

Red Shale and Fire Clay Chemical Resistant Brick

Belden shale and fire clay chemical resistant brick offer engineers a wide range of utility in environments that involve aggressive corrosive conditions and elevated temperatures.

These brick are currently in use in such industries as chemicals, steel, and metalworking, pharmaceuticals, pulp and paper, food and beverage, public utilities, aircraft, automotive and electronics. Typical applications in these industries are represented by process vessels, plating tanks, storage tanks, reaction vessels, fume ducts, scrubbers, bleach towers, waste treatment pits, rinse lines, and pickling tanks.

Chemical resistant masonry construction is designed to protect containment tanks and vessels made of steel, concrete, ordinary masonry, fiber-reinforced polyesters and the like. Chemical resistant brick provides thermal, mechanical, and chemical protection for these kinds of structures.

Belden chemical resistant brick is a particularly versatile construction material for sulfuric acid plants when installed as linings for carbon steel shells. These linings can be used regardless of the size of the vessels or equipment when prescribed construction techniques are followed. They can lower the temperature of the surface of the shell and eliminate erosion of the protective sulfate film. No other system

of corrosion resistance can provide the same level of cost effective protection in wet areas where acid concentrations vary from 2% to 98% and at high temperatures, as the three component system using chemical resistant brick and mortar with a membrane backing.

Historically, Belden corrosion resistant brick linings have won wide acceptance because of these features:

- **Usage flexibility without sensitivity to minor changes in chemical processes, and applicability for many different processes.**
- **Cost savings: where alloys and special metals become uneconomical because of accelerated chemical attack at high temperatures, chemical resistant brick liners inside the vessel can lower temperatures and concentration levels, making it feasible to use less expensive alloys.**

- **Repairability compared to the finite durability of alloys.**
- **Insulation inside a vessel is less susceptible to damage than is external insulation.**
- **Cooler operation reduces degree of external protection necessary for worker safety.**

Quality...from the ground up

Belden chemical resistant brick, backed by more than 100 years of brick making experience, are manufactured of specially selected American shales and fire clays. These are fine-ground and specifically formulated for density and strength and fired at over 2000° F. This process results in brick that resists virtually all corrosive liquids and gasses, except for acid fluorides and strong hot caustics.



BELDEN CHEMICAL RESISTANT BRICK IS IN SERVICE AT THESE COMPANIES

BASF Corporation • Chrysler Corporation • Conoco • Delco Remy • E. I. DuPont De Nemours & Company • Gould Incorporated • GTE Products Corporation • Hoechst Celanese • Inland Steel • Johnson Controls • LTV Corporation • Mobay Corporation • Monsanto Enviro Chemical, Incorporated • Proctor & Gamble • Revereware Corporation • Rhone-Poulenc • Rohm & Haas • The Timken Company • Union Camp Corporation • U.S. Steel Corporation • Wean Industries

Belden Red Shale Chemical Resistant Brick

The basic difference between red shale and buff colored fire clay chemical resistant brick is one of physical properties rather than chemical. Each kind is equally resistant to acids, alkalis, and solvents except for acid fluorides and strong hot caustics.

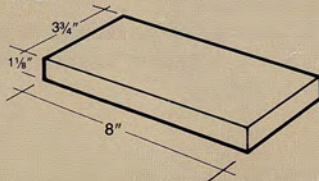
Generally, shale brick is used for applications where thermal shock is not a factor and minimum absorption is required. Shale brick contains sufficient integral iron to

provide high strength and resistance to abrasion.

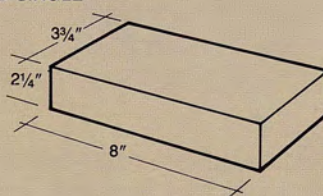
On the other hand, the quantity of ambient iron that red shale brick contains may leach out in some applications involving halogen acid environments. In these cases, our fire clay chemical resistant brick is recommended.

