

### Area and Volume Calculations

$$V_{BW} = d^2h, V_s = (1/3)H(d^2+dD + D^2)$$

$$V_{TOT} = d^2h + (1/3)H(d^2+dD + D^2)$$

$$A_{BW} = 4dh\Phi, A_s = D^2$$

$$A_{TOT} = 4dh\Phi + D^2$$

$$S = 2H(d+D)$$

Temperature range of 37°F-79°F  
Diurnal temperature swings <20°F during cold season

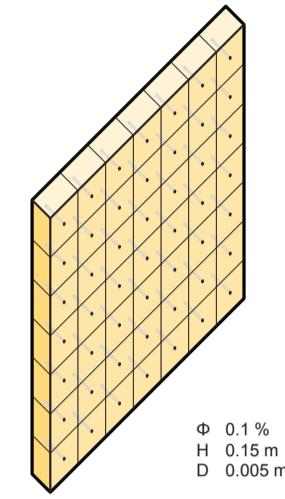
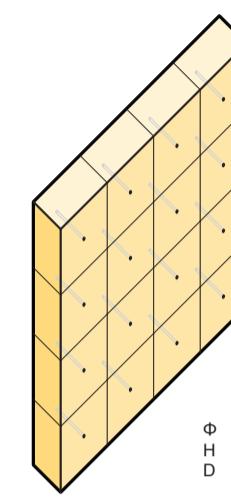
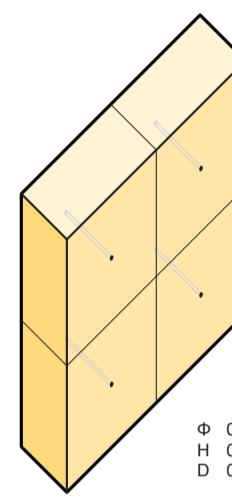
WOOD  
monterey pine  
0.26 W/mK

heat recovery  
pressure difference  
80 %  
5 Pa

DEPTH  
0.25 m

DEPTH  
0.15 m

DEPTH  
0.1 m



Previous Sizing Studies

### OBJECTIVE FUNCTION

Total breathing wall surface area:  $4dh$  OR Total stack surface area :  $2H(d+D)$

### INEQUALITY CONSTRAINTS

Total height limited to 7.5m:  $7.5 - h + H \geq 0$

More than 1 air change per hour:  $Q = A_{tot} * \sqrt{Hg\beta\Delta T} - V_{tot} / 3600 \geq 0$

