

ANNEX: DESIGN WITH MEASUREMENTS IN CENTIMETRES

In the following, the four designs shown at the start of Part B are presented with the dimensions in centimetres.

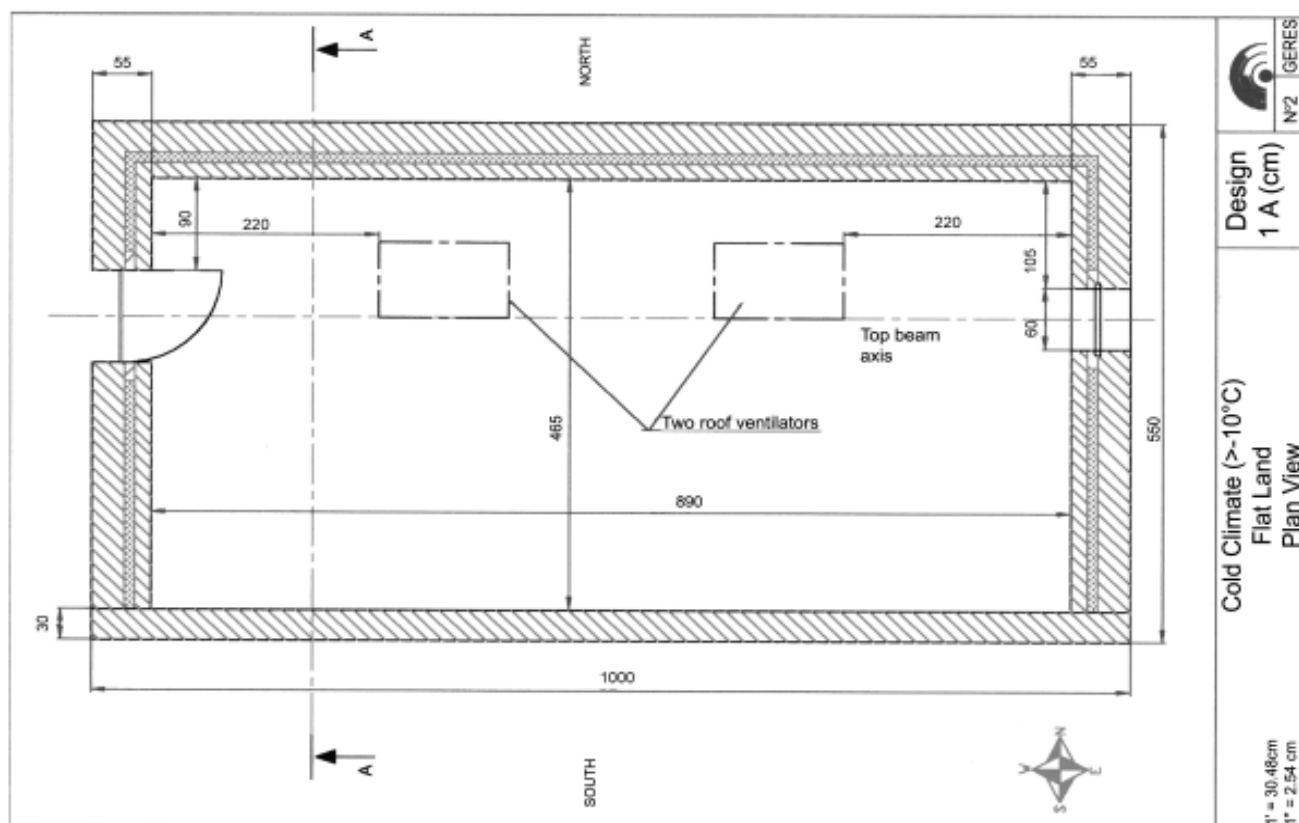
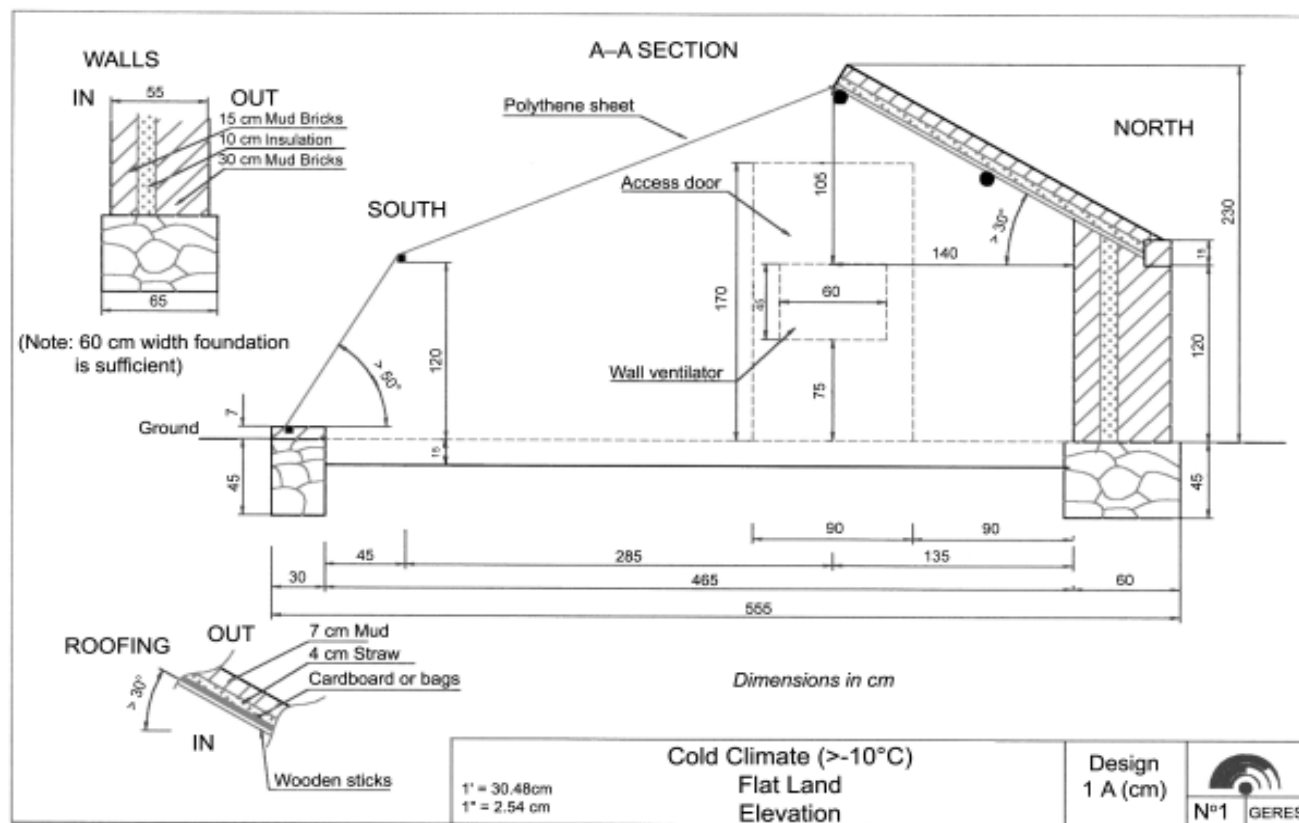


