RAMAL 85 Ramming Mix in metal contact areas under certain specific conditions.

Upper Walls

NARCO 68 Super Duty Firebrick.

SHUR-RAM Plastic Firebrick.
NARCOCAST 30
NARCOCAST 60

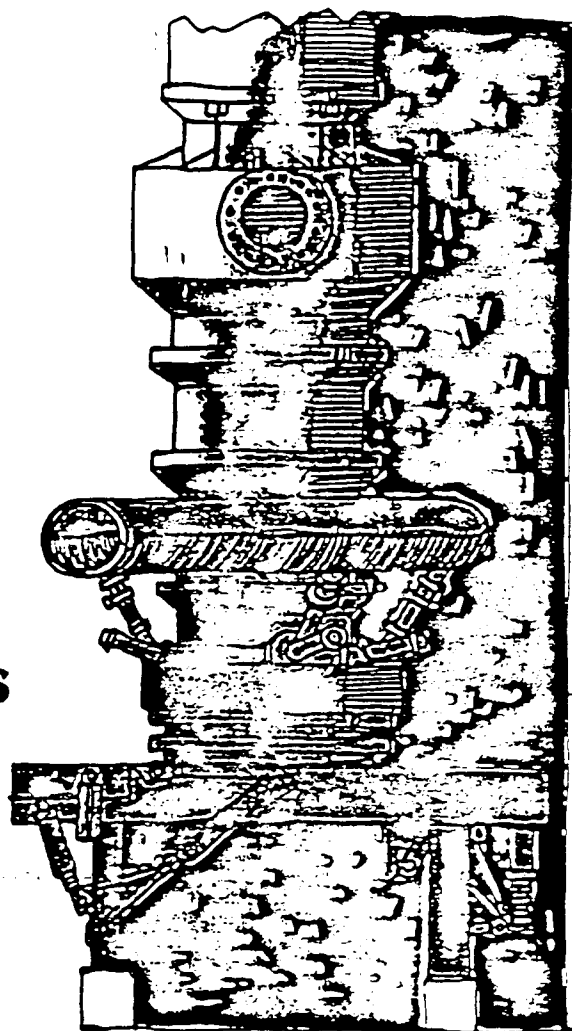
Roofs

NARCO 68 brick and suspended tile.

NARCOCAST 30 or
NARCOCAST 60 Castable.

Customized recommendations and drawings will be supplied on request.

Refractories for Cupolas



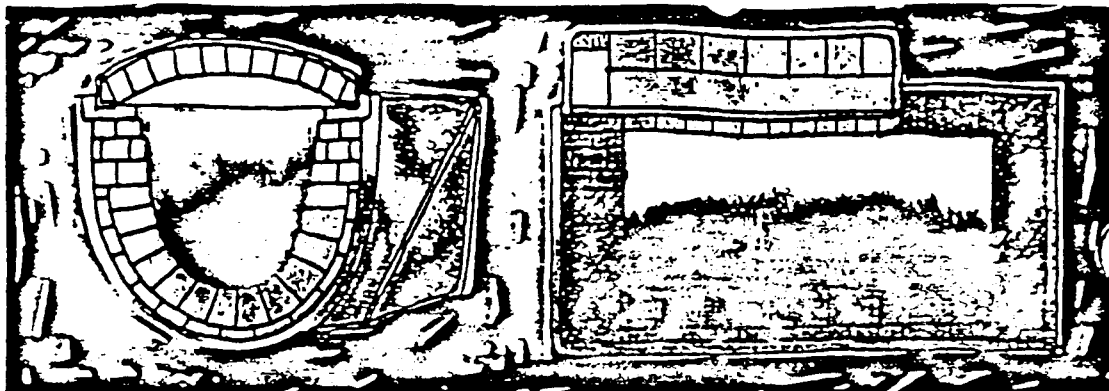
Cupolas impose some of the most severe conditions on refractories of any equipment in the foundry. The refractory has to withstand a combination of abrasion, heat, thermal shock, acid or basic slag chemistries and mechanical stress. Added to these are: high-velocity air-blast, spotty air impingement caused by channeling because of non-uniform density of the charge, and variations in tuyere design.

No one refractory can be the answer to all these punishing variables in day-to-day foundry operations and materials.

