Final report - Review of built infrastructures

Khammouane Province - Laos 2017

International Federation
of Red Cross and Red Crescent Societies

Shelter Research Unit

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Table of contents

1. Overview
2. Used Methodology
3. Identification matrix of construction organized by district
4. Analysis of collected data per construction (including individual comments)
    a. Mahaxay district
    b. Hinboun District
5. Highlighted observations during the visit

   (With operational conclusions and prioritized actions)
6. General conclusion and recommendations of the built infrastructures
    - Design phase
    - Implementation phase

Other complementary activities

7. Self-built latrines
8. Community shelter kit

Title:	Construction review in Laos - Final report

Date and place:	Luxembourg – 2017.02.10
Project name & code	Laos constructions review – 24LA00
Service client	AI Croix-Rouge luxembourgeoise – Beatrice Winandy

1. Overview

The LRC is actively working in Laos with a Shelter project (including WatSan component) in the Khammouane region (Mahaxay and Hinboun districts).
The current project of the LRC (last planned in this country) focuses on improving life conditions of the local population through the development of community infrastructures and mechanisms. The project is implemented in 10 villages and concentrates on three pillars: construction of storage/community infrastructures, improvement of water access and sanitary facilities, supply of community support kits.
The project is expected to end on 30th June 2017.

The IFRC-SRU has been called to conduct a review mission in Laos from 4th to 19th March 2017.
The overall objective of the IFRC-SRU consultancy is a basic technical review of the constructions on the followed agreed topics:

- *Built infrastructures (including community latrines)*: Structure, Finishing and Dimensioning
- *Latrines built by self-construction or subcontracted as support to the most vulnerable families:* Emplacement, Use of the distributed materials and overall stability
- *Community support kits*: adequacy of the proposed items and adequate use of the already distributed items.

2. Used methodology

The review methodology is divided into 3 chapters:

1. *Document analysis in Luxembourg*:
   The output of this first chapter is to extract the relevant information from the technical documents (plans and description sheets for constructions) and provide an individual matrix per construction for further collection and comparison of data during the field mission.
2. *Field visit and data collection:*
   The data collection will be based on individual visits of each construction (infrastructure) and complemented with a % of latrines per village.
   All the information will be documented in the predefined matrix and complemented with graphic information, interviews to relevant involved actors and beneficiary feedback if necessary.
3. A final document will summarize all the collected information during the review mission in a matrix format and be complemented with graphic information, suggestions and other relevant information that the research officer considers relevant to better understand the review.

3. ID matrix of the visited construction by District

- **Mahaxay district**

Infrastructure	Primary school		**Picture** 
Location	**Province**	Mahaxay	
	Village	TAEN	
	GPS	17°26'56''N / 105° 04'48''E	
Built surface	300m^2		
Company name	Sykham Construction Co.LTD		

Infrastructure	Community centre		**Picture** 
Location	**Province**	Mahaxay	
	Village	DONPHOUKHAM	
	GPS	17°15'46''N / 105°16'28''E	
Built surface	155m^2		
Company name	Sykham Construction Co.LTD		

Infrastructure	School latrines + warehouse		**Picture** 
Location	**Province**	Mahaxay	
	Village	NONDAENG	
	GPS	17°15'11''N / 105°13'28''E	
Built surface	25m^2		
Company name	Sykham Construction Co.LTD		

Infrastructure	School latrines + warehouse		**Picture** 
Location	**Province**	Mahaxay	
	Village	PHONSELERM	
	GPS	17°18'18''N / 105°17'32''E	
Built surface	25m^2		
Company name	Sykham Construction Co.LTD		

- **Hinboun district**

Infrastructure	Community centre + latrines		
Location	**Province**	Hinboun	
	Village	Bouamlou	
	GPS	17°46'04.76''N / 104°42'39.24'E	
Built surface	246m^2		
Company name	Sayphoulouang Construction Co.LTD		**Picture**

Infrastructure	Primary School		**Picture** 
Location	**Province**	Hinboun	
	Village	Kaengphakham	
	GPS	17°41'53''N / 104°35'44''E	
Built surface	295m^2		
Company name	Sayphoulouang Construction Co.LTD		

Infrastructure	Community warehouse		**Picture** 
Location	**Province**	Hinboun	
	Village	Napho	
	GPS	17°41'12.49''N / 104°41'4166''E	
Built surface	25 m^2		
Company name	Sayphoulouang Construction Co.LTD		

Infrastructure	Community warehouse		**Picture** 
Location	**Province**	Hinboun	
	Village	Hinkhan	
	GPS	17°44'03.95''N /104°35'40.51''E	
Built surface	25 m^2		
Company name	Sayphoulouang Construction Co.LTD		

Infrastructure	Community warehouse	**Picture** 

Location	**Province**	Hinboun
	Village	Natoei
	GPS	17°48'45''N / 104°34'03''E
Built surface	25 m^2	
Company name	Sayphoulouang Construction Co.LTD	

Infrastructure	Collective latrines + warehouse		**Picture** 
Location	**Province**	Hinboun	
	Village	Pakpakan	
	GPS	17°38'32''N / 104°37'02''E	
Built surface	25m^2		
Company name	Sayphoulouang Construction Co.LTD		

4. Analysis of collected data per construction (including individual conclusions)

Constructions of Mahaxay district

- **Village of Taen – Primary School**

EXCAVATION AND BACKFILL	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Footing trenching and pit excavation	2017.03.13	Interview		built, cannot verify
FONDATION AND STRUCTURE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete footing	2017.03.13	interview	80x80x80 d=12C15	built, cannot verify
Reinforced concrete pillar	2017.03.13	Interview + picture + measure	23.5x22 bars: 4/d=12	regular and good finishing
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	2017.03.13	Interview + picture + measure	Strep foot 30x5 two brick layers with concrete inside nylon layer under the slab slab 10cm d=5#20	Sand was provided by construction company not community participation Good finishing and regular
Stairs to access. width=2m	2017.03.13	Interview + picture	Stairs in brick and cement over s10cm slab d=5#20 Brick walls and plaster finished	Well finished H and CH regular
Ramp to access. width=1m	2017.03.13	Interview + picture	NOT built	H different is too big for a ramp, use of normal access without problems

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Stairs to access

Side of ground slab and pillar

Interior picture pillar and ground finishing

ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments
Enclosure of the interior spaces	2017.03.13	Interview + picture + measure	Regular measure of the rooms built following the plan including reinforced angles with bar d=16; h=270	Good finishing regular and painted
Door. Type D1	2017.03.13	Interview + picture + measure	(81x200) interior and exterior locking system included	Good finishing, good ambience artisanal handmade job Small pieces missing
Window. Type W1	2017.03.13	Interview + picture + measure	small variation with the total measure no mosquito net(180x160)	Good finishing, good ambience artisanal handmade job Small pieces missing, mosquito net missing
Ceiling of inner spaces -	2017.03.13	Interview + picture + measure	small variation with the total measure structure in half bamboo can	Good finishing, good ambience artisanal handmade job the structure in half bamboo can provide a better aspect inside the room
Int/Ext Painting	2017.03.13	Interview + picture	Done with 2 layers	No comments

2017 Lao

Interior door with bamboo panel

Classroom window

Interior space ceiling

ROOF COVERING	Date of visit	Measure of verification	Collected data	Comments
Metal sheeting roof over wood ribbons and trusses	2017.03.13	Interview + picture	Small additional pieces in joints added additional metallic plates in place CGI E=0,47mm	Good finishing following the project good general aspect

Roof structure general view ridge

Bolts and metallic plate- joint over pillar

Bolt + metallic plate and L Dephile under the

PLUMBING AND SANITATION	Date of visit	Measure of verification	Collected data	Comments
Filtrating pit. Concrete rings	2017.03.13	Interview + picture	the filtrating pit includes ventilation Deph=150	The ventilation pipes could be closed with T piece
Sand filtrating trench.	2017.03.13	Interview + picture	Deph = 150 1x2m surface	good aspect clean surface