Figure 83: Design 1A (cm) - Greenhouse for cold climate, flat land

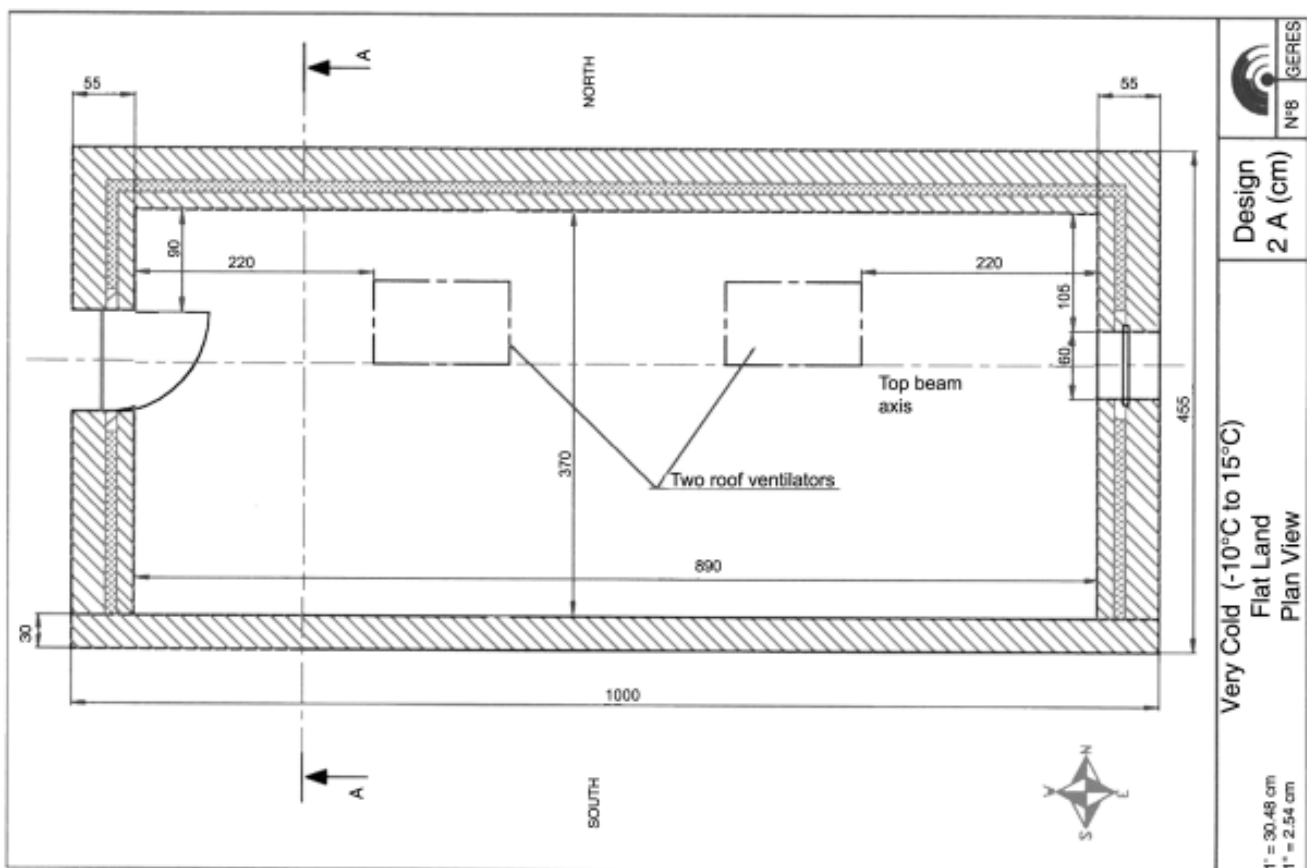
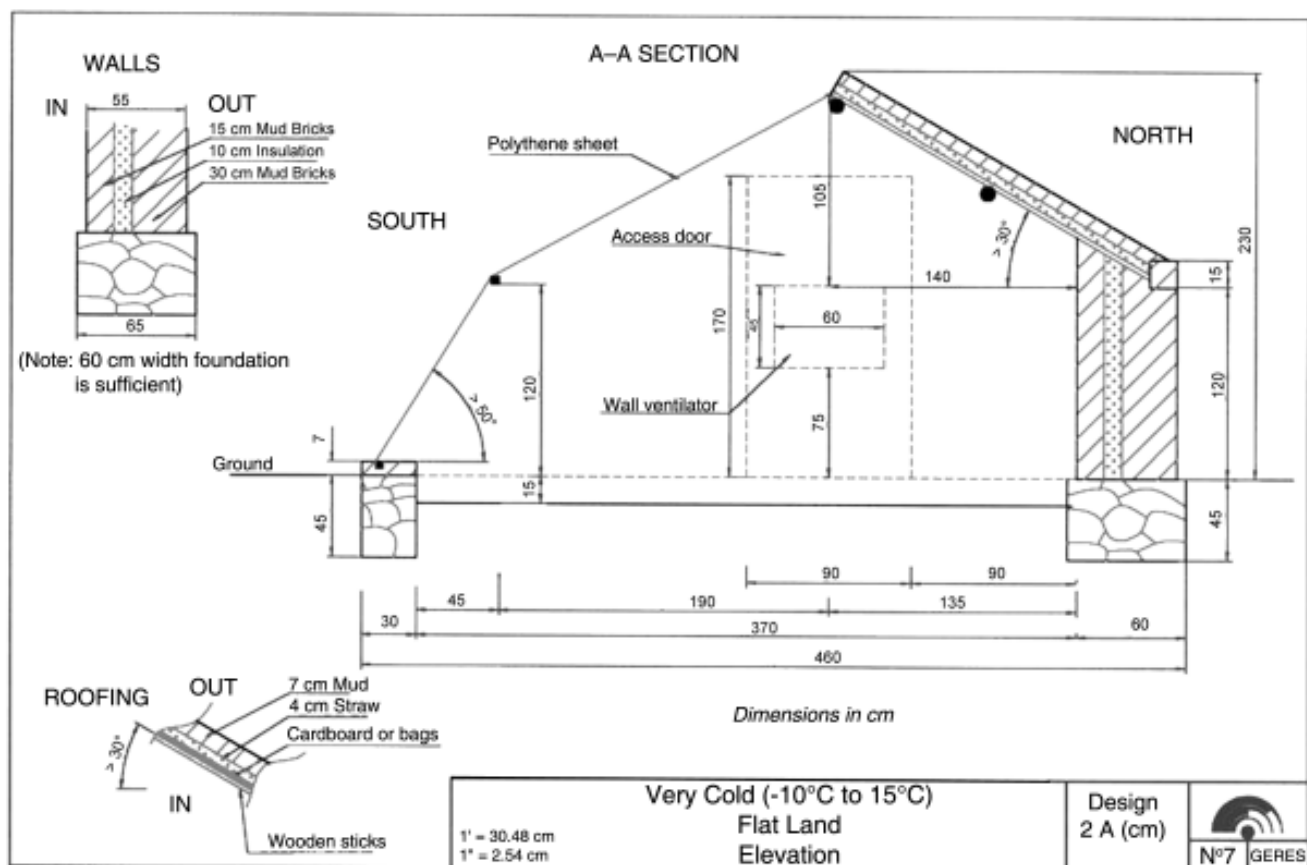
