

ANNEX 1 – G
REHABILITATION PLAN
FOR DRINKING WATER SYSTEM
(PANYEBAR)

ANNEX 1 – G

REHABILITATION PLAN FOR DRINKING WATER SYSTEM (PANYEBAR)

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G. REHABILITATION PLAN FOR DRINKING WATER SYSTEM (PANYEBAR)

1. Background

The community of Panyebar already had two drinking water supply systems. One system was installed by CARE in 1978 and the others was installed by FONAPAZ in 1998. The pipes of the water supply systems had structural problems, such as lack of sufficient support at the crossing of the creeks, and in some locations the pipes are on the ground surface, so falling rocks and trees damaged them. Also the water distribution tank of the system built by CARE lacked of capacity to store the volume of water carried by the conduction system throughout a night.

2. Objectives

The objective of the project is to achieve stable, sure, and constant drinking water supply in the community.

3. Components and Schedule

Project work components are summarized below.

- | | |
|--|--|
| a. River crossing works (aqueducts) | 7 units. Length of aqueduct; from 18m-30m. |
| b. Distribution Pipe rehabilitation | 3.0 km for pipe modification and protection, pipe protection works of PVC pipeline |
| c. Distribution tank | 1 unit, capacity: 50 m ³ , by concrete, size :5.0m * 5.0m * 3m, including connection pipe (PVC, 160psi, 3") |
| d Training for maintenance of pipeline | On the Job training and other several lectures to users for maintenance work. |

Item	2001					2002											
	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
1) Purchase of equipment					■												
2) River cross work						■	■	■				■	■	■	■	■	■
3) Protection work for pipeline						■	■	■				■	■	■	■	■	■
4) Distribution tank						■	■	■				■	■	■	■	■	■
5) Conduction pipeline/ Connection pipeline							■	■				■	■	■	■	■	■
6) Monitoring																▲	▲

4. Monitoring Results

Indicators for Evaluation and Monitoring Methods

Item	Frequency	Data collector
1) Progress of construction of water supply	Monthly	Water Committee
2) Payment rate of water charge	Every 4 months	Water Committee
3) Status on O&M of facilities	Once half year	Water Committee
4) Status of water use	Monthly	Water Committee

4.1 Progress of construction works

The construction works in Phase-I started on end of December 2001. However, because of lack of voluntary labor forces from the community, the progress at the end of phase I period (the end of March 2002), was so delayed from the original schedule. The actual completed works in Phase-I is shown in Table G1. Because of the delay, the schedule was obliged to be modified and Phase-II works have been conducted following the new schedule. Overall schedule and actual progress of the construction works are shown in Figure G1.

4.2 Collection rate of water charge

The Study Team offered and tried to introduce a new water collection system to the water committee in order to increase collection rate of water charge. However, based on the opinions of the water committee, the original plan of the new collection system should be modified, and the frequency of the water fee collection should be kept as before, once a year. (The details of the modified water collection plan should be referred to Section 5 “Problems Encountered and

Countermeasures”).) The water committee decided that a penalty of delinquency, i.e. cutoff of the water supply, will be strictly imposed on those who do not pay the water charge. They noted that before the implementation of the project they had reluctantly abandoned to apply this penalty to the delinquents when the delinquents alleged not to pay because of unstable water supply services provided by the water committee. Now that they have the stable water supply services which makes the water committee stronger than before, they can apply the penalty without any hesitation.

However the application of the penalty of delinquent should be waited until December 2002 when everybody have incomes from their products.

4.3 Status on O & M facilities

The rate of water charge collection in 2001 was around Q1,300 in amount, 48 % of the total beneficiaries. After investigating their account book and usage of the money, all the collected money was duly utilized in proper purposes from January 2002 to now. Major expenses were costs of materials for repairing pipelines and the labor wages for repairing works.

5. **Problems Encountered and Countermeasures**

5.1 Lack of voluntary labor forces in the construction works

At the beginning of the construction works from December 2001 to January 2002, the expected labor forces were not provided from the villages. The followings seem to be the reasons probably.

- The construction period was overlapped on harvest period of coffee, and preparatory period of seedling maize.
- There are persons who must works as daily labor workers in order to earn incomes.
- Hard work in the mountains
- Less leadership of the Water Committee
- Less interest of the project, especially the adult males who does not receive the project benefit directly.
- Projects of construction of bridge and road in Panyebar which are now implementing with the Municipality are paying the wage to the labors.

The Study Team made several meetings with all the beneficiaries with a

cooperation of MAGA Sololá and a mayor of the municipality of San Juan La Laguna. However the definitive countermeasure could not be found out within the community. Finally the Study Team accepted the Municipality's offer of financial support for paying daily labor wages. The initial labor charge was set at Q20 per day in January 2002. However the beneficiaries insisted to raise up to Q25 per day afterwards, and the mayor accepted their claim in July 2002.

5.2 Collection rate of water charge

The Study Team offered and discussed about a new water collection system to the water committee in order to increase collection rate of water charge. The new system includes the followings.

- 1) Adoption of group collection system: To reduce the burden of the water committee and secure water charge collection, beneficiaries will be decided into groups based on the sector of the water system.
- 2) More frequent collection: Frequency of charge collection will be increased at least 3 times a year instead of once in a year of the present system.

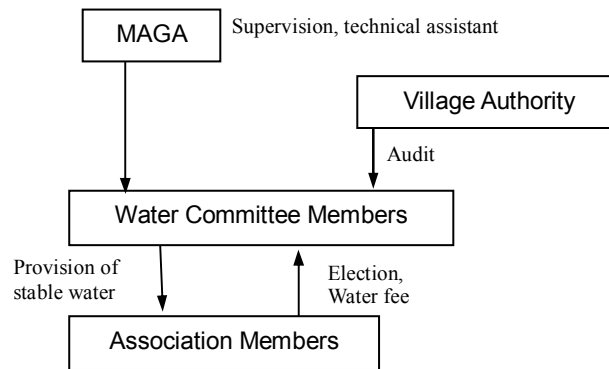
After discussion with the water committee, the plan was changed to (1) the number of the groups are only 4 in total, such as Central-1, Central-2, Panacal and Choacanac, and (2) the frequency of collection should be once a year because of the following reasons;

- 1) Commencement of imposition of penalty on delinquents: The water committee decided that a penalty of delinquency, i.e. cutoff of the water supply, will be strictly imposed on those who do not pay the water charge. They noted that before the implementation of the project they had reluctantly abandoned to apply those drastic penalty to the delinquents when the delinquents alleged not to pay because of the unstable water supply services. Now that they have the stable water supply services which makes the water committee stronger than before, they can apply the penalty without any hesitation.
- 2) Authorization of collection of money: The committee said that the village people would not pay the water charge to personnel who was not a member of the water committee. Thus the maximum number of the group which could be managed directly by 8 committee members was restricted up to 4 groups.
- 3) Frequency: The water committee was afraid of increase of their management works with the high frequency of the collection activities. With imposition of the penalty against the delinquents, the collection rate

would be increased, they insisted.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for management of further activities are shown in the figure below.



7. Observed Impact

7.1 Stable water supply and strengthening of the water committee

According to comments of the water committee and other villagers, the frequency of a sudden cutoff of the drinking water supply owing to the broken down of pipelines was drastically decreased from 8~9 times a month (before the Project) to 3 times for the last 6 months (during/after Project). The duration of suspension of water supply services was also shortened from 5-10 days to 2 days in maximum because of the prompt repair work done by the water committee. Those improvement of the water supply service makes the water committee be stronger than before and lets them to decide to apply the penalty against delinquency, which was abandoned and suspended so long.

7.2 Negative impact to activities with voluntary labor forces in future

In the Project, apart from the original concept of voluntary labor forces of the beneficiaries, all the labors received wages from the Municipality of San Juan La Laguna. Even those wages are so small, such as Q25/day, it is worried that this experience might accelerate destruction of their traditional mutual aid system in the indigenous community.