Metal gutter	2017.03.13	Interview + picture	In place including Lacquered support	good aspect support in laced metal too regular pendent
Tank to collect rain water (1000)	2017.03.13	Interview + picture	Reinforced structure foot 50x50x50 D=12 c/15 Pillars 15x15 4D=10/wood 4x15 with bolts	good aspect, already connected everything in place the modifications on the structure look logic and reasonable
PVC Sanitation pipe (D 100 mm with siphon)	2017.03.13	Interview + picture	100 for black water in place	good aspect No water supply No verification of use possible
PVC Sanitation pipe (D 40 mm with siphon)	2017.03.13	Interview + picture	40 for black water in place	good aspect No water supply No verification of use possible
PVC pipe for water supply (3/4" 18mm)	2017.03.13	Interview + picture	18 for black water in place	good aspect No water supply No verification of use possible
PVC pipe for water supply (1" 25mm)	2017.03.13	Interview + picture	25 for black water in place	good aspect No water supply No verification of use possible
Urinary (water supply and siphon)	2017.03.13	Interview + picture	In place	good aspect No water supply No verification of use possible
WC (dual flush)	2017.03.13	Interview + picture	in place but different model	good aspect, different model No water supply no use verification
Pedestal Sink + faucet	2017.03.13	Interview + picture	Sink in place including siphon no pedestal	good aspect but different model No water supply no use verification

Water tanks

Toilet sink with siphon

Filtrating pit with ventilation

FURNITURE & CARPENTRY	Date of visit	Measure of verification	Collected data	Comments
Wood + bamboo edge protection	2017.03.13	Interview + picture	h=1.1 attached to the pillars with wood	good finishing, good ambience wood protected and metallic plates + mechanical bolts in place small reinforced for lateral bracing done with adequate technical criteria
Single door for access	2017.03.13	Interview + picture	h=1.1 attached to the pillars with wood	
Double door for car access	2017.03.13	Interview + picture	h=1.1 attached to the pillars with wood	

Exterior fence general view

Exterior fence front facade

Pedestrian door

- Village of Donphoukham – Community center

EXCAVATION AND BACKFILL	Date of visit	Measure of verification	Collected data	Comments
Footing trenching and pit excavation	2017.03.14	Interview		Cannot verify, construction is finished
FONDATION AND STRUCTURE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete footing	2017.03.14	Interview	80x80x80 d=12 bar 10	Construction built, cannot verify
Reinforced concrete pillar	2017.03.14	Interview + picture	20x20 4bar d=12	Finished and painted regular termination
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	2017.03.14	Interview + picture	foundation of 30x5 Wall on 3 layer Compacted sand Propylene layer concrete slab of 10 Bar D=5 #15	Construction finished cannot verify details Sand provided by construction company not community participation Good finishing and regular
Wood Stairs to access.	2017.03.14	Interview + picture	Foundation 5cm brick walls Cover slab 10/20	Well finished H and CH regular Changes made by construction company
Wood Ramp to access.	2017.03.14	Interview + picture		

Front view with stairs

Side view with ramp

Rear view pillars and general finishing

ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments

Brick wall - Enclosure of the interior spaces	2017.03.14	Interview + picture + measure	Brick double plastered + painted Starting from the slab Lintel beam of 10x15 with 2bar D=10 Corner pillars from the base with 1 bar D=16	General good aspect correct measures and according to the plans
Door. Type D1	2017.03.14	Interview + picture	Wood doors with varnish (85x215)	Good aspect all doors with lock system Doors provided by community
Window. Type W1	2017.03.14	Interview + picture	Windows doors with varnish	Good aspect all windows with look system provided by community
Ceiling of inner spaces	2017.03.14	Interview + picture	Wood protected 5x15xcm Bamboo protected with the same colour but will be protected two sides	The structure is nailed over the wall
Int/Ext Painting	2017.03.14	Interview + picture	painted	regular and good aspect

Interior view with window in wood

Interior view with ceiling in bamboo

Interior view with door in wood

ROOF COVERING	Date of visit	Measure of verification	Collected data	Comments

Metal sheeting roof over wood ribbons and trusses	2017.03.14	Interview + picture	They close the side of the gable with bamboo panel and wood structure	General good aspect According to plans visual inspection
PLUMBING AND SANITATION	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Metal gutter	2017.03.14	Interview + picture		Good aspect
Tank to collect rain water 1000l	2017.03.14	Interview + picture	Solid wood structure but without bracing Tank in the plot but not connected	Waiting for the partners in the project LUX Dev for WATSAN component

Roof structure with bracing in 2 directions

Metallic Gutter

Water tank

FURNITURE & CARPENTRY	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Cement counter for kitchen	2017.03.14	Interview + picture	Structure wall in brick Polished mortar slab finished	Good aspect, already in use
Bamboo rolling shutter	2017.03.14	Interview + picture	In place	Good aspect providing friendly ambience
Wood substructure	2017.03.14	Interview + picture	Changed to brick	finished with plaster and painted

Kitchen counter

Rear view of kitchen

Inside view and Bamboo rolling shutter

URBAN AREA	Date of visit	Measure of verification	Collected data	Comments
Performance of perimeter fence.	2017.03.14	Interview + picture	in place	including paint in wood and insect protection in bamboo
Pedestrian gate for access	2017.03.14	Interview + picture	in place	including paint in wood and insect protection in bamboo
Vehicles gate	2017.03.14	Interview + picture	in place with wheels added to facilitate opening	including paint in wood and insect protection in bamboo

Fence door detail with wheel

Vehicles gate

Fence general view

- **Village of Nondaeng – Latrines / Warehouse**

FONDATION AND STRUCTURE	Date of visit	Measure of verification	Collected data	Comments
Reinforced concrete slab on ground floor	2017.03.14	Interview	Concrete slab over compacted ground wall base 30x5 brick wall 3 layer Slab ground H 10cm d5mm #15	Construction finished, cannot verify details Sand provided by construction company not community participation Good finishing and regular
ENCLOSURE AND PARTITIONS	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Enclosure of the interior spaces	2017.03.14	Interview + Picture	Simple brick wall plaster and painted Lintel 10x15 2 bars d10 Pillars on the corner with brick and cement 1D=16 inside; H=2.65	General good aspect Correct measured and according to the plans All improvements by construction company
Door. Type D1	2017.03.14	Interview + Picture	same than in project Including exterior lock (81x197 one measured)	Good aspect, the bamboo finishing provides a friendly ambience Exterior and interior lock system
Door. Type "toilet"	2017.03.14	Interview + Picture	same than in project Including exterior lock	Good aspect, the bamboo finishing provides a friendly ambience Exterior and interior lock system
Int/Ext Painting	2017.03.14	Interview + Picture	regular painted walls and wood	no comments
Wood + bamboo toilet wall	2017.03.14	Interview + Picture	Wood structure painted and protected bamboo panel protected	Solution with added value in terms of aesthetics and ventilation

Toilet door in wood

Bamboo wall

Exterior view with door and walls with plaster and painted

ROOF COVERING	Date of visit	Measure of verification	Collected data	Comments
Metal sheeting roof over wood substructure	2017.03.14	Interview + Picture	Additional lath added by the construction company some additional reinforced parts over the wall; Metal sheet e=0.47mm	In general well finished including metallic plates and bolts

