

**Industrial
Plasters
and Gypsum
Cements:**

**Versatile
Products for
Countless
Industrial
Applications**



United States Gypsum Company



Almost always one of the lowest cost solutions to your industrial product and process problems or product development opportunities

- Simplify a variety of manufacturing applications
- Easy to use and handle
- Retain desirable physical properties



You gain all these advantages with Industrial Plasters and Gypsum Cements from United States Gypsum Company

Controllable setting time

Plaster provides a controllable setting performance few other materials can offer. By adding accelerators or retarders, you can shorten or lengthen its setting time and reproduce setting time from batch to batch.

Controllable setting time . . .

- Gives you a broad choice of working times, ranging from about 3 minutes to 20 hours
- Maximizes production rate

Note: Plaster sets with a sharp, definable, measurable action. It sets fast—faster than typical portland cements and other cementitious materials.



Controllable expansion

Only plaster among cementitious materials offers controllable expansion—ranging from 0.0005 to 0.0156 in. per in. (or $\frac{3}{16}$ " per ft.). Plaster formulations can come closer to zero expansion than many other materials.

Controllable expansion . . .

- Ensures high dimensional accuracy
- Ensures duplication of fine detail
- Provides a positive mechanical key when poured into a cavity

Ease of use

Plaster can be fabricated or used in four main ways:

1. Mixed as a fluid slurry, it can be cast or sprayed
2. Worked in a plastic state by screeding or template forming
3. Pressed between dies as a semi-wet powder
4. Carved or machined as a solid

In *fluid slurry form*, plaster pours easily into flexible or rigid molds. Viscosity ranges from nearly water to molasses. Plaster captures fine detail and can be parted from any nonporous surface. Properly formulated, it can be self-leveling and pumpable.

In *plastic mass form*, plaster can be built up, troweled, added to, scraped away, or sculpted as easily as clay. Viscosity ranges from that of butter to modeling clay, or plaster can be applied as a plastic mass to virtually any contour—and will set in place to produce a reverse contour.

In *solid form*, casts from plaster formulation can be carved or machined using conventional tools and equipment, including numerically controlled milling equipment.

