



step by step



# MANUAL FOR HOUSE INSULATION



## INTRODUCTION

Lately, heating houses in Tajikistan is getting more and more difficult. Due to lack of accessibility and/or availability of fuel some houses are not heated at all. The quality of insulation used in the design of residential houses during construction has become a subject of interest and discussion among the local population and local construction experts. One of the main materials used for construction of residential houses is

mud. Mud is used without or in combination with hay. Hay is mainly used as a strengthening element in mud brick. Although the proportion of hay and mud is determined based on how strong the bricks need to be, no serious attention has been paid to the quality of insulation. Low quality of insulation in houses is compensated for by burning additional fuel. The way mud houses are currently built requires constant

expenditure for fuel. In addition, low quality home insulation allows a lot of heat to escape. The eventual result of overuse of fuel is severe forest depletion, soil degradation, and carbon emission pollution.

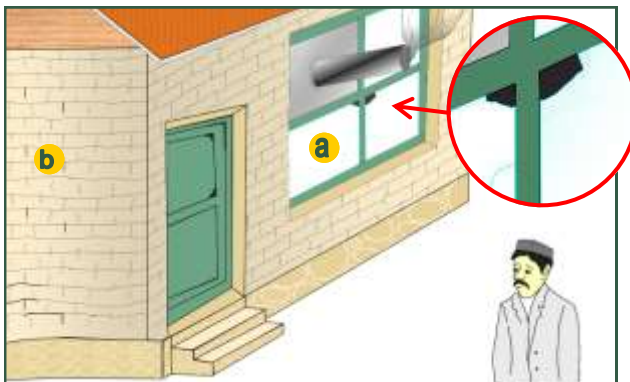
The home insulation techniques detailed in this manual prevent the above mentioned environmental threats and reduce heat loss.

# 1. WHY INSTALL HOUSE INSULATION?

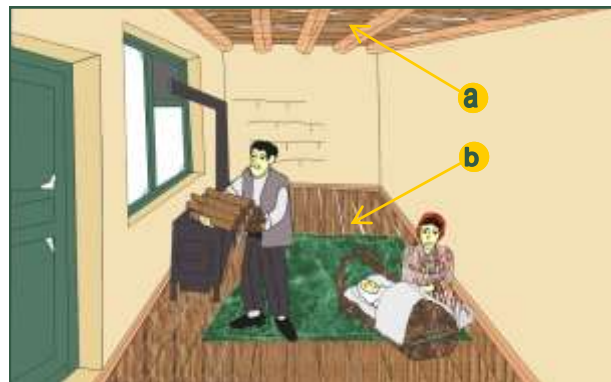
*It is used in winter rooms to save money on fuel*

The information presented below is based on studies performed in Oshoba Jamoat in Asht

**Heat is usually lost through doors, windows, ceiling and floors.**



**Houses which are not insulated lose 50% of heat through the walls (b). Heat loss through doors, single glazed windows and drafts (a) is equal to 25 %.**



**Ceilings in traditional houses (a), can contribute up to 10-15% of heat loss and non-insulated floors (b) can contribute up to 10-15% of heat loss.**

## 2. HOUSE INSULATION METHOD

House insulation is used for reducing heat loss, increasing warmth and saving fuel.

For insulation of houses, different insulation materials can be used.

**Insulation materials can be of two types:**

▪ **Local materials:**

- Hay,

- Rice straw,
- Reeds,
- Sawdust....etc.
- **Industrial materials:**
  - Glass wool,
  - Mineral wool
  - Polystyrene ...etc.

**House insulation consists of the following steps:**

***Step 1.*** *Insulation of door and windows;*

***Step 2.*** *Insulation of ceiling;*

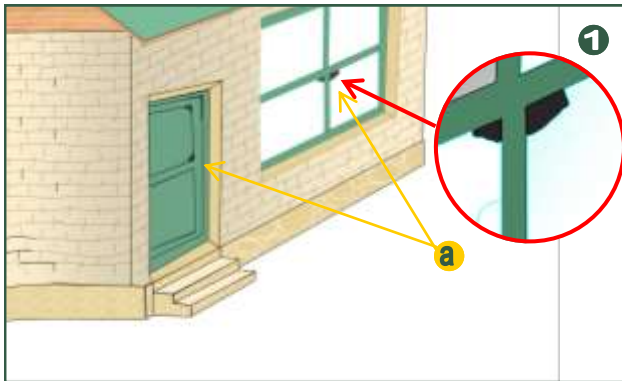
***Step 3.*** *Insulation of walls (from outside or inside);*

