Clayworks

PRODUCT DESCRIPTION & DATA

for Smooth, Tonal, Demi Rustic
and Rustic Finishes

Natural Clay Plasters

Clayworks

PRODUCT DESCRIPTION & DATA

for CLAYWORKS SMOOTH, TONAL, DEMI RUSTIC and RUSTIC FINISHES


absorbs toxins


non toxic


breathable


zero voc emission


100% compostable


UV resistant


humidity regulator


recycleable


passive regulator


absorbs odours


low embodied carbon


low embodied energy


acoustic absorber


seamless


durable


mold resistant


through body coloured


easily repaired


100% natural

OUR PRODUCTS

Clayworks Clay Plasters are unique blends of unfired clays mixed with minerals and pigments to provide a healthy, breathable finish for internal walls and ceilings.

Manufactured in Cornwall, UK from abundant raw materials, they are amongst the most sustainable wall finishes available. Recyclable, compostable, and containing no toxic ingredients, VOCs (harmful chemicals released during and after application) or synthetics, they are healthy for the planet, the building fabric and the occupants.

OUR RANGE OF FINISHES

CLASSIC AND CUSTOM FINISHES
Our finishes fall into two categories: the Classic and Custom Finishes.

The Classic Finishes range in texture, tonal variation, depth and thickness. From Smooth and Tonal (2mm) to Demi Rustic (5mm) and Rustic (8-10mm).

CLASSIC FINISHES

SMOOTH AND TONAL
These are our smoothest finishes, created with the finest raw materials.

DEMI RUSTIC
A clay plaster with slightly larger aggregate grain sizes, thus providing a subtly courser finish and a slightly thicker application in one coat. The health and performance benefits are enhanced due to the additional material in use.

RUSTIC
A single coat, robust and coarser finish ideally suited for artisanal finishes such as two-tone carving and relief work.

CUSTOM FINISHES

The Custom Finishes show the art of the possible. An example and opportunity to push the materiality of clay plaster – achieving completely unique effects.

All of our natural clay plasters are suitable for any wall or ceiling surface, and are available in all our colours.
For the full range of Custom Finishes refer to our website: https://clay-works.com/custom-finishes/

STANDARD SHIPMENT QUANTITY: 25kg bags.

COVERAGE (per 25kg bag):

Smooth Finish:	7-8m^2 @ 2mm thickness.
Demi-Rustic Finish:	2.7m^2 @ 5mm thickness.
Rustic:	1.25m^2 @ 10mm thickness.
Heavy Texture Rustic:	1.25 m^2 @ 10 mm thickness.
Base Coat:	1.25 m^2 @ 10mm thickness.

LOOSE WEIGHT: 25 kg dry powder in brown paper bags.

AMOUNT OF WATER (per 25kg bag)

Smooth Finish:	Approximately 10 litres
Demi Rustic Finish:	Approximately 6.5 litres
Rustic Finish:	6.5 litres

WALLING SURFACES
Suitable for use on most stable internal surfaces when properly prepared with Clayworks Primer. Such surfaces include plasterboard or gypsum plaster surfaces. Rough surfaces require a straightening coat of lime or clay. Not to be used in

areas in direct contact with liquid moisture, excessively damp areas or the elements, although can be used in areas of high humidity, such as bathrooms and kitchens.

Not suitable for floors or stair treads.

Clayworks Clay Plasters are suited to historic and eco-walling substrates such as cob, lime, hemp and strawbale due to their breathability and elasticity.

FIRE RESISTANCE:
Topcoat clay plaster organic content 0.5%; classified as non-combustible (EU Directive/UK Building regulations AD B). Class 1: when Clayworks Clay Plasters were tested and classified by BRE in accordance with BS476: Part 7; 1997. Tested in October 2019. Certificates available upon request.

MOISTURE ABSORPTION VALUE:
1.28 for Smooth and 1.4 for Rustic [calculated by moisture change (g/m^2) divided by relative humidity] where buffering was tested to be 9x that of painted plasterboard. (University of Bath figures).

HEALTH AND SAFETY
Non caustic: can be handled without gloves. Wear a dust mask when mixing dry powder.