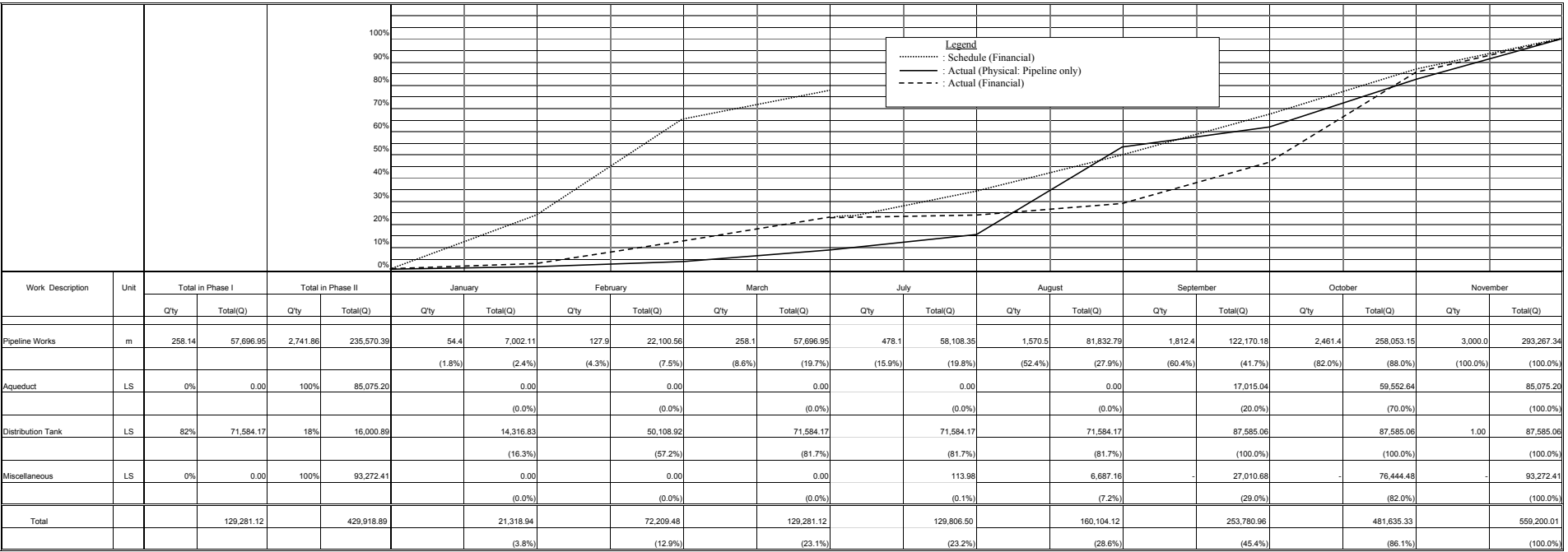
TABLES

Table G1 Completed Volume of Rehabilitation Works in Phase I

Work Description	Original Schedule												Actual Work															
	Q'ty	Unit	2002												Q'ty	Unit	2002											
			Jan			Feb			Mar			Jan					Feb			Mar								
			10	20	30	10	20	30	10	20	30	10	20	30			10	20	30	10	20	30						
1st Phase												1st Phase																
A. PLAN-1 Excavation & Backfilling	651.00	m													0.00	m												
B. PLAN-2 Concrete Support,Ave.H=1.5m)	78.00	m													28.14	m												
C. PLAN-3(a) Supported by Vinyl Sack (General Plan)	236.00	m													0.00	m												
D. PLAN-3(b) Supported by Vinyl Sack (with Excavation)	206.50	m													24.00	m												
E. PLAN-3(c) Supported & Covered by Vinyl Sack & Filling.(Rock Falling Area)	206.50	m													73.25	m												
F. PLAN-4(a) Supported by Steel Supporting(No Protection Panel)	99.00	m													0.00	m												
G. PLAN-4(b) Supported by Steel Supporting(with Protection Panel)	87.00	m													0.00	m												
H. PLAN-5(a) Hanging by Steel Wire & Steel Support (No Protection Panel)	99.00	m													99.00	m												
I. PLAN-5(b) Hanging by Steel Wire & Steel Support (with Protection Panel)	87.00	m													33.75	m												
Sub-Total	1,750.0	m													258.14	m												
J. Aqueduct Construction	100.0	%													0.0	%												
K. Distribution Tank	100.0	%													81.7	%												

G-T-1

FIGURES



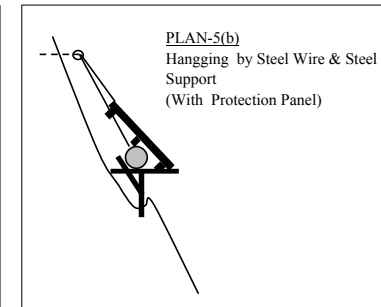
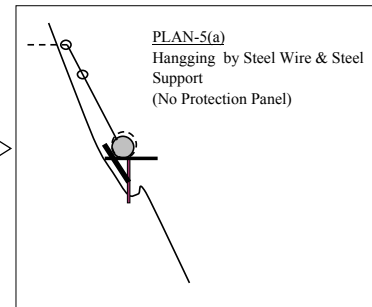
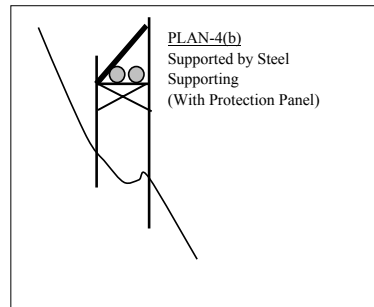
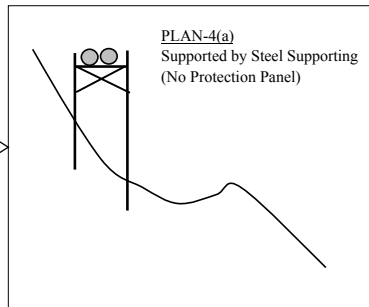
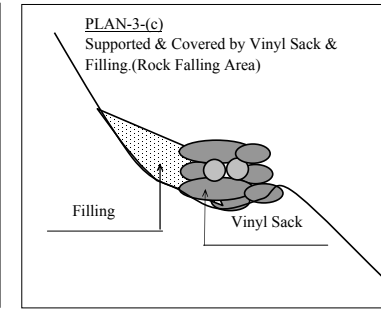
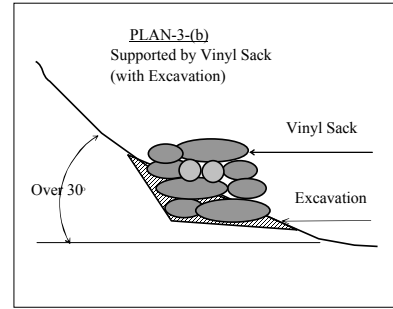
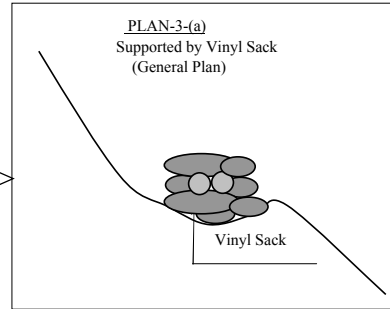
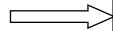
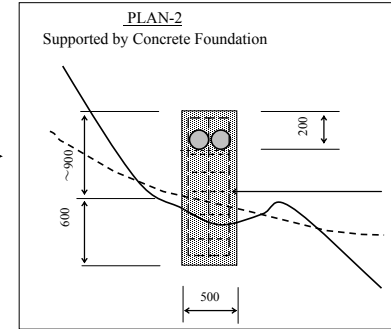
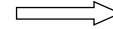
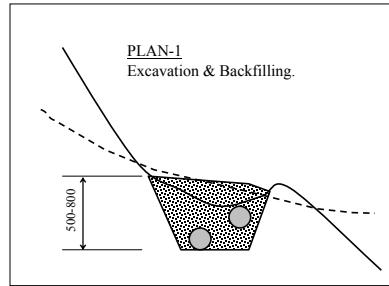
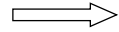
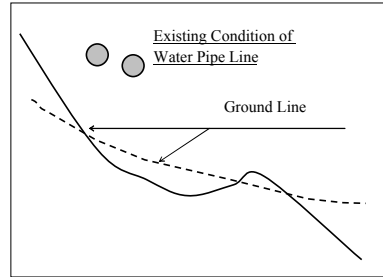
THE VERIFICATION STUDY OF MASTER PLAN ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION

Japan International Cooperation Agency (JICA)

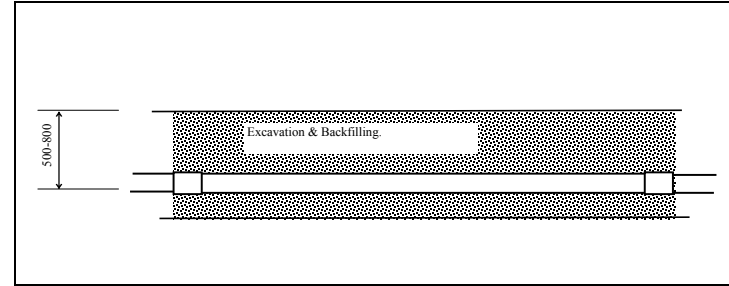
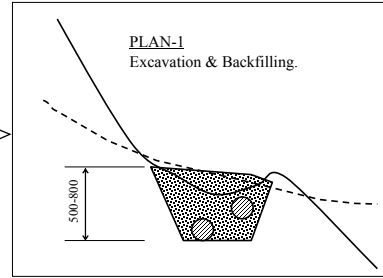
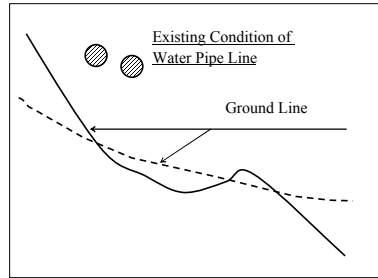
Figure G1
Overall Schedule and Progress of Construction Works:
Rehabilitation Plan for Drinking Water System in
Panyabar, Solola

ATTACHMENTS

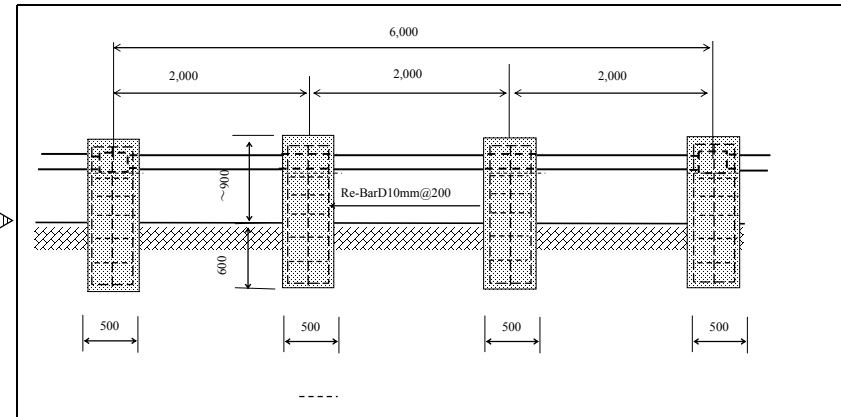
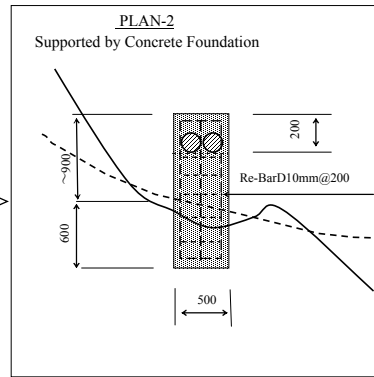
Drinking Water System Improvement Plan.