***Step 4.*** *Insulation of floor.*

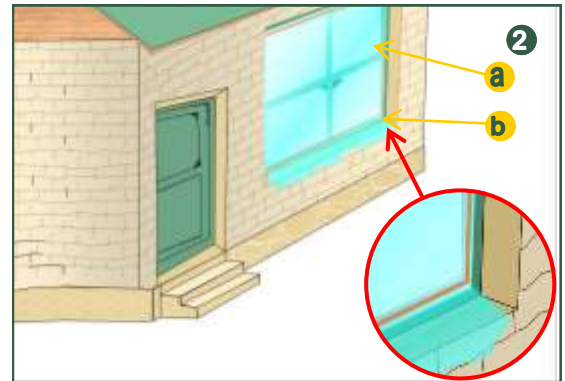
Step 1

## 2.1. INSULATION OF DOORS AND WINDOWS

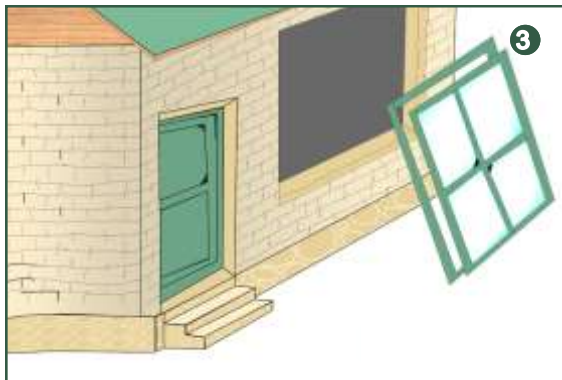
Doors and windows can be insulated through the following ways:



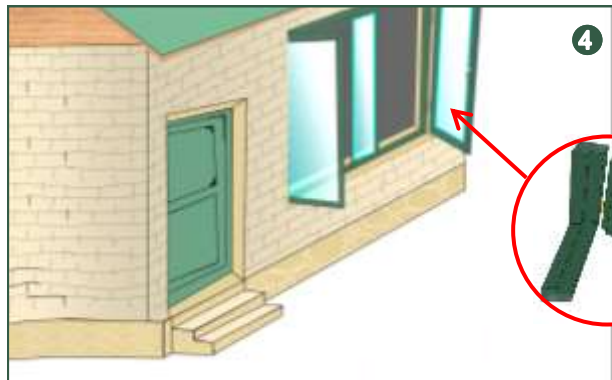
***Inspect the doors and windows. If the windows are single glazed and/or there are gaps between wooden frames and glass panes /doors, insulation is necessary.***



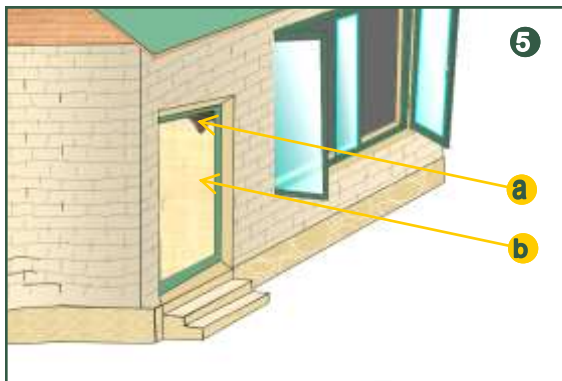
***If you don't have funds to replace the window panes, you can cover the window with polythene sheets (a) and fix it with wooden sticks (b).***



*If you have funds to replace the window, first, remove the existing one.*



*Then, purchase windows made from wood or plastic and replace the old windows. It is important to purchase double glazed windows.*



*If there is no opportunity to replace the door, a) cover the old one with one layer of felt, b) put one layer of leatherette over it.*



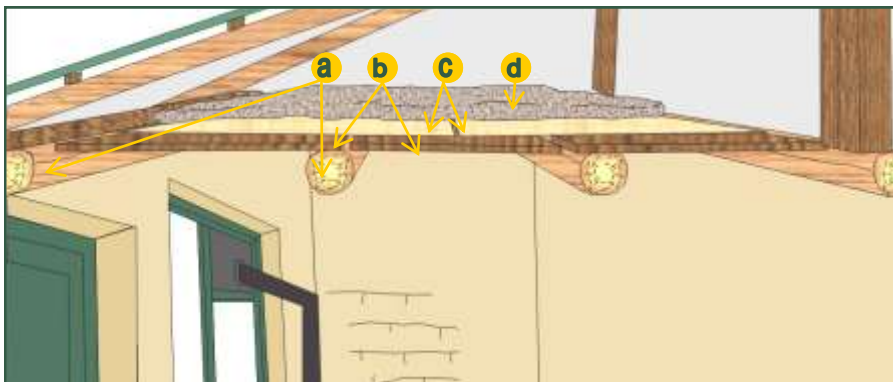
*If you have funds to replace the door, install a new one. There should be no air gap between the door's frame and the door.*



## 2.2. INSULATION OF HOUSE CEILING

Ceiling insulation consists of the following steps:

**Insulation of the ceiling is needed when the existing insulation thickness is less than 5 cm. Optimum insulation thickness of the ceiling is 10 cm.**



*During your inspection, if your ceiling is the same as the one described on the left sketch, then insulate it following the technical solutions described in the next pages.*

