

FW4.34 :
no. 4



FRESCO PAINTING

A CIRCULAR PRESENTING THE TECHNIQUE
OF FRESCO PAINTING, INCLUDING PRE-
PARATION OF THE WALLS, MIXING AND AP-
PLICATION OF THE MORTAR, PREPARATION
OF CARTOONS, GRINDING OF PIGMENT AND
NOTES ON PAINTING.



W. P. A. Technical Series
Art Circular No. 4

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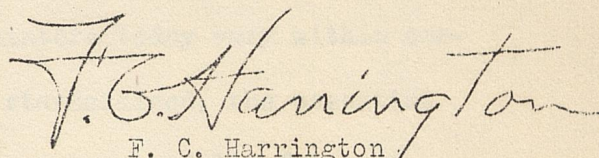
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FOREWORD

This manual is issued in response to an increasing number of requests from artists and art teachers employed on Statewide Art Projects throughout the country for technical information on fresco painting.

Acknowledgement is made of the suggestions offered during the preparation of this manual by Mr. Alfred Crimi, Mr. Rutherford Gettens, Mr. Lewis Rubenstein and artists of the New York City WPA Art Project.

A handwritten signature in cursive script that reads "F. C. Harrington". The signature is written in dark ink and is positioned above the printed name and title.

F. C. Harrington
Commissioner of
Work Projects

The decline in the use of fresco for mural decoration may be attributed to many causes. Important among these was a fundamental technical innovation introduced by the Flemish and Dutch painters and carried into Italy by the itinerant artists of the 15th century. These painters ground their dry color in linseed oil and painted on linen or wood panels instead of plaster.

The revival of fresco painting today and the increasing use of this medium is the result of the trend toward functionalism. The plastered wall is architecturally a part of the building as differentiated from the mural painted on canvas and applied to the wall. Certain myths, such as the belief commonly held that fresco will not survive in a cold or damp climate, have been disproved by research and demonstration. Chemical impurities in the atmosphere of industrial cities will not damage a fresco as much as an unvarnished oil painting.

While the methods used by painters today vary within certain limits, and details are not standardized, the essential principles remain unchanged and must be carefully followed.

GENERAL DEFINITION

The word "fresco" in Italian means 'fresh' and refers to the fresh plaster applied to the wall. When the painting is done on wet plaster it is called 'al fresco' and when done after the plaster is dry it is called "al secco". These techniques which both imply the use of dry color ground in water on a sand (or marble dust) and lime plaster, should not be confused with Tempera painting which is done upon a wall previously surfaced with a thin coat of burnt gypsum (plaster of paris). In Tempera painting, dry color is mixed with a vehicle such as an emulsion of egg yolk, egg white and boiled linseed oil, or casein. Research shows that the earliest so-called 'frescos' of India, China, and Asia were in reality Tempera paintings, and lime plaster was not used in Egypt until Roman times. Mr. Rutherford Gettens of the Fogg Museum in Boston who has made extensive analytical studies of the materials used in ancient wall paintings in Afghanistan and Chinese Turkestan as well as those of India, tells us that "The supporting material on which the paintings were done is clay, liberally reinforced and bound with vegetable fibre, chiefly straw and grass. The pigment appears to have been applied directly to a thin white layer of burnt gypsum which was laid over the smooth clay surface. The binding medium is animal glue, the traditional Tempera of the East."

True fresco or fresco buono was often employed by the Romans in their Pompeian dwellings and was in general practice throughout the Byzantine and Renaissance periods.

CHEMICAL PROCESS

Limestone (calcium carbonate) consists of carbonic acid chemically united with lime. When burned in the kiln the heat causes the carbonic acid gas and water to be expelled, reducing the calcium carbonate to calcium oxide or pure lime. When slaked by the addition of water, it becomes calcium hydroxide. This is used as the binder in the mortar and when exposed to the air in a thin surface film gradually re-absorbs carbonic acid gas present in the atmosphere and is returned to its original state as calcium carbonate.

