Worksheet

CLAYTEC®
Building with Clay

Clay plasters

Clay plasters

Plasters made from clay are THE ecological wall covering. They stand for a pleasant indoor climate and natural aesthetics. At the same time, CLAYTEC clay plasters are modern, suitable for use with machines, and easy to work with. All of our products have been certified in accordance with the strict pollutant and emission criteria of the ECO-Institut, Cologne. The present worksheet provides a compact overview of how to use CLAYTEC clay plasters.

Examples of uses for coarse-grained clay plaster mortars (grain size ≥ 1 mm) include
Masonry with mortar pockets or deep grooves, masonry of clay blocks, pumice stones, primed coarse-grained concrete, laths, straw clay, historic clay plasters.

Examples of uses for fine-grained clay plaster mortars (grain size ≤ 1 mm) include
bonded masonry of precision blocks or elements, clay basecoat renders, cement, lime and gypsum plasters, clayboards, drywall construction panels.

Basics of product selection and processing

Earth-moist plaster is undried. Its delivery form in 1.0-t Big Bag is eco-friendly and very reasonably priced. This is only possible with clay; other plaster mortars would set too fast. The product can be used in certain plastering machines that consist of a mixer and mortar pump.

In winter, earth-moist goods must be stored so they are protected from freezing, otherwise workability during frost is impaired.

Depending on the weather, coarse clay colour plaster must be used within 2-4 weeks.

Dry plaster in a 1.0 t Big Bag or 25 kg bag can also be used in a plastering machine.

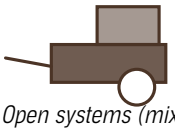
One particular feature of clay plasters is that they do not set without drying. This means that they can be left in machines and hoses overnight and at weekends. And because they can be dissolved in water, there is no mortar waste on the building site: any material that falls on the ground can simply be re-used.

Clay plaster coverages

Product	Delivery form	3	2	1.5	1	0.6	0.3	0.2	Application
Clay basecoat plaster with straw	1.0 t Big Bag, earth-moist	20.0	30.0	**40.0**	60.0				
	0.5 t Big Bag, earth-moist	10.0	15.0	**20.0**	30.0				
	1.0 t Big Bag, dry	20.8	31.3	**41.7**	62.5				
	25 kg bag	0.6	0.8	**1.1**	1.7				
Lightweight clay insulation plaster	0.9 t Big Bag, earth-moist	22.5	33.8	**45.0**	67.5				
	0.45 t Big Bag, earth-moist	11.3	17.0	**22.7**	34.0				
Clay plaster, mineral	1.0 t Big Bag, earth-moist			40.0	**60.0**	100.0			
	0.5 t Big Bag, earth-moist			20.0	**30.0**	50.0			
	30 kg bag			1.3	**2.0**	3.3			
SanReMo clay plaster (HW)	0.8 t Big Bag, dry				54.4	**90.7**	181.3		
	25 kg bag				1.7	**2.8**	5.7		
Coarse clay topcoat plaster	1.0 t Big Bag, earth-moist				**60.0**	100.0			
	0.5 t Big Bag, earth-moist				**30.0**	50.0			
	1.0 t Big Bag, dry				**62.5**	104.2			
	25 kg bag				**1.7**	2.8			
Coarse clay colour plaster	1.0 t Big Bag, earth-moist				**60.0**	100.0			
	0.5 t Big Bag, earth-moist				**30.0**	50.0			
Clay topcoat fine 06 without flax	800 kg Big Bag, dry						**181.3**	272.0	
	25 kg bag (06)						**5.7**	8.5	
	30 kg bag (flax)						**6.7**	10.0	
Clay filler	10 kg bucket								**20**

The **standard plater thicknesses** (in bold at the top of the yield table) should be observed. The lower limit for the plaster thickness refers to the minimum application necessary for a good technical result. The upper limit indicates the maximum thickness that is possible with the material, which should be tested in specific cases, depending on the substrate, by a work sample. **Ceilings should ideally be plastered with a thin layer. Planning and preparing the work**

You must always allow for drying times. Mechanical drying of the construction greatly reduces the drying time. Basecoat renders must always be dry enough to rule out any penetration of shrinkage cracks before the topcoat is applied. The clay plaster must be able to dry frost-free after its application. The surfaces of other parts of the building must be protected by masking etc. against contamination. Because clay plaster is water-soluble, the risk is lower than with other mortars. But clay mortars are not colourfast, so take care with surfaces that have any visible timber etc.