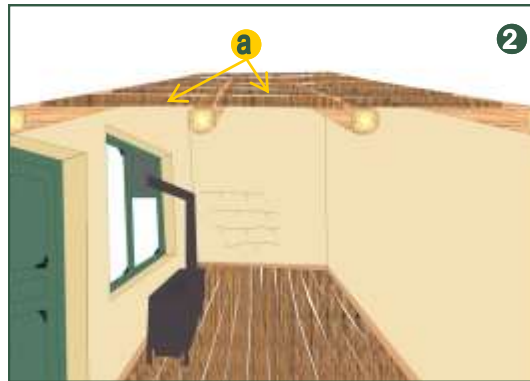
**First, inspect the insulation layer of the ceiling. Usually, houses with poor quality insulation system are built this way: a) wooden beams; b) wooden planks c) cardboard layer; d) mud plaster or soil.**



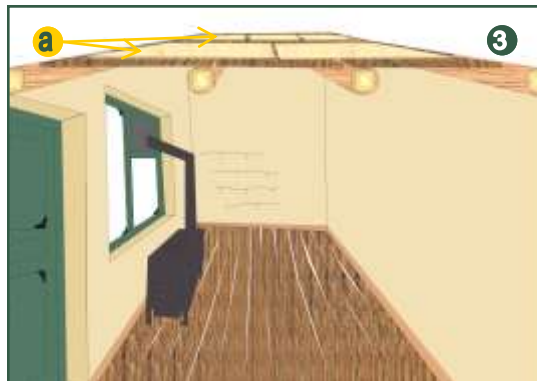
**Option 1.**  
Insulation of ceiling  
from outside.



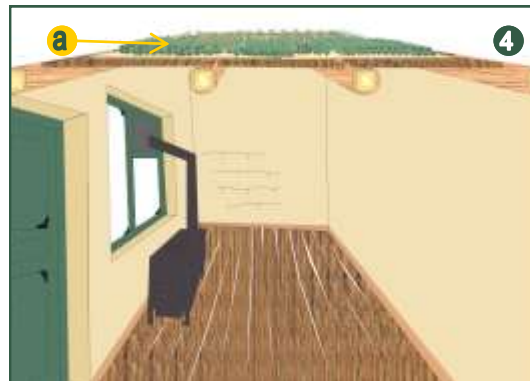
*Install wooden beams (a) (15 to 20 cm) as usual.*



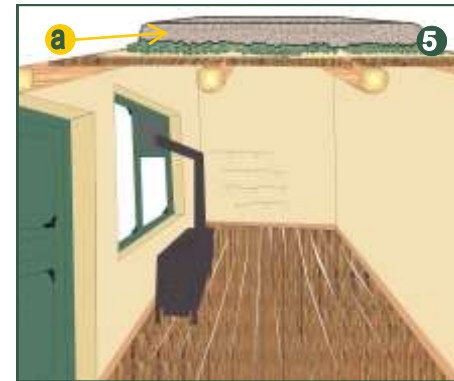
*Over the beam, put one layer (a) of wooden planks (a) (thickness = 2 to 3 cm)*



*Cover the wooden planks with one layer of cardboard (a) (thickness = 0.5 - 1 cm).*



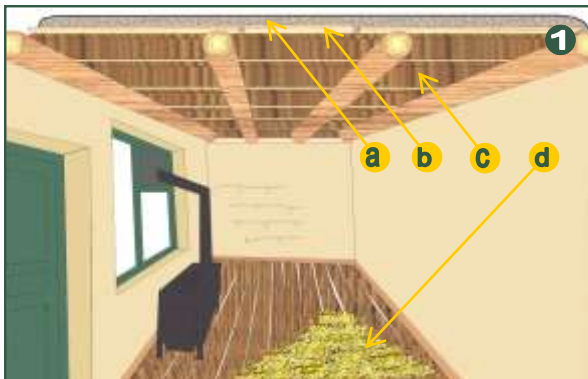
*Over the cardboard, install thermal insulation (hay, reeds, sawdust...). The thickness should be around 10 cm.*



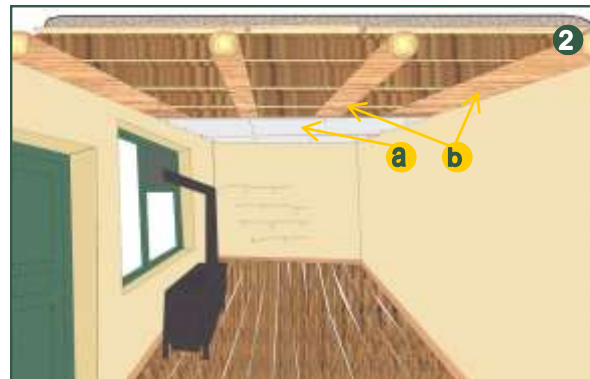
*Then, cover all the mentioned layers with 5 - 10 cm of thick mud plaster (a).*