For review of the physical properties of Belden red shale chemical resistant brick, please consult page 4 of this folder.

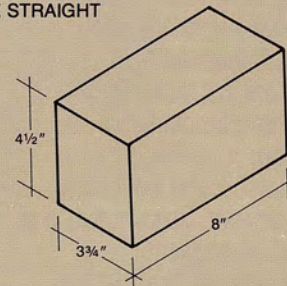
SPLIT



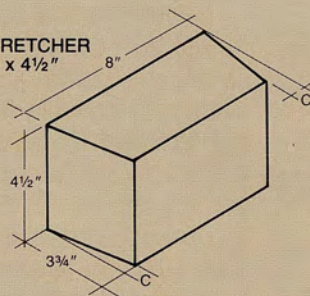
STANDARD SINGLE



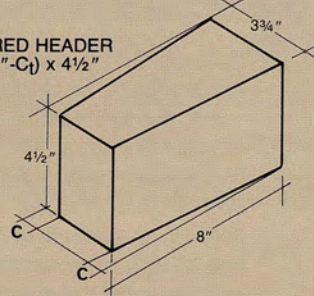
DOUBLE STRAIGHT



CHAMFERED STRETCHER
(8"-C_t) x 3 3/4" x 4 1/2"



CHAMFERED HEADER
8" x (3 3/4"-C_t) x 4 1/2"



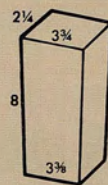
TOTAL CHAMFER (C_t)
EQUALS 2 X C

Chamfered double stretchers and headers are custom-chamfered in 1/16" increments to the size specified by the tank or vessel designer.

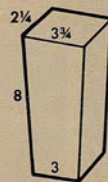
STANDARD SHALE SHAPES

All standard stretcher units shown are furnished as either W-5 (wire cut on five (5) sides) or as S-3, scored on three (3) sides. All standard shapes shown are furnished as wire cut units, six (6) sides.

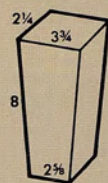
Bullnose radius headers and stretchers are available in both single and double size units upon request. Please contact The Belden Brick Company for availability: 216/456-0031.



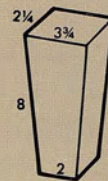
NO. 1 — KEY



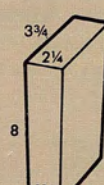
NO. 2 — KEY



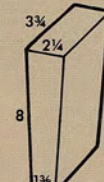
NO. 3 — KEY



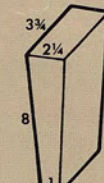
NO. 4 — KEY



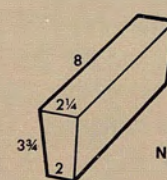
NO. 1 — WEDGE



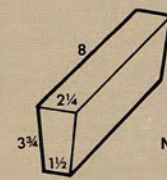
NO. 2 — WEDGE



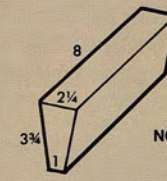
NO. 3 — WEDGE



NO. 1 — ARCH



NO. 2 — ARCH



NO. 3 — ARCH

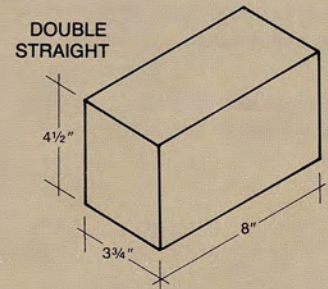
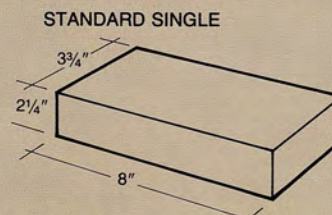
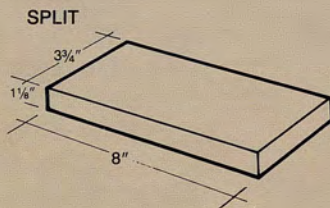
Belden Fire Clay Chemical Resistant Brick

One important advantage of fire clay brick is its low iron content. This characteristic makes fire clay brick preferable for textile mills and paper/pulp industries where processing chemicals can leach iron from the brick and cause color contamination. Accordingly, these brick are seen as contributing to end product integrity.