### LINKS

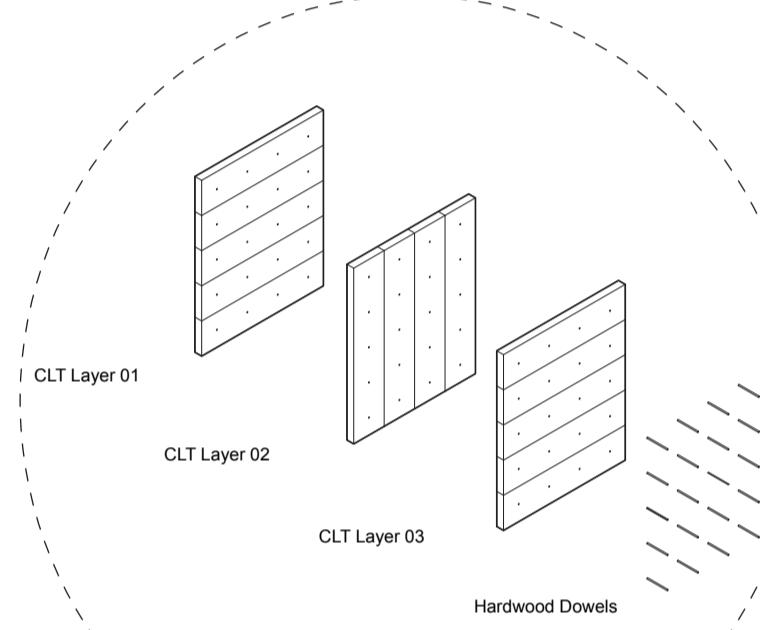
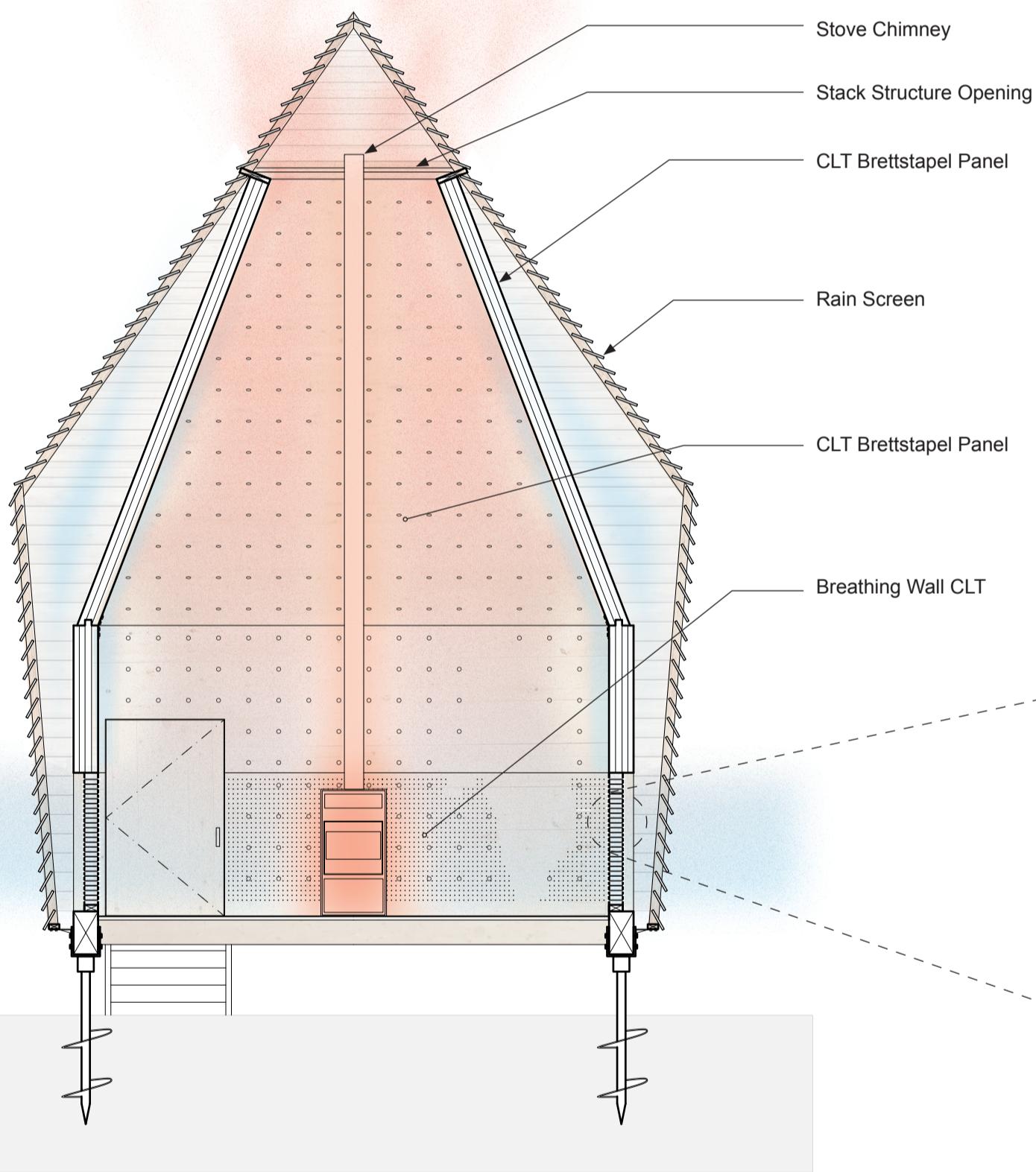
bejan number:  $be = \Delta P L^2 / \mu\alpha$