## Option 2. Insulation of ceiling from inside

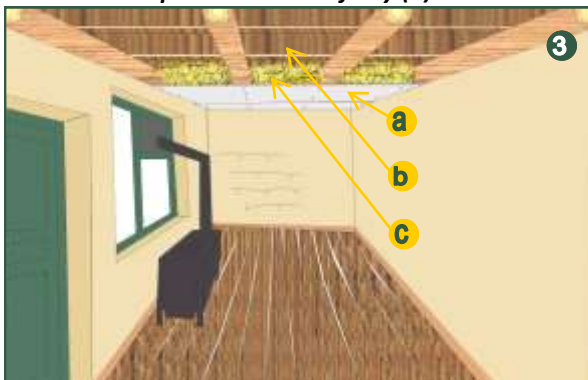
*Treat the insulation with lime to keep pests such as insects and rats away from it.*



*Insulation layer will be placed under the ceiling, between wooden beams. For this, prepare the appropriate amount of hay (d).*



*Then, start fixing the plywood or veneer (1 row only) (a) under the beams (b).*



*Now, between the plywood a) and wooden planks (b) fill with hay (c) .*



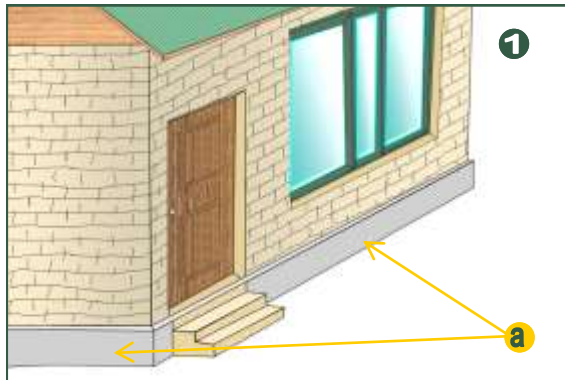
*In this order, continue filling the next row of plywood filling with hay. You can also use gypsum plaster-board.*

## 2.3. INSULATING THE WALLS

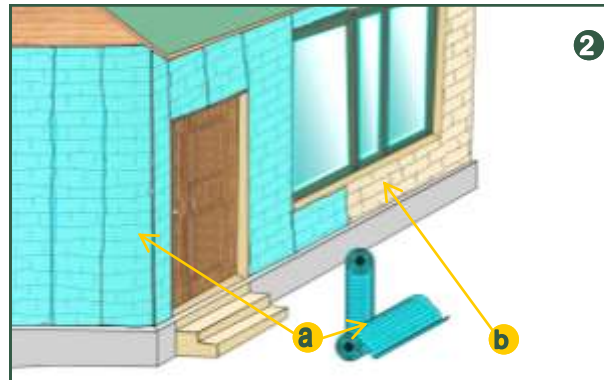
*Walls can be insulated in two ways: from the outside and from the inside.*

**Option 1.**  
Insulation of walls  
from the outside

Insulation of walls from the outside is done in the following order:



**First, adjust the foundation of the house (a) for installing the insulation layer on top of it.**

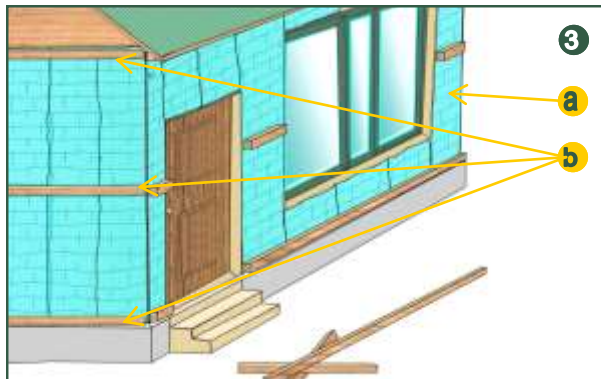


**Now, start the insulation by attaching one layer of vapor sealing (a), which protects from moisture. Glue it to the wall.**

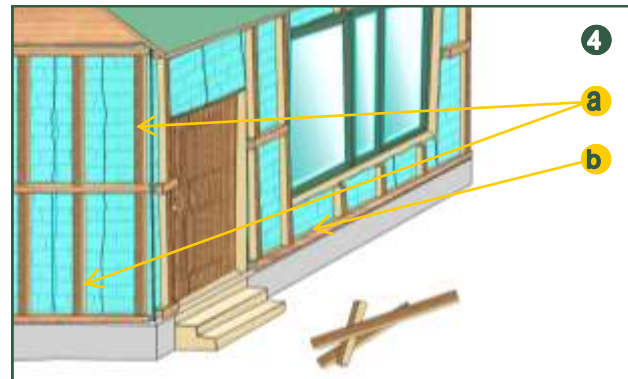
**For wall insulation, it is recommended to insulate it from the outside.**