Plan-1
Existing Pipelines are able to sift Under Ground

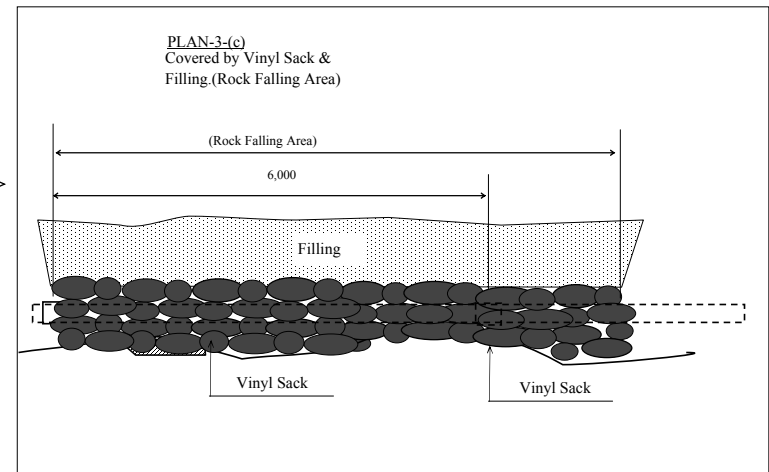
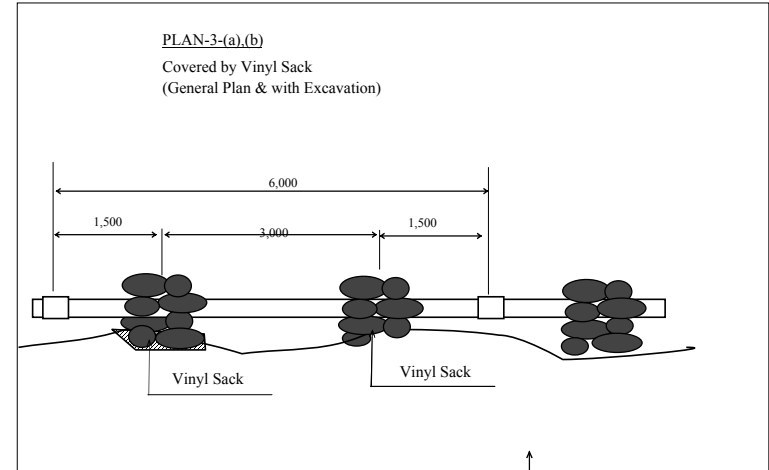
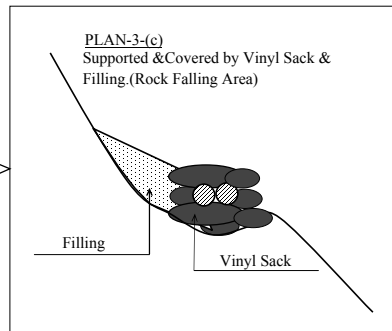
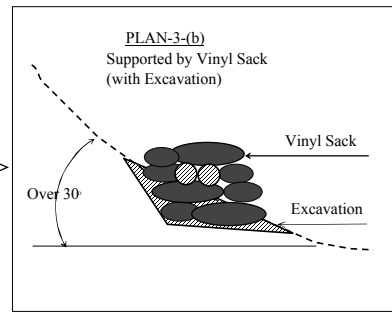
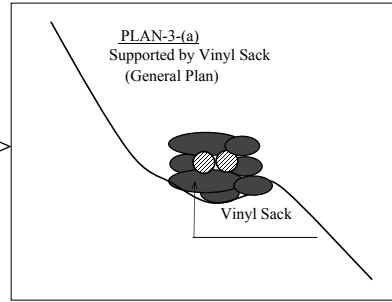
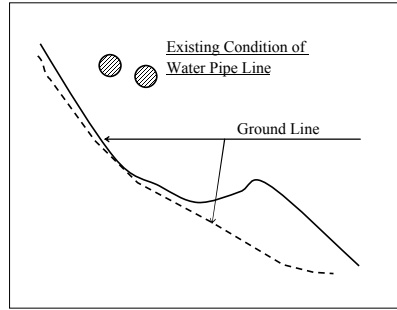


Plan-2
Supported by Concrete Foundation

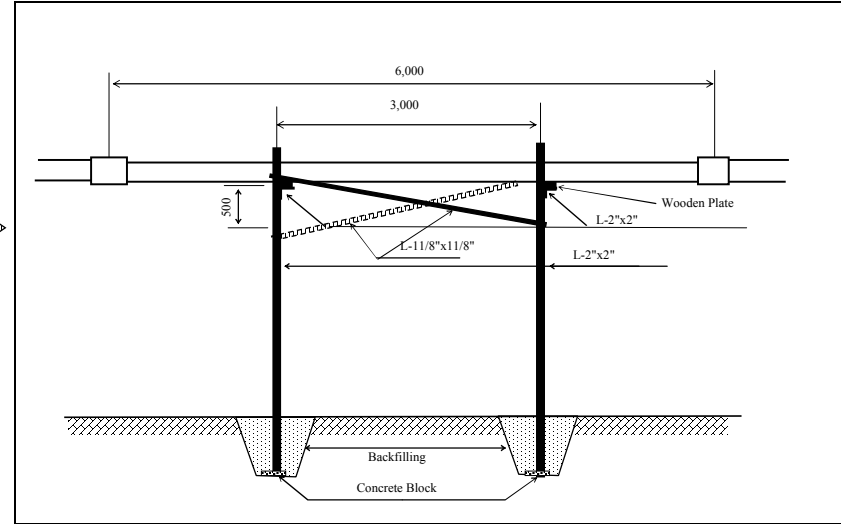
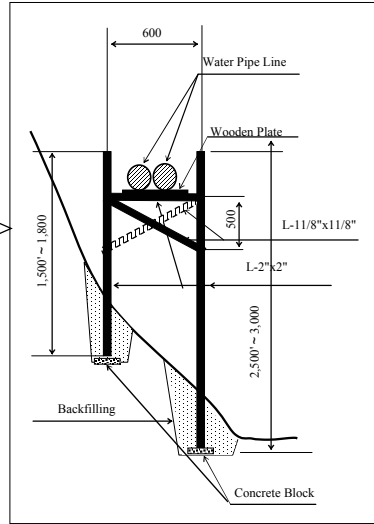
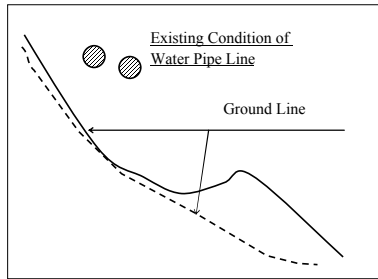


Plan-3

Existing Pipelines are able to sift to less than 1-M from Ground Level

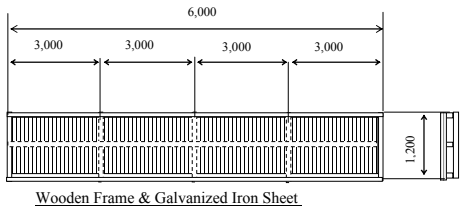


Plan-4
Existing Pipelines are not able to sift to less than 1-M
from Ground Level

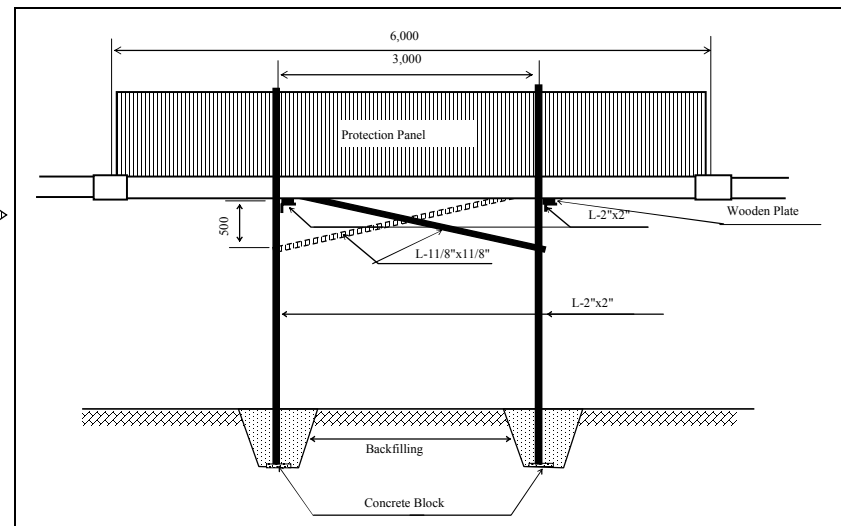
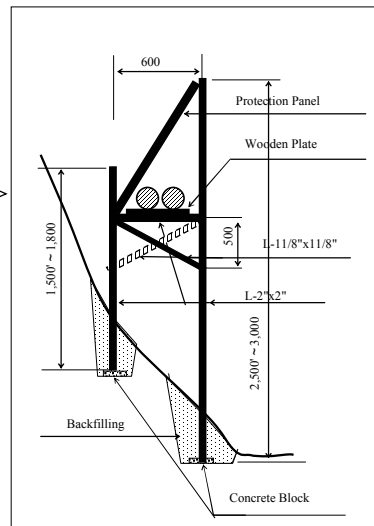