Roof structure joint with bolt and metallic plate

Roof structure detail over the corner

General view roof finishing

PLUMBING AND SANITATION	Date of visit	Measure of verification	Collected data	Comments
Filtrating pit. Concrete rings	2017.03.14	Interview + Picture	150 deep cover 1m diameter	well closed form outside
Sand filtrating trench.	2017.03.14	Interview + Picture	100x170x 150cm	there are additional connections from the toilets for cleaning (drains) but need to be connected to the trench
Metal gutter	2017.03.14	Interview + Picture	Placed and operational	NO comment
Tank to collect rain water	2017.03.14	Interview + Picture	Tank in place	The H of the tank is not adequate to the H of the tap but it is not possible to move the tank higher apparently it is a mistake of design
PVC sanitation pipe (D 100 mm; siphon)	2017.03.14	Interview + Picture	in place and connected to the pit filtrating	connected and operational
PVC sanitation pipe (D 40 mm; siphon + bracing))	2017.03.14	Interview + Picture	in place and connected to the sand filtrating New added pipes in the toilets without connection	The new pipes need to be connected to the sand filtrating
PVC pipe for water supply (3/4" ;18mm)	2017.03.14	Interview + Picture	In place and fully connected	connected and operational

PVC pipe for water supply (1";25mm)	2017.03.14	Interview + Picture	In place and fully connected	connected and operational
WC	2017.03.14	Interview + Picture	In place and connected different model	Different model than in the project
Pedestal Sink + faucet	2017.03.14	Interview + Picture	In place and connected including siphon no pedestal	Different model than in the project

Double sink and PVC pipe/ Bamboo wall

Metal gutter

General view and water tank

- **Village of Phonselerm – Primary School**

FONDATION AND STRUCTURE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on ground floor	2017.03.14	Interview	Concrete slab over compacted ground wall base 30x5 brick wall 3 layer Slab ground H 10cm d5mm #15	Construction finished cannot verify details Sand provided by construction company not community participation Good finishing and regular
ENCLOSURE AND PARTITIONS	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Enclosure of the interior spaces	2017.03.14	Interview + Picture	Simple brick wall plaster and painted Lintel 10x15 2 bars d10 Pillars on the corner with brick and cement 1D=16 inside; H=2.65	General good aspect Correct measures and according to the plans All improvements by construction company
Door. Type D1	2017.03.14	Interview + Picture	same than in project Including exterior lock (81x197 one measured)	Good aspect, the bamboo finishing provide a friendly ambience Exterior and interior lock system

Door. Type "toilet"	2017.03.14	Interview + Picture	same than in project Including exterior lock	Good aspect, the bamboo finishing provide a friendly ambience Exterior and interior lock system
Int/Ext Painting	2017.03.14	Interview + Picture	regular painted wools and wood	no comments
Wood + bamboo toilet wall	2017.03.14	Interview + Picture	Wood structure painted and protected bamboo panel protected	Solution with added value in terms of design and ventilation

Bamboo door detail

Bamboo wall detail

Front view with Bamboo wall and door

ROOF COVERING	Date of visit	Measure of verification	Collected data	Comments
Metal sheeting roof over wood substructure (TOILET)	2017.03.14	Interview + Picture	Additional lath added by the construction company some additional reinforced parts over the wall; Metal sheet e=0.47mm	In general well finished including metallic plates and bolt

Reinforced joint with metallic angle and bolt Interior view
Joint angle, exterior view

PLUMBING AND SANITATION	Date of visit	Measure of verification	Collected data	Comments
Filtrating pit. Concrete rings	2017.03.14	Interview + Picture	150 deep cover 1m diameter	well closed form outside
Sand filtrating trench.	2017.03.14	Interview + Picture	100x170x 150cm	there are additional connections from the toilets for cleaning (drains) but need to be connected to the trench
Metal gutter	2017.03.14	Interview + Picture	In place and operational	
Tank to collect rain water (1000L)	2017.03.14	Interview + Picture	Tank in place	The H of the tank is not adequate for the H of the tap but it is not possible to move the tank higher apparently it is a mistake of design
PVC sanitation pipe (D 100 mm)	2017.03.14	Interview + Picture	in place and connected to the pit filtrating	connected and operational
PVC sanitation pipe (D 40 mm)	2017.03.14	Interview + Picture	in place and connected to the sand filtrating New added pipes in the toilets without connection (for drainage)	The new pipes need to be connected to the sand filtrating
PVC pipe for water supply (3/4" ;18mm)	2017.03.14	Interview + Picture	In place and fully connected	connected and operational
PVC pipe for water supply (1";25mm)	2017.03.14	Interview + Picture	In place and fully connected	connected and operational
WC	2017.03.14	Interview + Picture	In place and connected different model	Different model than in the project
Pedestal sink +faucet	2017.03.14	Interview + Picture	In place and connected including siphon no pedestal	Different model than in the project

Sink with PVC pipe

WC in place

Pit Filtrating system and drainage

Water tank

Constructions of Hinboun district

- **Village of Bouamlou – Community centre + latrines**

EXCAVATION AND BACKFILL	Date of visit	Measure of verification	Collected data	Comments
Footing trenching and pit excavation	03.08.2017	interview	80x80x80	Built, not possible to confirm
FONDATION AND STRUCTURE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete footing	03.08.2017	interview	80x80x80	Built, not possible to confirm
Reinforced concrete pillar	03.08.2017	Measure + picture	20x20	Plaster + paint regular
Reinforced concrete slab on ground	03.08.2017	Picture + interview	Picture	no comments
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	03.08.2017	Interview + picture	Slab is not done but the walls are built in 2 layers; no pillars on axes the community didn't participate construction company decided to add	General aspect of the construction is not bad but the construction company made important changes in the configuration of the construction that need to be analysed.

			the sand by itself.	
Stairs to access.	03.08.2017	Interview + picture + measure	L=4m; stair in brick changed only one stair built	The stair in the rear side of the building have to be done
Stairs to access.	03.08.2017	Interview + picture + measure	L=9.35m; stair on brick over slab	General aspect is good but the dimensions in the steps are different
Ramp to access.	03.08.2017	Interview + picture + measure	3x2.5; stair on brick over concrete slab	High pendent on the ramp

Stairs with brick and concrete slap

Side view with ramp

Perimeter wall in 2 layers

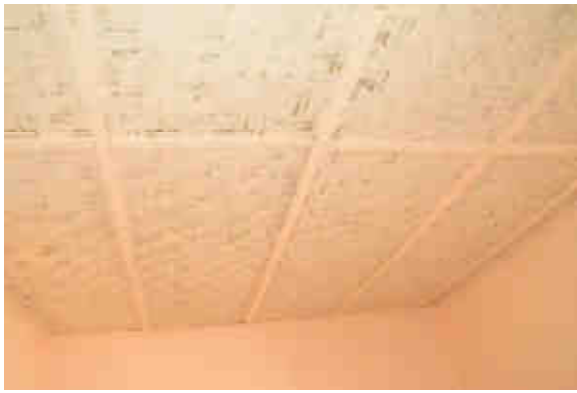
ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments
Enclosure of the interior spaces	03.08.2017	Interview + picture + measure	h=2.9 -+5cm same section of wall under the ground same "slab" Reinforced angles with brick pillar and concrete + 1D=16mm	Cannot verify the wall foundation the general aspect is good vertical and with regular plaster.
Door. Type D1	03.08.2017	Interview + picture + measure	80x2 +-3 one measured all in wood Some units are used	The doors were not in place but on the construction site. Not in good conditions. One with insects and other was second hand. No documents from company or district about the changes
Door. Type D2	03.08.2017	Interview + picture + measure	all in wood Some units are used different than the specifications	
Window. Type W1	03.08.2017	Interview + picture + measure		

Ceiling of inner spaces	03.08.2017	Interview + picture + measure	up 75x75cm down 2x75cm not treated against insects Nailed on the walls not over the wall	Construction company changes without advice the first time that district realise this change is today. That shows the poor technical follow up of the constructions.
Int/Ext Painting	03.08.2017	Interview + picture + measure	Not fully painted	To hand-paint but not finished