Contrary to the general conception regarding fresco painting, the color penetrates the plaster but slightly when applied with the brush but mixes with the calcium hydroxide present on the surface of the wet plaster. Consequently as the action of the air affects the calcium hydroxide, the color is locked up or petrified as part of the resulting limeskin. This hard moisture proof surface (calcium carbonate) is inert to further chemical change.

WALLS SUITABLE FOR FRESCO

Fresco may be applied to any wall that is structurally sound, dry and free from gypsum or other chemical impurities which will cause a white efflorescence or 'bloom' to appear on the surface. Suitable walls are built of stone, brick or hollow tile.

DAMP WALLS

Plaster will not adhere for any length of time to a damp wall. Consequently the dryness of the wall particularly in wet weather must be determined at the outset. If a wall cannot be made completely damp proof, a solution to the problem may be the construction of an inner wall allowing an adequate air space between the two walls. In some cases it may be more practical to execute the fresco on specially constructed reinforced wood or steel frames (see page 21) which are secured to the wall and which provide the safeguard of an air space.

EFFLORESCENCE

A white efflorescence can frequently be observed on newly constructed walls particularly when built of brick. This is caused by the presence of gypsum, salt, and other chemical contents of the brick itself. Such a wall is unsuitable for fresco painting and special remedies must be used as this 'bloom' will work through any plaster and cause spots to appear. Alfred Crimi takes the precaution of spreading a layer of asphalt on the wall even when efflorescence is not discernible and Max Doerner recalls the experience of two artists with this troublesome problem. One coated the wall with a mixture of tar and sand, while the other used asphalted felt (probably roofing material). In both cases successful results were obtained.

PREPARATION OF THE WALL

Every trace of plaster must be removed and the surface of the wall itself exposed to the air for some time. Old walls may prove to be of uneven surface and this condition should be corrected by chipping away the protruding or bulging portions. This will reduce the surface to a general level and avoid overloading depressed areas in applying the first coat of mortar and risking consequent cracks. In the case of very uneven walls the "rough cast" may be applied in two coats, taking care to allow the first to dry thoroughly before laying up the second.

In order to provide a good grip or bonding key for the first coat of mortar, the wall must be picked carefully with a cold chisel or sharp tool. This will roughen and pit the wall surface and provide many small cavities which when filled will help to lock the rough coat to the wall. In the case of a brick wall the old mortar must be picked out between the bricks to the depth of a half inch to an inch. Preparatory to wetting the wall it should be vigorously scrubbed with a wire brush to remove any loosened particles.

Many fresco painters reinforce the first coat of mortar with metal lath which is pressed into the wet surface and secured to the wall by means of tighar bolts. (See Page 8). Diego Rivera treats every wall as an individual problem and resorts to various means of insuring a good bond. His varied wall constructions designed for differing conditions are planned to insure absolute permanency and can be

studied with advantage. (See pages 19 and 20).

PLASTER

Slaked lime, sand and/or marble dust and water are combined in the preparation of the several coats of plaster necessary in building up the wall surface. The Byzantine and Renaissance painters strengthened the first coat with a small percentage of calves' hair, oakum, straw or hemp. Most fresco painters today are using goat's hair, calves' hair, or cocoanut fibre cut to two inch lengths which has been previously well soaked in lime paste.

The use of sand or marble dust in the final coat determines not only the texture of the surface but also its whiteness and light reflecting qualities. A mixture of fine sand and lime has a granular texture and 'depth' which is very pleasing to the eye. Some painters prefer the grayish tone obtained with sand to the smooth brilliant white of marble dust and lime. A compromise is, of course, a mixture of both sand and marble dust.

INGREDIENTS

Lime

Limestone is an organic rock. Variations in the color of the stone are due to the presence in small quantity of minerals such as iron oxide or magnesium. When limestone is burned in a kiln it is reduced to a strong alkaline earth (calcium oxide) known as calcined lime, quick lime, or caustic lime.

Lime is of three types; heavy lime, hydraulic lime, and cement. The two latter are unsuitable for fresco painting and contain a large proportion of clay and silica which causes the mortar to dry very rapidly. Only heavy lime known as plasterer's finishing lime can be used and its purity and freedom from gypsum should be ascertained by chemical test.