NARCO can provide a complete range of refractories developed and proved to work best at each trouble spot.

Taphole	Trough Area	Well & Bottom	Charge Area
RAMAK	RAMAK	RAMAK P	GUNCRETE
RAMAK P	RAMAL 80G	NARCAL 60PG	
RAMAL 85G	RAMAL 85G	NARCOLINE	

REFRACTORIES

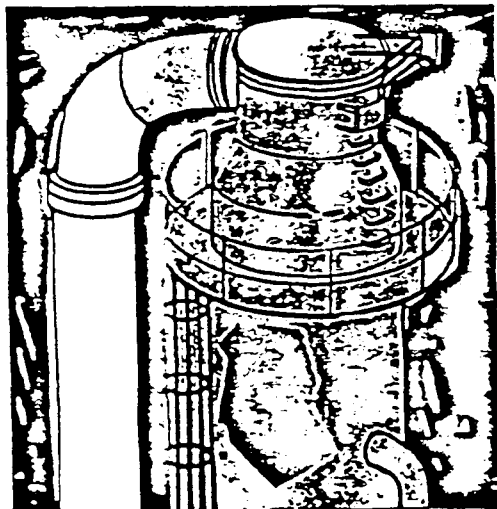


...for Ladles and Forehearth

Transfer and inoculating ladles are readily lined with NARCO Refractories brick ramming mixes, plastics and castables. These have been developed to give maximum resistance to fluid erosion, chemical attack and thermal shock. Users report longer in-service life and less repair downtime.

Brick	Plastic	Ramming Mix	Castable
NARCAL 606	NARCOLINE	BERLITE	NARCOCAST 30
NARCAL 70D	SHUR-RAM	CAROLINE	NARCOCAST 60
NARTAR PAD	NARCAL 60PG	FIRELINE	
	NARCAL 70P		
	NARPHOS 70P		

...for Anti-Pollution Systems



High temperature entry areas on dust collectors and fume-removal systems are protected from heat, corrosives and high-velocity dust-laden air impingement by NARCO refractory linings. The wide variety of available forms of refractories that can be brick-layed, cast, or gunned permits their use in all types of hot-spot anti-pollution systems and equipment.

Call on NARCO for refractory recommendations, as well as for solutions to unusual refractory problems, equipment operations, and slag chemistries. Ask your regional NARCO sales technician. Or write or phone us.

