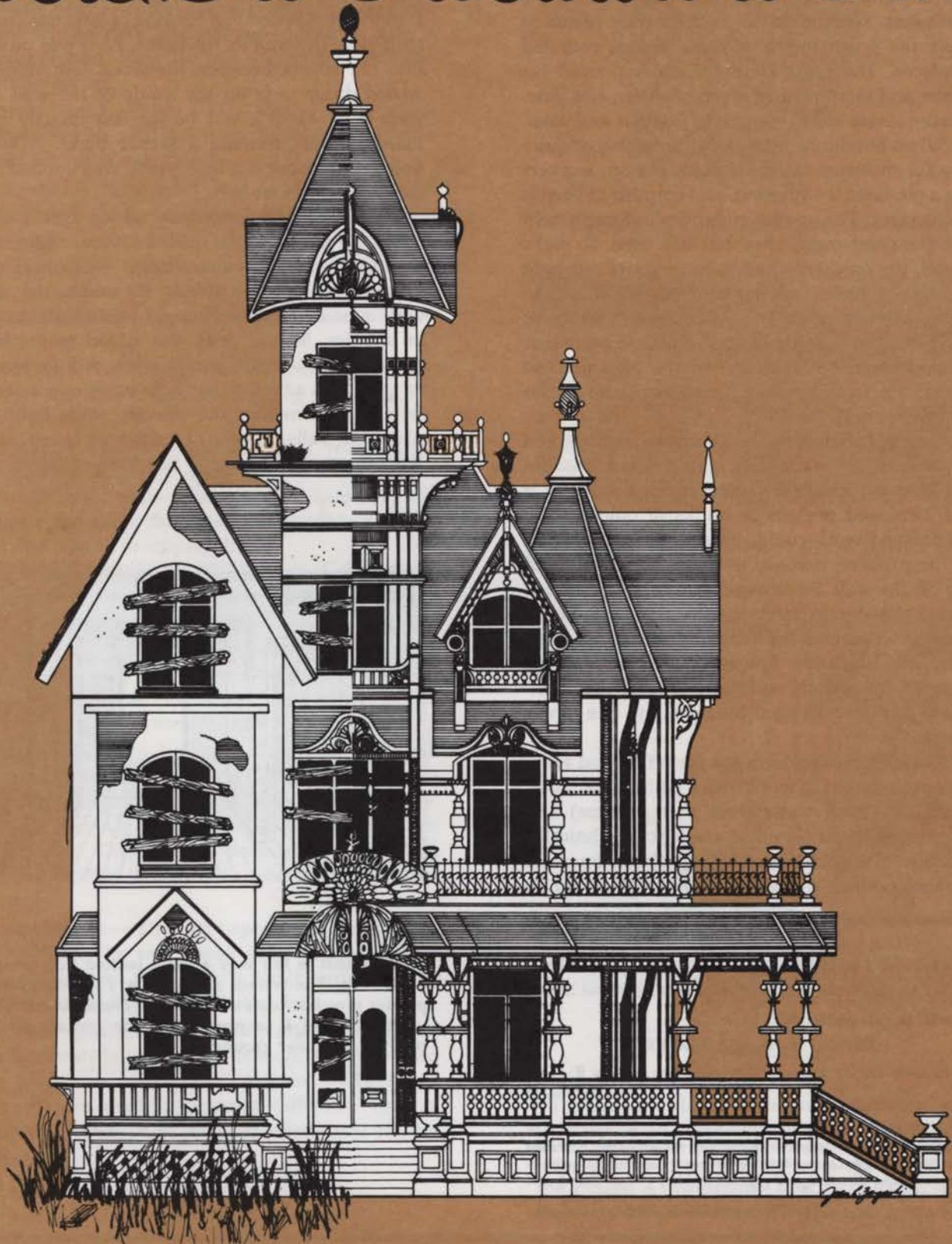


# OLD HOUSE RESTORATION



NO. 1

PLASTER

## HISTORICAL PLASTER TECHNIQUES

Early plasters used in this country were made from natural materials. Clay, mixed with hair, was used for the "brown" coat in 18th and 19th century houses in the east. The same material was applied to inside and outside walls of adobe houses in the southwest. Women plasterers used their hands to apply the finish to the region's unique rounded fireplaces. The more common material used for plaster and mortars of all sorts, however, was lime, because it was more resistant to weather and wear.

When building a house large enough to require lime for masonry mortar and for plaster, workers dug a pit, lined it with sand, and emptied in barrels of quicklime. For smaller quantities of lime, a tight wood or sheet-metal lined box was used. To make plaster, the quicklime had to have water put back into it — it had to be *hydrated* or *slaked*. As the quicklime reabsorbed the water, heat was given off. When the heat diminished, the lime paste that resulted could be taken out of the pit and used by masons, to make mortar, and by plasterers, for the interior wall finish.

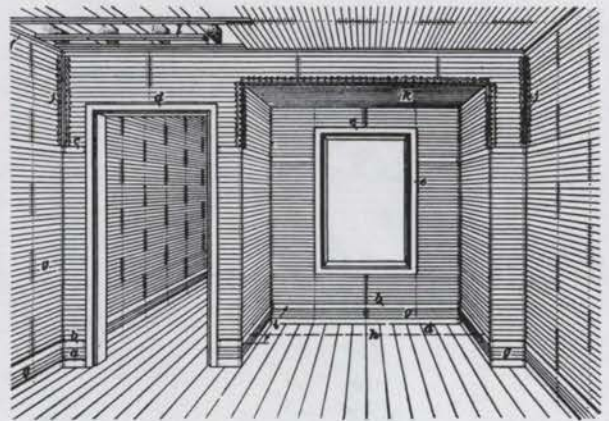
Lime paste could be used immediately or stored for months or years. The conventional wisdom said that the longer the lime stood, the better it was. Unslaked pockets or hunks of quicklime in the finished work could, indeed, cause problems for the plasterer because they would explode and pop off the wall. But scientific study by the British scientist Sleaton in 1863, showed that lime mortar actually weakened the longer it stayed in paste form. His research, however, was only slowly accepted by masons and plasterers, as they continued to prefer an aged lime paste to one newly mixed.

In addition to preferring a paste that had aged, masons preferred to work with a *fat* lime. Fat limes readily absorbed water (half their volume) and developed into a rich, oily consistency. Technically, a *fat* lime is a quicklime. *Meagre* or poor limes did not absorb much water. These were "slow" limes,

considered unsuitable for building; yet, they had desirable properties for humid climates because they resisted deterioration from ambient moisture.

Plaster, with sand and hair, was called *coarse stuff*. Today, it is referred to as the *scratch coat* and *brown coat*. Applied to a backing of lath, this coarse stuff gave the wall its thickness. As it was pushed into the spaces between the wood lath strips, it would droop over on the inside of the wall and form *keys*. Or it could be applied directly to a masonry wall, forming a *suction bond*. A white finish coat, using the lime paste, was applied at a thickness of about  $\frac{1}{8}$ ".

Different ingredients were added to this finish lime to give it different qualities. Fine, white sand was mixed in for a *float* finish. This finish was popular in the early 1900's. By raking the sand with a broom, the wall could retain swirl marks or stipples. Marble dust was added to the lime paste for ornamental plaster work. A little plaster of paris was added to the lime paste to accelerate setting, thus creating the smooth, white finish on plastered walls. Plaster of paris was called *gauge stuff*, or gauging. Gauging is a form of gypsum.



In 1910, this is the way a room looked just prior to plastering. The letters *a, b, c, d, e, f* indicate where plaster grounds were used. Metal corner beads were used at *j* and *k* to protect outside corners and to provide a plaster ground.

### OLD HOUSE RESTORATION

Number 1

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Material in this publication by:

Marylee MacDonald, SHC-BRC

Illustrations: Donna Milner

Editors: Henry R. Spies  
M. MacDonald

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## PLASTER TERMS

**Brown Coat** — The brown coat is the rough basecoat of plaster used with rock lath systems. With metal or wood lath systems, it is the second application of wet, basecoat plaster.

**Casing Bead** — Metal casing beads are sometimes used around door and window openings. Like a wood ground, they indicate the proper thickness for the plaster.

**Corner Bead** — Wire mesh with a rigid metal spline used on outside corners. Installing the corner bead plumb is important.

**Cornerite** — Wire mesh used on inside corners of adjoining walls and ceilings. It keeps corners from cracking.

**Finish Coat** — Pure lime, mixed with a little gauging, is used for the very thin surface finish of the plaster wall. Fine sand can be added for a sanded finish coat.

**Gauging** — Gauging, added to pure lime paste, causes the lime to harden. Gauging is also known as plaster of paris.

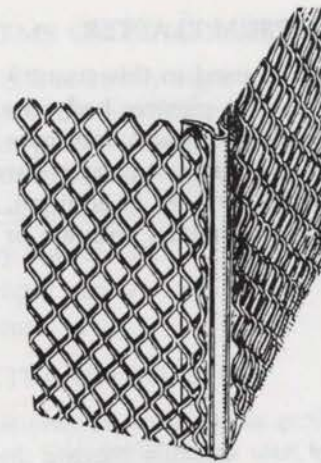
**Ground** — Plasterers use metal or wood strips around the edges of doors and windows and at the bottom of walls. These grounds help keep the plaster the same thickness and provide an edge for the plaster to stop against.

