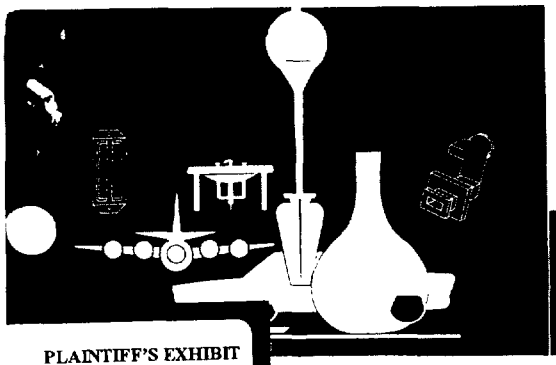


PLAINTIFF'S EXHIBIT

GP-667

GEORGIA-PACIFIC
GYPSUM DIVISION

INDUSTRIAL GYPSUM

DENSCAL™ HP (High Permeability)

Bulletin No. 225

Denscal HP is a unique gypsum cement which is designed to produce a highly porous mold media for the casting of many nonferrous metals and alloys. This specially formulated product, when mixed according to the directions outlined below, will produce a mold having an extremely smooth surface. Directly beneath this surface, a highly porous structure of interconnecting air cells form the desired mold.

MIXING

To obtain a satisfactory mold which has both a smooth surface and the proper structure of air cells, a mixer must be used which introduces air into the mix. Experience has proved that the more energy introduced into a mix, a finer and more uniform cell structure will result.

The quantity of Denscal HP, water and air should be balanced to produce a mold of sufficient strength, porosity and low expansion. Best results are achieved when the water to plaster ratio is in the range of 80-100 parts water to 100 parts Denscal HP by weight. Sufficient air should be introduced into the mix to increase the volume from 50-100% during mixing. Normally, an increase in the amount of air should coincide with an increase in the amount of water.

For best results, it is recommended that the temperature of the Denscal HP and the mixing water be maintained to produce a constant slurry temperature. Warm water, not to exceed 100 degrees F., is recommended, as this also will assist in maintaining lower expansion.

The actual mixing operation is perhaps the most important step in the proper handling of Denscal HP Gypsum Cement, as this is the point at which the air cells are formed and incorporated into the mix. There are many variables that can affect the efficiency of the mix, the speed of set and the porosity of the mold. Among these the variables are the size of the bucket, diameter of the mixing disc, speed of the mixer and volume of the plaster slurry. Normally the diameter of the mixing disc should be approximately ⅔ the diameter of the bottom of the bucket. The mixer should be of sufficient speed to create a vortex of air down to within 1-2 inches of the bottom of the bucket when the mixer shaft is in a vertical position.

The mixing disc is generally made from a ⅛" or ¼" rubber material, such as rubber belting. This disc is fastened to a metal rod which is then inserted into the mixing motor such as a ¼" or ½" drill motor.

MIXING PROCEDURE

The water is accurately weighed into the mixing bucket and the appropriate amount of Denscal™ HP is sifted into the water. After a 30 second soaking time, the mixing disc is introduced into the slurry and the slurry is thoroughly mixed for 15-30 seconds. After this slurry has been thoroughly mixed, raise the mixing disc to a height sufficient to introduce air into the slurry. The slurry volume will gradually increase to the desired height in the bucket. When the desired volume increase is obtained, lower the mixing disc just below the surface of the slurry. Continue the mixing operation with the disc held just below the vortex which is created in the slurry. This is maintained until all the large air bubbles are reduced to the proper size. Pour the Denscal HP slurry over the pattern as soon as the mixture operation is completed. Normally, the mold may be extracted after 15-20 minutes.

PATTERN EQUIPMENT

The customary allowance for metal shrinkage must be made on the pattern. Because of the low drying temperatures permissible with Denscal HP Gypsum Cement, drying shrinkage may usually be disregarded. Flexible patterns may be desirable because of ease of extraction and freedom from separator problems. Patterns may also be made of metal, plastic, properly sealed Densite, Denscal, or wood. Wood patterns must be properly water proofed, preferably with lacquer. Rigid patterns must be designed with sufficient draft to permit easy release. Patterns should be as smooth as possible since Denscal HP Gypsum Cement is capable of reproducing extremely fine details. Flexible patterns are recommended for those intricate castings where the release of rigid patterns would be impractical. In large scale production, include all gates, runners and risers in the pattern equipment. Because of the insulative properties of Denscal HP Gypsum Cement molds, gates and runners may be made smaller than in sand. Chills may be incorporated in the Denscal HP Gypsum Cement mold, to provide directional solidification on particular positions of the mold.

PARTING COMPOUNDS

Parting Compounds must be applied on all types of rigid patterns to permit removal from the Denscal HP Gypsum Cement mold. Commercial parting compounds, commonly found in Matchplate shops are satisfactory if applied sparingly. Parting compounds

should be applied sparingly with a camel's hair brush or a spray gun. Too liberal use of parting compound will cause excessive bubble breakage and large air bubbles on the surface of the mold. These appear as undesirable blemishes on the finished casting.

PATTERN REMOVAL

Pattern removal may be difficult when compared to the relatively easy withdrawal of patterns from sand. A properly prepared and lubricated pattern is generally released with air pressure applied at the proper point. Denscal™ HP Gypsum Cement is rigid and rapping that is sufficient to release a pattern from a sand mold may result in a broken pattern or mold. Due to the porosity of the Denscal HP Gypsum Cement mold, care must be exercised during removal from the pattern. Flexible patterns do not cause serious removal problems and release can be readily attained by the use of air pressure.

DRYING

The purpose of the drying operation is to remove the free moisture in the mold. During the mixing operation an excess of water is intentionally added. This produces a pourable slurry capable of assuming the fine details of the pattern surface. This excess water must be removed before the metal is poured into the mold. The oven drying temperature will vary with the type of oven equipment, but generally it will be in the range of 250-500° F. The length of time required to dry a Denscal HP Gypsum Cement mold will depend upon the following factors:

1. Oven Temperature
2. Velocity
3. Humidity of the circulation air
4. Size and thickness of the mold
5. Porosity of the Denscal HP mold

Molds dryed at a high temperature should not remain in the oven for an excessive period of time since after the excess or free water is driven off, water of crystalization may also be removed. This can result in excessive cracking, shrinkage and mold breakage. The oven may be operated at a high temperature to remove excess water and then reduced to prevent calcination. The metal should be cast into the mold as soon after drying as possible due to the fact that the porosity of the mold makes it subject to having a high degree of affinity for water.

CASTING THE METAL

Denscal™ HP Gypsum Cement molds are usually satisfactory for the casting of most non-ferrous metals such as.

1. Low melting metals of the lead-zinc alloy group
2. Aluminum and its alloys
3. Brasses and bronzes, with low lead content, particularly aluminized yellow brass
4. As insulating risers, sleeves and pads for all above

Cast the metal in plaster molds at as low a temperature as possible. It is advisable to keep casting temperatures below 2,000° F. Due to the insulating properties of the Gypsum Cement molds, the molds should not be disturbed until the casting is completely solidified.

We have, in this bulletin, tried to set forth the directions for making molds of Denscal HP Gypsum Cement suitable for the production of nonferrous castings. It should be realized, however, that patience, experience and persistence are needed to master the making of molds with Denscal HP Gypsum Cement. It is recommended that your first work with this material be done with a casting on which you have previously checked the pattern equipment.

If further information is desired, please contact your nearest representative or write directly to the Georgia-Pacific Corporation · P. O. Box 311 · Portland, Oregon 97207 to the attention of Industrial Sales Department.

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