VOLUME 2 – CHAPTER 11
RESETTLEMENT INFRASTRUCTURE DEVELOPMENT

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11 RESETTLEMENT INFRASTRUCTURE DEVELOPMENT

11.1 INTRODUCTION

This chapter describes the infrastructure that will be provided for each plateau resettlement village and how it will be developed. The infrastructure provided at each resettlement site will include housing, irrigated farm plots[1] and community buildings. The provision of such infrastructure will be preceded by the topographic survey and mapping of each resettlement site. The resulting maps will be a basic tool for the on-going consultations with the resettlers, who will continue to participate in the planning and design of the village and irrigation system layouts. The resettlers will also participate in the design of the houses, community buildings and other facilities.

Electricity will be provided to all villages and buildings therein. The provision of domestic water is a priority, and various options are available for this. Every house and farm plot will have access to a road, and this road/track network within each village will be directly connected to the new all-weather roads from Oudomsouk north west to the Thalang Bridge, and from Oudomsouk southeast to the last resettlement village of Ban Khone Khen.

11.2 TOPOGRAPHIC SURVEY, MAPPING AND BEACON INSTALLATION

While Chapter 10 describes the existing topographic maps and data that have been used to date for the preliminary selection of the resettlement sites, the next step will be the topographic survey and the preparation of maps of all the resettlement sites. Following the survey of the Ban Nong Boua pilot village in 2002, two sites – Ban Oudomsouk and the Ban Sop On/Phonsavang (currently known as Theun Douan) – were surveyed in the dry season of 2003/2004 to produce topographic maps of 1:2,000 or 1:5,000 scale with 0.5 m contour interval. Included in this surveying program is the installation of bench marks and beacons to demarcate the Nakai Reservoir full supply level of EL 538 m and EL 540 m.

All the remaining (10) plateau resettlement sites will be surveyed during the 2004/5 dry season to produce topographic maps of 0.5 m contour interval. The Nam Pan resettlement site, to which half of Ban Sop Hia and all of Ban Nam Nian will move, will also be surveyed in the 2004/5 dry season.

11.3 VILLAGE LOCATION AND LAYOUT

After detailed topographic maps have been prepared, preliminary alternative village locations and possible layouts for (a) farm plot, (b) irrigation system, (c) village housing and community infrastructure, and (d) the road and track network will be developed and presented to each village. During consultations, the reasons for the layouts will be explained to the villagers, who will then have time to review and consider the layouts and other data such as the results of soil surveys and visit the sites. They will then decide the preferred locations and layouts. Following this participatory decision making process, detailed layouts will be prepared.

11.4 UXO CLEARANCE AND SITE PREPARATION

Unexploded Ordinance (UXO) will be surveyed and cleared from all resettlement areas. It is envisaged that two contracts will be necessary for full UXO survey and clearance, as follows:

(a) sample surveys of all the areas in which a representative sample strip will be surveyed. The sample survey will identify the level and type of UXO contamination. An area may be classified as either having light, moderate or heavy contamination;

(b) the second contract will be for the actual clearance and based on the findings of the sample surveys. Experienced companies and/or NGOs will be contracted to undertake the work, with an important selection criteria being the ability of a company or NGO to include the resettling villagers themselves in the UXO clearance activities.

[1] Chapter 13 provides a description of the irrigation systems to be constructed.

After UXO clearance, the demarcated areas will be cleared, by the villagers themselves, of trees and other vegetation. Some of the areas will have trees that are commercially useful, particularly in the northern Plateau resettlement areas and at Ban Nam Pan. These areas will have to be surveyed and identified and the Plateau area trees logged by the Nakai Plateau Village Forestry Association (NPVFA). The small trees and bushes will be cleared by the villagers using slash and burn techniques.

The individual plots will then be surveyed, measured and set out, and plot boundaries marked on the ground. The land titling procedures (see Chapter 10) can then commence.

11.5 ROADS AND DRAINS

Every house and farm plot will have access to a village road (or track) and the village roads will have access to the nearest all-weather road. For the resettled villages located north of Oudomsouk, the nearest all-weather road will be the relocated Road 8B, for which the NTPC head contractor – the HCJV – is responsible for the survey, design and construction. For the villages located south of Oudomsouk, a new road will be built from Oudomsouk to the Nakai Reservoir saddle dams in this area, and this is again the responsibility of the HCJV. However, there will be at least two villagers located further south of this road, and thus this saddle dam road will have to be extended (by the resettlement program) to connect to these villages.

Road 8B will have two lanes, a gravel pavement, a formation width of 7m and a design speed of 40km/hour. The road south to the saddle dams and the extra 30 km of new southern resettlement roads will be a single lane with a formation width of 5m, a gravel pavement and a design speed of 40km/hour. Rainfall on the Nakai Plateau is high during the wet season and the inclusion of a surface water drainage system will be an important aspect of the road design, and the village layouts. Road 8B and the resettlement road bridges will be designed for 100-year occurring design floods and culverts 50-year floods.

The intra village roads will be connected to the main roads described above. They have a minimum of 4 m pavement and a formation width of 8 m. The drainage system will consist of "v" shaped open channels and precast concrete culvert pipes to convey the runoff to the reservoir or nearest other natural water course.

Local competitive bidding procedures will be undertaken for the construction of the roads which will be completed before the commencement of house construction.

11.6 HOUSE DESIGNS AND CONSTRUCTION

11.6.1 House Designs

Based on the farm plot and village layout preferred by the pilot villages, each resettled household will be allocated a 0.65 ha plot for irrigated agricultural land and a 600 m^2 (20 x 30 m) plot for the construction of a new timber house and surrounding garden. It should be noted however that such a configuration may change slightly if villages choose to locate the house plot within the agricultural land area.

House designs have been developed through consultations with the villagers who are to be resettled. Figure 11-1 illustrates the modified house design as a result of feedback during the second round of PCPP in April and May 1998. The main improvements on earlier designs where (i) to build houses with wood instead of bamboo walls, (ii) to incorporate larger verandas, and (iii) and where possible, to split the roof into two peaked sections. These improvements reflect the current designs of houses belonging to the better-off villagers on the plateau, a house design that all plateau dwellers aspire too.

The improved design incorporates aspects of traditional house designs, including three 'zones' - private, public and production spheres. The private sphere is the sleeping quarters. The public sphere is the veranda, for receiving guests and entertaining. The production sphere is the kitchen, for cooking food, washing and growing spices and vegetables. The new structures will further conform to traditional house designs by incorporating elements such as two doors in accordance with kinship taboos, an elevated

construction on columns with two ladders, one to the kitchen and one to the veranda, the ladders having an odd number of rungs, and doors which open in a direction other than the west.

Not only is the NT2 Project committed to providing houses in a style which are preferred by villagers, it is also committed to providing housing of adequate size. The housing entitlement of plateau resettlers, in terms of size of house, is a minimum of 14m² per person. It is estimated that for at least 75 % of the plateau population this is larger than the house they currently occupy. For those households whose current house is larger than this, their new house will not be smaller than the original dwelling, so that households whose dwellings are currently larger than 14m² per persons will be provided with a house as large as their current dwelling.

Thus, based on this requirement to provide a house which is proportionate in size to the number of household members, there are seven standard house designs, based on households or 3, 4, 5, 6, 7, 8 and 9 persons, which thus varies in minimum size from 42m² to 126m².

In 1998, 66 % of the households lived in bamboo walled houses and 21 % in softwood walled houses, so that a full 67 % of households will be living in houses of improved construction materials.

All the house plots will be fenced.

Typical house designs for a 3, 6 and 8 person households are provided in Figure 11-2, Figure 11-3 and Figure 11-4, while Table 11-1 provides a summary Bill of Quantities for the materials required to build these houses

Table 11-1: Summarized Quantities of Materials to Build 3, 6 and 9 Person House's.

			3 pers/hh	6 pers/hh	9 pers/hh
no	Description	unit	quantity	quantity	quantity
1	doorframes and doors	pc	3	3	3
2	windows frames and windows	pc	3	3	5
3	wooden pillar 15 x 15 x 300	pc	11	13	24
4	concrete pillar 15 x 15 x 250	pc	11	13	24
5	galvanized iron 300 cm	sheet	80	21	109
6	galvanized iron 240 cm	sheet		89	43
7	nut & bolt 18cm	pc	38	43	80
8	nails for galvanized iron	box	20	28	35
9	concrete to support stair	sheet	2	2	2
10	all type of nails	kg	40	53	70
11	hinge/(door and window)	pc	21	21	24
12	locks/latches (door and Window)	pc	12	12	16
13	handles/(door and window)	pc	12	12	16
14	Normal lock/ pad lock and hinges (door)	set	2	2	2
15	wooden planks wall: 1.7 x 20 x 400 = 420 pc	m^3	2.448	3.536	5.7
16	wooden planks floor: 2.2 x 20 x 700 = 70 pc	m^3	1.1088	1.584	1.12
17	other types of wood				
	> 5 x 15 x 500 = 28 pc	m^3	0.9	0.78	1.05
	> 5 x 15 x 400 = 32 pc	m^3	0.45	0.525	0.96
	> 5 x 10 x 500 = 70 pc	m^3	0.325	0.84	1.75
	> 5 x 10 x 400 = 34 pc	m^3	2.304	0.6	0.68
	> 4 x 8 x 400 = 300 pc	m^3	2.304	3.072	4.1

Figure 11-1: House Designs Following Consultations in 1998

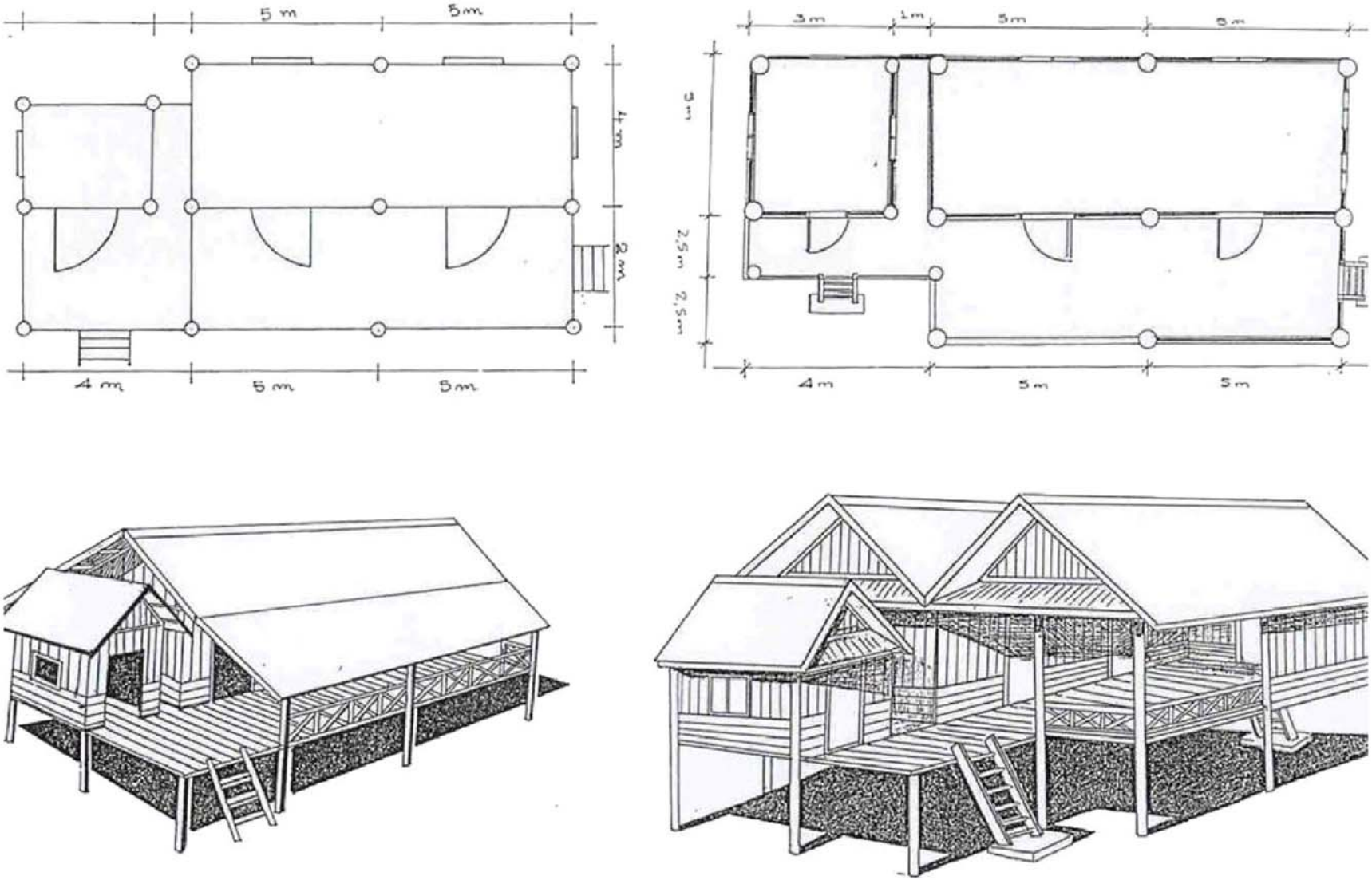


Figure 11-2: Typical Design of a 3 Person House, as used in Ban Nong Boua, 2003.

