

# Perma-Flex

## Cold Molding Compounds

### GENERAL PRODUCT INFORMATION

Perma-Flex Cold Molding Compounds (CMC) are polymercaptan base synthetic resins, furnished as ingredients "A", "B", and "C", to be mixed at time of use. Components, when combined, cure at room temperature to flexible resilient products, with close dimensional tolerance. They are the modern answer to "precision" flexible patterning and tooling.

REGULAR  
BLAK-TUFY  
GRA-TUFY  
GREEN-TUFY  
UNH

### PROPERTIES AND USES OF "CMC"

Cured CMC cannot be remelted. It is not latex, vinyl base, or a newly developed product, but a tried and proved material used extensively for the past ten years by automotive, aircraft, rubber manufacturers, pattern shops, potteries, foundries, art plaster shops, sculptors, etc., wherever flexible tooling or molds are adapted.

PERMA-FLEX CMC may be cast against any non-porous surface, and into itself when prepared with proper parting agents. It is useful in casting many plasters and cements and some low temperature acid casting resins; especially adapted for "waste" molds for gypsum cement reproductions, for pottery case facing, for single casts of phenolic- and urea-formaldehyde resins (#1000 Toolcast Resin, Marblette Resin #71, Durez, Catalin, and similar plastics).

CMC forms flexible molds directly over modeling clay, wax, soap, wood, and other heat sensitive materials, with minimum damage to model, when used with proper parting. The uncured liquid mixture pours easily and cures rapidly to finished form without heat. The cured CMC mold is used in casting gypsum cement master models for the PERMA-FLEX process of vacuum forming Koroseal FMC, replacing plaster and gelatin waste molds. Molds are not as tough as KOROSEAL FMC, but will produce many precision plaster casts if carefully used. The cured CMC is not affected by water, mineral oil, and most solvents when cured.

CMC contains no water or other volatile substance to dry out and shrink the mold later, differing in this respect from other types of cold formed molding materials, such as gelatin, hydrocolloids, rubber latexes, etc.

CMC molds retain close dimensional accuracy for an indefinite period. They are adapted to precision impressions of wood, wax or metal foundry patterns, direct copying of architectural ornaments, and similar fragile objects, including live tissue. They can be vulcanized, cemented, or mechanically bonded to metal, wood, etc. They will stand temperatures of 250 deg. F. without distortion for short periods. CMC molds modernize the casting of gypsum cements, portland cement concrete, magnesium oxychloride, low-melting white metals, hot waxes, and a limited number of casting resins which must be cured at between 100 - 250 deg. F.

PERMA-FLEX CMC forms make ideal models and molds for the forming of low temperature curing Plastics and Organosols. It is further possible, with special equipment, to reproduce flexible duplicates of the original model by forming CMC into molds made of itself, or of KOROSEAL FMC, thus making it possible to produce flexible positives and negatives at will, without the need for forming plaster "waste" molds on a model and the laborious removal of these "waste" molds from the model.

Where KOROSEAL FMC finished cavity molds are desired, develop the first temporary "waste" mold directly in CMC. We recommend this so-called "temporary" mold for all short run casting operations. If long runs are necessary after the design has been proved, plaster or Hydrocal models for KOROSEAL FMC fabrication can be taken from PERMA-FLEX CMC as desired.

### CMC MOLDS ARE DIFFERENT:

1. Require no tanning, sealing, greasing or lubrication for use with plaster.
2. Not affected by water, mild acids, or alkalis.
3. Not affected by mineral oils or greases.
4. Extremely accurate flexible impressions and casts, since molds are:
  - (a) formed cold—no thermal contraction,
  - (b) non-volatile—never dry out with age,
  - (c) practically chemically inert at and below 250 deg. F.
  - (d) retain full "body" and do not soften noticeably, up to 250 deg. F.,
  - (e) readily reinforced, internally or externally, with metal, wood, plaster, or fabric mesh, thus insuring against deformation in use, either hot or cold.

