



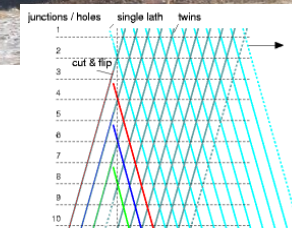
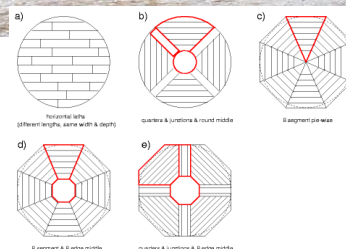
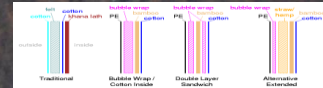
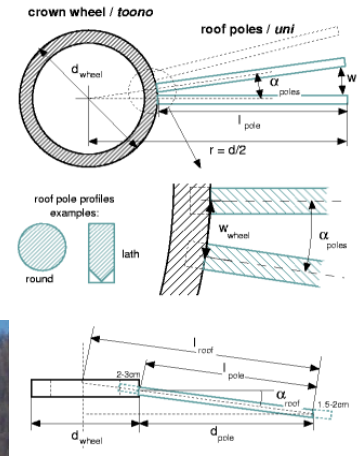
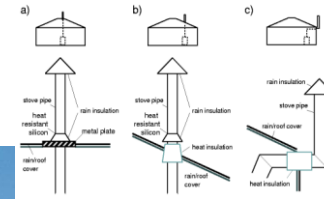
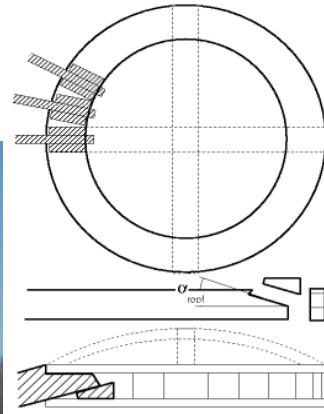
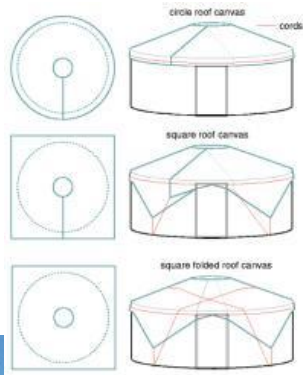
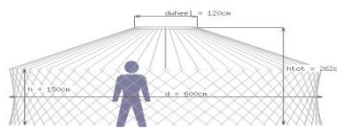
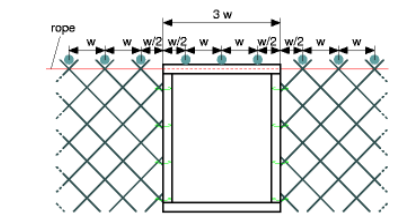
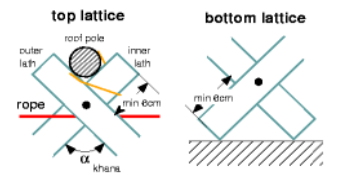
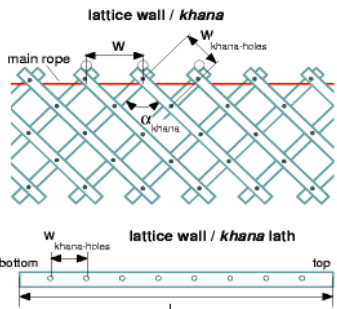
Milestone Meeting

R&D of winterized Shelter Solution for Mongolia



BritishRedCross

London, April 25th





Recap Field visit



International Federation
of Red Cross and Red Crescent Societies

Shelter Research Unit
an initiative of the Benelux Red Cross Societies



Dates:

- collaboration agreement signed December 2013
- **Field-visit 6 –12 February 2014**
- Regular follow up skype-conferences with MRCS and BRC

Main objectives of the project confirmed during field visit:

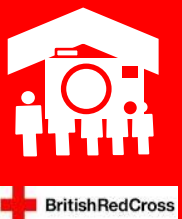
- support MRCS in disaster preparedness (scenario strong earthquake in UB)
- contribute to the global shelter sector with the development of a winter-solution.
- Through Mongolia project showcase an innovation that has global potential.



Points noted from Field-visit :

- Pursue collaborate with NEMA, critical for testing
- Try to build collaborations with Universities both in UB and UK
- Collective shelter as potential option worth exploring

Pictures





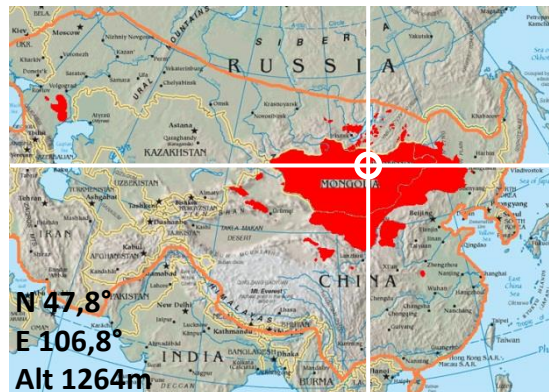
Contexts



International Federation
of Red Cross and Red Crescent Societies

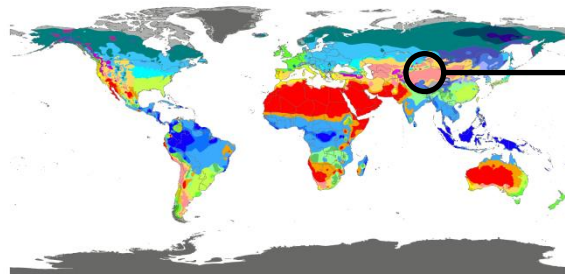
Shelter Research Unit
an initiative of the Benelux Red Cross Societies

Regional



World map of Koppen-Geiger climate classification

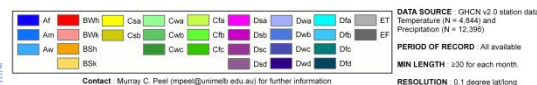
World map of Köppen-Geiger climate classification



Classification **Dwc**
= subarctic climate exposure



= winter is extremely cold and long
while summer is short and cool



Ulaanbaatar Climate Data

Heating period

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Average temperature

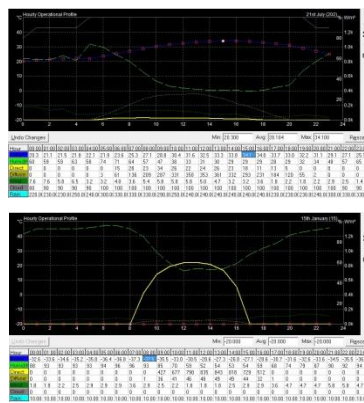
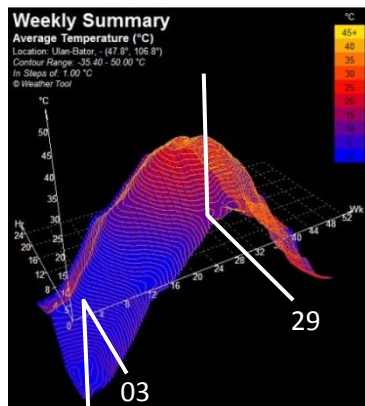
-24.4	-19.6	-7.6	+2.7	+10.4	+17.5	+20.1	+17.3	+10.1	-0.4	-13.1	-22.8
-------	-------	------	------	-------	-------	-------	-------	-------	------	-------	-------

Hottest week	Week 29	Always including Jul. 19 th
Coldest week	Week 03	Always including Jan. 18 th
Hottest day peak	July 22 nd	+35,2 °C
Coldest day peak	January 15 th	-37,5 °C

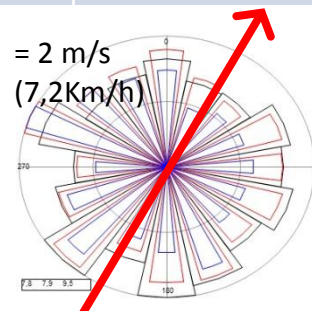
Heating period = 9 months



72,7 °C



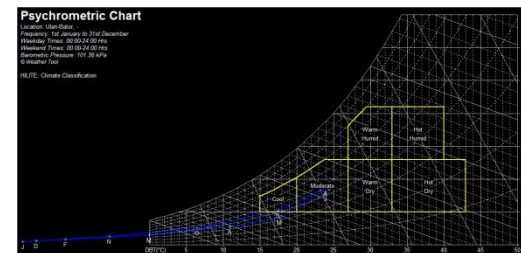
= 2 m/s
(7,2Km/h)



South / South-West

Beaufort scale = 1 = light air

= Smoke drift indicates wind direction. Leaves and wind vanes are stationary.



BritishRedCross



Contexts



International Federation
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Global



Nepal



Afghanistan



Kyrgyzstan



Tajikistan



Kazakhstan



Turkmenistan



Uzbekistan



Mongolia



China



Iran



Lebanon



Pakistan



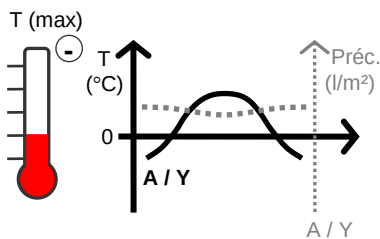
Syria



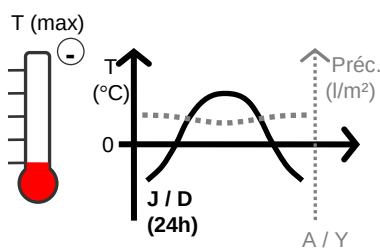
Turkey

Climate Data

Cold

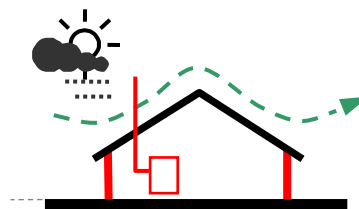


Altitude

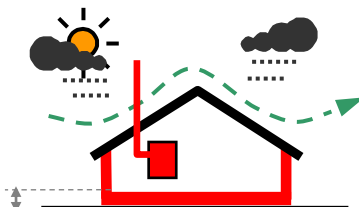


Answers

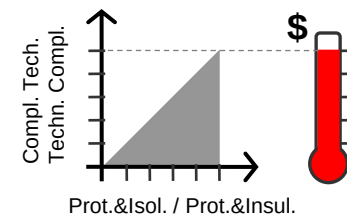
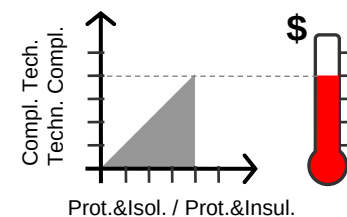
Wind



Cold



Impacts





Contexts



International Federation
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Global



