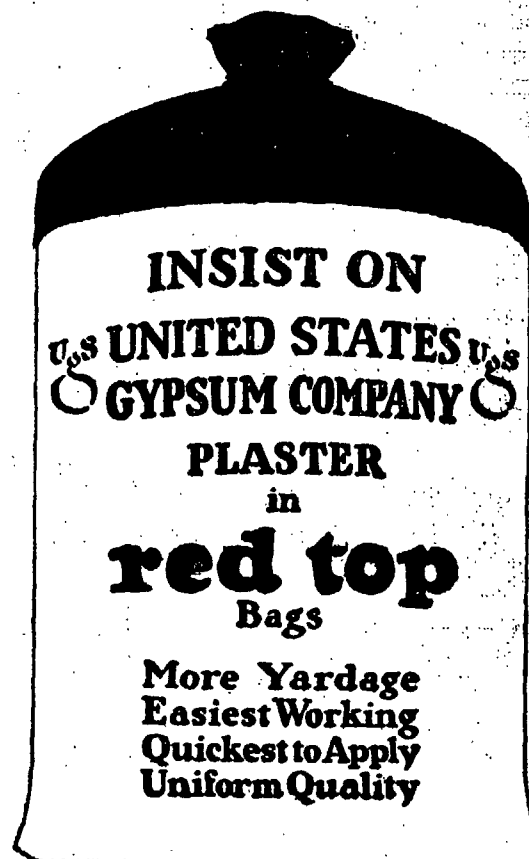




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There Are Two Reasons for This Book

THE first reason is to impart information as to the laws which govern the action of all gypsum plasters in order that plaster troubles may be **prevented**.

Owing to the advanced manufacturing and testing methods employed by the UNITED STATES GYPSUM COMPANY, our plasters will give satisfactory results if properly used. Dealers, architects and contractors should therefore read this book through carefully and, armed with the knowledge which it contains, should take steps to correct any wrong practices noted.

The second reason for the book is to provide a quick means of finding the cause of any plaster trouble, and the remedy therefor. By making use of the chart on pages 5 to 11 the cause of plaster trouble, and the remedy, can in almost every instance be determined. If the cause of the trouble cannot be ascertained, write or wire the UNITED STATES GYPSUM COMPANY, 300 West Adams St., Chicago, Illinois.

The old saw, "An ounce of prevention is worth a pound of cure," applies with special force to wall plaster. Do not therefore wait until trouble comes before reading the book. Get acquainted with the simple principles which govern the use of gypsum and join hands with us in urging a higher standard of plastering.

United States Gypsum Company

300 West Adams St., Chicago, Ill.

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The charts on the seven pages which follow will tell you the cause of any plaster trouble, the remedy and how similar trouble may be prevented in future. To use the chart, find in the left hand column the description which applies to the condition, then read to the right. Before applying the remedy, turn to the pages in the text referred to and read the more detailed instructions.

Troubles Which Have to Do With the Application of the Mortar

Nature of Trouble

How to Prevent This Trouble

Irregularity of Set—Too Slow Set

If mortar fails to set after being on the wall 4 hours, provided all precautions given under "Trouble Due to Weather Conditions", page 12, have been taken, the trouble is probably Slow Set. See "How to Detect Slow Set," page 17.

Be sure that the sand is clean (see "Troubles Due to Sand Conditions," page 21), and that water is pure. If this does not remedy the trouble, try mixing more thoroughly, or any of the other ways to quicken set listed under "Remedies for Slow Set," page 17.

Irregularity of Set—Too Quick Set

If the mortar sets in the box before it can be used, or sets on the wall before it can be dabbed, and if it feels hard and firm, not crumbly, the trouble is probably too Quick Set. See "How to Detect Quick Set," page 19.

First correct local conditions. See that tools and mixing box are free from set plaster; that sand is clean (see "Troubles Due to Sand Conditions," page 21), and that water is pure. Send for our Retarder or, if there isn't time, use pulverized glue, as directed under "Remedies for Quick Set," page 19.

Short Working Plaster

If the mortar works hard and does not carry the sand, the trouble is Short Working Plaster. See "How to Detect Short Working Plaster," page 20.

Provide proper storage; do not pile plaster against green wall or damp ground. See "How to Prevent Short Working Plaster," page 21.

Remedies for Short Working Plaster

Add a sack of fresh plaster to each sack of short working plaster or
Add about two shovels full of well slaked lime to each sack, or
Decrease amount of sand and water.
Make sure that sand is not too coarse or too fine.
See "How to Remedy Short Working Plaster," page 21.

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Troubles Due to Weather Conditions

If Plastered Wall:	The Trouble Is:	Remedy:	To Prevent Trouble in Future:
Remains soft, white, chalky, usually in spots, particularly on ceilings over openings, a hot weather condition.	A "Dry-Out." The plaster has dried out before it has had time to set. See "How to Detect Dry-Outs," page 12.	Spray walls with clean water; repeat operation if necessary. See "How to Remedy Dry-Outs," page 13.	Screen openings. Wet lath and floors. Beware of too thin coats. See "How to Prevent Dry-Outs," page 13.
Remains damp and soft, not chalky, usually a winter condition.	"Sweat-Out." See "How to Detect Sweat-Outs," page 15.	After plaster has set open doors and windows. Supply artificial heat in cold weather.	After plaster has set, open doors and windows. Supply artificial heat in cold weather.
Remains soft, something like a "Sweat-Out," and the rooms have been at freezing temperature.	The wall is frozen. See "How to Detect Frozen Plaster," page 16.	Keep building closed, provide artificial heat and thaw out walls. Then provide ventilation and heat to remove moisture.	Don't let walls freeze for 24 hours after application of plaster.

Trouble Due to Sand Conditions

Is soft (plaster often Quick Set), and trouble is not due to Slow Set, or to rettempering of the plaster (Read under "Lime Putty Finishes," page 33) or to a weather condition.	Too much sand. See "How to Detect Over-Sanded Plaster," page 22. or Too fine or dirty sand. See "How to Detect Poor Sand," page 24.	No Remedy.	Measure sand accurately. See "How to Prevent Oversanding," page 23.
		No Remedy.	Use other sand. See "How to Prevent Troubles Due to Poor Sand," page 25.

Trouble Due to Too Thin Coats

Is weak and trouble is not due to causes already mentioned.	Too thin grounds. See "How to Detect Too Thin Grounds," page 25.	If plaster is not finished or troweled smooth, apply another coat.	Full grounds. See "How to Prevent Too Thin Grounds," page 25.
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Troubles Due to Plastering Bases

If Plastered Wall:	The Trouble Is:	Remedy:	To Prevent Trouble in Future:
Wood Lath			
Has cracks or bulges running horizontally with the lath; sounds hollow and loose when tapped.	Due to swelling and buckling of poor grade, or improperly spaced wood lath or failure to wet the lath.	Remove defective parts of wall and replaster.	Use No. 1 lath, preferably white pine, cypress or spruce, free from knots, sap or bark. Space lath $\frac{1}{4}$ to $\frac{1}{2}$ in. apart at sides and ends, each group of 5 to 7 lath staggered, ends of each lath to be nailed with 2 nails, with 1 nail at each intermediate stud. Wet lath the day before plastering and again an hour before plastering. See "How to Prevent Wood Lath Troubles," page 26.
Has straight vertical cracks.	Failure to stagger joints.		
Shows stains on the surface.	Sap, pitch, resin, oil, tar or gum in the lath.		
	See "How to Detect Troubles Due to Wood Lath," page 26.		
Gypsum Lath			
Shows cracks around boards.	Too thin coat of plaster. See "Causes of Cracks with Gypsum Lath," page 28.	If plaster is not finished or troweled smooth, apply another coat.	Use proper grounds. See "How to Prevent Too Thin Coats," page 25.
Metal Lath			
Shows cracks or sagging on ceilings.	Use of too light gauge lath or lath with too open mesh; failure properly to staple, stretch, lap or tie the lath.	Correct all conditions mentioned.	See "Causes of Cracks with Metal Lath," page 29.
Mortar does not adhere to lath.	Any of above causes and in addition plaster not "extra finished," or too much sand in plaster.		