Open systems (mixer and mortar pump) are suitable for earth-moist products, e.g. PFT MAXIMIX and ZP3.

Closed systems (plastering machines) are only suitable for dry products, e.g. PFT G4.

Substrate preparation

Slits, holes and other defects are plastered over with a mortar that matches the substrate according to good construction practice, and reinforced if necessary.

The substrates must be stable, frost-free, dry, clean, sufficiently rough and absorbent. Movements and shrinkage must be prevented.

The building components to be plastered and any repairs must be absolutely dry; drying of the plaster must not be delayed by any residual moisture in the substrates. This is particularly true of concrete, bricks that have become wet through storage or unfinished building conditions, sand-lime bricks or autoclaved cellular concrete and slow-drying clay components such as inner layers of light clay. You must ensure that ground-level parts of walls are absolutely dry.

Permanently moist components that may thus become contaminated with salt cannot be plastered with clay mortar. One exception is the temporary application of clay mortars to desalinate substrates: these so-called 'sacrificial plasters' absorb the salt from the substrate and are then removed.

The substrate must be free from bleeding materials (e.g. nicotine). Soot-contaminated (= steeped in tar and soot) surfaces on old fireplaces and chimneys have to be sealed according to good construction practice before plastering.

Very alkaline substrates such as fresh concrete (and autoclaved cellular concrete, sand-lime bricks) must be treated with fluorosilicate if dark or bold-coloured clay designer plasters or paints are planned as a finish.

The suitability of the substrate and application thickness must always be checked by means of a sufficiently large work sample.

Two layers of clay plaster are required
- on substrates with defects and other recesses.
- on substrates with irregular absorption properties.
- if the mortar does not allow the necessary plaster thickness in one layer.
- if reinforcing elements have to be worked in.

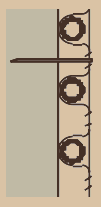
One layer of clay plaster is allowed
- on level, coarse-grip substrates with coarse-grained clay mortar.
- on level, fine-grip substrates with fine-grained clay mortar.

Laths

One plaster lath often used in clay constructions is reed matting St70 (CLAYTEC 34.001). When working on surfaces, the approx. 1 mm thick base wire is fixed into place using galvanised staples that are at least 16 mm long. The base wire should press the reed firmly against the substrate, in other words it should lie on top of the stems.

The spacing between staples is 5-7 cm. 'Rabitz' constructions can also be made from reed matting. The max. substructure spacing is 20 cm; the mesh is clipped into place with an additional 1.2-1.6 mm thick galvanised wire.

Laths are needed
- on smooth substrates.
- on timber elements and areas.
- for plaster adhesion that is largely independent of the substrate.



Stapling the reed matting with the base wire

Binding
The colourless deep penetrating primer and stabiliser (CLAYTEC 13.405 und 13.400) binds sandy old plasters and other substrates. It is also used in preparation for tiling, see below.

Deep penetrating primer and stabiliser

Priming
Substrates with less grip and/or poor absorption properties are prepared with a primer. The primer equalises the absorption properties of highly absorbent substrates or those with different absorption rates.

RED primer with a grain size of 0-1.6 mm (CLAYTEC 13.435 and 13.430) is used in preparation for coarse clay plasters.

YELLOW primer with a grain size of 0-1 mm (CLAYTEC 13.425 and 13.420) is used in preparation for fine clay plasters (grain size < 1 mm) and YOSIMA Clay designer plaster.

RED primer

YELLOW primer

Pre-wetting
Substrates can be moistened to bind dust and prolong the mortar's workability. Pre-wetting must be carried our sparingly with spray mist. Heavy watering leads to the accumulation of water in surface pores. This prevents the adhesive bond and unnecessarily delays drying.

Preparing the mortar and plaster application, use of plastering machines
The addition of water determines the working consistency, which as with other plaster mortars is in the range between stiff but malleable to paste-like. The mortar must not be too stiff during work because it would then not stick to the substrate enough. If the mortar is made up too thin, it contains too much mixing water, leading to shrinkage cracks during drying. The product sheets and bag labels contain further details of the amounts of mixing water.