APPLICATION
Applied in the conventional manner with a hawk and laying on trowel. Can also be applied with a spray machine. Application is similar to gypsum with the exception of the finishing process. A smooth finish is preferred for durability and cleaning. This is achieved by hard polishing with a plastic trowel or a Japanese Trowel. However, an open grained, more textured finish can be achieved using a damp sponge to lose trowel marks. This is often a more suitable finishing approach for undulating surfaces. Please see our guidance notes for detailed application guidelines, downloadable from our website www.clay-works.com

FINISHING
Best finished with Clayworks protective glaze for maximum damage resistance. Can be painted with micro-porous paint or pigmented protective glaze for an interesting decorative effect.

DRYING TIMES
Dependent on ambient conditions in the room and rates of absorption from the background material. In ideal conditions, the plaster should be fully dry within 24 hours. Good air circulation is encouraged during and after application.

Low, even heat can be used in cold conditions, but must be used with caution as it can cause hairline cracks in the plaster if it dries too quickly.

WORKING CONDITIONS
Application should not proceed when temperatures fall below 5 degrees centigrade or rise above 30 degrees centigrade.

CLEANING
Wipe gently with a soft, damp sponge, if it has been finished previously with Clayworks protective glaze. On textured surfaces, such as the Arakabe or Sculpted finishes, cleaning should be carried out with due care and attention avoiding rough treatment of the surface.

HANGING PICTURES
Observe the same protocol as for conventional plaster using picture hooks or screws.

PHYSICAL PROPERTIES & COVERAGE

DENSITY

Smooth and Tonal Finish:	1600 kg/m^3
Demi-Rustic Finishes:	1722 kg/m^3
Rustic Finishes:	1722 kg/m^3

IMPACT

Smooth and Tonal Finish:	BS EN 520 – Impact Diameter < 15mm
Demi-Rustic Finishes:	BS EN 520 – Impact Diameter < 15mm
Rustic Finishes:	BS EN 520 – Impact Diameter < 15mm

THERMAL CONDUCTIVITY

Smooth and Tonal Finish:	0.84 W/mK
Demi-Rustic Finishes:	0.97 W/mK
Rustic Finishes:	0.97 W/mK

MOISTURE BUFFER VALUE

Smooth and Tonal Finish:	1.28
Demi-Rustic Finishes:	1.4
Rustic Finishes:	1.4

THICKNESS WHEN APPLIED

Smooth and Tonal Finish:	2mm
Demi-Rustic Finishes:	5-7mm
Rustic Finishes:	7-15mm (standard is 10mm)

COVERAGE PER 25KG BAG

Smooth and Tonal Finish:	7-8sqm
Demi-Rustic Finishes:	2.7sqm (at 5mm thick)
Rustic Finishes:	1.25 sqm (at 10mm thick)

VOCS

Smooth and Tonal Finish:	Zero
Demi-Rustic Finishes:	Zero
Rustic Finishes:	Zero

EMBODIED CARBON

Smooth and Tonal Finish:	0.1162 Kg CO_2 eq/KG

ACOUSTIC ABSORPTION PROPERTIES

Smooth and Tonal Finish:	Noise Reduction Coefficient (NRC): 0.10 NRC: Sound Absorption Coefficient: 0.090N
Demi-Rustic Finishes:	Noise Reduction Coefficient (NRC): 0.10 NRC: Sound Absorption Coefficient: 0.090N
Rustic Finishes:	Noise Reduction Coefficient (NRC): 0.10 NRC: Sound Absorption Coefficient: 0.090N