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Troubles Due to Plastering Bases—Continued

If Plastered Wall:	The Trouble Is:	Remedy:	To Prevent Trouble in Future:
Brick or Tile Bases			
Shows a network of small cracks.	Failure to wet brick, clay or terra cotta tile before plastering, or Use of too little sand in plaster, or "One coat" work.	Float cracks or apply more plaster.	Wet brick or clay tile before plastering. Use 3 parts sand to 1 part plaster for these surfaces. "Two coat" work.
Shows cracks at the wall and ceiling angle.	Likely to be wall not wedged at ceilings, or Too much sand, which permits shrinkage in horizontal joints.		Wedge walls at ceilings. Do not use over 3 parts sand to 1 part plaster.
Shows cracks around door openings, especially over doors.	Usually faulty laying of tile, omission of proper keying in jack arch construction over doors, or incorrect construction or swelling of door buck.		See manufacturers' specification for these details.
Stains on the surface of the plaster applied to clay or terra cotta tile.	Efflorescence.		Use gypsum stainless tile. See "Causes of Plaster Trouble," page 30.
Concrete Surfaces			
Loosens or falls.	Use of plaster not specially made for concrete surface. Neglecting to prepare the concrete surface.	Remove loose plaster, put wall in condition, replaster.	Use plaster specially made for concrete surfaces. Surface must not be too smooth and must be freed from dust, oil and efflorescence. All ceilings must be well hacked. See "How to Prevent Plaster Trouble," page 31.

Troubles With Plaster Finishes

If Finish:	The Trouble Is:	Remedy:	To Prevent Trouble in Future:
Lime Putty Finishes			
Develops pops and blisters.	Lime is insufficiently slaked.	Cut out defects and replaster.	Lime should be slaked for several weeks. The use of Hydrated Lime insures against pops and blisters.
Is soft and weak, and develops chip cracks.	Too little gypsum gauging plaster.	Re-trowel.	Use 1 part of gauging plaster to 2 or 3 parts of lime putty.
Separates from base coat.	Base coat improperly prepared—too smooth or too dry.		Properly prepare base coat.
Comes off in places, taking parts of sanded coat with it.	Sanded coat oversanded or killed by "retempering."		See that base coat is hard. See "Troubles with Finishes" and "Lime Putty Finishes," pages 32 and 33.
Sand Float Finish			
Shows light and dark spots or light stains not due to plastering base.	Improper floating, or use of too much water in floating, or use of varying amounts of sand.		Use a prepared float finish, or use care in floating and proportion sand and plaster uniformly.
Keene's Cement			
Lacks strength.	Too large a proportion of lime has been used.		Use Keene's Cement without lime for greatest strength. See "Keene's Cement," page 35, and "Troubles with Finishes," page 32.
Gypsum Prepared Finishes			
Appears to work hard and curls under trowel.	Mixed too stiff.		Mix so thin finish will not pile more than 1 inch on hawk.
Shows streaks.	Improper troweling or use of too much water.		Use less water in smoothing; trowel so as to incorporate the "slobbers" in the wall. See page 34.

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- Troubles with Plastint (Colored Finish Plaster)

If Plastered Wall:	The Trouble Is:	To Prevent Trouble in Future:
Shows an uneven color. (Note.—There will be slight variation in lights and shadows in textured and float finishes. See page 38.)	Uneven absorption in base. Too much water used in floating, which carries color from aggregate. Dirty boxes or tools.	Apply over half green base. If base coat is dry, wet down uniformly with clean water, etc. Grind in first coat. Use less water in floating. Keep all boxes and tools clean.
Falls to bond properly.	Failure to broom base coat. Failure to grind in thin finish coat. Application over too wet or too dry base.	See Plastint specifications for proper bonds.
Cracks over wood lath.	Defects in wood lath (see page 6), settlement cracks, etc.	See same remedies as for other plasters.

For best results, follow in detail Specifications on page 48.

Troubles with Oriental Stucco Finish

If Finish:	The Trouble Is:	To Prevent Trouble in Future:
Shows an uneven color.	Uneven absorption of base coat. Improper flashing; lack of drip on sills and overhanging. Dirty boxes or tools.	Apply over half green base. If base coat is dry, wet down uniformly with clean water, etc. See that building is properly flashed, and proper drip installed. Keep all boxes and tools absolutely clean.
Falls to bond properly.	Failure to rake base. Failure to grind in finish coat.	Grind in first coat; rake it thoroughly, and tear the surface.
Shows cracks.	Putting on too heavy coat in one application. Settlement cracks, etc.	Apply in two coats. Keep wall damp by spraying after finish is applied. Reduce suction by wetting base coat.

For best results, see Oriental Stucco Direction Sheet, which gives complete information as to design of building, stucco base, reinforcement, mixing, application, working of textures, etc.

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HOW TO PREVENT AND REMEDY GYPSUM WALL PLASTER TROUBLES

How Gypsum Plaster Sets

Gypsum Plaster is made by subjecting to heat (calcining) gypsum rock, which process drives off a large percentage of the water of crystallization contained in the rock. When plaster is mixed with water on the job, it takes up the water that was expelled during calcination and returns to its original rock state.

From this it will be seen that the crystallization, or setting, of gypsum is a law of nature; plaster must set if conditions are right.

TROUBLES DUE TO WEATHER CONDITIONS

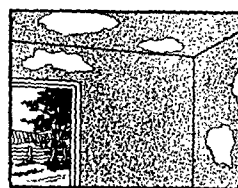
"Dry-Outs"

CAUSE OF "DRY-OUTS"

"Dry-out" means that the water that has been mixed with the plaster has evaporated from the wall before the plaster has set. By far the greater number of plaster troubles during the hot summer months are "dry-outs."

HOW TO DETECT "DRY-OUTS"

Dried out walls are soft, crumbly and of a light, chalky appearance. If the condition is a partial dry-out, as is usually the case, the dried out portion of the wall will appear as chalky, light colored spots, usually more numerous over openings, whereas the portions of the wall that are set will be darker colored and hard. After two or three days the entire wall will grow lighter in color.



The presence of white, chalky spots indicates a "Dry-Out"

However, the dried out places if not attended to will always be somewhat lighter and softer than the set places, and cracks will also probably appear.

HOW TO PREVENT "DRY-OUTS"

The three simple precautions which follow will prevent "dry-outs":

First. Before plastering in warm weather, always *screen the openings* so that the hot winds cannot strike the walls.

Second. *Wet wood lath thoroughly* the day before plastering and again an hour or so before plastering. If the lath are not wet at least a day before plastering, it is dangerous to wet them at all, because applying the plaster too soon after the lath are first wet is apt to cause the lath to buckle; on the other hand, wetting the lath as directed will prevent the buckling of lath as well as help to prevent "dry-outs." At the time of wetting the lath, it is also advisable to wet down the floors.

Third. *Apply plaster to proper thickness*, because a thin coat of plaster is much more liable to dry out.

REMEDY FOR "DRY-OUTS"

Dried out plaster should not be torn from the wall, because it can be made to set up as strong and hard as any plaster.

Dried out plaster is identical chemically with the plaster in the sack. All that is needed to make the plaster set is to add more water. Therefore, procure a spray pump or a garden hose with spray nozzle, and spray the dried-out parts of the walls thoroughly with water. If the water be sprayed on from a hose, the pressure should be reduced so that it is not strong enough to wash off any of the plaster.

Spray every dried-out part of the wall systematically. After the plaster has stopped absorbing water, which condition you will recognize by the excess water running down the wall in little streams or appearing on the surface in drops, discontinue spraying for the time being.

About two hours after the first spraying, again inspect the wall and if it is not completely set, spray it again as before. It may require several applications of water to set up the wall. Do not become discouraged. Remember that plaster *must* set in time if it is kept wet.

When the plaster is set and thoroughly dry, "sound" the walls and if any plaster has loosened on account of the lath buckling, remove the loose plaster and replaster.

When dry-out spots are very small and a spray pump or hose is not available, the water may be whipped on from a plasterer's brush. This will not, however, supply sufficient water for a large "dry-out."