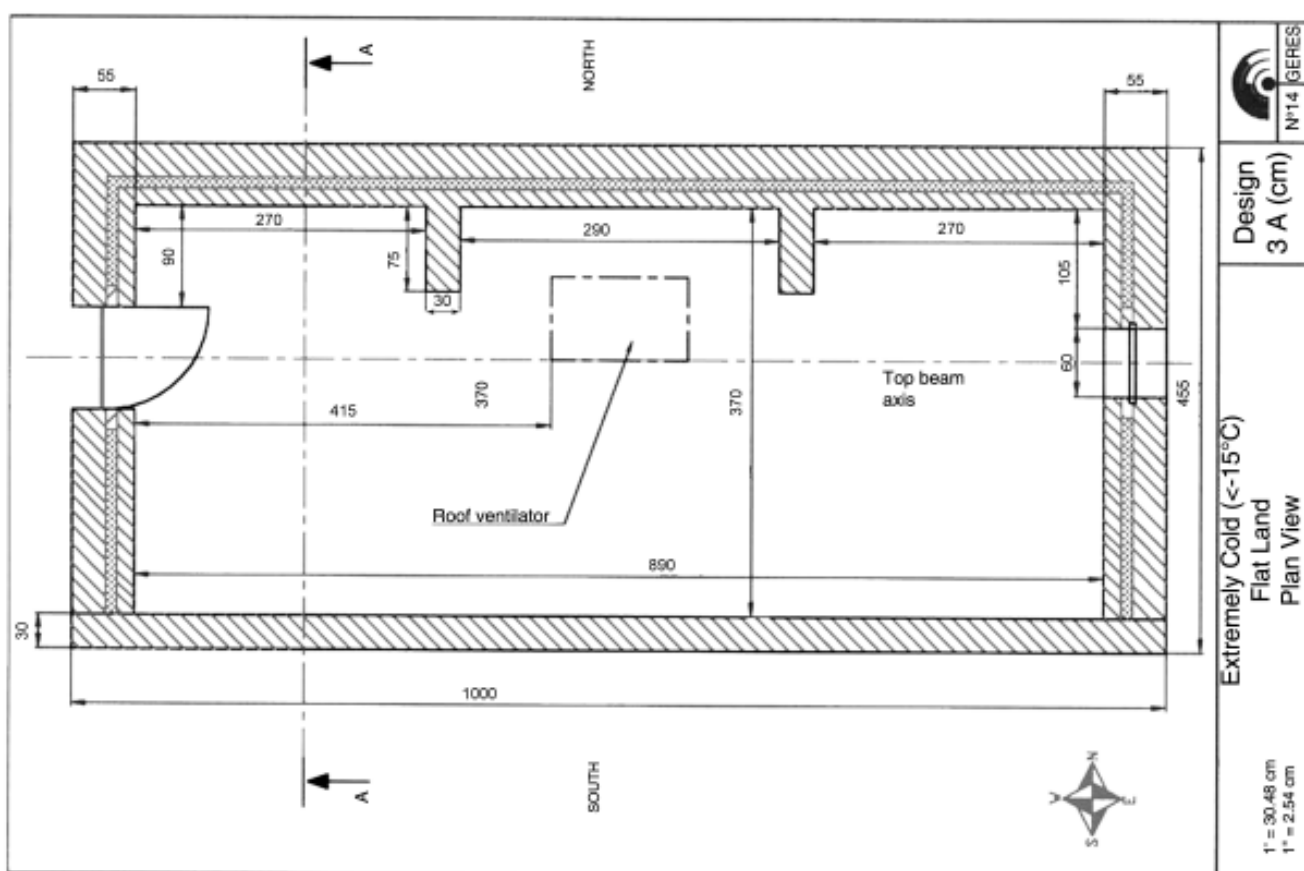
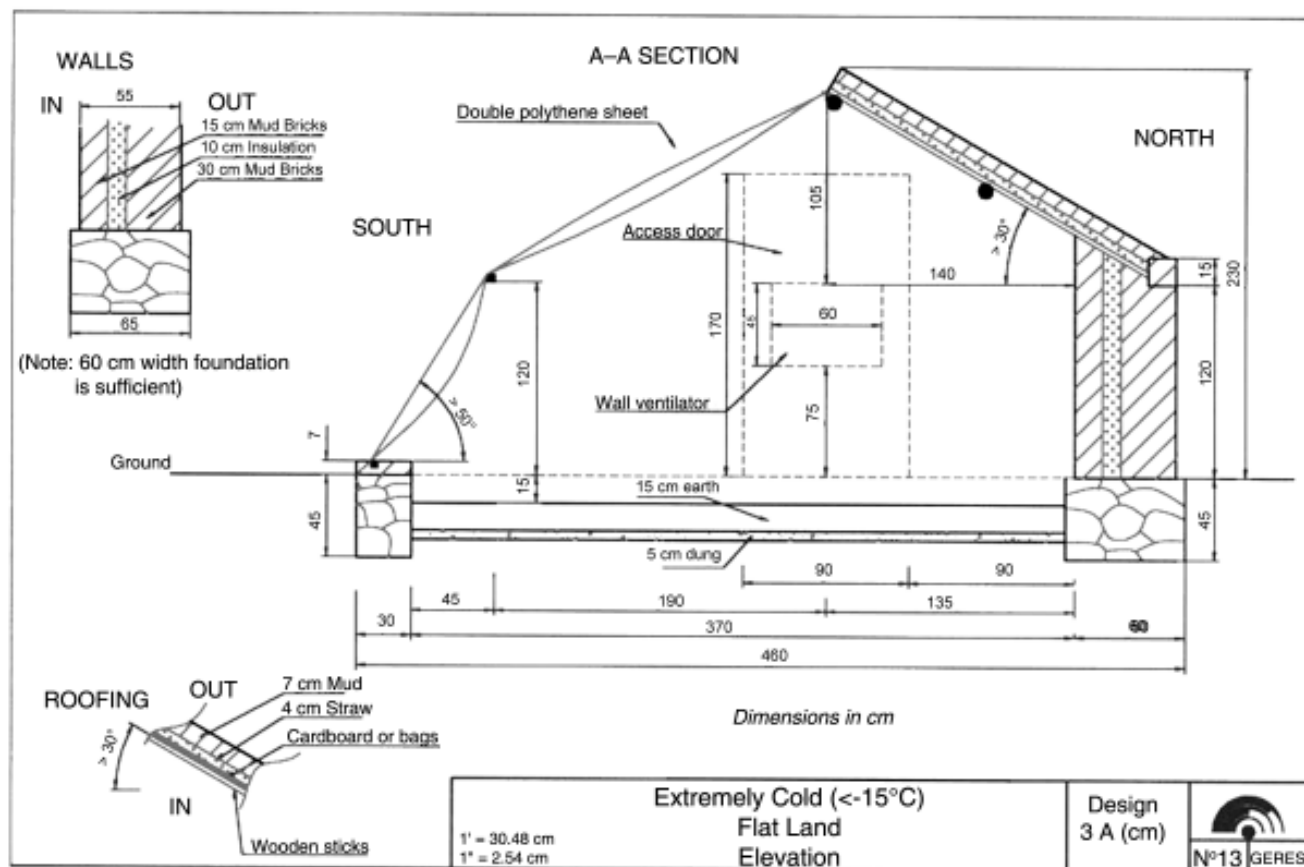