The presence of gypsum in the plaster will cause efflorescence and result in cracks appearing in the finished wall.

INGREDIENTS

Sand

The best sand for use in fresco painting is a clean white quartz sand found in the beds of fresh water streams and rivers. Salt water sand is unsuitable for fresco because it contains injurious mineral salts including salt-petre which cause efflorescence. It is also unsuitable because the particles are round instead of sharp and gritty and consequently will not bind well in the plaster.

In preparing the river sand for use it must be thoroughly and repeatedly washed in order to eliminate every particle of extraneous matter such as clay and humus. It is important that the sand be dried before use because the first mixing of lime and sand is made without water (see page 9), and also because all measuring of quantity is usually done by volume. Sand should be sifted for grade and uniformity of size and boxed as coarse, medium, fine.

PROPORTIONS

The following is typical of the variation in proportion of ingredients recommended by different authorities. Every artist will determine his preference through experiment. All measurements are by volume.

	AUTHORITY	SAND OR MARBLE DUST	LIME
<u>FIRST COAT</u> (Roughcast)	Doerner	3 (sand)	1
	St. Hubert	3 (sand)	1
	Hale	2 (sand)	1
	Rivera	2 (marble) (dust)	1
	Crimi	2 (sand)	1
<u>SECOND COAT</u> (Brown Coat)	Doerner	2 (sand and marble dust)	1
	St. Hubert	2 (sand)	1
	Hale	2 (sand)	1
	Rivera	2 (marble dust)	1
	Crimi	2 (sand)	1
<u>FINISH COAT</u> (Intonaco)	Doerner	1 (sand and marble dust)	1
	St. Hubert	2 (sand)	1
	Hale	8 (sand)	5
	Rivera	1 (marble dust)	1
	Crimi	2 (sand and marble dust)	1
	Orozco	1½ (sand)	1

In the first coat a coarse grade of sand or marble dust is used and a finer grade is used in each succeeding coat.

Brick and hollow tile walls dry unevenly due to variations in manufacture. This will cause the various plaster coats when applied to do likewise. A method of overcoming this, endorsed by the fresco painters, Alfred Crimi and Jose Guttierrez, is to mix a handful of non-waterproof cement into each bucketful of the mortar used in the first coat. This will tend to even up the drying of the wall base. If metal lathe is used in the first coat, the addition of this small quantity of cement will also improve the grip of the mortar on the metal.

PORTABLE PANELS

In the construction of portable panels Diego Rivera, the Mexican muralist, uses a preliminary cement coat in order to build up a primary surface, before applying the others.

Into this while still wet metal lath is partially pressed. Galvanized metal lath or wire cloth is reliable and is recommended for permanent work. However ungalvanized metal lath is less expensive and some artists report that they have used it successfully after taking the precaution to coat it thoroughly with asphalt to prevent rusting. A formula for the cement coat is given in an article appearing in the Architectural Forum in January, 1934, together with the drawings reproduced on pages 19 and 20 as follows;

<u>CEMENT COAT</u>	Atlas Cement	Marble Dust	Lime	Goat Hair
	(non-waterproof)			
	33%	33%	33%	1%

Jose Gutierrez however advises a rough primary surface coat of 2 parts marble dust (coarse) and one part composed of one half white non-waterproof cement and one half lime. He points out that this coat should be wet down several times during the drying period for the reason that cement sets more quickly than lime. The wetting retards the setting of the cement and prevents the fine hair line cracks that will appear on the surface if the lime and cement are allowed different drying rates. A full week or more should elapse after the cement coat appears to be dry, because cement although setting rapidly retains moisture longer than ordinary mortar, and has a tendency to "throw up" water to the surface and so loosen the rough-cast if it has been applied too soon.

SLAKING THE LIME

Caustic lime when combined with water undergoes a chemical change and becomes calcium hydroxide or slaked lime. Water is poured onto the lime which is then thoroughly mixed and raked with a hoe. A large wooden trough is used for this purpose. During the process much heat and water is given off accompanied by a violent hissing sound. The mixture should be reduced to a soft creamy consistency. Small lumps of unslaked lime will be found and these must be removed by straining and on no

account should they be crushed up and incorporated in the lime paste. This is most important because such fragments will continue to slake in the mixed plaster and cause white spots to appear on the surface of the wall. Lime is fully slaked when it has cooled and become inert and is then referred to as lime putty.