Clear water is the best treatment for "dry-outs." However, when speedy action is absolutely necessary, it may be had by applying with spray pump or plasterer's brush a solution of six ounces of pulverized commercial sulphate of zinc or alum mixed with twelve quarts of water.

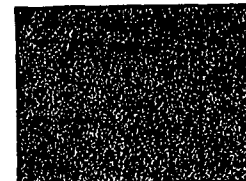
"Sweat-Outs"

CAUSE OF "SWEAT-OUTS"

A "sweat-out" is the opposite condition to a "dry-out." Walls in this condition are set but the water in excess of the amount needed to cause crystallization has not been expelled. "Sweat-outs" are more likely to be encountered in winter than in summer.

HOW TO DETECT "SWEAT-OUTS"

This condition will be recognized when walls remain damp. Instead of being white and chalky, as in the case of a "dry-out," the walls are dark in color and soft, and if the condition is permitted to continue uncorrected, the walls will have a damp, musty odor.



When walls remain damp and soft and are dark in color, the condition is a "Sweat-Out"

HOW TO PREVENT "SWEAT-OUTS"

It is important to dry out the walls as quickly as possible after they are set. Plaster which has set but still remains damp over an extended period of time loses its strength and may result in a total loss. However, when a sweat-out condition is detected, immediate provision for proper heat and ventilation will preserve the remaining strength of the plaster.

If, after the walls are set, doors and windows are opened to permit a free circulation of air, and if in extremely cold weather proper artificial heat be also introduced into the building, together with proper ventilation, there will be no danger of "sweat-outs."

REMEDY FOR "SWEAT-OUTS"

After the plaster has set, open up doors and windows. In very cold weather also use artificial heat to dry out the walls.

Frozen Plaster

CAUSE OF FROZEN PLASTER

Walls freezing before they are set.

HOW TO DETECT FROZEN PLASTER

If the temperature inside the building was at a freezing point before the plaster had set, and if the walls remain damp and dark in color, the plaster is probably frozen.

HOW TO PREVENT PLASTER FROM FREEZING

In order to prevent freezing before the plaster has set, use artificial heat in the building with good ventilation. Frost will not injure plaster which has set if no excess moisture is present.

REMEDY FOR FROZEN PLASTER

Keep the building closed. Provide artificial heat and completely thaw out walls. When plaster has thawed and set, provide ventilation and heat to remove moisture and prevent a "sweat-out."

Never apply a finish coat over a base coat containing frost.

IRREGULARITY OF SET**Too Slow Set****CAUSES OF TOO SLOW SET**

Impure sand may cause plaster to set too slowly, especially if the sand contains organic matter. Water containing sulphur or considerable vegetable matter may also be responsible for the condition.

The setting time of plaster is regulated by the addition of retarder at the mill. Markets in which the sand or water supply deviates from the standard, require plaster that is specially retarded. When the sand or water supply is changed in any market, the amount of retarder must be changed to conform with the new conditions. Plaster made for use in summer is made to set faster than plaster for use in winter, so as to lessen the danger of summer "dry-outs."

HOW TO DETECT SLOW SET

When plaster fails to set after being on the wall for over four hours and shows tendencies to dry out near openings, it is slow setting. This condition is not necessarily due to defective plaster, but may be due to improper mixing.

Before definitely concluding that a plaster is slow-setting, it is well to make a simple test as follows: Mix dry a sample of sanded plaster on a clean hawk or mortar board. Put about a pint (two tumblers full) of the mixture in the center of the hawk or mortar board. Now, with the handle of a pointing trowel, make a hole in the center of the dry-mixed material and work it into a ring about five to eight inches in diameter. Into this ring pour clean water, then fold the plaster into the water slowly and mix thoroughly. Place the mixture on a well cleaned wet board, or better still, on a piece of glass or the bottom of an old plate or saucer. Take the time of set. The time will vary from an hour and a half in some parts of the South, to four hours or more in other sections.

REMEDIES FOR SLOW SET

Below are listed nine things which may be done to make plaster set quicker. None of these remedies will have any injurious effect on the plaster.

1. Send to the United States Gypsum Company for U S G Accelerator and add four to six ounces (about a handful) to each sack of plaster.
2. Scrape the mixing box vigorously with the hoe so as to incorporate with the mixture all the set plaster

- accumulated on the sides of the box. Also mix plaster more thoroughly.
3. Crush some plaster droppings, screen through a fly screen, and use about a quart of this set plaster to each sack of plaster.
 4. Add about a quart of hydrated lime to each sack.
 5. Add about a quart of Portland cement to each sack.
 6. Use water in which tools have been washed for mixing the plaster.
 7. Put 15 lbs. of any kind of unretarded plaster (plaster of Paris, moulding plaster, etc.) into a barrel of water about one hour before it is desired to mix the plaster. Use this water, thoroughly stirred, for mixing.
 8. Add alum to the mixing water in proportion of 1 lb. of alum to 20 gallons of water.
 9. Add zinc sulphate to the mixing water in proportions of two ounces of zinc sulphate to a gallon of water.

Too Quick Set

CAUSES OF TOO QUICK SET

Although the too quick setting of plaster may be caused by an insufficient quantity of retarder having been added at the mill, the condition is far more likely to be due to one or more of the following causes: the use of water in which tools have been washed for mixing with plaster; permitting set plaster to accumulate in the mixing box; use of water which has been treated with alum or other salts in a filtration or purifying system; use of dirty sand or sand containing silt;

permitting plaster and sand to stand "dry mixed"; use of too much sand.

HOW TO DETECT QUICK SET

Quick set can be recognized by noting if the material sets in the mortar box before it can be handled by the plasterer, or sets on the wall before it can be darbied.

If there is any doubt as to the condition, mix up a little of the plaster and time the set as described under "How to Detect Slow Set," page 17.

HOW TO PREVENT QUICK SET

Most quick-set troubles can be prevented by correcting local conditions described under "Causes of Quick Set."

REMEDIES FOR QUICK SET

Correct local conditions. See that tools and mixing box are free from set plaster. See that mixing water does not contain set plaster. If you suspect that the water contains alum or salt, try other water. If the sand is dirty or contains silt, try other sand. Whether the sand is dirty can be determined by making a wash test as described under "How to Detect Poor Sand," page 24. Do not permit plaster and sand to stand dry-mixed before adding the water.

If an investigation of local conditions does not suggest a remedy, send to the United States Gypsum Company, 300 West Adams St., Chicago, Ill., for some U S G Retarder. Distribute this over the top of the batch, about an ounce of retarder to each sack of plaster, and mix thoroughly. Increase or decrease the quantity of retarder until the proper time of set is obtained.

If there is not time to procure U S G Retarder the set may be retarded by the

addition of glue water. Pulverized glue in the proportions of 1 lb. of glue to 5 gallons of water should be mixed, and about a quart pail full of this solution used with the gauging water for each 100-lb. sack of plaster. U S G Retarder is much better than glue.

"SHORT WORKING" PLASTER

CAUSES OF SHORT WORKING PLASTER

Gypsum is composed of minute crystals. When the gypsum is made into plaster, these crystals are broken down. They set and return to their crystalline form when the plaster is mixed with water. When plaster is stored for long periods, it absorbs moisture from the atmosphere; this causes a partial re-crystallization, resulting in short-working plaster.

Plaster may become short working from *improper storage* either in the warehouse or on the job.

HOW TO DETECT SHORT WORKING PLASTER

The plaster will not carry the usual amount of sand. It will be difficult to mix and difficult to apply. After being mixed it will look "sloppy"—thin in some places and stiff in others. The plaster will not take the water properly, the excess water remaining on the surface. The mortar will appear oversanded and it will not adhere to the ceilings. Squeeze a handful of the mortar and if a core of sand remains in your hand you may know the plaster is short working, provided you know that it has not been oversanded. (See Oversanding, page 21).

HOW TO PREVENT PLASTER FROM BECOMING SHORT WORKING

Proper storage should be provided and the older stock should be sold first. Plaster should never be piled against a green plastered wall or on the damp ground.