If working manually, mortar can be made up with a trowel, motor agitator or rotary drum. The mortar must be thoroughly mixed. Prolonged and excessive preparation, however, can lead to shrinkage cracks.

CLAYTEC clay plaster mortars can be thrown on by hand with a trowel or applied with a spreader. They are usually used with plaster pumps and plastering machines. Earth-moist products are processed with a pug mill mixer plus mortar pump; dry products with the closed drum mixer (plastering machine, closed system). If working with plastering machines, the conveying ability must not be optimised at the expense of a very thin working consistency.

Our website www.claytec.de/service/maschinentechnik provides further help on the use of plastering machines. This is where you will find the contact data for all major plastering machine manufacturers with a **list of plastering machines for Claytec products** for each manufacturer. Please contact us if you require silo deliveries.

Following its application, the plaster is smoothed with the spreader or levelling board. The plaster is compacted by pressing down firmly whilst still in a malleable state, particularly after spraying with the plastering machine. This reduces the formation of possible shrinkage cracks and promotes firm setting.

Reinforcements

One special reinforcement for clay plaster is flax mesh (CLAYTEC 35.030, 35.035). It combines ideal ecological properties with reliable application safety and good working properties. Hessian (CLAYTEC 35.001) and glassfibre meshes (CLAYTEC 35.010) are also suitable. The mesh is always placed on the undercoat plaster whilst this is still wet and worked in immediately. Wooden boards or floats should be used on hessian; spreaders or similar tools can also be used on flax and glassfibre mesh.

Reinforcement fabrics are needed
- on mixed substrates.
- on soft substrates.
- if areas made up of abutted boards have to be reinforced.
- to bridge changes in materials.
- to absorb thermal stresses (ovens, wall panel heating).
- to stabilise edges.

Plastering tools and surfaces

A plasterer's normal tools are also suitable for clay plasters. Clay plaster surfaces are usually rubbed using a sanding board of sponge, felt, plastic or wood. The surface texture depends on the mortar grain and the tool used. The time of application also has a great effect on the surface texture (degree of dryness). The later the surface is rubbed, the finer it will become.

Clay plaster surfaces can also be smoothed with a trowel. CLAYTEC Japanese trowels are ideal tools for applying and smoothing.

Avoid air flows from radiators and draughts when applying and working the surface of thin clay plasters. These areas could otherwise dry at different speeds, leading to irregular surfaces.

Japanese clay plaster trowel

Plaster beading and edge protectors

Beading is fastened as usual with plaster attachment adhesive. The fastening points should be a little closer together than usual with gypsum plaster, roughly every 20 cm in the lower part of the wall (up to 1.0 m above the FF). Clay plaster edges and valleys are often rounded. We can offer Japanese edge and valley trowels, each in three different radii, for this purpose.

Japanese trowel for plaster valleys

Drying

Drying clay plasters depends to a large extent on the application thickness, the absorption properties of the substrate and the conditions on the building site (ventilation, weather, drying of the construction) because all mixing water has to be dried out of the material. The building period will not be prolonged with good drying: subsequent processing of a 1 cm thick layer of plaster on a highly absorbent substrate is possible after approx. one week in favourable conditions. 2-3 mm thick layers dry within approx. 24-48 hours. No setting takes place during the drying and hardening of clay mortar for which the water has to be retained in the structure over a longer period of time. Clay plasters can thus be dried mechanically better than other plasters. Excessive drying can lead to shrinkage cracks.

The Appendix **Notes on the correct drying of clay plasters** provides important information on how drying works and which machines can be used. It also contains the requirements of DIN 18550 on keeping a **record** for critical application cases.

Fast drying prevents the formation of mould. This has to be taken into account in particular with surfaces that are to receive no subsequent processing such as coarse clay colour plaster.

Information is also available in the text 'Clay plaster, indoor climate and mould' on our website (downloads page).

Subsequent processing

The clay plasters described here, with the exception of coarse clay colour plaster, have been produced for subsequent processing. They have been produced from pit clay that has only a roughly uniform colour. Mineral efflorescence (circular discolorations) are possible.

Clay filler (CLAYTEC 13.511) is applied to close the pores of clay topcoat fine ≤ 0.5 mm thick, multiple layers if necessary. The material can be sanded. This means that surfaces of quality level Q3 are possible. The surface is then coated with clay paint, which is usually applied by spraying in this case.