**Gypsum** — Originally mined from large gypsum quarries near Paris, gypsum in its natural form is calcium sulfate. When heated, one and a half water molecules are driven off, leaving a hemihydrate of calcium sulfate — the material commonly known as plaster of paris. When mixed with water, it becomes calcium sulfate again.

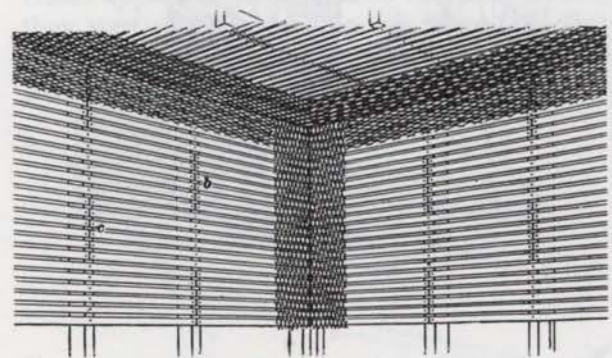
**Lime** — Found in limestone formations or shell mounds, naturally occurring lime is calcium carbonate. When heated, it becomes calcium oxide. After water has been added, it becomes calcium hydroxide. This calcium hydroxide reacts with carbon dioxide in the air to recreate calcium carbonate.

**Scratch Coat** — The first basecoat put on wire or wood lath. The wet plaster is "scratched" with a broom or comb to provide a rough surface so the next layer of basecoat will stick to it.

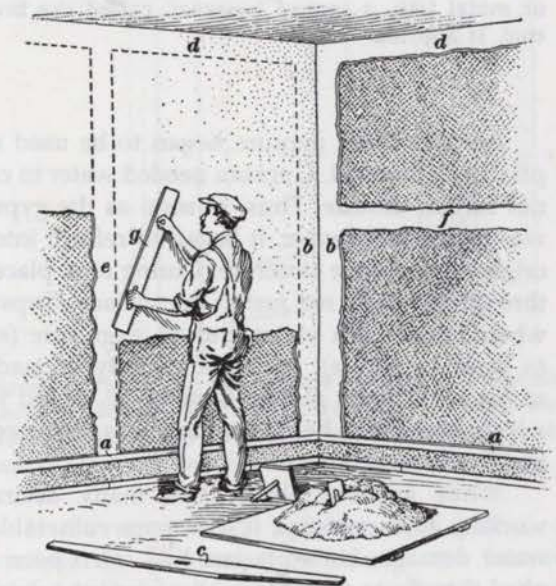
**Screed** — Screeds are strips of plaster run vertically or horizontally on walls or ceilings. They are used to plumb and straighten uneven walls. Metal screeds are used to separate different types of plaster finishes or to separate plaster and cement basecoats.



Corner bead covers the outside corners.



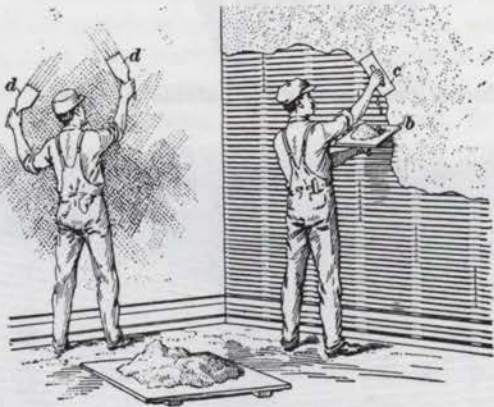
Cornerite is installed at all the interior angles.



To make sure plaster is the same thickness at the top and bottom of the wall, screeds (*d, b, f*) are placed in the same plane as the plaster ground (*a*). A straight-edge (*c*) is used to carefully level the screeds with the ground. A two-handed float (*g*), or *darby*, is used to fill in the remaining basecoat.

## LIME AND GYPSUM PLASTER

Lime plasters were used in this country until the early 1900's, but lime plasters had certain disadvantages. Lime plaster would only cure when in contact with *carbon dioxide*. A plastered wall would take over a year to dry fully. In addition, lime had to be protected from contact with air, or it would become inert.

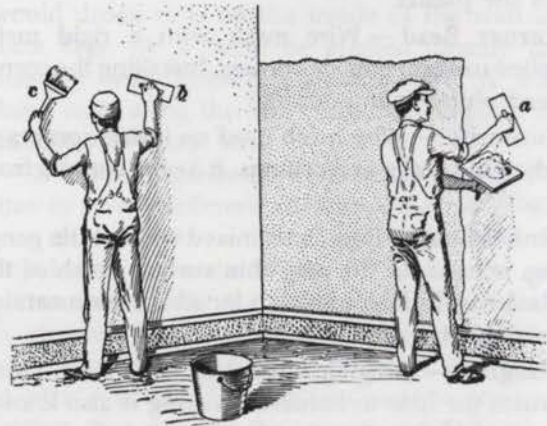


A hawk (b) and trowel (c) are used to apply wet plaster to the wood lath. A comb (d) is used to scratch the first basecoat, called the scratch coat. Over wood or metal lath, a second basecoat, called the brown coat, is applied.

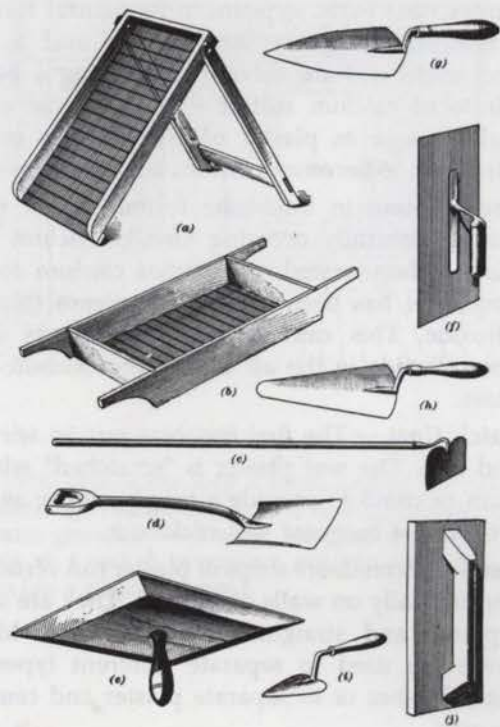
Around 1900, gypsum began to be used as a plastering material. Gypsum needed water to cure, not carbon dioxide. Thus, as soon as the gypsum was mixed with water, it began to reform into its original crystalline structure. Curing took place all through the wall, not just at the surface. Gypsum, when mixed with water and an aggregate (such as sand or perlite), hardened rapidly. It made a stiffer, more rigid, plaster. Lime paste, mixed with a little gypsum to help it harden, was still used as the final coat.

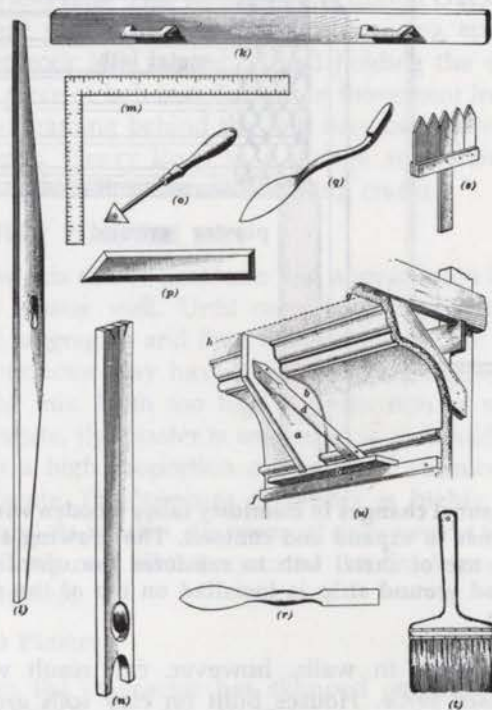
While gypsum plaster had many desirable working characteristics, it was more vulnerable to water damage. Lime plasters had often been applied directly to masonry walls, forming a suction bond. Lime plaster could survive occasional wind-driven moisture or water wicking up from ground level. Gypsum plasters required more protection from water. Furring strips were used against masonry walls to create a dead air space. This space prevented moisture transfer.

Gypsum is now the only material used for plaster basecoats. It is mixed with many different types of aggregate, such as wood fibers, sand or perlite. These different aggregates are used for different applications. Perlite aggregated plaster, for example, is lighter weight and works better in cold weather. It also has a slightly better insulating value than sand-aggregated plaster.



The plasterer on the right is applying the finish coat of plaster using a hawk and trowel. The plasterer on the left is smoothing the finish coat with water, applied with the brush in his left hand, and a sharp steel trowel.





A hawk (b) and trowel (c) are used to apply wet plaster to the wood lath. A comb (d) is used to scratch the first basecoat, called the scratch coat. Over wood or metal lath, a second basecoat, called the brown coat, is applied.

Old-time plastering tools, many of which are still used today: (a) screen used for separating coarse sand from fine sand; (b) lime screen used to remove unslaked particles of lime; (c) hoe; (d) shovel; (e) hawk, used for holding small amounts of plaster; (g), (h), (i) assorted trowels, used for gauging and pointing; (j) float, used for smoothing the surface of the second coat; (k) a two-handed float, or darby, used for floating larger surfaces; (m) square, used to test trueness of angles; (n) plumb, used to tell whether the plastered surfaces are strictly vertical; (o), (p), (q), (r) jointing and mitering tools, used for picking out angles in decorative moldings; (s) comb, made of sharpened lath pieces, used to scratch the basecoat of plaster; (t) brush, used for dampening plaster surfaces while they are worked smooth; (u) template, made of wood and metal to cut a required outline for a fancy mold.