### DESCRIPTION OF MATERIAL

There are several types of PERMA-FLEX CMC. All are 3 component materials; each component shipped separately. The major ingredient, COMPOUND "A", is syrupy in nature, with excellent pouring quality, reasonably low viscosity, stable under normal storage conditions indefinitely. All types require stirring before use.

THE PERMA-FLEX MOLD COMPANY



COMPOUND "B" (curative) is a brownish colored fluid, consisting of solids and liquids in suspension. If aged, slight segregation or settling may occur. In using, shake until uniformly dispersed before weighing.

Note; Compound "B" contains lead—handle with all necessary precautions as to cleanliness.

COMPOUND "C" (catalyst) is a yellow or pink fluid consisting of a mixture of solids and liquids. When

segregation or settling occurs, shake until uniformly dispersed before weighing.

The combination of these three ingredients as directed below, produces a liquid, which, depending on temperature and curatives, will cure in a controllable time. The cured material is a flexible and elastic solid, dimensionally stable. While containing a small percentage of lead compounds, these remain permanently combined in the finished product.

RECOMMENDED WEIGHING PROPORTIONS

	Liquid A	Curative B	Yellow or Pink Curative C
BLAK-TUFY.....	100	20	2
REGULAR.....	100	10	1
GRA-TUFY.....	100	12	1.2
GREEN-TUFY.....	100	12*	0.6
UNH.....	100	25	3

\*or 9 parts Paste B.

The above recommended weighing proportions are predicated on using at 70-80 deg. F.

PERMA-FLEX Cold Molding Compounds BLAK-TUFY, GRA-TUFY, and REGULAR, used in proportions as recommended at temperatures above 70 - 80 deg. F. thicken quickly. When used at 70 deg. F., more pouring or work time is obtained. The above proportions will give a three-hour to over-night curing time, depending on room temperature, and are the standard proportions shipped.

DIRECTIONS FOR MIXING

Mixing container: Select stiff paper cups or larger disposable containers (stoneware or glass mixing bowls clean easily and are preferred by some operators) of about fifty per cent greater capacity than volume to be mixed. Weigh desired amount of Compound "A" into this container. Add the "C" to "A" and mix thoroughly; then stir in the "B", making sure all three components are completely and thoroughly mixed, and taking care that sides of mixing vessel are scraped clean and incorporated so no unmixed portions are present. Stir rapidly, mixing as little air in mass as possible. On small mixes of about one pound capacity, at least one and one-half minutes of stirring is required. Longer agitation increases the early thickening. For larger batches, longer stirring time will be required to get complete dispersion of the components. In all cases the operator should learn the nature of this material before attempting large volume mixes. Stir with FLAT PADDLE rather than round dowel.

The "B" and "C" Curatives for BLAK-TUFY CMC are shipped in amounts of 20% and 2% respectively, of the total shipment. This is the amount required to develop proper room temperature cure. Both are furnished as thick pourable liquids. Care should be taken to mix well, or shake well, before weighing. "B" and "C" tend to settle out on long time standing. They should be warm (at least 70 deg. F.) at the time of use. The "A" may settle on long standing and should be well stirred before weighing.

The application of vacuum to a plaster model permits perfect surface lay by removing any surface pinholes through the body of the model. This is not practical where impervious models are used.

After the pour, it will be noted that in about fifteen to thirty minutes the CMC will begin to gel and it

should then be allowed to remain undisturbed until gelling ceases and the material has taken its body. This gelling can be speeded up by placing the assembly in a warm oven at 100 - 150 deg. F. for an hour, or by warming the assembly slightly—using radiant heaters or infra red bulbs. Temperatures above 150 deg. F. are not essential and may damage the model. Metal models should be warmed slightly. DO NOT OVERHEAT.

NOTE: If insufficient compound has been mixed to fill the cavity, a further small quantity may be mixed, and poured directly against the previously poured mix. Any number of mixes may be poured one against the other, and will adhere perfectly together. In case of damage to any mold, a small amount of fresh mix can be made, and used as the adhesive for patching the torn area.