YOSIMA clay designer plaster is applied in a 2 mm thick layer. The products from this range have the colours of pure raw clays rather than being 'artificially' coloured. YOSIMA offers 140 shades and 8 surface variants.

YOSIMA colour clay surfacer is a very smooth coloured finish on clay topcoat fine, which should be pre-treated with WHITE primer. The application thickness is 0.1-0.2 mm

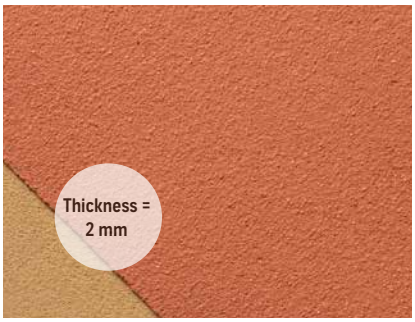
The **CLAYFIX clay direct** coating system begins with WHITE primer (CLAYTEC 13.415 and 13.410). It is suitable for clay and all other substrates. It is a firm coating base and prevents issues such as the brown clay of the plaster surface discolouring light coatings. CLAYFIX clay direct is a coating whose bond is based on a combination of clay and plant binders. CLAYFIX clay direct brush-on plasters have a grain size of up to 0.5 mm. CLAYFIX clay direct clay paints have no visible grain. They are normally used on smooth surfaces. They are available in 12 selected colours.

Further information on using YOSIMA clay designer plaster and coloured clay filler as well as CLAYFIX clay direct paint can be found in the CLAYTEC **Fine surfaces** worksheet.

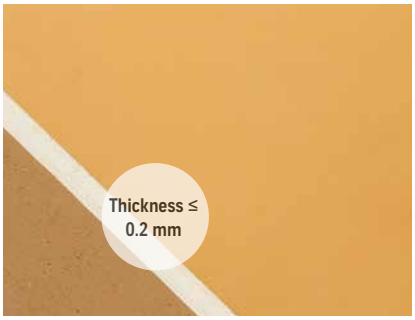
CLAYTEC fine lime thin-coat render is a fine-grain indoor lime finish. It is used on CLAYTEC clay plaster, especially for work on historic buildings.

If you wish to later **wallpaper** over clay plasters, they must be smooth enough. Rough surfaces first have to be coated with a smoothing layer; if necessary apply a coat of lining paper beforehand. If you wish to wallpaper over plastered areas again remember that the old wallpaper has to be removed very carefully during renovation work.

A suitable plaster (e.g. cement or lime cement plaster) or a tileable (green) plasterboard must be used for **tiling** in shower and bath areas. Tiles can also be fixed to the clay plaster in other areas that are only occasionally exposed to splashes, e.g. if this is easier than changing the plaster material. In this case, treat the surface with deep penetrating primer (CLAYTEC 13.405 and 13.400). The material must penetrate deep in to the clay plaster if possible; this can be achieved by applying several layers while still moist. Proceed in a similar manner if clay plaster is used as a substrate for seals in the connecting area between floors and walls that are only exposed to occasional stress (no accumulation of water!).

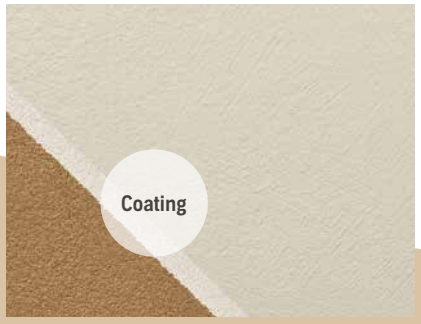


YOSIMA clay designer plaster



YOSIMA colour clay surfacer

WHITE primer



CLAYFIX clay direct coating

Special applications

Drywall construction

CLAYTEC offers boards made of clay, clay-hemp and softwood fibre for ecological drywall and timber construction. Plasterboards or gypsum fibreboards can also be coated with clay plaster.

REINFORCE THE recessed joints of plasterboards carefully; begin with self-adhesive joint tape, then use a gauze mesh in the joint filler. Plasterboards without recessed joints should be bonded according to the manufacturer's instructions. Prepare all boards with the deep penetrating primer recommended by the manufacturer.