**NB: Industrial insulation materials are generally more efficient than local insulation materials (up to 60 % more efficient)**

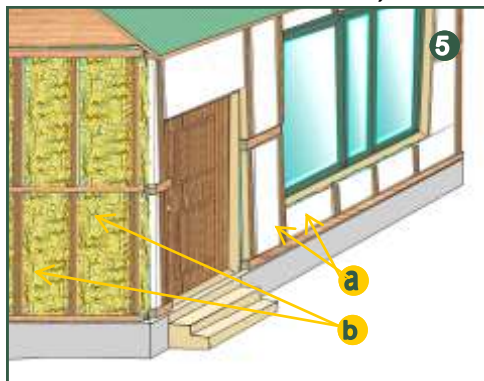
*The insulation layer should be 10 cm thick.*



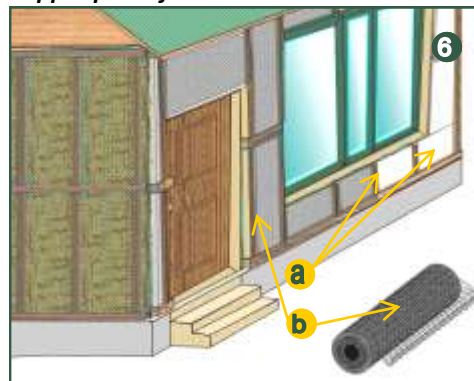
*After attaching the vapor sealing (ex: "Izospan") (a) place horizontally three rows of wooden lintels (b) on lower, middle and upper part of the wall.*



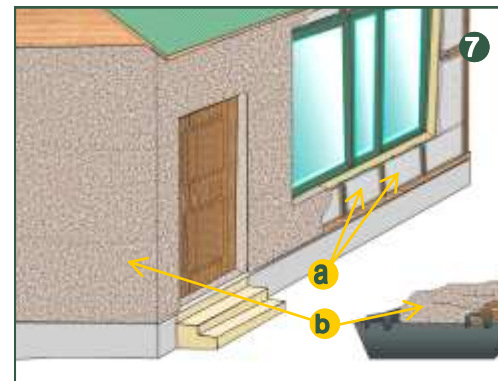
*Then, put vertical wooden lintels (a), between the horizontal wooden beams (b). The distance between the vertical wooden beams should be 60-80 cm.*



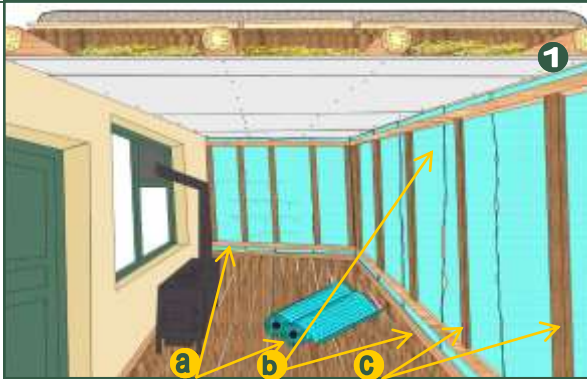
*Now, fill in the space with industrial (a) or local insulation materials (b).*



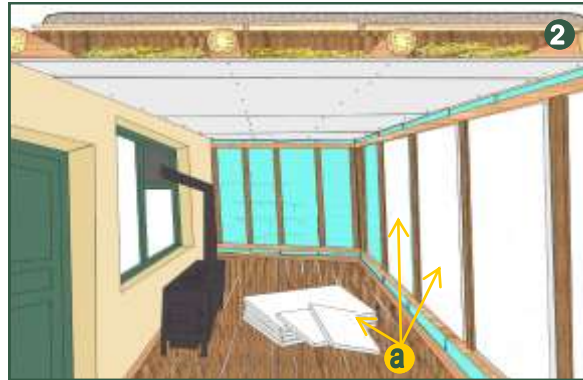
*Over the insulation material, (a), whether local or industrial, stretch one layer of wire mesh (b).*



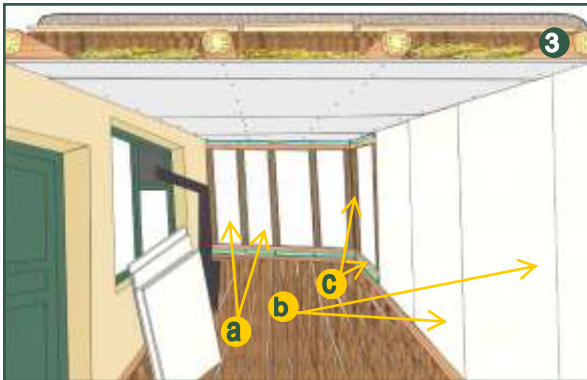
*At the final stage, cover the insulation layer and mesh wire (a) with clay or cement plaster (b).*