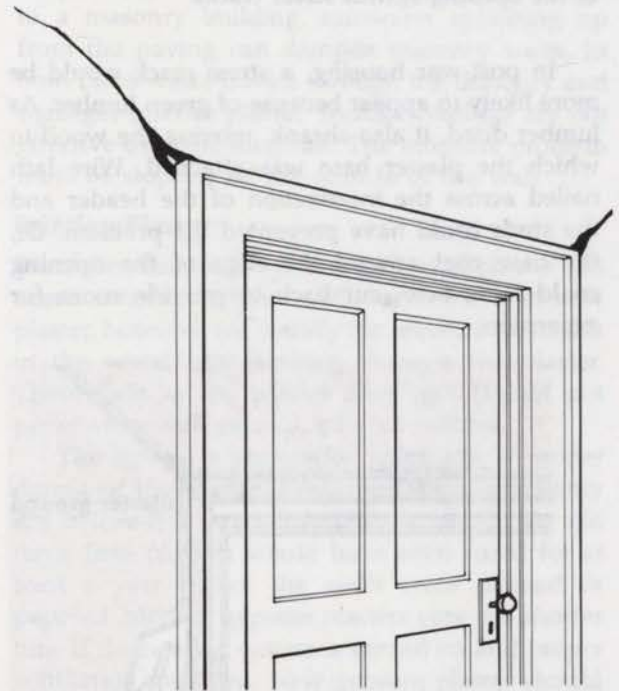
## PROBLEMS CAUSING PLASTER FAILURE

Plaster is a relatively rigid material. Normally, it will last indefinitely. However, there are conditions that cause plaster to crack, effloresce, and separate. These conditions are caused by:

- Structural problems
- Faulty plaster mix
- Improper curing
- Moisture

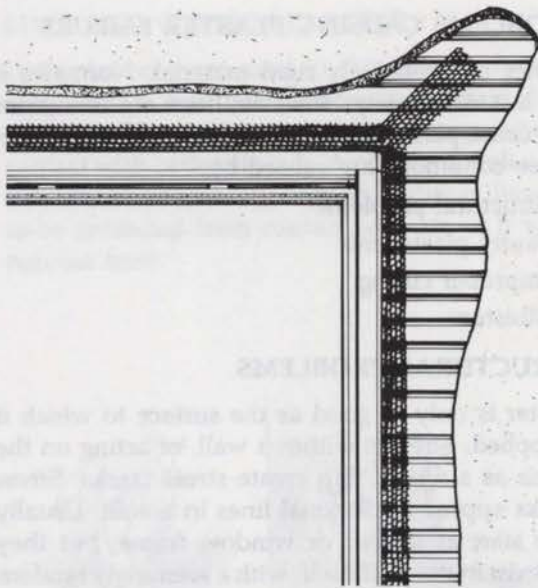
### STRUCTURAL PROBLEMS

Plaster is only as good as the surface to which it is applied. Stresses within a wall, or acting on the house as a whole, can create stress cracks. Stress cracks appear as diagonal lines in a wall. Usually they start at a door or window frame, but they can exist in the wall itself, with a seemingly random starting point.



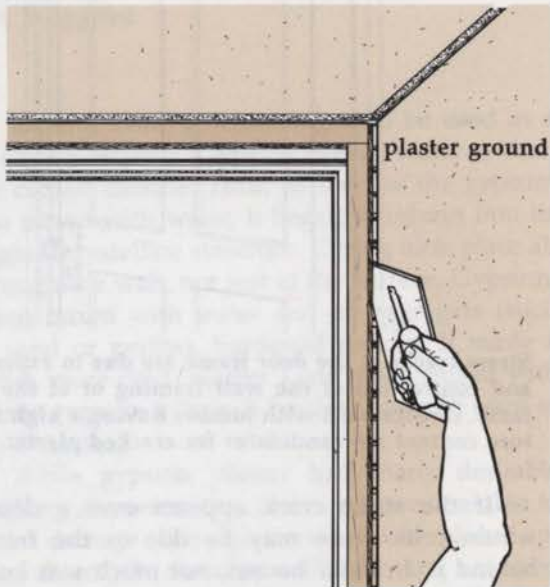
Stress cracks at the door frame are due to expansion and contraction of the wall framing or of the door jamb. Houses built with lumber having a high moisture content are candidates for cracked plaster.

If the stress crack appears over a door or window, its cause may be due to the framing behind it. In older houses, not much was known about lumber dimensions needed to carry the load. Even when houses were overbuilt, later remodeling efforts may have cut in a doorway or window without adding a structural beam, or header, across the top of the opening. Occasionally, a header was simply too small to carry the load above it.

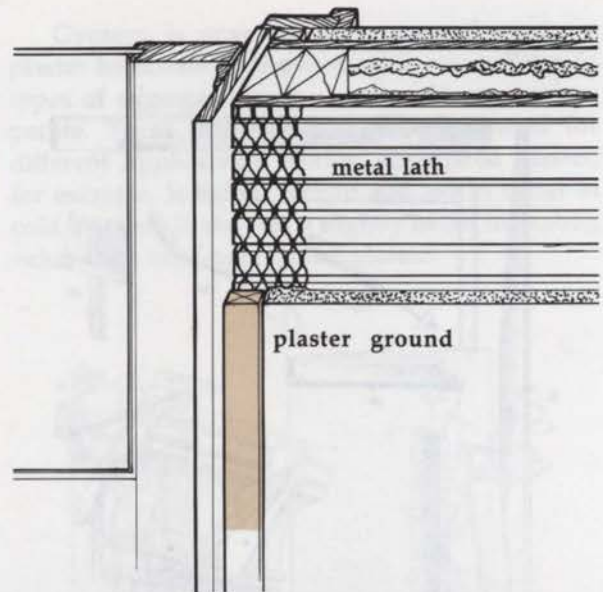


Metal lath under the basecoat reinforces the edges of the opening against stress cracks.

In post-war housing, a stress crack would be more likely to appear because of green lumber. As lumber dried, it also shrank, moving the wood to which the plaster base was attached. Wire lath nailed across the intersection of the header and the studs could have prevented the problem. Or, the base coat around the edge of the opening could have been cut back to provide room for expansion.

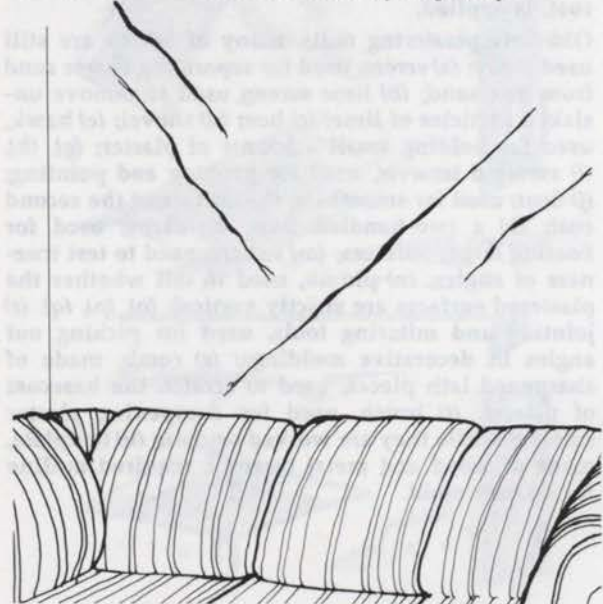


When replastering, the wet plaster basecoat can be cut back from the ground with a trowel. The diagonal cut at the corner of the doorway will be covered with the finish coat. Cutting the basecoat leaves room for expansion.



Seasonal changes in humidity cause wooden window frames to expand and contract. The drawing shows the use of metal lath to reinforce the opening. A wood ground strip is installed on top of the metal lath.

Cracks in walls, however, can result when houses settle. Houses built on clay soils are especially vulnerable. Clay absorbs water readily. In dry seasons, water leaves the clay particles, causing them to contract. Thus, even a large house can be riding on an unstable footing. Diagonal cracks running in opposite directions suggest that house settling and soil conditions may be at fault. Similar symptoms occur when there is a nearby source of vibration — a train line or busy highway.



Stress cracks running diagonally, in opposite directions, are caused by train or highway vibration or by expansion of clay soil.

Horizontal cracks are often caused by lath movement. Wood, because it absorbs moisture from the air, expands and contracts as humidity rises and falls. This can cause horizontal cracks to appear year after year. Cracks can also appear when rock lath is used. A nail holding the edge of a piece of lath may loosen, or movement in the wood framing behind the lath may cause a seam to open. Heavy loads in a storage area above a rock lath ceiling can cause ceiling cracks.

### FAULTY PLASTER MIX

A bad mix causes problems that appear years later in a plaster wall. Until recently, proportions of sand, aggregate and lime were mixed on the job. A contractor may have used too much aggregate in the mix. With too high a proportion of sand aggregate, the plaster is weaker than it should be. With a high proportion of perlite or vermiculite aggregate, the basecoat of plaster is highly absorbant. As it cures, the basecoat draws water from the finish coat. This may cause the finish coat to delaminate.