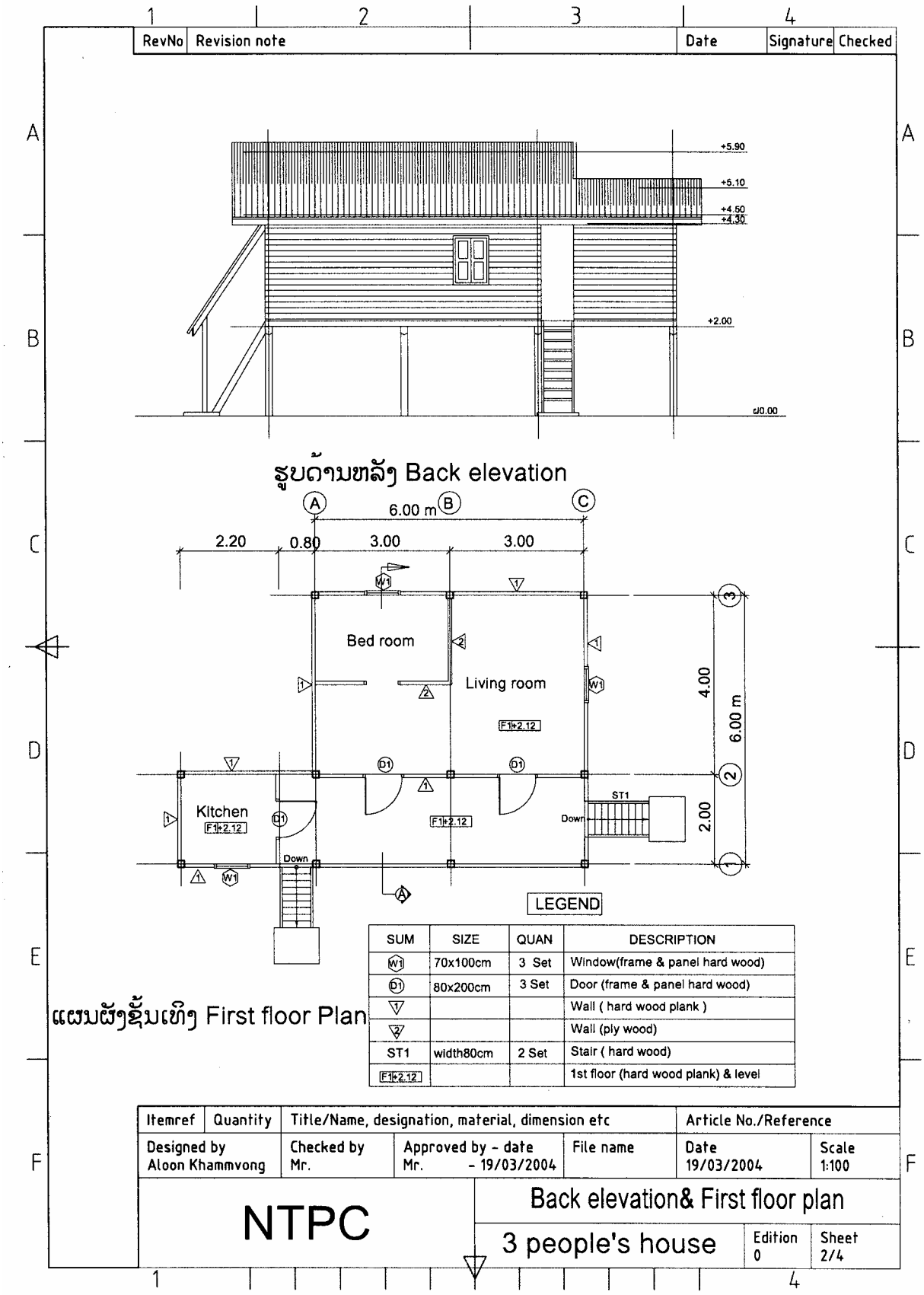
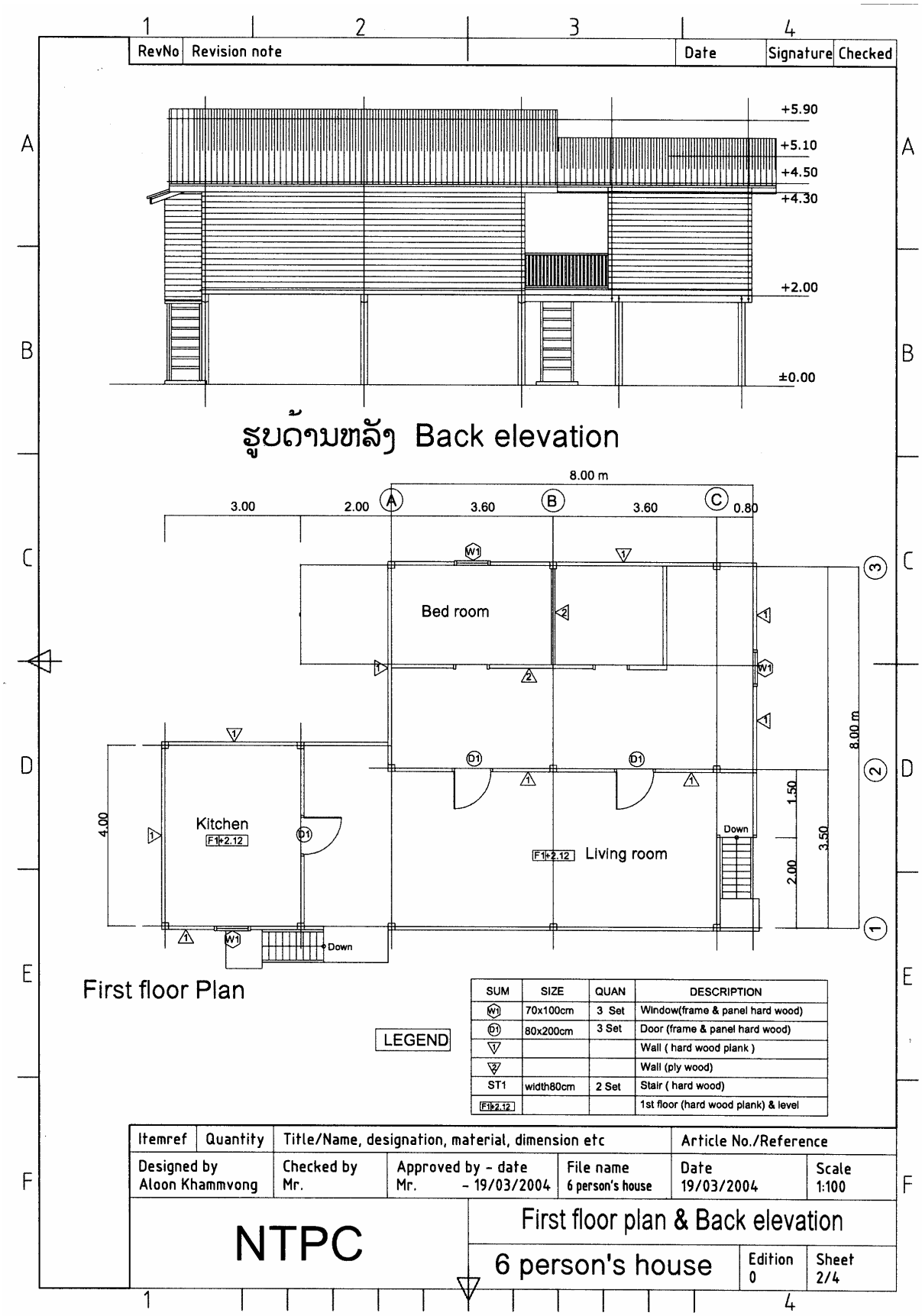