PLAN-4(a)
Supported by Steel Support
(No Protection Panel)

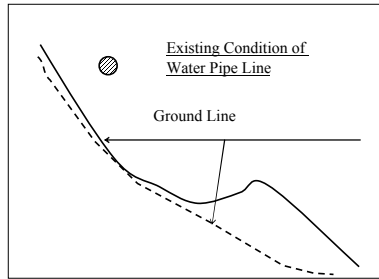
Protection Panel



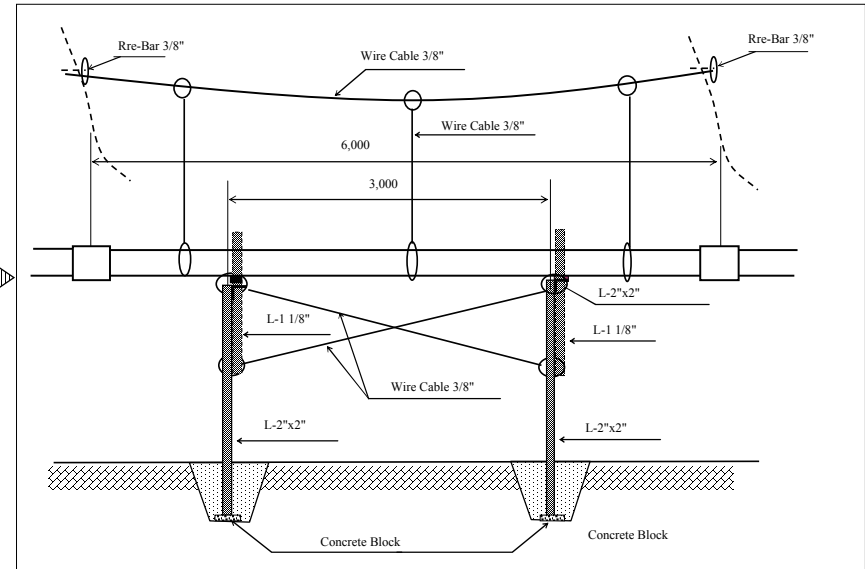
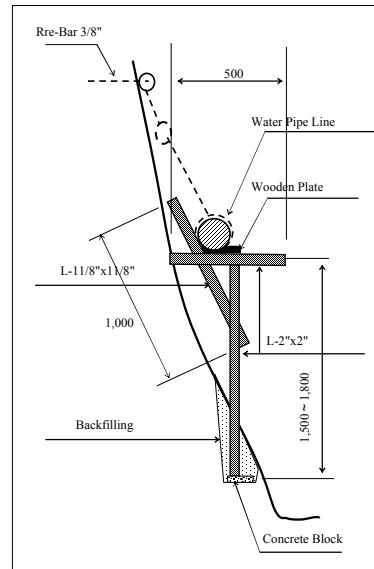
PLAN-4(b)
Supported by Steel Support
(With Protection Panel)



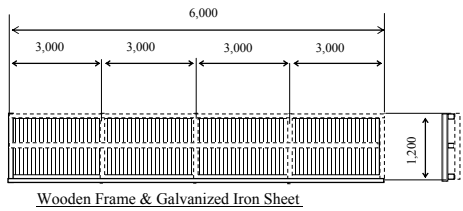
Plan-5
Existing Pipelines are Hanging by Steel Wire



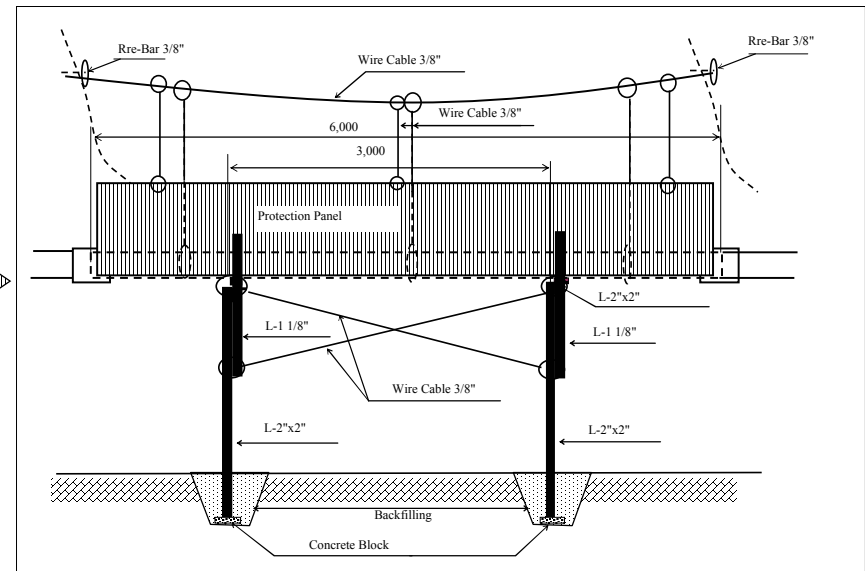
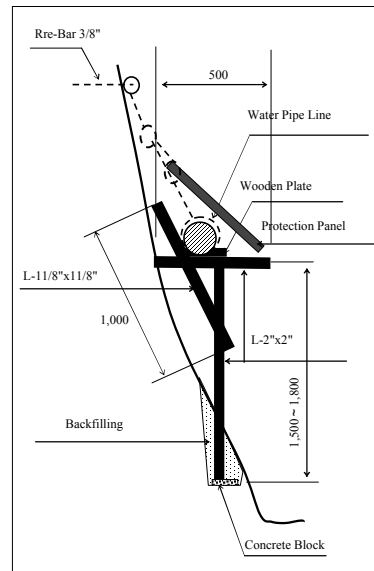
PLAN-5(a)
Hanging by Steel Wire & Steel Support
(No Protection Panel)



Protection Panel

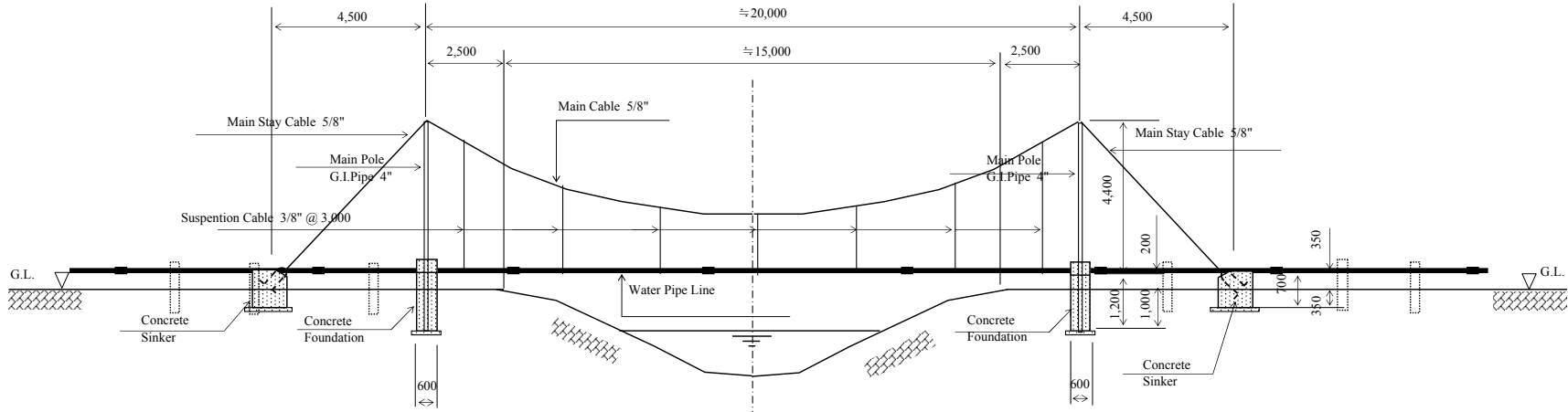


PLAN-5(b)
Hanging by Steel Wire & Steel Support
(With Protection Panel)

