Projects library of the specialised group of construction **SHELTER**

Project **Housing**

Project name **Temporary Solutions for Collective Centre Residents**
TeSoCC in North Caucasus (Russian Federation)
"Box Tents" (BT) Programme

Region/Town	**Chechnya (ChR)** **Ingushetia (RI)** **North Ossetia-Alania (RNOA)**
GIS data (WGS 84)	**---**
Project type	**New construction**
Typology	**Individual housing**
Approach	**Self help**
Beneficiaries	**IDPs / Refugees**
Climate	**Moderately continental**
Special constraint	**Earthquakes, landslides**
Start / End of project	**2002-2007**
Country GDP	**9,075 USD/cap (2007)**
Update	**17 September 2009**

Partners

Organisation (Implementer)	UNHCR Northern Caucasus (UNHCR Sub-Office Vladikavkaz & UNHCR Field Office Nazran)
Donor	UNHCR NC shelter programmes co-funded by SDC/SHA
IO/NGO partners	Danish Refugee Council - DRC & Vesta
GO partners	Local administrations

Context to project

Initial Situation	Chechnya: UNHCR reintegration programme in favour of Chechen IDPs displaced in Chechnya itself Ingushetia: UNHCR reintegration programme in favour of Ingush IDPs from Prigorodny district (RNOA) and Chechnya North Ossetia-Alania: UNHCR reintegration programme in favour of Ossetian refugees from Georgia
Goals, Beneficiaries	Temporary housing solution in favour of beneficiaries participating in the self help shelter rehabilitation programme in Chechnya enabling them to reside on site during the construction phase
Implementations / Results	2,622 Box Tents 2002-2007 all over the 3 North Caucasus Republics: - 1,799 BTs in Chechnya (2003: 20, 2004: 889, 2005: 222, 2006: 351, 2007: 317) - 797 BTs in Ingushetia (2002: 11, 2003: 154, 2004: 218, 2005: 238, 2006: 114, 2007: 62) - 26 BTs in North Ossetia-Alania (2004: 2, 2005: 2, 2006: 22)

Reference data (comparative)			
Land plot (per house unit)	--- (not defined)	Garden (per house unit)	--- (not defined)
Ground floor (walls included)	27.368 m² (5.500 x 5.025)	Floor	1 floor, ground floor only
Occupants max.	5 persons	Occupants min.	2 persons
Total house area	26.389 m²	Surface/occupant	5.278 m²/cap (5) 13.194 m²/cap (2)
House volume (gross volume) h_1 = 2.700, h_2 = 2.400, $h_ø$ = 2.550	70.476 m³	Volume/occupant	15.095 m³/cap (5) 35.238 m³/cap (2)
Number of rooms	1 room	Occupants/room (= Occupants/object)	2 – 5 cap/room
Heated area (= Total house area; net object area)	26.389 m²	Heated area/occupant (= Surface/occupant)	5.278 m²/cap (5) 13.194 m²/cap (2)
Cost/unit (building material)	944 USD UNER 30 June '05 28.60	Cost/occupant	189 USD/cap (5) 472 USD/cap (2)
Cost/m²	34 USD/m²	Cost/m³	13 USD/m³
Total housing cost (= Cost/unit)	944 USD UNER 30 June '05 28.60	Self help, virtual value of labour (material cost : work cost ~ 1 : 2)	~ 1,888 USD/object
Community development projects cost (depending from plot location) => infrastructure: - drinking water supply - power network connection - gas network connection - sewage / septic tank - access road	+ ~ 1,000 USD	Community development projects cost/occupant (depending from plot location) => infrastructure: - drinking water supply - power network connection - gas network connection - sewage / septic tank - access road	+ ~ 200 USD/cap(5) + ~ 500 USD/cap(2)

Approach to results

Initial Situation

2002, when the programme has been started, immediately after the armed conflicts in the Caucasus ended (1st & 2nd war in Chechnya 1994-1996 & 1999-2001, the war following the secession of South Ossetia from Georgia 1989-1992 and the Prigorodny conflict between Ingushetia and North Ossetia 1992) there was a substantial number of IDPs and refugees in need of shelter assistance in North Caucasus.