ORIGIN

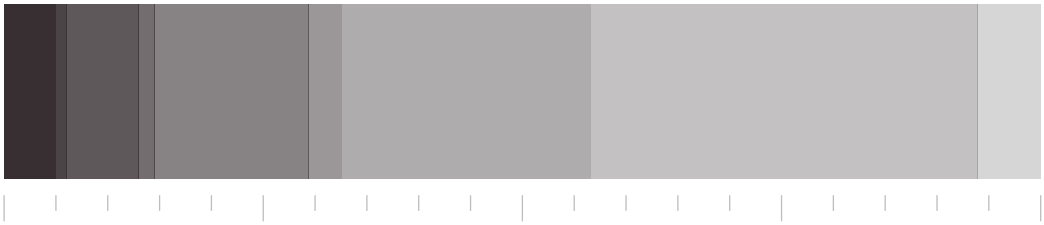
All Finishes:	Cornwall, UK

PERFORMANCE BENEFITS – HEALTHY BUILDINGS

BREATHABILITY AND ASSOCIATED HEALTH BENEFITS

Healthy, durable, working buildings can only be brought about by designing with a full understanding of breathability; [1, 19]. The current focus on airtightness in design needs to also consider how vapour inside a building will be treated. Clay plasters, made from unfired clays and sands, are considered breathable (with excellent vapour permeability) and hygroscopic. Unfired clay can absorb and desorb indoor humidity faster than any other building material [1, 2].

Clay plasters regulate relative interior humidity between 40% and 70%.



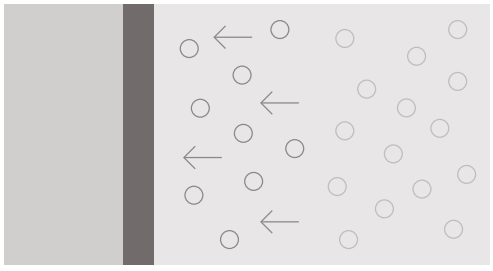
Lime Plaster	1.1	Cellular Concrete	1.1
Brick	1.2	Wool Insulation	1.2
Cast Gypsum	2.6	Light Clay	2.6
Wood, radial	2.8	Wood, longitudinal	2.8
Gypsum Board	2.9		

By keeping RH between 40% and 70% research has shown that the likelihood for airborne infectious bacteria and virus to survive is the lowest [3].

Keeping RH between 40 and 60% also prevents building materials from off gassing toxins, such as formaldehyde [3].

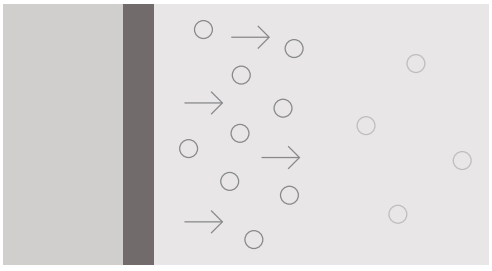
Water controls the life or the demise of building fabric. Wall moulds and areas of damp are minimised by the hygroscopic properties of clay plaster. Experiments at the University of Kassel in Germany proved that a 1-sided 15mm

High Relative Humidity



Moisture absorbed and stored by clay surface when relative humidity is high

Low Relative Humidity



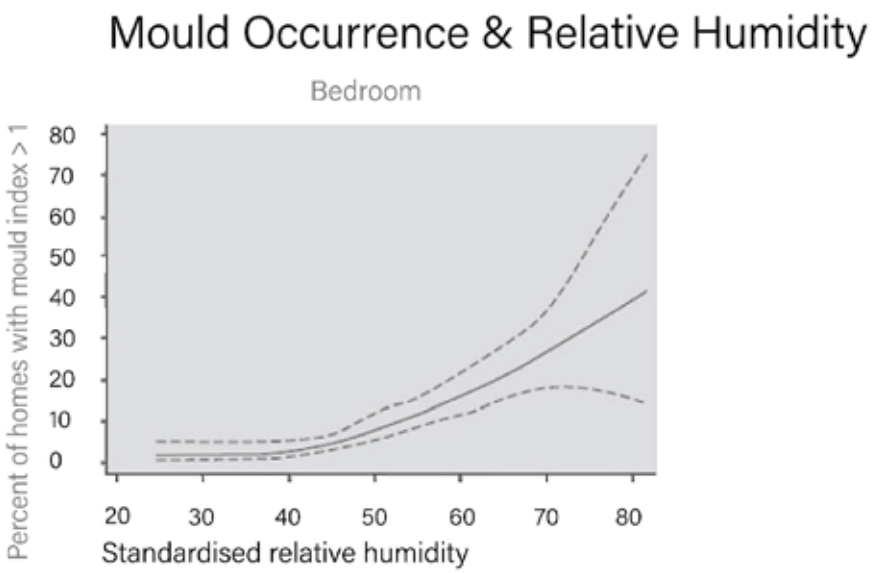
Moisture released by clay surface when relative humidity of a space is low.

sample of clay plaster could absorb 5x the moisture of a sample of gypsum plaster. The ability to absorb humidity varies significantly depending on clay content.