Interior wall base
view of interior ceiling

Reinforced angle on interior wall

General



ROOF COVERING	Date of visit	Measure of verification	Collected data	Comments

Metal sheeting roof over wood ribbons and trusses	03.08.2017	Interview + picture + measure	Metallic sheet 0.4mm measured Structure: Missing diagonals on the roof Additional diagonals on pillars No metallic plates in the unions, some L Dephile on small joints double beams in only one direction union of timber with nails in critical places wood not fully protected against insects metallic plates changed by wood pieces	The construction company changed or built the roof structure with less quantity of pieces. The technical control/follow up don't inform about changes, missing pieces or irregularities. These modifications need to be solved as soon as possible to finish the structure as defined in project
Metal sheeting roof over wood substructure (TOILET)	03.08.2017	Interview + picture	Metallic sheet 0.4mm measured Structure: No metallic plates in the joints, Some L Dephile on small unions joint of timber with nails wood not fully protected against insects metallic	The construction company changed or built the roof structure differently (adding some additional reinforcements). The technical control/follow-up didn't inform about changes, missing pieces or irregularities.

			plates changed by wood pieces	

Metallic plate missing over the pillar

Piece joint with nails

External beam with piece missing

PLUMBING AND SANITATION	Date of visit	Measure of verification	Collected data	Comments
Filtrating pit. Latrine	03.08.2017	Interview	Deep 150m D= 80cm	Good exterior aspect Ventilation could be finished with a T piece
Sand filtrating trench.	03.08.2017	Interview + picture	Not built	It is recommended to build the filtrating trench as in project. All the drain pipes into the trench.
Metal gutter	03.08.2017	Pictures	Not finished, distance between hooks excessive. Hooks made with reinforced bars	It is recommended to change the reinforced bars for the defined pieces in project.
Tank to collect rain water	03.08.2017	pictures	1000L tank is in place but in a low position in relation to the taps.	It is recommended to raise the water tank until the bottom level of the tank is placed at the same level as the highest tap.
PVC sanitation pipe (D 100 mm)	03.08.2017	picture	In place connecting the pit latrine	no comment
PVC sanitation pipe (D 40 mm)	03.08.2017	picture	In place connecting drainages	evacuation pipe of one shower missing

PVC pipe for water supply (3/4"/18,75mm)	03.08.2017	picture	In place	
PVC pipe for water supply (1"/25mm)	03.08.2017	picture	In place	
Shower	03.08.2017	pictures	Not built	No shower just tap Construction company changed without information, district does not approve but did not inform.
WC	03.08.2017			simple model not the same than in the plan
		 picture	 picture	
Pedestal sink + faucet	03.08.2017			different model

Sink Water tank WC Filtrating pit

FURNITURE & CARPENTRY	Date of visit	Measure of verification	Collected data	Comments
Cement counter for kitchen.	03.08.2017	Pictures	Not finished	Structure change to bricks reinforced columns in angles
Bamboo rolling shutter height 3m	03.08.2017	pictures	Not built	No info
Wood substructure	03.08.2017	Pictures	Not built	No info
URBAN AREA	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Performance of perimeter fence.	03.08.2017	Pictures	Not built	No info
Pedestrian gate for access	03.08.2017	pictures	Not built	No info
Vehicles gate	03.08.2017	Pictures	Not built	No info

General view of the community centre without exterior fence

Front view the works are not finished

- **Village of Kaengphakham – Primary school**

FONDATION AND STRUCTURE	Date of visit	Measure of verification	Collected data	Comments
Reinforced concrete footing	2017.03.11	interview	80x80x80	Built, not possible to confirm
Reinforced concrete pillar	2017.03.11	Picture + interview + measure	section 22x20 ; 4bar d=12	
Reinforced concrete slab on ground floor (toilet)	2017.03.11	Interview + pictures	(D=4 #25); no polystyrene H=10	General good aspect and finishing The company made the changes the technical follow-up approve but not inform.
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	2017.03.11	Interview + pictures	Perimeter wall foundation 30x5cm wall in two layer H=10; Bar grid (D=4 #25) no polystyrene	General good aspect. The company made the changes, the technical follow-up from the district approve but not inform.
Stairs to access. wood width=2,20m	2017.03.11	pictures + interview	Stairs/Ramp on brick wall over 5cm slab compacted sand concrete slab	Irregular measures in H and depth of steps The company made the changes, the technical follow-up from the district approve but not inform. LRC delegate realised the change after construction and did not inform.
Stairs to access. Wood width=4.60m	2017.03.11	pictures + interview		
Stairs to access. Wood width=6.00m	2017.03.11	pictures + interview		
Ramp to access. Wood width=1m	2017.03.11	pictures + interview		

International Federation
of Red Cross and Red Crescent Societies

Shelter Research Unit

General view including stairs and finished slab

Ramp to the warehouse

Lateral stairs

ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments
Enclosure of the interior spaces	2017.03.11	Picture+ interview+ measures	Some cracks on the junction with pillars Lintel 10x15 D=10/2 e6/20	General aspect is good with two faces plastered and regular surface. Some cracks to follow up. The company made the changes, the technical follow-up from the district approve but not inform.
Door. Type D1	2017.03.11	Picture + measures	W+=0,805 h2005 +- 2cm 3 door measured green wood, no full insect protection	The changes where suggested by district, construction company accepted and LRC delegate inform HQ. In general the quality of the doors and windows are poor. The wood needs to be dry and protected against insects
Window. Type W1	2017.03.11	Picture + measures	In wood Not fully protected against insects No mosquito net	
Ceiling of inner spaces	2017.03.11	Picture + interview	nailed to the wall Not fully protected against insects Made with rests of wood not regular measures	The company made the changes, the technical follow-up from the district approved but not inform Changes suggested for good image and durability
Int/Ext Painting	2017.03.11	Pictures	not finished	N/C
Wood + bamboo toilet wall	2017.03.11	Pictures + interview	Wood structure fixed with angles and screws Bamboo cane with transparent protection is not possible to evaluate Wood structure with regular paint	General aspect is good. The interior ambience is friendly and the ventilation in the toilet is open and fluent

Interior view including ceiling

Wood window

Toilet door in wood

ROOF COVERING	Date of visit	Measure of verification	Collected data	Comments
Metal sheeting roof over wood ribbons and trusses	2017.03.11	Picture + interview	Aluzinc anoy e=0.47 in place Structure: Missing diagonals on the roof Additional diagonals on pillars Metallic plates only in some joints but in general with nails double beams in only one direction union of timber with nails in critical places wood not fully protected against insects metallic plates changes by wood angles	The construction company changed or built with less quantity of pieces in the roof structure. The technical control/follow up didn't inform about changes, missing pieces or irregularities.
Metal sheeting roof over wood substructure (TOILET)	2017.03.11	Pictures + interview	Metallic sheet Aluzin 0.47mm picture Structure: No metallic plates on the joints, some L Dephile on small unions junction of timber with nails wood not fully protected against insects	The construction company changed or built the roof structure differently (adding some additional reinforcements). The technical control/follow up didn't inform about changes, or irregularities

Roof structure with one missing piece
Joined on to wood with nails

Junction with metallic plate but nailed

PLUMBING AND SANITATION	Date of visit	Measure of verification	Collected data	Comments
Filtrating pit. Concrete rings	2017.03.11	Pictures + interview	Deep 150m D=80cm	Good exterior aspect Ventilation could be finished with a T piece
Sand filtrating trench.	2017.03.11	Pictures + interview	Not built	It is recommended to build the filtrating trench as in project. All the drain pipes into the trench.
Metal gutter	2017.03.11	Pictures + interview	Not finished, distance between hooks excessive.	It is recommended to change the hooks for the defined pieces in project.
Tank to collect rain water 1000L	2017.03.11	Pictures + interview	1000L tank is in place but in a low position with relation to the taps.	It is recommended to raise the water tank until the bottom level of the tank is placed at the same level as the highest tap.
PVC pipe (D 100 mm)	2017.03.11	Pictures	In place connecting the pit latrine	no comment
PVC pipe (D 40 mm)	2017.03.11	Pictures	In place connecting drainages	In place but no water needs to be tested before final reception of works
PVC pipe for water supply (18mm)	2017.03.11	Pictures	In place	
PVC pipe for water supply (25mm)	2017.03.11	Pictures	In place	
WC	2017.03.11	Pictures	in place but different model	
Pedestal sink + faucet	2017.03.11	Pictures	in place but different model	Needs to be tested the siphon was without glue. Attention!!!
FURNITURE & CARPINTERY	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Brise-soleil >2m long	2017.03.11	Pictures + interview	Partially done by the beneficiaries not the company	It is recommended to finish the Brise-soleil as indicated in project to protect the class from excessive sun light The used wood, according to the local knowledge is not affected by the termites.