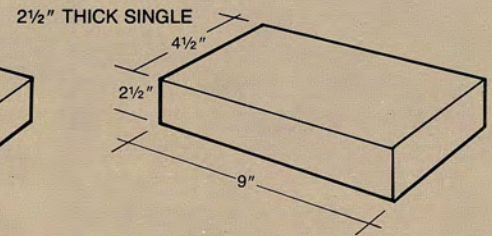
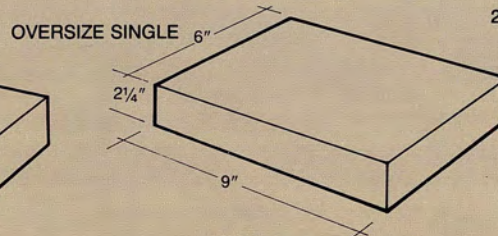
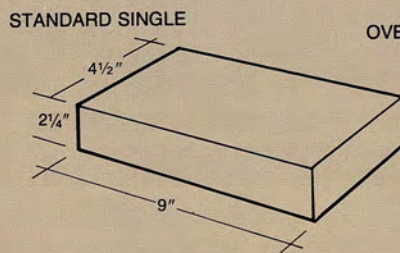
In addition, fire clay brick's buff coloration is more light reflective than red shale brick. This factor can sometimes be a factor in illumination planning.

For a review of the physical properties of Belden fire clay chemical resistant brick, please consult page 4.

STANDARD 8" SERIES

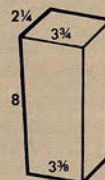
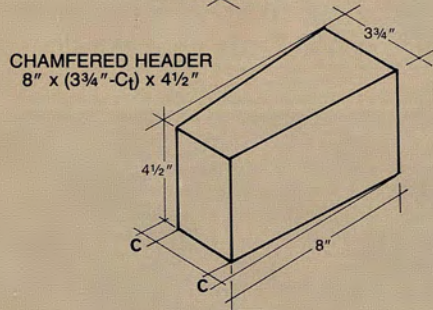
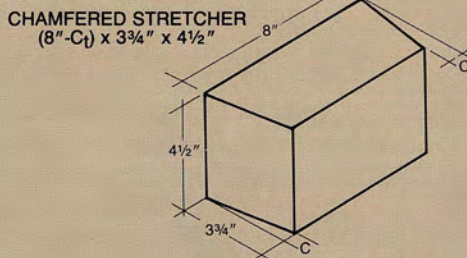


STANDARD 9" SERIES

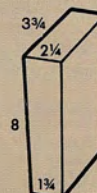


**TOTAL CHAMFER (C)
EQUALS 2 x C**

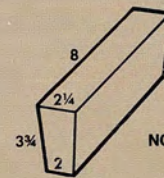
Chamfered double stretchers and headers are custom-chamfered in 1/16" increments to the size specified by the tank or vessel designer.



NO. 1 — KEY



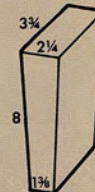
NO. 1 — WEDGE



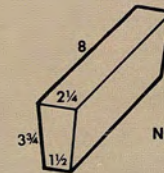
NO. 1 — ARCH



NO. 2 — KEY



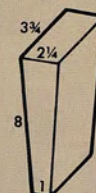
NO. 2 — WEDGE



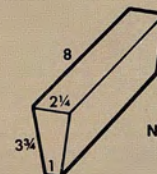
NO. 2 — ARCH



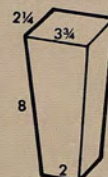
NO. 3 — KEY



NO. 3 — WEDGE



NO. 3 — ARCH



NO. 4 — KEY

STANDARD FIRE CLAY SHAPES

All standard stretcher units shown are furnished as either W-5 (wire cut on five (5) sides) or as S-3, scored on three (3) sides. All standard shapes shown are furnished as wire cut units, six (6) sides.