Mongolia



China



Iran



Lebanon



Pakistan



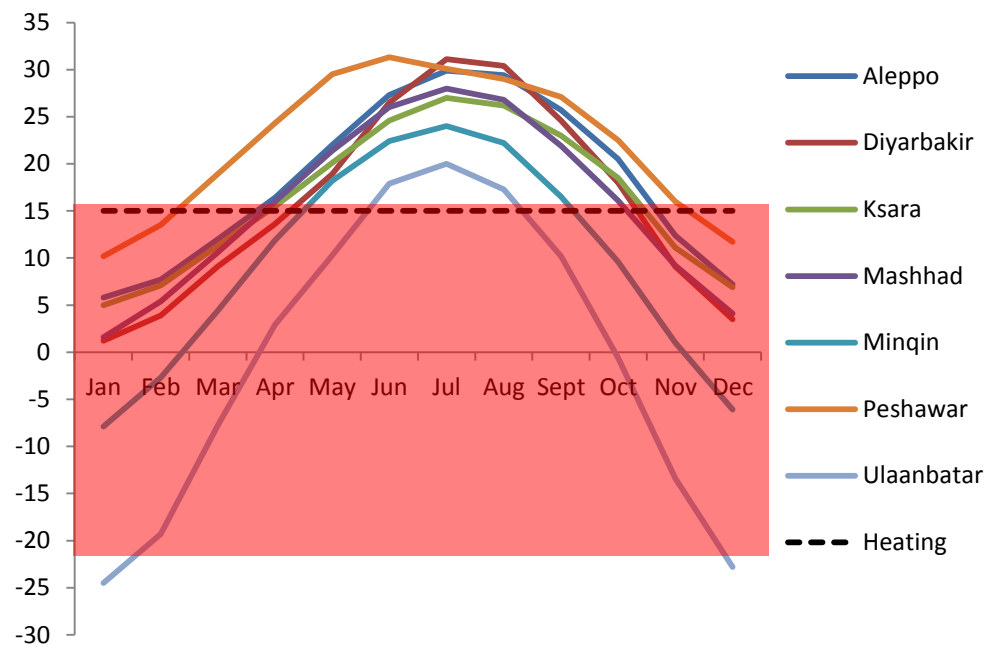
Syria



Turkey

lat N	36,2	37,9	33,8	36,3	38,6	34	47,9
long E	37,2	40,2	35,9	59,6	103,1	71,5	106,8
Alt (m)	620	677	927	990	1367	360	1264

name	Aleppo	Diyarbakir	Ksara	Mashhad	Minqin	Peshawar	Ulaanbaatar
Jan	5,8	1,2	5	1,6	-7,9	10,2	-24,5
Feb	7,7	3,9	7,1	5,4	-2,7	13,5	-19,3
Mar	12	9,1	11,3	10,6	4,4	18,9	-7,8
Apr	16,4	13,6	15,5	16	11,9	24,3	2,9
May	22	18,9	20,1	21,4	18,2	29,5	10,3
Jun	27,3	26,5	24,6	26	22,4	31,3	17,9
Jul	29,9	31,1	27	28	24	30,1	20
Aug	29,4	30,4	26,2	26,8	22,2	29	17,3
Sept	25,7	24,6	23	21,9	16,5	27,1	10,2
Oct	20,5	18	18,5	16,1	9,6	22,5	-0,6
Nov	12,4	9,1	11,1	9,2	1	16	-13,4
Dec	7,2	3,5	6,9	4,1	-6,1	11,7	-22,8







BritishRedCross

6/39

SOTA – Family Tent options survey



NRS



NTH



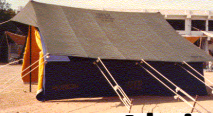
NIZAM



NRC



Paramount



Alpinter



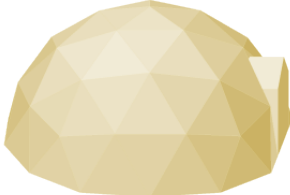
Unilander



CNTrail



YDS



Geo shelter



Roofi



Tent supply

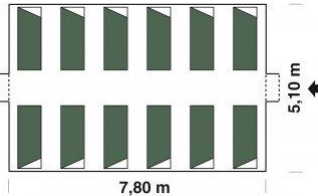
SOTA – other options proposition



D&D FRB



Ferrino



Standard Family Tent Specifications – Description Sheet

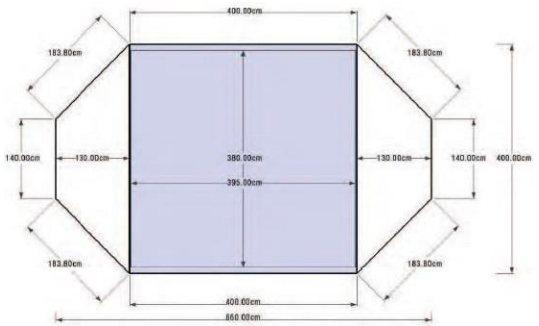


Diagram showing the dimensions of the Standard Family Tent. The outer dimensions are 400.00cm by 400.00cm. The inner dimensions are 380.00cm by 390.00cm. The height is 140.00cm. The diagram also shows the dimensions of the mud flap and the inner room.

OUTER

Roof, polyester and cotton blended fibers yarns, 350 g/m2 ± 15%)

Wall, polyester and cotton blended fibers yarns, 200 g/m2 ± 10%)

Mud flap, HDPE laminated both sides with polyethylene, 180 g/m2 ± 5%)

INNER

Room, polyester and cotton blended fibers yarns 130 g/m2 ± 10%)

Floor, HDPE laminated both sides with polyethylene, 180 g/m2 ± 5%)

Winter kit



- ~~FLOOR PROTECTION, heat resistant, for tent heater, 0.5x1m~~
- ~~SLEEVE, heat resistant, for tent heater fume pipe, 0.7x0.35m~~
- ~~INSULATING FLOOR MAT, aluminized, fleece covered, 0.9x1.8m~~
- ~~PARTITION, winterization for the standard Family Tent~~
- LINER, winterization for the standard Family Tent, polycotton 130gr**

310 CHF = 354 USD

425 USD

325 USD

750 USD

On request



Winter Kit definition



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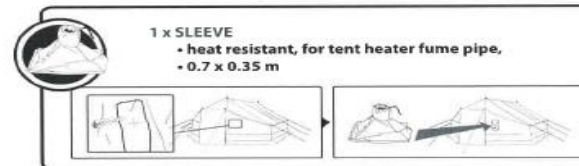
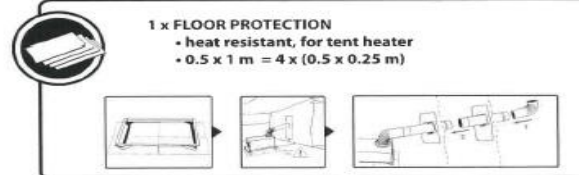
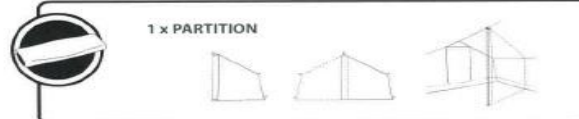
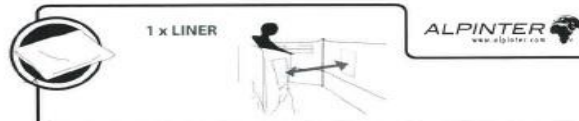
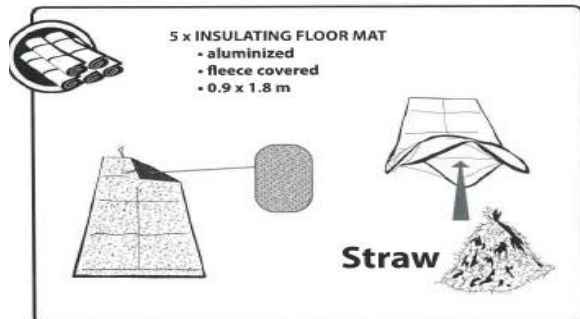
Specifications

WINTERISATION KIT

for the standard
Family Tent



Packing list



Family Tent + winter kit



Sdt Family Tent





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[Home](#) - [About](#) - [Syria Crisis: Refugees in Lebanon](#), 1

SYRIA CRISIS: REFUGEES IN LEBANON, 1 22/02/2013

In the second part of his visit to Lebanon, Saleh Saad visits

Here he sits

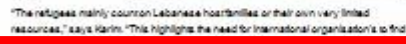
Day 3: Bekaa Valley, Lebanon

Our journey took us out of Gelius through the snow topped mountains and down into the beautiful green Gelius Valley. The valley acts as a natural collection point for the melting snow from the surrounding mountains, which then gathers in the far areas, helping farmers grow vegetables for the local markets.

The first stop was the offices of DGC member World Vision where Refugee Response Manager Karim Sayoud explained how the growing crisis is affecting both the refugees and the Lebanese people.

"Imagine that as hosts the local Lebanese welcomed refugees into their homes thinking it will be for one to two months - now that's been two years. Resources are so low that tension is growing and the situation is at tipping point. So it's important for us to ensure that we don't contribute to the situation and deal with it creatively."

World Vision is targeting the most vulnerable refugees by supporting them with food vouchers to over 40,000 refugees. They also distribute hygiene kits and over 1,000 stoves for heating and cooking have been delivered helping over 7,000 people.



World Vision decided to focus on unregistered refugees for the stove distributions because they are among the most vulnerable and cannot access formal assistance. Each stove costs about \$100 and each family requires about \$100 per month in fuel coupons.

programme as a formal part of the Lebanese curriculum.

We then visited a distribution centre that was a small room in a building in the city of Saida in Iraq. In this distribution centre refugees receive both their food vouchers and mattresses. World Vision Lebanon is also working with the Danish Refugee Council (DRC) to ensure that they coordinate their relief efforts to distribute vital supplies on the long distances to the distribution points.

We then left the distribution centre and visited a family that now has to live in a converted garage. Jodulast 1 and his wife Paryal have four children, Jams 12 who has a spine condition that needs treatment, Jodulrahman 11, Wiyam 9 and Jodulkarim 9.

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

Source: <http://www.dec.org.uk/blog/syria-crisis-refugees-lebanon-1>



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Bekaa Valley
Alt – 850m

Winter = 4 months
(Dec-Mar)
with T below 15°C
Average $T = 6^{\circ}\text{C}$



Feb. 2013 = 3,17 USD / 1 Gallon
= 0,84 USD / 1 liter

100 USD = 119 liters = month cons.
119 liters / 30 days = 3,96 liters / day
= 3,4 USD / day / shelter

$$3,96 \text{ liters / day} = 0,165 \text{ liters / h}$$

Heat of combustion
Kerosene = 9,78 KW/ liter.

0,165 liter/h * 9,78 Kw / liter.

