HEMP ECO SYSTEMS SA

TECHNISCHE DATAFICHE

Index:

1.0 RAW MATERIALS

1.1 HEMP HURDS

MATERIAL: Hemp hurds for building and insulation.

NAME: HES-hurds.

DESCRIPTION: Is the stem of the hemp plant, cut into chips (called hurds), after removal of the hemp fibres, sifted and cleaned for dust, it represents a material 100% natural.

TECHNICAL DATA:

Density	Approx. 120kg / m3
Thermal conductivity	0.05 w/mk

DESCRIPTION OF COMPOSITION:

Standard grade: "HES-hurds S"
A balanced mix of large, medium, and small hurds, dust free. Minor presence of small fibres tolerated. No chemical treatment of the hurds. Size of chips varies from 5 to 20 mm.

Medium grade: "HES-hurds M"
Medium size hurds are used for HES-wall.
Size of chips varies around 5 to 10 mm.

Fine grade: "HES-hurds F"
Small size, dust-like hurds particles are used for HES-finish.
Size of chips varies around 1-4 mm.

The 3 grades must be approved by Hemp Eco Systems SA.

PACKING: Standard and medium hurds - 20 kg bales.
Fine hurds - 30 kg bales.

UTILISATION: Mixed with a blinder and water used as insulating and building material.

STORAGE: Dry place, under the roof or covered with tarpaulins.

SAFETY: No hazard.

1.2 BINDER

MATERIAL:	Hydrated lime.
NAME:	HES-lime A.
TYPE:	Purity of 95-98.
DESCRIPTION:	Hydrated lime of superior and selected quality. This pure lime is able to contribute to the thermal and humidity regulation, cures by uptake of CO2 and has a favourable grey energy.
PACKING:	25 kg bags.
STOCKAGE:	In dry atmosphere.
SAFETY:	Use eyes protection, gloves and mask during the mixing process.

1.3 ADDITIVE TO BINDER

MATERIAL/PRODUCT:	Composed natural additive for HES-mix and HES-wall.
NAME:	HES-plus.
DESCRIPTION:	A blending of several natural minerals (no processed chemicals or cements) that have the effect of making an accelerated curing (from 4-6 months to 1-2 days), gives better mixing properties, and permits reduced quantity of binder.
USE:	Add 3kg of HES-plus per 25kg HES-lime A, or follow specifications.
PACKING:	3 kg or 15 kg bags.
SAFETY:	Use eyes protection, mask and gloves while mixing.
COLOR:	Light grey.
HAZARD:	None.

1.4 WATER

DESCRIPTION: Clean tab water.

USE: Water is added during the mixing process, first wetting the HES-hurds and at the end of the mixing process, to adjust the mixture.

PRECAUTION:

- The quantity of water used is very important.
- It is the water that will initiate the carbonation process.
- The quantity will vary with the outside temperature.
- Follow instructions.
- Too much water or too little can cause the curing to stop and the material will not stand-up.
  This effect is seen immediately.

2.0 EQUIPMENT

2.1 MIXER

TYPE:	Horizontal mixer (HES design).	
ORIGIN:	Italy.	
CAPACITY & FORCE:	Type 200 litres Capacity in volume 400 litres Work capacity 200 litres	
	Motor:	Electric 220 V with reinforced electric cable
	Weight:	180 kg
	Size:	185 cm Length 90 cm Width 130 cm Height
PRODUCTION CAPACITY:	200 litres:	1 bale of HES-hurds, HES-lime A and HES-plus.
QUALITY OF MIXTURE:	This type of mixer offers a fast and high quality mixture.	
FUNCTION:	Switch position	1- Axe turning for normal production 2- Axe turning reverse. 2 turns only to deblock material if necessary. NB: Never more than 2 turns.
MAINTENANCE:	Must be always thoroughly cleaned inside and outside after use.	

2.2 TIGER

TYPE: Tool for application of HES-wall.

NAME: Tiger

DESCRIPTION:

- The tiger substitutes a worker" throwing" the product on the wall.
- It requires an electric compressor: 3 HP, 80 lit., 220V.With the right compression, the HES-wall is projected on to the wall fast and efficiently.
- The Tiger consist of a connection to the compressor, a container for the HES-wall and an exchangeable exit with various sizes of holes.
- The compressor's capacity (litres) is important and related to the speed at which the product is thrown on to the surface.