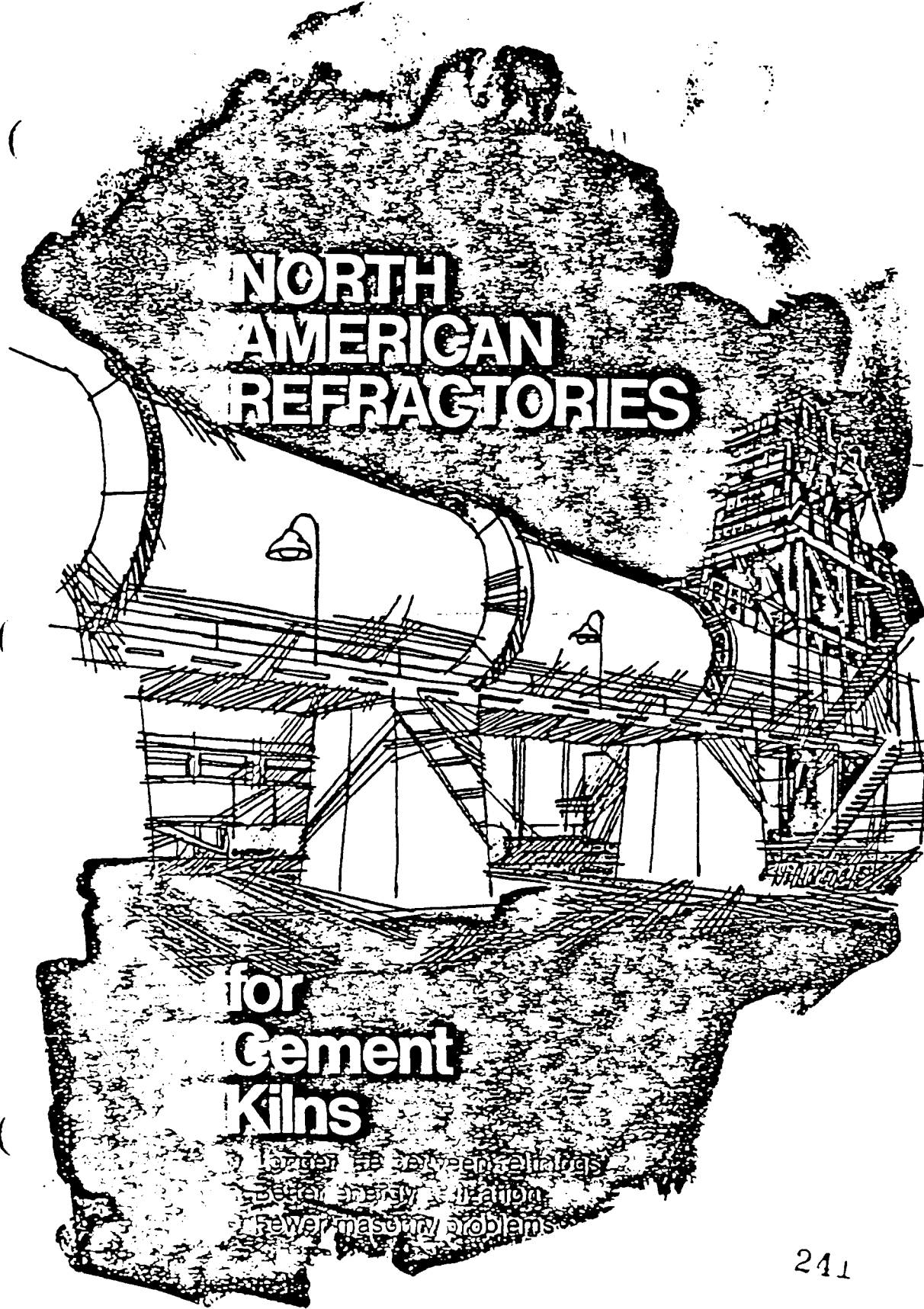


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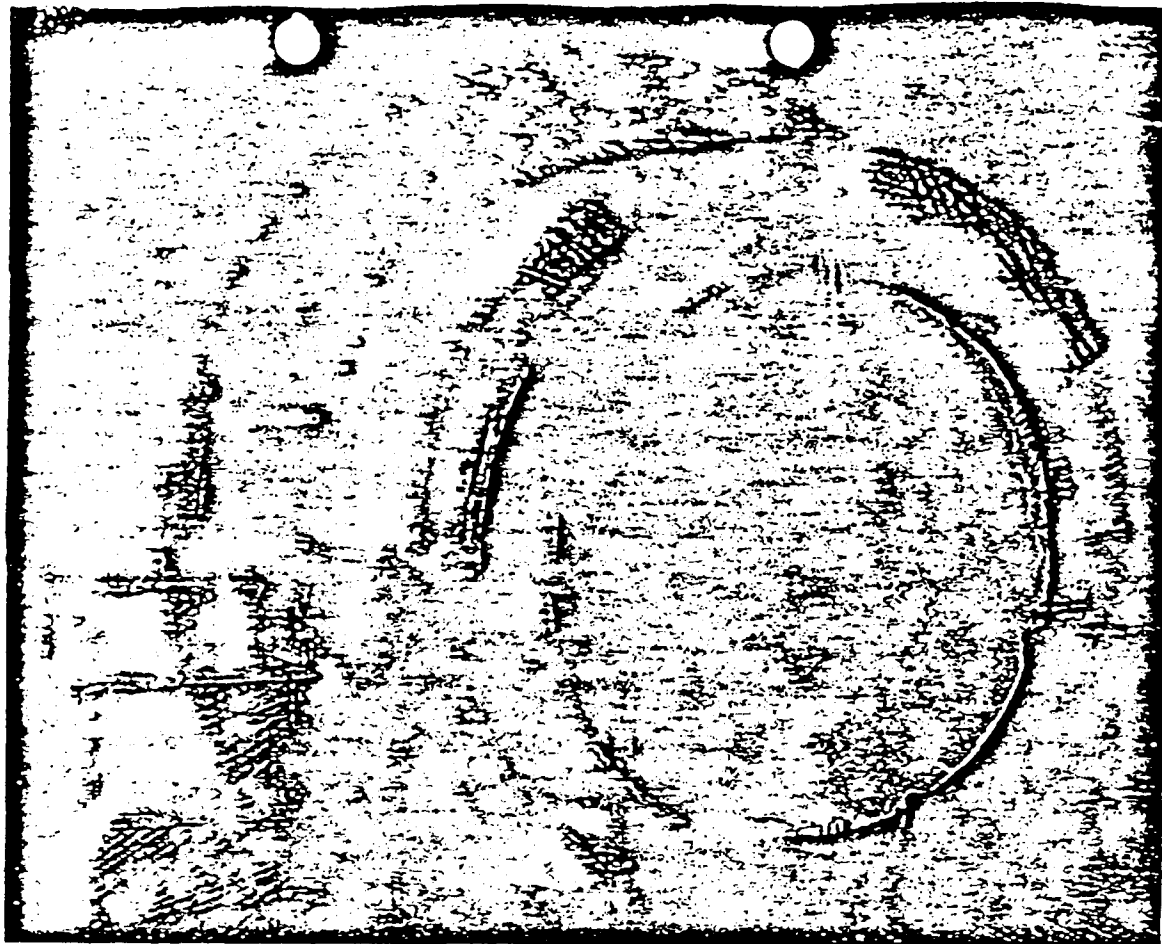
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NORTH AMERICAN REFRACTORIES