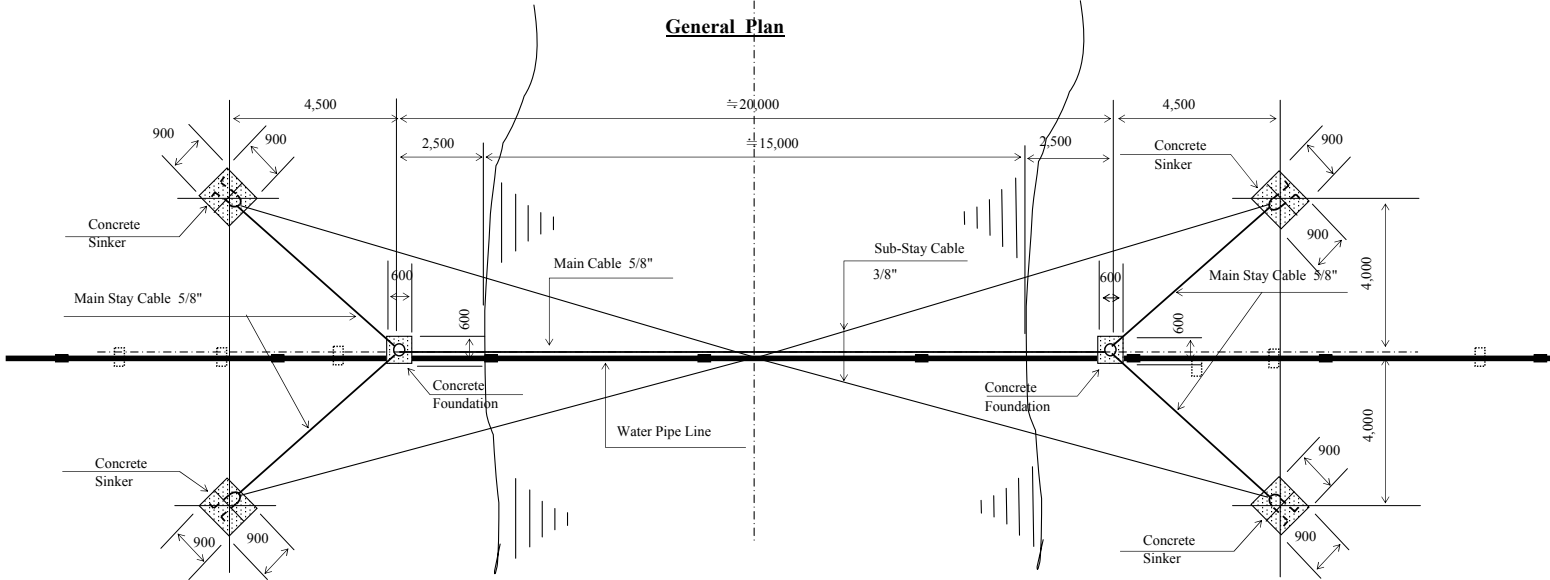


Drinking Water System Improvement Plan.
General Plan of Aqueduct

General Section



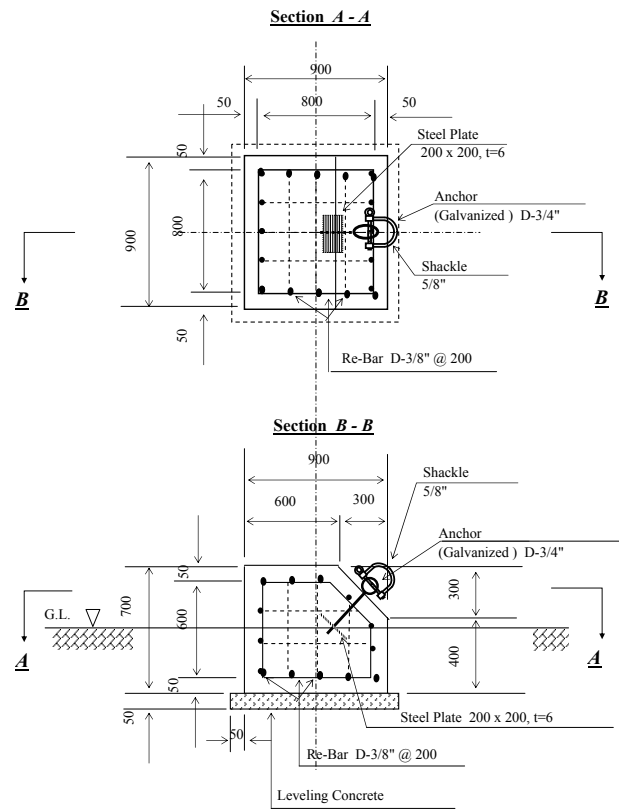
General Plan



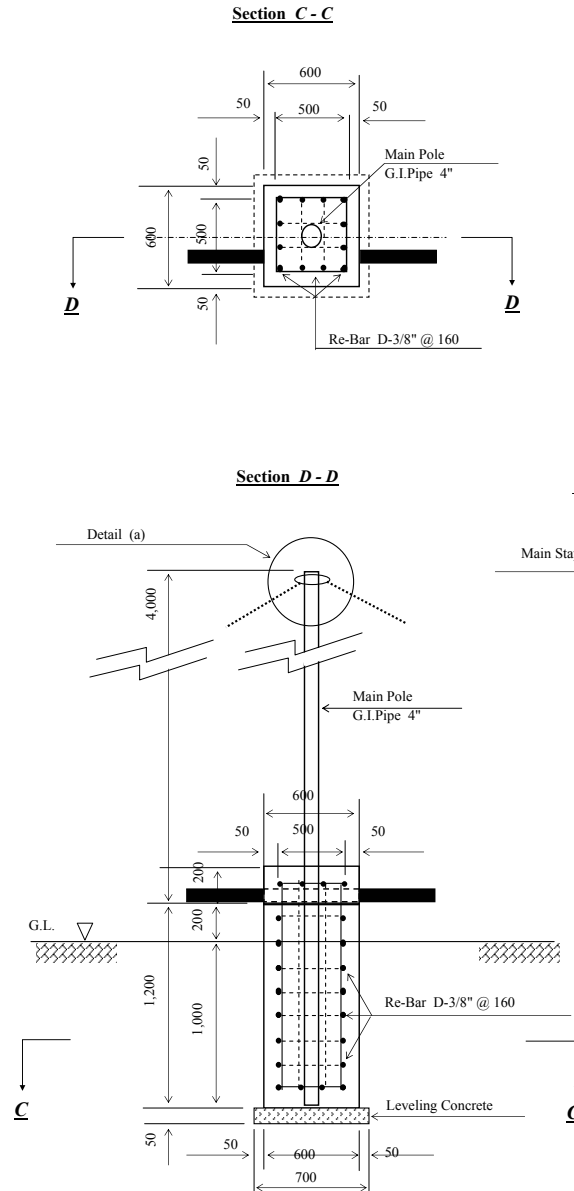
G-AT-6

Drinking Water System Improvement Plan.
Detail Plan of Aqueduct

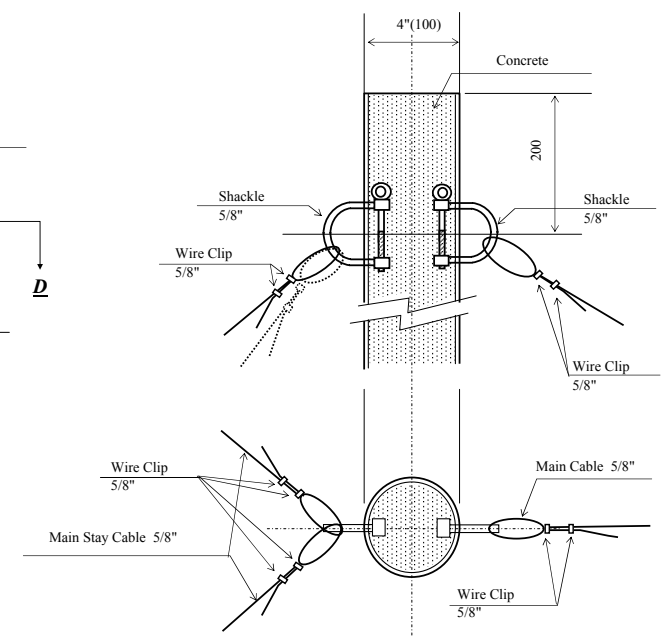
Detail for Concrete Sinkers



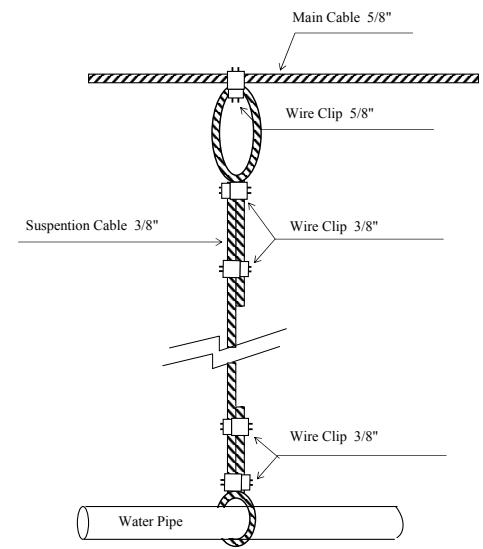
Detail for Concrete Foundation



**Detail (a)
 Top of Main pole**

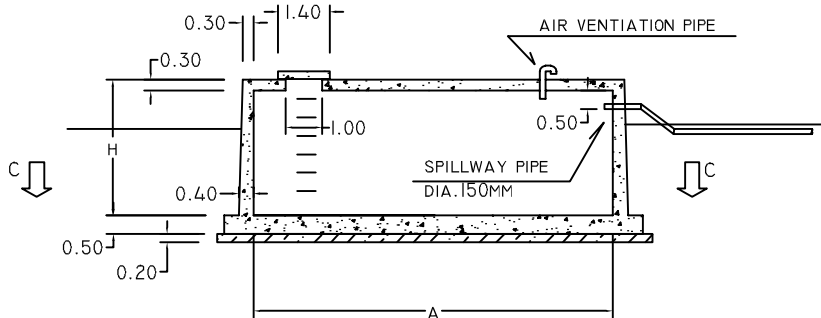


**Detail of
 Suspension Cable**

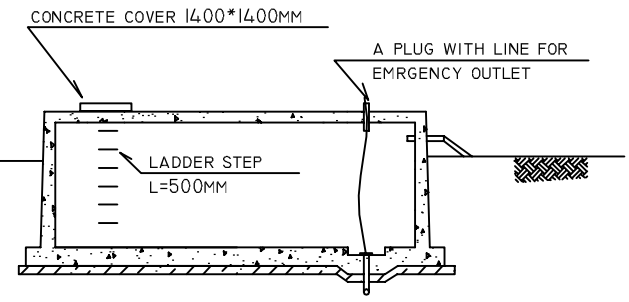


G-AT-7

G-AT-8



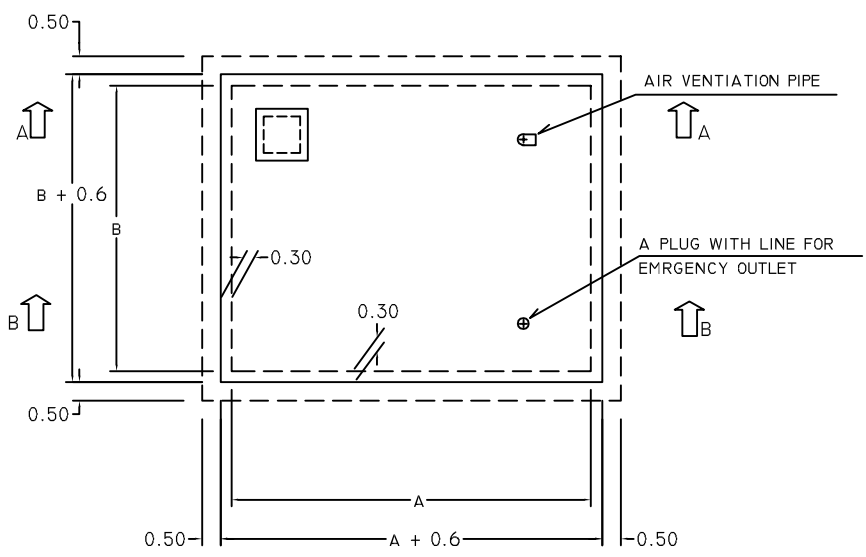
SECTION A



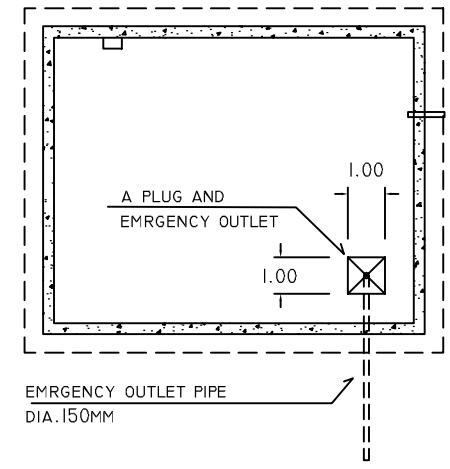
SECTION B

SIZE OF THE REGULATION TANKS

	A	B	H
XEATZAN BAJO	4.60	7.20	2.60



GENERAL PLAN OF TANK



PLAN C

SCALE : 1/200

THE MASTER PLAN STUDY ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION OF THE REPUBLIC OF GUATEMALA	
TITLE OF DRAWINGS GENERAL LAYOUT OF REGULATION TANK FOR WATER SYSTEM IN PANYEBAR	
JAPAN INTERNATIONAL COOPERATION AGENCY	DWG. NO

ANNEX 1 – H
WATER QUANTITY IMPROVEMENT PLAN
FOR EXISTING WATER SUPPLY
(PANYEBAR)

ANNEX 1 – H

WATER QUALITY IMPROVEMENT PLAN FOR THE EXISTING DRINKING WATER (PANYEBAR)

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7. Observed Impacts	H-4
7.1 Assistance and positive involvement of Municipality to the Project	H-4

Attachment

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Attachment 1 Result of Water Quality Test (before Project Implementation)	H-AT-1
Attachment 2 Result of Water Quality Test (after Project Implementation)	H-AT-3

H. WATER QUALITY IMPROVEMENT PLAN FOR THE EXISTING DRINKING WATER (PANYEBAR)

1. Background

In Panyebar Model Area, there was a communal potable water system, which uses spring water for drinking purpose without any treatment. The operation and maintenance of water supply system was duly managed by the water committee, but it was detected that the water quality was not suitable to drink directly in the result of water sampling test. Thus a water treatment facility, i.e., a sterilizer with hypo-chloride-sodium, was required.

2. Objectives

The main objectives of the project are to improve health condition of the community residents through improvement of drinking water quality by installation of sterilizer.

3. Components and Schedule

The work components are summarized as follows;

- Installation of the sterilizer (including a protection house) : 2 set
- Calibration of the equipment
- Capacitation for using the equipment

Item	2001					2002												
	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	
1) Purchase of equipment																		
2) Installation of sterilizer																		
3) People education																		
4) Monitoring																▲	▲	

4. Monitoring Results

Indicators for Evaluation and Monitoring Methods

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>
1) Users of improved water.	Every 3 months	Dev. Committee
2) Operation status of sterilizer.	Monthly	Dev. Committee
3) Number of diarrhea patient.	Every 3 months	Dev. Committee
4) Simple water quality test.	Every year	FIS

4.1 Users of improved water

After installation of the equipment, an interview survey has been conducted to some users in the community in order to know status of using the purified water. In result, no any user quitted using the treated potable water because of a taste and smell.

4.2 Operation status of sterilizer

Before commencement of the water purification, a capacitation to the water committee members has been made in order to give skills and knowledge for using and maintaining the sterilizer. It seems that this capacitation has been finished successfully and all the attendants learned all the skills and knowledge. However time has not passed so long after commencement of the treatment, thus actual operation and maintenance works could not be observed at site yet.