LIME PUTTY

Until the lime putty has aged properly and acquired body, it is unsatisfactory for fresco use. Most painters agree that lime putty should age in a pit for at least six months and preferably two years. The older the lime the better its consistency and consequently the plaster surface upon which the painting is done. Lime placed in a pit for ageing should be covered with a thick layer of sand.

MIXING THE MORTAR

Lime putty and sand must first be mixed together without the addition of water. This insures the sand particles being brought in direct contact and coated with the lime. A flat trough and hoe is used for the first mixing. The grade of sand varies from coarse sand for the rough cast to very fine sand for the finish coat. When the first mixing is finished a quantity is placed on a stone or marble slab to be worked together with a trowel adding as little water as possible. The more water is added the weaker will be the binding quality of the plaster and its grip upon the wall. It is the continuous mixing rather than the water that produces the consistency so desirable for fresco painting and which is variously described as, supple, unctuous, pliable, buttery, like ointment, and stiff enough to stand up when dropped from the trowel.

Opinions differ on the advisability of mixing mortar in quantity in advance. Doerner recommends mixing only enough for one or two days work and points out that if stored for a long time a limeskin will form on the surface, necessitating careful removal and reworking of the mortar. However, most artists agree today that it can be kept in a cool dark room for several weeks in a tub or barrel with water covering the surface of the lime and a damp tarpaulin covering the tub.

WETTING THE WALL

Before applying the first coat of mortar the wall must be evenly and thoroughly soaked with water. A dry wall suitable for fresco painting is naturally hygroscopic and will absorb lime water from the wet plaster which thus robbed of its binder will fall off. Consequently the wetting should be repeated until the wall is completely saturated. In the case of brick walls it may be noticed that some bricks absorb water more quickly than others. This is due to differences of manufacture and baking at higher temperatures. Occasionally bricks will be found which contain 'clinker' caused by impurities in the clay fusing into a hard glazed substance. As these bricks will not absorb water at all, they must be removed and replaced.

APPLICATION OF MORTAR

There is less likelihood of plaster cracks developing if the wall surface is built up with several thin coats. For this reason, three coats of mortar are necessary.

FIRST COAT (Roughcast)

The first coat of mortar is traditionally known as the roughcast as it is literally

thrown on the wall by means of a trowel. In doing so the mortar splatters and air pockets will be avoided. This coat should not exceed 1/2" in thickness and the surface should be roughened or scratched to provide a good grip for the next coat.

SECOND COAT

(Equalizer)

(Brown Coat)

The first coat will probably dry unevenly and if the second is laid up too soon it will be inclined to fall off in places. The safest procedure is to wait until the first coat is thoroughly dry all over then wet it down evenly with an ordinary gardener's syringe and then apply the second coat. The surface should be levelled or equalized by means of a straightedge worked from bottom to top. The resulting surface is not to be trowelled smooth, but allowed to remain rough.

FINISH COAT

(Intonaco)

Only sufficient plaster for the days work is laid up, because all painting must stop as soon as surface hardening can be detected with the brush. This hardening, due to the gradual absorption by the plaster of carbonic acid gas from the air is noticeable, depending on the temperature and humidity, after 8-16 hours.

After wetting down a portion of the wall the plaster is applied as a thin coat, no more than 3/16"-1/4" in thickness. The finish coat is always applied to the wall from top to bottom to avoid paint dropping down on completed sections. As it begins to set it is smoothed with a wet plasterer's plane made of wood to bring the surface to the desired texture.

A finishing trowel is then used to perfect the joining of the fresh plaster to sections already completed. The surface should not be polished by putting water on the finishing trowel. Repeated trowelling of the intonaco should be avoided because this will bring the water and lime contained in the plaster to the surface prematurely and dilute the color when applied.