Perhaps the best description of the need for breathable walls is from Tim Padfield in a description on indoor air quality:

> In the home and in the office, porous, absorbent walls are equally beneficial. The "Sick Building Syndrome" has become a cliché, used to berate designers for all manner of defects which cause psychological or physiological harm to the occupants. The extraordinary number of synthetic chemicals which outgas from modern interiors cannot be blamed on impermeability, but the mould growth that adds natural irritants such as spores to the air can certainly be reduced by permeable walls. Impermeable walls are much more prone to transient episodes of condensation caused by cooking and washing, or simply by the breathing of a large gathering. Insects also thrive where liquid water is available. Dust mites, whose excrement is a potent allergen, thrive only above about 50% relative humidity. A bedroom with windows closed against the night cold will rise considerably in RH during the night, from moisture from the breath and bodies of the sleepers. A porous wall will absorb this moisture and release it when the room is aired during the day, giving a lower average RH. This will reduce the operating time of a dehumidifier or make it unnecessary [4].

According to research carried out by Padfield [5] a 20mm clay plaster layer will substantially regulate daily fluxes in RH. The type of clay used has an impact on a plaster's ability to absorb moisture.
Through regulating RH the occurrence of mould can also be prevented. The graph below shows the relationship between mould occurrence and RH; Ucci, M. 2009 [6, 7].



Oreszczyn et al., (2006), Mould and winter indoor relative humidity in low income households in England, Indoor and Built Environment, 15(2): 125-135

Terms like Sick Building Syndrome (SBS) and Building Related Illness (BRI) are mentioned more often in the context of mould fungi.

Factors of influence are not only viruses, pollen, mites, nitrogen oxides, carbon monoxide, ozone, radon, emissions from building and facility materials and electromagnetic fields but also "Microbial Volatile Organic Compounds" (MVOC) and fungus spores [8].

In the study of using unfired clay materials in a test house in Scotland, Tom Morton, Principal Architect at Arc, Fife, UK, states that in the bathroom, 'the clay plaster had such a strong ability to absorb peaks of air moisture after showers that it cleared the air without surface condensation. The effect of the extractor fan was of no statistical significance.' [9].

MOISTURE CONTROL AND ASTHMA

Stirling Howieson in his 2005 book Housing and Asthma [18] highlights that warm, humid conditions in modern buildings are the conditions in which dust mites thrive. Dust mites are one of the known causes of asthma and he hypothesises that our homes are the most influential, single, identifiable factor driving the current asthma pandemic in the UK. He calls on the entire construction sector to improve Indoor Air Quality in our buildings, with particular consideration of moisture control, if we are to address the asthma problem.

ELECTRO MAGNETIC RADIATION

There is research to suggest that clay is anti-static and can screen electromagnetic radiation. According to Strawtec Australia [10], who cite tests conducted at a University in Munich, Germany in 1999, these showed that solid timber and clay had by far, better radiation shielding properties than concrete, bricks, concrete blocks or stud & plasterboard walls. From these tests they concluded that the superior performance of natural materials such as timber and clay is due to their unique cell structures made up of cavities, capillary tubes, cell walls, encased resins and various other materials and that man-made building materials can just not compete with nature [11].

OZONE AND FORMALDEHYDE

Research by Corsi and Darlin into the potential of clay plasters as passive removal materials for the removal of ozone in buildings [15] is particularly exciting and further accelerates the material's potential to be truly problem solving on so many levels. Ozone is a respiratory irritant that seeps into our homes and the by-products that are created when ozone reacts with materials such as carpets, cleaning products, materials and furniture are also toxic: they include hydroxyl radicals and other chemicals such as formaldehyde and acetaldehyde.

Dr Richard Corsi and E. Darling of the Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin, state that the products of indoor ozone reactions may be irritating or harmful to building occupants. In fact, some by products created when ozone hits skin oils are probably more toxic than the starting ozone according to a report by Science News.