Figure 11-3: Typical Design of a 6 Person House, as used in Ban Nong Boua, 2003



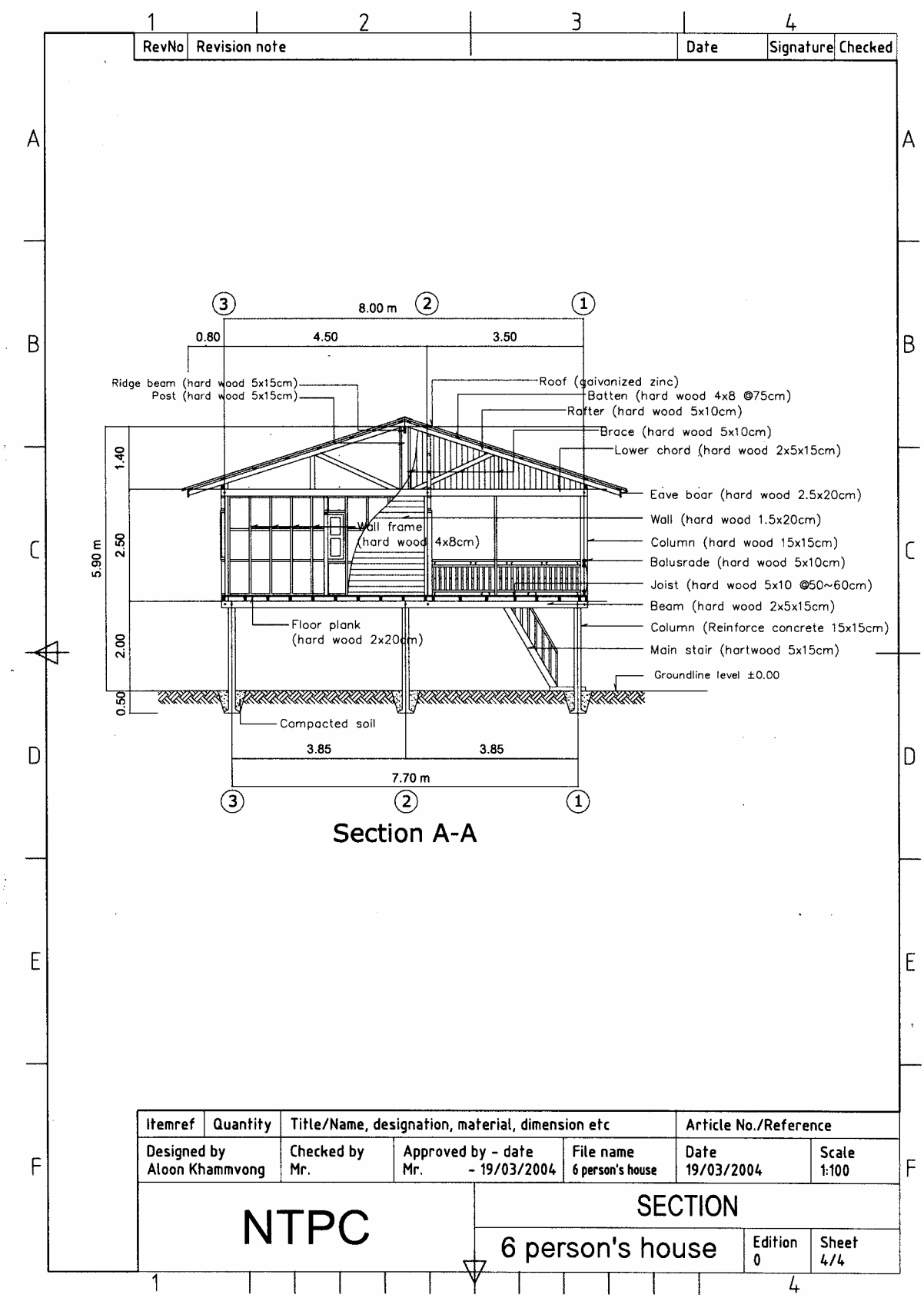
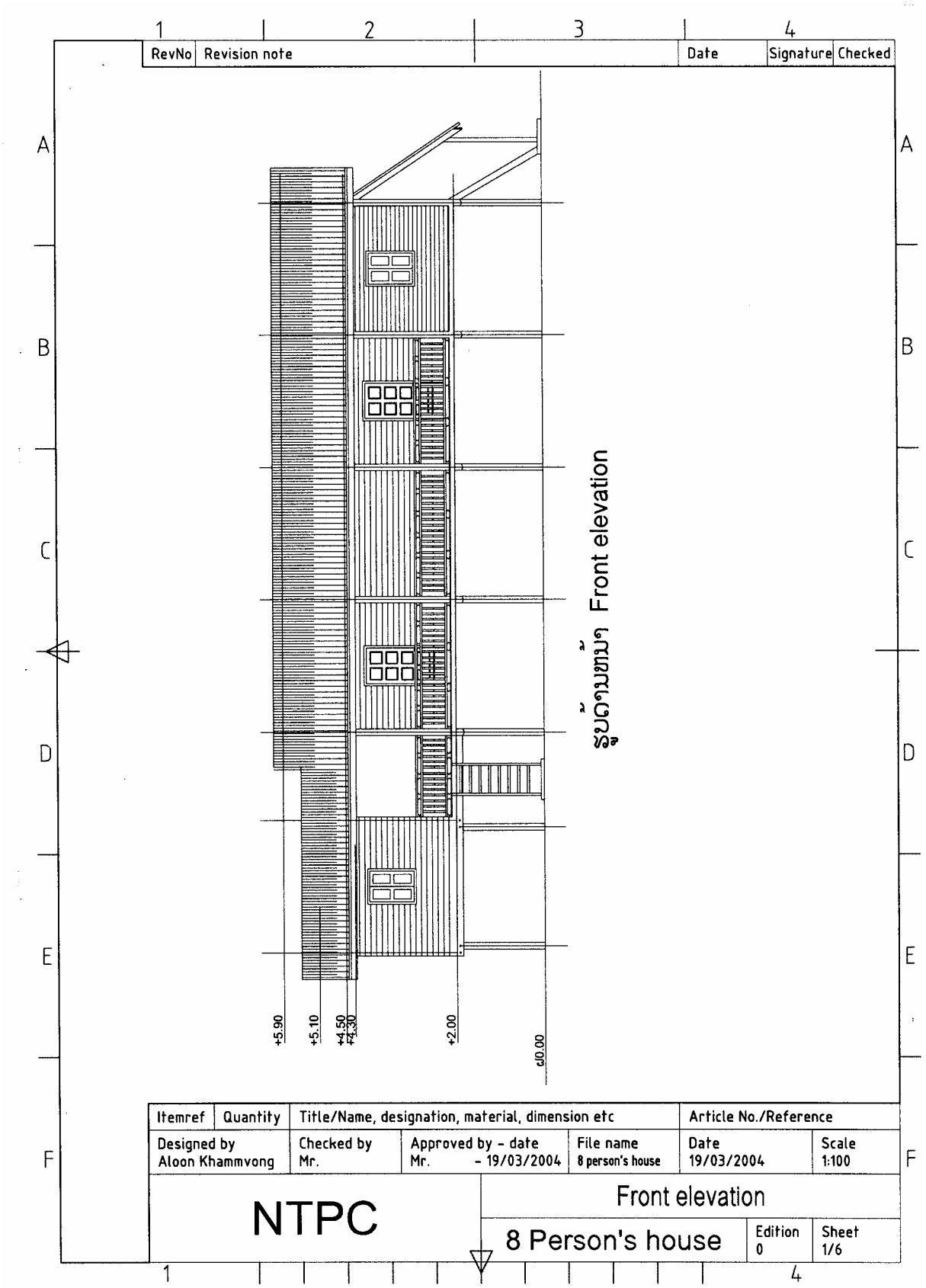
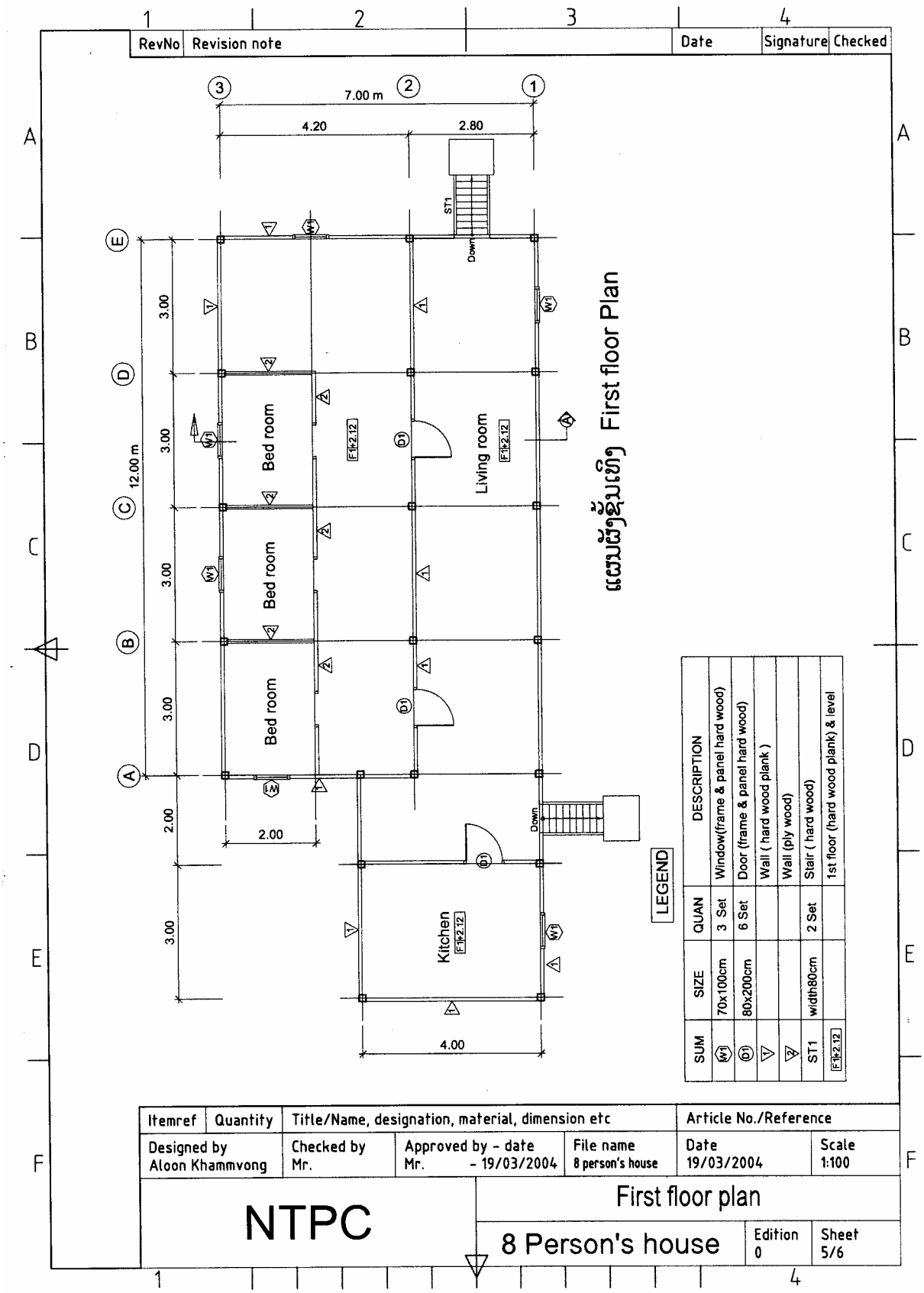

RevNo
Revision note
Date
Signature
Checked
8.00 m
0.80
4.50
3.50
Ridge beam (hard wood 5x15cm)
Post (hard wood 5x15cm)
Roof (galvanized zinc)
Batten (hard wood 4x8 @75cm)
Rafter (hard wood 5x10cm)
Brace (hard wood 5x10cm)
Lower chord (hard wood 2x5x15cm)
Eave boar (hard wood 2.5x20cm)
Wall (hard wood 1.5x20cm)
Column (hard wood 15x15cm)
Balusrade (hard wood 5x10cm)
Joist (hard wood 5x10 @50~60cm)
Beam (hard wood 2x5x15cm)
Column (Reinforce concrete 15x15cm)
Main stair (hartwood 5x15cm)
Groundline level ±0.00
Wall frame
(hard wood 4x8cm)
Floor plank
(hard wood 2x20cm)
Compacted soil
5.90 m
1.40
2.50
2.00
0.50
3.85
3.85
7.70 m
Section A-A
Itemref
Quantity
Title/Name, designation, material, dimension etc
Article No./Reference
Designed by
Aloon Khammvong
Checked by
Mr.
Approved by - date
Mr. - 19/03/2004
File name
6 person's house
Date
19/03/2004
Scale
1:100
NTPC
SECTION
6 person's house
Edition
0
Sheet
4/4

Figure 11-4: Typical Design of an 8 Person House, as used in Ban Nong Boua, 2003




RevNo
Revision note
Date
Signature
Checked
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4.20
2.80
12.00 m
3.00
2.00
4.00
ST1
Down
Bed room
Living room
Kitchen
F1k2.12
First floor Plan
LEGEND
SUM
SIZE
QUAN
DESCRIPTION
70x100cm
3 Set
Window(frame & panel hard wood)
80x200cm
6 Set
Door (frame & panel hard wood)
Wall (hard wood plank)
Wall (ply wood)
width80cm
2 Set
Stair (hard wood)
1st floor (hard wood plank) & level
Itemref
Quantity
Title/Name, designation, material, dimension etc
Article No./Reference
Designed by
Aloon Khammvong
Checked by
Mr.
Approved by - date
Mr. - 19/03/2004
File name
8 person's house
Date
19/03/2004
Scale
1:100
NTPC
First floor plan
8 Person's house
Edition
0
Sheet
5/6

11.6.2 House Construction

Following agreement on the design of houses, NTPC staff will finalise detailed final drawings and bills of quantities (BoQ). The BoQs will be divided into two sections:

- Section 1 will include all non-timber materials including precast concrete footings, nails, nuts and bolts.
- Section 2 will include all the timber for the house including columns, beams, floors, walls, roofing, doors and windows.