Drywall construction panels are usually provided with thin-layer coatings. The surfaces are coated with a 3 mm layer of clay adhesive and reinforcing mortar. This can also be sprayed on using a plastering machine; if this application method is used, rest periods are not necessary. Glassfibre mesh is worked flatly into the surface of the still-wet layer. Apply YOSIMA clay designer plaster professionally when dry. The reinforcing layer for YOSIMA colour clay surfacer systems or the CLAYFIX clay paint system has to be applied very carefully (= fill drill holes and recesses in advance and leave these areas to dry). Alternatively, it may be easier to prepare the reinforcing layer with a thin layer of clay topcoat fine.

Thin layer of clay coating at BV UN-Campus, Bonn

Thick layers of coating are possible on clay-hemp and softwood fibre boards. Pre-treat the surfaces of soft wood fibre boards with RED primer. Apply clay undercoat plaster with straw, clay plaster mineral or SanReMo to the walls in a layer thickness not exceeding 8 mm and to ceilings or sloping roof surfaces in a layer thickness not exceeding 5 mm. Glassfibre mesh is worked flatly into the surface of the still-wet layer. Leave to dry. The max. total thickness of the wall plaster layer is 15 mm and 10 mm for plaster on ceilings and inclined roofs.

Plasterboards or gypsum fibreboards are only given a thick layer of coating in exceptional cases. Treat the surfaces with a water-repellent primer with silica sand additive (e.g. KNAUF Aton), then prime with RED primer. Prime with RED primer when dry. The max. thickness of the applied plaster layer is 5 mm. A second layer is possible after drying.

The surfaces of softwood fibre boards are prepared with RED primer or notched plastering with clay adhesive and reinforcing mortar for wall panel heaters. Leave to dry. Then spray on an initial thin layer (max. 8 mm) of one of the aforementioned clay plaster mortars. When this first layer is dry a second layer can be applied, which is used to fill up to the pipe clamp for the wall heating. The entire undercoat plaster must be dried with the help of heaters! Further construction steps are described below.

Wall panel heating

The wall-mounted heating pipes of wall panel heaters are plastered into the wall with clay mortar. The wall panel heating heats up the plaster cover, which is a few centimetres thick, and this radiates the heat into the living space. The following procedure has proven successful for plastering:

- The wall heater must be tested with the prescribed test pressure before it is plastered over. The system should be at working pressure during plastering
- Apply one or two layers of undercoat plaster with the heating turned off; smooth off over the pipes.
- **Turn heating on to dry the first layer of undercoat plaster. Alternatively, heat temporarily with a mobile heater, e.g. Laing S.O.S. Heizmobil EP 13 M.**
- Once the first layer of undercoat plaster has largely dried with the help of the heating, apply a second 5-10 mm thick layer with the heating off.
- Embed reinforcement fabric in the wet surface of the second layer of undercoat plaster. Overlap the fabric sufficiently at joints and continue at least 25 cm beyond the edges of the heating area to the unheated areas.
- Leave the second layer of undercoat plaster to dry, if necessary with a little help from the heating.
- Apply the finish layer. Do not turn the heating on for this.

The undercoat plaster is smoothed over the pipe clamp

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Special applications

Timber-frame restoration and monument conservation

CLAYTEC clay plasters are very often used on existing substrates of straw clay or clay plasters in historic buildings. Procedure: Begin by removing all loose components, usually including earlier repairs with incompatible materials. Wet any defects and then touch up with clay plaster. Wooden beams must be given a plaster lath. The surfaces of the beams do not have to be covered beforehand with film or cardboard. Reed matting St70 (CLAYTEC 34.001) is a suitable plaster lath. It can be stapled to the wood in strips cut to roughly the width of the beam. (In the case of clay undercoat plaster reinforced with straw, the plaster lath is not necessarily needed if the beam is < 8 cm wide and there are no adjacent plaster surfaces.) The reed only serves as an adhesive base for the plaster: The change in material from wood to old plaster is normally reinforced, especially if fibre-free mortar is used. The reinforcement fabric is worked into the wet surface of the undercoat plaster, over the entire are if necessary. Before starting any plastering work, the old clay substrates should be swept with a soft brush. Then wet the area to bind the dust to the surface.