Sink with siphon
Brise-soleil

Filtrating pit and PVC system

- **Village Napho – Community Warehouse**

EXCAVATION AND BACKFILL	Date of visit	Measure of verification	Collected data	Comments
Footing trenching and pit excavation	2017.03.10	interview		not possible to verify
FONDATION AND STRUCTURE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete footing	2017.03.10	interview	Foot base 60x60x60 Bars d12#15	not possible to verify
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	2017.03.10	Interview + pictures	Perimeter wall foundation 30x5cm wall in two layers no polystyrene Slab H=10	General good aspect. The company made the changes, the technical follow-up from the district approved but did not inform.
Wood stairs to access.	2017.03.10	Interview + pictures	Stairs/ramp on brick wall over 5cm slab compacted sand concrete slab	Irregular measures in H and depth of steps The company made the changes, the technical follow-up from the district approved but did not inform. LRC delegate realised the change after construction and did not inform.
Wood ramp to access.	2017.03.10	Interview + pictures		

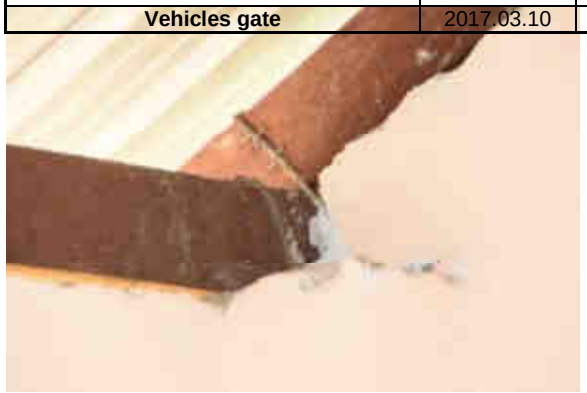
Front view with ramp

Side view with stairs

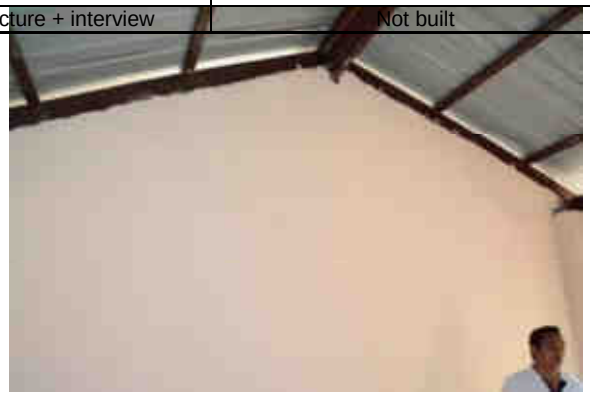
Ramp details

ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments

Enclosure of the interior spaces	2017.03.10	Picture + interview	Full plaster painted Lintel beam 10x15 +2/D=10 Wall H=2.60	General aspect is good with two faces plastered and regular surface. Some cracks to follow up. The company add the beams, the technical follow-up from the district approved but not inform
Door. Type D1	2017.03.10	Picture + measure	Green wood, no full insect protection W+=0,805 h=2,05	The changes where suggested by district, construction company accepted and LRC delegate informed HQ. In general the quality of the doors is poor. The wood need to be dry and protected against insect
Int/Ext Painting	2017.03.10	Picture	Painted	N/C
ROOF COVERING	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Metal sheeting roof over wood substructure.	2017.03.10	Pictures + interview	Metallic sheet e=0.47mm Structure: Turned 90 over the construction nailed joint over the walls in the wood beam wood not fully protected 3 laths inside the building + 1 outside metallic plates with nails not screws	The construction company changed or built the roof structure with less quantity of pieces. The technical control/follow-up didn't inform about changes, missing pieces or irregularities.
URBAN AREA	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Performance of perimeter fence.	2017.03.10	Picture + interview	Not built	No info
Vehicles gate	2017.03.10	Picture + interview	Not built	No info



Junction wall and wood structure
Joined wood



General interior view

- **Village Hinkhan – Community Warehouse**

EXCAVATION AND BACKFILL	Date of visit	Measure of verification	Collected data	Comments
Footing trenching and pit excavation	2017.03.09	interview		not possible to verify
FONDATION AND STRUCTURE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete footing	2017.03.09	interview	base 60x60x60; Bars d12#15	not possible to verify
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	2017.03.09	Interview + pictures	Perimeter wall foundation 30x5cm wall in two layers no polystyrene; Slab H=10	General good aspect. The company made the changes, the technical follow-up from the district approved but did not inform.
Wood stairs to access.	2017.03.09	Interview + pictures	Stairs/ramp on brick wall over 5cm slab compacted sand concrete slab	Irregular measures in H and depth of steps The company made the changes, the technical follow-up from the district approved but did not inform. LRC delegate realised the change after construction and did not inform.
Wood ramp to access.	2017.03.09	Interview + pictures		


General view with ramp


Stairs detail


Rear view with stairs

ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments
Enclosure of the interior spaces	2017.03.09	Picture + interview	Wall H=2.50l; Full plaster and painted Lintel beam 10x15 +2/D=10	General aspect is good with two faces plastered and regular surface. Some cracks to follow up. The company added the beams, the technical follow-up from the district approved but did not inform

Wood door. Type D1	2017.03.09	Picture + measures	Green wood, no full insect protection W+=0,805 h=2,00	The changes where suggested by district, construction company accepted and LRC delegate informed HQ. In general the quality of the doors is poor. The wood needs to be dry and protected against insects
Int/Ext painting	2017.03.09	Picture	Painted	N/C
ROOF COVERING	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Metal sheeting roof over wood substructure	2017.03.09	Pictures + interview	Metallic sheet e=0.47mm Structure: Nailed joint over the walls in the wood beam (no danger because is over the wall). Wood not fully protected beam on the bridge with nails and metallic plate	The construction company changed or built the roof structure differently. The technical control/follow-up didn't inform about changes, missing pieces or irregularities.
URBAN AREA	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Performance of perimeter fence.	2017.03.09	Picture + interview	Not built	No info
Vehicles gate	2017.03.09	Picture + interview	Not built	No info

Wood structure with metallic plate and nails

General interior view with plastered walls and paint

Wood door

- **Village Natoei – Community Warehouse**

EXCAVATION AND BACKFILL	Date of visit	Measure of verification	Collected data	Comments
Footing trenching and pit excavation	2017.03.09	interview		not possible to verify

FONDATION AND STRUCTURE	Date of visit	Measure of verification	Collected data	Comments
Reinforced concrete footing	2017.03.09	interview	35x50+16mmd/1	not possible to verify
ELEVATED BASE	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Reinforced concrete slab on compacted earth	2017.03.09	pictures + interview + measure	Perimeter wall foundation 30x5cm wall in two layers Slab H=10; no polystyrene	General good aspect. The company made the changes, the technical follow-up from the district approved but did not inform.
Wood stairs to access.	2017.03.09	Interview + pictures	Stairs/ramp on brick wall over 5cm slab compacted sand concrete slab	Irregular measures in H and depth of steps The company made the changes, the technical follow-up from the district approved but did not inform. LRC delegate realised the change after construction and did not inform.
Wood ramp to access.	2017.03.09	Interview + pictures		