REMEDIES FOR SHORT WORKING PLASTER

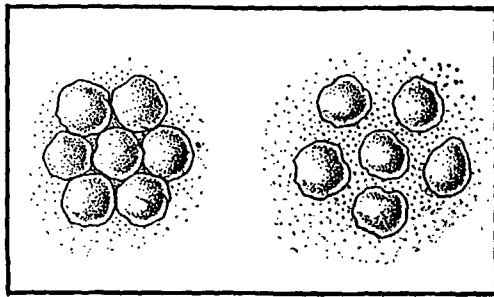
1. The best remedy is to add one sack of fresh plaster to one sack of the short working material. In some cases it may be necessary to use two sacks of fresh plaster to one of the old plaster. A more thorough mixing will often improve the working qualities.
2. Use a well slaked lime putty or hydrated lime that has been soaked overnight, in proportions of about two shovels full of lime to each sack. The same amount of dry hydrated lime may be used if lime putty is not available. Since lime accelerates plaster, about 1½ oz. of U S G Retarder will usually also have to be added.
3. A short working plaster can usually be used by decreasing the amount of sand and water in the mixture. However, remedies Nos. 1 and 2, which make the plaster carry nearly its full measure of sand, will of course be more economical.

TROUBLES DUE TO SAND Oversanding

CAUSE OF TROUBLE

In order that a sanded plaster wall may be strong, each grain of sand must be ce-

mented to the grains on all sides of it. When the proportion of sand to plaster is too great, it is obvious that the sand grains cannot be properly cemented.



At left are magnified sand grains as they would appear when plaster is over-sanded. At right are sand grains properly cemented for wall strength.

HOW TO DETECT OVERSANDDED PLASTER

The walls are not strong. Holes may be easily bored into the walls with a key or a coin. Sand may be brushed off the wall by rubbing the hand over it, and the excess sand can be seen by close inspection. The color of the wall indicates that the condition is not a "dry-out." If any of the mixed mortar is at hand, squeeze a handful, permitting it to ooze out between the fingers, and if a core of sand remains in the hand it indicates one of two things: oversanding or old plaster.

Fresh plaster is more easily oversanded than aged plaster, due to its ability to work well and spread easily. It is not common to hear of old plaster being oversanded, because it is impossible to apply old material in this condition, due to its inability to carry over a certain amount of sand and work well.

Whether plaster is oversanded can be proved by a wash test made as follows:

Crush and dry a sample of set plaster. Place 100 grams of this material in a quart pan; add a liberal quantity of water; stir; then pour off most of the water, being careful to retain the sand. Repeat this operation until sand alone remains and until the water you add remains clear when the mixture is stirred. Dry over a stove or a Bunsen burner, and the weight in grams will give you the percentage of sand used. More than 75 grams of sand is proof of oversanding, as this means more than a 3 to 1 mix. The proportion of sand actually added will be a little greater than shown by the test, for the reason that some particles of loam, etc., contained in the sand will have been washed away. A druggist will lend you the necessary apparatus, or he will usually make the wash test for you at small cost.

HOW TO PREVENT OVERSANDING

Architects can do much to insure the proper sanding of material by rigid and detailed specifications.

Plasterers who understand that proper sanding not only will save them much trouble and expense but also will save much time and labor in application of the material will be very particular about the sanding of plaster.

The proper amount of sand to be used with gypsum cement plaster for application to wood lath, gypsum lath, or first coat on metal lath is two parts of sand to one of plaster by weight. This is equal to 12 to 14 No. 2 shovels of sand to a 100-lb. bag of cement plaster; or 10 or 11 No. 2 shovels of sand to one 80-lb. bag of cement plaster.

For application to brick, gypsum tile or clay tile the correct proportion is three parts of sand to one of cement plaster by weight. This is equal to about 20 No. 2 shovels of sand to a 100-lb. bag of plaster, or about 16 No. 2 shovels of sand to an 80-lb. bag of plaster.

A positive method of preventing oversanding is to specify Gypsum Wood Fibre Plaster to be used without sand. The wood fibre plaster has supplanted the sanded material in many markets, and owing to its greater strength and durability, to its superior resistance to heat, cold, sound and fire, and to its low cost on the wall, this material is recommended to those who wish the greatest possible assurance of perfect results.

Too Fine, Too Coarse or Dirty Sand

HOW TO DETECT POOR SAND

When plaster sets too quick or too slow, or when the finished walls are weak, the trouble may be due to the quantity of sand. Sand should be clean, sharp, and graduated from fine to coarse. It should be free from clay, loam or other foreign matter.

To determine whether a sand contains loam or clay, note whether the hands are dirtied when a sample of the damp sand is rubbed between them. Or fill a bottle half with sand and half with water, shake it, let it stand, and the clay or loam sediment will settle on top of the sand.

The following is the Sand Specification of the American Society of Testing Materials: "Sand for all plastering purposes shall be free from salt, alkali, organic or other deleterious substance. It shall be graded from fine to coarse, and not more than 10% shall be retained on an 8-mesh sieve, and not less

than 80% on a 50-mesh sieve." A sand meeting these specifications is available in almost every community.

HOW TO PREVENT TROUBLES DUE TO SAND

Use clean sand—not too fine or too coarse—although there is less danger in the coarse than in the fine sand.

The possibilities of poor sand and of oversanding can be eliminated by the use of Gypsum Wood Fibre Plaster without sand.

TOO THIN COATS

HOW TO DETECT TOO THIN COATS

When walls are hard but lacking in strength, provided the sand conditions are all right, the trouble is probably due to too thin grounds. This can be determined by pulling off a piece of plaster and measuring its thickness.

HOW TO PREVENT TOO THIN GROUNDS

The architect should specify the grounds as follows: For wood lath, $\frac{3}{4}$ "; for $\frac{1}{4}$ " gypsum lath, $\frac{3}{4}$ "; for $\frac{3}{8}$ " gypsum lath, $\frac{7}{8}$ "; for metal lath, $\frac{3}{4}$ "; for brick or clay tile walls, $\frac{5}{8}$ "; for gypsum tile walls, $\frac{1}{2}$ ".

The architect should also specify that the work is to be rodded and brought to a true and even surface, so that the plaster will not vary in thickness between ground strips.

TROUBLES DUE TO PLASTERING BASES Wood Lath

CAUSES OF WOOD LATH TROUBLES

Probably 90% of the cracks in plastered walls not due to building settlement are due to lath. The quality of wood lath today is very poor.

The principal causes of lath troubles are four:

1. Inferior lath which expand and contract unduly, shearing the keys and cracking the plastered surface, or which contain sap that stains the plaster.
2. Neglecting to wet the lath so that they will swell as much as they can before the plaster is applied.
3. Failure properly to space the lath.
4. Insufficient nailing.

HOW TO DETECT TROUBLES DUE TO LATH

Cracks and buckles in the plaster coat running horizontally with the lath are always traceable to lath conditions. When plaster sounds hollow and loose when tapped, but is hard, faulty spacing may be looked for, except in cases of dry-outs or oversanded plaster where the keys have fallen off from lack of strength.

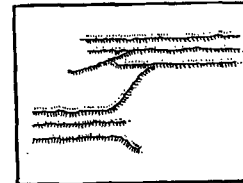
Straight vertical cracks, either chip cracks or larger cracks, are often the result of failure properly to break joints in the lath. Settlement and shrinkage cracks are very liable to follow lath joints that are not properly staggered.

Lath stains on the surface of the plaster are due to sap, pitch, resin, oil, tar or gum in the lath.

HOW TO PREVENT WOOD LATH TROUBLES

Quality of lath. Architects should specify No. 1 lath and also the kind of wood desired. White pine, cypress or spruce lath are preferable when they are to be had. Lath should be free from knots, sap and bark. However, this is not the only test of a good lath, because many clear laths on the market today are of very inferior quality.

Proper wetting of lath before plastering. Wetting of lath before plastering is important in the prevention of plaster cracks due to the swelling, warping, twisting and buckling of wood lath. Wood lath should be wet the day before plastering and again an hour or so before plastering. Swelling lath exert tremendous pressure, which shears off the keys and causes the plaster to loosen and crack. This condition can be avoided only by using a good grade of lath and by swelling the lath to the limit before plastering, so that it will not swell afterward.



Cracks following the direction of wood lath are the result of buckling lath. The plaster is often bulged out along the cracks.