The, local, Provincial and National level builders will be invited to bid for the construction of the villagers houses, and contracts will most likely be for one or multiple numbers of houses. However, the villagers will be fully involved in the construction of their own houses, in order to:

(a) facilitate a flexible design process and thus ensure a design appropriate to ethnic and other concerns of the householders;

(b) ensure householder feelings of ownership and belonging; and

(c) generate some transitional income;

Thus, while local and provincial builders will be contracted to build the resettler houses, the builders will be given an allowance to employ the householder, plus any other labour they may require. In cases where no able bodied men are available in a particular household, the whole village will be mobilised to assist.

Having villagers participating in the construction of their own home has important social and psychological advantages since by investing time and energy in establishing themselves on their new plots, they will more easily acquire a sense of belonging to the new sites. Men are traditionally responsible for constructing houses in villages and form a pool of labour whenever new buildings are put up. A similar pool of labour would ensure that all houses are built and that disadvantaged households, that is households with a labour shortage, single mothers, ill or disabled members or few kinship ties, will not be negatively affected by this aspect of the relocation.

Local competitive bidding procedures will be applied for the supply of the non-timber materials such as house footings, roofing materials, nails, hinges etc. For the supply of timber, it is likely that timber will come from two sources. One source of timber will come from the trees salvage harvested from the reservoir area and processed by a local sawmill. The second source will be the processing of trees salvage logged from the various Project Lands in the Resettlement Area. This logging will be undertaken by the NPVFA and they will also saw and process this timber, so that they can provide (i.e. sell) not only wall and floor planks but also prefabricated doors and window panels and frames.

Just before construction commences, each family will be consulted once again on the house design, and the design can then be modified and amended on site during the course of construction, as long as no more construction materials are required. Villagers will not only be provided with a new house but also assistance with the transportation of materials from their former houses. These materials can be reassembled on the new site, if so desired, to either enlarge the house built by the Project or to build an outhouse. The materials can also be saved for future family expansion.

11.7 PUBLIC BUILDINGS

11.7.1 Introduction

Each resettled village will be provided with the following community buildings:

- nursery and primary school;
- meeting hall/community centre/village office;
- market, small or larger, depending on village size;
- rice mill and workshop; and
- organic fertilizer factory.

Standard designs for the buildings were prepared for the construction for the Pilot Village. These designs will be used or modified for the other resettled villages of similar number of households. For the larger village communities, larger buildings will be required. In either case, there will be further consultations with all the resettled villages to agree on the designs.

All the public buildings will be connected with electricity. They will have access to water and latrines will be built nearby. They all will have adequate drainage facilities to evacuate surface water.

11.7.2 Nursery and Primary Schools

Section 26.6 of the SDP describes educational support. It explains that three types of educational support are envisaged: (i) nursery and crèche-type facilities, (ii) primary and secondary schooling, (iii) adult education and vocational training.

Nursery facilities will be provided in every resettlement village to improve the welfare of infants and to relieve their parents of the task of childcare during the day. The villagers will decide whether the nursery facilities will be part of the village primary school or independent of it. The nurseries will be of a simple design, allowing good air circulation, with a mixture of wooden tile and corrugated iron roofing, rainwater collection and latrines. Nursery school equipment will include simple bedding, mosquito-nets and first-aid kits.

The primary school design will be based on two students per household and a classroom area of 56 m^2 for thirty students. The school will be constructed with concrete flooring, a hardwood frame, half brick and half timber walls, and roofing of either corrugated iron or timber tiles. The school will be connected to the electricity supply and will also have a water supply. There will be at least one latrine provided per class room.

Housing will be provided to teachers, as necessary, and they will be constructed to the same design and standards as the resettler houses and provided with the same facilities.

The adult education and vocational training will take place mainly in the village meeting hall.

11.7.3 Meeting Hall/Community Centre/Village Office

As a general rule, few of the villages on the plateau have or maintain a temple. Thus, a communal meeting area must be developed to provide a space where issues can be discussed openly, and where non-formal training can be provided. In addition, village technical staff should have a good environment in which to keep their records, in which to plan and report on their work, and in which to conduct small and larger meetings.

Thus, it has been decided that a multipurpose building or group of buildings will be constructed to serve these purposes. The floor plan of the village hall constructed in Nong Boua is illustrated in Figure 11-5.

The village meeting hall and office will be constructed with a hardwood structure, concrete floor and sheet metal roofing. It will be connected to the electricity and water supplies. There will be a toilet and adequate drainage to evacuate surface water.

11.7.4 Market

Each village will have a roofed market with a concrete floor, wooden roof structure and sheet metal roofing. Considering the crucial importance of produce marketing for the NT2 resettlement program, special and innovative consideration will be given to the design of these markets, including consideration will be given to the requirements of fish marketing. The size of the markets will depend on the number of village households. Adequate drainage around the market area is particularly important.

11.7.5 Rice Mill/Workshop

The project will provide one rice mill and workshop for every fifty families. They will be constructed with concrete flooring, hardwood structure and sheet metal roofing.

11.7.6 Organic Fertilizer Factory

An organic fertilizer factory will be established in most villages as in some cases it can be shared by more than one village. The experience gained in Ban Nong Boua Pilot village will be used to finalize design of the factories, which require the design of efficient workspaces for raw materials storage, materials mixing, composting areas, packaging areas and a finished product storage areas. They are likely to be constructed with concrete flooring, hardwood structure, bamboo lattice walls and a mixture of timber tile and thatched grass roofing.

11.7.7 Seed Processing and Storage Facility

Most likely aligned to the organic fertilizer factory, each village or group of villages will be provided with a seed processing and storage facility. The facility will include a covered and concrete area for final seed drying and cleaning and at least one room with air conditioning. Rat and mice proofing is another important design factor.

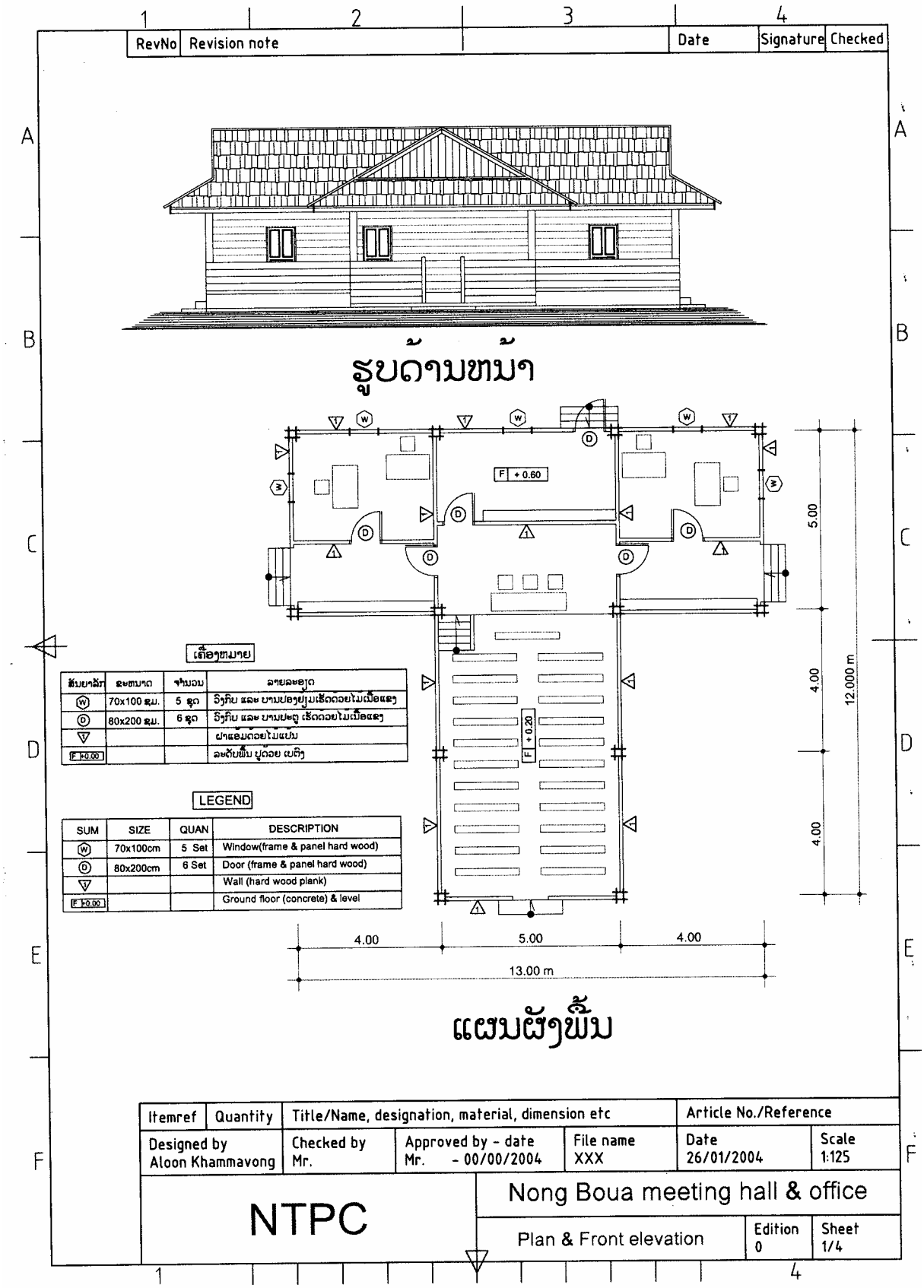
The design of the facility being built in Ban Nong Boua pilot village is presented in Figure 11-6, and experience gained from the construction and utility of this building will be used to design further seed facilities.