Front view with stairs

Side view with ramp

Ramp and door detail

ENCLOSURE AND PARTITIONS	Date of visit	Measure of verification	Collected data	Comments

Enclosure of the interior spaces	2017.03.09	Picture + interview	The plaster is NOT finished +painted Lintel beam 10x15 +2/D=10 Wall H=2.50	General aspect is good but the interior plastering is not finished. The company added the beams, the technical follow-up from the district approved but did not inform
Wood door. Type D1	2017.03.09	Picture	Green wood, no full insect protection	The changes where suggested by district, construction company accepted and LRC delegate informed HQ. In general the quality of the doors is poor. The wood needs to be dry and protected against insects
Int/Ext painting	2017.03.09	Picture	Painted outside / not finished inside	N/C
ROOF COVERING	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Metal sheeting roof over wood substructure	2017.03.09	Pictures + interview	ALUZINC Metallic sheet e=0.47mm Structure: Nailed joint over the walls in the wood beam Wood not fully protected beam on the bridge with bolt and metallic plate	The construction company changed or built the roof structure differently. The technical control/follow-up didn't inform about changes, missing pieces or irregularities.
URBAN AREA	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Performance of perimeter fence wood bamboo	2017.03.09	Picture + interview	Not built	No info
Vehicles gate	2017.03.09	Picture + interview	Not built	No info

Junction with metallic plate and bolt

No fully plastered wall and general interior view

Junction pillar and beam

- **Village Pakpakam – Collective latrines and warehouse**

FONDATION AND STRUCTURE	Date of visit	Measure of verification	Collected data	Comments

Reinforced concrete slab on ground floor	2017.03.10	interview +picture	5x30 cm foundation walls d=4 #25x25 foot = 80x80x60 with d=12#20	The general finishing aspect is good The company made the changes, the technical follow-up from the district approved but did not inform.
ENCLOSURE AND PARTITIONS	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Enclosure of the interior spaces	2017.03.10	interview +picture	Fully plastered and painted Lintel beam 10x15 +2/D=10	General aspect is good with two faces plastered and regular surface. The company added the beams, the technical follow-up from the district approved but did not inform
Door. Type D1	2017.03.10	Picture+measure	Green wood, no full insect protection W+=0,805 h=1,90	The changes where suggested by district, construction company accepted and LRC delegate informed HQ. In general the quality of the doors is poor. The wood needs to be dry and protected against insects
Door. Type "toilet"	2017.03.10	Picture+measure	Green wood, no full insect protection W+=0,805 h=2,05	
Int/Ext painting	2017.03.10	Picture	Painted	N/C
Wood + bamboo toilet wall	2017.03.10	picture +interview+	Framework painted and nailed No bracing Metallic L piece + screw for junction with ground	The general exterior aspect is friendly and good finishing. The bamboo solution on the walls allow ventilation

General view including bamboo wall

Side view with wood door and ramp

Latrine door

Detail of bamboo wall

ROOF COVERING	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**

Metal sheeting roof over wood substructure (TOILET)	2017.03.10	Pictures + interview	Metallic sheet e=0.47mm Nailed junction over the walls in the wood beam Wood not fully protected beam on the bridge with bolt and metallic plate	The construction company changed or built the roof structure differently. The technical control/follow-up didn't inform about changes, missing pieces or irregularities.
PLUMBING AND SANITATION	**Date of visit**	**Measure of verification**	**Collected data**	**Comments**
Filtrating pit. Concrete rings	2017.03.10	Pictures + interview	Depth 150m D= 80cm	Good exterior aspect Ventilation could be finished with a T piece
Sand filtrating trench.	2017.03.10	Pictures + interview	Not built	It is recommended to build the filtrating trench as in project. All the drain pipes into the trench.
Metal gutter	2017.03.10	Pictures + interview	Not finished, distance between hooks excessive.	It is recommended to change the hooks for the defined pieces in project.
Tank to collect rain water	2017.03.10	Pictures + interview	1000L tank is in place but in a low position in relation to the taps.	It is recommended to raise the water tank until the bottom level of the tank is placed at the same level as the highest tap.
PVC pipe (D 100 mm)	2017.03.10	Pictures	In place connecting the pit latrine	no comment
PVC pipe (D 40 mm)	2017.03.10	Pictures	In place connecting drainages	In place but no water needs to be tested before final reception of works
PVC pipe for water supply (18mm)	2017.03.10	Pictures	In place	
PVC pipe for water supply (25mm)	2017.03.10	Pictures	In place	
WC	2017.03.10	Pictures	in place but different model	
Pedestal sink + faucet	2017.03.10	Pictures	in place but different model	In place but not functional Needs to be tested

Water tank and pit filtration

Sink and PVC drainage system

Latrine view

Junction between roof structure and pillar

5. Highlighted observations during the visit

The built infrastructures are finished with a general good aspect and most of them are already operational. The quality of construction and design will provide a qualitative improvement in the daily life of the villagers.

The next tables show the operational conclusions after the visit. All the comments are based on the interviews and the information that was collected. The limitation in the observations and recommendations comes from the fact that the constructions were visited once already built. So, the buildings were only assessable by visual inspection and indirect information (interview) and it was not possible to get reliable technical information for a deep analysis.

- **Operational conclusion and actions to be done in Mahaxay district**

IDENTIFICATION		PRIORITIZATION		
VILLAGE	**CONSTRUCTION**	**NEED TO BE DONE**	**SUGGESTED**	**GOOD TO BE DONE**
Taen	Primary school		o Full protection against insects in all the wood/bamboo elements.	The ventilation pipes of the pit latrines can be closed with T piece. Test all the sanitary systems with water in real conditions. Document all the changes and relevant actions according to the agreed documents
Donphoukham	Community centre		o Full protection against insects in all the wood/bamboo elements.	o Document all the changes and relevant actions according to the agreed documents.
Nondaeng	Latrines + warehouse	There are additional connections from the toilets for cleaning but need to be connected to the sand filtrating trench	o The level of the water tank can't be raised. But it is recommended that the bottom part of the tank is at least at the same level as the highest tap. If the tank height does not allow this, two tanks of 500l each can be placed in line connection and with the criteria of height described before.	o Document all the changes and relevant actions according to the agreed documents
Phonselerm	Latrines + warehouse	There are additional connections from the toilets for cleaning but need to be connected to the sand filtrating trench	o The level of the water tank can't be raised. But it is recommended that the bottom part of the tank is at least at the same level as the highest tap. If the tank height does not allow this, two tanks of 500l each can be placed in line connection and with the criteria of height described before.	o Document all the changes and relevant actions according to the agreed documents

- **Operational conclusion and action to be done in Hinboun district**

IDENTIFICATION	PRIORITIZATION	

VILLAGE	CONSTRUCTION	NEED TO BE DONE	SUGGESTED	COULD BE DONE
Bouamlou	Community centre +Community latrines	o The construction is not finished (preliminary estimation around 75 to 80% of work done) need to be finished! o Roof structure has to be done according to the project including: Metallic plates, bolts, full protection against insects, double wood pieces on beams and brazing in all defined directions. With particular attention in the missing pieces and in the brazing. Joints/splices in structure timber are not allowed without specific written authorization from the technical responsible (in English). o The concrete slab has to be done according to the project documentation. o The stairs in the back part has to be done according to the district approved solution. o Sand filtrating trench and connections according to the project documents.	o The level of the water tank can be raised. The bottom part of the tank has to be at least at the same level as the highest tap. If the tank height does not allow this, two tanks of 500l each can be placed in line connection and with the criteria of height described before. o Full protection against insects in all the wood/bamboo elements. o Quality control on doors and windows to ensure a good quality product and implementation.	o Adjust the finishing on ceiling, doors, windows and any other termination that will provide a good aspect. o Test all the sanitary systems with water in real conditions o Document all the changes and relevant actions according to the agreed documents.
Kaengpakham	Primary school	o The construction is not finished (preliminary estimation around 80 to 85% of work done) need to be finished! o Roof structure has to be done according to the project including: Metallic plates, bolts, full protection against insects, double wood pieces on beams and brazing in all defined directions. With particular attention in the missing pieces and in the brazing. Joints/splices in structure timber are not allowed without specific written authorization from the technical responsible (in English). o Metallic gutter needs to be done according to the project. In addition has to be easy to access and clean for maintenance purposes. o Bamboo shades have to be done according to the project. o Pedestrian road to access the latrines have to	o The level of the water tank can be raised. The bottom part of the tank has to be at least at the same level as the highest tap. If the tank height does not allow this, two tanks of 500l each can be placed in line connection and with the criteria of height described before. o Full protection against insects in all the wood/bamboo elements.	o Adjust the finishing on ceiling, doors, windows and any other termination that will provide a good aspect. o Test all the sanitary systems with water in real conditions o Document all the changes and relevant actions according to the agreed documents.