Reed matting St70 on wooden beams of a half-timbered wall

A thin layer of coarse, not too stiff, clay plaster mortar is worked (rubbed) into the old plaster surface to prepare the old plasters. This helps improve the bond and minimise stresses. This preparation is indispensable if the clay topcoat fine is applied directly to the old clay plasters, which can be possible, for example, with good and intact, homogeneous old plasters. Two layers of plaster are usually applied to old clay substrates; beams and installation slits almost always have to be covered, uneven spots levelled out or changes between materials reinforced. One or more lining layers often have to be applied before the actual undercoat plaster layer; they must be left to dry before each new application. Topcoats of thin lime plaster are explained in worksheet 6.9 'Lime interior plaster'.

One further field of application in historic building preservation are ceilings with plaster-clad beams. Plastic clay plasters adhere well. Mixed with straw, they were always used in former times when it was necessary to work with very thick layers or 'overhead'. The beam plasterwork was parallel and sharp-edged; defects were levelled out with thick clay plaster or straw clay packages. The finish was usually a thin lime plaster.

Ceiling with plaster-clad beams, rounded valleys and stucco mouldings

In the 'Cologne ceiling' that is very widespread in Rhineland, the transition from the beam to the surface of the wall or joist is rounded off with a package of thick clay. The curve's radius is normally 10-15 cm. The sharp-edged form can easily be produced for repairs and new constructions with reed matting that is developed over the beams and ceiling panels. Plastering is then carried out with the help of board gauges screwed underneath the beams. Begin by plastering the flanks of the beams. Once the plaster has dried sufficiently, the undersides of the beams and ceiling panels can be plastered. If any reinforcement fabric is necessary, this can be worked into an additional layer of clay topcoat fine. Joists or vertical posts are also clad in plaster in the same was as the ceiling beams. Today's topcoats are usually of clay plaster, e.g. white YOSIMA clay designer plaster. Plastering clay basecoat render with thin lime mortar layers is described in Worksheet 6.9 'Lime interior plaster'.

Please note:

The information in the worksheets is based on many years of experience in the execution of clay construction work and the use of our products. No legal obligation can be derived from this. Adequate experience as a craftsman and the necessary skills from the relevant building trades are assumed. The latest version of the worksheet is always valid; this is available from www.claytec.de if necessary.

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Notes on the correct drying of clay plasters

Clay plasters
have for many years been recognised as highly appropriate wall coatings in terms of construction biology. Because the aim is fast drying with no formation of mould, you have to ensure good ventilation after the plaster has been applied. The following text explains the drying mechanisms and provides tips on how this can be done. These tips are also useful for other building materials that contain no fungicidal components but which are installed when moist or are exposed to high atmospheric humidity during the building period.

How does drying work?
The drying process is based on the attempt to find a balance between moist and dry air. The air close to interfaces with wet materials is saturated or enriched with water vapour molecules; the concentration falls the further away you get. The densely packed molecules spread into less saturated, more distant areas, a process that is mechanically aided by the circulation of air.

What is "relative humidity"?
The moisture in the area is expressed as a percentage. 100% corresponds to the limit of the absorption capacity, saturation. Warm air can absorb more water vapour than cold air. For example, 4.85 g/m³ of water is needed to saturate cold air at a temperature of 0 °C with water vapour, but 17.30 g/m³ is needed for warm air at a temperature of 20 °C. This corresponds to a factor of around 3.5! (Please refer to Table 1 on page 10.)

Moisture absorption capacity of outdoor air
If dry outside air is brought near moist surfaces, it absorbs water vapour molecules. The dryer the air, the more water it can absorb. The temperature and moisture content of the outside air differs between seasons and regions.

Warm summer air can essentially absorb greater amounts of water than cold winter air. Thus the theoretical absorption capacity of air up to saturation in Cologne in January is only 1.0 g/m³, but in July it is 4.5 g/m³. (Please refer to Table 2 on page 10.)

The situation changes radically if the cold and absolutely dry winter air is heated up on the building site. With a temperature of 15 °C on the building site, the difference between the water content of outside air in Cologne in January and the saturated inside air is 8.2 g/m³. This is then the amount that can be extracted through ventilation.

In summer, on the other hand, the moisture on the building site can in fact increase due to the inflow of outside air, for example if hot and humid thundery air cools down on the surfaces of a building, which are cold on account of the evaporation of water. At the same time, the temperature is ideal for the formation of mould. This is why particular care has to be taken in late summer.

Large amounts of air are needed for drying purposes on unheated building sites in winter and later summer. A heated winter building site, on the other hand, is easy to dry.