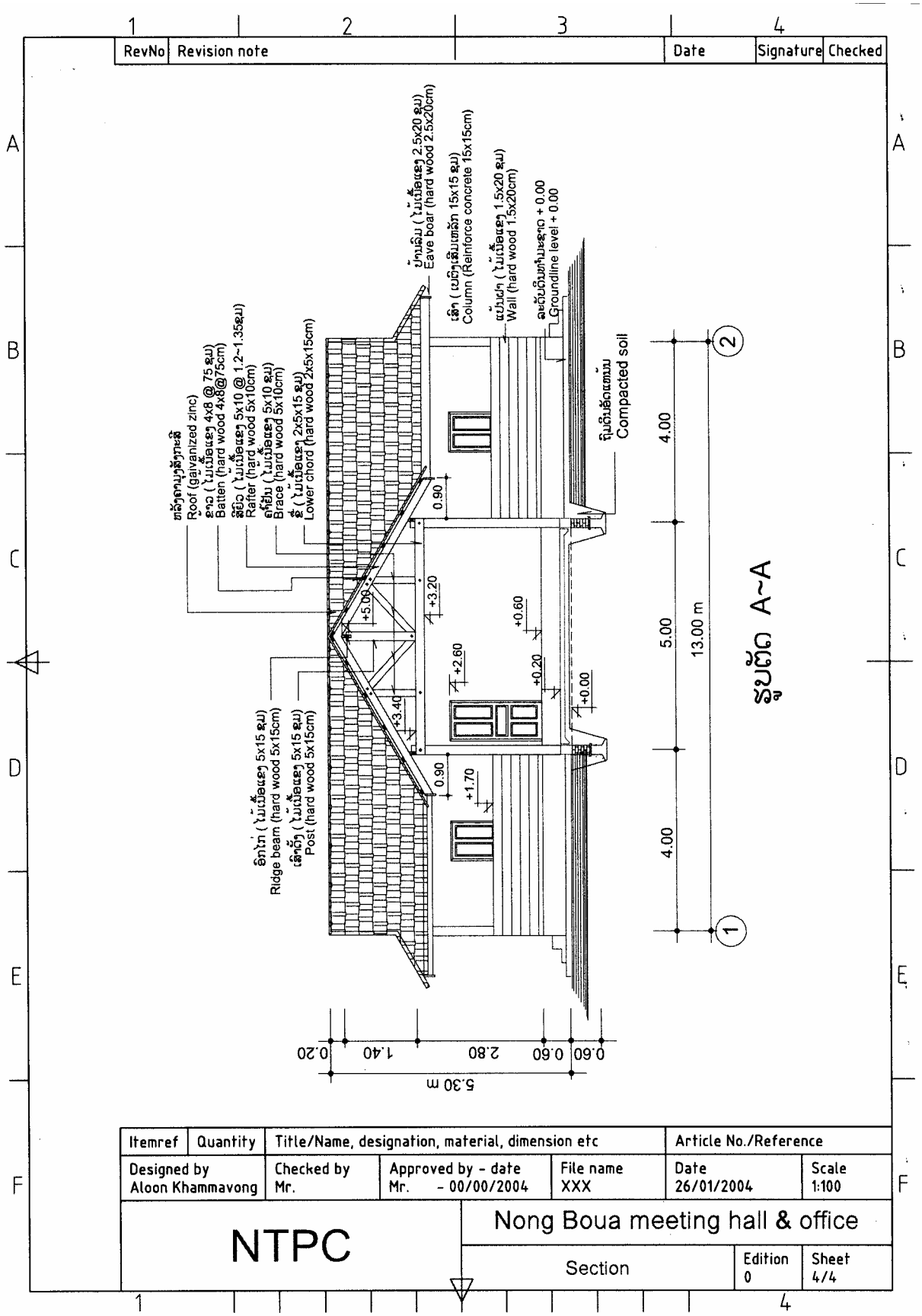
11.7.8 Clinic

There will be at least 2 clinics constructed and operated in the Resettlement Area (in addition to the rehabilitated District hospital), one in the north west (probably in Ban Thalang) and one in the south east (either Ban Sop On or more likely Ban Done).

These clinics will be constructed with concrete flooring, brick and/or hardwood structure and corrugated iron roofing. The clinic will be supplied with a sink and furniture appropriate to the size of the clinic. If required, staff housing, to the same standard as resettler houses, will be constructed.

Figure 11-5: Design of the Combined Meeting Hall and Village Office for Ban Nong Boua

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Revision note
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Signature
Checked
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Batten (hard wood 4x8@75cm)
Rafter (hard wood 5x10cm)
Brace (hard wood 5x10cm)
Lower chord (hard wood 2x5x15cm)
Ridge beam (hard wood 5x15cm)
Post (hard wood 5x15cm)
Eave boar (hard wood 2.5x20cm)
Column (Reinforce concrete 15x15cm)
Wall (hard wood 1.5x20cm)
Groundline level + 0.00
Compacted soil
+5.09
+3.20
+2.60
+3.40
+1.70
+0.60
+0.20
+0.00
0.90
4.00
5.00
13.00 m
5.30 m
0.20
1.40
2.80
0.60
 รูปตัด A~A
Itemref
Quantity
Title/Name, designation, material, dimension etc
Article No./Reference
Designed by
Aloon Khammavong
Checked by
Mr.
Approved by - date
Mr. - 00/00/2004
File name
XXX
Date
26/01/2004
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Nong Boua meeting hall & office
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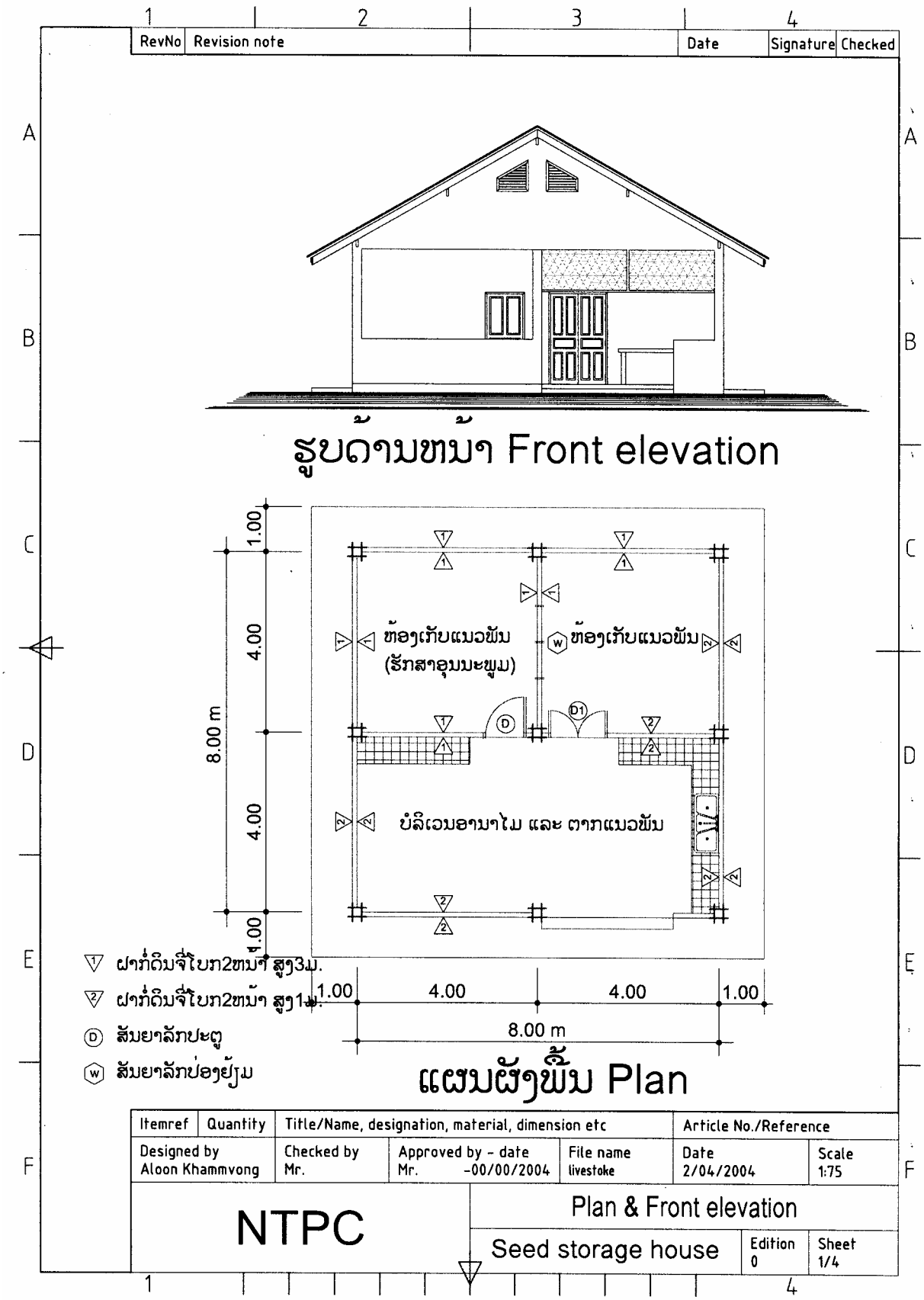
Figure 11-6: Design of the Seed Processing and Storage Facility, Ban Nong Boua



11.8 WATER SUPPLY AND SANITATION

11.8.1 Water Supply

All the resettlement villages will be provided with water supply systems for domestic use. There are a range of possible domestic water supply systems that could possibly be developed[2] in the area, including

- rainwater collection;
- water pumped or hand lifted from an open well;
- water pumped from a lined borehole; and
- water piped from the irrigation header tanks, via a filtration system.

The development of domestic wearer supply systems will be undertaken in two stages;

- **Prior to reservoir inundation:**
  During this period, the use of the irrigation system water supply for domestic water will not be possible. However, boreholes or wells may be dug in lower areas.
- **Following reservoir inundation:**
  During this period the lower area boreholes or wells will not be possible (flooded) but the water table in the general area will be higher and thus groundwater more easily accessible. Also, it will now be possible to use/divert some of the water pumped from the reservoir in the irrigation system for domestic purposes.

Groundwater is generally the cleanest source of water, and the feasibility of using groundwater, abstracted by hand pumps or by rope and bucket from hand dug or bored wells, will be assessed. The water quality, well discharge and depth to the water table in the dry season are the principal considerations and some test wells will be implemented.

If the use of groundwater is found feasible, then consultations will be held with the villagers to assess the type of well, method of abstraction, number and location. The number will depend on the village layout and number of households in the village. The dug well is a traditional method of obtaining water in rural areas. Smaller diameter wells, boreholes or tube wells are quicker and easier to sink. This type of well is usually fitted with a hand pump but water can also be raised by small buckets or an electrical pump. For shallow wells, "TARA" hand pumps, designed and manufactured in India, is a reliable pump and are commonly used by UNICEF in Lao PDR. However there are cheaper Thai and Lao manufactured pumps available.

Whatever type of well is dug, it will be protected from contamination by the construction of a reinforced concrete apron around the well head and a drainage channel to a soakaway to prevent creating a muddy surrounding. Also, before a well is used, it will be disinfected by a chlorine solution.

The yield of wells placed in the higher areas of a resettlement villages before reservoir inundation may not be sufficient for all domestic use, and thus it may be necessary to excavate or drill the wells at a lower elevation and pump up to a header tank, or tanks, located within the village.

Rain water collection, by individual households, from roofs via guttering and downpipe into storage tanks, is a common source of domestic water supply and is being practised at the Pilot Village. It provides very clean water and will be promoted in all villages. However, problems with this method include:

- it is somewhat expensive to install, for every house;
- there may be insufficient storage to last a family through the dry season; and
- if the collection tank is not covered, dengue fever may be problem.

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[2] The generally preferred method of rural village water supply is by a piped gravity fed system after tapping a perennial spring or stream located above a village. However it is unlikely that any such stream exist near the sites of the resettled villages on the Nakai Plateau.

These issues will be addressed, and the use of this rain water, in the wet season, for consumptive use, is a preferred method to be presented to villagers for consideration.

Filtered and piped irrigation/reservoir water. The irrigation system to be developed for Plateau resettlement villages will consist of pumping from the Nakai Reservoir to a header tank or stilling basin located on high ground in the resettlement area. The less-sloping areas will have a stilling basin and an open canal system of water conveyance. The more-sloping areas will require a header tank and buried pipe conveyance system. It is possible to construct a gravity domestic water system in parallel to this irrigation system, by installing a supply pipeline from the header tank to the village housing area, via a filtration system. In this case the water is pumped by the irrigation system, and a small quantity siphoned of for the domestic water system.

Such a system has already been constructed in the Pilot Village, and includes a gravel and charcoal filtration tank, located between the header tank and the village, to remove suspended solids and some micro-organisms from the water (see Figure 11-6).

After passing the filtration tank the water is piped to stand-pipes located within a household group, with approximately 5 households per standpipe. If the wells and rain water collection methods are not satisfactory, then this further method of water supply will be investigated and implemented if proved feasible.

11.8.2 Sanitation

Every household will have its own latrine. There are several types of latrine available in Lao PDR. Given alternatives, the usual village choice is the "pour flush" type which uses a pit for excreta disposal but a ceramic pan cast into a cover slab. The pan provides a water seal which ensures that odours are kept from the shelter, and a vent pipe, with fly screen, will be fitted to the pit. Pour flush types require 1.5 to 2 litres of water for flushing. The pans are slightly more expensive but they are odour free and are the safest type of latrine regarding the transmission of excreta related diseases. Latrines should be located at least 30 m from any well. A timber shelter will be located around the latrine for privacy and protection from weather.

Notwithstanding the above, a review will be made of the various designs provided by or recommended by WHO, and in consultation with villages, the final decision will be made. Installation is not technically difficult and after being shown how to construct a couple of latrines, the villagers will be able to construct their own. As previously stated, latrines will also be constructed outside all public buildings.