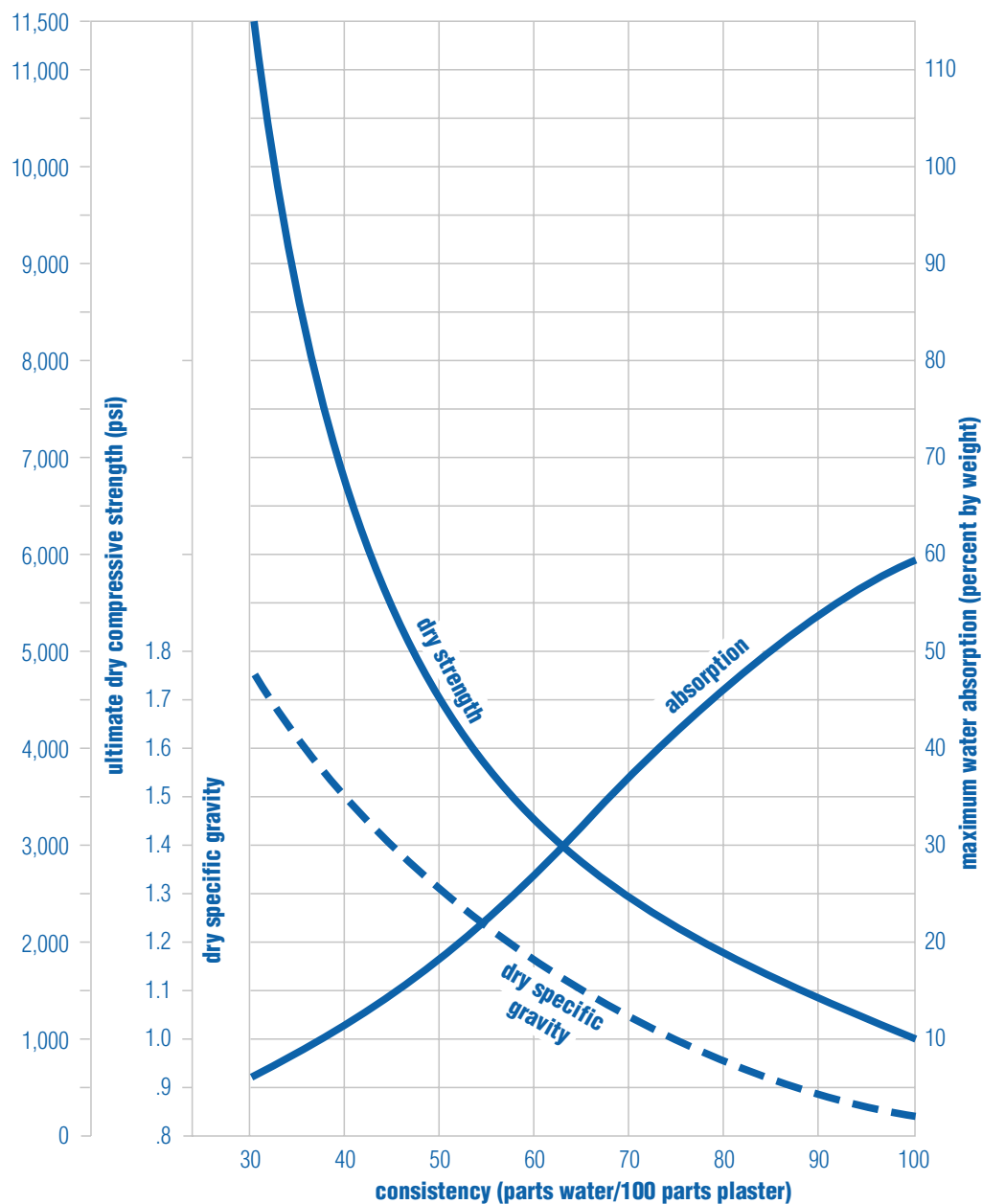
Toll-Free Technical Assistance is available at (800) 487-4431.

Controllable strength, absorption, density

Only gypsum among commercial materials possesses extreme ranges in strength, absorption, and density. For example:

- Compressive strength (and hardness) can range from that of weakest chalk to four times greater than concrete
- Absorption can equal that of a rigid sponge or an impervious surface that sheds water
- Density can vary from that of popcorn to stone

This great range occurs by selecting the appropriate plaster formulation, then controlling the amount of mixing water. The graph below indicates how you can obtain this range through predictable control of desired characteristics.



Consistency vs. strength, absorption and specific gravity.

Solubility

Only gypsum among casting materials is self-cleaning in the mold—a basic requirement in the ceramics industry. What gives gypsum this advantage is its solubility (about two grams per liter of distilled water).

Note: If reduced solubility is not required, gypsum cements can be formulated to meet conditions—it's that versatile.



Compatibility with other chemicals, aggregates

Industrial plasters and gypsum cements readily blend with chemicals and aggregates to achieve special properties. Both wet and dry blending are done with various chemicals, powders, and granular materials. These include:

talc	iron oxide	kaolin
resins	ball clay	asphalt
perlite	starches	sand
dyes	vermiculite	pigments
wood fiber	polymers	foaming agents
powdered glue		
set-time control additives		
glass/polymer fibers		

Note: Except for special gypsum cement formulations, do not use coarse aggregates (gravel, stone, rip-rap, or any aggregate larger than 10 mesh) as gypsum crystals do not readily bond to them.



Fire resistance and nonconductivity

Industrial plasters and gypsum cements are noncombustible. With a coefficient of thermal conductivity (k) of 0.25 to 4.0, depending on density and additives, these materials provide a high degree of fire resistance. When exposed to heat, they do not exceed 212 °F until three-

quarters of the chemically combined water is driven off. At about 1800 °F the CaSO₄ portion dissociates into quicklime (CaO) and sulfur trioxide (SO₃). Dry gypsum is electrically nonconductive and makes a good insulating medium.