The figures reads as follows:

- Chechnya (figures update as on 31.12.2005):
  . IDPs (displaced in Chechnya itself): 59,879 Chechens
- Ingushetia (figures update as on 30.12.2005):
  . IDPs (from Chechnya): 19,822 Chechens + 6,197 Ingushs
- North Ossetia-Alania (figures update as on 01.01.2006):
  . refugees (from Georgia inclusive South Ossetia): 16,686
  . IDPs: 882 from Chechnya + 10 from Ingushetia

These IDPs and refugees have either been accommodated in collective centres in Chechnya, Ingushetia and North Ossetia or found a temporary accommodation in private sector. They live mostly in very poor conditions.

Approach

Temporary housing solution "Box Tent" in favour of self help programme participants enabling them to reside on site during the construction phase; prefabricated wall panels and supplementary material supply for the construction of a comfortably habitable hut (self-help approach). Individual dwelling construction at privately owned building land.

Programme implementation by DRC, seconded by Vesta as implementing partners.

Problems/Constraints

Volatile security situation 2002-2007 in Chechnya: substantial number of construction sites not accessible due to security reasons

Lessons learned	Housing objects construction in general under the following conditions only: - plot developed: utilities available on site (water, power, gas) - access all-weather road trafficable by trucks (building material supply) Lesson learned from the "Box Tents" programme in particular: - the renouncement of the thermal insulation in the floor construction (simple 25 mm timber planking instead of 50 mm glass wool sandwiched between two layers of 25 mm planks) in favour of the relative moderate cost reduction (- ~ 12%) has clearly emerged as not justified; the quality of the whole object in terms of isolation degraded substantially by an average thermal transmission rate $U_{\varnothing}$ increase from 0.446 W/(m²•K) up to 1.004 W/(m²•K)
Evaluation	A complete final 2002-2007 programme evaluation has never been done due to the enormous number of objects to be assessed (2,622 BTs), the local situation in Chechnya (security problems; frequent unavailability of escorts provided by Khankala, the Chechen headquarters of NC security forces), Ingushetia (drastically worsened security situation since 2008) and North Ossetia-Alania (FSB controlled strict restrictions of foreigners' freedom of movement at the territory on RNO-A)
Prospects	Resumption of the "Box Tent" programme planned in 2010: a huge cost increase has to be taken into consideration; plus more than 400% for building material from 2005 until today (2009)

Legal framework

Politically attached to	Numerous local administrations in Chechnya, Ingushetia and North Ossetia-Alania
Type of ownership	Private property

Construction information

			Cost USD	Repartition [%]
Construction	"Box Tent" (BT), a "kit of parts" supply to the beneficiary: set of 6 prefabricated wall panels (light heat insulated sandwich elements) with door and one window, completed by the needed building material for foundations, floor and roofing (carpentering & covering) and basic installation (water, power, heating) to be assembled to a simple hut (self-help approach)			
Shell	Wall panels with 1 door and 1 window (6 elements) & ceiling	prefabricated wall panels, type "sandwich": - inner & outer shell: fibreboard (double layer, d = 2.2 mm); - thermal insulation: glass wool (single layer, d = 50 mm); - elements painted in blue wooden door (0.85 x 2.10) wooden window (1.20 x 1.00), single glazed ceiling (fibreboard + glass wool)	535	57
	Roof	covering: corrugated steel roof sheets on basic carpentering	160	17
	Floor	flooring: timber planks (d = 25 mm), support grid: wooden beams (100/50)	123	13
Installations	Wiring/Power	outlet to power supply system (230 V), distribution box / fuse box; lamp holder, switcher, socket	11	1
	Gas/Heating	metal stove (for heating/cooking with gas or firewood), with heat insulation sheet; chimney (steel tube)	15	2
Tools	Tools set	basic set of tools	24	3
Assistance	Minor labour	accessories packing	76	8
Total **(30 June 2005)**	**transport costs & loading / unloading costs excluded** **(~ 3% of Total)**		**944**	**100**