		be done. o Sand filtrating trench and connections according to the project documents.		
Napho	Community warehouse	o The construction is not finished (Perimeter fence and other finishing missing) need to be finished!	o Roof structure has to be done according to the project including: Metallic plates, bolts and full protection against insects. Joints/splices in structure timber are not allowed without specific written authorization from the technical responsible (in English).	o Document all the changes and relevant actions according to the agreed documents
Hinkhan	Community warehouse	o The construction is not finished (Perimeter fence and other finishing missing) need to be finished!	o Roof structure has to be done according to the project including: Metallic plates, bolts and full protection against insects. Joints/splices in structure timber are not allowed without specific written authorization from the technical responsible (in English).	o Document all the changes and relevant actions according to the agreed documents
Natoei	Community warehouse	o The construction is not finished (Perimeter fence and other finishing missing) need to be finished! o All the interior walls have to be fully plastered and painted	o Roof structure: Joints/splices in structure timber are not allowed without specific written authorization from the technical responsible (in English). o Change doors for units without space between panels or other fabrication problems. Fully protected against insects o All wood elements have to be fully protected against insects with particular attention in all the structural pieces	Document all the changes and relevant actions according to the agreed documents
Pakpakhan	Collective latrines + warehouse	o The construction is not finished, need to be finished according to the project documents	o All wood elements have to be fully protected against insects	o Test all the sanitary systems with water

		o Sand filtrating trench and connections according to the project documents.	with particular attention in all the structural pieces o The level of the water tank can be raised. The bottom part of the tank has to be at least at the same level as the highest tap. If the tank height does not allow this, two tanks of 500l each can be placed in line connection and with the criteria of height described before. o The sink is not the same than I the project (pedestal missing)	in real conditions. Document all the changes and relevant actions according to the agreed documents.

6. General conclusion and recommendations of the built infrastructures

Overview

The design of the infrastructures (buildings) was done with participative working groups with the participation of: Beneficiaries + district authorities and LAO/LRC Red Cross representatives. As result of these workshops and the adaptation to the international standards, a set of documents was completed to build the infrastructures.

Per each building:

- General description of the works
- Project drawings including details at 1:5; plans 1:100 and other graphic information
- Technical specifications
- Detailed bill of quantities

Design phase conclusion

The direct participation of a professional expat (Architect rep of LRC in the country) has provided a high level of quality in the design documents which facilitate the execution and traceability of works. In addition, the project takes into account concepts like environment or passive construction.

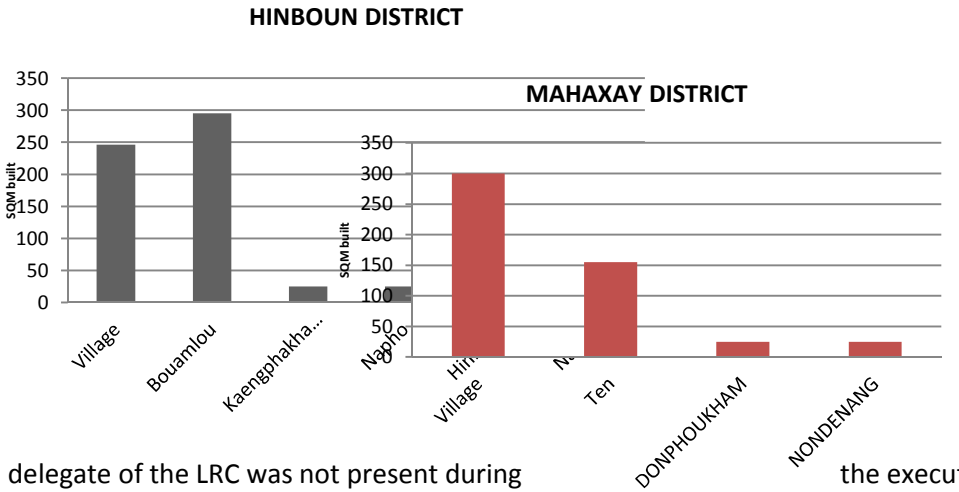
As a result of the participatory design led by the LRC delegate, the final buildings are very well adapted to the context and provide an additional guaranty in terms of structural safety.

Based on this experience, it is suggested to include accredited technical staff to lead future construction projects.

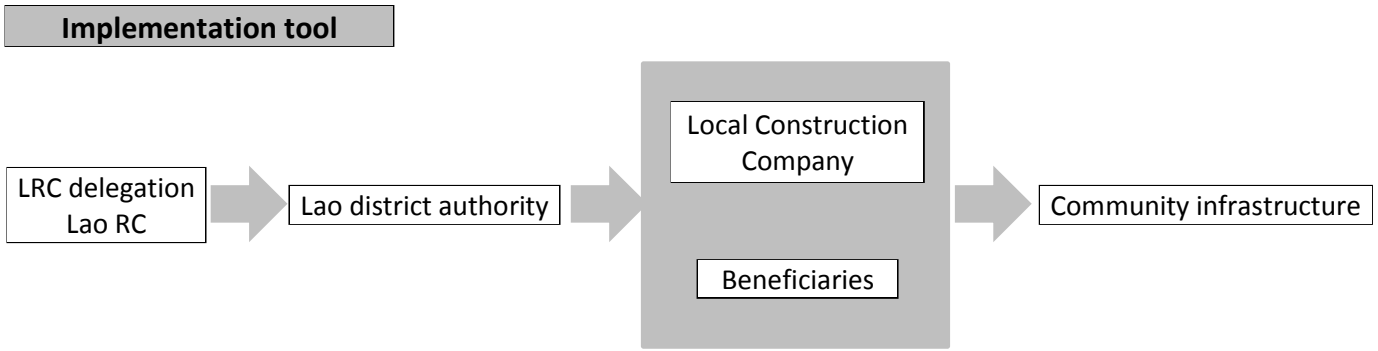
Implementation

Overview

During the construction phase of this project more than 1200m^2 of infrastructures (community centre, latrines, warehouses and schools) have been built.