for Cement Kilns

- longer life between relinings
- better energy utilization
- fewer masonry problems



Reduce kiln operating costs and downtime with the NARCO Family of refractories

The Portland Cement Industry is currently facing a period of rapid technological change. Energy is scarce. And expensive. At the same time, there is ever-increasing emphasis by builders and governments on more predictable, repeatable performance by the cement in producing uniform top-grade concrete.

Higher rates for skilled masons make rebricking even more costly. The ratio between refractory cost and labor rates now makes it wise to buy better refractories with longer life expectancy, thus reducing labor costs by reducing the number of kiln outages.

You are struggling with an unusual combination of operating circum-

stances . . . keep production up . . . hold maintenance costs down . . . use energy more efficiently . . . reduce unproductive downtime . . . make a profit . . . maintain cement quality and uniformity.

A refractory for every need

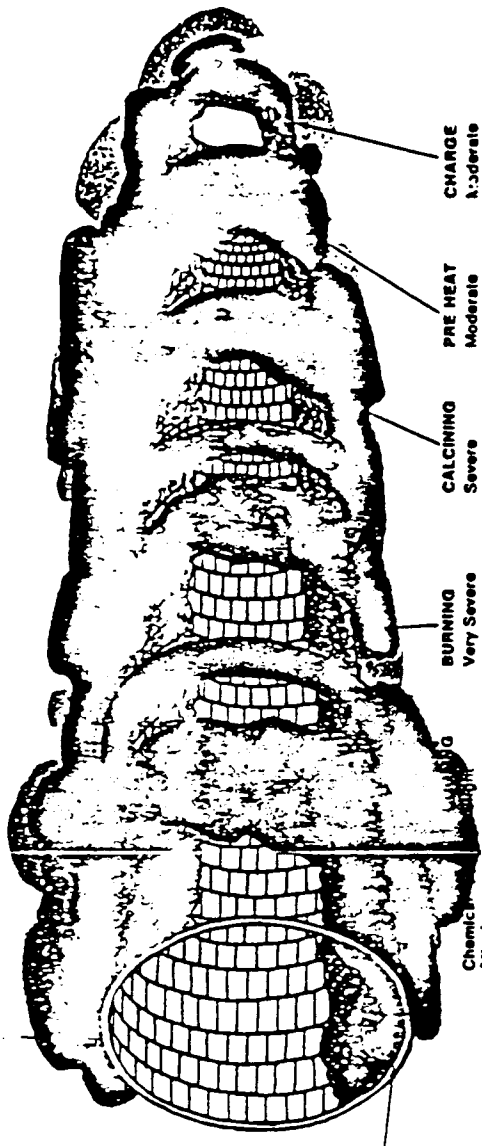
The NARCO line of cement kiln refractories was designed to meet the specific thermal, chemical, and mechanical requirements for prolonged service life in each zone of your kiln. We offer one of the most complete lines of refractories available to the Portland cement industry.