EXPERIMENTAL MIXES

We suggest experimental mixes before use, in sufficient quantity to familiarize the operator with the curing characteristics of CMC. Also, whenever a batch is poured, the final residue should be kept for observation as to completeness of cure, and the poured assembly not disturbed until the test sample is cured and has reached normal strength. Whenever possible, it is recommended that any large assembly be kept overnight in a warm room at from 80 - 100 deg. F. to assure completeness of curing.

Work requiring small mixes can be considerably speeded up by judicious increases in the "B" and "C". For example, for more rapid curing, the "B" and "C" may be increased, up to a maximum of 100 "A", 25 "B", and 4 "C" by weight, at which proportion the curing time is accelerated to one hour or less.

WE STRONGLY RECOMMEND THE PERMA-FLEX 4-BEAM BALANCE OR ITS EQUIVALENT, FOR SIMPLICITY IN WEIGHT PROPORTIONING THESE COMPOUNDS AND MAINTAINING THE ACCURACY OF PROPORTION REQUIRED. EXTREME CARE MUST BE USED IN WEIGHING OUT COMPOUND "B" AND COMPOUND "C".

STANDARD FORMS OF CMC

BLAK-TUFY CMC: General purpose material—contains carbon black pigmentation. Approximately three-fourths the strength of GRA-TUFY. Cures to slightly

harder than regular CMC, although has good elasticity, is tear resistant, reproduces detail accurately. May be used by pouring over model or by brush coat method, with fabric laminations.

REGULAR CMC: Handles in all respects like BLAK-TUFY CMC excepting there is no pigment to settle, and is the best where longtime storage of the "A" may be encountered. The cured REGULAR CMC has approximately twenty per cent of the "tear" resistance of BLAK-TUFY. It may be cured with less "B" and "C" as indicated, but also responds to increases in "B" and "C".

GRA-TUFY CMC: Carries a reinforcing pigment, which makes it tougher than BLAK-TUFY. When used with Yellow "C" it has a short fluid life, thickening rather rapidly, and then dragging out into a final cure at room temperature. Where a longer fluid time is required, we recommend the use of the Pink "C" in amounts from 1.2 to 5.0%, depending on the nature of the work. When used with Pink "C" the GRA-TUFY does not thicken so rapidly and remains fluid for a longer period of time, then goes into its final set rapidly. GREEN-TUFY CMC "F": Cured with 9 parts of Paste "B" blended in thoroughly, plus 0.6 parts Curative "C" by weight, develops a Durometer hardness approximately twice that of Gra-Tufy or Blak-Tufy CMC. It likewise has from three to five times the elongation under load. It may be used as a brush coat facing over models, followed by back-up pour coat of Gra-Tufy or Blak-Tufy CMC where hard, tough, tear resistant surface is needed; also, it may be built up with inter-layers of woven fabric, fiberglass, or other flexible mesh, into semi-rigid patterns where stiffer structure than normal is required. (See detailed Green-Tufy direction sheet for additional instructions.)

UNH CMC: An extremely fast setting white pigmented CMC, designed for use where a very fast set is desired. The proportions given permit a one minute mix time, a one to three minute work life or pouring time, and a ten to fifteen minute final cure. Because of the extremely fast set, any included air bubbles are likely to remain on the surface of work being copied, unless very special precautions are taken to brush or flow on a uniform coat. UNH is especially adaptable to making quick impressions of human tissue, and any other applications where time is of the essence.

PARTING CMC—PREPARATION OF MODELS

PLASTER—Using damp plaster model, apply surface coating of PERMA-FLEX neutral soap parting compound, applied as directed on label.

Using dry plaster model, seal plaster with thin coat of orange shellac. When dry, apply surface coat of Perma-Flex neutral soap parting compound, or thin coat of DC No. 7 Compound, or petrolatum thinned with kerosene.