### Thin Plaster

When the contractor has skimmed on materials, the wall may not have sufficient plaster thickness to withstand the normal force of movement within a building. The minimum thickness for new plaster, on a rock lath base, is  $\frac{1}{2}$ ". The minimum thickness for wire lath is  $\frac{7}{8}$ ", while a wood lath base might require two base coats of about 1". Plaster applied in thicknesses over  $\frac{1}{2}$ " would droop off the wall before it could set. Thus, the *scratch* coat and the *brown* coat would have been applied on successive days to make up the required wall thickness.

### IMPROPER CURING

Plaster can weaken due to improper curing. In some cases, a retarder may have been added to the plaster mix to slow its set-up time. If gypsum plaster doesn't set within a 4-hour period, it may be insufficiently strong to withstand cracking.

Providing the proper amount of heat and ventilation is the key factor in a durable plaster job. When houses were plastered before windows were put in, there was no way to control temperature and humidity. When temperatures were too hot, the plaster would dry too rapidly, leading to *map-cracking* and separation of the top layer from the bottom. When the windows were shut, but the temperature was too cold, the plaster would *sweat* or rot from remaining wet for days. Similarly, wide

swings of temperature, hot days and cool nights, damage plaster. If you do have to replace plaster, maintain the temperature at 55-70°F. Use fans to circulate moist air and ventilate as needed.

### MOISTURE

The signs of plaster failure due to a moisture problem occur on the surface in the form of efflorescence. Efflorescence is the appearance of dry bubbles. These bubbles are salts coming to the surface when water is reaching the plaster. The only solution for a moisture problem is to eliminate the moisture before replastering the damaged area.

Moisture problems occur for several reasons. Gutters and downspouts may have leaks, or they may be pouring run-off rainwater next to the building foundation. In brick buildings dampness at the foundation level can wick up into the above-grade walls. Another common source of moisture is splashback. When there is a paved patio next to a masonry building, rainwater splashing up from the paving can dampen masonry walls. In both cases water travels through the masonry and damages interior plaster. Interior coatings are not effective over the long run. The moisture problem must be stopped on the outside of the wall.

### Painting Plaster

Blemishes that occur on the surface of plaster can cause concern. Yellow marks and stains in new plaster, however, are usually the result of chemicals in the wood lath leaching through the plaster. These fade as the plaster dries and should not penetrate a well-primed, painted surface.

The key to a successful paint job is proper drying of the plaster. Plaster must be thoroughly dry before it is painted with anything. In the old days, lime plasters would have been cured for at least a year before the walls were painted or papered. Modern gypsum plasters cure in a shorter time if the heating system is turned on and proper ventilation provided. New gypsum plaster should dry for three or four months before being painted. Humidity can prolong drying time.

A good primer, specifically formulated for new plaster, should be used. Then, either a latex or an oil base paint can provide the final coat. In rooms where high humidity is likely, or where painting is absolutely necessary, old time painters often applied a coat of shellac to act as a sealer. This is the solution for rooms which have been painted repeatedly and are subject to high humidity. Bathrooms are especially vulnerable. After removing all the flaking and peeling paint possible, sand the surface and paint with a shellac, or shellac-based, primer.

## REPAIRING OR REPLACING PLASTER

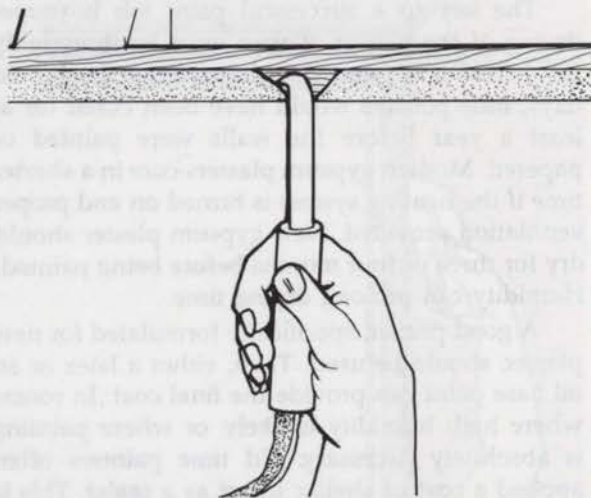
Because replacing plaster is expensive, a homeowner needs to think carefully about the condition of the plaster that remains. In addition, if the home has historical significance, the original lime plaster is an important part of original building fabric. It should be left in place and repaired if at all possible.

In rare cases, loose, damaged plaster can be conserved using special techniques designed to preserve decorative paintings on interiors of historic buildings.<sup>1</sup> Homes qualifying for inclusion in the list of buildings considered historically significant by the National Trust for Historic Preservation often have interiors that are important to preserve in their original condition.

Homes built before the Victorian period had plastered walls that were slightly irregular. The slight undulations of a hand-applied finish added character to the building. If affordable, a conventional plastering system would most closely duplicate the original. Victorian plastering tended to be smoother and straighter, making drywall or veneer plaster an option.

### Hairline Cracks

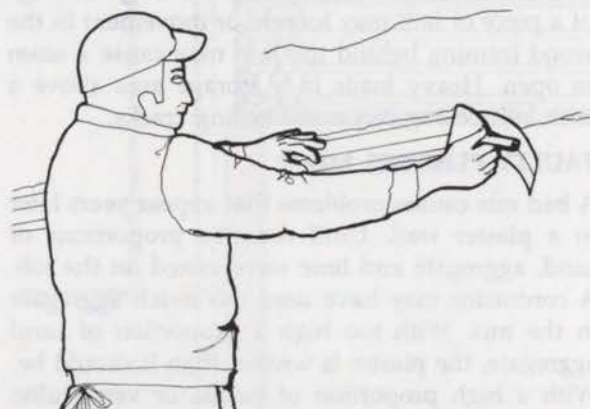
Hairline cracks in plaster are not a serious cause for concern as long as the underlying plaster is in good condition. Hairline cracks can be repaired by opening the crack with a crack widener, or a beer can opener. The crack should be wide enough for spackle to *key* into the crack. The spackle can be sanded and painted.



For small cracks, use a crack widening tool or a can opener to provide a *key* for the patching material. Make a "V" by cutting into the plaster basecoat.

<sup>1</sup>Phillips, Morgan, "Adhesives for the Reattachment of Loose Plaster," *A.P.T. Bulletin*, Vol. XII, No. 2, 1980, pp. 37-63.

Sometimes, ordinary drywall tape and taping compound will bridge a crack that reopens. Pressure sensitive drywall tape made of fiberglass, when used in combination with drywall compound, works well.



A hairline crack can be repaired with drywall tape and joint compound.

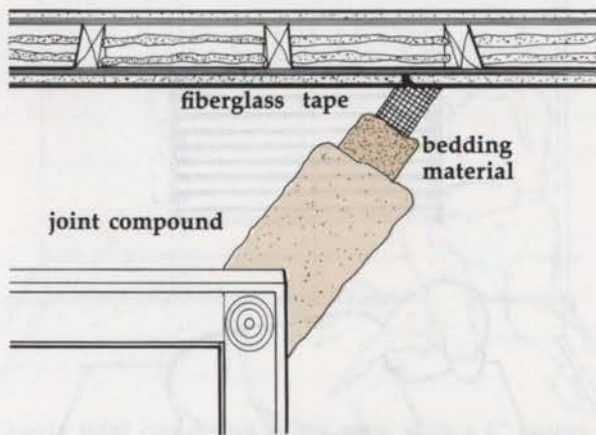
For more serious cracks that seem to reopen year after year, a fiberglass tape and bedding material, available in a kit from hardware or paint dealers, can be used. The bedding material is a heavy bodied, pigmented compound with high adhesion. The tape and bedding material provide a flexible, permanent bridge across the crack. Directions should be followed carefully, because the bedding compound, made of processed oils, cannot be sanded after it is dry. A scraper, provided with the crack coating kit, should be used to remove excess bedding liquid before it hardens.

### Soft Walls

Walls give way less frequently than ceilings, mainly because gravity is not acting on them; yet, a bad mix of plaster can occur on walls as well. Paint and layers of wallpaper may be all that is holding the walls in place. If the lime in the original plaster mix has leached out, the walls may look like sand held in place by paint. An experienced plasterer can often hear these soft spots by tapping along the walls, much like testing a watermelon for ripeness. Constant exposure to high humidity or a long initial curing time could have been factors that caused the plaster to give out.

Walls in this condition do not necessarily need replastering. The homeowner should not try to remove all layers of wallpaper and paint. Four foot wide rolls of a canvas- or fabric-like material, held in place with a vapor barrier paint, can be used to "wallpaper" a room. Gypsum impregnated canvas is also available. These materials will cover uneven wall surfaces caused by partial wallpaper removal and painting, a common condition in old houses.





Fiberglass tape, a heavy-bodied bedding compound, and drywall joint compound patch this recurring crack.

### Bonding Problems

Sometimes, the finish coat of plaster will come loose from the basecoat. This happens for a number of reasons. The basecoat may have dried out too rapidly or been too dry when the finish coat was applied. With perlite or vermiculate aggregate in the basecoat, rather than sand, the brown coat trowels down so smoothly that a good mechanical bond between the brown and finish coats may not occur.