Corsi and Darling conclude that:

> Results indicate that clay-based coatings may be effective as passive removal materials for ozone in buildings ... the addition of clay plaster when carpet and ozone were present result in significant improved indoor air quality and lower formaldehyde concentrations.

Formaldehyde is a Category 1B carcinogen that can also cause skin, eye and respiratory irritation. The authors are clear that further research is required, but as understanding of the extraordinary health and sustainability benefits of clay plasters advance, and the aesthetic beauty of the material is further innovated, the material clearly has the potential to reframe the interior wall finish sector.

INDOOR COMFORT

Clayworks Clay Plasters

- absorb odour
- buffer sound
- are anti-static
- contain no chemical ingredients

SUSTAINABILITY

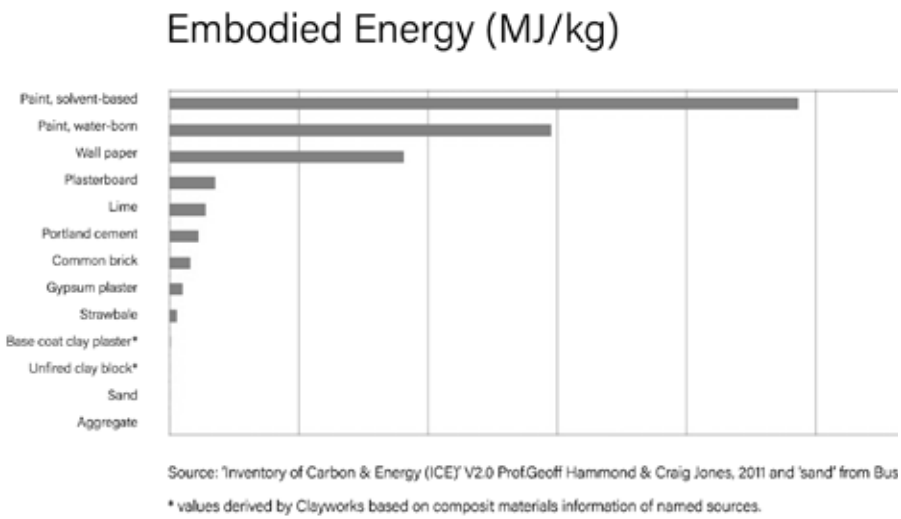
RECYCLABLE, REUSABLE OR 100% COMPOSTABLE.

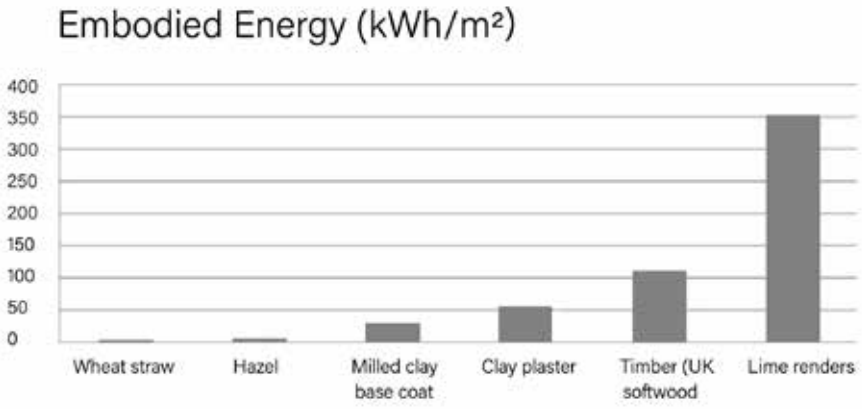
Clay plasters are 100% natural, non-toxic, with Zero VOC emissions and no synthetic, concrete or lime additives. Made from readily available, naturally abundant materials, they require no processing, only blending. During this process very little energy is required, no water is used, and there are no waste materials. Clayworks Clay Plasters are packaged in Brown Paper sacks that contain no plastic. Hence there is no waste.

EMBODIED ENERGY

All this means that they have very low embodied carbon and embodied energy, a concept best explained by Jane Anderson of PE INTERNATIONAL [13].