Figure 84: Design 2A (cm) - Greenhouse for very cold climate, flat land



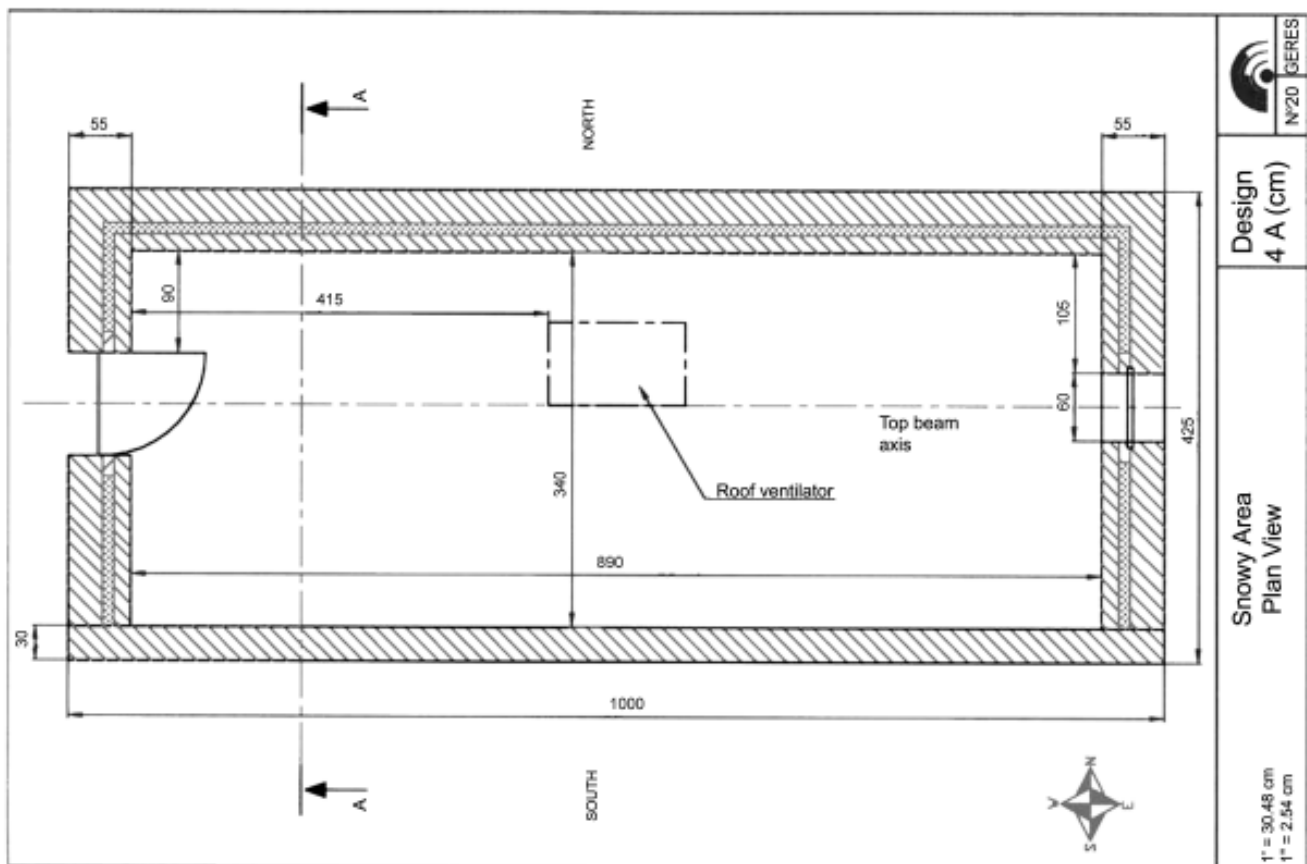
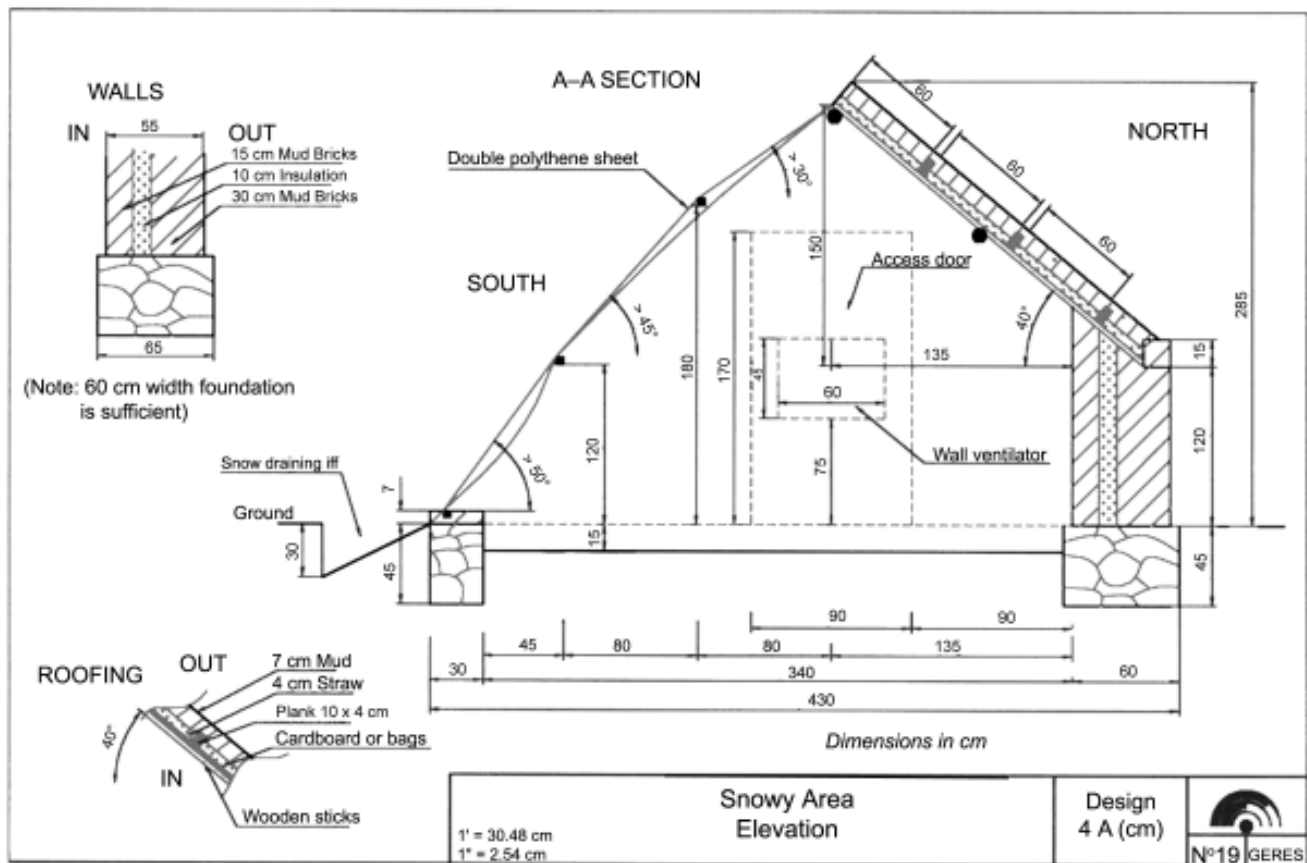