Another cause is the presence of particles of magnesium oxide and calcium oxide in the lime. These oxides are formed when the kiln temperature at the lime kiln is too high. These oxides resist rehydration (or the soaking up of water) that occurs



Map cracking, named for its resemblance to a crumpled map, indicates that the surface finish coat of plaster is pulling away from the basecoat.

when bags of lime are mixed with water at the job site. Months or years later, when the rest of the wall has set into a rigid mass, they begin to absorb atmospheric humidity or moisture. Their movement creates *map cracking and surface delamination*.

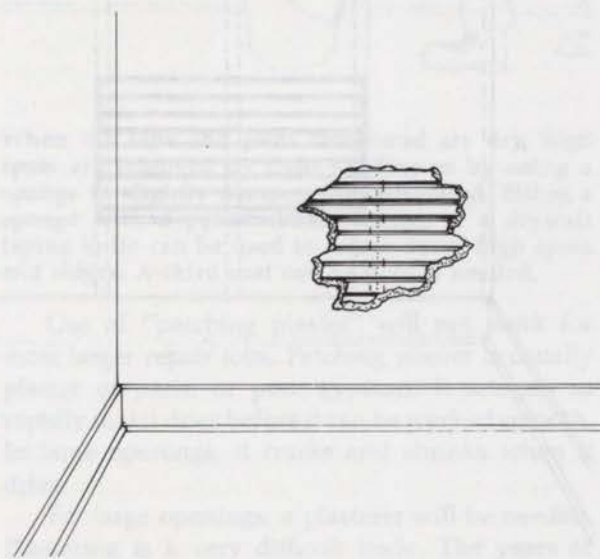
In fixing this kind of problem, the plasterer must use a *latex bonding agent*. This bonding agent is a liquid that is painted on the basecoat plaster. Edges of the delaminated area should be carefully coated so moisture in the new finish coat does not cause delamination in surrounding areas. The plasterer should use a well-gauged, pressure hydrated lime. The finish coat should be thoroughly troweled and allowed to dry two weeks before painting.

### Patching Holes in Plaster

Plaster surrounding a hole should be firmly attached to the wall. The plaster keys, where wood lath serves as the backing, should still be intact.

If the plaster is too loose, or badly damaged, the deteriorated area should be carefully removed, back to an area where plaster is still firmly keyed, or attached, to the lath. If the hole is over 16" wide, it may be helpful to enlarge the hole so that the patching material can be screwed into the studs.

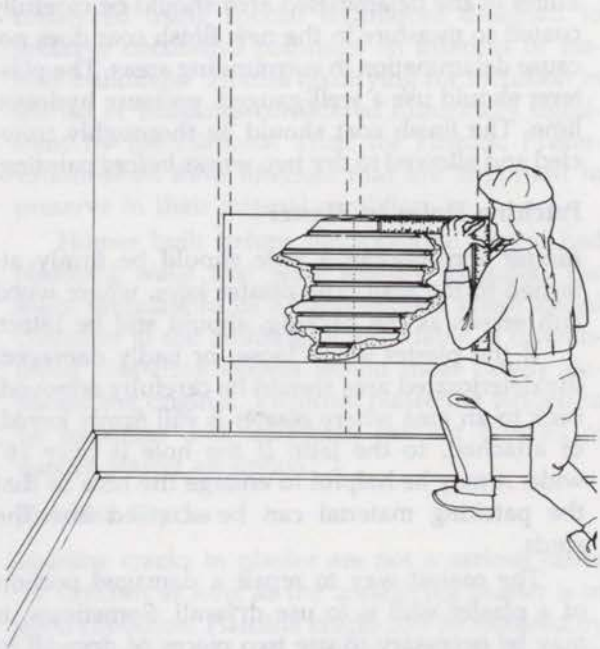
The easiest way to repair a damaged portion of a plaster wall is to use drywall. Sometimes, it may be necessary to use two pieces of drywall to compose a wall thickness equal to that of the plaster. Drywall comes in  $\frac{3}{8}$ ",  $\frac{1}{2}$ ", and  $\frac{5}{8}$ " thicknesses. A tape measure placed against the lath can be used to measure the thickness of the plaster



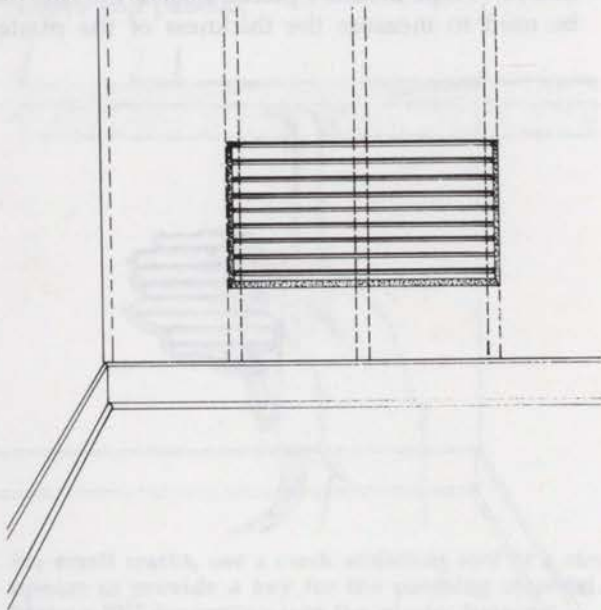
An irregular hole in an old plaster wall can be repaired using a drywall patch.

and decide on the thicknesses of drywall needed to duplicate it.

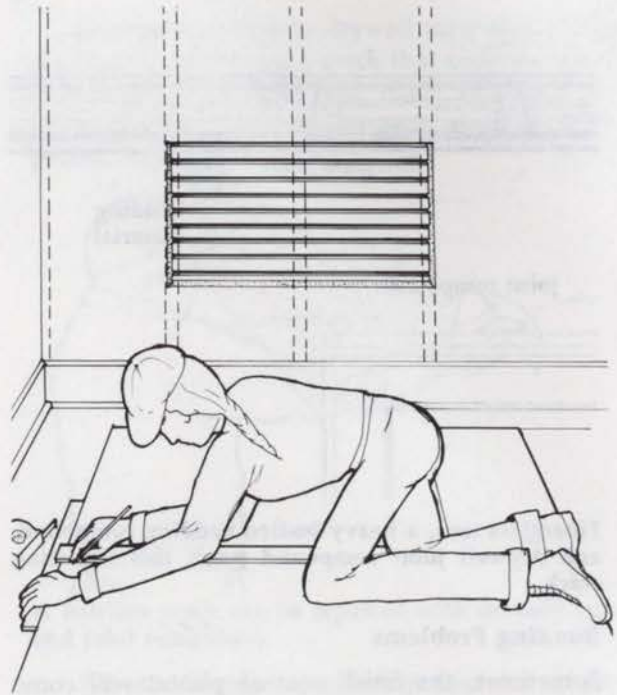
Removing enough plaster to make the hole a square one will also simplify the repair job. A framing square is useful in squaring up a hole to be patched. Cutting away excess plaster can be done with a utility knife or keyhole saw. Loose plaster can be removed using a mason's tuckpointing trowel.



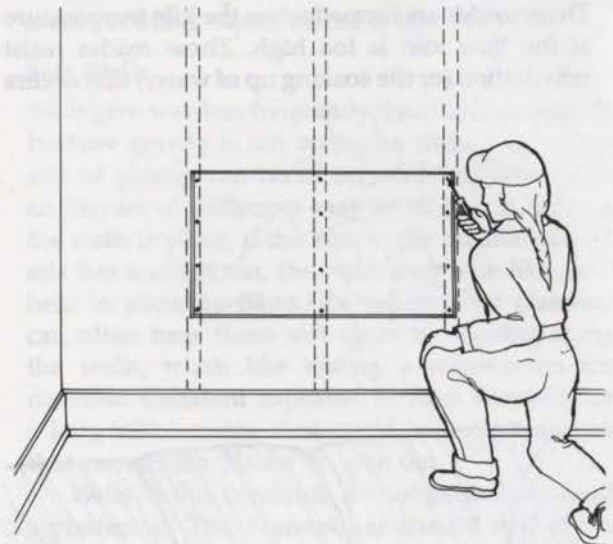
Use a framing square to mark out a rectangle. The sides of the rectangle should fall in the middle of the closest studs.



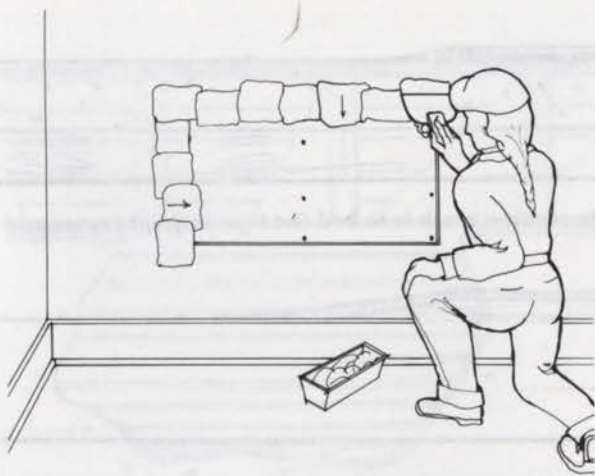
Cut back plaster with a keyhole saw. Leave wood lath in place.