= 1,61 Kwh

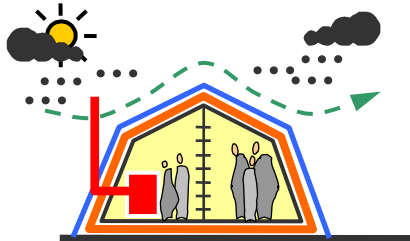
World Vision decided to focus on unregistered refugees for the stove distributions because they are amongst the most vulnerable and cannot access formal assistance. Each stove costs about **\$100** and each family requires about **\$100** per month in fuel coupons.



Kerosene Heater
8500 BTU
= 2.5 Kwh

depends from 6 parameters:

- The metabolism



Station :	Activities:	Energetic value (w)
Laying	At sleep	85
	At rest	100
Sitting	At rest	114
	With moderate work	145
Standing	At rest	128
	Light work	174
	Moderated work	197
	Active work	232
	Intense work	290
	Heavy work	406

- The Cloths

Cloths	Clo factor
Naked body	0
Sumer clothing	0.5
Ski polar equipment	2
Light polar equipment	3
Heavy polar equipment	4
Polar down duvet	8



- The ambient air temperature Ta.

An ambient temperature of 15-19°C is desirable, but lower temperatures can be tolerated with warm clothing

Source: B Wisner, J Adams (2002), Environmental health in emergencies and disasters - Shelter and Emergency Settlements - Technical aspects, WHO, part II 6.3 p. 87

15 °C

- The average temperature walls Tp.
- The relative humidity (RH).
- The air velocity (air velocities generally do not exceed 0.2 m/s)



Thermal model

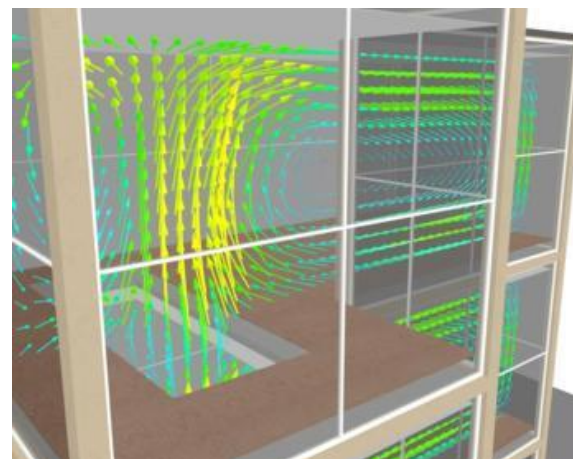
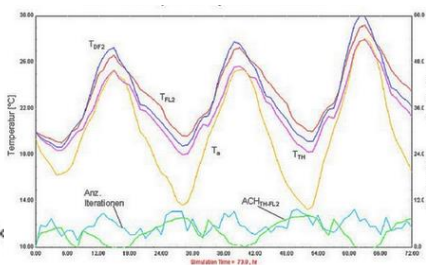
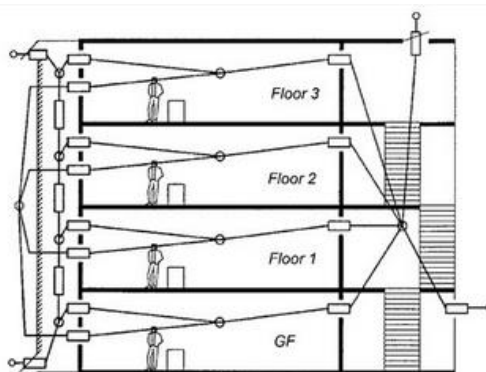


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What?

- Multizones dynamic
 - One room = one point
 - Simulate time evolution
 - Building scale
- Computational fluid dynamics
 - One room = millions of points
 - Simulate spacial distributions
 - Room scale



Why?

- Health problems related to indoor conditions
 - Too cold or too hot
 - Stuffy or too dry
 - Poor air quality in crowded badly ventilated spaces
- Comfort
 - Same parameters as health in a more limited range of values
- Fuel dependence
 - Improving thermal behavior of the tents may reduce the logistic problem of fuel supply





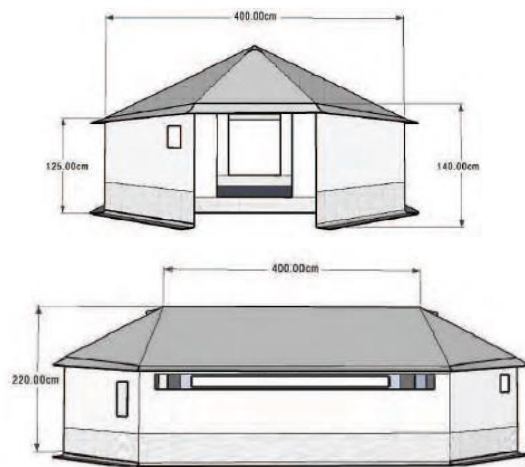
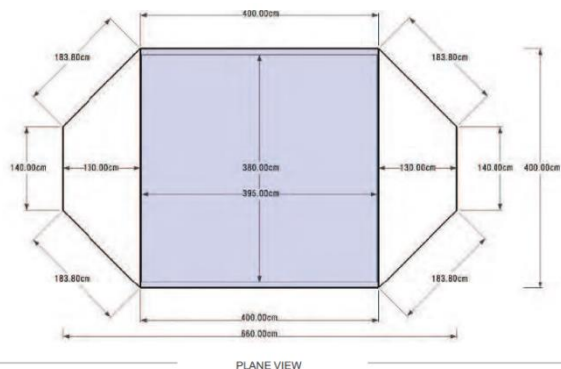
Thermal model



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How?

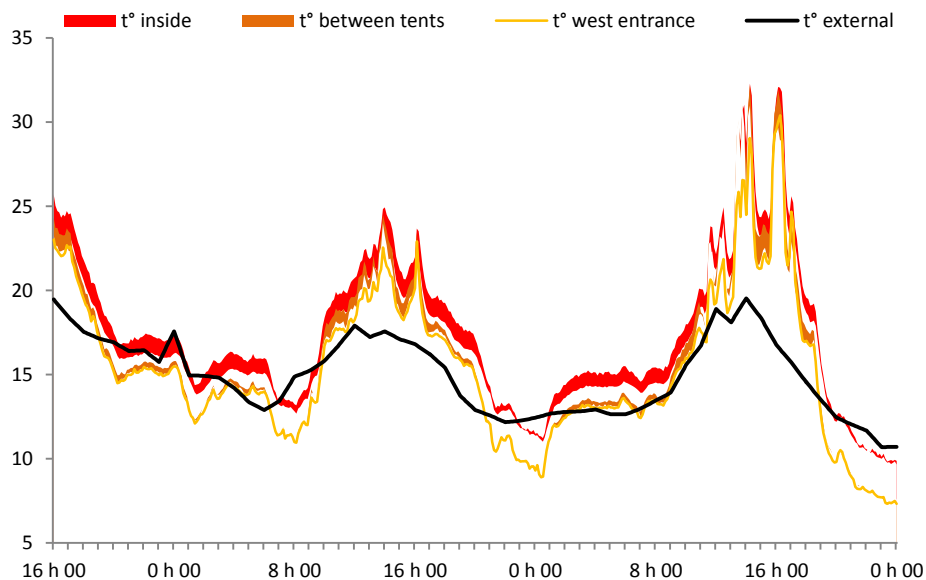
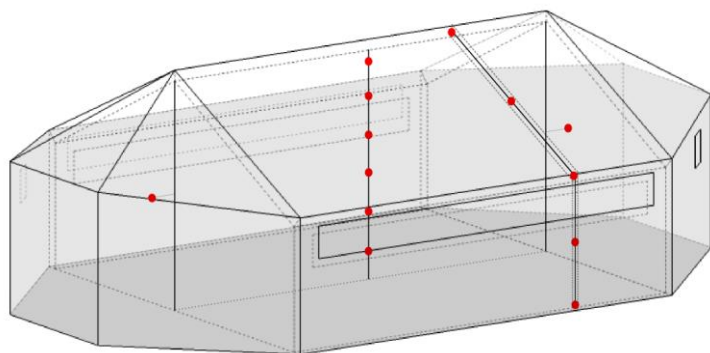


Step 1: data acquisition

Step 2: model creation

Step 3: model validation

Step 4: analysis



BritishRedCross



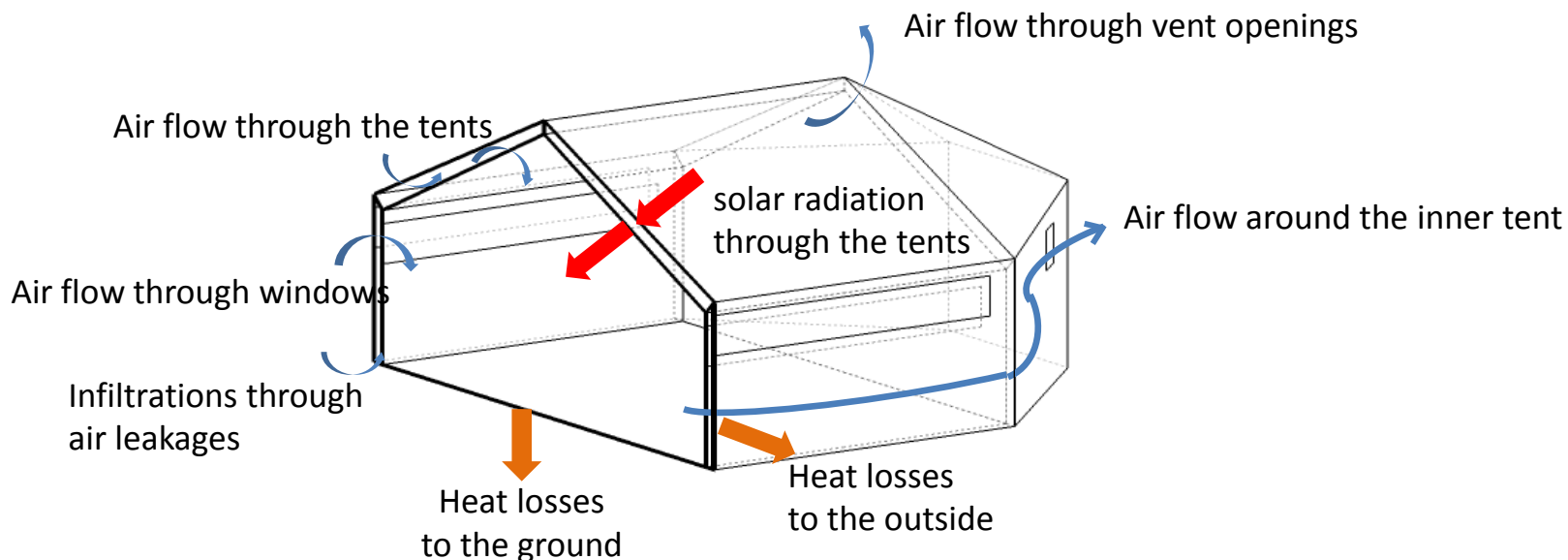
Thermal model



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Calculate the interaction between many physical aspects