Proper spacing of lath. Lath should be spaced $\frac{1}{4}$ " to $\frac{3}{8}$ " apart, and should be so spaced at ends as well as at sides, as lath swells endwise as well as sidewise. Narrower spacing will not provide sufficient room for the lath to swell, and will result in weakened keys. A wider spacing, on the other hand, is unnecessary and is a waste of materials. Lath should be applied in groups of five to seven lath, which should be staggered—i. e., the ends of each group moved to the stud at right or at left of the group below.

Proper nailing requires two lath nails at the ends of lath and one at intermediate studs, the nails driven home so as to hold the lath tightly against the stud.

REMEDY FOR LATH CRACKS

The only remedy for this condition is to remove the parts of the wall that are defective and replaster.

GYPSUM LATH

The use of gypsum lath does away with the three great causes of plaster cracks which are present when wood lath are used. Instead of being of uncertain quality, gypsum lath is all perfect. Instead of swelling, warping, buckling and thus causing cracks in the plaster, gypsum lath does not swell, warp or buckle. Properly applied, it also keeps the water from getting to and swelling the studding and joists. Unlike wood lath, which form little or no permanent bond with the plaster, gypsum lath and plaster unite perfectly.

CAUSES OF CRACKS WITH GYPSUM LATH

It will be seen from the foregoing that by the use of gypsum lath the factors which can cause trouble are reduced to three, as follows:

1. Defects in the general structure of the building which result in the expansion and contraction of heavy timbers, settling in the foundation, and defects in the floor joists, all of which produce stresses which will crack the strongest plastered walls.
2. Failure to observe the simple directions for applying gypsum lath.
3. Improper preparation or application of the plaster.

Too thin coats of plaster cause by far the greater number of cracks in plaster applied to gypsum lath. The strength of the plaster coat must obviously be depended upon to maintain the integrity of the wall at the joints—i. e., where there is no gypsum lath—and when the plaster coat is too thin, vibrations and strains naturally cause cracks at the joints. This skimping of the plaster is more liable to be found on ceilings than on walls.

HOW TO DETECT TOO THIN COATS

When cracks following the joints of the lath are noted, measure the thickness of the plaster.

HOW TO PREVENT TOO THIN COATS

Three-quarter-inch grounds should be specified when $\frac{1}{4}$ " gypsum lath is used, and $\frac{7}{8}$ " grounds when $\frac{3}{8}$ " gypsum lath is used. This means $\frac{1}{2}$ " coat of plaster over the lath in each case. As it is extremely difficult to apply the required thickness of plaster in one coat, it is recommended that the base coat be applied in two coats—first a scratch coat, and after this has set, a second or browning coat.

Metal Lath

CAUSES OF CRACKS WITH METAL LATH

One cause of weak walls when metal lath is used is the use of a lath with a too open mesh. It should be remembered that the stiffness of metal lath is determined by the weight. The minimum weights per sq. yd. that should be specified and used are: On wood studding, $2\frac{1}{3}$ lbs. Ceilings on wood joists, $2\frac{3}{4}$ lbs. On steel studding, $2\frac{1}{2}$ lbs. On suspended ceilings, 3 lbs.

The use of too open mesh lath in addition to resulting in a waste of plaster, causes sagging on ceilings, as also does failure to properly stretch and staple the lath.

Failure properly to tie the lath between studs or to lap the bottom sheet over the one above, instead of vice versa, is a frequent cause of cracks at the horizontal joints.

Wet plaster standing against the unprotected studs and joists may result in cracks from swelling and shrinkage of the wood members.

Stresses due to defects in the design or general construction of the building as treated hereinafter under "Other causes of plaster cracks," will cause cracks in metal lath walls.

Brick or Tile Bases

CAUSES OF PLASTER TROUBLE

Probably the majority of cracks found in plaster in fireproof structures are due to deflection and deformation strains, to which fireproof buildings as well as non-fireproof buildings are subject.

Expansion and contraction of the various materials used in fireproof structures is a frequent cause of cracks in partitions. Such cracks will be more noticeable where clay or terra cotta tile is used than where gypsum tile is used, for the reason that the gypsum tile has the same coefficient of expansion as the gypsum plaster.

Cracks which occur at the wall and ceiling angle are likely to be due to neglect to wedge the wall at the ceiling, or to the use of too much sand in the mortar, which permits settlement through shrinkage in the horizontal joints, or to settlement of the floors. Cracks around door openings—especially over doors—are usually traceable to faulty laying of the tile, omission of proper keying in jack arch construction over doors, or improper construction of the door bucks. Wood door bucks, when damp, swell and contract, causing the plaster and sometimes the entire partition to crack.

Stains on the surface of the plaster come from efflorescence from clay or terra cotta tile.

A network of small cracks in the plaster would probably be due to either one of three causes:

First, failure properly to wet brick, clay tile or terra cotta tile before plastering.

Second, the use of too little sand (use 3 parts sand to one of plaster by weight) with the plaster.

Third, one-coat instead of two-coat work.

Concrete Surfaces

Ordinary gypsum plaster or lime mortar does not adhere properly to concrete surfaces; consequently the use of Bondcrete, a specially made plaster for concrete surfaces, is recommended.

CAUSES OF PLASTER TROUBLES

The chief difficulty when ordinary plasters are used on concrete is that the evaporation of water from the concrete, which continues for some months after the concrete is poured, destroys the bond between the two materials. Failure to properly prepare the concrete surface is another source of trouble, regardless of what kind of plaster is used. The surface must not be too smooth and must be free from dust, oils, and efflorescence before the plaster is applied. All ceilings must be well hacked.

HOW TO PREVENT PLASTER TROUBLE

Use Bondcrete, the plaster that is specially prepared for plastering on concrete.

If there is any sign of efflorescence on the concrete surface, remove it entirely with a wire brush, then wash the concrete with a 1 to 5 solution of muriatic acid. Wash off the acid thoroughly before applying the plaster.

If the concrete is too smooth to afford a bond for the plaster, or if oil has been used on the concrete forms, the walls would have to be either furred and lathed, or else hacked before the plaster is applied.

Do not apply a sanded browning coat over Bondcrete.

TROUBLES WITH FINISHES

Finishes made of gypsum or that contain gypsum are, in general, subject to the same abuses as are gypsum base coats. Quick sets and slow sets are detected and treated exactly as in the case of base coats. To prevent dry-outs all precautions given for dry-outs under base coat plasters should be taken, and, in addition, *care must be taken that the base coat is in proper stage of moisture when the finish is applied*—that is, for gypsum prepared trowel finishes or for lime putty finishes the base coat should be about 75% dry; for sand float finishes the base coat should be about 50% dry, or what the plasterer would call "a half green wall."

The base coat should be hard and firm, but not too smooth. All Wood Fibre Plaster bases and sanded bases on metal lath ceilings should be broomed and old walls scratched or hacked before finishing. Base coats should never contain frost when the finish is applied.

Dry, brittle and cracked finishes, which can be easily removed from the base coat, are the result of the following conditions:

Base coat being too dry when finish was applied.

Improper application, that is, applying in one thick coat only.

Insufficient troweling.

Insufficient amount of gauging plaster in lime putty finishes.

When the base coat has become too dry it should be sprinkled with clean water before the application of the finish coat, in order to reduce the suction between the base and the finish coats, thus preventing the tendency of rolling under the trowel and at the same time producing a good bond.

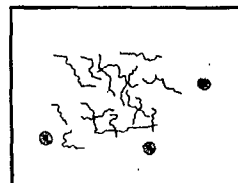
The Proper Method of Applying a Lime Putty Finish

1. The base coat should be in the proper stage of drying—that is, about 75% dry. If bone dry, the wall should be lightly sprinkled with clean water before applying finish. On walls that are too dry, the finish has a tendency to check crack, due to extreme and rapid absorption of water from the finish. On walls that are too "green" there will be difficulty in getting proper bond, and blistering may occur.
2. For an ideal mix use one part (by weight) *unretarded* gauging plaster to two parts lime putty; or one part (by weight) *retarded* gauging plaster to three parts lime putty.
3. Apply in two or three coats, according to local custom. Spread first coat thin, filling all voids to an even surface; succeeding coat or coats to be spread, allowed to "draw," and then troweled to finished surface. Use no more water than necessary in troweling.