Air exchange rate and necessary amounts of air
You have to ensure a draught over newly plastered clay plaster building sites; in other words, all the windows and doors must be left open around the clock. Openings in opposite exterior walls are particularly effective. It can be assumed that the air exchange rate (= factor for the exchange of the entire amount volume of air per hour) will be 4 times higher if the windows are left open. The air exchange rate is 0.8 or less if the windows and doors are closed. The airflow volume in this case drops to 1/5 or less of the amount that would be effective with open windows.

Quite large amounts of air are usually needed to dry moist plaster areas, as the following example shows: 1 m³ of clay plaster (2 cm thick, 50 m² area) contains a good 200 l of mixing water. This means that, in a simplified assumption, 200,000 g of water has to be dried by ventilation. In May, indoor air can absorb a maximum of 3.5 of water per m3 (in Cologne). With the windows open and a volume of indoor air of 60 m³, 20,160 g of water can be removed by ventilation in 24 hours, so that it would take around 10 days for the plaster to dry fully with the windows open. With an air exchange rate of 0.8 it would take 50 days!

Mechanically assisted dying
The natural exchange of air is assisted by a mechanical blower. The blower should be positioned so as to ensure a supply of incoming and outgoing air. The volume flow has to leave the building. Movements of recirculated air distribute the air well, but are otherwise not very effective. Simple and low-cost rental equipment can generate a volume flow of several 100 m³ up to 1,000 m³ and more per hour. If used as a hot air blower, they can also increase the absorption capacity of the air by several orders of magnitude. The air must be able to flow unhindered over all moist surfaces of the building components wherever possible. You should also consider the significant distribution of building site dusts, which may contain spores and nutrients.

Condensation or cold drying works according to the heat pump principle. Water condenses on the cold surfaces of a chiller. Condensation dryers work with air recirculation, which is why windows and doors must be kept closed. The water tanks have to be emptied regularly. The drying capacity of a single unit can be several 10-30 l of water per 24 hour period. Drying takes place evenly and gently. Sorption dryers should be used at temperatures below 15 °C.

The mechanical drying of buildings is easy to do and very effective. However, you should not be tempted to overdo things. Stresses develop in plasters that dry too quickly. They result from the faster shrinkage of the dry surfaces compared to the still moist lower layers The thicker the application, the greater the risk. In extreme cases, huge shrinkage cracks appear that can lead to disintegration or even the loss of the plaster's adhesion.

Other sources of moisture
Additional moisture, for example from gypsum plasters and screeds installed when wet, can multiply the drying load. Drywall construction building materials and surfaces that have already dried can then once again reach a critical moist condition. However, there are sometimes conflicting interests, for example if customer requirements mean that a screed that is installed wet has to dry in the first week without any draughts. The solution to such problems has to be taken into account when coordinating operations on the building site. Poor or too slow drying is not a solution!

Drying report
The plaster application standard DIN 18550-2 (6-2015) 'Plasters and plaster systems execution (interior plasters)' as well as the Technical Data Sheet TM 01 (6-2014) 'Requirements on clay plaster as a building component' of the Dachverband Lehm (German clay construction trade association) call for a monitoring of compliance with sufficient drying conditions in critical application cases. The aim is to prevent or at least minimise the temporary formation of mould on moist surfaces. This monitoring has to be verifiably documented in a drying report. (Please refer to the template on page 10.)

Application
A drying report should be kept in particular if:

- Layers over 1.5 cm in thickness have to dry
- Plaster is applied to poorly absorbent substrates (e.g. concrete)
- The atmospheric humidity on the building site is high (e.g. after installing screed)

A drying report should be kept for all applications with more than thin layers (> 3 mm in thickness).

Drying measures
Drying measures consist of natural aeration and ventilation (draughts) or mechanical construction drying. The measures must be coordinated with the parties involved on site and described in the report (e.g. '8 windows open without interruption, 2 doors open for 10 hours a day' or 'uninterrupted use of 2 condensation dryers, windows and doors closed'). Choose the measures so that all plastered surfaces are affected in the same way as far as possible. Caution: excessive use of the mechanical drying of constructions (drying equipment) can cause stress cracks in the plaster!

Responsible record keeper
The drying report should be kept by a person who has the necessary expertise and specialist knowledge. This can be the architect supervising the building work, the craftsman carrying out the clay plastering work, the client or any other suitable person.