> As regulation and voluntary measures such as BREEAM and the Code for Sustainable Homes have looked to reduce operational carbon, there has been an increasing focus on embodied carbon – the carbon which is associated with the materials in the building. Embodied carbon normally encompasses both CO^2 and other greenhouse gases, and includes emissions from all the extraction, transport and manufacturing processes required before products are ready at the factory for delivery to the customer – such an assessment is known as "cradle to gate".



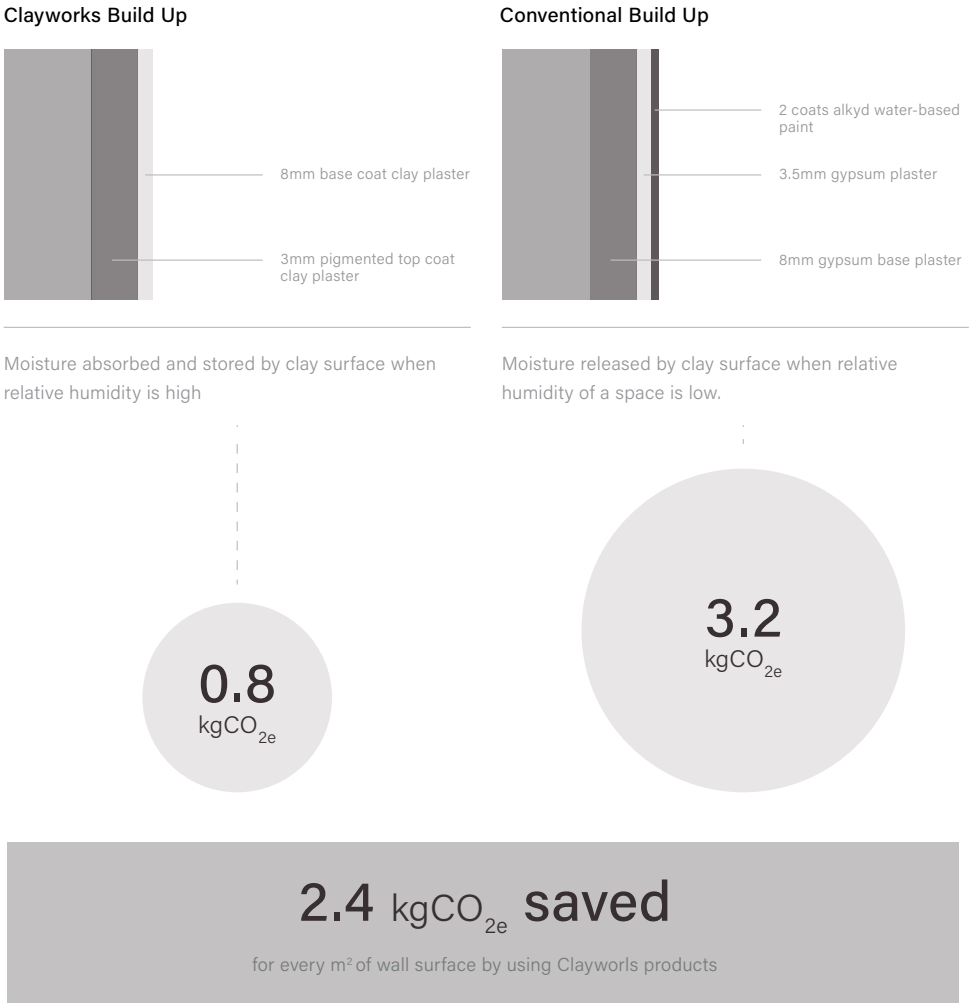


Source: Carol Atkinson, Msc Architecture:
AAES, Energy Assessment of a Straw Bale Building, Jan 2008

A useful paper to have come from Centre for Alternative Technology (CAT) on embodied energy is that of Carol Atkinson, MSc Architecture: Advanced Environmental and Energy Studies Energy Assessment of a Straw Bale Building, Jan 2008.

Carol lists the measurements she took (kWh/m^3) of all the constituent materials. The clay plasters were sourced/made in Yorkshire and included hemp [15].

The Materials Council have concluded that up to 2.4kg of carbon could be saved by using a clay plaster wall build up rather than gypsum and paint [20]. Their calculations were based on Clayworks Clay Plasters and using data produced by the University of Bath [21].