Lime Putty Finish Troubles

Soft, weak lime putty finishes are the result of using too small a percentage of gypsum gauging plaster. Generally speaking the more gauging plaster that is used the stronger the finish will be. An ideal mix would be one part gauging plaster to two parts lime putty, although good results can be had by using one part gauging plaster to three parts lime putty, provided a *retarded* gauging plaster is used. Lime putty is a strong accelerator, and when the gauging plaster is unretarded or "quick set," there is danger of the putty being applied in a setting or "retempered" state.

Chip cracks in lime putty finish may be due to the shrinkage of the lime in a finish in which there is not a sufficiently large percentage of gauging plaster to prevent such shrinkage. Also chip cracks are sometimes due to the finish not being sufficiently troweled.



Chip cracks and pops in a lime-putty finish

Streaks and discolorations in lime putty finishes are due to the lime and the gauging plaster not being sufficiently mixed, or to the use of too much water in troweling.

Sometimes the hardened lime putty finish loosens from the brown or base coat, taking part of the sanded coat with it. This indicates an oversanded brown or base coat, or a sanded coat which has been weakened by being applied in a "setting" or "retempered" state. When the putty coat is applied, further weakening occurs, due to the absorption of water from the finish coat. Upon drying out, the hard, rigid putty coat flakes off in places, taking some of the sanded coat with it.

Pops and blisters in lime putty finishes are caused by the lime being insufficiently slaked before application. In order to be absolutely sure that pops and blisters will not occur, common lime should be slaked several weeks before being used. A better, quicker and cheaper insurance against these defects is to use Hydrated Finishing Lime.

Sand Float Finishes

Walls to be sand floated should be about 50% dry, or what a plasterer would call "a half green wall." However, *the base coat must be hard and firm.* Walls too dry when this finish is applied will cause the material to roll and work extremely hard under the float.

Sand float finishes should be thoroughly mixed, thin but plastic, and applied in one coat with a trowel and then use a cork, carpet or felt float (cork float is best), working the material to an even surface, free from float marks and cat faces. Use water sparingly in order not to kill the surface; that is, to prevent separating the sand from the rest of the material, which would cause a non-uniform appearance in finished walls.

Do not attempt to float after the material begins to set, for in so doing there is danger of using too much water, which will kill the face of the finish.

Never apply a sand float finish in a thick coat, for in attempting to float to an even surface the material will roll or slide on the base coat and a true, even surface cannot be made.

The chief causes of trouble with sand float finishes are improper floating, or the use of too much water in floating, or the varying amounts of sand in different batches when prepared on the job.

The best assurance against using varying amounts of sand and of uniformity in color is to use Adamant 1XX White Sand Float Finish or Adamant 1X, Imperial or Silico Gray Sand Float Finish, all of which are scientifically mixed at our mills.

Keene's Cement

Lack of hardness and strength in a Keene's Cement finish is due to the presence of a too high percentage of lime. One 10-quart pail of lime putty may be added to each 100-lb. bag of Ivory Keene's Cement with good results.

When lime is used with Keene's Cement, the same troubles of popping, chip cracking, etc., may be expected as described under "Lime Putty Finishes," page 34.

Gypsum Prepared Finishes

As these finishes are scientifically mixed at the mill and require the addition of water only at the job, the few troubles attending their use are due to wrong application.

Like lime putty finishes, if the base coat is too dry it should be sprinkled with clean water before applying the finish, and it should be applied in three coats, the consistency of which should be so thin that not more than one inch can be piled on the hawk. The first time over the material should be ground into the surface of the base coat, filling all voids to an even surface, allowing it to draw for a few moments. Then apply second coat evenly and allow it to draw to avoid blistering, and the third time over make material as thin as can be handled to fill in all imperfections. Then trowel to an even, smooth finish, using water very sparingly in order not to kill the face of the finish.

The use of these finishes by inexperienced mechanics may result in streaks, or "slobbers." These discolorations do not affect the hardness of the wall, and they are entirely concealed by the wall decoration. They can be avoided by the use of less water in troweling; by troweling down the "slobbers" and incorporating them in the wall, instead of trailing the trowel with a brush; and by having a man on the scaffold and one below finish the walls simultaneously so as to avoid a streak at the joining.

Caution:

Base coat must not be too dry.

Material should not be mixed too stiff.

Material should not be applied in one thick coat.

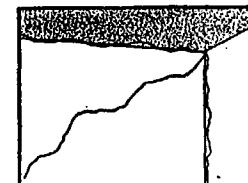
Applying gypsum prepared finishes under these conditions will result in hard working qualities and curling under the trowel, thus producing very unsatisfactory results.

OTHER CAUSES OF PLASTER CRACKS

Gypsum plaster will never crack or loosen of itself. The only source of defect in the plaster, therefore, provided the plaster is properly mixed and applied, is from some outside influence. This influence, as we have seen, may be the swelling, warping or buckling of wood lath; or it may be the expansion and shrinkage of the building framework; or it may be the distortion of the frame caused by severe settlement, wind pressure, etc.; or, as frequently happens, it may be improper design of the joists which support the floors and ceilings.

Cracks on ceilings are in most part due to the stretching of the ceiling plaster, which is caused by the deflection of the joists. Floor and ceiling joists should be so designed that there will at no time be a deflection of greater than 1-360 of their span, because this is the limit to which plaster may be stretched without cracking.

Wall cracks caused by settlement usually are found in the corners of rooms or running diagonally across the walls. In a wood lath wall these diagonal cracks usually follow the direction of the lath in places.



Cracks due to settlement usually appear at corner angles or run diagonally across the room

Vertical or horizontal cracks following the lath or plaster board joints usually indicate the swelling or shrinkage of the frame due to moisture or to temperature changes.

If by examination both sides of a partition are found to be cracked in approximately the same direction, making due allowance for the variation in the plan of staggering the joints on each side, it is a positive indication that the cracks are due to settlement.

TROUBLES WITH PLASTINT (Colored Finish Plaster)

As this finish comes to the job ready for use with the addition of water, there are few troubles to be encountered in its use.

Uneven Color

Uneven color, which is most commonly encountered with colored finish plasters, cannot occur except from improper application, because the colors are mineral colors, mixed in at the mill.

Variation in color sometimes occurs because of uneven absorption in the base coat, which can be prevented by applying Plastint over a base which has set firm and hard, but is in a half green condition. If the base coat has become dry, it should be uniformly wet down with clean water to cut suction.

Variation in color may be caused by using too much water in floating the finish coat. The water carries a portion of the color away from the aggregate.

The use of a dirty mixing box, or tools that have not been properly cleaned, will produce a "streaky" or uneven color.

When the finish coat of Plastint is applied in textures, there will appear to be a variation in color, owing to the effect of lights and shadows produced by the texture, consequently the same color will appear to have a different shade for a texture than for float finish.

A precaution that assists materially in securing uniform color is to thoroughly grind in the first coat, completely covering the base, thus forming a background of color and creating a uniform suction for the finish coat.

Lack of Bond

Trouble from the lack of bond between Plastint and the base coat is often due to failure to thoroughly broom the base coat. This work should be done so that the base coat is torn, and not merely marked.

In general, application over a base either too wet or too dry will not give maximum bond. This is true of all types of plastering. The base coat should be set firm and hard, and be in a half green condition.

All loose and projecting particles on the base coat should be removed, as these will prevent proper bond.

Whether a texture or a float finish is used, a thin coat should first be applied, grinding it well into the base, and thoroughly covering the base. This will insure a perfect bond.

Cracking

There is nothing in Plastint that will cause cracking. Cracks may appear, due to faulty application of the lath, or to swelling and buckling of the lath over which the base coat has been applied, or for structural reasons as outlined on page 37.

For best results in using this colored finish plaster, follow in detail the specifications on pages 48 and 49.

TROUBLES WITH ORIENTAL STUCCO FINISH

Oriental Stucco Base Coat and Oriental Stucco Finish are mill-mixed materials for exterior stucco. The colors in the Finish are mineral colors mixed in at the mill. Both materials are ready for use with the addition of water. The troubles that are encountered in their use are due to job conditions entirely.