CLEANING: The Tiger must be perfectly cleaned after every single shift.

2.3 CONVEYOR BELT

TYPE: Device used for simplified delivery of HES-mix to elevated or limited access areas.

NAME: Conveyor Belt

DESCRIPTION:

- A conveyor belt is used primarily during roof insulation.
- The mechanism helps rapidly deliver the HES-mix to elevated surface. It saves plenty of time and physical labor for workers.
- Belt comes in 4m or 6m length and require 220 V voltage. Two belts can be used at the same time, by placing one belt in continuation of the other.

CLEANING: A Conveyor belt must be cleaned after every single shift.

2.4 FORMWORK

TYPE: Equipment designed by HES used during wall erection.

NAME: HES-formwork.

DESCRIPTION:

- A structure is designed and used specifically for HES mix application during wall erection.
- It can be used for renovation and new wall construction.
- Formwork is easy to set up and can be utilized on all sorts of projects.
- Two or more sets of formwork can be connected with each other depending on the length and shape of the surface to be insulated.
- Comes in two versions, large & small.

CLEANING: Formwork has to be thoroughly cleaned in the end of the project.

3.0 HES-mix FOR CONSTRUCTION AND RENOVATION

MATERIAL/PRODUCT: Composed mixture of natural materials for building and insulation.

NAME: HES-mix.

DESCRIPTION: Mixture of hemp hurds, hydrated lime, additive and water to form a humid component.

TECHNICAL DATA:

Density	Approx. 240kg / m3
Thermal conductivity	0.056 w/mk
Fire test (European Standard)	B - s1, d0
Humidity	See certificate
Stress, compaction	See certificate
Sound, acoustic	See certificate

MIXTURE: In a horizontal mixer (Specially built for HES), is added the hemp hurds, water, binder, additive (HES-plus), and the balance of water in that sequence.

GENERAL REMARKS:

- All mixing and preparation is done on the building site.
- The ready mixture (HES-mix) can be prepared in advance and spread on a plastic sheet next to the mixing machine, but for a maximum of 1 - 1,5 hour.
- 2 hours after mixing, the product is not to be used.

QUALITY APPROVAL: The hurds and a binder must be approved by Hemp Eco Systems SA before use.

PROPERTIES OF HES-mix:

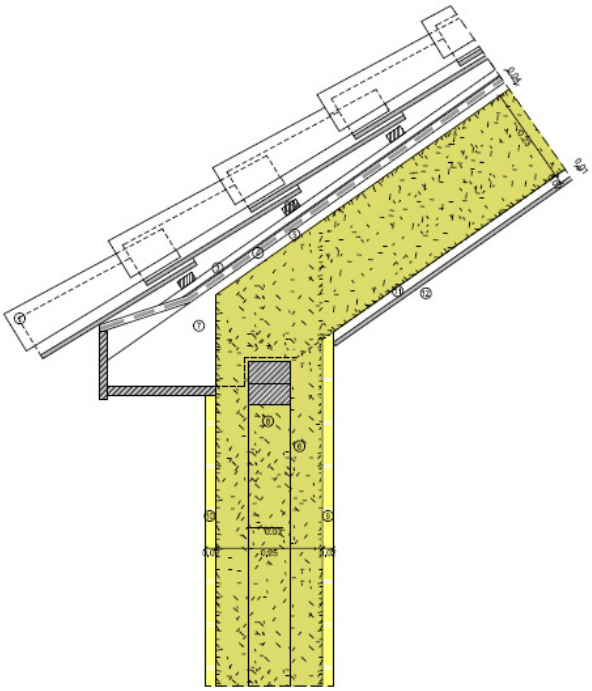
- Thermal performance = Outstanding.
- Humidity regulation = Outstanding.
- Does not burn.
- Does not rot.
- Repulses vermin.
- Can be used as insulation in houses and buildings.
- Can be used to build new constructions.
- 100% biodegradable and recyclable.
- Contains no toxic chemicals.
- Has a favourable grey energy.

STORAGE AFTER MIXING:	Maximum 1 - 1,5 hours between mixing and application. 1 hour at high temperature (+ 25°).
SAFETY:	Wear gloves, mask and glasses.