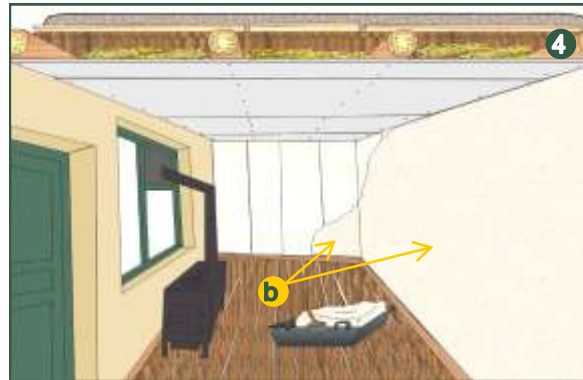
**Option 2 also starts with attaching vapor sealing (a), then place two rows of horizontal (b) and vertical (b) square metal beams (or wooden beams) with 60-80 cm distance between each beam.**



**Then, fill in the created space between the sections with industrial insulation materials (a).**



**Now, cover the insulation layer (a) with plasterboard (b). Fix the plasterboard between the sections (b).**



**At the end, plaster over all the layers with putty (filler) (a).**

**Option 2.**  
Insulation of walls  
from inside

*The disadvantage of insulating from inside the walls is that moisture can build up on the insulation layers.*

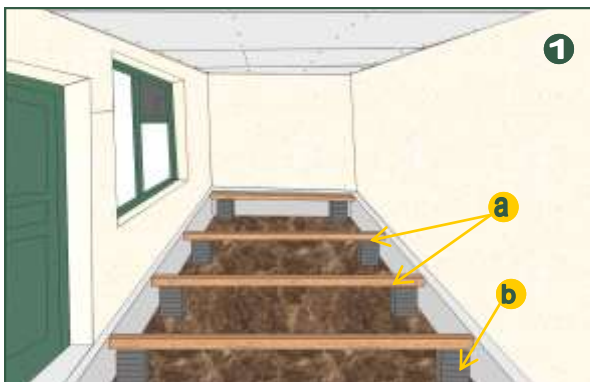


Step 4

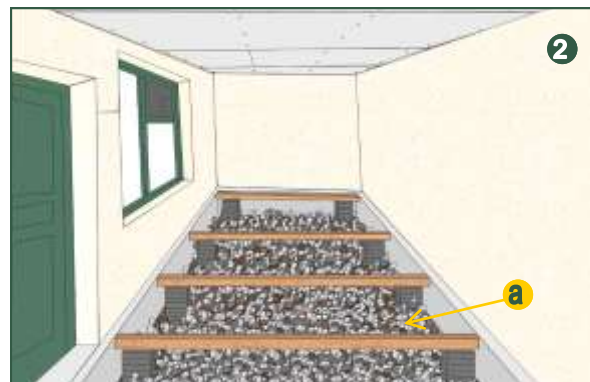
## 2.4. INSULATION OF FLOORS

Houses in Tajikistan generally have 3 types of floors : 1) wooden floors; 2) with basement ; 3) earthen floor

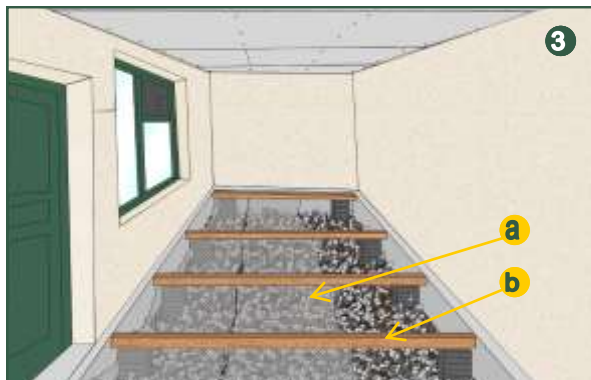
### Option 1. Insulation of wooden floor



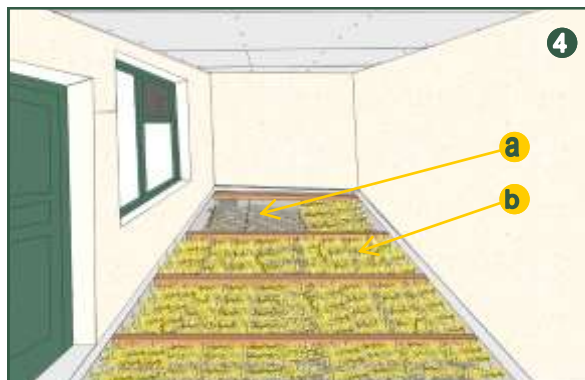
*Remove the wooden planks and make sure that wooden beams (a) are located properly on the supports (b) and that there is free space for insulation between beams and the ground*