Color Variations

Variation in color in the finish coat may be caused by applying it over a base coat that is too dry, and which consequently absorbs the water too rapidly for the finish coat. The finish coat should never be allowed to dry too rapidly. If the weather is extremely hot and dry, the walls should be kept damp by spraying after the finish is applied. *Do not use a heavy stream in spraying.*

Discolorations of the finish coat are sometimes caused by lack of proper flashing around openings, and neglecting to provide sufficient drip on cornices, sills, etc., so that the water cannot run down the face of the stucco. Discoloration close to the ground can be avoided by not carrying the stucco down to the ground line.

Uniformity of color is assured if the first coat of finish is thoroughly ground into the base coat, and the base coat completely covered with this first coat.

Lack of Proper Bond

To insure a perfect bond, the base coat should be thoroughly raked so as to tear up the surface, thereby providing a bond for the finish coat. Merely scratching the base coat will not be sufficient. A thorough grinding in of the first coat of finish will also insure a good bond.

Cracking

There is nothing in Oriental Stucco Base Coat or Finish that will cause cracking. Any cracking in finished work is due to imperfections in the material used as a base coat, or to shrinkage of timbers or settlement of the building. Failure to properly wet down the base coat before applying the finish coat will cause cracks.

For best results, follow the specifications for applying Oriental Stucco on page 51.

SPECIFICATIONS

The following general directions apply to all brands of cement plaster, wood fibre plaster and prepared plaster:

(1) General Directions—

- (2) Use a clean, tight mixing box, about 3½x7 ft., raised about 4" at one end. Mix with a hoe; the manufacturer disclaims all responsibility if mixing is done by machine.
- (3) Use only clean water, free from alkali and impurities; keep tools clean. Never rinse tools in gauging water.
- (4) Do not mix more material than can be applied in about 1 hour.
- (5) Do not mix one gauging with another; and never retemper plaster after it has commenced to set. Clean the mixing box after each gauging.
- (6) Keep plaster from freezing for 24 hours after application.
- (7) In hot, dry weather, close all openings while plastering to prevent material drying out before it is set. If plaster should dry out, which condition can be detected by the soft, white spots in the walls, the condition can be remedied by sprinkling with clean water from a spray pump or a brush until the material sets.
- (8) After plastering has set, open the windows and permit the wall to dry out as quickly as possible.
- (9) Keep plaster in a dry place; never store it on the bare ground.

Gypsum Cement Plasters**(1) REQUIREMENTS—**

- (2) *Grounds*—To be not less than ¾" for ¼" gypsum lath, wood, wire or expanded metal lath; ⅞" for ⅜" gypsum lath; ½" for Pyrobar tile; ⅝" for brick or clay tile.

- (3) *Lathing*—Preferably $\frac{1}{4}$ " or $\frac{3}{8}$ " gypsum lath, applied according to manufacturer's specifications. If wood lath be used it should be of good grade—free from knots, sap or bark. White pine, cypress or spruce lath are best. Lath must be well nailed; not less than four 3d common nails to each 4-ft. lath, driven well home. Double nailing should be resorted to on very particular jobs, especially if lath are not up to standard in quality and condition.

Break joints every fifth lath, and do not permit ends of lath to butt or overlap; at least $\frac{1}{4}$ " space between ends is best.

- (4) *Mortar*—To be any brand of UNITED STATES GYPSUM COMPANY's Cement Plaster and to be mixed and applied according to directions of the manufacturer.

(5) DIRECTIONS FOR MIXING—

- (6) First put in a layer of sand, then one of plaster in raised end of box. Hoe dry from one end of the box to the other, then back again, working sand and plaster thoroughly together to a uniform color. Put water in the other end of the box; hoe plaster into the water, mixing thoroughly. Mix thin at first, then add sufficient dry plaster and sand in right proportions to bring it to the proper consistency for application.
- (7) Do not mix sand and plaster until you are ready to add the water.
- (8) Use only dry, clean, sharp sand, free from loam and dirt. Screen through a 6-mesh screen. Avoid quicksand.
- (9) *For Gypsum Lath, Wood, Wire and Expanded Metal Lath*—Mix 2 parts by weight of clean, sharp, dry sand with 1 part of plaster.
- (10) *For Brick, Pyrobar Tile, Clay Tile and Second or Browning Coat*—Mix 3 parts by weight of clean, sharp, dry sand with 1 part of plaster.

(11) DIRECTIONS FOR APPLYING—

- (12) *On Gypsum Lath*—Do not wet lath. Plastering to be 3-coat work, scratch coat to be allowed to set before brown coat is applied. Straighten all angles and base ready to receive finish.
- (13) *On Wood Lath*—Soak lath thoroughly the day before plastering, and again an hour or so before plastering. Lay plaster on with sufficient pressure to obtain a good key, and fill up grounds. Darby lightly, and use water sparingly.
- (14) *On Wire or Expanded Metal Lath*—Apply a scratch coat, lightly covering the lath and filling meshes. After the scratch coat is set firm and hard, but before it is dry, apply the second coat, bringing it to a straight and even surface with rod and darby, ready to receive the finishing coat. Darby lightly and use water sparingly.
- (15) *On Brick, Pyrobar Gypsum Tile, or Clay Tile Walls*—Soak brick or clay tile walls thoroughly—and if necessary sprinkle Pyrobar lightly—to reduce the suction. Apply sufficient material to fill out grounds. Bring to a straight and even surface with rod and darby, ready to receive the finishing coat. Darby lightly and use water sparingly.

Gypsum Wood Fibre Plasters

See General Directions, No. 1, page 41.

- (16) REQUIREMENTS—
- (17) *Grounds and Lathing*—Same as specified for cement plasters, 2 and 3 on pages 41 and 42.
- (18) *Mortar*—To be any brand of the UNITED STATES GYPSUM COMPANY's Wood Fibre Plaster, to be mixed and applied according to directions of the manufacturer.
- (19) Only water is to be added to this material to fit it for application, and under no circumstances will the contractor be allowed to mix in sand or other solid material.
(Exception: See paragraphs 25 and 26.)

Note: The company also manufactures wood fibre plaster under a formula which permits the use of an equal amount of sand by weight, but recommends the use of the neat material for application to wood lath and gypsum lath, as the addition of sand reduces the flexibility and toughness and adds weight.

(20) DIRECTIONS FOR MIXING—

(21) Place the plaster in upper end of the box and water in the lower end. Hoe the plaster into the water and allow it to soak from 10 to 20 minutes. Then mix to the correct consistency.

(22) DIRECTIONS FOR APPLYING—

(23) *For Gypsum Lath*—Do not wet the lath. Plastering to be 3-coat work, scratch coat to be allowed to set before brown coat is applied. Straighten all angles and base. Leave base coat rough to receive finish.

(24) *Wood Lath*—Soak lath thoroughly the day before plastering, and again an hour or so before plastering. Apply first a thin coat of mortar, following up at once before it sets with sufficient material to fill out the grounds. When the wood fibre is to be troweled down smooth for a finish, it should be used neat. When a float or trowel finish coat is desired, the surface of the base coat must be broomed—left rough—to receive the finish. Broom before the plaster begins to set.

(25) *For Wire and Metal Lath*—Apply the mortar a little stiff. Scratch a thin coat on the lath. After this coat is set hard, apply a second coat mixed same as for brick (see No. 26), straightening up the walls. The second coat should be left rough or broomed to receive the finish.

(26) *For Pyrobar Tile, Brick or Clay Tile*—Mix equal parts, by weight, of plaster and clean sharp sand. Apply plaster in usual manner. Material must be specially retarded for use with sand.

Prepared (Sanded) Wall Plasters

See General Directions, No. 1, page 41.

(27) REQUIREMENTS—

(28) *Grounds and Lathing*—Same as specified for cement plasters, Nos. 2 and 3, pages 41 and 42.

(29) *Mortar*—To be any brand of the UNITED STATES GYPSUM COMPANY's Prepared Wall Plaster, to be mixed and applied according to the directions of the manufacturer.