4.0 APPLICATION OF HES-mix

- **Table showing average thickness of HES-mix in different areas of application.**

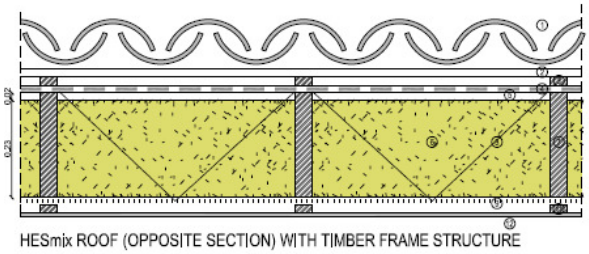
Location	Thickness (cm)
Roof	25 cm applied, 23cm thickness after compacting (2cm for ventilation)
Attic floor	20-30
Hard finish	5
Internal wall insulation	10-20
Ground floor	15-20
External wall (brick or concrete)	20
New wall	30-35



HESmix ROOF WITH TIMBER FRAME STRUCTURE, TILE COVERING
HESmix WALL WITH TIMBER FRAME STRUCTURE (MIDDLE)

DIN-A3 SCALE: 1/10

0 0,1 0,5 1



HESmix ROOF (OPPOSITE SECTION) WITH TIMBER FRAME STRUCTURE

1 TILES
2 HORIZONTAL LATHS 2x2cm
3 VERTICAL LATHS 2x2cm
4 BREATHABLE WATERPROOF LAYER (optional)
5 AIR GAP 2cm
6 HESmix
7 ROOF STRUCTURE
8 VERTICAL WOOD STRUCTURE
9 LIME RENDER (OPTIONAL WITH MARBEL SAND FINAL COAT)
10 LIME SAND RENDER (OR TIMBER CLADDING)
11 HORIZONTAL LATHS 2x2cm
12 FINISHING BOARD (open to steam diffusion)

INSULATION OF ROOF

INSULATION OF AN ATTIC

EXISTING WALLS WITH 15 CM HES-mix

HES-mix WITH FLOOR HEATING

NEW CONSTRUCTION WITH WOOD STRUCTURE

HES-mix MOUNTED WITH FORMWORK

TUBING INCORPORATED IN HES-mix

5.0 WHERE TO USE HES-mix

5.1 INSULATING ROOF

MATERIAL: HES-mix.

DESCRIPTION: Roof should be insulated when space under roof is inhabited. The roof is the most critical area to insulate as it requires a certain air tightness, thermal insulation and regulation of humidity.
HES-mix offers all three without synthetic barriers assuring that the house will continue to breathe. HES-mix repulses vermin.
The roof can be insulated with HES-mix from the outside (removal of tiles) or from the inside.

5.2 INSULATING ATTIC

MATERIAL: HES-mix.

DESCRIPTION: The attic, under roof with no insulation, to obtain a suitable storage area and an efficient insulation for the rest of the house.
This area is in most cases where the first intervention takes place and its presence will have a thermal effect on the entire house.

USE: Ideal storage for furniture, clothing and paper. The Hemp will regulate the humidity. Needs no flooring.

BEFORE LEVELING

FINISHED

5.3 INSULATING CONCRETE WALLS

MATERIAL: HES-mix.

DESCRIPTION: Walls made in concrete offer poor thermal or humidity regulation. To obtain the most efficient insulation, insulate the exterior of the wall.

AREA OF APPLICATION: House or building exterior (or interior) walls.

THICKNESS OF INSULATION: 20 cm recommended using HES-formwork.

5.4 INSULATING BRICK OR STONE WALLS

MATERIAL: HES-mix.

DESCRIPTION:

- These walls are made from natural materials that offer some insulation.
- If space is a problem, give priority to north walls or exposed walls.

AREA OF APPLICATION: House or building walls interior or exterior.

THICKNESS: 10 – 20 cm using HES-formwork.

5.5 INSULATING OLD EXISTING WALLS (STONES, LIME, AND SAND)

MATERIAL:	HES-mix.
DESCRIPTION:	These walls of thickness from 0,5 - 2 meters are usually built on the ground without foundation. They take up quantities of water, necessary to keep the wall binders humid. For this reason the HES-mix is double important, it gives thermal insulation and regulates the humidity from the wall.
AREA OF APPLICATION:	House walls inside.
THICKNESS:	15 – 20 cm using HES-formwork.