Safety

Properly used, industrial plasters and gypsum cements are safe to handle and work with. (Handling directions and safety warning statements on the container should be read and followed.) With few exceptions, they are nontoxic, nonallergenic, odorless, and nonirritating to the skin. Industrial plaster and gypsum cements do not attract or support vermin. When dry, gypsum will not support mold, fungus, or bacteria growth.

Note: For detailed information, request Material Safety Data Sheets (MSDS). Contact United States Gypsum Company, Dept. 982-8, 125 South Franklin Street, Chicago, IL 60606-4678, or call (800) 487-4431.

Gypsum—the base mineral of high performing Industrial Plasters and Gypsum Cements from United States Gypsum Company

This highly versatile, basic mineral is finely ground and calcined to produce a powder with uniform chemical and physical properties.

In manufacturing industrial plasters and gypsum cements, a portion of the chemically combined water is removed by calcination.

The chemical equation that expresses the calcination of gypsum to form plaster is:



In the presence of water, the plaster will revert to gypsum (this is the setting action).

How do industrial plasters and gypsum cements differ?

Chiefly in the size and shape of crystals formed during the manufacturing process. This difference in crystalline structure has the following effects:

- Industrial plasters require from 65 to 160 lb. of water per 100 lb. of plaster to make a workable slurry.
- Gypsum cements require from 22 to 45 lb. of water to gain good workability.

Industrial Plasters from United States Gypsum Company

Ceramics

Pottery Plaster—general purpose product recommended for most slip casting applications in the ceramic industry.

No. 1 Pottery Plaster—formulated to provide stronger, longer-lasting ceramic slip cast molds. Standard of the industry.

PURITAN® Pottery Plaster—slightly denser, longer-wearing mold material. Recommended for jiggering applications in the ceramic industry.

DURAMOLD™ Pottery Plaster—formulated to provide a longer-lasting, more durable gravity slip casting mold. Used at a lower consistency than conventional pottery plasters.

3-D Casting and Statuary

Moulding Plaster—good general purpose plaster where expansion control, hardness, and strength are not of major importance. (Referred to as “casting plaster” on the West Coast.)

Industrial Gauging Plaster—coarser-grind product than Moulding Plaster, resulting in a lower water demand for mixing.

White Art Plaster—similar in working properties to Moulding Plaster, except contains a surface hardening agent that reduces paint absorption.

No. 1 Casting Plaster—similar to White Art Plaster, except mixed at a lower use consistency to increase strength and chip resistance, and to further reduce paint absorption.

TUF CAL™ Plaster—unique polymer-modified, high early-strength fibered plaster. Provides higher green strength and greater chip and impact resistance than White Art Plaster, No. 1 Casting Plaster, or HYDROCAL® White Gypsum Cement. It is ideal for hollow cast products.

Dental

Regular Dental Plaster—normal set dental plaster recommended for general purpose applications. Similar to Moulding Plaster.

Laboratory Dental Plaster—same as Regular Dental Plaster, except for faster set (6 to 9 min.).

Impression Dental Plaster—designed for mouth impression work. Fastest setting of all dental plasters (3½ to 5 min.).

Specialty

AIRTROL® Geobinder—industrial plaster formulated for use in hydroseeding equipment to control erosion while providing protective cover to stimulate plant growth. Also can be sprayed over coal refuse piles to smother spontaneous combustion fires. Other uses include effective method for dust control.

Metal Casting Plaster—combination of industrial plaster, sand, and refractory materials for casting nonferrous matchplates.