(30) DIRECTIONS FOR MIXING AND APPLYING—

(31) Nothing is to be added to this material but water, and under no circumstances will the contractor be allowed to mix in sand or other solid material.

(32) Put plaster in one end and water in the other end of the box. Hoe plaster into water, mixing thoroughly. Mix thin at first, then add a sufficient amount of dry material, and work to proper consistency for application. Apply same as specified for cement plaster, Nos. 11, 12, 13, 14 and 15, page 43.

Bondcrete

REQUIREMENTS—

Caution—Use rough form boards. Avoid dressed or oiled boards. The concrete surface must be dry and free from dust, oils and efflorescence before base coat plaster is applied, and all ceilings must be hacked. If oil or grease is on the concrete surface, burn off with a torch. If there is any efflorescence, remove the frost with a wire brush, then wash

with a diluted solution (1 to 5) of muriatic acid. Wash off acid with clean water.

Mortar—To be Bondcrete, manufactured by the UNITED STATES GYPSUM COMPANY, only water to be added, the plaster to be mixed and applied according to directions of manufacturer.

Grounds—To be $\frac{1}{2}$ " on side walls; $\frac{3}{8}$ " on ceilings.

DIRECTIONS FOR MIXING AND APPLYING—

Same as for unsanded wood fibre plaster, Nos. 20 and 22, page 44. Finish with a trowel or sand float finish.

Ivory Keene's Cement

For a smooth, hard finish, add water only, mix thoroughly, bring to working consistency, and apply. In applying, follow directions for Prepared Trowel Finishes on page 47.

In cases where extra plasticity is desired, 1 pail of lime putty may be added to each 100-lb. bag of Ivory Keene's Cement.

Prepared Trowel Finishes

REQUIREMENTS—

Trowel Finish—To be Adamant 1, Universal No. 1, or Badger Light Gray Trowel Finish, or Adamant 1XX or Universal White Trowel Finish, to be mixed and applied according to directions of manufacturer.

These finishes require nothing added but water to fit them for application, and under no circumstances will the contractor be allowed to mix in other material.

DIRECTIONS FOR MIXING—

Observe "General Directions No. 1," on page 41, except use a small mixing box, about 2'6" x 4'6" x 10" deep.

Put the material in raised end of mixing box and water in lower end. Hoe the material into the water (using approximately 1 part of water to 2 parts of material measured by volume). Allow the material to soak and draw in the water without hoeing for at least 10 minutes. Then, after all the material has soaked and shows no further signs of air bubbles, mix thoroughly and with particular care, break down the mix to a smooth, even, creamy consistency.

Bring the mix finally to a very thin consistency. The mixture is too thin to carry in a hod; use a bucket.

DIRECTIONS FOR APPLYING—

Base coat must be dry before finish is applied. If suction is too great, sprinkle lightly with clean water from a clean brush.

Apply in 3 coats. The first time over, put on enough material to cover the surface completely, using material as thin as possible, and grinding it thoroughly into the base coat. Allow this to draw a few moments to avoid blistering.

The second time over, lay the material on perfectly level; and the third time, make the material as thin as can be handled on the hawk and fill in cat faces and imperfections. After it has drawn a few moments, trowel to a smooth surface, applying water with a damp brush. Do not drench with water, as it will kill the face of the material.

Work top and bottom of the wall at the same time to avoid joinings.

Caution—Never apply a finish coat on a base coat which contains frost, and keep finish from freezing for 24 hours after the finish is applied.

Prepared Sand Float Finishes**REQUIREMENTS—**

Sand Float Finish—To be Adamant 1XX White Sand Float Finish or Adamant 1X, Imperial or Silico Gray Sand Float Finish, to be mixed and applied according to directions of manufacturer.

These finishes require nothing but water to be added to fit them for application, and under no circumstances will the contractor be allowed to mix in sand or other solid material.

DIRECTIONS FOR MIXING—

Same as for prepared trowel finishes, page 47, but do not mix so thin.

DIRECTIONS FOR APPLYING—

Float finish shall be applied after base coat has set firm and hard, but while still green, and within 12 hours after base coat is applied.

Lay on with the trowel and then use cork, carpet or felt float (cork float is best), working material to a true and even surface, free from float marks and cat faces.

Use as little water as possible in floating, so as to avoid killing the surface. Use damp brush only.

Do not attempt to float after the material begins to or is set.

Caution—Same as for trowel finishes, page 47.

Plastint (Colored Finish Plaster)

Plastint requires only the addition of clean water to make it ready for use. Under no circumstances shall sand or other solid material be added.

DIRECTIONS FOR MIXING—

Use a small mixing box about 2'6" x 4'6" x 10" deep, raised 4" at one end. Keep mixing box, mortar board and tools perfectly clean.

Put material in raised end of box, with water in lower end. Hoe material into water, using approximately 1 part water to 2 parts Plastint, by volume. Let Plastint soak and draw in the water without hoeing for at least 10 minutes. After soaking, mix thoroughly and carefully hoe the mix to a smooth, creamy consistency.

DIRECTIONS FOR APPLYING—

Do not leave finished base coat under darby, or smooth. Darby dry. BROWN COAT MUST BE BROOMED to leave a rough surface.

To obtain best results Plastint should be applied after base coat has set firm and hard. The base coat should be in a "half green" condition. If base coat is dry, wet down uniformly with clean water to cut suction.

Remove all loose or projecting particles from base coat which may show through the finish coat (loose particles prevent proper bond).

In both texture and float finishes, apply thin coat, grinding into base and thoroughly covering it.

(a) In float finish use cork, carpet or felt float, working material to a true and even surface free from float marks and cat faces. *Do not use excess water in floating.* Do not attempt to float after the material begins to set.

(b) In texture work, after grinding in thin coat apply additional material, working same into desired texture. See our directions covering textured finishes.

To avoid cutting angles, it is best to use a trowel with edges rounded to approximately the same curve as the circumference of a dime.

For tile effects, mark off with a straight-

edge while the material is "green"—preferably about 4 or 5 hours after application.

Plastint should be properly protected while in the warehouse, and at the job should not be placed on the ground or in other places where moisture will be encountered.

Gauging Plasters Used with Lime Putty

Mixing Lime Putty—First pour water into the box, then add UNITED STATES GYPSUM COMPANY'S Ivory or Grand Prize Hydrated Finishing Lime in the proportion of one 50-lb. sack to about 9 gallons of water, distributing the lime uniformly. If the mix is hoed thoroughly after soaking for about an hour, then allowed to stand over night, and hoed again before using, it will improve the spreading qualities. By forcing the lime putty through about a $\frac{1}{4}$ -in. mesh screen with the back of a shovel, the plasticity will be still further improved.

Trowel Finish—Mix 3 parts of this lime putty by measure with 1 part of dry UNITED STATES GYPSUM COMPANY'S Gauging Plaster equal to 2 parts of dry hydrated lime and 1 part dry gauging plaster by weight. See preceding paragraph for mixing of lime putty. Mix thoroughly and apply in the customary manner.

Float Finish—Use 1 part UNITED STATES GYPSUM COMPANY'S Unfibred Gypsum Cement Plaster to 1 part clean, sharp sand by weight—equal to 7 to 9 shovels of sand to each 100-lb. bag. Screen sand through No. 12 screen. Mix thoroughly and apply in usual manner.

ORIENTAL STUCCO

Base Coat

Add clean water only to Oriental Stucco Base Coat, and apply in two coats. The first coat must not be less than $\frac{1}{2}$ " thick and

scratched. Allow to dry thoroughly; then follow with a brown coat not less than $\frac{3}{8}$ " thick, properly floated to straighten the work.

Finish Coat

Add clean water only to Oriental Stucco Finish. After second base coat is completely dry, spray wall sufficiently to cut suction and apply second coat $\frac{1}{8}$ " to $\frac{1}{4}$ " thick, depending on the finish desired.

The finish coat may be troweled smooth or given any desired texture.

For specifications for Gyplap and Oriental Stucco Construction for Frame Buildings, see OS-1 Folder.

For complete specifications for the preparation and application of Oriental Stucco over all surfaces, see Bulletin OS-3.