FINISH COAT
(Intonaco)

That portion of the finish coat which has not been painted on must be cut away with the trowel at the end of the day's work. The cutting should occur either on a contour line, at a change of tone, or in some dark portion where the join will not be noticeable. The edge of the plaster should be bevelled to provide a good bonding key for the fresh plaster to be added on the following day. When wetting the wall in preparation for plastering an additional section, care should be taken to wet not only the edges of the plaster applied on the previous day but also the surrounding area. This will prevent the plaster drying more rapidly at the joints which would otherwise be the case.

Guttierrez prefers to apply the finish coat in two separate and very thin layers when working in a dry warm atmosphere such as that of the average steam heated building. Both layers may be applied the same day. The second layer is put on while the first is still wet but already beginning to set. By another method the first layer is applied the evening before and floated. Then it is refloated the next morning before applying the final layer. The two layers will form a slightly thicker finish coat than usual with one layer, but will dry more slowly and provide valuable extra time for painting.

PATCHING

Sometimes it becomes necessary to remove a section of plaster that has been painted on but which has become loosened from the wall. In such cases the surrounding wall surface must be soaked with water, over for a wide area, otherwise the wall will absorb the water from the fresh plaster and it will fail to adhere firmly. When making such patches the fresh plaster should be very firmly pressed to the wall and the edges of the surrounding plaster.

PIGMENT

Dry pigment in powder form is ground in water for use in fresco painting. Only the best quality pigment should be used. Dry color sold by the vendor of commercial paint, will probably contain chemical impurities and should be avoided. The pigment must be lime proof, in other words not susceptible to change when mixed with lime. A chemical test to determine this is to place a sample of color in a solution of 30% sodium hydroxide and water. If it does not change its hue after twenty-four hours it can be considered safe. Doerner offers a simple test; a sample of pigment is shaken up with slaked lime and water and allowed to stand for several days. If no change in color is discernable the pigment is lime-proof.

COLORS

The following colors including all the iron oxide are considered safe:

Mars Yellow	Red Ochre
Yellow Ochre	Mars Violet
Golden Ochre	Terre Verte
Raw Sienna	Viridian (Trans. oxide of chromium)
Burnt Sienna	Cobalt Blue
Raw Umber	French Ultramarine
Burnt Umber	Ivory Black
Puzzuoli Red	Vine Black
Venetian Red	
Indian Red	

Blues

French ultramarine and cobalt blue should be applied with plenty of water and repeated coats, to build up intensity and transparency. If pigment is applied too thickly it will become unpleasantly opaque. French ultramarine should always be used with care. It is very powerful when mixed with lime and its intensity will af-

fect the values of the surrounding colors. When mixed with other colors to overcome this the effect is muddy and its beauty is lost. One method used to reduce this is to lay a preliminary light tone of yellow ochre over the area to be painted blue. Diego Rivera completely avoids the use of French ultramarine. On the other hand he uses a great deal of black, which can also be harsh and disturbing. Hale recommends as a substitute for black a mixture of ultramarine, mars violet and raw umber.

Cadmiums

Some artists claim to have used the cadmiums with success although they are inclined to set poorly.

Colors to Avoid

The chromes, the madders and vermillion.

Earth Reds

Application similar to the blues is necessary to avoid an opaque quality.

White

Although many formulas exist for the preparation of white in fresco painting, pure lime putty cannot be improved upon. Well seasoned buttery pit lime is medium and color combined and requires no preparation other than straining. It should be dried and ground in the same manner as the colored pigments, following Cenino Cennini's directions in his Libro del' Arte.

Mixing the Tones

Place a piece of heavy cellophane over the color sketch and bind the edges with scotch tape. Select the several principal tones which occur repeatedly throughout the sketch and place identifying numbers on the cellophane with ink. It will be found practical to mix the various tones that require white with dry pigment in quantity in advance of the grinding. This is necessary because the powder changes color when water is added and does not return to its original tone until dry. After each numbered tone is matched, the mixture of dry pigment should be placed in a screw topped glass jar, labelled and numbered correspondingly. It will greatly facilitate mixing additional quantities if the labels also state the colors and approximate

proportions used in obtaining the tone.

The principal tones are now ready for grinding in small quantities for daily use.