On all other type of models, surface should be sealed with a very thin coat of orange shellac. When dry, apply a thin coat of DC No. 7 Compound, DC Mold Release Fluid, or petrolatum thinned with kerosene.

Apply all greases and oils carefully. Caution should be exercised to remove all brush marks or excess build-up that may be transferred to surface of the mold being made.

CMC cures in place without heat or moisture. This permits working on models which heretofore have been impossible to use with water borne latexes or hot melted thermoplastics.

Where it is desired to reproduce a plaster or other model or pattern in flexible material, it is only necessary to prepare a plaster cavity mold, pour it full of CMC, and cure it out as directed.

Where a plaster positive is available, a Koroseal FMC cavity mold may be made and an indefinite number of flexible casts in CMC can be cast in it—the two materials stripping readily without lubrication, since the Koroseal FMC carries its own lubricant.

CMC FROM CMC:

Where CMC is cast into CMC molds, apply to the CMC mold a thin coat of orange shellac. (Cut shellac one-half pound to one gallon wood or denatured alcohol.) When dry, apply Pink Parting with fine atomized spray coat or careful brushing with fine bristle brush. Allow to dry thoroughly before using. Also, for easier release—but sacrificing some surface detail—a coat of DC No. 7 grease can be applied over the Pink Parting. Do not flex mold after shellac has set; flexing of the mold will cause the shellac to crack and transmit this cracked surface to the casting made in the mold. If more casts are required, and cast has been made and extracted from the mold, the previously applied coatings of shellac and Pink Parting should be washed out of the mold, using alcohol, then rinsed thoroughly with alcohol. After alcohol has evaporated, the shellac and Pink Parting and DC No. 7 grease should be reapplied for following cast.

STRIPPING FROM MODEL

CMC cures so closely to any model surface that stripping must be done with care. In parting from model or pattern, we strongly recommend that a jet of compressed air at 80 to 120 pounds pressure be used to start the separation. Once the parting is started, the compressed air jet will work easily between the model and the cured CMC, and with a little experience the operator can learn to strip it from the model without damage.

INTERNAL REINFORCING

In some complicated molds it may be necessary to reinforce CMC internally with fabric, and open weave burlap or other woven type of fabric is recommended. Where this is used, the fabric takes any bending and tearing stresses and protects CMC from damage in severe service. CMC will bond to any grease-free fabric used with it and will also bond perfectly to itself, so that if any shapes are made in it and damaged, they may be repaired by the use of a small mix of CMC applied at the point of damage and cured in place, either cold or by directing a heat lamp against the repair for a few minutes. (See REPAIR and REVISION.)

CMC will bond tightly to clean, sandblasted, or roughened brass or copper. Make sure surface is completely grease-free. Clean the surface with carbon tetrachloride or cleaner's naphtha. Where ultimate bond is required, copper wire mesh can be attached to metal backing, acting as a mechanical attachment. CMC will not bond tightly to aluminum, iron, or steel surfaces without the use of Perma-Flex Adhesive.



The bond to wood, dry plaster, and dry cement is good. CMC also bonds to itself, which is a desirable feature when succeeding coats or laminate build-ups are required.

CMC adheres strongly to dry plaster, which is not lubricated or treated with Parting Compound. This is a definite advantage where a mold assembly requires an exact fitting plaster or HYDROCAL shell, from which the cured CMC is not to be removed. This is an especially desirable characteristic in the facing of pottery cases, foundry patterns, etc., where the case or pattern contains the positive from which a plaster negative is to be taken. For improved bond, use PERMA-FLEX Adhesive. It is possible, with the above two points in mind, to pour CMC into a multiple assembly of dry porous plaster surfaces and wet sized plaster surfaces, so that the cured CMC will strip from the sized surfaces and remain bonded to the dry surfaces.

Where ultimate bond is desired, we recommend the use of PERMA-FLEX Primer Adhesive No. 1 applied to the plaster first, which acts both as a sealer and to improve the bond of the CMC. In exceptional cases, we recommend the use of a thin coat of Primer Adhesive No. 1 plus a thin coat of Adhesive No. 2 brushed on.