Cut drywall to fit the size of the opening. Make sure the drywall is the same thickness as the plaster, or the patch will be visible. Use a drywall or framing square to mark the drywall. Score the drywall on the front side with a utility knife. Pick up the drywall, stand behind it, and place a knee behind the scored line. Snap the drywall against the knee to break it. Cut the paper on the back side with the utility knife.



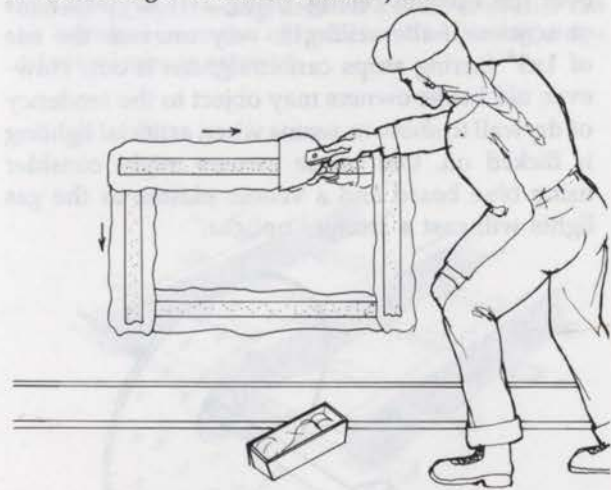
Use drywall screws to anchor the drywall to the studs.



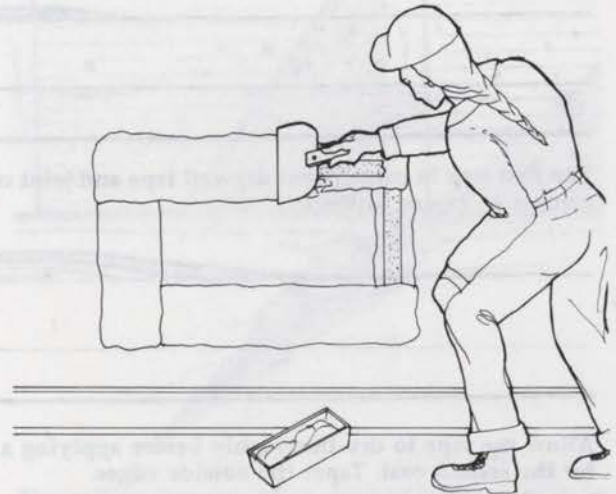
Apply joint compound to the seam with a 6" tapping knife.

Any pounding around the hole will only damage the plaster further. Even nailing pieces of drywall to the studs will loosen adjacent plaster. After removing loose pieces of plaster, the drywall should be secured to wood lath or to the studs with drywall screws.

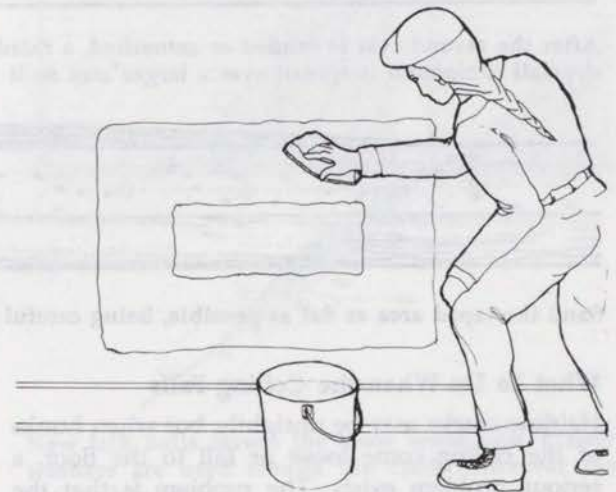
Smooth finishes are easier to achieve if ready-mixed joint compound (available in 5-gallon buckets) is used. It is important to keep the lid on the bucket when it is not in use. If the compound dries out around the edges of the bucket, small pieces can fall into the compound and cause streaks to appear in the taping. Similarly, a drywall pan that is wide enough to accommodate the tapping knife can accumulate dried bits of compound. Keeping the pan clean and throwing away any bits of dirt that get into the compound will make it easier to get a smooth finish job.



Bed the tape in the joint compound by pressing it in with fingers. In one continuous motion, pull the tapping knife along the seam to remove excess compound and push out air bubbles.



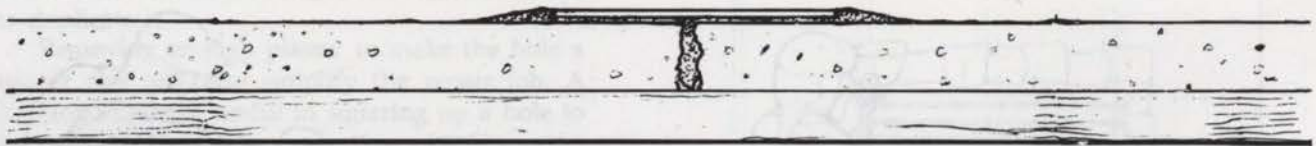
A second coat, applied with a wider knife, is used to cover the tape and blend it into adjacent areas.



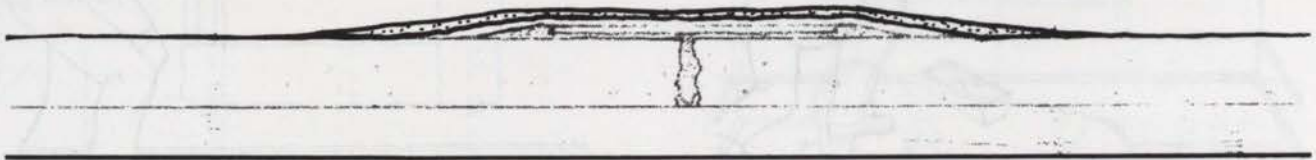
When the tape and joint compound are dry, high spots are removed by light sanding or by using a sponge to slightly dampen the compound. Either a sponge with a pot-scrubber backing or a drywall tapping knife can be used to scrape down high spots and ridges. A third coat can be used if needed.

Use of "patching plaster" will not work for most larger repair jobs. Patching plaster is usually plaster of paris, or pure gypsum. It sets up so rapidly that it dries before it can be worked smooth. In large openings, it cracks and shrinks when it dries.

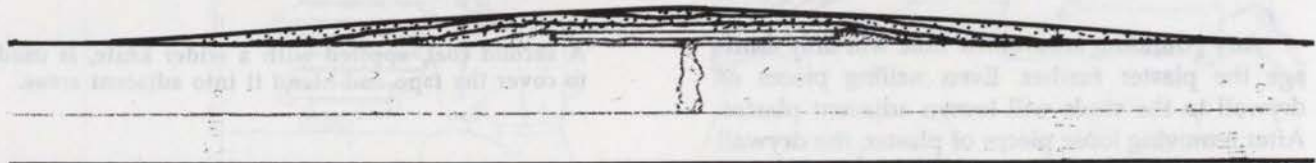
For large openings, a plasterer will be needed. Plastering is a very difficult trade. The years of practice and tricks of the trade learned from experience cannot be duplicated the the eager do-it-yourselfer.



The first step in using paper drywall tape and joint compound to repair a crack is to bed the tape in *joint compound* using a 6" tapping knife.



Allow the tape to dry thoroughly before applying a second coat. Use a *topping compound* and a 12" tapping knife for the second coat. Taper the outside edges.



After the second coat is sanded or smoothed, a third coat is used to *feather* the edges. This means the "hill" of drywall compound is spread over a larger area so it will be less noticeable.



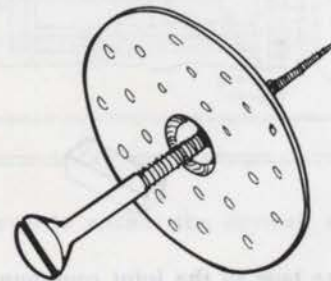
Sand the taped area as flat as possible, being careful not to expose the tape.

### What To Do When the Ceiling Falls

Hairline cracks may be unsightly, but when hunks of the ceiling come loose or fall to the floor, a serious problem exists. The problem is that the plaster keys holding the ceiling have broken off. Examine the plaster around the opening where a hunk of plaster has dropped off. Keys in one area may have deteriorated because of a longstanding moisture problem, poor quality plaster, or structural overloading; yet, the surrounding system may be intact. If the keys are in reasonably good shape, secure the plaster using plaster washers.<sup>2</sup>

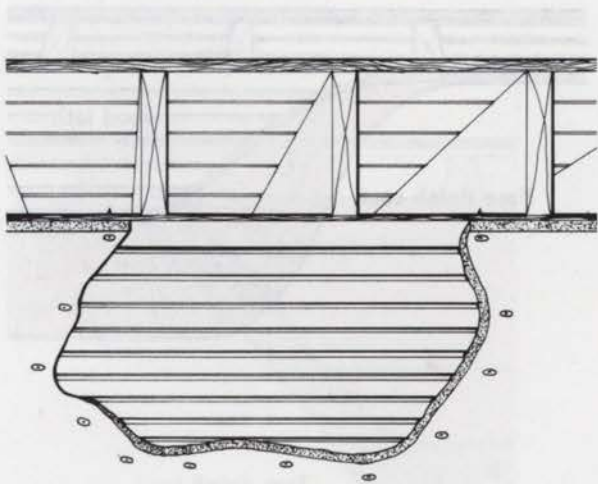
If the whole ceiling is sagging badly and about to let go, act quickly to shore or support the ceiling. Replastering can be done without the mess of removing the old plaster if metal lath is used. The plasterers must be sure to anchor the metal securely into the ceiling joists and stretch it tight.