5.6 INSULATING WOODEN WALLS

MATERIAL: HES-mix

DESCRIPTION: Wood houses or chalets, if insulated, or not, having an outside and inside wood wall held by a wood structure.

AREA OF APPLICATION: Between wood walls.

THICKNESS: 20 cm HES-mix.

5.7 INSULATING EXISTING SOLID EXTERIOR WALL WITH WOOD OR PANEL FINISH INSIDE

MATERIAL: HES-mix, wood planks or panels.

DESCRIPTION: The exterior wall has no or inefficient insulation. Therefore an inside wall in wood or panels is mounted and the space filled with HES-mix.

Alternative: HES-mix mounted on existing wall using formwork. HES-finish is applied after drying time.

AREA OF APPLICATION House walls inside.

THICKNESS: 15-20 cm.

5.8 INSULATING GROUND FLOOR

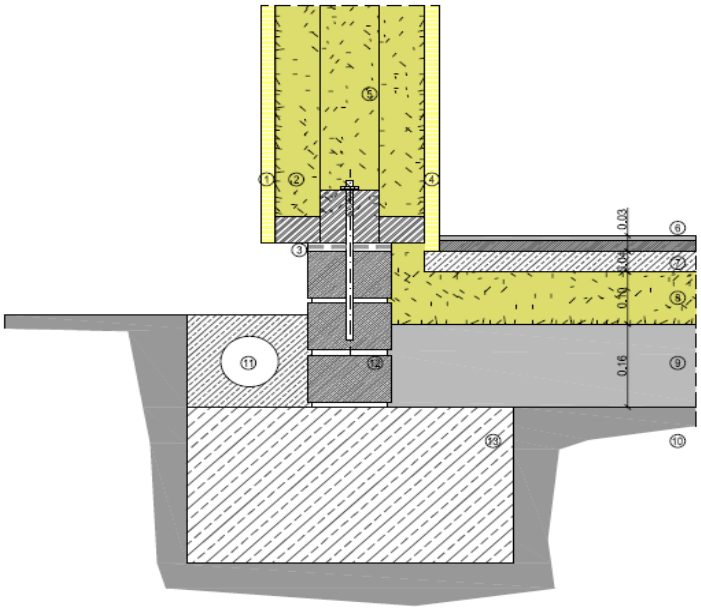
MATERIAL: Gravel, HES-mix.

DESCRIPTION: The insulation of the ground floor must be done so that the humidity from the ground is regulated and not blocked.
This is in particular important for ancient houses without foundations where the ground humidity will soak the walls if blocked.
Even if a modern house is different, the same procedure is recommended.

AREA OF APPLICATION House walls inside.

THICKNESS: 15-20 cm.

INSULATING GROUND FLOOR (Continued..)

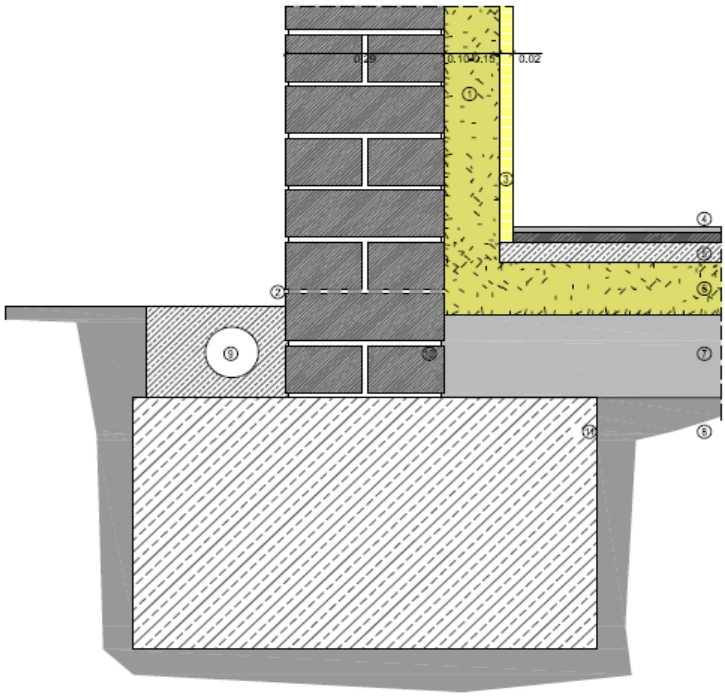


1 LIME SAND RENDER (OR TIMBER CLADDING)
2 HESmix
3 BREATHABLE WATERPROOF LAYER (optional)
4 LIME RENDER (OPTIONAL WITH MARBEL SAND FINAL COAT)
5 VERTICAL WOOD STRUCTURE
6 FLOOR TILES
7 MORTAR/LIME SCREED
8 HEMP/SAND/LIME SLAB
9 GRAVEL. VENTILATED
10 SOIL
11 DRAIN
12 BRICK PLINTH
13 FOUNDATION