Figure 85: Design 4A (cm) - Greenhouse for snowy area, flat land

LIST OF MATERIALS (Metric)

The tables lists as a guide all the materials needed to build Design 1A. Optional components are shown in italics. The list can be modified to show the amounts needed to construct the other designs using the information given in the design plan and the technical datasheets. The numbers of days of labour shown are estimates based on experience in a number of countries; the exact times will depend on the local situation and the level of skill and training of those doing the work.

	Material required	Quantity*	Carpenter person days	Mason person days	Unskilled labour person days
1	Foundation				
	Excavation	7 m ³			3
	Construction				
	stone	7 m ³		3.5	7
	<i>5 cm PCC concrete layer (M 60 kg/cm², 1:2:4) (optional)</i>	<i>0.63 m³</i>		0.25	0.5
	- cement	<i>1.5 bags</i>			
	- sand	<i>0.25 m³</i>			
	- gravel	<i>0.5 m³</i>			
2	Walls				
	Construction			7.5	23
	mud bricks (30 x 15 x 15 cm) (10 m ³)	1800 pieces			
	mud	4.4 m ³			
	sticks Ø 5 cm, 30 cm long	34 pieces			
	insulating material (straw, sawdust, etc.)	11 bags			
	seabuckthorn (if available)	1 bag			
	<i>waste planks 50 cm long, 7.5cm wide (optional)</i>	<i>100 pieces</i>			
	Finishing	55 m ²		5	10
	mud for plaster	2 m ³			
	whitewash (lime)	2.75 kg			
	black powder	0.3 kg			
	straw glue	2.75 kg			
3	Door		2		2
	Door Frame and Door				
	wooden timber 10 x 7 cm for shutter	5.2 m			
	wooden timber 5 x 4 cm for frame	5.5 m			
	6mm plywood for outside	160 x 80 cm			
	4mm plywood for inside	160 x 80 cm			
	insulating material (straw, sawdust, etc.)	0.5 bags			
	hinge 10 cm	2 pieces			
	Door Lintel				
	timber 10 x 7 cm or beam Ø 10 cm for lintel	2 m			
	plank 2.5 cm thick	100 x 55 cm			
	<i>or sticks Ø 5cm, 1.2 m long</i>	<i>10 pieces</i>			
	<i>and jute bag</i>	<i>2 pieces</i>			
4	Wall ventilator		0.5		0.5
	wooden timber 10 x 7 cm for frame	1.9 m			
	wooden timber 5 x 4 cm for shutter	1.65 m			
	6mm plywood for outside	35 x 40 cm			
	4mm plywood for inside	35 x 40 cm			
	insulating material (straw, sawdust, etc.)	small amount			
	hinge 5cm	2 pieces			
	chicken mesh	50 x 45cm			