11.8.3 Hygiene Education and Maintaining and Monitoring the Facilities

Generally, the resettled villagers will not have experience of water supply and sanitation facilities. The installation of the facilities alone will not lead to improvements in health unless they are accompanied by changes in hygiene behaviour. A hygiene education programme will be implemented by the RMU that will encourage the villagers to correctly maintain the water supply and sanitation facilities.

The quality of the water will be monitored and regular inspections will be made of the water supply systems to check for contamination.

The costs of operation and maintenance of the water supply and irrigation systems will be borne by NTPC prior to COD, and by the Social and Environmental Remediation Fund (SERF) after COD.

Figure 11-7: Design of the Filtration Tank Constructed for the Ban Nong Boua Domestic Water Supply.

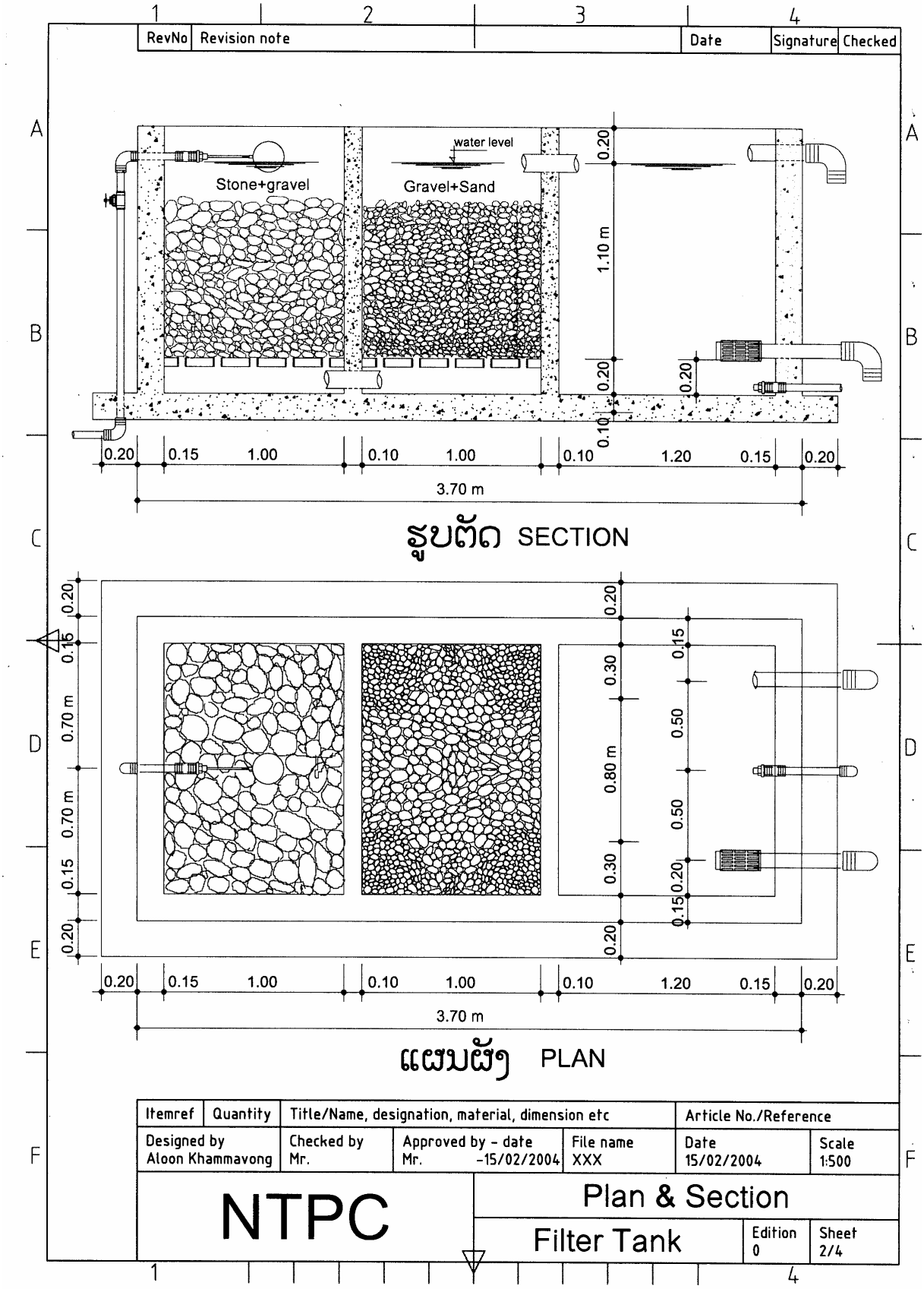
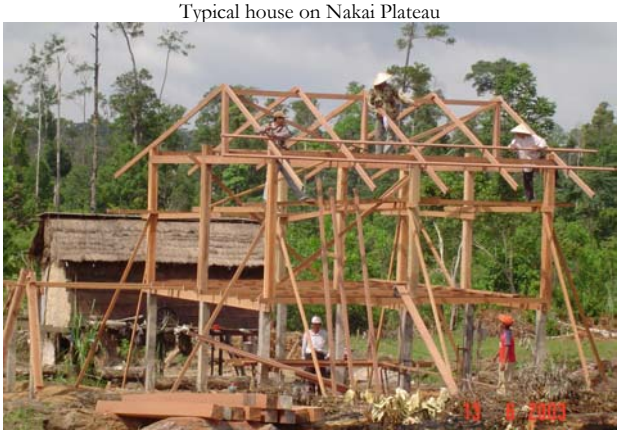


Figure 11-8: Old and New Houses at Nakai Plateau

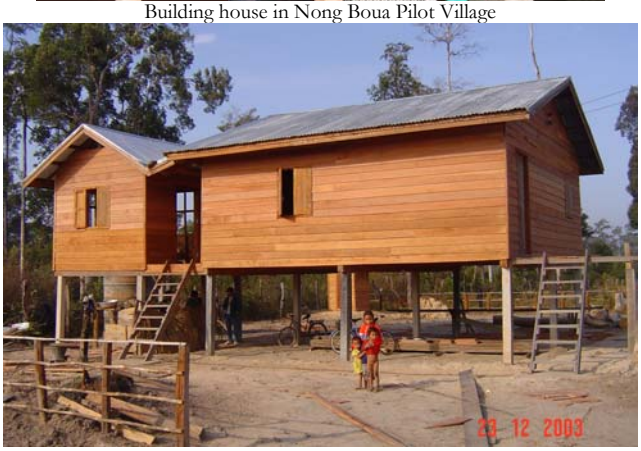
Typical house on Nakai Plateau

Typical house on Nakai Plateau

Building house in Nong Boua Pilot Village



Joining hands in Nong Boua Pilot village



House in Nong Boua Pilot Village

House in Nong Boua Pilot Village

Nong Boua Pilot Village

House in Nong Boua

11.9 VILLAGE ELECTRIFICATION

Every resettled household will be connected with electricity. This will require the following:

- Provision of a 22 kV transmission line to each village;
- The installation of step down transformers with accessories and safety features;
- Provision of a 0.4-kV network through the housing area; and
- Individual house and public building connections with meters, wiring, and the provision of fluorescent light fixtures and power points consistent with the size of house/household.

11.10 GENERAL DEVELOPMENT METHODOLOGY

The process by which any particular infrastructure is to be designed and constructed will depend on the scale and complexity of the structure, on whether NTPC undertakes the activity or the work is contracted out, under the supervision of NTPC, and whether the villagers can be involved in the activity.

A summary of the agencies or groups that may implement each of the main activities required for the development of an infrastructure is provided in Table 11-2 below. For those activities which will be contracted to private companies the following process will, in general, be followed:

- NTPC will call for technical submissions – for major or difficult infrastructure activities – usually via newspaper advertisements;
- NTPC will then review the technical submissions, and prepare a list of preferred bidders for each major activity. This will be the first round of technical pre-qualification.
- NTPC will then issue a call for tender, in some cases only to those companies that have passed the technical pre-qualification;
- The bids will then be evaluated, based on (a) technical content of the bid (that is, the companies and firms will be evaluated twice for their technical and personnel capability to conduct the task), and (b) the financial submission.
- Contracts will then be prepared.

Table 11-2: Infrastructure Development (Summary) Matrix

	Description	Activity	Implementation	Village consultation or participation
1	**Topographic Survey and Mapping**	Tendering procedures	NTPC	none
		Survey and mapping	Consultant companies	none
2	**Village Location and Layout**	Tendering procedures	NTPC	none
		Prepare alternative locations and choose location.	Consultant companies	yes – crucial
		Prepare alternative layouts and choose layout.	Consultant companies	yes – crucial
3	**UXO Surveys and Clearance**	Tendering procedures, identification of NGO, and subsequent negotiation	NTPC	none
		Survey and clearance	Private companies or NGOs	participation
4	**Site Preparation**			
4.1	Site preparation: trees	Identify and log commercially useful trees	NPVFA	yes
4.2	Site preparation: Small trees and bushes	Clearance by slash and burn methods	Resettlement farmers	yes
5	**Roads and Drains**			
5.1	Design roads and drains	Completed during preparation of village layouts.	Consultant Companies	some consultation
5.2	Construct roads and drains	Tendering procedures	NTPC	none
		Construct roads and drains	Contractors	none