HESmix WALL WITH TIMBER FRAME STRUCTURE (MIDDLE)
HEMP-BASED SLAB FLOORING

DIN-A3 SCALE: 1/10

0 0,1 0,5 1



1 HESmix
2 BREATHABLE WATERPROOF LAYER (optional)
3 LIME RENDER (OPTIONAL WITH MARBEL SAND FINAL COAT)
4 FLOOR TILES
5 MORTAR/LIME SCREED
6 HEMP/SAND/LIME SLAB
7 GRAVEL. VENTILATED
8 SOIL
9 DRAIN
10 SOLID WALL (BRICKS, STONES, CONCRETE,..)
11 FOUNDATION

SOLID WALL WITH HESmix CAST ONTO INNER FACE

DIN-A3 SCALE: 1/10

0 0,1 0,5 1

5.9 INSULATING BASEMENT

MATERIAL: HES-mix.

DESCRIPTION:

- A basement cold and humid requires insulation between the basement and ground floor that is both thermal and humidity regulating.
- The basement ceiling may be held by beams or a concrete slab. In the first case, HES-mix is used. For concrete ceiling, use pumice stone 6-8 cm on to the ceiling.

6.0 NEW CONSTRUCTION WITH HES-mix

MATERIAL: HES-mix.

WHERE: New construction or extension.

DESCRIPTION: HES-mix is not made to carry, but constitutes a wall, being wall and insulation in one. As it cures it becomes extremely hard and resistant.

BUILDING: The wooden structure (walls & roof) is mounted directly on the foundation. Steel structure is also acceptable.

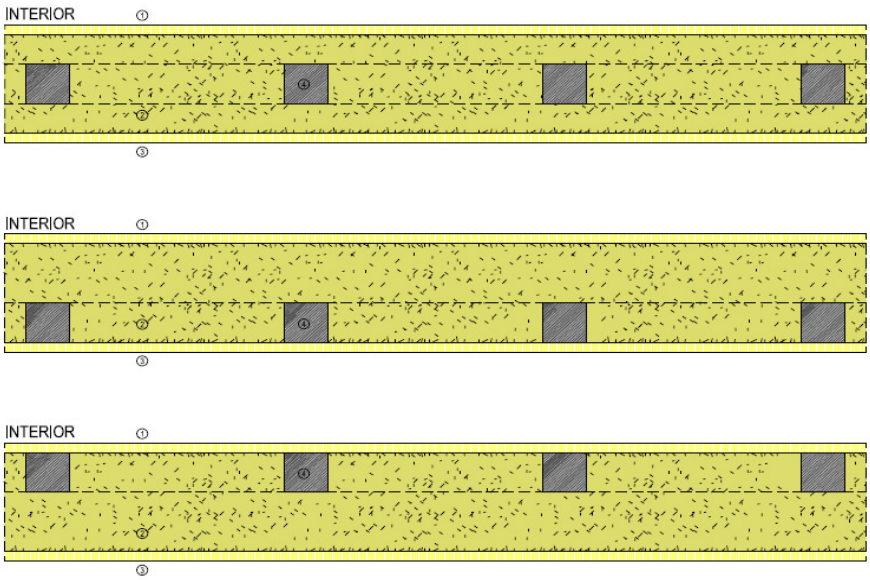
SPECIFICATION: Upon request.

GROUND FLOOR:
1: Excavate and fill with gravel mixture (dia: 5 – 8 cm) to a thickness of 10 cm.
2: Pose a perforated tube (air drain dia: 4-6 cm) imbedded in gravel. Add 5 cm of gravel (dia: 3-5cm)
3: Apply HES-mix on the gravel bed 15-20 cm.
4: Pose floor heating (if required).
5: Pose a 6 – 8 cm lime-sand mortar.