NARCO refractory researchers are not resting on their achievements. New combinations of refractory materials are being developed in a continuing program to keep NARCO number one in quality.

Let our kiln refractory engineers help you select the most suitable NARCO products for your particular kiln, fuel, operating procedures, raw materials, and end products. We can help you keep your kiln running longer between refractory-related outages.

Dry Process Kiln

NARCO REFRACTORY SELECTOR CHART FOR ROTARY CEMENT KILNS



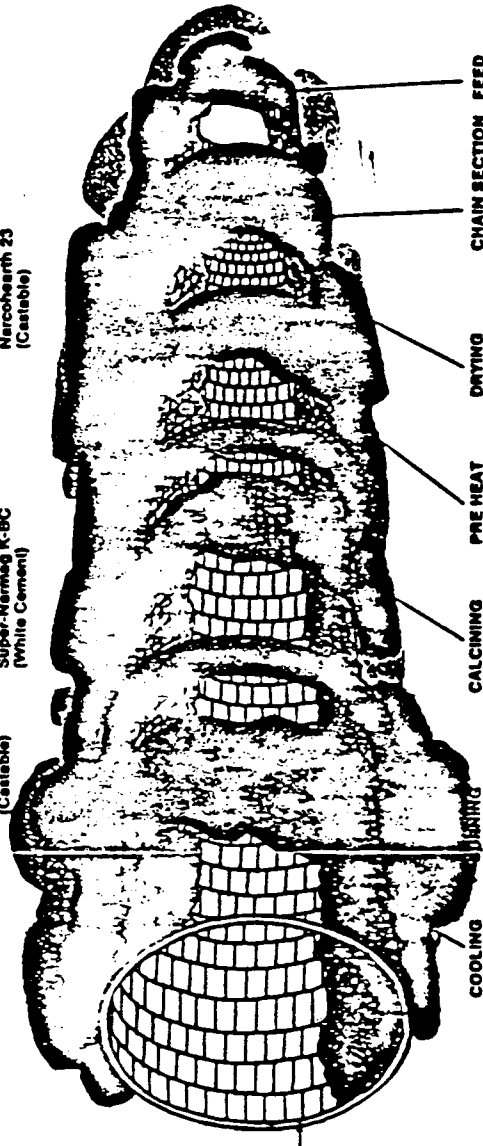
Nose &
Dam Ring
Narcal 75C
Narcal 75D
Narcal 85P
(Plastic)

From feed end to nose ring, any kiln can be lined with the right NARCO refractory shapes or castables to fully protect the structure, produce more cement with less downtime for refractory repairs, and use precious fuel at maximum BTU efficiency.

The complete line of NARCO materials for cement kilns is described in various sections of this catalog. Index tabs will help you turn quickly to the selections that are recommended zone-by-zone on these kiln diagrams.

For specific recommendations and answers to special questions, please call us or your NARCO sales/service engineer.