Other data requested : Fabric properties

Both from literacy and lab measurements

	Outer tent	Outer roof	Ground sheet
Composition	Cotton: 40%, polyester: 60%	Cotton: 40%, polyester: 60%	Coated polyethylene
Weight (g/m ²)	239	373	165
Solar trans. (%)	13.38	8.52	0.46
Solar reflex (%)	62.15	64.48	34.64
Air permeability @100Pa (l/(m ² s))	30.1	3.88	<0.1





Thermal model



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requested and missing information

Parameters				
Ref.	characteristics	Measurement tool	Test Description	Units
01	Density = ρ	Scale		Kg/m ³ gr/sqm
02	Conductivity = λ Thermal Resistance			W/m.K
03	Surface propriety : - Reflection (solar and visible) - Transmission (solar, visible and IR) - Absorption - Emissivity	photometry		- % (0,00) - % (0,00) - % (0,00) -
04	Specific Heat = Heat capacity			Wh/kg.K J/kg.K
05	Air permeability			l/m ² .s





Thermal model



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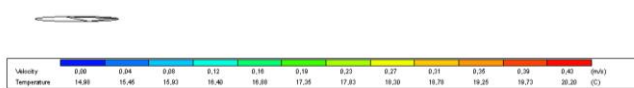
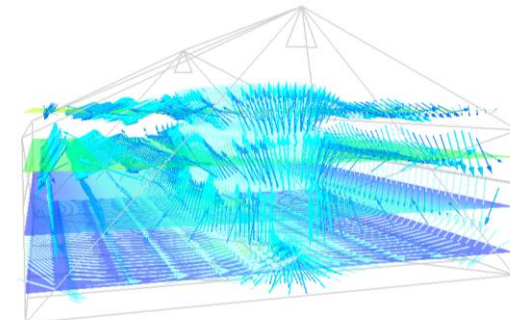
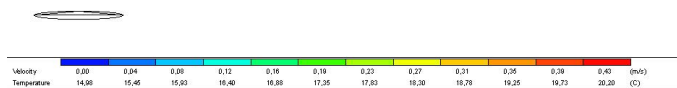
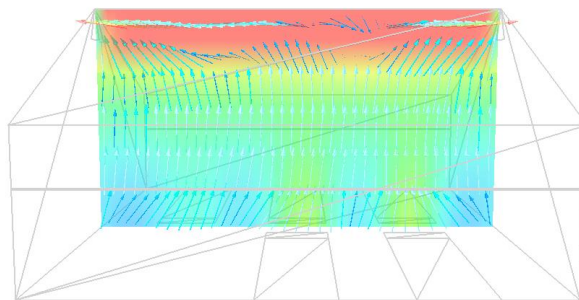
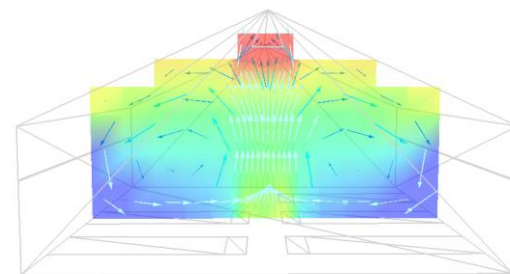
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Software

- Building models tools:
 - Energy + simulation software and Design builder
 - combined with Sketchup 3D plugin
 - combined with a meteodata software generator : Meteonorm + ClimoPro and Ecotect
- To be adapted
 - Extremely lightweight structure
 - Solar transmission through walls
 - No airtight walls
 - Box in a box shape

Results:





Lux Field tests



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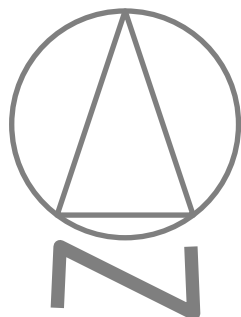
Protocol

Bertrange test site

N 49° 36' 45"

E 06° 03' 01"