WALLS:
1: Mount formwork (our special made steel formwork) so that the vertical wood beams are placed in the middle. Distance between formwork (wall thickness) 30-35 cm, or according to specification.
2: Pour HES-mix in the formwork, level, spread and compact slightly.
3: Lift the formwork as soon as filled and continue the process.

ROOF:
1: Fix a net under the beams. Reinforce with steel wire if required.
2: Fill HES-mix between the beams to 25 cm and compact to 23 cm.
3: Apply wood planks or panelling on the inside.
4: Apply roofing on the outside.

- **Position of the vertical supporting posts with relation to HES-mix.**



1 LIME RENDER (OPTIONAL WITH MARBEL SAND FINAL COAT)
2 HESmix
3 LIME SAND RENDER (OR TIMBER CLADDING)
4 VERTICAL WOOD STRUCTURE

PLAN OF A HESmix WALL. DIFFERENT POSITIONS OF TIMBER STUDS

DIN-A3 SCALE: 1/10

0 0,1 0,5 1

7.0 HES-wall – NATURAL INTERIOR INSULATION, HUMIDITY REGULATOR FOR A HEALTHY INDOOR CLIMATE.

NAME: HES-wall.

INTRODUCTION: This interior insulation system has been developed to be able to apply a lining interior walls:

- Where the insulation has been done on the outside walls
- Where there is no space for a full interior insulation (10-20cm).
- When a natural humidity regulation is wanted (no ventilation system is necessary).
- In order to obtain a healthy, alkaline interior climate.

DESCRIPTION: HES-wall is applied in thickness of 1-8 cm on interior wall to give a partial insulation and a perfect humidity regulation. HES-wall can be finished by applying HES-finish with or without fine hurds.
By this means, we obtain a healthy alkaline inner lining. Read more about HES-Health System.

HOW TO APPLY: HES-wall is premixed and applied with a Tiger (our model) and an electric hand compressor (3 HP, 50-80 lit., 220V.)

WHERE TO APPLY: On interior walls (exterior is also possible) whether facing exterior or separation walls.
Ideal for bath-rooms, kitchens, and other high humidity areas where the HES-wall and its finishes will regulate humidity.

QUALITIES: HES-wall enables us to serve the interior of houses and building and has the following qualities:

- Thickness can be varied according to need and space without change of formula.
- Thermal insulation is relative to thickness of material, 4-8 cm HES-wall is not optimal insulation, but a substantial improvement.
- Humidity regulation is most efficient in all areas (example: bathrooms without ventilation).
- Application is fast and efficient.
- The base of a healthy alkaline indoor lining system is achieved.
- Finishes based on hydrated lime with sand or fine hurds (HES-hurds fine) give an attractive, maintainable finish.

- We obtain herewith an alkaline indoor climate, thanks to the hydrated lime, very important for better and healthier living conditions.

WHERE TO APPLY: On interior walls where space is a problem (exterior is possible in certain cases).
Ideal for bath-rooms, kitchen, high humidity areas, but also in normal living areas, in school class rooms, office space etc.

GENERAL REMARKS: It is presumed that full required insulation is handled a part.
HES-wall will provide some insulation where little space is available. It will provide a most efficient humidity regulation.
HES-wall offers an ideal foundation for the finishes.
HES-wall is the base for creating a toxic free, alkaline in-door climate.

- **Demonstration of HES-wall application with tiger.**
- **Smoothening surface out after application.**

8.0 FINISHES

INTRODUCTION: The surface of a HES-mix wall gives a texture ideal for over coating, as it provides a perfect anchor pattern for the renders. The HES-mix wall must have reached a satisfying drying state before applying the renders. Renders, based on lime with or without fine hemp hurds, can be applied on all kind of surfaces, following normal instructions (cement, bricks, panels, wood, etc…). All exterior renders should be applied by the end of September in order to avoid any problem caused by low temperatures.

FINISHES ON HES-mix SURFACES:

Walls insulated with HES-mix can be left without over coating as a decoration. If outside, it needs no over coating, being resistant to weather conditions. It can be coloured by mixing natural soluble pigments with linseed oil, (siccative), and turpentine, which can be applied with a brush. Also, walls can be covered with following renders and finished:

INTERIOR RENDERS ON HES-mix OR HES-wall:

9.1 HES-finish INTERIOR WITH OR WITHOUT HURDS

System 1: Apply last coat of HES-wall, level, and smooth to give a desired finish.