Internal or back reinforcing, as may be desired, are readily obtained by the use of strips or pieces of fabric such as cheesecloth, open weave burlap, wire mesh, or FIBREGLAS fabric. In many cases, it is desirable to reinforce in this fashion to prevent tearing in handling, or to add some rigidity to the structure internally. The reinforcing of CMC is highly recommended when making molds with brushed coat or laminate method, to give rigidity and thickness by using layers of reinforcing material between coats of CMC.

### **REPAIR AND REVISION**

Changes and revisions are occasionally required after CMC faced blocks and cases have been in operation. Because CMC bonds to itself without the use of adhesives, etc., it is possible to build in new areas where required, pour in a patch, and stick pieces together if torn.

The revision or change should be made in the plaster "block mold." The CMC must be removed from the case face where the change in the block mold occurs. This can be done by cutting away this area with a sharp knife, leaving a smooth cut. Usually the CMC is supported in position by a rigid plaster back-up. Where this is the case, a sprue should be cut through this backing large enough to allow the CMC to flow readily into the area cut away. The plaster block mold then must be placed on a level marble slab, through which has been placed a pipe connected to a vacuum source. This is usually done by drilling through the marble slab, running a completely threaded pipe through the slab, and fastening it on each side of the slab with lock nuts, metal washers, and rubber washers. The location of this pipe should be near the center of the base of the master block mold. It is advisable to dig shallow grooves in the back of this plaster block mold to create space from which the pump can draw air.

The CMC faced block is now inverted and placed, with care, to fit on the block mold, which has been dampened, soap sized, and centered over the vacuum port. Base of block must be flat. Make completely sure that the CMC facing is in position against the block mold, especially where the revision is being made. The block mold should now be evacuated. While it is being evacuated, pour a fresh mix of CMC slowly through the pouring sprue. Try to let this run or trickle down the sides of the sprue so as to eliminate choking of the sprue, which might entrap air and produce a faulty fill. As soon as the CMC levels across the surface to be remade, and comes in contact with the existing CMC block, it will form its own gasket and the atmospheric pressure will press the complete assembly tight against the block mold.

The CMC should be allowed to set from four to six hours, until it completely cures. It is suggested that the CMC filling the sprue be cut out to within one inch of the working face of mold, and this sprue filled with B-11 Hydrocal after shellacking the absorbent sprue surface, before block is removed from the block mold. After pouring the CMC, it is advisable to allow the evacuation to continue through the entire curing cycle.

### **REPAIRING PARTS OF CMC CASE MOLDS**

Follow the same procedure as outlined above. For sticking together pieces of CMC, make mixture of CMC and paint the edges of torn pieces. Place them together carefully over the master. In four to six hours this will have set and the pieces completely cured. It is advisable to use vacuum procedure as described above to prevent patch from showing.

### **INSTRUCTION FACILITIES**

The technique of forming PERMA-FLEX CMC is such that it is desirable, wherever possible, to learn the many applications by observation. Prospective users are welcome to our mold fabricating shop, to confer on special adaptations. No direction sheet can cover the numerous applications for the material.

The Perma-Flex Mold Co. maintains shop instruction service to afford prospective users the opportunity to learn proved Perma-Flex techniques of patterning procedure, pouring methods, lay-up and laminate construction, and the many adaptations of these new methods. If interested, write or wire and a mutually satisfactory time will be arranged. Inasmuch as new procedures are constantly being developed to fit special conditions, shop instruction is available to all users or prospective users on special problems. Shop time and materials used are only costs involved, except where the work involves special patterning or plaster model making.

The Perma-Flex Mold Company has shop facilities, equipment, and materials for production of CMC\*\* Cold Molding Compound (as well as Koroseal\* FMC) flexible molds. We will be pleased to quote prices as to your needs. Models should be submitted for estimation.

## **THE PERMA-FLEX MOLD COMPANY**

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