



STAG



# LAMBING SHED CONSTRUCTION GUIDE



## Introduction

This lambing shed design has been conceived in ChangThang, a cold desert area in the high altitude plateaux contiguous to Tibet (above 4500m). The local population, mostly nomadic and semi-nomadic herders live essentially from sheep and goats breeding. In spring, during animals delivery period, mortality amongst kits and lambs frequently reaches 50%. The lambing shed whose construction is described hereafter, strives to reduce this mortality by 60%, together with ameliorating the life of the herders by procuring a warm shed usable for other purposes.

A basic skilled mason can build it, and most of the material required is locally available.



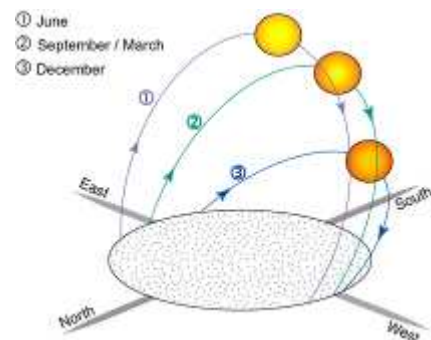
## 1 Passive solar concept

### 1.1 Principle

Passive solar architecture aims at taking advantage of solar radiation during the cold season to heat the inner space. The building collects solar radiation during the day and this keeps the room warm both in the daytime and night. Heat is stored inside the walls, and released during night. Ventilation avoids overheating during daytime.

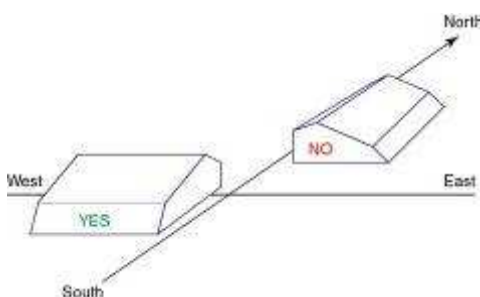
### 1.2 Solar radiation

The sun rises in the east, moves on to the south and sets in the west. Sun is higher in the sky in summer than in winter. Therefore in summer, most of the solar radiation is picked up by the roof whereas during wintertime, the south face picks up the largest amount of solar radiation.



### 1.3 Orientation

Building should be aligned along an East-West axis, to maximise the surface area facing south. A  $\pm 30^\circ$  variation is acceptable, if required by the site.



## 2 Site feasibility

### 2.1 Site

To fulfil its principal aim, that is to reduce mortality amongst lambs and kits, the shed should be built at the place where herds are staying during lamb and kit births period. According to the grazing pattern of the herders (most of them are semi-nomadic), this place will either be isolated, or close to the family settlement.

In this second case, the utilisation of the shed will be more diversified, eg. for handicraft activities, bathing, washing cloths, and growing vegetables after the lambing period. Therefore, the impact will be major. The shed can be built separately from the house or attached to it, if the orientation and size of the building permits it. One advantage is that the house will also be warmed by the attached greenhouse.

### 2.2 Soil

The area should be suitable for construction. Soil humidity is to be considered carefully as some places seem suitable in summer, but are marshy and unsuitable in spring and this causes the collapse of the building.

### 2.3 Shade

The shed should be situated in such a place where there is no obstruction from direct light (caused by a building, trees...), and winter sun duration should be more than 6 hours.

### 2.4 Availability of raw material/accessibility

Stones and mud, or mud and cement should be available easily at close distance from the site, and it should be accessible to bring other required building material from the nearest market (door, ventilator, beams and twigs if necessary).

Presence of water nearby is also necessary for the construction.



## 3 Theoretical elements and design process

### 3.1 Size

Size of the shed is determined according to the number of animals in the herd, the type of animals and the family needs. 4 sqft should be available per animal kept in the shed (this ratio is augmented if there are more sheep). In a 12x24ft shed can be accommodated 60 to 80 sheep and goats

### 3.2 Material required and costs estimation for a 12x24ft shed

Material	Quantity	Costs estimation*
Stones	300	600 INR
Ricks	1000	2 000 INR
Door	1	1800 INR
Window	1	1400 INR
13ft ballies	4	1600 INR
Pole to sustain the roof (5 ft)	1	100 INR
Twigs (12 to 15 ft)**	60	1020 INR
Polysheet	1	1500 INR

\* according to prices in Leh, Ladakh in 2007

\*\* twigs are requested for the roof

other costs

Mason	6 days	1 500 INR
Unskilled labour force	2x10 days	2 600 INR
Eventual transportation of material		case to case

Transportation costs vary according to the availability of material in the area, distance and the number of lambing shed to be build (costs are less if transportation costs are shared).  
Considering transportation costs, the total cost of the building approaches 16 000 INR.