LIME WATER

Lime water is used as a vehicle for the color only under certain circumstances. It acts as a binder and improves the adhesive property of such difficult colors as venetian red or lutramarine. It should only be used as a last resort as it detracts from the essential luminous quality of the painting. To prepare it, shake up some lime in a jar of distilled water and allow it to stand until the lime has settled to the bottom. When the water is completely clear it should be poured off and bottled for use.

GRINDING THE COLOR

First of all the primary tones previously mixed in dry form are ground, placed in jars with a very small quantity of water covering the color, and capped with screw tops. Second, the pure unmixed raw pigments including white are ground and put up in the same way. The white enamel palette upon which the final tones are mixed with the brush while painting, is replenished from this supply of prepared mixed tones and raw pigment. The dry color is ground with distilled water, to the consistency of a thick cream or paste. The grinding is done with a flat-bottomed glass muller on a sheet of ground glass or a slab of marble. A palette knife is used to pile up the color and the muller grasped in one hand is rotated continuously in increasingly wide circles until the color is spread thinly over a large area. Then it is heaped up again with the palette knife and this process repeated many times. When the color is thoroughly ground it is scraped up and placed in airtight glass jars and appropriately labelled. In this way the color will keep for months.

CARTOONSPreparation

The small finished sketch having been drawn to a stated scale, such as an inch to the foot, it is enlarged on paper as a cartoon equal in size to the wall area to be painted. A sheet of tracing paper or cellophane is placed over the sketch and on this are drawn evenly spaced vertical and horizontal lines which divide the sketch into small squares. The same number of lines are drawn upon the cartoon resulting in an equal number of squares proportionately larger. The design is then drawn on the cartoon by reproducing the linear content of each square in the sketch in the corresponding square on the cartoon. The cartoon may then be mounted in place upon the wall so that its design may be observed in actual relation to its architectural setting and refinements of drawing and other improvements made.

The cartoon remains from start to finish of the job a reference document essential to the painter working rapidly on wet plaster. Only that section of the whole which is to be painted in one day is pounced upon the freshly laid plaster. Consequently to preserve the cartoon proper a duplicate is made for use on the second coat and from which a section is cut off daily and used on the finish coat. This duplicate is automatically made by placing tracing paper (glassine paper is excellent having a waxy surface which will not stick when applied to the wet plaster) on the face or the back of the cartoon and with a perforating wheel or etching needly perforating the design through both cartoon and tracing paper. The vertical and horizontal lines should also be perforated.

Transferring to the Wall

Before commencing to lay the finish coat the perforated tracing paper should be placed on the wall and the entire design pounced upon the second coat. This is done by means of a small bag of cheesecloth or cotton filled with dry pigment. After removing paper the faintly discernible design should be lined up and strengthened with a brush using color thinned with water. When the plaster is laid up for the first

Transferring to the Wall

day's work a portion of this pounced area will be covered up. A section of the perforated tracing corresponding to that part of the design covered up by the fresh plaster is not cut off, and using the uncovered portion and the vertical horizontal lines as a guide, it is laid in place and pounced. Many fresco painters prefer the incision method. A tracing is made from the cartoon and the outlines pressed through the paper with a stylus. An incised line remains on the intonaco throughout the painting. This method allows of greater freedom and directness.

USE OF PIGMENT

It should be remembered that too thick a use of pigment will result in stopping the pores of the plaster, and prevent the necessary penetration of the air. Thus there is no formation of limeskin on the surface and the color when dry may be easily brushed off.

TIME TO PAINT

A certain length of time must elapse after the finish coat is laid up before commencing to paint. The plaster should be allowed to dry until it feels hard to the touch and no longer takes the imprint of the finger. After this, painting may continue for from 8 - 16 hours according to the temperature and humidity of the air. As the plaster gradually sets surface crystalization takes place. This chemical change can be detected quickly by a certain dragging of the brush. This is a signal to stop work. If painting continues after this point, unfortunate results may be expected, colors will not dry as anticipated and may be easily brushed off. Uncompleted sections of plaster must be cut away and fresh plaster laid up after first wetting the wall and the edges of the completed portion. (See page 12).