Alt 288m



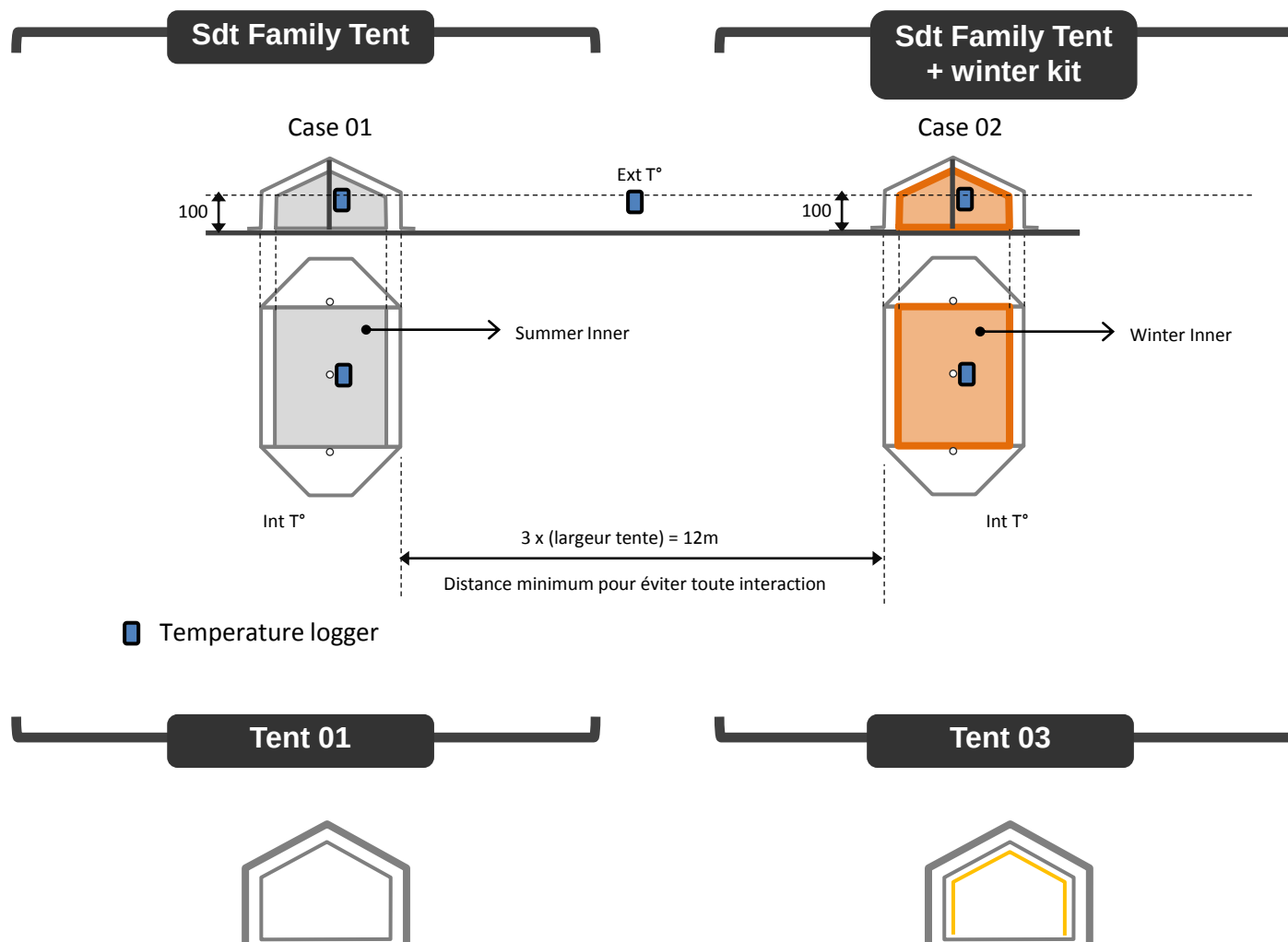
BritishRedCross



Lux Field tests



Protocol

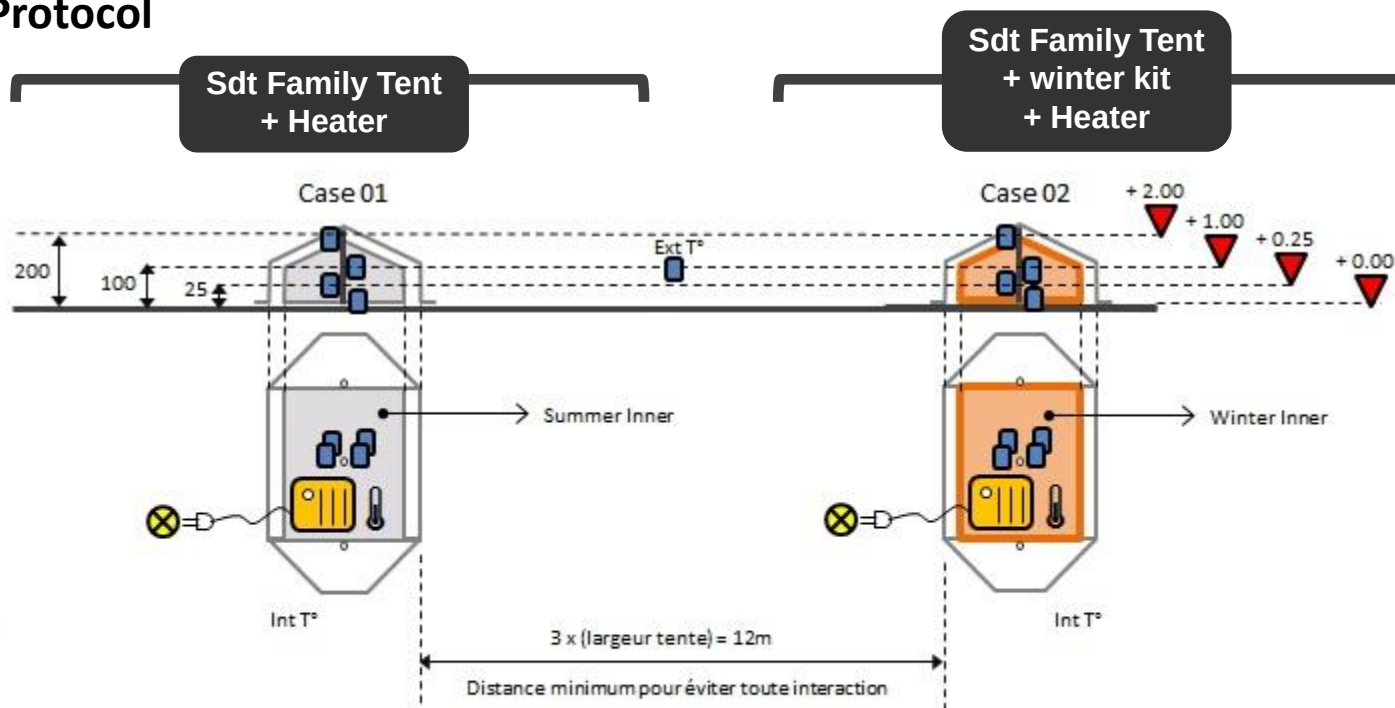




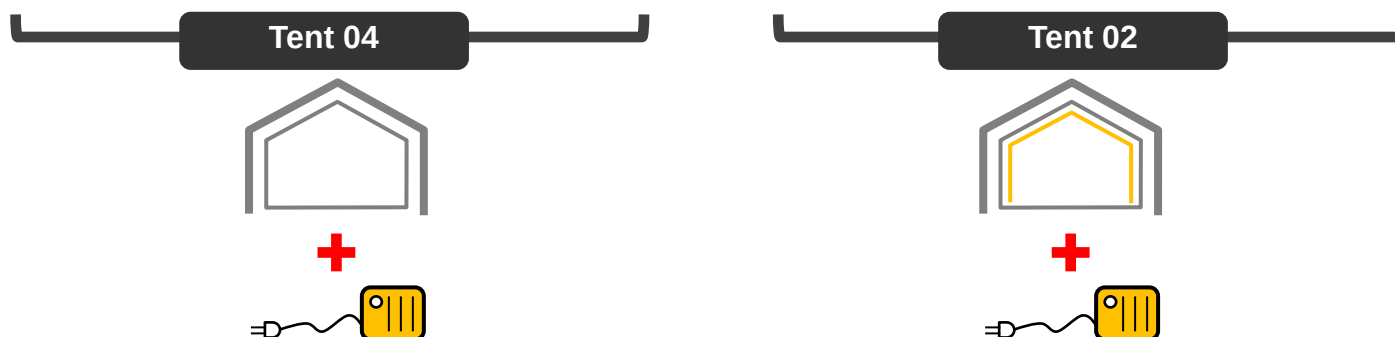
Lux Field tests



Protocol



 Temperature logger  Electric Heater  Power meter  Requested Temp. 15°C





Lux Field tests



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Protocol

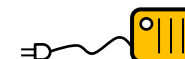


Sdt Family Tent
NRS

Sdt Family Tent
+ winter kit
Alpinter

Sdt Family Tent
+ winter kit
+ Heater
Alpinter

Sdt Family Tent
+ Heater
Alpinter





Lux Field tests

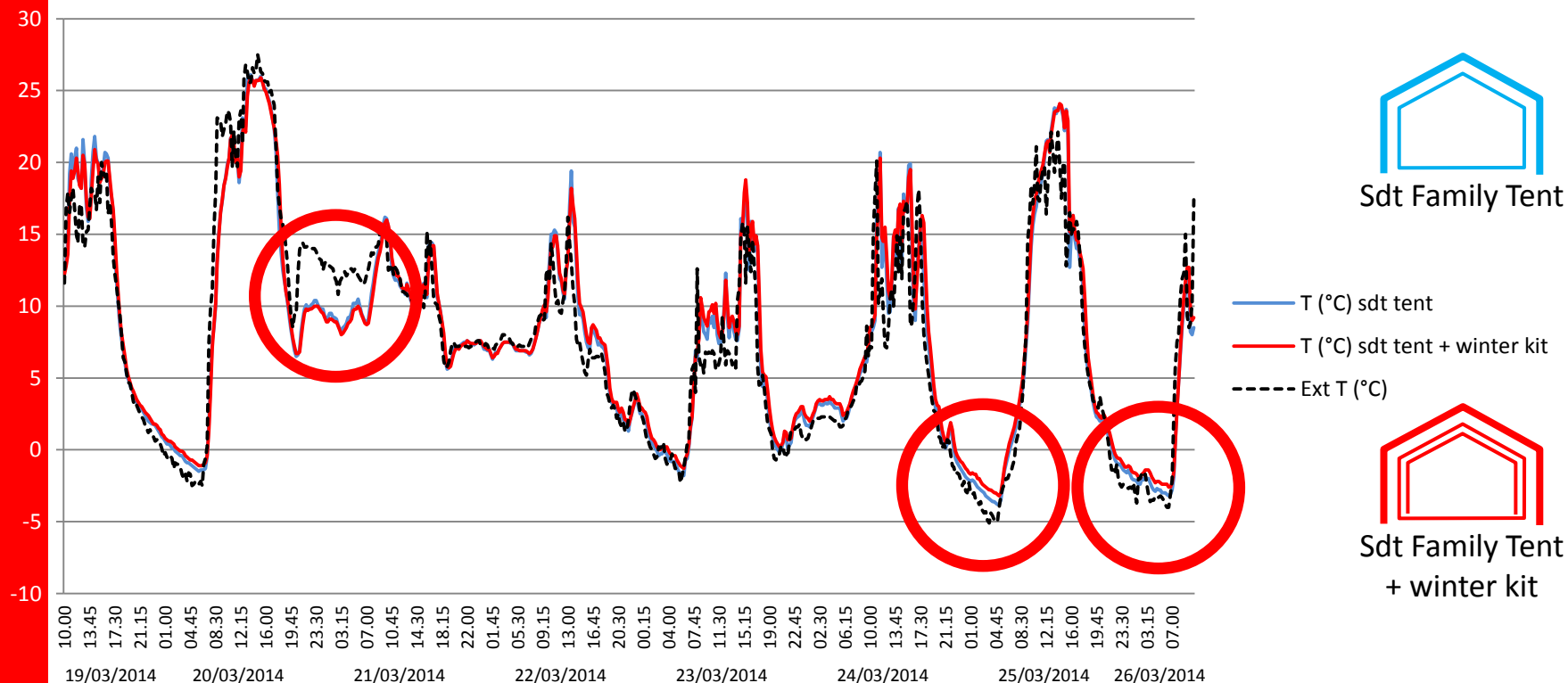


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Comparison between Sdt Family tents (without and with winter kit)



Observations

- With covert sky (cloudy) and the ground influence the temperature inside the tent is lower than the external temperature
- Only gain of few decimals during the strongest night with -5°C □ max 1°C



**Need of Floor
Insulation**



**Need of better
insulation**





Lux Field tests

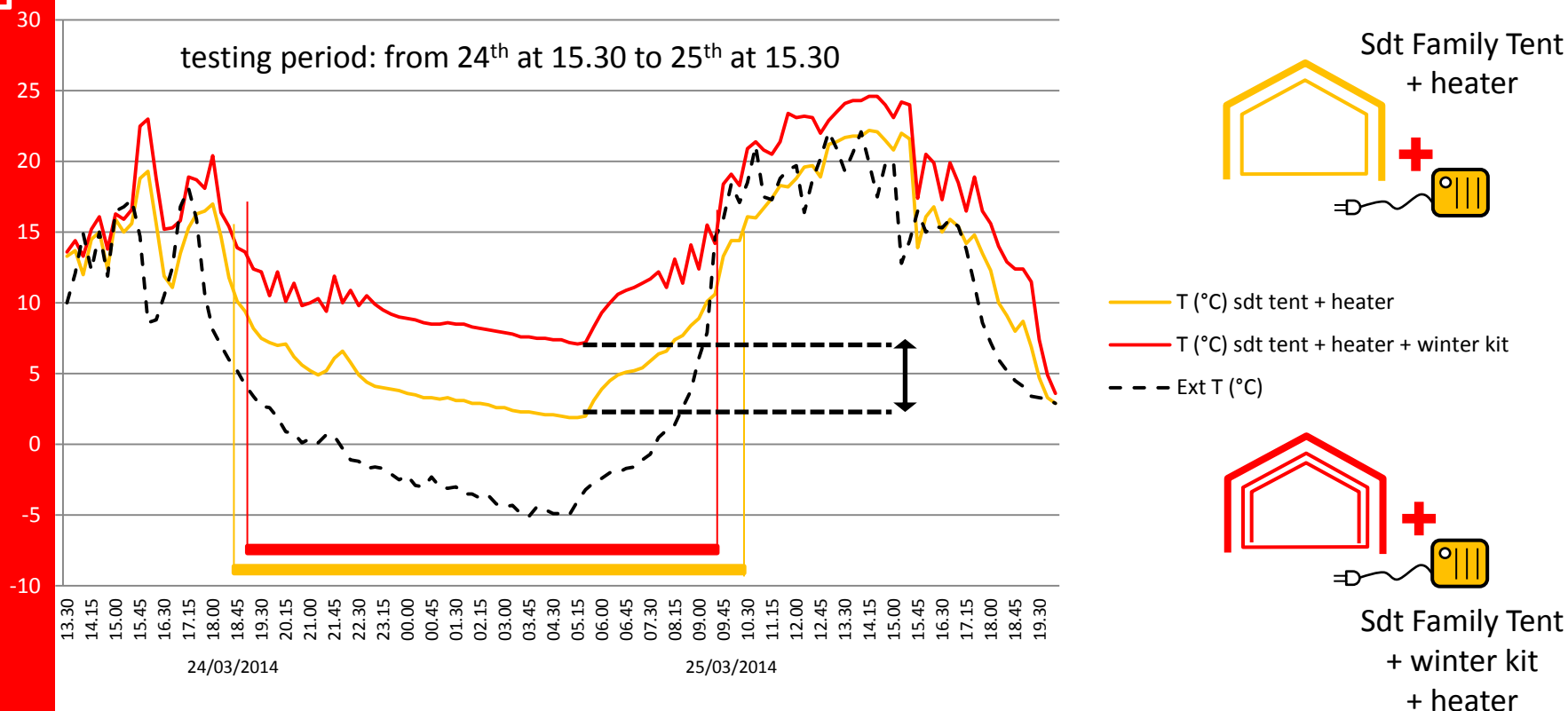


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Comparison between Sdt Family tents (without and with winter kit) + Heater



Observations

- The winter kit is not providing a huge difference
Only gain of almost 5,3°C between 2 configurations
 - With a 2Kw heater it's impossible to guarantee a temperature of 15°C inside the tent
Lower inside temperature recorded
- Sdt tent + 1,9°C
Winter kit + 7,2°C