ventilation rate:  $Q = A_{tot} * \sqrt{Hg\beta\Delta T}$

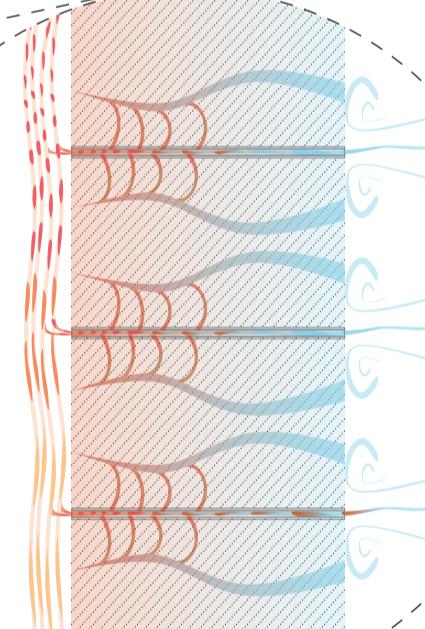
discharge coeff:  $c = 0.61$

air density:  $\rho = 1.225 \text{ kg/m}^3$

$$Q = c * A_{tot} (2\Delta P / \rho)^{0.5}$$



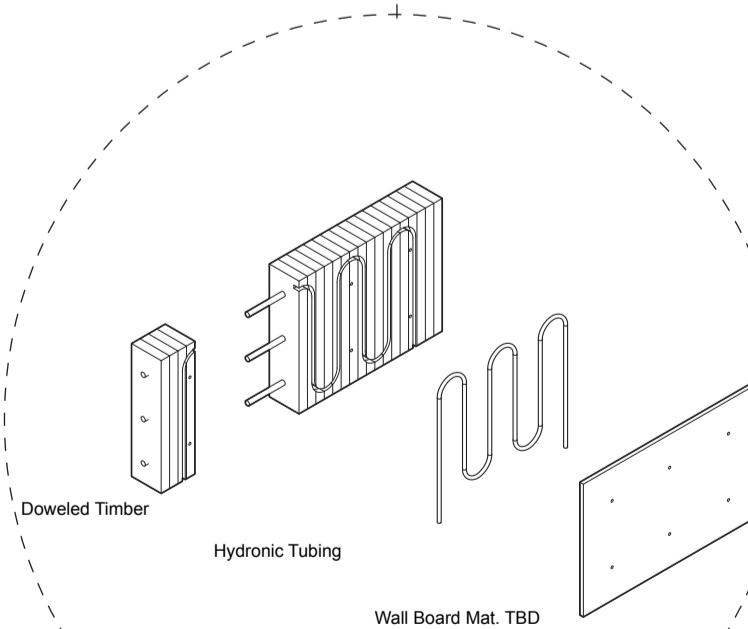
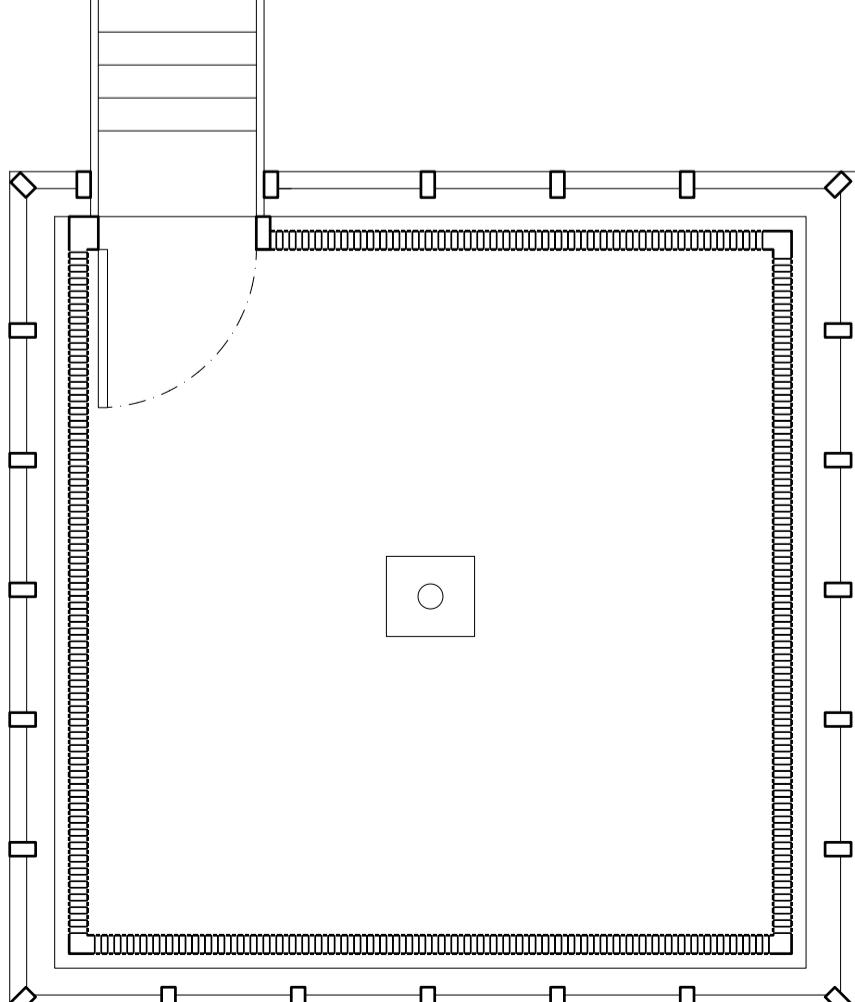
Brettstapel Wall Panel Construction Option A



Breathing Wall Section Detail

### Section

0  
.5m  
1m  
3m



Brettstapel Wall Panel Construction Option B (Hydronic Embedded Lam)