4.3 Number of diarrhea patient

After commencement of the water treatment, time has not passed so long, thus actual effect could not be observed at site yet. However a certain tendency of decrease of the number of water born disease patients is anticipated based on a sample analysis in the case of a sterilizer installed in Palestina. The details should be referred to the description of water quality project in Palestina .

4.4 Simple water quality test

Water quality before the water treatment were checked and existences of colon bacillus in the water has been confirmed again. Detail should be referred to Table D1. I. In terms of quality of the sterilized water with the equipment, an examination is under process. The results and conclusions will be provided in the Draft Final Report.

5. Problems Encountered and Countermeasures

5.1 Unreasonable rumors about the sterilization

Problems: Because of lack of knowledge about the water treatment, unreasonable rumors, such as a burn in stomach by the treated water with chloride, etc., were observed in the community.

Countermeasures: The Study Team held a meeting for all the village people to explain effectiveness and harmlessness of the water sterilization. Prior to the explanation, pictures showing progresses of the projects which were executed in Panyebar were exhibited with a liquid crystal projector in a wide screen. Because of this attraction, more than 200 peoples attended the meeting and received the visualized explanation prepared by Microsoft powerpoint. After the explanation, no any critical opinion against the water treatment was observed.

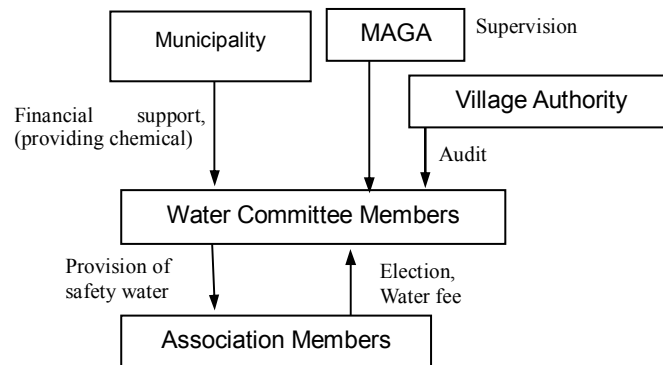
5.2 Land for the sterilizer

Problem: In the planning stage, in year 2000-2001, the water committee promised to provide the land for the sterilizer. They found a land owner who offered his land gratis. However when the project started actually, the land owner requested for the committee to pay for the land. The discussion between the committee and the owner was made verbally and no any concrete agreement had been made in writing. Finally the committee found another free land but the precious time passed in vain for several weeks.

Countermeasure: In the planning stage, all the important agreement, especially regarding money and land, should be made in writing.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for management of further activities are shown in the figure below.



7. Observed Impacts

7.1 Assistance and positive involvement of Municipality to the Project

In terms of obligation of water purification in rural drinking water system, the Ministry of Public Health and Social Assistance clearly stipulated by the law, i.e. Article 87 of “the Codigo de Salud (Decreto 90-97) in December 1999”, that the Municipalities have responsibility on it. However it is fact that, in general, the municipalities had not put a lot of attentions to it and the realization of water purification was behind.

Recently, coupled with the strong instructions of the Ministry of Health, the Municipalities gradually start to get involved with the water treatment. In the project, the mayor of the municipality of San Juan La Laguna promised in writing their positive involvement and a financial assistance for the operation of the sterilizer, specially purchasing a chemical of Hypochloride-sodium. With this assistance, the community people were released from a burden of increase of water charge for the sterilization.