Typical Physical Characteristics—Industrial Plasters

Product	Use Consistency (Parts of Water by Weight per 100 Parts of Plaster)	Approximate Hand Mix VICAT Set (minutes)	Minimum Dry Compressive Strength (psi)	% Setting Expansion Maximum	Density (lb./ft. ³)	
					Wet	Dry
Ceramics						
Pottery Plaster	74	27-37	1,800	0.190	97.6	66.0
No. 1 Pottery Plaster	70	27-37	2,000	0.210	99.0	69.0
PURITAN Pottery Plaster	66	27-37	2,400	0.220	101.0	72.0
DURAMOLD Pottery Plaster	62	27-37	2,900	0.220	102.5	75.0
3-D Casting and Statuary						
Moulding Plaster	70	27-37	2,000	0.200	99.0	69.0
Industrial Gauging Plaster	62	27-37	2,400	0.220	102.0	75.0
White Art Plaster	70	27-37	2,000	0.200	99.0	69.0
No. 1 Casting Plaster	65	27-37	2,400	0.220	100.0	72.5
TUF CAL Plaster	50	27-37	3,500	0.220	108.0	85.0
Dental						
Regular Dental Plaster	70	19-22	2,000	0.200	99.0	69.0
Laboratory Dental Plaster	70	6-9	2,000	—	99.0	69.0
Impression Dental Plaster	70	3 1/2-5	2,000	—	99.0	69.0
Specialty						
AIRTROL Geobinder	—	300-420	—	—	—	—
Metal Casting Plaster	130	25-30	—	0.100	84.0	41.0

Gypsum Cements from United States Gypsum Company

Traditional Tooling

HYDROCAL® A-11® Gypsum Cement—high-strength gypsum cement has very low setting expansion. Adapts to production on hard, strong, tough models of uniform and stable dimensional accuracy. Used for production of master models and KELLER™ duplicating machines. Stiffening rate very rapid after setting action begins. Recommended for slurry casting techniques.

HYDROCAL® B-11® Gypsum Cement—similar to HYDROCAL A-11 Gypsum Cement in setting expansion and dimensional accuracy, but with slightly less strength. Greater plasticity and more gradual setting action make it more suitable for built-up or template-formed models.

3-D Casting and Statuary

FAST CAST™ Exterior Gypsum Cement—fast-setting cement formulated for casting non-water bearing exterior decorative statuary that can offer increased casting production of more than 300% vs. regular portland cement. Must be used with sand aggregate.

HYDRO-STONE® Gypsum Cement—hard and strong, especially suitable where high strength and resistance to water absorption are necessary. Cannot be worked under a template. Used in high-quality art novelty and statuary castings. Should not be cast in glue molds, but works well

ULTRACAL® 30 Gypsum Cement—a low-absorption gypsum cement for case molds. Specially made for close tolerance tooling; provides the greatest hardness, accuracy, and freedom from efflorescence of any gypsum cement on the market.

ULTRACAL® 60 Gypsum Cement—similar to ULTRACAL 30 Gypsum Cement, except slightly higher consistency gives it less surface hardness and compressive strength. Longer set gives it less expansion. Recommended where extreme dimensional accuracy is required.

HYDROPERM® Gypsum Cement—permeable metal casting product formulated with HYDROCAL Gypsum Cement. Suitable for nonferrous castings because of smooth mold surface, carvability, and controllable permeability.

in plaster and other flexible moulding compounds. Expands about three times greater than HYDROCAL A-11 or B-11 Gypsum Cements.

TUF STONE™ Gypsum Cement—polymer-modified, fibered casting material formulated for solid cast giftware applications.

Ceramics, Statuary, and General Purpose

CERAMICAL® Gypsum Cement—low consistency, smooth-wearing mold material for use in pressing clayware. Low absorption. Specified for use with RAM® automatic clay-forming equipment.

HYDROCAL White Gypsum Cement—a basic HYDROCAL gypsum cement with a use consistency of 45 lb. of water per 100 lb. of gypsum cement. Can be carved or added to. Setting expansion about twice that of Moulding Plaster or Pottery Plaster. Manufactured at Southard, Oklahoma, only.

HYDROCAL Gypsum Cement—same as HYDROCAL White Gypsum Cement, except for color. Manufactured at Ft. Dodge, Iowa, only.

Statuary HYDROCAL Gypsum Cement—a basic HYDROCAL gypsum cement with a lower use consistency of about 40 lb. of water per 100 lb. of gypsum cement. Extremely hard and strong. Recommended for solid and slush casting.

HYDRO-STONE Super-X Gypsum Cement—one of the strongest and hardest gypsum cements available. Designed for use at a consistency of 21 to 23 parts of water per 100 parts gypsum cement by weight.