A simpler method involves installing drywall over the existing ceiling, using 2½" drywall nails or screws. If the ceiling is very uneven, the use of 1x3" furring strips can straighten it out. However, old house owners may object to the tendency of drywall to show its seams when artificial lighting is flicked on. Old house owners might consider using blue board and a veneer plaster, as the gas lights will cast a strong "uplight."

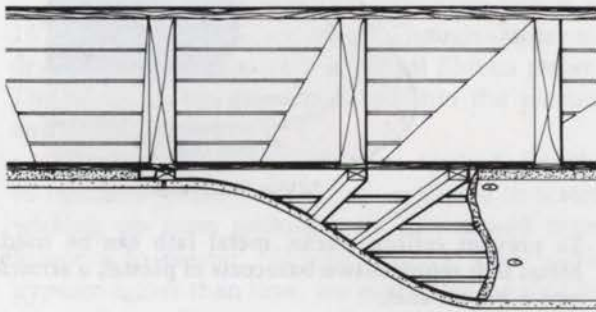


A plaster washer is used to reattach loose plaster to wood lath when the keys have broken off.

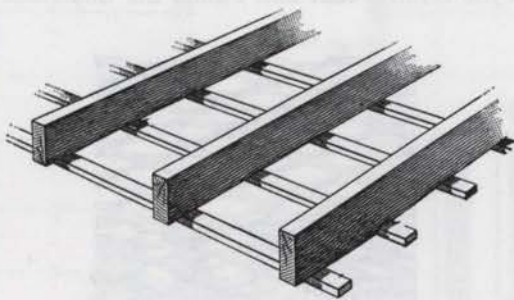
<sup>2</sup>Old House Journal, Oct. 1980, Nov. 1983, Dec. 1983.



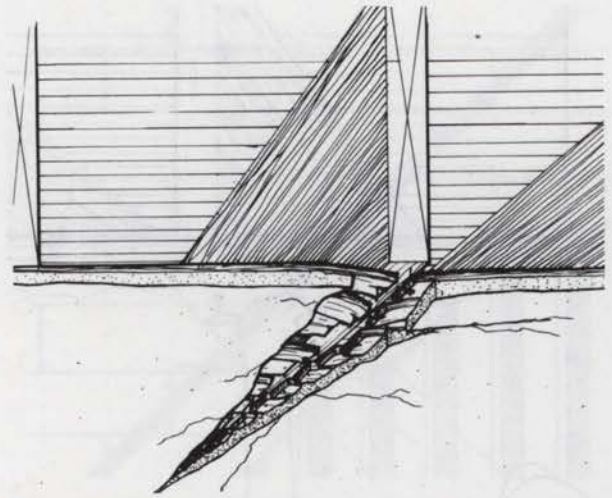
For missing ceiling plaster, anchor adjacent plaster with plaster washers and replaster the hole.



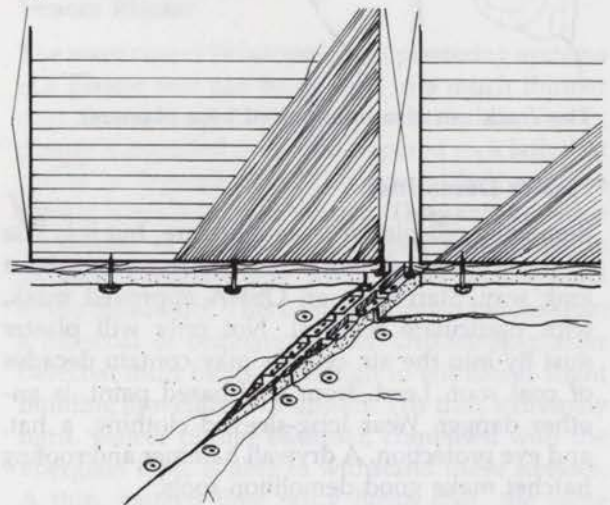
Instead of replastering, drywall or veneer plaster can be installed over the old plaster. Use furring strips where plaster is missing.



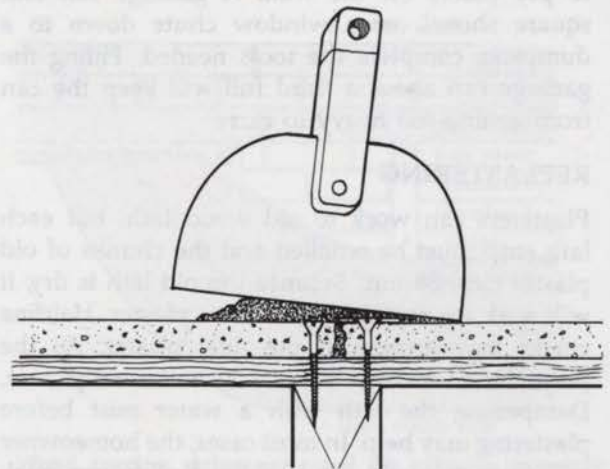
If the ceiling is badly out of level, cross-furring may be needed. Remove the existing lath and use furring strips at right angles to the joists.



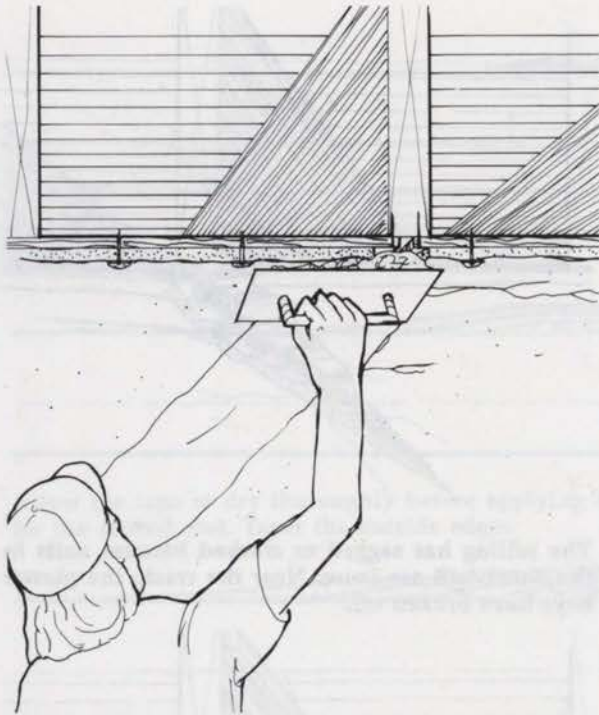
The ceiling has sagged or cracked because nails in the wood lath are loose. Near the crack, the plaster keys have broken off.



New lath nails secure the loose wood lath. Plaster washers are used around the crack wherever the plaster has sagged.



Apply joint compound over the plaster washer, but angle the blade to avoid ridges.



The crack can also be repaired by a plasterer.

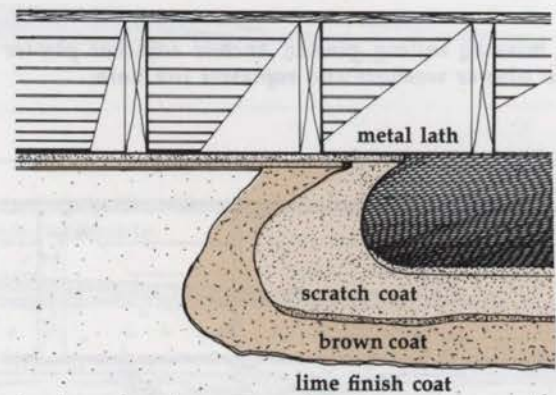
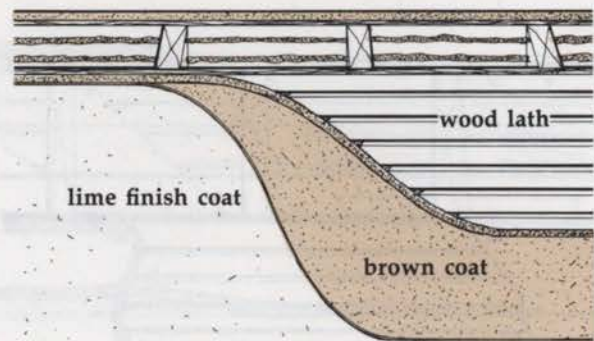
### Plaster Demolition

Removing old plaster is a nightmare, but it is one of those mindless jobs where enthusiasm goes a long way. Start with an OSHA approved mask, with particulate removal. Not only will plaster dust fly into the air, ceilings may contain decades of coal soot. Lead, from lead-based paint, is another danger. Wear long-sleeved clothing, a hat, and eye protection. A drywall hammer and roofing hatchet make good demolition tools.

If plaster in adjacent rooms is still in good condition, do not pound on the walls. Use a small trowel or pry bar and work it behind the plaster to pry pieces off the wall. A garbage can and square shovel, or a window chute down to a dumpster, complete the tools needed. Filling the garbage can about a third full will keep the can from getting too heavy to carry.