### 3.3 Roof

Roof has different functions:

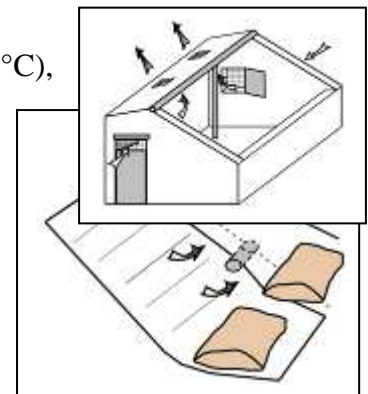
- it helps to reduce the space to heat
- it reduces night heat loss.
- it facilitates water and snow drainage, which occurs on both sides, with a major slope of the polythene.
- it reduces polythene sheet size, and allows a stronger fixation of it. Thus, polythene is less shaken and damaged by the wind.
- it also allows a improved ventilation by top apertures.
- during daytime, lambs and kits remain in the shed. Roof provides an additional shady area where they can take shelter from the sun.

Where beams and sticks are hardly available, a solution without roof is also possible, ventilation being augmented with holes in the upper part of the back wall.

### 3.4 Ventilation

During sunny days, the air inside the shed can be very warm (over 40°C), which is not suitable for the kits and lambs kept inside. Moreover, animals exhale a lot of humidity. This overheating and humidity can cause diseases and ailments.. To avoid such problems, proper ventilation is necessary which is provided by the side and top ventilators. As the warm air rises, the cooler ambient air outside enters the shed through the side ventilators, cools the shed, gets warmer and finally rising and exiting the shed through the top ventilator. This air flow is generated if both apertures are open.

An alternative solution for ventilation is polythene divided into 3 stripes, with an overlap of 15 cm. To ventilate, a gap is created between the stripes by the insertion of a piece of wood or other material.



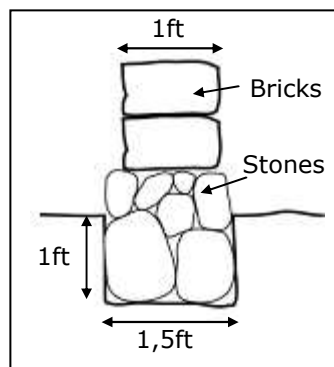
## 4 **Step by step construction**

### 4.1 Levelling

Levelling can be requested if the site surface is not plane.

### 4.2 Foundations

1 ft deep foundations are usually recommended. If soil is soft, 1,5 ft deep foundations are advisable. Foundations are usually done of stones. According to raw material available, a mix of mud and cement (12%) is also suitable. Foundations should overpass ground level of at least half foot.



Sand or  
mud bags

### 4.3 Walls



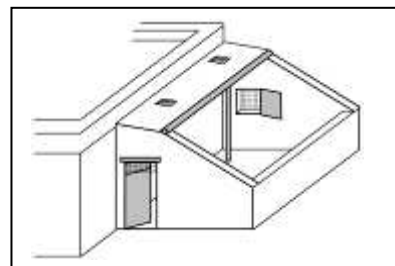
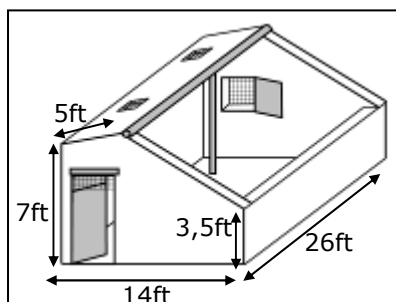
Mud bricks or rammed earth provide good insulation. If mud is not available, walls can also be built in stones. South wall measures 3,5 ft and North one 7 ft.

Finishing of the upper part of the walls should be done with mud. This way, the polythene will be supported by a smooth surface, and will not be damaged.