Urban planning

Distance to	Health center	--- (not defined; numerous locations)
	Education facilities	--- (not defined; numerous locations)
	Income activities	--- (not defined; numerous locations)
	Public transport	--- (not defined; numerous locations)
	Shopping facilities	--- (not defined; numerous locations)

For further information

Involved SHA construction group consultant	René Edward Knupfer Technical Coordinator SDC/SHA Secondee at UNHCR Northern Caucasus UNHCR Sub-Office Vladikavkaz
Other involved SHA consultants	Philippe Genoud (2002) Hans Weigum (2004)
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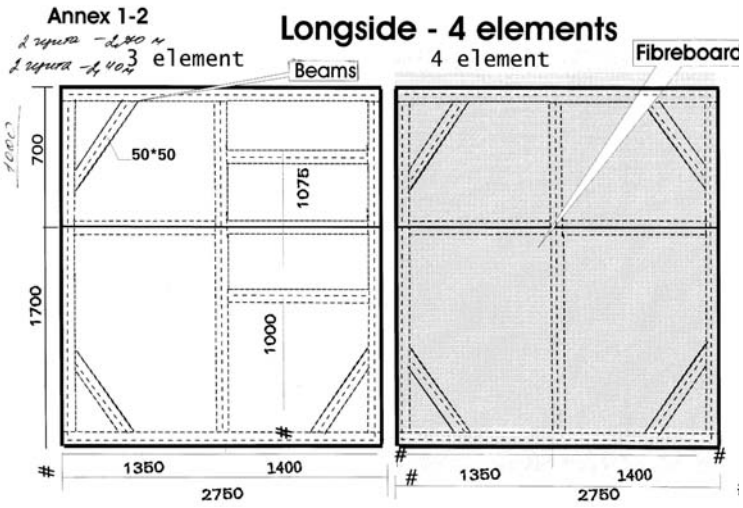
Recommended institutions:	UNHCR Northern Caucasus (UNHCR Sub-Office Vladikavkaz)
Recommended partners:	Danish Refugee Council - DRC Vesta
Recommended books/reports:	- Selecting NFIs for Shelter December 2008 IASC Inter-Agency Standing Committee Emergency Shelter Cluster - UNHCR Shelter in Northern Caucasus 2000-2007 (PowerPoint presentation, 2007)
Relevant other projects (links):	- DuSoCC-NC Housing Programme 2006-2009 (SDC/SHA Secondment at UNHCR Vladikavkaz) RUS48 Standard "Self-Help" Houses Programme - DuSoCC-NC Housing Programme 2000-2009 (SDC/SHA Secondment at UNHCR Vladikavkaz) "(Roof +) One Dry Room" Programme
Annex	- DRC Field Workshop in Karabulak (Ingushetia) - BT construction plans (wall elements) - U-coefficient calculation