BRUSHES

Avoid the use of a stiff brush that will disturb the surface of the plaster. This surface is more easily disturbed when the plaster is freshly laid at the beginning of the day's work. If at first the brush should dig into the fresh plaster, such

places may be easily troweled smooth. Brushes must have resilience and hold plenty of water. Round brushes are suitable when the color is applied by a technique, sometimes called "hatching," involving many short strokes made with the tip of the brush. For broader work, the striper brush of soft bristle cut on a bevel is preferable. Sable brushes hold more water and so speed up the work. Have at hand a pail of clean water to rinse the brush frequently. Lime water may be used to increase adhesion of the colors. Before starting to work the brush is well pressed out between the fingers and only the tip of it is used to take up color. Brushes must be cleaned at once at conclusion of the day's work otherwise the lime will cause them to become hard.

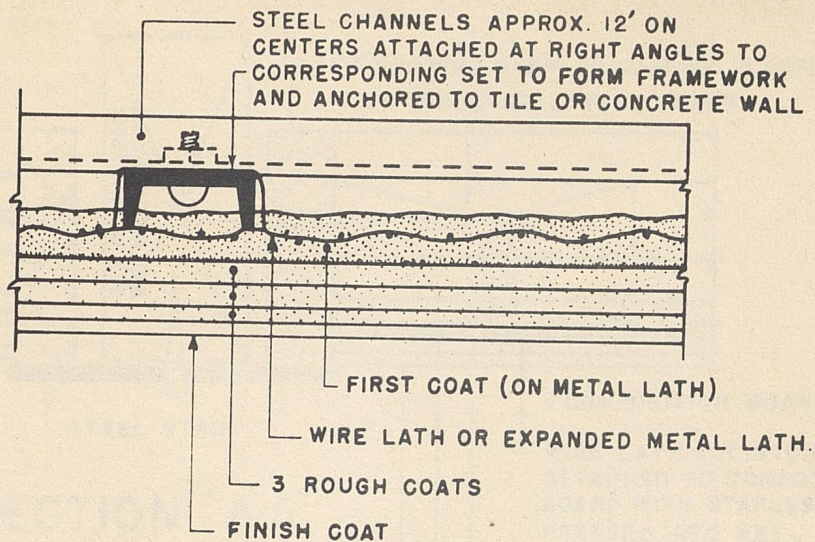
Methods of Painting

Fresco may be painted with or without the use of white. When white is eliminated from the palette, the color of the intonaco is the lightest tone in the painting, and advantage must be taken of it in much the same way as the white paper in a water-color drawing. Depth and intensity is gained by working in clear washes of color from light to dark. In this way, a richness and luminosity of tone is built up with a result quite unlike that obtained if white is introduced. While the limitations of this method tend to produce large, simple flat areas, and a high degree of modelling is not possible, a fine harmony of earth tones is obtained which lends itself well to certain types of decoration. This technique of painting in clear washes permits the wall itself to be actually seen through the color, and is especially suitable if the areas surrounding the fresco are of stone.

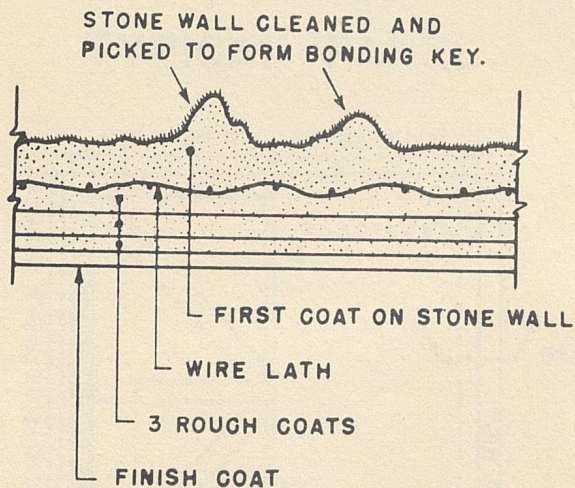
When white is introduced to the palette the key is heightened and the range of tone increased immeasurably. The opacity of tone resulting from the use of white offers unlimited possibilities for modelling and color subtlety. The first step is to lay in the outlines with ochre and sicna, venetian red, or Terre Vert and umber. The main areas of dark are then laid in with a primary tone. Flesh is usually underpainted with a light greenish-blue tone into which are worked the warm yellows and reds, thereby developing form and modelling. The final step consists of strengthening

the darks and setting in the highlights. It should be remembered that the more white is used in the mixing of the color, the lighter will it become when dry, and due allowance for this must be made. A highlight which will appear to be properly keyed to the surrounding area at the end of a days work will continue to grow lighter and eventually may proclaim itself unpleasantly.