Outer walls (inside wall if possible also) should be plastered with mud, to fill up the gaps and improve insulation.

### 4.4 Roof

A half-foot slope is recommended, for a 5ft width roof. The shed can either be attached to a house, or separated. In the first case, slope should be towards the polythene, so that rain and snow do not fall towards the house. In the second one, slope is towards the back side of the shed.



Backside of the roof is supported either by the backside wall, or by a thin beam for an attached shed. First is a layer of twigs, that is then covered by dry grass or cardboard, recovered then by mud.

The roof main beam will be supported either by a pole (pipe or beam), with an extra 6 feet beam, or by a partition wall, but that occupies more space.

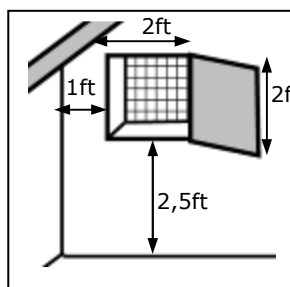
### 4.5 Ventilators

#### 4.5.1 Side apertures

Side apertures consist of manually operated openings:

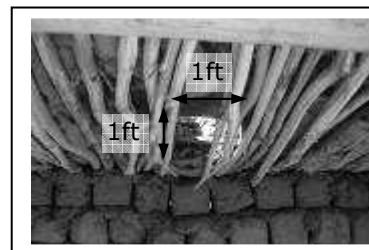
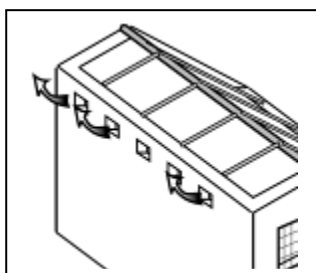
- the door upper shutter (1,5 ft high)
- a window on the opposite side wall (2x2 ft)

These apertures should be meshed, to prevent intrusion of predators (wolves are common in ChangThang, and few lynxes and snow leopards roam over).



#### 4.5.2 Upper apertures

If the shed has a roof, traditional permanent 1x1ft openings are arranged in the roof (2 for a 12x24ft shed). They can be made with 1x1ft tin oil. It is recommended to cover them with chicken mesh.

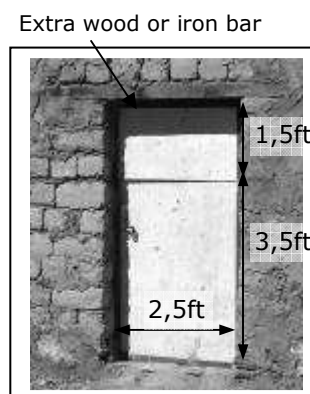


If there is no roof, one beam and 8 twigs will support the polythene sheet. Additional ventilation is then required through permanent holes in the shed at the back side.

#### 4.6 Door and window

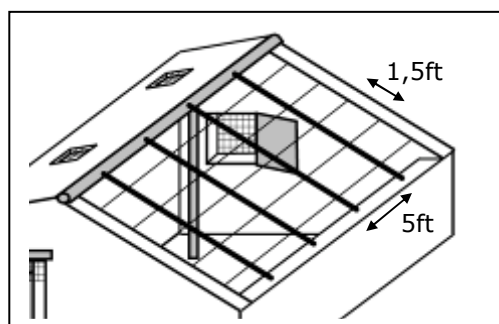
The door is supported by the backside wall, and opens inside, resting on this same wall, so that animals will not damage it by entering the shed. Similarly, the window opens toward the inside of the shed, so that wind does not shake it.

If door and window frames are of iron an extra iron bar or piece of wood should be put above the frame, to avoid it from getting stuck with the wooden lintel while opening or closing the shutter. This is not required if frame is made of wood.



#### 4.7 Support of polythene

To support the UV resistant polythene (150grm), joists are put laterally every 5 ft, and wire is tied horizontally every 1,5 ft. This is necessary to maintain the polysheet properly and to prevent it from being damaged by the wind.



#### 4.8 Fixation of polysheet

Polythene sheet should be fixed on a sunny day, around midday, so that it will remain well tied by getting cold and contract.

4 persons minimum should be present to fix it properly. It is put from the top to the bottom. Then, polysheet is fixed on the roof, with bags filled with mud, and similarly from south side to the upper part.



#### Contact:

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