MATERIAL PERFORMANCE

- Seamless surfaces and flexibility accommodate movement of building elements.
- Through body naturally pigmented and UV resistant, meaning no painting, repainting or fading.
- Durable, easy to maintain, repairable surfaces.

FIRE REGULATIONS & RESISTANCE

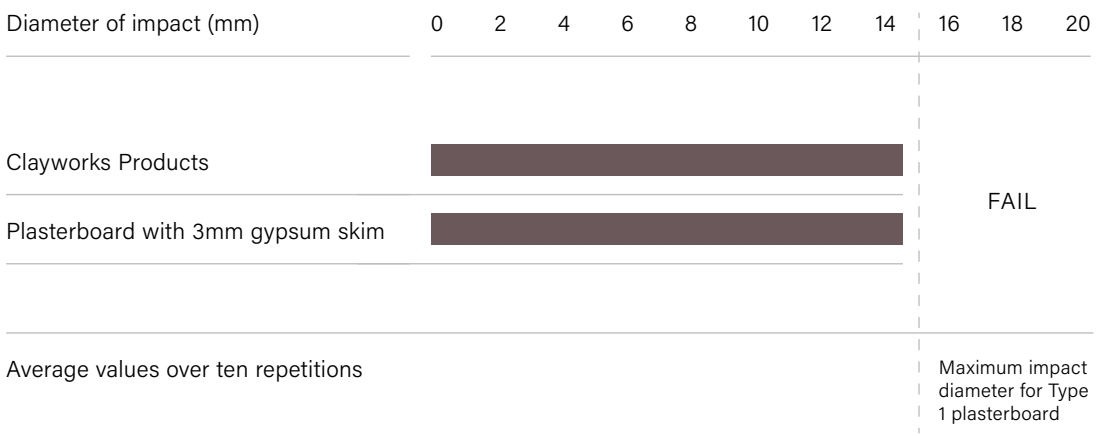
- Class 0 rating Non-combustible. BS 1377 – Euroclass A1 fire rating. Organic Matter 0.5% – Defined as – in Building Regulations Document B. Density: 1600 kg/m^3 – Thermal conductivity: 0.84 W/mK.

SURFACE HARDNESS

Surface hardness is excellent. As there is currently no standard for testing the performance of clay plasters the impact resistance of Clayworks products was tested to BS EN 520, the standard for gypsum plasterboards. The impact resistance test drops a standard weight and measures the diameter of impact.

Clayworks clay plasters achieved a surface hardness equivalent to Type I (enhanced surface hardness) plasterboard, with an average impact diameter less than 15mm. The performance was identical to gypsum rendered plasterboard tested in parallel.

Impact Test: BS EN 520



REPAIRS

Any damage caused to a Clayworks surface will be inconspicuous due to their through bodied colouring. Chips, divots and scratches can be simply repaired through the addition of a small quantity of colour matched clay plaster, trowelling and reapplication of the protective glaze.