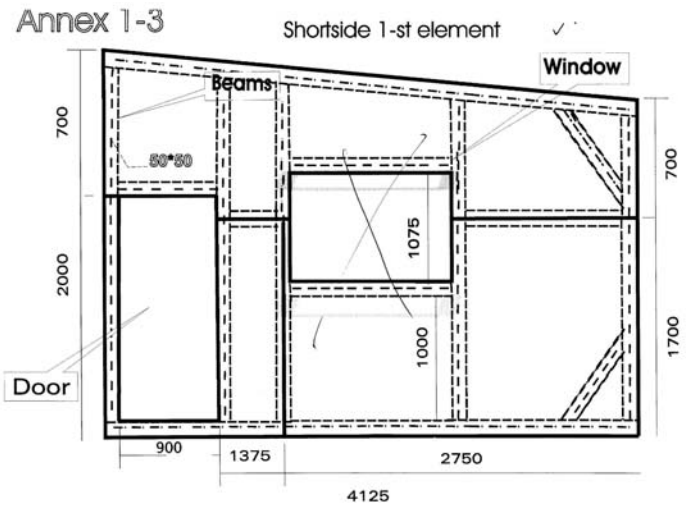
Annex

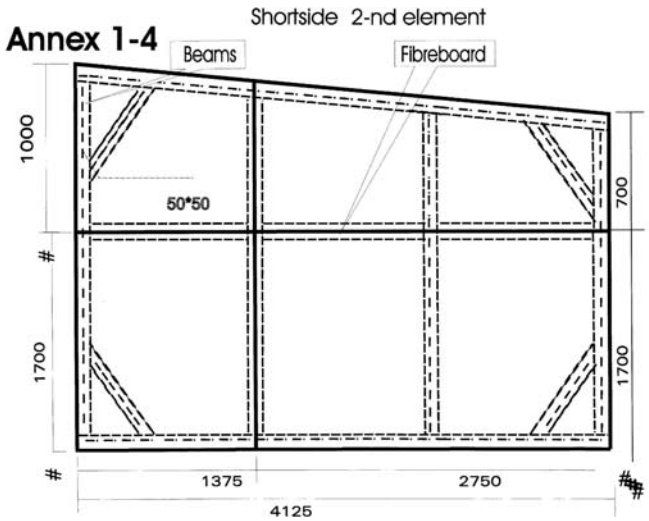
Temporary Solutions for Collective Centre Residents (TeSoCC) in North Caucasus
"Box Tents" (BT) Programme
DRC Field Workshop in Karabulak (Ingushetia)

Annex

BT construction plans (wall elements)







Annex

U-coefficient calculation

BT Box Tent

shell

thermal transmission coefficient calculus

U-coefficient

$$U = \frac{1}{\frac{1}{h_i} + \frac{d_1}{\lambda_1} + \frac{d_2}{\lambda_2} + \frac{d_3}{\lambda_3} + \frac{d_4}{\lambda_4} + \frac{1}{h_o}} \quad W/(m^2 \cdot K)$$

façade panels	heat transfer coefficient inside	h_i	=	8.000	W/(m²•K)	$1/h_i$	=	0.125	(m²•K)/W
	inner shell (fibreboard, d = 22 mm, two layers)	d_1	=	0.044	m				
	thermal conductivity	λ_1	=	0.040	W/(m•K)	d_1/λ_1	=	1.100	(m²•K)/W
	heat insulation (glass wool, d = 50 mm, one layer)	d_2	=	0.050	m				
	thermal conductivity	λ_2	=	0.035	W/(m•K)	d_2/λ_2	=	1.429	(m²•K)/W
	façade - outer shell (fibreboard, d = 22 mm, two layers)	d_3	=	0.044	m				
	thermal conductivity	λ_3	=	0.040	W/(m•K)	d_3/λ_3	=	1.100	(m²•K)/W
	heat transfer coefficient outside	h_o	=	25.000	W/(m²•K)	$1/h_o$	=	0.040	(m²•K)/W
						Σ	=	3.794	(m²•K)/W
	$A_{façades} = (5.50 + 5.02^{5}) \times 2 \times 2.40 - A_{door} - A_{window} = 50.520 - 1.785 - 1.200 = 47.535$ m²								

$U_{façades} = 1/\Sigma = 0.264$ W/(m²•K)

door	heat transfer coefficient inside	h_i	=	8.000	W/(m²•K)	$1/h_i$	=	0.125	(m²•K)/W
	timber	d_1	=	0.025	m				
	thermal conductivity	λ_1	=	0.120	W/(m•K)	d_1/λ_1	=	0.208	(m²•K)/W
	heat transfer coefficient outside	h_o	=	25.000	W/(m²•K)	$1/h_o$	=	0.040	(m²•K)/W
						Σ	=	0.373	(m²•K)/W
	$A_{door} = 0.85 \times 2.10 = 1.785$ m²								