ATTACHMENTS



INSTITUTO DE FOMENTO MUNICIPAL - INFOM - LABORATORIO DE AGUA

Telefax: 472-0498

INFORME DE ANÁLISIS FÍSICOQUÍMICO Y BACTERIOLÓGICO DE AGUA MUESTRA No. 1171-02

INFORMACIÓN DE LA MUESTRA

Interesado: EQUIPO DE ESTUDIO JICA, QUETZALTENANGO	Temperatura in situ (°C): ---
Punto de muestreo: Grifo domiciliario	pH in situ: ---
Fuente: Bomba de distribución	Conductividad (µS/cm): ---
Municipio: Panyebar	Cloro residual (mg/L): ---
Departamento: Sololá	Sólidos disueltos (mg/L): ---
Fecha de captación: 05-11-02	Salinidad (%): ---
Hora de captación: 08:30	Fecha de recepción laboratorio: 05-11-02
Técnica de preservación: Refrigeración	Hora recepción laboratorio: 16:00
Responsable de captación: Sr. Murakamy (Persona ajena al Laboratorio INFOM)	

RESULTADOS

ITEM	PARÁMETROS FÍSICOS	UNIDADES	LMA	LMP	RESULTADO
1	Color aparente	Unidades Pt-Co	5.0	35.0	<1
2	Color verdadero	Unidades Pt-Co	Nsc	Nsc	<1
3	Conductividad	µS/cm	100	750	120
4	Olor en frío	Organoléptico	No rechazable	No rechazable	Inodora
5	Olor a 60 °C	Organoléptico	No rechazable	No rechazable	Inodora
6	pH (laboratorio)	Unidades pH	7.0 - 7.5	6.5 - 8.5	6.5
7	Sólidos disueltos totales	mg/L	500.0	1000.0	58
8	Sólidos en suspensión	mg/L	Nsc	Nsc	<1
9	Temperatura de análisis	°C	15.0 - 25.0	34	22
10	Turbiedad	UNT	5.0	15.0	<0.5
ITEM	PARÁMETROS QUÍMICOS	UNIDADES	LMA	LMP	RESULTADO
11	Acidez	mg/L CaCO ₃	Nsc	Nsc	0.75
12	Alcalinidad debida al bicarbonato	mg/L CaCO ₃	Nsc	Nsc	54
13	Alcalinidad debida al carbonato	mg/L CaCO ₃	Nsc	Nsc	0
14	Alcalinidad debida al hidróxido	mg/L CaCO ₃	Nsc	Nsc	0
15	Alcalinidad total	mg/L CaCO ₃	Nsc	Nsc	54
16	Dióxido de carbono	mg/L CO ₂	Nsc	Nsc	0.66
17	Dureza total	mg/L CaCO ₃	100.000	500.000	45
18	Manganeso total	mg/L Mn	0.050	0.500	<0.1
19	Sulfatos	mg/L SO ₄ ²⁻	100.000	250.000	<7
20	Hierro total	mg/L Fe	0.100	1.000	<0.01
21	Nitratos	mg/L NO ₃	Nsc	10	1.0
ITEM	PARÁMETROS BACTERIOLÓGICOS	UNIDADES	LMA	LMP	RESULTADO
22	Coliformes fecales	NMP/100 mL	Nsc	Nsc	0
23	Coliformes totales	NMP/100 mL	Nsc	< 2	140
24	Conteo aeróbico total	UFC/mL	Nsc	Nsc	56

* LMA = límite máximo aceptable, LMP = límite máximo permisible

Nsc = no se contempla en la norma

OBSERVACIONES

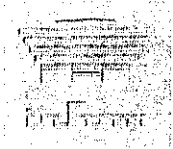
- Los límites máximos aceptables y permisibles corresponden a la Norma COGUANOR para agua potable NGO 29001 (Ac. Gubernativo No. 986-1999) publicada en el Diario de Centro América el 4 de febrero de 2000.
- De acuerdo a los resultados obtenidos, **el agua NO CUMPLE con los requerimientos bacteriológicos establecidos en la Norma COGUANOR 29001.**



Mirna Gómez
Ingeniera Química, Col. 914
Supervisora de Laboratorio

William Estrada Vargas
Químico Biólogo, Col. 2241
Supervisor de Laboratorio





INSTITUTO DE FOMENTO MUNICIPAL - INFOM - LABORATORIO DE AGUA

Telefax: 472 8499

INFORME DE ANÁLISIS FÍSICOQUÍMICO Y BACTERIOLÓGICO DE AGUA MUESTRA No. 1280-02

INFORMACIÓN DE LA MUESTRA

Interesado: EQUIPO DE ESTUDIO JICA - QUETZALTENANGO-	Temperatura in situ (°C): ---
Punto de muestreo: Salida del equipo de cloración	pH in situ: ---
Fuente: Sistema de abastecimiento de Panyebar	Conductividad (µS/cm): ---
Municipio: San Juan La Laguna	Cloro residual (mg/L): 0.3
Departamento: Sololá	Sólidos disueltos (mg/L): ---
Fecha de captación: 27-11-02	Salinidad (%): ---
Hora de captación: 13:00	Fecha de recepción laboratorio: 28-11-02
Técnica de preservación: Refrigeración	Hora recepción laboratorio: 09:00
Responsable de captación: Ing. Héctor Godínez (Persona ajena al Laboratorio INFOM)	

RESULTADOS

ITEM	PARÁMETROS FÍSICOS	UNIDADES	LMA	LMP	RESULTADO
1	Color aparente	Unidades Pt-Co	5.0	35.0	<1
2	Color verdadero	Unidades Pt-Co	Nsc	Nsc	<1
3	Conductividad	µS/cm	100	750	120
4	Olor en frío	Organoléptico	No rechazable	No rechazable	Inodora
5	Olor a 60 °C	Organoléptico	No rechazable	No rechazable	Cloro
6	pH (laboratorio)	Unidades pH	7.0 - 7.5	6.5 - 8.5	7.0
7	Sólidos disueltos totales	mg/L	500.0	1000.0	58
8	Sólidos en suspensión	mg/L	Nsc	Nsc	<1
9	Temperatura de análisis	°C	15.0 - 25.0	34	23
10	Turbiedad	UNT	5.0	15.0	<0.5
ITEM	PARÁMETROS QUÍMICOS	UNIDADES	LMA	LMP	RESULTADO
11	Acidez	mg/L CaCO ₃	Nsc	Nsc	0.75
12	Alcalinidad debida al bicarbonato	mg/L CaCO ₃	Nsc	Nsc	50
13	Alcalinidad debida al carbonato	mg/L CaCO ₃	Nsc	Nsc	0
14	Alcalinidad debida al hidróxido	mg/L CaCO ₃	Nsc	Nsc	0
15	Alcalinidad total	mg/L CaCO ₃	Nsc	Nsc	50
16	Dióxido de carbono	mg/L CO ₂	Nsc	Nsc	0.66
17	Dureza total	mg/L CaCO ₃	100.000	500.000	40
18	Manganeso total	mg/L Mn	0.050	0.500	<0.1
19	Sulfatos	mg/L SO ₄ ²⁻	100.000	250.000	<7
20	Hierro total	mg/L Fe	0.100	1.000	0.05
21	Nitratos	mg/L NO ₃	Nsc	10	5.7
ITEM	PARÁMETROS BACTERIOLÓGICOS	UNIDADES	LMA	LMP	RESULTADO
22	<i>Escherichia coli</i>	NMP/100 mL	Nsc	Nsc	<2
23	Coliformes totales	NMP/100 mL	Nsc	< 2	<2
24	Conteo aeróbico total	UFC/mL	Nsc	Nsc	0

* LMA = límite máximo aceptable, LMP = límite máximo permisible

Nsc= no se contempla en la norma

OBSERVACIONES

- Los límites máximos aceptables y permisibles corresponden a la Norma COGUANOR para agua potable NGO 29001 (Ac. Gubernativo No. 986-1999) publicada en el Diario de Centro América el 4 de febrero de 2000.
- De acuerdo a los resultados obtenidos, **el agua CUMPLE con los requerimientos bacteriológicos establecidos en la Norma COGUANOR 29001.**

Mirna Gómez
Ingeniera Química, Col. 914
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William Estrada Vargas
Químico Biólogo, Col. 2241
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ANNEX 1 – I
PLAN OF EXTENSION USE
OF IMPROVED COOKING STOVES
AND SAUNA BATH
(PACHUM)

ANNEX 1 – I

PLAN OF EXTENSION USE OF IMPROVED COOKING STOVES AND OF SAUNA BATH “TEMASCAL” (PACHUM)

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I. PLAN OF EXTENSION USE OF IMPROVED COOKING STOVES AND OF SAUNA BATH “TEMASCAL” (PACHUM)

1. Background

According to the household survey, the diffusion of improved stoves in Pachum area was so low, only 2 % and most inhabitants cook meals with open fire. In Pachum area, ethnical sauna bath was popularly used, called “*Temascal*”,. Those cooking and sauna facilities used a lot of firewood, which were taken from forests in the mountain area.

2. Objectives

The purposes of introducing improved stove and improved sauna bath are summarized below:

- Reduce the daily consumption of firewood in order to conserve the forest in the mountainous area.
- Mitigate heavy work of firewood transportation by the reduction of firewood consumption.
- Improve the villagers’ health condition by the introduction of a comfortable and economical type of sauna bath.