THE VALUE OF UNFIRED CLAY PLASTERS OVER CONVENTIONAL BUILDING MATERIALS

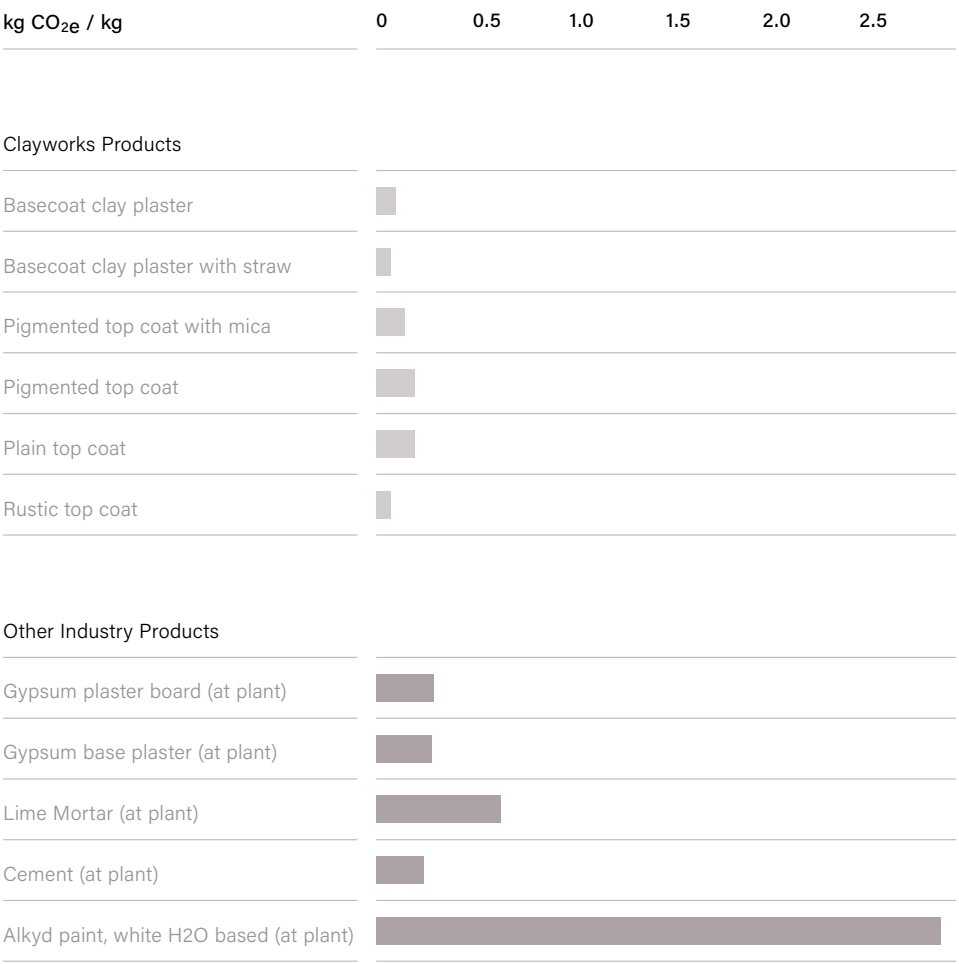
Given the implication of CfSH, the true 'cost' of a product to the consumer, must be measured beyond mere face value 'unit' price. In the same way that locally sourced, organic food more accurately reflects the true price of food, we can suggest that products and concepts in unfired clay are priced appropriately and allow for adoption within the mainstream market. Admittedly, producers of sustainable building materials cannot currently enjoy the economies of scale achieved by large and highly leveraged corporates.

Unit prices start at a moderate, but affordable premium to conventional, high carbon materials. But considering the wider context, and the related cost saving you are also 'buying', when choosing a building designed with unfired clay and clay plaster, for instance:

- Reduce/replace use of ventilation systems/extractor fans and associated maintenance/repair costs
- Zero to landfill – unfired clay products can be 100% bio-degradable
- Saving on energy/heating bills through the evening out of temperature swings (see below).
- Savings on resistance to building overheating through thermal mass effect. Even a 15mm plaster coat has significant thermal mass to store heat (see footnote 13) Tom Morton et al.

- According to this same research by Tom Morton et al, the physical mass of clay plaster (20.6 kg/m^2) with that of gypsum plaster (8kg/m^2) as 2.5 times of the latter. According to Borer and Harris (see footnote 14) the denser building materials perform better in storing heat, with dense soil as the best performer in comparison with other building materials such as fired brick, concrete and stone (Borer and Harris, 1998). N.B. Clay Plaster has a density of 1900kg/m^3 as opposed to the 1370kg/m^3 of the clay plaster in these tests.

Specific comments we have come across:
- Hygroscopic materials contribute to thermal comfort thereby permitting smaller heating systems. The walls will absorb and store heat and moisture, buffering against temperature and humidity fluctuations. Mechanical ventilation systems can be eliminated. (Ruth Busbridge, MSc Jan 2009, footnote 9).
- A porous wall will absorb this moisture and release it when the room is aired during the day, giving a lower average RH. This will reduce the operating time of a dehumidifier or make it unnecessary. (Tim Padfield PhD, footnote 4)
- The clay plaster had such a strong ability to absorb peaks of air moisture after showers that it cleared the air without surface condensation. The effect of the extractor fan was of no statistical significance (Tom Morton, see footnote 8).



DISCLAIMER

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