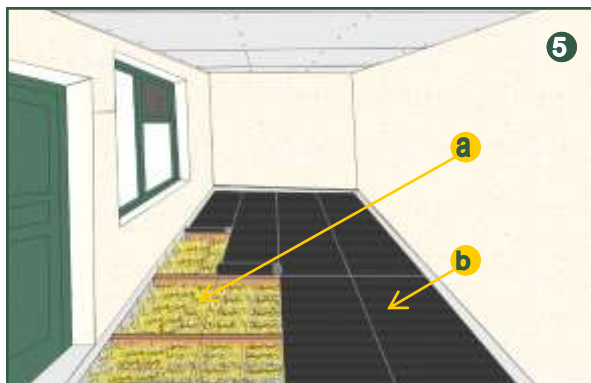
*For insulation of the floor, first, add a layer of gravel (10 to 15 cm) over the ground (a).*



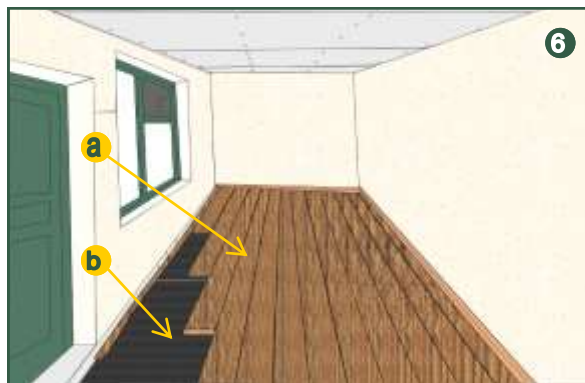
**Attach one layer of gauze or similar fabric (a) to the lower level of the wooden beams (b), so that next, you can put the insulation layer over it.**



**Fill the gauze with (a) insulation material, such as hay (b). You can also use glass wool or mineral wool.**



**Cover the upper side of the insulation (a) with a waterproof layer (b).**



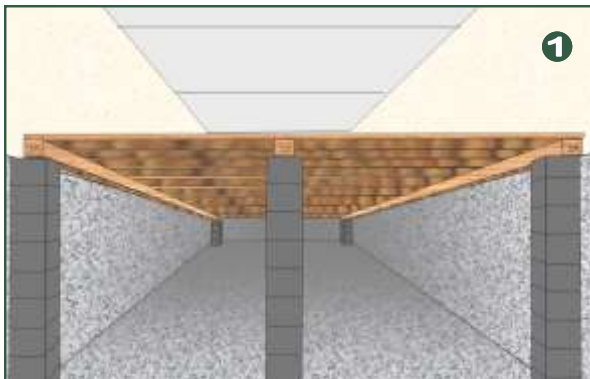
**Now attach the wooden planks to the wooden beams (a) covering the waterproof layer (b)**

**When using local insulation materials, DO NOT FORGET to treat it with slack lime.**

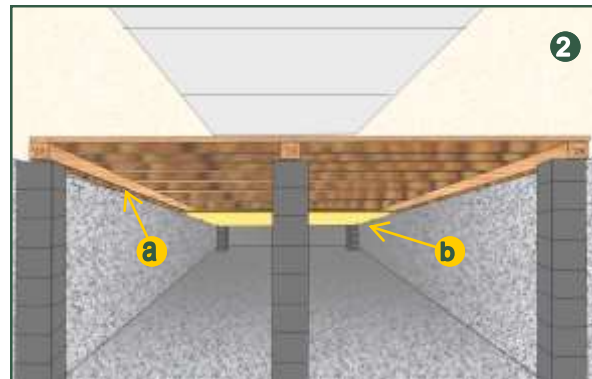


## Option 2.

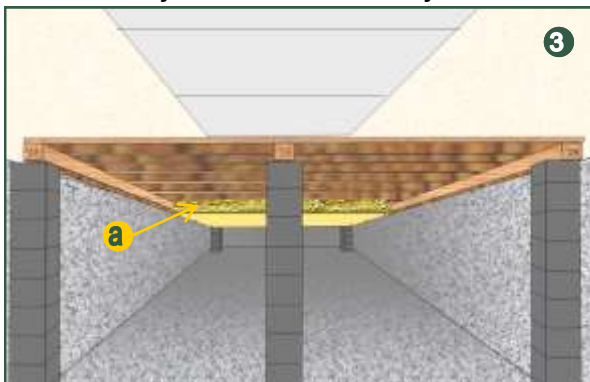
### Floor insulation of houses with basement



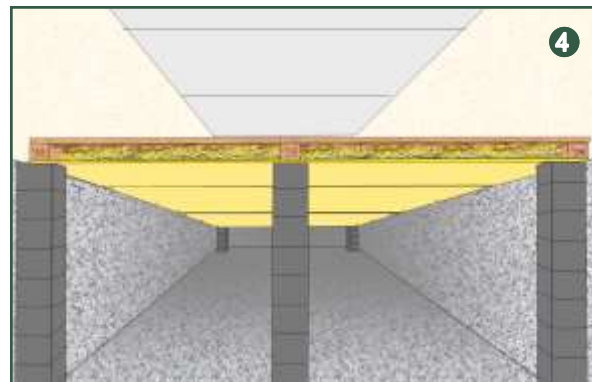
*One type of non-insulated floors is a basement. Houses with a basement can be insulated from below, i.e. from the basement itself.*