**No big
performance
registered**



**Need of better
insulation**

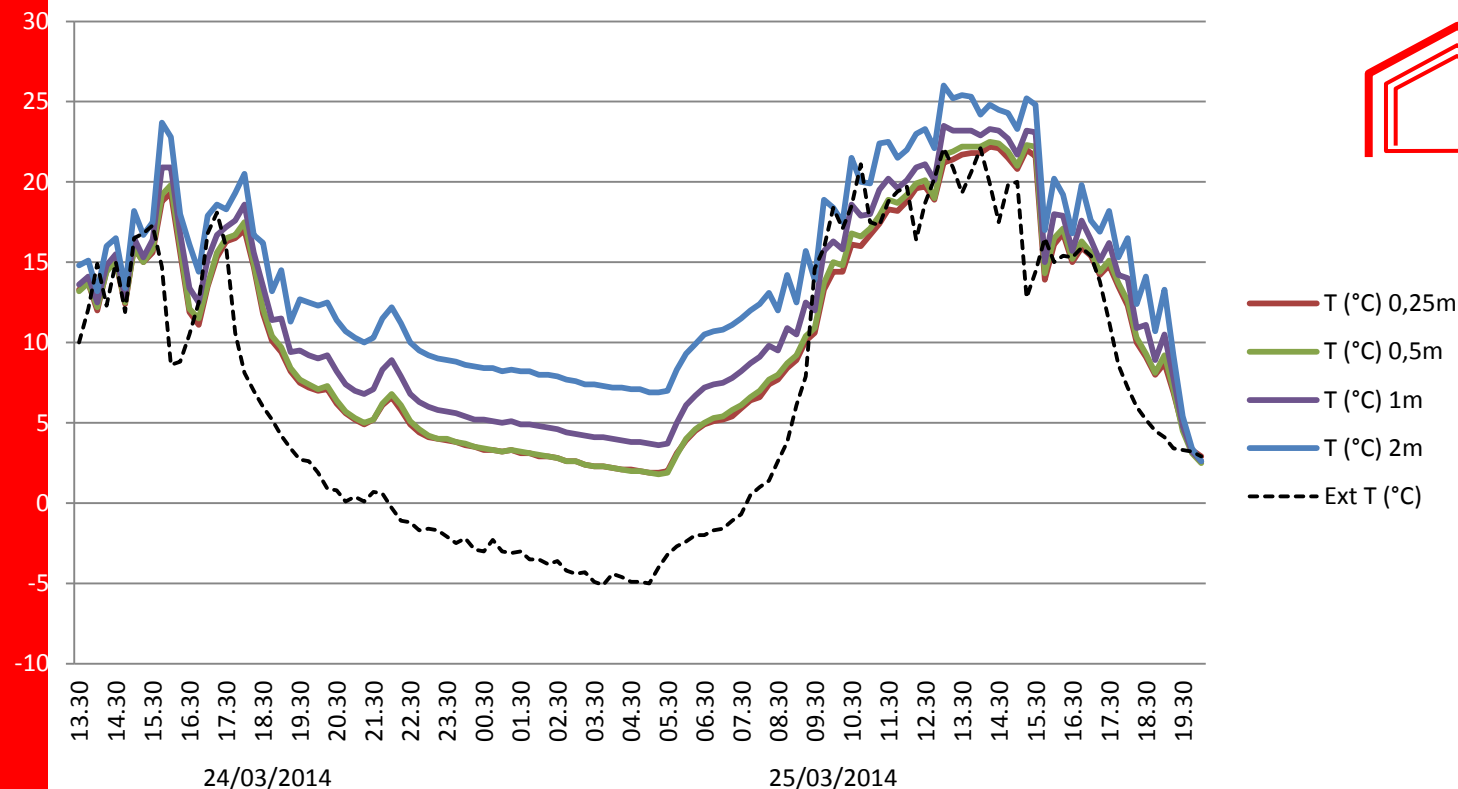




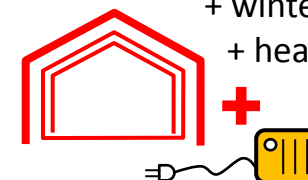
Lux Field tests



Stratification



Sdt Family Tent
+ winter kit
+ heater



Observations

- Convection: higher temperature at the highest measurement point
lower temperature at the lowest measurement point
- where people are laying and sleeping



**Need of Floor
Insulation
+ volume
reduction?**

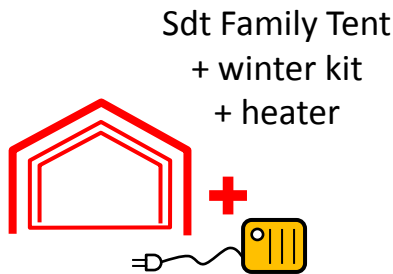
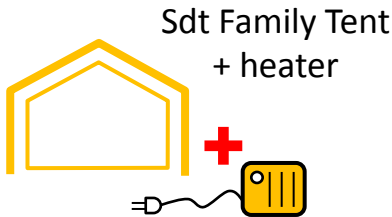


**Need of more
efficient insulation
material**



Comparison between Sdt Family tents (without and with winter kit) + Heater

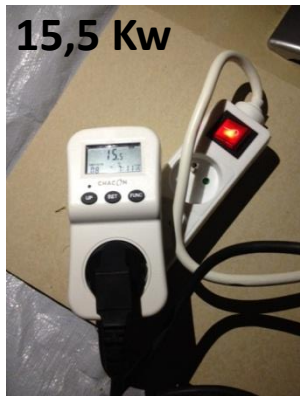
Temp requested



Kw Consumption



Watt peak:
1703,9 Kwh



Watt peak:
1712,7 Kwh



During a 27h heating period ☐ really low difference between the 2 tent models
Gain = 0,8 Kw



Lux Field tests



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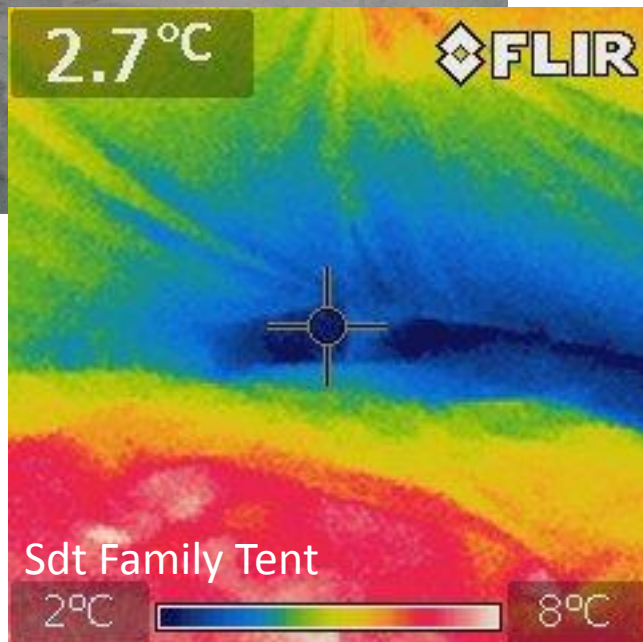
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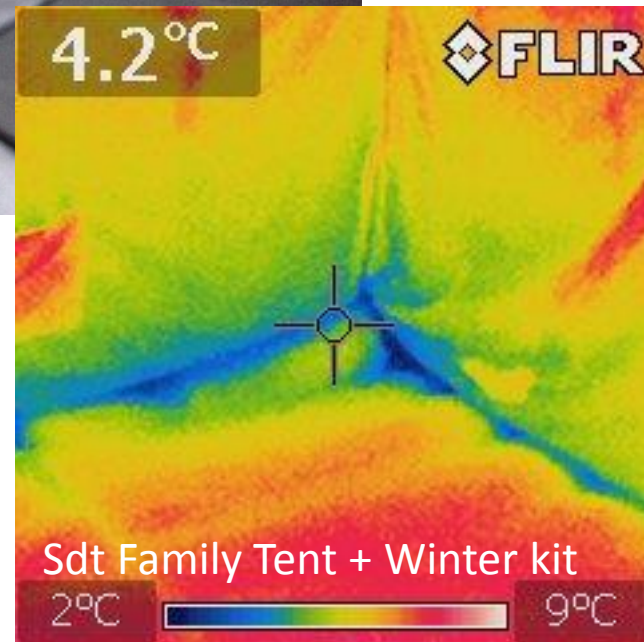
Thermal infra-red camera



Sdt Family Tent

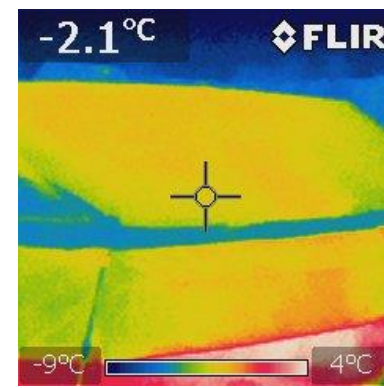
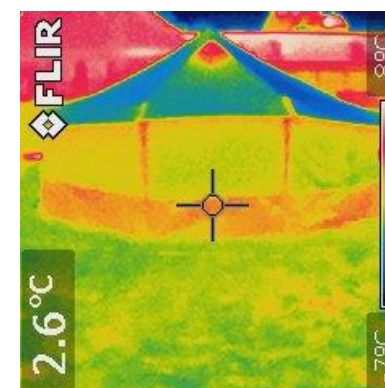
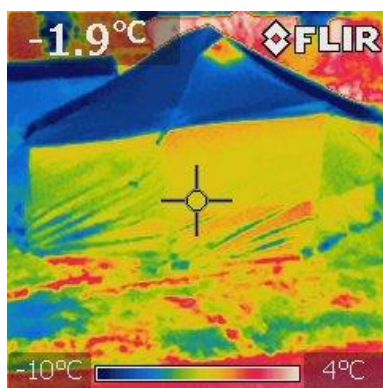
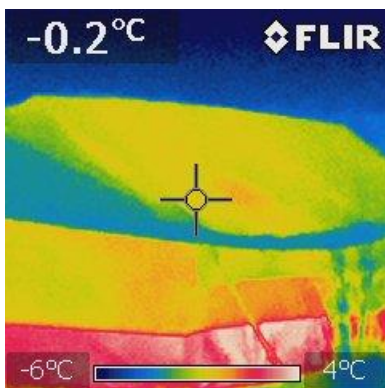
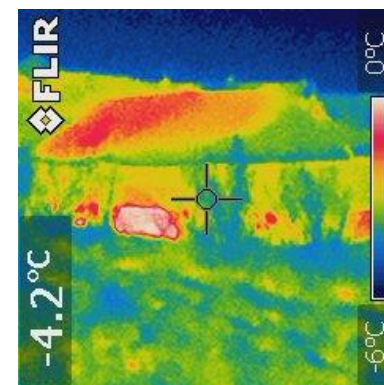
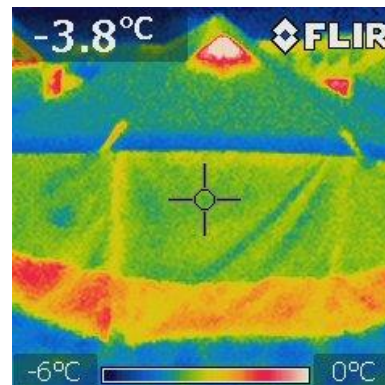
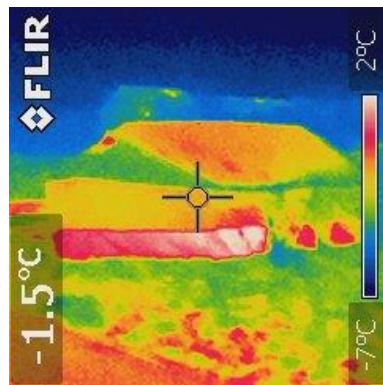
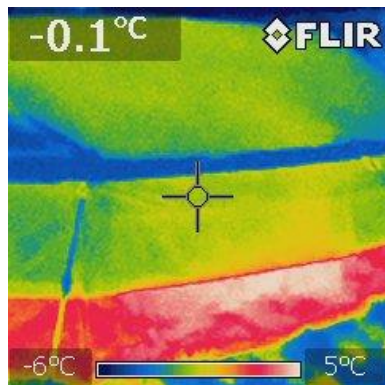