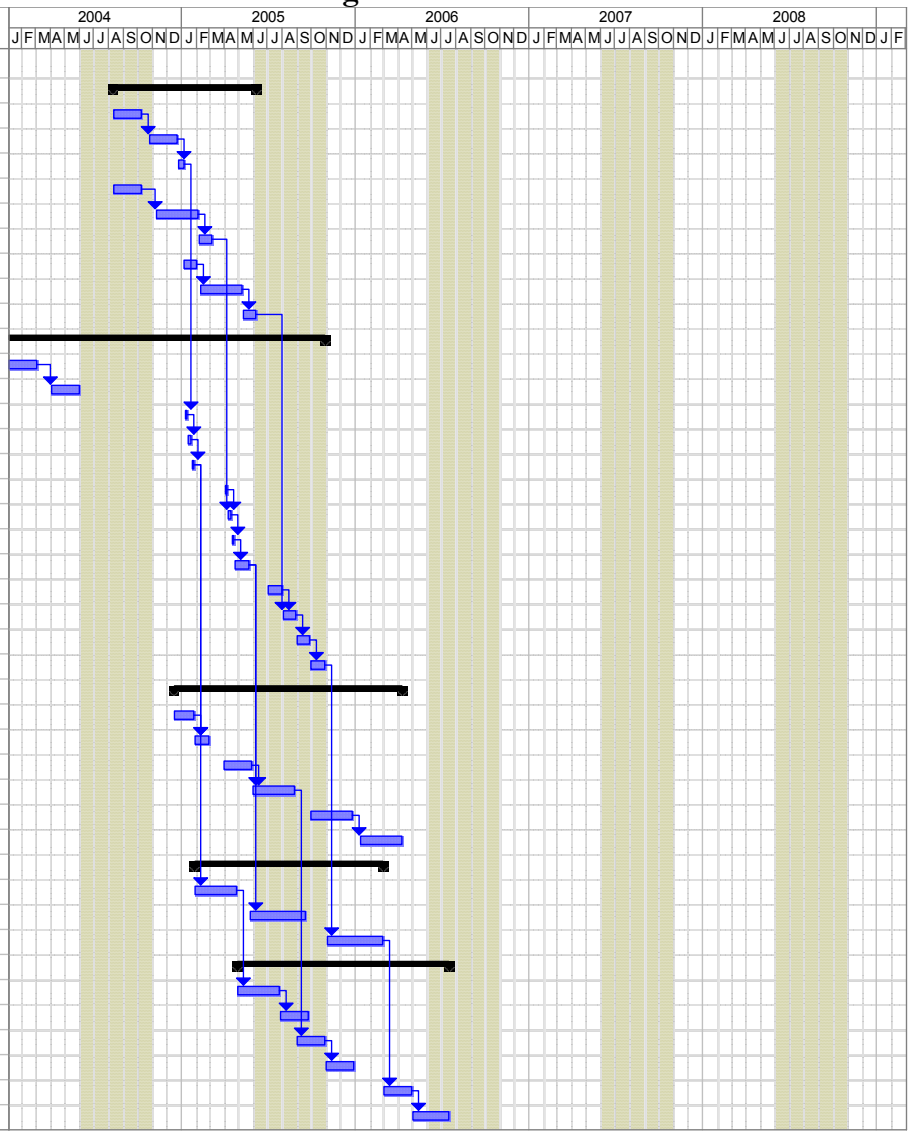
	Description	Activity	Implementation	Village consultation or participation
6	**House Design and Construction**			
6.1	Design	Design Houses	NTPC	yes -consultations
6.2	Construction: Supply materials	Tendering procedures	NTPC	none
		Supply materials	>Wood: NPVFA >Other: Supply companies	> yes - via NPVFA > none
6.3	House construction	Tendering procedures	NTPC	none
		Construct houses	Individual carpenters, small & larger contractors	yes - help builders
7	**Public/Community Buildings**			
7.1	Design	Design buildings	NTPC	yes - consultations
7.2	Construction: Supply materials	Tendering procedures	NTPC	none
		Supply materials	Supply companies, Contractors, NPVFA	yes - if NPVFA
7.3	Construction	Tendering procedures	NTPC	none
		Construct buildings	Small and larger contractors	villagers can tender fro construction
8	**Water Supply and Sanitation**			
8.1	Groundwater assessment	Tendering procedures	NTPC	none
		Investigations	Private companies	none
8.2	Wells/boreholes	Tendering procedures	NTPC	none
		Locate and design	GoL (Nam Saat)	yes - consultations
		Construction	GoL and resettlers	yes - participation
		Assess supply success	RMU and villagers	yes -consultations
8.3	Rainwater collection	Prepare sketches and BoQs	GoL/RMU	yes - consultations
		Tendering procedures for supply contracts	NTPC/RMU	none
		Tank placement, installation of guttering and down-pipes	Villagers	yes - participation
		Assess supply success	RMU and villages	yes - consultations
8.4	Incorporate with irrigation supply	Assess feasibility of gravity supply from irrigation systems	RMU and villages	yes - consultations
		Prepare drawings and BoQs	GoL/RMU	yes - consultations
		Construction tendering procedures	NTPC/RMU	none
		Install gravity supplies	Contractors	yes - participation
8.5	Monitor water quality	Samples and analysis	NTPC/GoL	yes - participation
8.6	Sanitation	Review and choose latrine type	RMU/GoL/WHO	yes - consultations
		Prepare BoQs	RMU/GoL	none
		Tendering procedures for supply contracts	NTPC/RMU	none
		Installation	RMU and villages	participation
8.7	Hygiene education	Undertake workshops	RMU/GoL	participation
9	**Village Electrification**			
9.1	Transmission lines and transformers	Design	NTPC/EDL	none
		Construction	NTPC/EDL	none
9.2	Village Networks	Design	EDL	none
		Construction	EDL or Contractors	none
9.3	House connections	Design	EDL	participation
		Construction	EDL or Contractors	none

11.11 SCHEDULE FOR RESETTLEMENT INFRASTRUCTURE PROGRAM

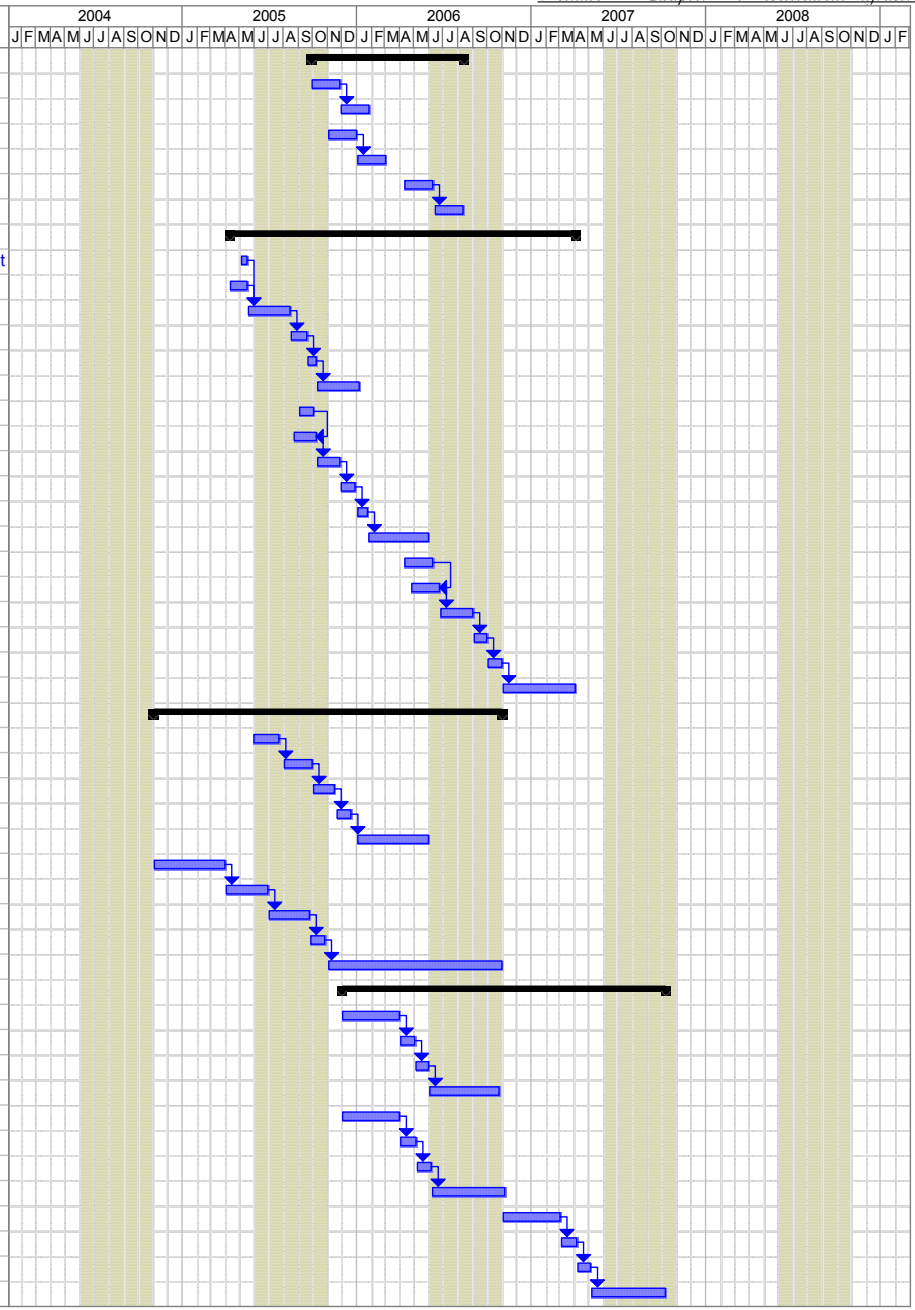
Table 11-3 below presents the main activities of the Resettlement Infrastructure Program.

Table 11-3: Timetable of the Main Activities of the Resettlement Infrastructure Program.

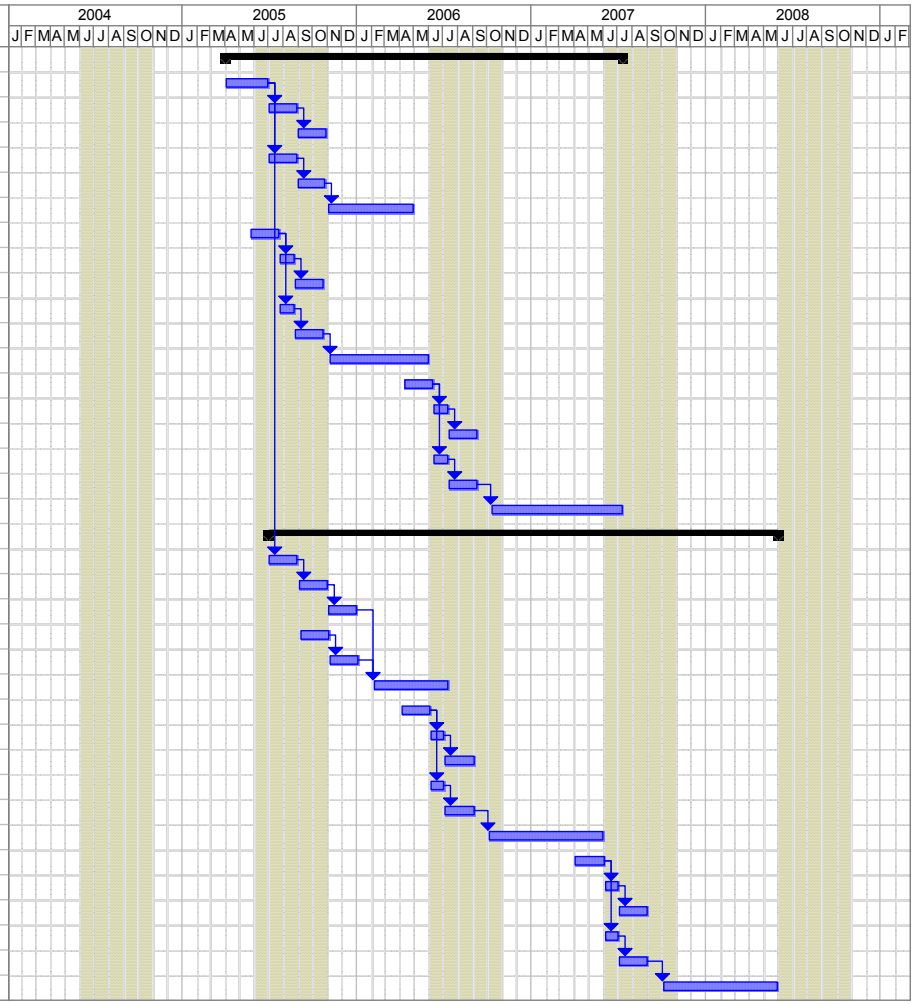
ID	WBS	Task Name
181	**04**	**RESETTLEMENT INFRASTRUCTURE**
182	**04.01**	**TOPOGRAPHIC SURVEY AND MAPPING OF INDICATIVE LOCATIONS**
183	04.01.01	Tender procedures, Survey and Mapping Contract, Sop Hia/ Nam Pan
184	04.01.02	Undertake Topographic Surveys, Sop Hia/Nam Pan
185	04.01.03	Draft and Finalise Maps/Reports, Sop Hia/ Nam Pan
186	04.01.04	Tender procedures, Survey and Mapping Contract, Village Group 1 (VG1)
187	04.01.05	Undertake Topographic Surveys, Village Group 1
188	04.01.06	Draft and Finalise Maps/Reports, Village Group 1
189	04.01.07	Tender procedures, Survey and Mapping Contract, Village Group 2 (VG2)
190	04.01.08	Undertake Topographic Surveys, Village Group 2
191	04.01.09	Draft and Finalise Maps/Reports, Village Group 2
192	**04.02**	**FINALIZATION OF VILLAGE LOCATION**
193	04.02.01	Inspect all resettlement Sites - Consultations (Phase 1)
194	04.02.02	Produce Maps and Disclosure Sites
195	04.02.03	access results of Topo survey for Sop Hia/Nam Pan
196	04.02.04	stakeholders review of data, site inspection, Sop Hia/Nam Pan
197	04.02.05	***confirmation (or rejection) of relocation sites, Sop Hia/Nam Pan***
198	04.02.06	access results of detailed soil surveys, VG1
199	04.02.07	access results of Topo survey for VG1
200	04.02.08	stakeholders review of data, site inspection, VG1
201	04.02.09	***confirmation (or rejection) of relocation sites, VG1***
202	04.02.10	access results of detailed soil surveys, VG2
203	04.02.11	access results of Topo survey for VG2
204	04.02.12	stakeholders review of data, site inspection, VG2
205	04.02.13	***confirmation (or rejection) of relocation sites, VG2***
206	**04.03**	**VILLAGE LAYOUT DESIGN**
207	04.03.01	Prepare TOR, Organise Contract, Sop Hia/Nam Pan
208	04.03.02	Design Village Layout, with Villagers, Sop Hia/Nam Pan
209	04.03.03	Prepare TOR, Organise Contract, Village Group 1
210	04.03.04	Design Village Layout, with Villagers, VG1
211	04.03.05	Prepare TOR, Organise Contract, Village Group 2
212	04.03.06	Design Village Layout, with Villagers, VG2
214	**04.04**	**UXO SURVEY AND CLEARING**
215	04.04.01	Participatory UXO clearance of Site, Sop Hia/Nam Pan
216	04.04.02	Participatory UXO clearance of Site, VG1
217	04.04.03	Participatory UXO clearance of Site, VG2
218	**04.05**	**SITE PREPARATION**
219	04.05.01	Land Clearing, Sop Hia/Nam Pan
220	04.05.02	Measure and Mark Plots, Sop Hia/Nam Pan
221	04.05.03	Land Clearing, VG1
222	04.05.04	Measure and Mark Plots, VG1
223	04.05.05	Land Clearing, VG2
224	04.05.06	Measure and Mark Plots, VG2