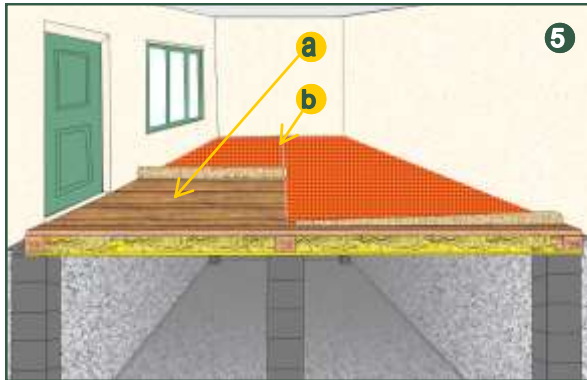
*First, attach one layer of plywood (a) under the wooden beams (only the first row).*



*Then, fill the space between the plywood and wooden planks with insulation materials (a). In this case, you can use hays or glass wool*



*Continue the work in this fashion, attaching one row of plywood, covering it with hay, continuing on until the space under the floor is fully covered and complete.*



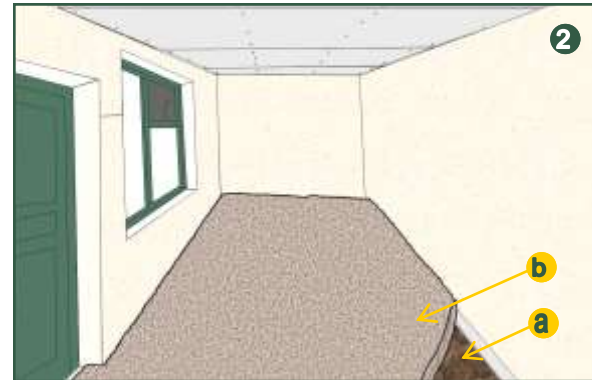
**Finally, cover the floor (a) with linoleum (b), to decrease risk of water dripping down.**

Some village houses have earthen floors. Residents of such houses cover the floor with polyethylene and carpet. However, it is difficult to keep such houses warm, as heat is lost through the floor.

Therefore, in order to save heat loss in houses with an earthen floor, the following insulation method is recommended.



**Step 1. Prepare the earthen floor (a) for insulation by cleaning the surface.**



**Then prepare a mixture of mud and hay in a proportion of 70% hay and 30% mud (by volume). Then plaster the surface of the earthen floor up to 10cm (b) with mixture.**

**Option3.**  
**Insulation of earth-**  
**en floor.**

**You may also put one layer of fabric over the plaster and color it.**

### 3. ADDRESSES FOR MASTERS AND PROMOTERS

	Ayni district	Asht district
For house insulation please contact:	<b>Sirojiddinov Ayomiddin.</b> Address: Dijik village, jamoat Fondaryo; Phone.: 93 545 00 25	<b>Ergashev Zokir.</b> Address: Upponi Bollo village, jamoat Oshoba Phone: 92 902 94 67
For purchasing construction materials, please go to:	<b>Sarvoda town Construction Store</b> Address: Sarvoda town, (near hospital).	<b>Appon Market Place</b> Address: upponi Bollo village, jamoat Oshoba
To purchase the Insulated windows and doors, please contact:	<b>Kayumov Amonullo.</b> Address: Zarafshon 1 village, jamoat Fondaryo Phone.: 93-437-77-77	<b>Odil Yuldoshev.</b> Address: Marhamat village, jamoat Oshoba, Asht district Phone.: 92-839-11-40,
For consultation and more infor- mation, please contact:	<b>Sirojiddinov Asliddin.</b> Address: jamoat Fondaryo, Phone: 92-764-20-52.	<b>Abdulloev Faizullo.</b> Address: Jamoat Oshoba, Phone: 92-727-06-51.



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Women in Europe for a Common Future



German cooperation



Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH



UKAID



Abbé Pierre Foundation



Groupe Energies Renouvelables, Environnement et Solidarités



Agency for Support Development Process Nau

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#### **GERES - TAJIKISTAN**

Address: 79 Hamza Hakimzoda Street, Dushanbe, Tajikistan

Phone: (+992) 37 880 65 64

E-mail: [tajikistan@geres.eu](mailto:tajikistan@geres.eu)

Web: [www.geres.eu](http://www.geres.eu)

#### **Agency for Support Development Process Nau**

Address: 20-34 Lenin Street, Khujand, Tajikistan

Phone: (+992 34) 224-53-20; 6-03-62

E-mail: [office@agencynau.tj](mailto:office@agencynau.tj)

Web: [www.agencynau.tj](http://www.agencynau.tj)