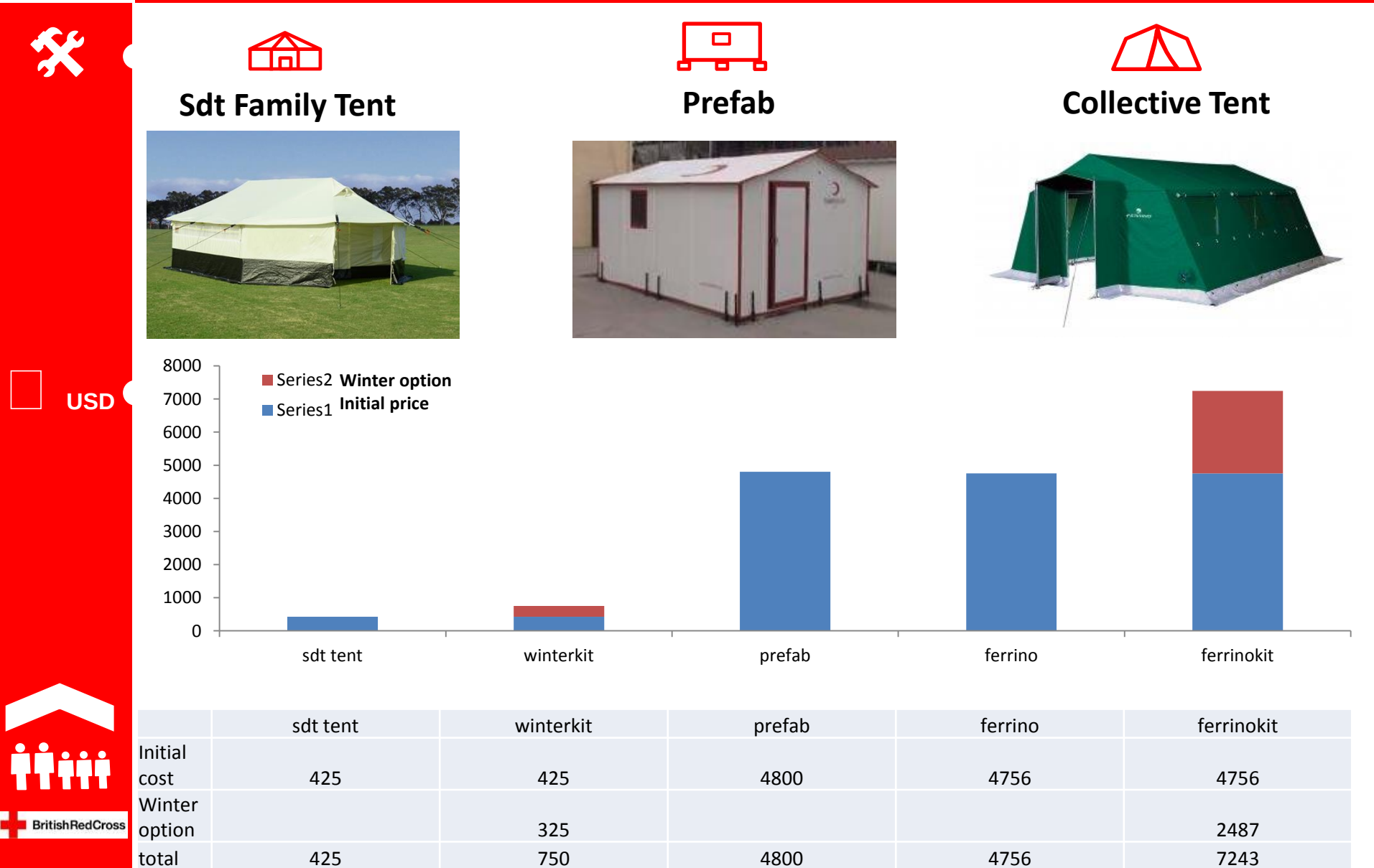
Sdt Family Tent + Winterkit



BritishRedCross

Thermal infra-red camera







Lux Field tests



International Federation
of Red Cross and Red Crescent Societies

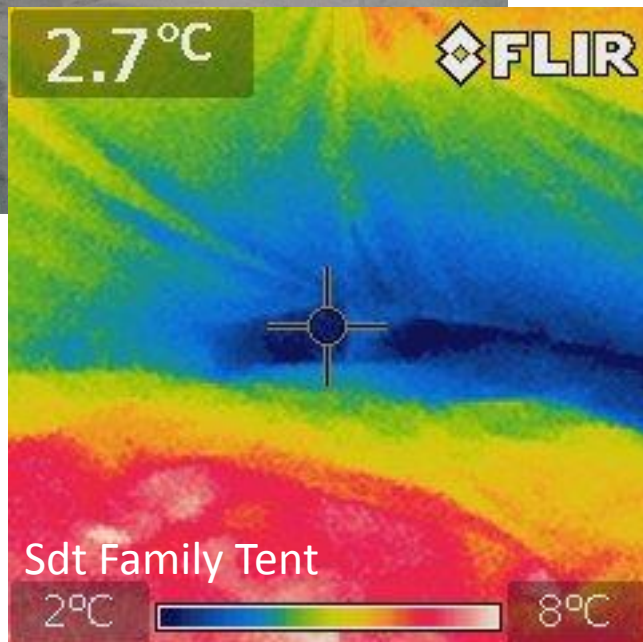
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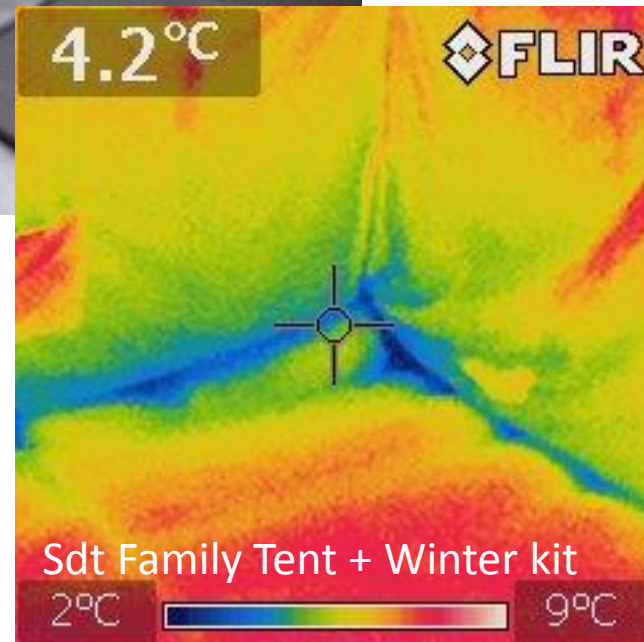
Thermal infra-red camera



Sdt Family Tent

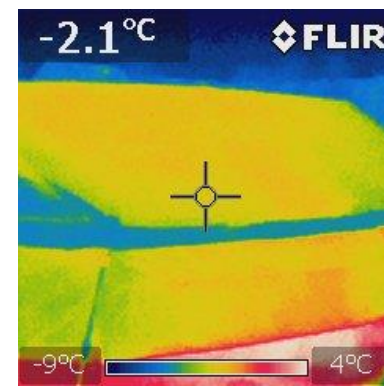
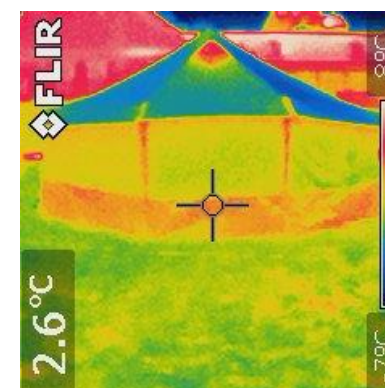
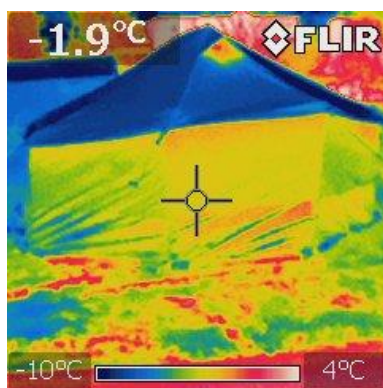
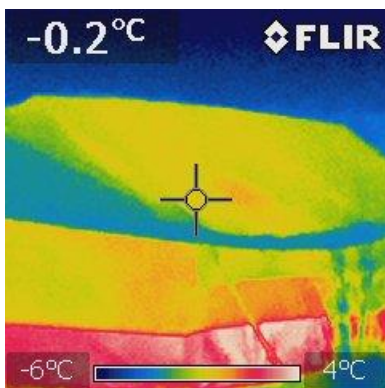
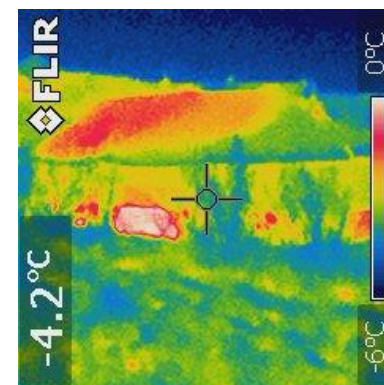
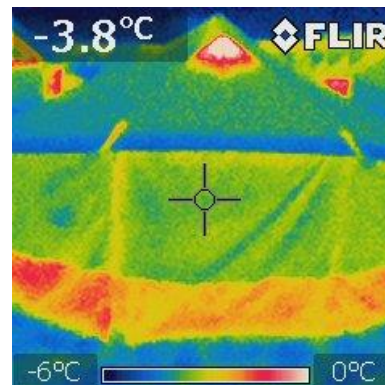
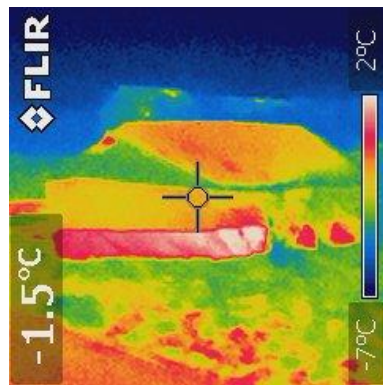
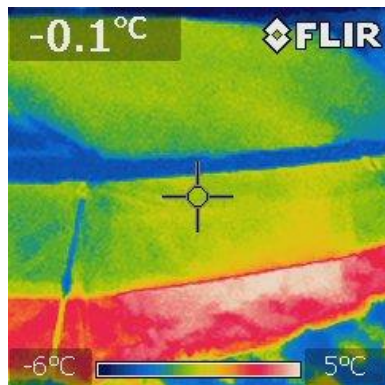