$U_{door} = 1/\Sigma = 2.679$ W/(m²•K)

window	heat transfer coefficient inside	h_i	=	8.000	W/(m²•K)	$1/h_i$	=	0.125	(m²•K)/W
	glass	d_1	=	0.030	m				
	thermal conductivity	λ_1	=	0.760	W/(m•K)	d_1/λ_1	=	0.039	(m²•K)/W
	heat transfer coefficient outside	h_o	=	25.000	W/(m²•K)	$1/h_o$	=	0.040	(m²•K)/W
						Σ	=	0.204	(m²•K)/W
	$A_{window} = 1.20 \times 1.00 = 1.200$ m²								

$U_{window} = 1/\Sigma = 4.891$ W/(m²•K)

ceiling	heat transfer coefficient inside	h_i	=	8.000	W/(m²•K)	$1/h_i$	=	0.125	(m²•K)/W
	ceiling boards (fibreboard, d = 22 mm, two layers)	d_1	=	0.044	m				
	thermal conductivity	λ_1	=	0.040	W/(m•K)	d_1/λ_1	=	1.100	(m²•K)/W
	heat insulation (glass wool, d = 50 mm, one layer)	d_2	=	0.050	m				
	thermal conductivity	λ_2	=	0.035	W/(m•K)	d_2/λ_2	=	1.429	(m²•K)/W
	heat transfer coefficient outside	h_o	=	25.000	W/(m²•K)	$1/h_o$	=	0.040	(m²•K)/W
						Σ	=	2.694	(m²•K)/W
	$A_{ceiling} = 26.389$ m² (= heated area, "total house area" or net object area)								

$U_{ceiling} = 1/\Sigma = 0.371$ W/(m²•K)

floor	heat transfer coefficient inside	h_i	=	8.000	W/(m²•K)	$1/h_i$	=	0.125	(m²•K)/W
	timber planks	d_1	=	0.025	m				
	thermal conductivity	λ_1	=	0.120	W/(m•K)	d_1/λ_1	=	0.208	(m²•K)/W
	heat transfer coefficient outside	h_o	=	25.000	W/(m²•K)	$1/h_o$	=	0.040	(m²•K)/W
						Σ	=	0.373	(m²•K)/W
	$A_{floor} = 26.389$ m² (= heated area, "total house area" or net object area)								

$U_{floor} = 1/\Sigma = 2.679$ W/(m²•K)

$A_{shell} = A_{façades} + A_{door} + A_{window} + A_{ceiling} + A_{floor} = 47.535 \text{ m}^2 + 1.785 \text{ m}^2 + 1.200 \text{ m}^2 + 26.389 \text{ m}^2 + 26.389 \text{ m}^2 = 103.298 \text{ m}^2$

$A_{façades} \times U_{façades} = 47.535 \text{ m}^2 \times 0.264 \text{ W/(m}^2\text{•K)} = 12.549 \text{ W/K}$	=	12.549	W/K
$A_{door} \times U_{door} = 1.785 \text{ m}^2 \times 2.679 \text{ W/(m}^2\text{•K)} = 4.782 \text{ W/K}$	=	4.782	W/K
$A_{window} \times U_{window} = 1.200 \text{ m}^2 \times 4.891 \text{ W/(m}^2\text{•K)} = 5.869 \text{ W/K}$	=	5.869	W/K
$A_{ceiling} \times U_{ceiling} = 26.389 \text{ m}^2 \times 0.371 \text{ W/(m}^2\text{•K)} = 9.790 \text{ W/K}$	=	9.790	W/K
$A_{floor} \times U_{floor} = 26.389 \text{ m}^2 \times 2.679 \text{ W/(m}^2\text{•K)} = 70.696 \text{ W/K}$	=	70.696	W/K
Σ	=	103.686	W/K

BT "Box Tent" average thermal transmission rate $U_{ø} = \Sigma/A_{shell}$ = 1.004 W/(m²•K)