Unfortunately due to operational reasons the technical delegate of the LRC was not present during the executions of the works. To solve this inconvenience an implementation tool was been defined as follows:

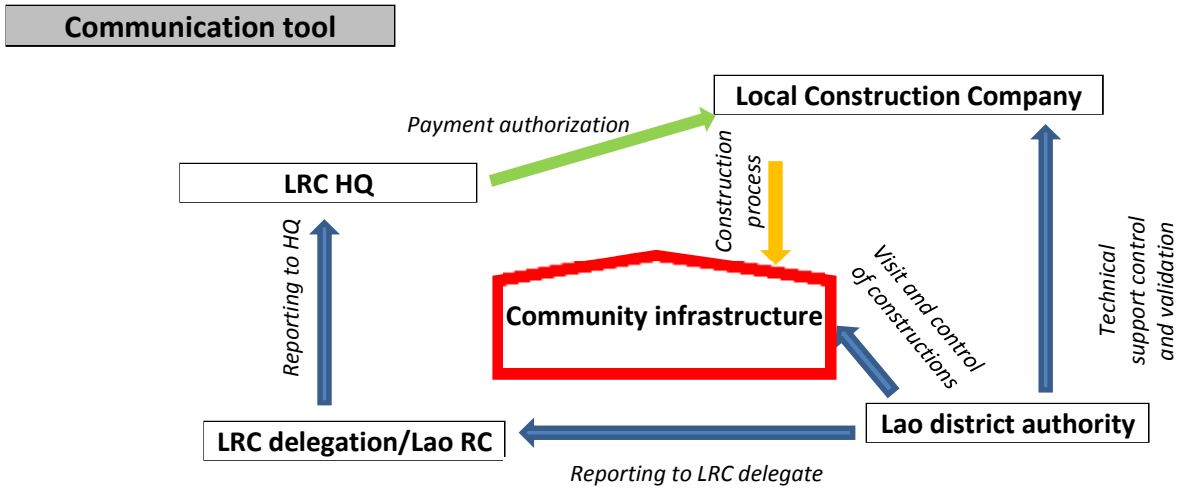


Where the design and financial support comes from the LRC, the district is responsible for the technical follow up of the works and the construction companies in collaboration with the beneficiaries make the construction in self.

Agreed by the IMC (Implementation Management Committee) the tool was use as a base of the contract with the construction company and helps to define that the technical responsibility during the construction phase was over the local district.

Implementation phase conclusion

To implement this tool it was necessary to design a communication/ reporting system with following structure:



The communication was broken at the level of the district and the LRC delegation which results in poor information at the HQ level and technical decisions applied on site without correct approval.

After the review visit it was verified that independently of the deviations with the original project, there are no major risks in the final product (Note: the limitation of the review mission was that the buildings where already finished and only a visual inspection complemented with interviews were performed).

Improving this system of communication and follow-up appears as the most logical recommendations for future projects where the technical monitoring is from the distance. The inclusion of intermediate control points, independent technical teams and additional verification sources could be the key to develop the communication/implementation system for other missions.

Finally it can be concluded that the built infrastructures have an additional functional and cultural value that will improve the quality of life of the beneficiaries. In addition, the more than 1200m^2 of construction will help to develop the local communities with better conditions in the schools, economic development with community centres and stabilize the community economy with safe warehouses.

7. Self-built latrines

The WATSAN component of this shelter project was organized in two parts:

1- Hygienic sensitization in the schools to improve the habits of the local population in particular the children.
2- Promotion of the constructions of safer latrines by distribution of construction materials.
In cases of extreme vulnerability the latrine was completely built by the construction company.

During the SRU review mission self-built latrines have been visited to verify that the distributed materials were properly used. In addition we have visited latrines built by the construction company (for the most vulnerable people).

The next matrix shows the visited latrines per village and district:

MAHAXAY DISTRICT		
Village	**Construction**	**Number of latrines visited**
Taen	Primary school	No latrines
DONPHOUKHAM	Community centre	No latrines
NONDAENG	Latrines + warehouse	3
PHONSELERM	Latrines + warehouse	5
Total of visited latrines in Mahaxay district		**8**

HINBOUN DISTRICT		
Village	**Construction**	**Number of latrines visited**
Bouamlou	Community centre + Community latrines	No latrines
Kaengphakham	Primary School	No latrines
Napho	Community warehouse	5
Hinkhan	Community warehouse	5
Natoei	Community warehouse	3
Pakpakan	Collective latrines + warehouse	3
Total of visited latrines in Hinboun district		**16**

Self-built latrines

We have seen different typologies of latrines according to the economic capacities of the beneficiaries or the location of the village (floodable or not). Also




some common point where identified: filtrating pit system using the distributed concrete rings and roof using the distributed CGI. In general we can classify the latrines according to the enclosing system: bamboo, wood, block or mix.

Latrine with bamboo	Latrine with wood	Block latrine	Latrine with mixed material
Cheap	Mid price	most expensive	Expensive
Good ventilation	Poor ventilation	Poor ventilation	Poor ventilation
Short durability	Mid durability	Long durability	Transitional solution
Environment friendly	No ecofriendly	No eco but the most appreciated	

Latrines built by construction companies

These latrines have been built with the objective to help the most vulnerable people and all of them where 100% built by a construction company following the predefined design. With bamboo wall, filtrating pit and elevated base in blocks, the latrines are very well adapted to the local context. The major difference with the self-built units is that the surface is smaller approx. 2.25m^2 in total.

Latrine with beneficiary | Latrine interior view | Painted bamboo panel | Elevated solution

The support of the bamboo panels solved by using a framework in wood; the junction between panels with metallic plates and screws. The wood is painted and protected against insects and in some cases the bamboo panels are painted too. All these latrines are “elevated” over the ground level and the height difference is covered by using small stairs. The interior space is clean and finished with polished mortar to facilitate the cleaning.

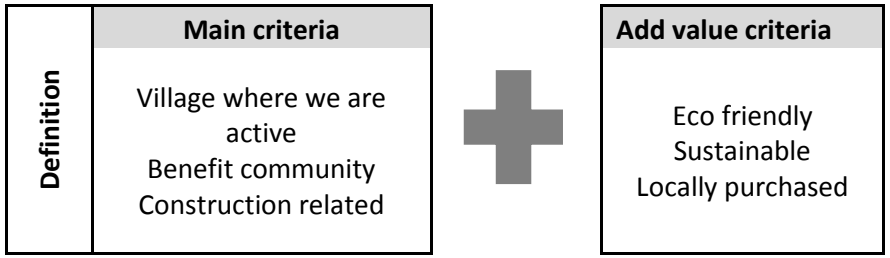
In general the latrines are well appreciated by the beneficiaries and the general aspect is well adapted to the context.

Finally it is interesting to flag that due to the cultural conditions, the latrines were built but not in use waiting for the official delivery and authorization.

8. Community support shelter kit

After the successful construction of the more than 1200m^2 of infrastructures, complementing this action with a community shelter kit appears as the adequate complementary action. The design of these Community Shelter Kits is the key activity that will ensure the positive impact for the villagers.

Workshop sessions where performed in the field to develop this subject based on the general criteria of:



Based on these defined criteria, the LRC/LAO RC team have predefined the preliminary composition of the Community shelter kit. The concept was to define a flexible kit that can respond to the basic criteria and the needs of the different communities. The next table shows the structure and the basic composition of this kit.

Standard kit for distribution with some additional elements per village					
Standard kit to distribute	**Hygiene kit**	*optional*	**Maintenance kit**	*Optional*	**Additional options**
	Soap	Water filters	Paint	CGI	Solar light
	Tools to clean toilet	Gloves	Insect protection	Bamboo mats	Solar water pump
	Clorox		Brush	Doors and windows	Hand water pump
	Industrial cleaning product		oil	Cement	
	Buckets		Tools to clean		
	Fabrics		Buckets		
			Small tool box		

Community kit, Conclusion and suggestions

- It is recommended to share the composition of the predefined kit with the beneficiaries in order to verify that the materials are according to the current needs.
- Soft activities like a sensitization and/or maintenance training are recommended to ensure the proper use of the materials, infrastructures and the maintenance activities.
- In particular villages the addition of specific components (solar lamps, water pump with solar energy and others) could increase the quality of the shelter response in a mid to long term.

The result of a correct implementation of these Community Shelter Kits in combination with the built infrastructures would be translated into new capacities for durable development and resilience of the beneficiaries.

Ensuring or reinforcing the livelihood systems, education conditions and sanitary/health context are the base for a sustainable development of these villages. All the results of this project including constructions, soft actions and community kits are in place to facilitate this process.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