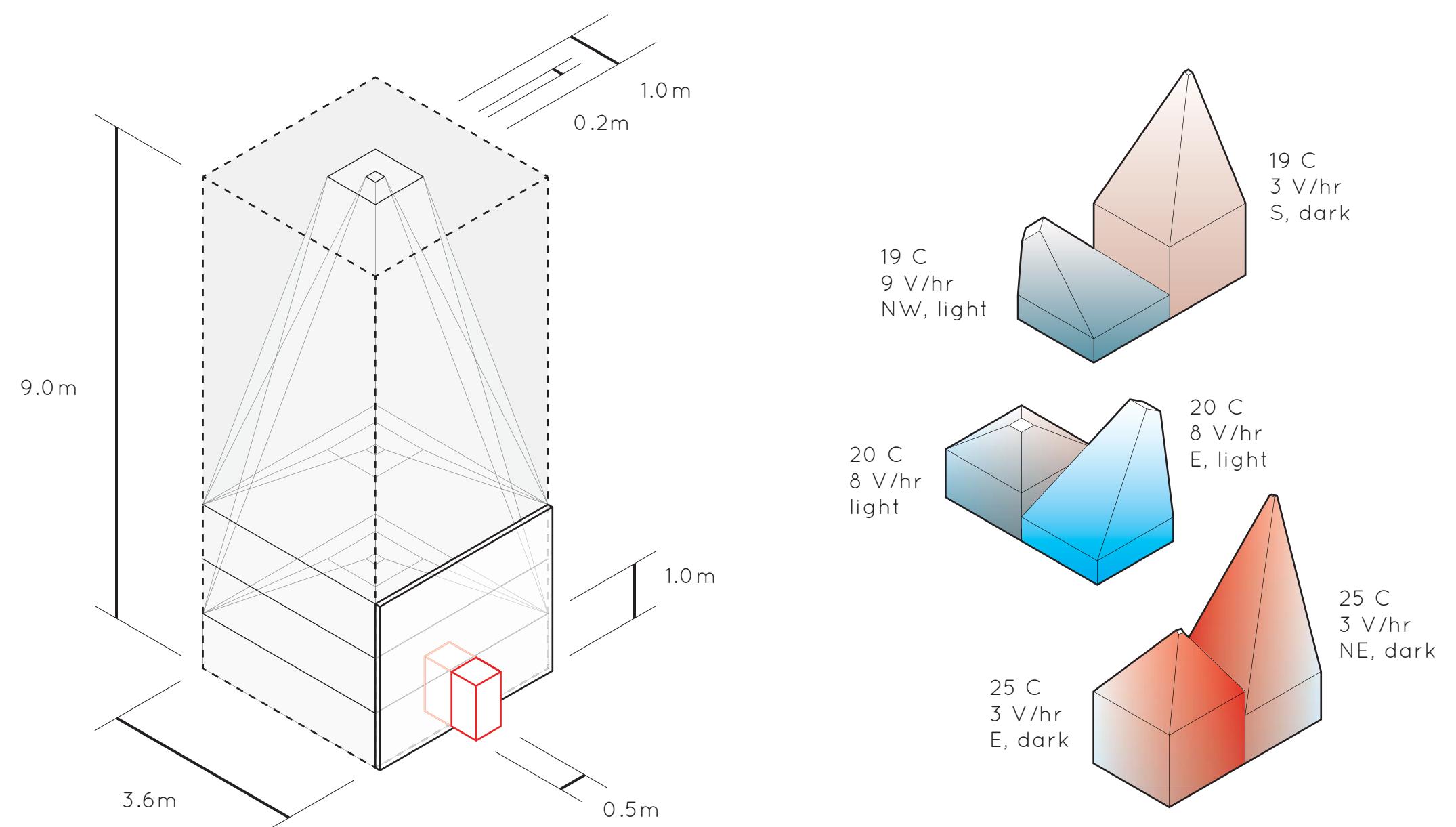
### Plan

## 01 MORPHOLOGY

The southern Chilean climate experiences an **annual low of 2.8C (37F)**. Designed for this condition, our half huts enclose a range of interior atmospheres in terms of temperature and ventilation rate, powered by the same standard wood stove. The stack can be reoriented based on the solar path which, paired with a calibrated stack opening, controls the interior daylighting condition for each type of space.

### Control parameters

breathing wall height, stack height, and stack opening size and direction.



290K 17C 62F	291K 18C 64F	292K 19C 66F	293K 20C 68F	294K 21C 70F	295K 22C 71F	296K 23C 73F	297K 24C 75F	298K 25C 77F	299K 26C 79F
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