ID	WBS	Task Name
225	**04.06**	**LAND TITLING (Housing and Agricultural Plots)**
226	04.06.01	Sop Hia/Nam Pan: Adjudication, Confirm Survey, Public Announcement
227	04.06.02	Sop Hia/Nam Pan: Install markers, Issue land titles
233	04.06.03	VG1: Adjudication, Confirm Survey, Public Announcement
234	04.06.04	VG1: Install markers, Issue land titles
235	04.06.05	VG2: Adjudication, Confirm Survey, Public Announcement
236	04.06.06	VG2: Install markers, Issue land titles
237	**04.07**	**VILLAGE ROADS and DRAINAGE**
238	04.07.01	Sop Hia/Nam Pan: Preliminary Design (Use Topo Maps and Village Layout
239	04.07.02	Sop Hia/Nam Pan: Prepare ToR, Organise Design Contract
240	04.07.03	Sop Hia/Nam Pan: Prepare Design, BoQ and Tender Documents
241	04.07.04	Sop Hia/Nam Pan: Call for Tenders
242	04.07.05	Sop Hia/Nam Pan: Evaluate and Contract Award
243	04.07.06	Sop Hia/Nam Pan: Construct Roads and Drains
244	04.07.07	VG1: Preliminary Design (Use Topo and Village Layout),
245	04.07.08	VG1: Prepare ToR, Organise Design Contract
246	04.07.09	VG1: Prepare Design, BoQ and Tender Documents
247	04.07.10	VG1: Call for Tenders
248	04.07.11	VG1: Evaluate and Contract Award
249	04.07.12	VG1: Construct Roads and Drains
250	04.07.13	VG2: Preliminary Design (Use Topo Maps and Village Layout)
251	04.07.14	VG2: Prepare ToR, Organise Design Contract
252	04.07.15	VG2: Prepare Design, BoQ and Tender Documents
253	04.07.16	VG2: Call for Tenders
254	04.07.17	VG2: Evaluate and Contract Award
255	04.07.18	VG2: Construct Roads and Drains
256	**04.08**	**MAINS ELECTRICITY NETWORK**
257	04.08.01	Organise Design Contract for Lak Sao - Nam Pan Transmission Line
258	04.08.02	Prepare Design and Tender Documents for Lak Sao - Nam Pan Line
259	04.08.03	Call for Tenders
260	04.08.04	Evaluate and Contract Award
261	04.08.05	Construct Lak Sao - Nam Pan Transmission Line
262	04.08.06	Meetings with EDL on Southern Resettlement Village Transmission Line
263	04.08.07	Prepare Tender Documents, Resettlement Village Transmission Line
264	04.08.08	Call for Tenders
265	04.08.09	Evaluate and Contract Award
266	04.08.10	Construct Southern Resettlement Village Transmission Line
267	**04.09**	**230 V HOUSEHOLD ELECTRICITY SUPPLY**
268	04.09.01	Sop Hia/Nam Pan: Organise Design Contract
269	04.09.02	Sop Hia/Nam Pan: Call for Tenders
270	04.09.03	Sop Hia/ Nam Pan: Evaluate and Contract Award
271	04.09.04	Sop Hia/Nam Pan: Install Household Electricity
272	04.09.05	VG1: Organise Contract, Prepare Designs, BoQ and Bid Documents
273	04.09.06	VG1: Call for Tenders
274	04.09.07	VG1: Evaluate and Contract Award
275	04.09.08	VG1: Install Household Electricity
276	04.09.09	VG2: Organise Contract, Prepare Designs, BoQ and Bid Documents
277	04.09.10	VG2: Call for Tenders
278	04.09.11	VG2: Evaluate and Contract Award
279	04.09.12	VG2: Install Household Electricity



ID	WBS	Task Name
280	**04.10**	**VILLAGE HOUSES**
281	04.10.01	Sop Hia/Nam Pan: Prepare Designs and BoQ
282	04.10.02	Sop Hia/Nam Pan: Call for Supply Contracts
283	04.10.03	Sop Hia/Nam Pan: Award Supply Contracts
284	04.10.04	Sop Hia/Nam Pan: Call for Carpentry Contracts
285	04.10.05	Sop Hia/Nam Pan: Award Carpentry Contracts, Arrange Participation
286	04.10.06	***Construct for Sop Hia/Nam Pan Village***
287	04.10.07	VG1: Prepare Designs and BoQ
288	04.10.08	VG1: Call for Supply Contracts
289	04.10.09	VG1: Award Supply Contracts
290	04.10.10	VG1: Call for Carpentry Contracts
291	04.10.11	VG1: Award Carpentry Contracts, Arrange Participation
292	04.10.12	***Construct for Group 1 Villages***
293	04.10.13	VG2: Prepare Designs and BoQ
294	04.10.14	VG2: Call for Supply Contracts
295	04.10.15	VG2: Award Supply Contracts
296	04.10.16	VG2: Call for Carpentry Contracts
297	04.10.17	VG2: Award Carpentry Contracts, Arrange Participation
298	04.10.18	***Construct for Group 2 Villages***
299	**04.11**	**PUBLIC BUILDINGS**
300	04.11.01	Sop Hia/Nam Pan: Prepare Designs and BoQ
301	04.11.02	Sop Hia/Nam Pan: Call for Supply Contracts
302	04.11.03	Sop Hia: Award Supply Contracts
303	04.11.04	Sop Hia/Nam Pan: Call for Carpentry Contracts
304	04.11.05	Sop Hia/Nam Pan: Award Carpentry Contracts, Arrange Participation
305	04.11.06	***Construct for Sop Hia/Nam Pan Village***
306	04.11.07	VG1: Prepare Designs and BoQ
307	04.11.08	VG1: Call for Supply Contracts
308	04.11.09	VG1: Award Supply Contracts
309	04.11.10	VG1: Call for Carpentry Contracts
310	04.11.11	VG1: Award Carpentry Contracts, Arrange Participation
311	04.11.12	***Construct for Group 1 Villages***
312	04.11.13	VG2: Prepare Designs and BoQ
313	04.11.14	VG2: Call for Supply Contracts
314	04.11.15	VG2: Award Supply Contracts
315	04.11.16	VG2: Call for Carpentry Contracts
316	04.11.17	VG2: Award Carpentry Contracts, Arrange Participation
317	04.11.18	***Construct for Group 2 Villages***



ID	WBS	Task Name
318	**04.12**	**IRRIGATION SYSTEMS - Sop Hia/Nam Pan**
319	04.12.01	Preliminary Design based on Topo Survey and Mapping
320	04.12.02	Feasibility Study and Detail Design - Finalize ToR
321	04.12.03	Feasibility Study and Detail Design - Call for Tenders
322	04.12.04	Feasibility Study and Detail Design - Evaluate Bids/Contract Award
323	04.12.05	Undertake Feasibility Study, Detail Design, Prepare Tender Documents
324	04.12.06	Construction - Call for Tenders
325	04.12.07	Construction - Evaluate Tenders and Contract Award
326	04.12.08	***Construct Headworks and Canal Systems***
327	04.12.09	***Construct: field canals and terraces***
328	**04.13**	**IRRIGATION SYSTEMS - Villages with Pre-Reservoir Available Water (3)**
329	04.13.01	Preliminary Designs, Based on Topographic Survey and Mapping
330	04.13.02	Prepare ToR for Contract for Detail Design, BoQ and Tender Documents
331	04.13.03	Call for Tenders
332	04.13.04	Evaluate Tenders and Contract Award
333	04.13.05	Prepare Detail Design, BoQ and Tender Documents
334	04.13.06	Construction - Call for Tenders
335	04.13.07	Evaluate and Contract Award
336	04.13.08	***Construct: intake canals, pump stations, header tanks, distribution syst***
337	04.13.09	***Construct: on-farm distribution systems and terraces***
338	**04.14**	**IRRIGATION SYSTEMS - Villages Requiring Nakai Reservoir Water (9)**
339	04.14.01	Preliminary Designs, Based on Topographic Survey and Mapping
340	04.14.02	Prepare ToR for Contracts for Detail Design, BoQ and Tender Documents
341	04.14.03	Call for Tenders
342	04.14.04	Evaluate Tenders and Contract Award
343	04.14.05	Prepare Detail Design, BoQ and Bid Documents
344	04.14.06	Construction - Call for Tenders
345	04.14.07	Evaluate and Contract Award
346	04.14.08	***Construct: intake canals, pump station foundations/pipelines, header ta***
347	04.14.09	***Construct: conveyance and distribution canal/pipe systems, install pum***
348	04.14.10	***Construct: field distribution systems***
349	04.14.11	***Construct: terraces, remaining villages VG1***
350	04.14.12	***Construct: terraces, remaining villages VG2***
351	**04.15**	**DOMESTIC WATER SUPPLY AND SANITATION**
352	04.15.01	Sop Hia/Nam Pan: Village Consultations
353	04.15.02	Sop Hia/Nam Pan: Prepare Designs and BoQ
354	04.15.03	Sop Hia/Nam Pan: Construct/install Water Supply System and Latrines
355	04.15.04	VG1: Village Consultations
356	04.15.05	VG1: Prepare Design and BoQ (for possible temporary supplies)
357	04.15.06	VG1: Construct/install Water Supply Systems and Latrines
358	04.15.07	VG2: Village Consultations
359	04.15.08	VG2: Prepare Designs and BoQ (for possible temporary supplies)
360	04.15.09	VG2: Construct/install Water Supply Systems and Latrines
361	04.15.10	Sop Hia/Nam Pan: Review, Possibly Develop Rainwater Collection Facilitie
362	04.15.11	VG1: Review Possibly Develop Rainwater Collection Facilities
363	04.15.12	VG2: Review, Possibly Develop Rainwater Collection Facilities
364	04.15.13	VG1: Review Water Supply Facilities
365	04.15.14	VG2: Review Water Supply Facilities
366	04.15.15	VG1: Possibly Incorporate with Irrigation System, include filtration tanks/sta
367	04.15.16	VG2: Possibly Incorporate with Irrigation System, include filtration tanks/sta