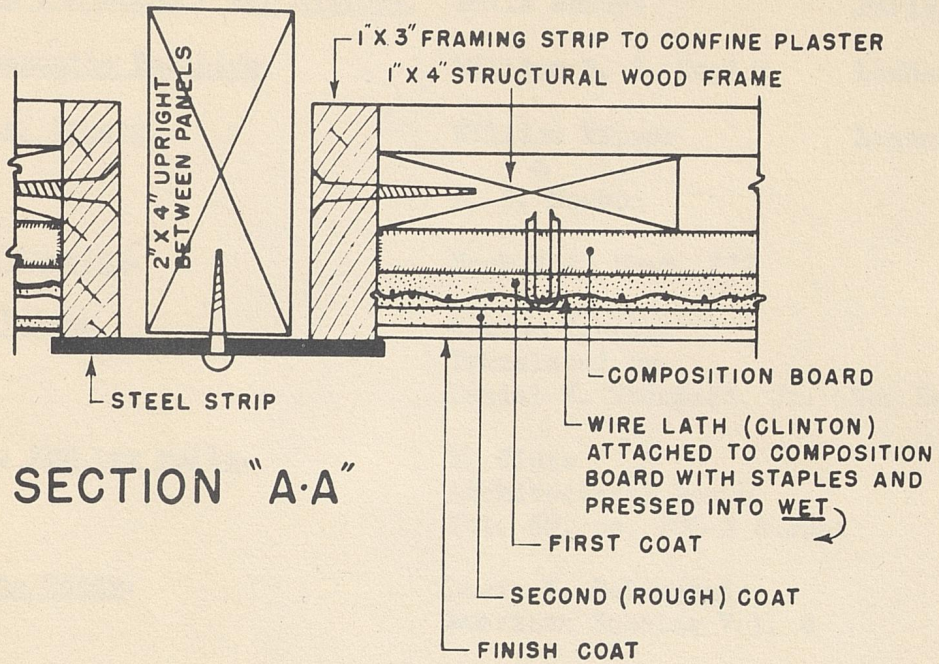
WALL CONSTRUCTION BY DIEGO RIVERA AT DETROIT INSTITUTE OF ART AND ROCKEFELLER CENTER, N.Y.



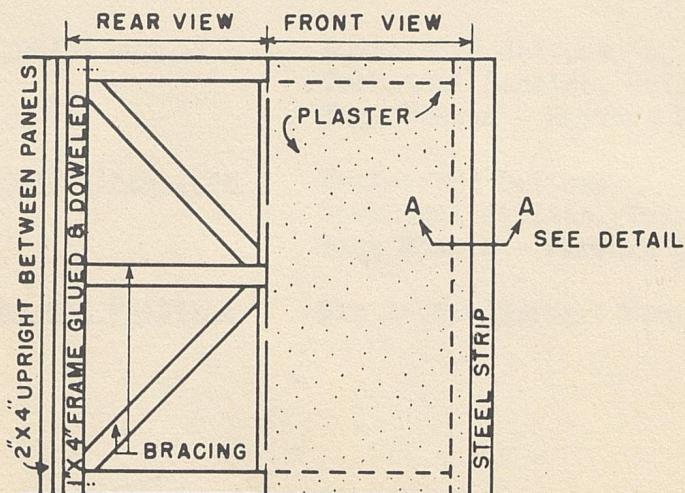
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REMOVABLE PANELS BY DIEGO RIVERA AT NEW WORKERS SCHOOL NEW YORK



TYPICAL PANEL



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