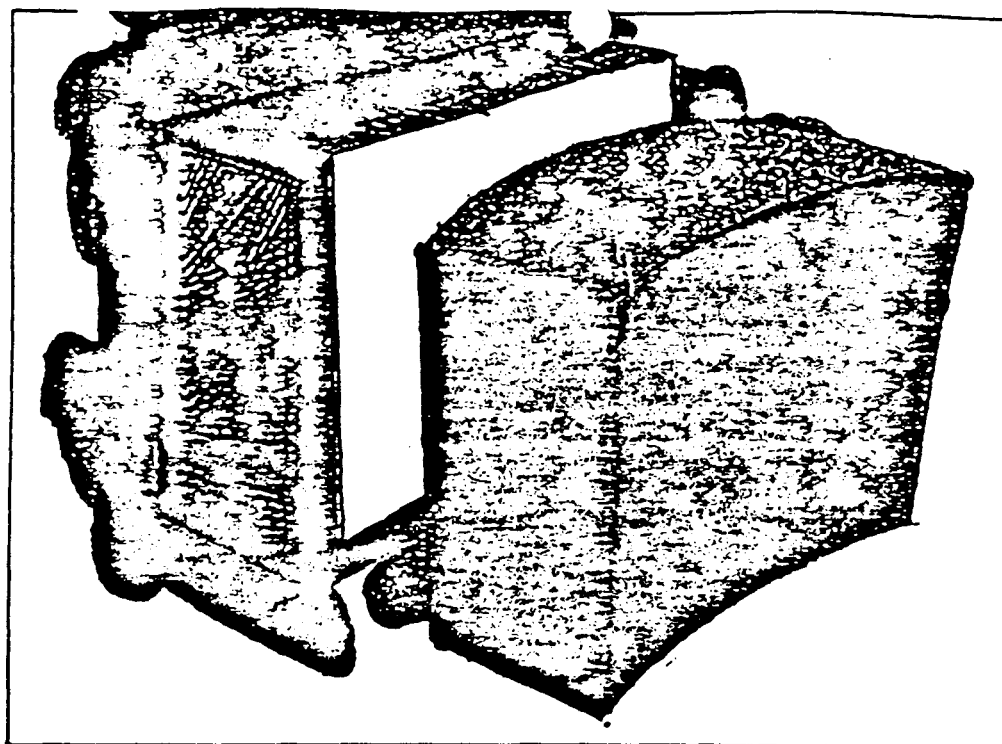
Chemical Attack	Thermal Spalling	Abrasion	Slagging	Refractory Quality	Recommendation
Moderate to Severe	Severe	Very Severe	None	Narcal 700	
				Narco 71	
				Narco 68	
				Narcast 25 (Castable)	
BURNING	Very Severe	Moderate to Severe	Slight to Severe	Severe	Narmag 60K-C Narmag 60K-DBRC Romeag 1 WO 963-B Super-Narmag K-BC (White Cement)
CALCINING	Severe	Slight to Moderate	Slight to Moderate	Slight to Moderate	Narco 700 Narcast 25 (Castable)
PRE HEAT	Moderate	Slight to Moderate	Slight to Severe	None	Narco 71 Narco 68 Crescent Farber Narcohearth 23 (Castable)
CHARGE	Moderate	Slight	Severe	None	Flint Narcohearth 23 (Castable)



Nose &
Dam Ring
Narcal 75C
Narcal 75D
Narcal 85P
(Plastic)

Wet Process Kiln

Chemical Attack	Thermal Spalling	Abrasion	Slagging	Refractory Quality	Recommendation
Moderate to Severe	Severe	Very Severe	None	Narcal 700	
				Narco 71	
				Narco 68	
				Narcast 25 (Castable)	
COOLING	Slight	Moderate to Severe	Very Severe	Severe	Narmag 60K-C Narmag 60K-DBRC Romeag 1 WO 963-B Super-Narmag K-BC (White Cement)
CALCINING	Severe	Moderate to Severe	Moderate	Slight to Moderate	Narco 700 Narcast 25 (Castable)
PRE HEAT	Moderate	Slight	Moderate	None	Narco 71 Narco 68 Crescent Farber Narcohearth 23 (Castable)
DRYING	Slight to Moderate	Slight	Slight	None	Crescent Farber
CHAIN SECTION	Slight	Slight	Very Severe	None	Flint Narcast 25 (Castable) Narcohearth 23 (Castable)
FEED	Slight	Slight	Slight	None	Crescent Farber



NEW REFRACTORY FROM NARCO...

NARMAG 608K-C delivers longer life in the burning zone.

This patented refractory was developed by NARCO research to meet the requirements of Portland cement producers for a basic liner that will provide substantially longer burning zone life.