System 2: Apply on HES-mix:
1st application of HES-finish 0,5 - 1,0 cm of hydrated lime and river sand 04-06.
2nd application of HES-finish 0,5 cm consisting of hydrated lime and river sand 02-04
or
hydrated lime and HES-hurds fine.

System 3: Same as system 2. In case of presence of wood beams joint to HES-mix, add flax fibres in the mixture to avoid cracks.

9.2 HES-superfinish

Apply system HES-finish as first application.
Apply HES-superfinish 0,5 cm last application.
HES-superfinish consists of hydrated lime and a small quantity of Gipson. It gives a smooth silk-like finish, and no cracks.

9.3 CALCATEX

This point based on hydrated lime (and no chemicals) is applied on any of above renders

- to obtain a uniform coloured finish
- to obtain a coloured finish (comes in 20 different colours).

All HES renders are based on natural materials with no toxic additives. The hydrated lime cures by taking up CO2 and give in interior healthy and comfortable atmosphere.

EXTERIOR RENDERS ON HES-mix:

9.10 HES-finish IN SOUTHERN (FROST FREE) CLIMATES:

- Check if surface needs to be wetted.
- Apply HES-finish (hydrated lime and river sand 04-06) as first application 0,5-1,0 cm.
- Apply HES-finish as second application 0,5 cm.

9.11 HES-kalei IN NORTHERN CLIMATES:

Apply on HES-mix still humid or if dry, wet before application (the day before, or just before application).

Application: First application of HES-kalei
and if required,
second application of HES-kalei.

The first application will cover the voids in the HES-mix, plus a thin layer. The second to give a smooth film of 0,2-0,4 cm.

Covering:

- Is difficult to predict as it depends on the texture of the HES-mix.
- The total layer should not exceed 1 cm.
- Calculate 2-3 kg of HES-kalei per m2.
- If sprayed, one application and levelled with a ruler is sufficient.

9.12 CALCATEX

Apply immediately and some day one coat of Calcatex by brush.

Covering: 6 - 10 m2 / kg
Adjust with water to get the necessary covering.

9.0 AIR TIGHTENING FOR DOORS AND WINDOWS

DESCRIPTION: Doors and windows gradually lose their efficiency and require proper lining to stop draft.

This should not be confounded with doors and windows that close hermetically. Hermetical air tightened houses are in contradiction with any principle that places human health and well-being as a priority. Artificial ventilation installed for the sole purpose of compensating the negative effect of air tightness is, also, unacceptable, having a detrimental effect on health and well-being. Any house or building needs a soft and natural air flow, some of which comes from the doors and windows. This airflow is there for the well-being of the inhabitants.

Draft signifies space that let in air constantly as a jet stream and in particular when the wind is blowing. To correct this, a rubber or similar lining can be installed. Even old doors and windows can thus be corrected. When carrying out an energy renovation this is the first area to be controlled.

11.0 SAFETY REGULATIONS

HES products only contain natural, non-toxic materials in different amounts. These products are:

- HES-hurds (standard, medium, fine)
- HES-lime A
- HES-plus
- HES-superfinish
- HES-Kalei
- Sand

When in contact with HES-lime A (hydrated lime), special precautions have to be taken.

Precautionary measures:

- During handling, mixing and application procedures avoid inhalation, eye and skin contact by wearing respiratory mask, suitable eye protection (goggles), full-body clothing covering all body including legs and hands, waterproof footwear and waterproof gloves.
- After working with lime-containing materials, workers should wash lime off and use skin moisturizers.
- Clothing covered with HES-lime A should be washed before re-use.
- Worker must have a first-aid kit on site containing moisturizing hand cream and eyewash bottle.

First Aid Measures:

- Inhalation
  Irrigate nose and throat with water for at least 10 minutes. Remove worker from prolonged and repeated inhalation of high exposure.

- Eye contact
  Irrigate with water using eyewash bottle for at least 10 minutes. Seek medical assistance!!!

- Skin contact
  Wash affected area immediately with plenty of water. Apply moisturizing cream on irritated area.

- Ingestion
  Do not induce vomiting. Wash mouth with water and drink large quantities of water.