Bullnose radius headers and stretchers are available in both single and double size units upon request. Please contact The Belden Brick Company for availability: 216/456-0031.

Belden Chemical Resistant Brick

All Belden chemical resistant brick are manufactured to conform to or exceed ASTM-C279 and generally are available in the Type II designation.

Minimum requirements regarding the ASTM-C279 specification are shown in the following table:

Physical and Chemical Requirements

Designation	Modulus of Rupture (Brick or Tile Flat-wise) min. psi (MPa)	Water Absorption Maximum % by 2 hr Boiling Test		H ₂ SO ₄ Solubility Maximum % Weight Loss
	Average of 5 Brick or Tile Low Individual	Average of 5 Brick or Tile High Individual		Average of 5 Brick or Tile
Type I	1250 (8.6) 1000 (6.9)	6.0	7.0	20
Type II	1250 (8.6) 1000 (6.9)	4.0	5.0	12
Type III	1250 (8.6) 1000 (6.9)	1.0	1.5	8

Typical Physical Properties of Belden Shale and Fire Clay Chemical Resistant Brick

Typical Physical Properties of Belden Shale and Fireclay Chemical Resistant Brick Products

PROPERTY	TEST STANDARD	RED SHALE	BUFF FIRECLAY	REFERENCE
Bulk Density, lbs./cu. ft.	ASTM C-20	139-141	145-148	PSI (Professional Services Industries, Inc.)
Water Absorption, %	ASTM C-20	3.14-3.46	3.22-3.55	" "
Solubility in Sulfuric acid. Loss in mass, %	ASTM C-279	2.2-3.9	2.1-3.1	" "
Apparent Porosity, %	ASTM C-20	7.42-8.06	7.76-8.51	" "
Apparent Specific Gravity, grams/cc	ASTM C-20	2.54-2.55	2.61-2.62	" "
Modulus of Rupture, p.s.i.	ASTM C-67	1900-3560	2210-2600	" "
Compressive Strength, p.s.i.	ASTM C-67	21,390-22,650	21,060-23,600	" "
Tensile Strength, p.s.i.	ASTM C-1006	3195-3390	1675-3285	" "
Modulus of Elasticity, p.s.i.	ASTM C-885	6.98-7.97x10 ⁶	6.68-6.84x10 ⁶	" "
Poisson's Ratio	—	.125-.193	.125-.127	" "
Coefficient of Expansion, in/in/°F x 10 ⁻⁶	—	4-5.5	2-3.5	Corrosion and Chemically Resistant Masonry ⁽¹⁾
Thermal Conductivity, BTU-in/hr.-ft. 2.°F	ASTM C-236	7-9	6-10	" "
K Factor, BTU/sq. ft./in./hr.	ASTM C-177	8	9	" "

(1) Corrosion and Chemically Resistant Masonry Materials Handbook by Walter Lee Sheppard, Jr., P.E.B. Chem., M.S. C.C.R.M., Inc., 1988

Please Note. The information given in this reference table should be used as a guide only. No guarantee is made nor can we assume any liability in connection with the use of this information. Please contact The Belden Brick Company for specific recommendations.

Mortar manufacturers should be consulted for their recommendations in connection with chemical resistant brick construction. For names and addresses of mortar manufacturers, please contact The Belden Brick Company, P.O. Box 20910, Canton, OH 44701-0910.

THE BELDEN BRICK COMPANY / P.O. BOX 20910 / CANTON, OHIO 44701-0910

Telephone: 216/456-0031 FAX: 216/456-2694

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