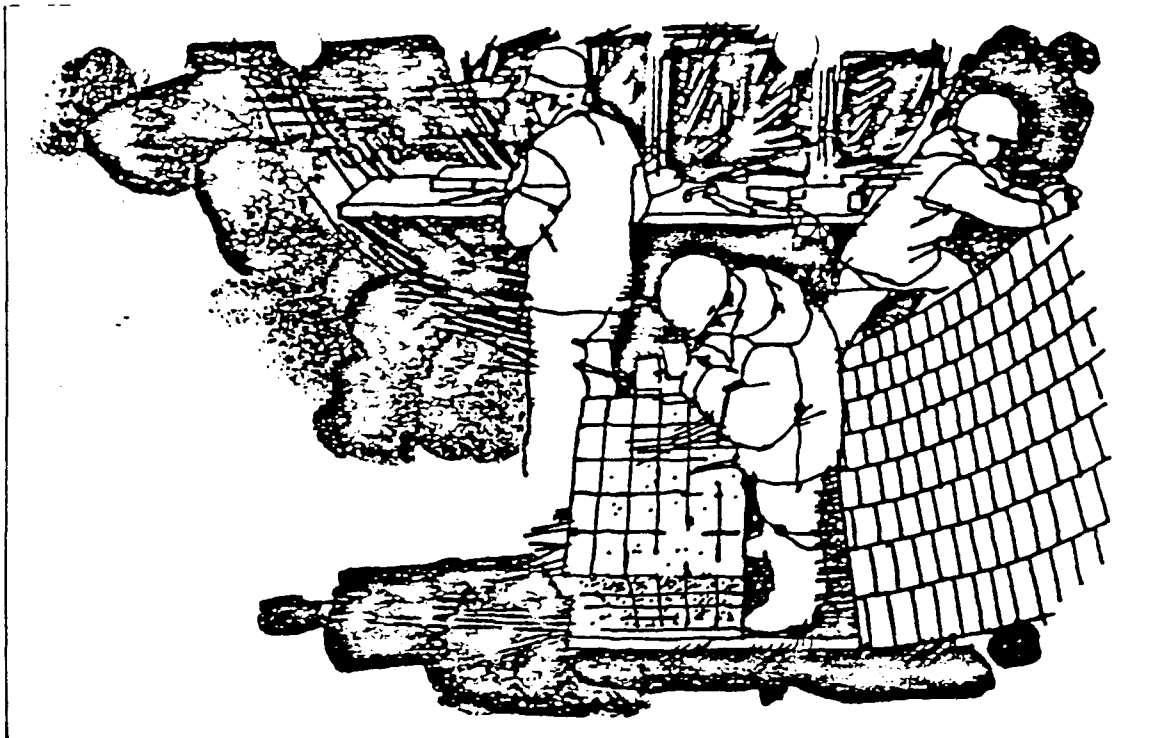
NARMAG 608K-C refractory is 20% less porous than most direct-bond brick. Its unique combination of properties includes chemical compatibility with the kiln feed, produces faster clinker coating formation, improves fuel utilization. This makes the clinker coating more stable; combined with the fact that in most cases, the clinker coating can be removed from the liner with minimum damage to the surface of NARMAG 608K-C refractory.

NARMAG 608K-C's 20% lower porosity reduces penetration of the refractory pores by alkalis and sulfides. It also holds thermal dimensional changes to a minimum, resulting in less change in refractory microstructure at elevated process temperatures. (The tendency of this product to spall during outages is also less than with other basic brick.)

Chemical compatibility of NARMAG 608K-C with the feed in the burning zone is excellent. This prevents the development of an overly dense structure in the refractory hot face that can cause undesirable spalling during outages.

Higher strengths at refractory operating temperatures greatly improve the structural stability of the refractory at maximum kiln zone temperatures. It also improves the resistance of the refractory to mechanical torsional stresses set up in kiln and liner during rotation.

For complete information, analysis, and lining recommendations on our newest NARMAG 608K-C refractory in all standard shapes, call your NARCO sales/service representative.



OUR SERVICE EQUALS OUR LINE . . . IT'S COMPLETE!

Technical Services: When you need recommendations or answers, the NARCO Technical Services staff will provide them promptly, using the latest developments in refractory technology and the newest improvements in the state of the art as their bases. If yours is an unique problem, NARCO refractories research will provide unique answers . . . or even develop a special refractory to meet your need.

Quality Control Lab: Uniform adherence to chemical and physical specifications is carefully maintained by regular, statistically-determined production-line tests of all NARCO refractory materials in our own Quality Control Laboratories. NARCO also runs tests under conditions that parallel your own operating environments.

Field Service Staff: In the actual installation of refractory materials in commercial kilns, the NARCO Field Installation staff can install NARCO monolithic specialty refractories to

supplement your own lay-up crews or masonry contractors in getting the job done quickly and properly. Our staff can also provide supervisory assistance for your crews when unusual lay-up is required or new materials are being installed.

Engineering: Engineering assistance and lay-up drawings for all parts of your kiln and its auxiliaries are available when you require them.

*If you don't find what you need
in this catalog, phone us.*



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