### REPLASTERING

Plasterers can work to old wood lath, but each lath strip must be renailed and the chunks of old plaster cleaned out. Because the old lath is dry, it will soak up moisture from new plaster. Hairline cracks may appear in the new plaster. As the plaster and lath dry, these cracks will usually close. Dampening the lath with a water mist before plastering may help. In most cases, the homeowner will want to avoid the likelihood of future crack filling, especially on the ceiling.

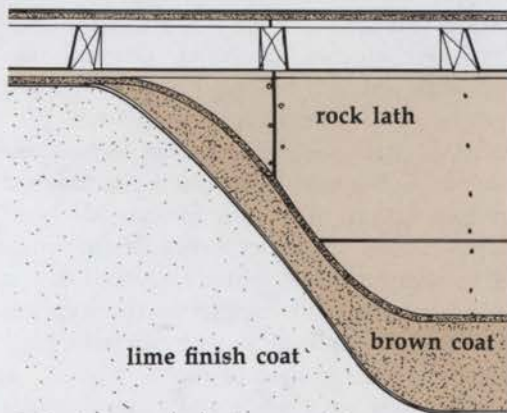


To prevent ceiling cracks, metal lath can be used. Metal lath requires two basecoats of plaster, a *scratch* and a *brown* coat.

An alternative to using the old wood lath is to install a different lathing system. *Metal lath* is the most expensive, and the most reliable modern lath. This is because it uses three coats of wet plaster to form a solid, monolithic unit with the lath. The first coat, called a *scratch* coat, keys into the metal lath. The second, or *brown* coat, bonds to the scratch coat and builds the thickness. The



In metal lath, plaster forms small keys.



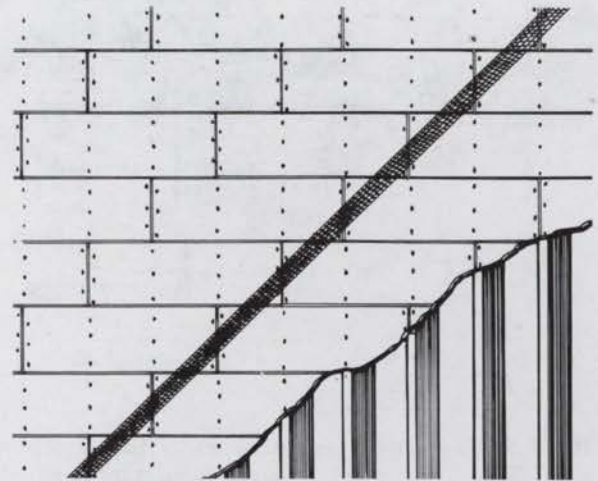
Rock lath panels provide a stable base for plaster brown coat. The rock lath takes the place of the scratch coat used in metal lath assemblies. The very thin finish coat, made of lime putty and gauging, is the final coat for most plastered walls.

Another system uses rock lath. Rock lath is a 16" by 36", gypsum-core panel. Though similar to drywall, it is covered with a special fibrous paper. The fibers in the paper pull out into the plaster and anchor it securely.

Old lime plasters were often applied directly to masonry walls. Wind-driven moisture or water wicking up from ground level can spread from masonry to plaster. Modern plasters, made with gypsum rather than lime, are especially vulnerable to moisture. Plaster manufacturers now recommend using furring channel against masonry walls. This creates a dead air space that prevents moisture transfer.



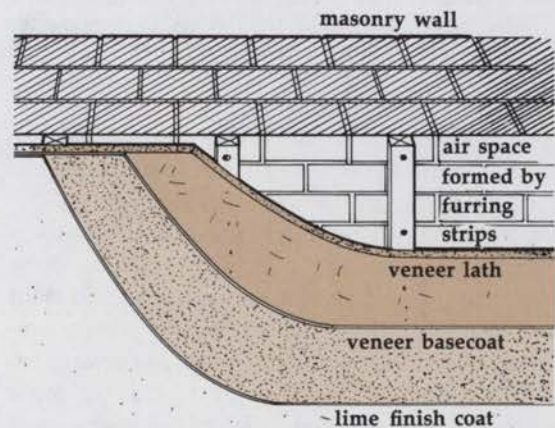
Rock lath on ceilings should use staggered joints. Fiberglass tape or metal lath strips reinforce the butted ends.



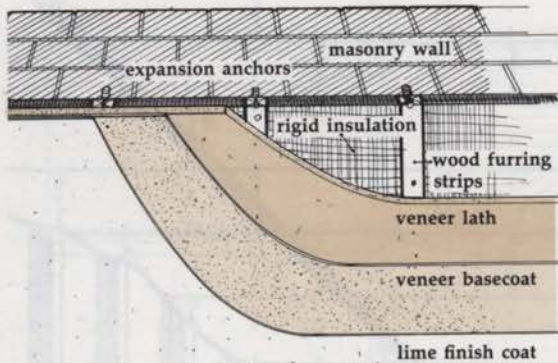
An alternate nailing pattern for applying rock lath to ceilings and walls is shown here. The diagonal strip of metal lath is optional.

### Veneer Plaster

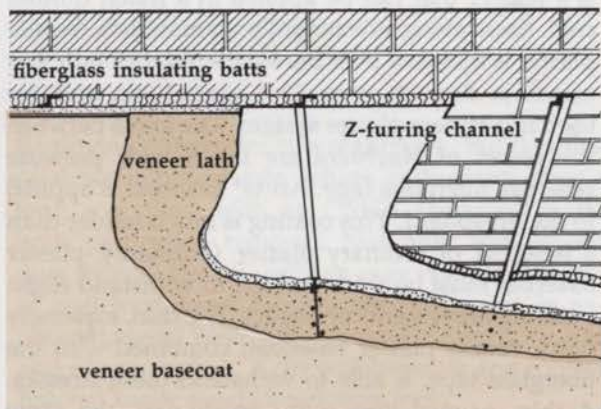
The most recent development in plastering systems is a plaster that can be applied in a much thinner coat, thus saving substantially on materials. Veneer plaster is installed over blue-papered rock lath that comes in drywall sizes. This special lath *must* be used in a veneer plaster system. The joints between the pieces of *blueboard* are taped with pressure sensitive fiberglass tape. An 1/8" basecoat is applied to the blueboard. This coating is much harder than a basecoat of ordinary plaster. Ordinarily, plaster basecoat must be thick enough to withstand slight building movements or impact. The thin, extremely hard, veneer plaster basecoat, combined with the fiberglass tape, is able to withstand these stresses. A thin, gauged lime putty finish coat, the same finish coat used with regular plaster, covers the veneer basecoat. The veneer system looks like conventional plaster when the job is complete.



Wood furring strips are used on exterior masonry walls. The furring strips are nailed with a powder activated tool.



Wood furring strips are anchored to the masonry wall. Rigid extruded polystyrene insulation is glued to the wall. A veneer plaster system is then used.



Metal furring channel and compatible fiber batts can also be used with veneer systems. Veneer lath and plaster is thinner than ordinary plaster. In most cases, it will be possible to add insulation to a masonry wall if a veneer system is used.

The thinner profile of the veneer system has an added benefit, especially for owners of old masonry houses. Insulation can be installed between the pieces of furring channel used to attach blueboard to masonry walls. This can be done without having to furr out the window and door jambs. The insulation plus the veneer plaster system will result in the same thickness as the original plaster. Occupants in the rooms will be more comfortable because they will not be losing heat to cold wall surfaces.

## MODERN PLASTER SYSTEMS

In the 1950's, drywall began to replace plaster as the most commonly used wall finish in residential construction. When it was introduced, drywall was called plasterboard, to call attention to characteristics that were similar to plaster. Drywall was easier to install and did not require the extended drying period needed in "wet wall" plaster.

Drywall is made of gypsum, just as modern wet plaster is. Compressed gypsum is sandwiched between two layers of paper. Special kinds of drywall have other ingredients besides gypsum. Moisture resistant drywall, usually covered with a green facing paper, adds asphalt to the gypsum core. Fire-rated drywall adds glass fibers to bind the gypsum together in case of fire.

Drywall panels are 4' wide and come in many different lengths. The most common lengths are 8', 10', and 12'. Some suppliers also provide 6', 7', and 16' panels. The ends of the panels are square-cut, exposing the gypsum core. The long sides of drywall panels have tapered edges. The paper wraps around the edges to provide strength when nailing near the edge. The tapered edge is important because it allows the tape and joint compound to fit into a valley created for the seams where panels join. If the panels are joined end to end, seams are harder to hide.

Drywall can be installed in either single or double layers. Several alternatives can improve the look of a single-layer system. Adhesive can be applied to the framing members. Screws can be used instead of nails. (Screws are less likely to pop.) Drywall panels can be installed perpendicular to the framing members. This is especially important on ceilings. Because ceilings are vulnerable to sagging, the use of thicker  $\frac{5}{8}$ " drywall is recommended where a single-layer of drywall is used.

For an even better looking finished wall surface, two layers of drywall can be applied to the wall. Double-layer applications transmit less sound, have fewer nail pops, and result in smoother looking walls. The top layer is glued to the first layer with drywall adhesive. Because of the glue, the top layer requires fewer nails. In houses that had been plastered, a double-layer system or furring strips may be needed to duplicate the thickness of the original plaster wall.

For further reading:

McKee, Harley, *Introduction to Early American Masonry: Stone, Brick, Mortar, and Plaster*, National Trust for Historic Preservation and Columbia University, 1973