Architectural

HYDROCAL FGR Gypsum Cement—unique, high-strength gypsum cement for use with glass fiber for fabricating glass-reinforced architectural

details that are lightweight, fire-resistant, and thin-cast.

Road Repair

DURACAL® Cement—unique, fast-setting, high early-strength, gypsum cement-based product with a positive expansion. Designed for concrete

patching of highways, bridges, loading docks, etc. Can be driven on 60 minutes after set.

Typical Physical Characteristics—Gypsum Cements

Product	Use Consistency (Parts of Water by Weight per 100 Parts of Gypsum Cement)	Hand Mix VICAT Set (minutes)	Minimum Dry Compressive Strength (psi)	% Setting Expansion		Approximate Density (lb./ft. ³)	
				Maximum	Final	Wet	Dry
Traditional Tooling							
HYDROCAL A-11 Gypsum Cement	42	16-20	5,500	0.120	0.080	112.5	93.8
HYDROCAL B-11 Gypsum Cement	44	25-35	4,500	0.110	0.080	111.2	91.6
ULTRACAL 30 Gypsum Cement	38	25-35	6,000	0.080	0.060	115.0	99.0
ULTRACAL 60 Gypsum Cement	39	75-90	5,000	0.065	0.055	114.4	97.5
HYDROPERM Gypsum Cement	100	12-19	—	0.140	—	40.0	—
3-D Casting							
FAST CAST Exterior Gypsum Cement ⁽⁶⁾	12.5	25-35	8,000 ⁽⁴⁾	0.100	—	135.0	130.0
HYDRO-STONE® Gypsum Cement	32	17-20	10,000	0.240	—	119.4	108.7
TUF-STONE Gypsum Cement	32	25-30	10,000	0.240	—	122.0	112.0
Ceramic, Statuary, and General Purpose							
CERAMICAL Gypsum Cement	40	18-23	6,500	0.165	—	113.7	96.0
HYDROCAL White Gypsum Cement ⁽¹⁾	45	25-35	5,000	0.390	—	110.6	90.0
HYDROCAL Gypsum Cement ⁽²⁾	45	25-35	5,000	0.390	—	110.6	90.0
Statuary HYDROCAL Gypsum Cement	40	25-35	6,500	0.250	—	113.7	96.0
HYDRO-STONE Super-X Gypsum Cement	22	17-20	13,500	0.300	—	129.0	127.1
Architectural							
HYDROCAL FGR Gypsum Cement	30	50-70	—	—	—	112.0 ⁽³⁾	101.6 ⁽³⁾
Road Repair							
DURACAL Cement ⁽⁵⁾	13	25-35	8,000 ⁽⁴⁾	0.100	—	140.0	135.0

(1) Southard plant only. (2) Ft. Dodge plant only. (3) Based on spray application using 6% glass fiber by weight. (4) 28-day compressive strength. (5) Based on DURACAL mixed at a ratio of 1:1:1 (cement, sand, coarse aggregate). Sand should be clean, dry, properly sized, free from dolomitic contamination, and conform to ASTM C-33. Coarse aggregate should be clean, ASTM size no. 8, free from dolomitic contamination, and conform to ASTM C-33. (6) Based on FAST CAST mixed at a ratio of 1:1 (cement and sand). Sand should be clean, dry, free from dolomitic contamination, and conform to ASTM C-33.

Shelf Life

To help ensure against user variables, industrial plaster and gypsum cement plaster formulations are stabilized to a large degree. Shelf life may

range from three to six months, depending on formulation.

WARNING

When mixed with water, plaster in these products hardens and then slowly becomes hot. DO NOT attempt to make a cast enclosing any part of the body using this material. Failure to follow these instructions can cause severe burns that may require surgical removal of affected tissue. Dust from products may cause eye, skin, nose, throat, or respiratory irritation. Use eye, skin, and respiratory protection in accordance with good industrial hygiene practices. Read MSDS of product for specific details. Product safety information: 800-507-8899.

KEEP OUT OF REACH OF CHILDREN.

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