	Material required	Quantity*	Carpenter person days	Mason person days	Unskilled labour person days
5	Roof			2	8
	Support Structure				
	beam Ø 15cm, 10m (<i>5m or 3.3m</i>) long	2 (<i>4 or 6</i>) pieces			
	post Ø 15cm, 3m long	2 pieces			
	post Ø 15cm, 2.7m long	2 pieces			
	cross support Ø 15cm, 3.8m long	1 piece			
	Covering				
	sticks Ø 5 cm, 2.05 m long	200 pieces			
	cardboard	19 m ²			
	straw or bushes	4 bags			
	mud	1.9 m ³			
	<i>White cloth (optional) 1.8m wide</i>	8.8m			
6	Roof ventilator (for two, halve amounts for one only)		2		2
	wooden timber 10 x 7cm	8.8m			
	wooden timber 5 x 5 cm	8.8m			
	galvanised metal sheet for outside (25 gauge) 120 x 90 cm	2 pieces			
	<i>or plywood for outside 6mm, 120 x 90 cm</i>	<i>2 pieces</i>			
	plywood for inside 4mm, 120 x 90 cm	2 pieces			
	<i>or galvanised metal sheet (25 gauge) 120 x 90 cm</i>	<i>2 pieces</i>			
	straw	0.4 bags			
	hinges 7.5 cm	4 pieces			
	hinge 5 cm (between shutter and iron bar)	2 pieces			
	iron bar 10 cm long, 2.5 cm wide, 5 mm thick	2 pieces			
7	Transparent plastic covering			1	1
	Support Structure				
	pillar post Ø 10cm, 1.7m long	2 (<i>3</i>) pieces			
	beam Ø 10cm or 7 x 5 cm, 3.3m (<i>5m</i>) long	3 (<i>2</i>) pieces			
	wooden joists Ø 5 cm or 5 x 4cm or Ø 10 cm bamboo, 3m long	5 to 7 pieces			
	iron (Ø 3mm) or plastic wire	55m			
	Cover				
	polythene sheet 6m wide, UV resistant (0.4 mm thick)	10 m			
	empty bags	20 pieces			
8	Night insulation		1		4
	cloth (parachute material) 4.9m wide, 3.5m long	3 pieces			
	metal wire (Ø 3mm)	146m			
	rings (curtain rings)	64 pieces			
9	Miscellaneous				
	oil or varnish (2 coatings)	35 kg			
	white oil paint for opening	15 kg			
	nails	3 kg			

* 'Bags' indicates a full bag/sack of the type used to package cement, fertiliser, and other chemicals.

ABOUT THE AUTHORS

Vincent Stauffer, a French thermal engineer, is the main contributor to this manual: he has led the design process, the experimentation, and the dissemination of the greenhouse model which is presented. He has been working since 1992 in the field of solar energy and since 1998 in the Hindu Kush-Himalayan region. At GERES, he is contributing to the development of solar poultry farms, passive solar housing, improved stoves, and food and wool processing in the Hindu Kush-Himalayas.

Important contributions were also made by the following.

Tashi Tokhmat, Dorge Raftan, and Gulam Razul (LEHO) – carried out the first experiments and suggested the main improvements

Christophe Viltard and **Laetitia Rivagorda** (GERES) – did the agricultural experimentation

Philippe Rynikiewicz, Benoit Giraud and **Claude Tournellec** (GERES) – suggested practical improvements

Rodolphe Castelani (GERES) – did the drawings

Thomas Mansouri (GERES) – set up the manual

Alain Guinebault (GERES) – initiated the projects



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