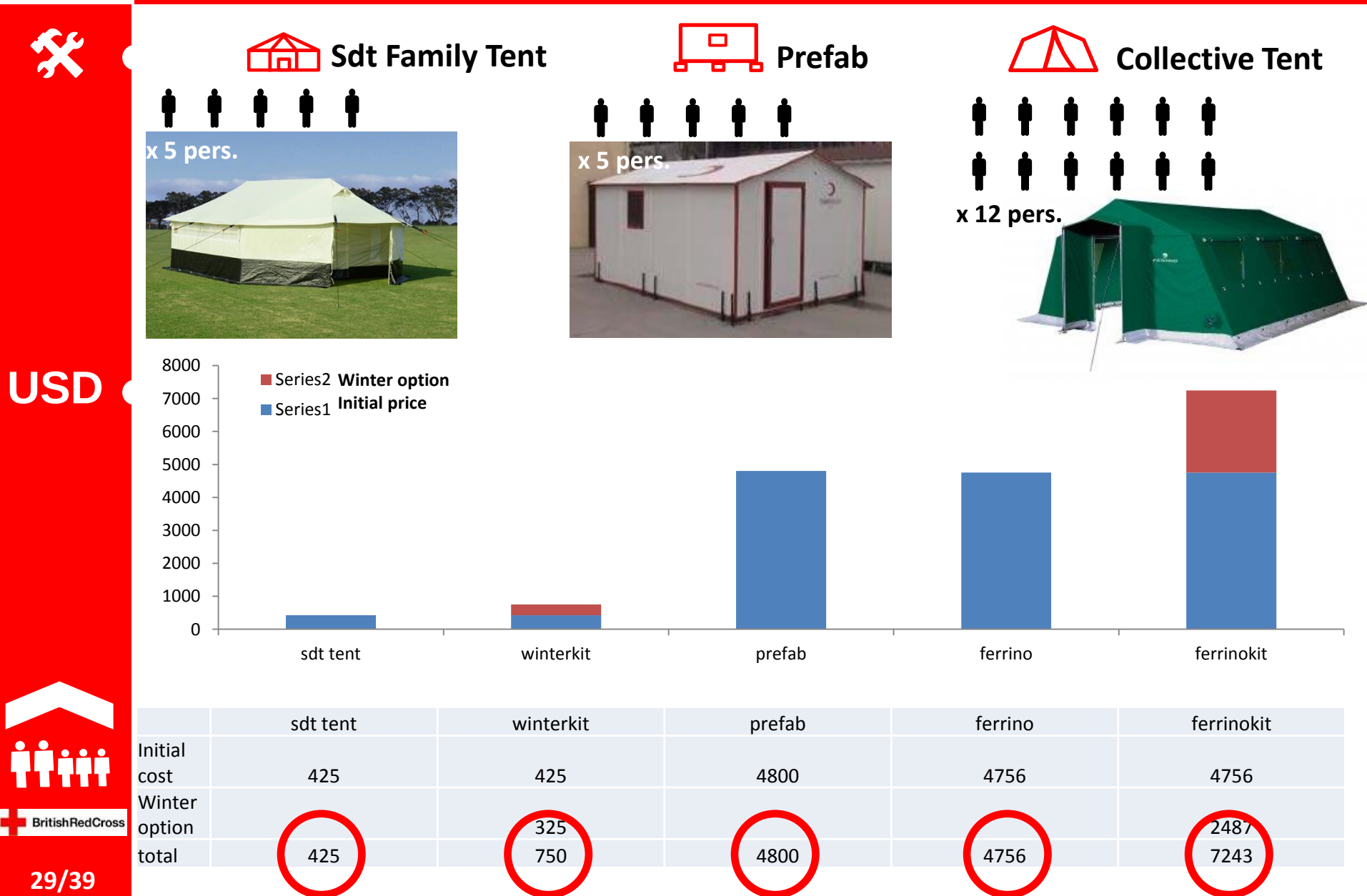
Sdt Family Tent + Winterkit



BritishRedCross

Thermal infra-red camera







Analysis

1

[illegible]



Sdt Family Tent



Prefab



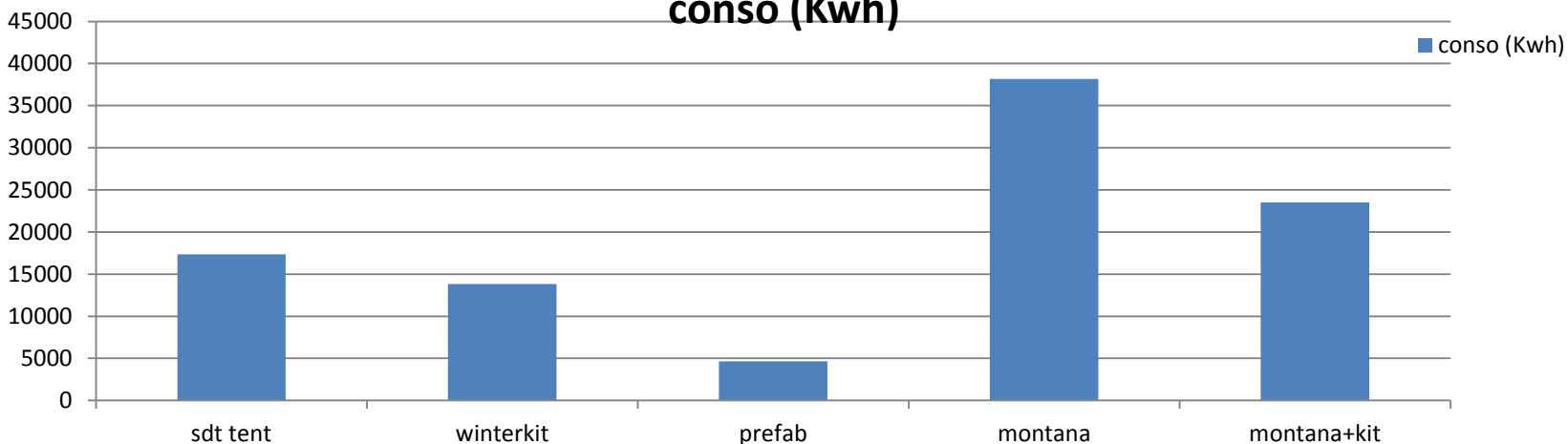
Collective Tent



Kw Consumption

	sdt tent	winterkit	prefab	montana	montana+kit
conso (Kwh)	17341,25	13837,56	4642,06	38150,76	23523,85
kerosene (liters)	1773	1415	475	3900,89	2405,31
Charcoal (kg)	2229	1779	597	4904	3024

conso (Kwh)





Sdt Family Tent



Prefab



Collective Tent



	sdt tent	winterkit	prefab	ferrino	ferrino+kit
annual cons	17341	13838	4642	38151	23524
kerosene lit	1773	1415	475	3901	2405
fuel cost	479	382	128	1053	649
total heating hours	6056	5907	5439	5944	5751
heating days	252	246	227	247	239
average power	3	2	1	6	5
max power	8	7	2	18	11
balance cost 1 year:					
structure	425	425	4800	4756	4756
winter option		325			2487
fuel cost	479	382	128	1053	649
total	904	1132	4928	5810	7892



Results



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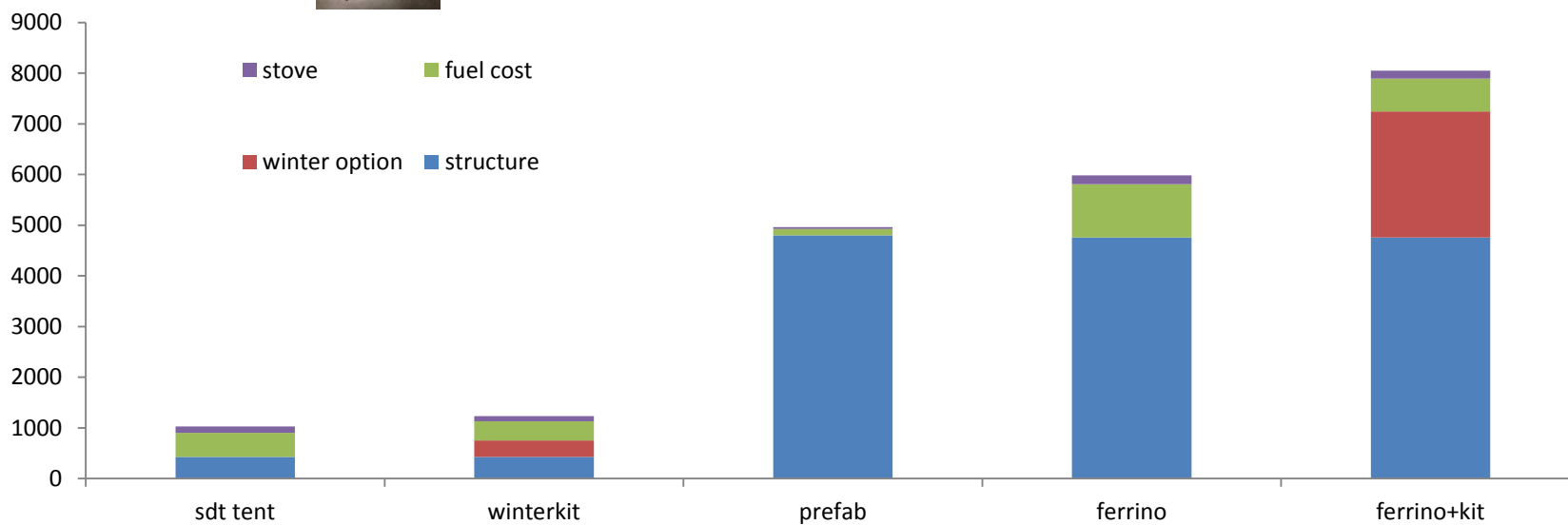
Sdt Family Tent



Prefab



Collective Tent



8KW
125 USD



7,5KW
100 USD



2,5KW
35 USD



20KW
175 USD



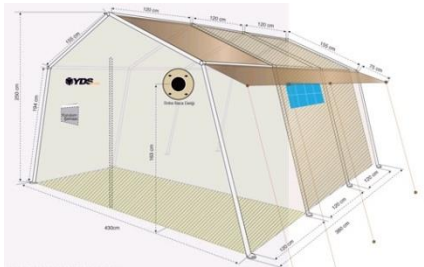
12KW
155 USD



BritishRedCross



Kizilay Tent









Rub hall

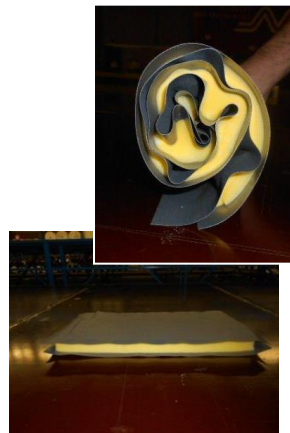





New insulation material







Geotextile Inflatable PE mattress Isotherm bags Synthetic felt Coated PVC foam



34/39



Contacts:



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