Recording
The building site and thus the drying process should be checked at regular intervals that should be agreed between the parties but that must not exceed 48 hours. Compliance with the drying measures as well as the progress of the drying (e.g. 'rapid drying, first light spots') must be documented.

The parties concerned must be informed immediately of any deviations from the agreed drying measures so that a remedy can be found.

Remuneration
The remuneration for recording has to be agreed.

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Drying clay plasters

Table 1: Water content of air per m³ depending on the relative humidity and temperature

	-10 °C	-5 °C	0 °C	+5 °C	+10 °C	+15 °C	+20 °C	+25 °C	+30 °C
100%	2.14 g	3.23 g	4.85 g	6.79 g	9.39 g	12.80 g	17.30 g	23.00 g	30.40 g
80%	1.71 g	2.58 g	3.88 g	5.43 g	7.51 g	10.24 g	13.84 g	18.40 g	24.32 g
50%	1.07 g	1.62 g	2.43 g	3.40 g	4.70 g	6.40 g	8.65 g	11.50 g	15.20 g

Table 2: Example of the average monthly temperature and relative humidity for one location (Cologne)

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
+1.8 °C	+2.5 °C	+5.3 °C	+8.8 °C	+13.3 °C	+16.4 °C	+18.0 °C	+17.5 °C	+14.3 °C	+10.4 °C	+5.7 °C	+2.9 °C
82%	78%	75%	70%	69%	70%	71%	73%	78%	80%	82%	83%

Drying report

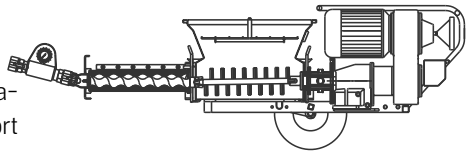
BP .....

Intervals between checks	Record keeper	Agreed drying measures

Date / time	Compliance with drying measures	Drying progress

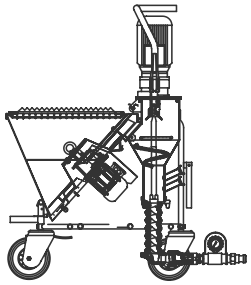
Working with the plastering machine

Claytec clay plaster mortars are either earth-moist pourable or dry. They can be prepared by hand with a trowel or with agitators, stirrers or rotary drums (cement mixers). They are thrown on with trowels or applied with spreaders.



Clay plaster mortars are generally applied professionally with a plastering machine. The material for mixing is stirred mechanically, forced through a transport hose with a rotating screw and sprayed onto the plaster lath by compressed air.

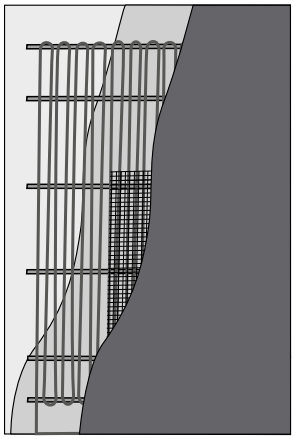
Earth-moist clay plaster mortars are mixed in batches and transported to the area to be plastered by robust mortar pumps ('open systems').



Dry clay plaster mortars can also be processed with the widespread gypsum plastering machines. In these, the mixing stirrer that rotates in a closed chamber also powers the feed screw ('closed systems').
Detailed information can be found on our website **https://www.claytec.de/de/fuer-profis/maschinentechnik**.

Wall heating

Claytec clay plaster mortars are often used to plaster wall panel heaters into place. In this method, pipes carrying water are embedded in clay plaster. The plaster package is heated up and radiates the heat into the room. No further radiators are usually needed.



This kind of heating is found to be particularly pleasant on account of the high share of radiant heat. Wall panel heating systems also help to save energy; the rule of thumb is: on account of the high radiant share, 17° is felt to be the same as 21° with only hot air.

This kind of heating is ideal for the use of regenerative energies. The system can be used to cool rooms in summer.

A number of different systems are available on the market. The only difference between them is the pipe material, the amount of radiant heat and the pipe diameter. 8-18 mm are common diameters for systems that use water. Systems with electric current are very thin.

Detailed information on the different providers can be found on our website **https://www.claytec.de/de/fuer-profis/flaechenheizung**.

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