3. Components and Schedule

The Project provided the followings;

- Improved Stove ... 130 nos.
- Improved Temascal (newly construction) ... 10 nos.
- Improved Temascal (only combustion box installation) ... 30 nos.
- Capacitation and demonstration
- Several interview surveys

Item	2001					2002											
	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
1) Designing & demonstration					■	■											
2) Construction works						■	■	■								■	
3) Monitoring & Evaluation							■									■	

4. Monitoring Results

Indicators for Evaluation and Monitoring Methods

Item	Frequency	Data collector
1) People's impression on facility use.	Before installation & 3 months after the installation.	MAGA
2) Firewood consumption before and after the project.	Before installation & 3 months after the installation.	MAGA

4.1 People's impression on facility use

In order to obtain the beneficiaries' opinions on the facilities after the implementation of the project, a questionnaire survey was conducted to 20 beneficiaries who have the facilities, the improved stove and improved Temascal, in October 2002. The followings are summary of the results of the questionnaire survey (after Project) and the detail result is shown in Table I1.

Questions	Improved Stove (Total answer : 20 persons)	Improved Temascal (Total answer : 19 persons)
How do you think about ?	Very satisfied (20), Satisfied little (0), Not satisfied (0)	Very satisfied (19), Satisfied little (0), Not satisfied (0)
What points are improved?	Reduction of firewood (12), Free from smoke (8), Less accident around fire (0) Clean (0), Easy cooking (0)	Reduction of firewood (18), Easy for burning firewood (1), Clean (0), hot (0)

According to the result of survey, all the interviewees highly expressed their "satisfactions" on their improved facilities.

4.2 Firewood consumption before and after the project

The firewood consumption of the improved stove and improved Temascal were checked at 5 families for more than 3 weeks in Pachum community. As mentioned below, consumption of firewood depressed up to around 57% of the

previous consumption in the improved stove and less than 45% in the improved Temascal. The details are shown in Table I2 and Table I3.

Comparison of Firewood Consumption

	Improved Stove [lb. / family / week]	Improved Temascal [lb. / time]
Before Project : ... (1)	259.2	42.0
After Project : ... (2)	147.9	18.7
Relative consumption Rate : ... = (2)/(1)	57.1%	44.5%
Reduction Rate : ... = {(2)-(1)} / (2)	42.9%	55.5%

5. Problems Encountered and Countermeasures

5.1 Abandonment of usage of the improved Temascal (operation stage)

Problems: After installation of the previous design of the improved Temascal (hereinafter the old design Temascal), it was revealed that many beneficiaries abandoned the old design Temascal. In the ad-hoc survey, most of beneficiaries, especially old persons and women, pointed out its low temperature / less heat of the improved Temascal as a primary reason.

Despite the Study Team executed many trials in front of the committee members and collected their opinions until they accepted it on the course of finalization of the old design Temascal in January 2002, it is revealed that finally this procedure did not function well and could not reflect their true opinions to the plan. The trials should have made not only by one-day trials but also a long-term monitoring trial in several houses for a certain period, such as a few weeks, to obtain their real opinions through their daily use.

Countermeasure: The Study Team reviewed the old design Temascal and modified the design in order to provide high temperature heat and be accepted by all the beneficiaries. After design review with several trial tests, including the long-term trial from beginning of August 2002 in 6 houses to obtain their real opinions through their daily use, in Tonicapán city and Pachum community, the new design Temascal was formulated. The feature and comparison between the old design and the new one are shown in Figure I1. In the new design, a function of chimney, i.e. discharging smoke, is abandoned in order to provide the required high temperature heat. Because of high temperature and high burning

rate in the combustion box, however, the beneficiaries mentioned that the new design make less smoke than the traditional Temascal even without chimney. 40 sets of new design Temascals were duly installed in September and October 2002 in Pachum community. The beneficiaries' acceptance of those new Temascal was proved in the result of questionnaire survey mentioned previously.

5.2 Collection of money by the committee

At the stage of recruitment for the beneficiaries of the improved stove, it was revealed that the stove and Temascal committee requested people to pay Q25 per person on the condition of receiving such improved facility, which caused a friction between the committee and some villagers. The Study Team and MAGA-Totonicapán did not have any consultation or information from the committee about the collection of money until a villager informed directly to the office of the Study Team in Quetzaltenango. According to the committee, the followings are the reasons for collection of money;

- The committee spent several expenses. (including foods for MAGA staff in order to express their thanks)
- The committee member needed some financial compensation for their activities.

The Study Team confirmed and collected information as follows;

- Some beneficiaries accepted the concept of payment voluntary and 45 persons had already paid. However some people did not agree to pay and the committee did not put them in the list of the beneficiaries.
- The staffs of MAGA were offered to eat meals by the committee in several times at site, however the staff never requested the committee to prepare meals. MAGA staff accepted their offers not so as to insult the committee's honor following the indigenous culture.
- Actual activities of the committee were so small and not so heavy works. No any reasonable expense for their activities was found and the explanation of usage of the collected money was not clear.
- According to a NGO who has a lot of experiences of improved stove project in Totonicapán, it was rare case that the committee for improved stove requested people to pay money for their activities.

The Study Team made following decisions and explained to village people.

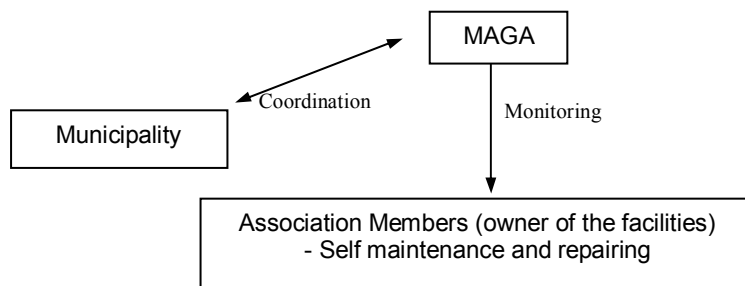
- The project did not accept any collection of the money by the committee.

- In order to avoid problems in future, MAGA staff should not receive meals, and the committee should not prepare meals for them. MAGA should return money for the meals which they ate.
- The collected money should be returned to beneficiaries who have paid.
- The works of the committee should be done on a voluntary basis. If committee members did not agree to this concept, such personnel should be changed.

There were so long discussions about this matters in the meeting, but finally the committee accepted those concepts and to work voluntary. After that the recruitment of the beneficiaries was done smoothly and all the persons who wanted the improved facilities could received it freely.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for monitoring of the project are shown in the figure below.



7. Observed Impacts

7.1 Economic impact

Based on the date of reduction of firewood consumption with the improved facilities, a part of its economic benefit can be calculated with a value of the reduced consumption of firewood. The result is shown as follows and details are in Table I4.

	Annual Reduction of Firewood / unit			Value (Q)
	(lb.)	(kg)	(Tarea*)	
Improved Stove	5,919.5	2,685.1	3.03	394.4
Improved Temascal	1,990.4	902.8	1.02	132.6
Total	7,909.9	3,587.9	4.1	527.0

*: "Tarea" is a special commercial unit for firewood in rural area. 1 tarea is a bulk of firewood (size; w:0.5m * h:0.84 * L: 3.36m * 0.78). Price of 1 tarea of firewood is around Q130.

Taking consideration of costs of the improved stove, around Q800, and the improved Temascal, around Q350, its cost will be returned by only the benefit of the reduced firewood within 3 years.

7.2 Health improvement

According to the questionnaire survey (before Project), most of villagers has anxious about health problems caused by smoke. After the Project, the improved stove makes smoke go out safety and the improved Temascal produces less smoke. In the questionnaire survey (after Project), many persons selected "free from smoke" as the most improved point for the improved stove. In terms of the improved Temascal, most of the families increase frequency of taking bath because of less consumption of firewood. So the Temascal contributes improvement of their health condition also.

7.3 Additional time and opportunity

With the improved facilities, the villagers certainly decrease their trips to mountain for firewood. According to the questionnaire survey (after Project), they decreased their trips to mountain from 4.2 times/week to 2.1 times/week, 50% reduced, in average. Instead of going to mountain, they spent this time and opportunity for other several activities. 12 persons out of 18 interviewees answered that they spent it for more care of children and housework, and 5 persons spent for business. With the improved facilities, the beneficiaries are not only released from the heavy and dangerous works but also received more opportunities for another activities for improving their quality of life.

7.4 Conservation of forest

The total annual reduction of firewood is estimated at 385tons consistency of 349tons and 36tons by the implementation of 130 units of improved stove and 40 units of improved Temascal, which will contribute great conservation of forest in Pachum area. It is roughly estimated that about 7,000m²/anuum of forest area

will be conserved in this project.

TABLES

Table II Result of Questionnaire Survey (after Project) in Pachum (1/2)

(Total interviewees : 20 persons)

0. Family member: Adult : (2.6 persons) Children : (3.9 persons) [average of 20 interviewees]

1. Do you have the improved stove ? Yes (20) NO (0)

2. Do you have the improved Temascal ? Yes (19) NO (1)

3. Improved Stoves

3a. Do you use the improved stove ? Yes (20) NO (0)

3b. How do you think about your improved stove ?

1. Very satisfied (20) 2. Satisfied little (0) 3. Not satisfied (0) 4. Do not like it (0)

3c. What is the most improved points ?

① Reduction of firewood (12) ② Less accident around fire (0) ③ Clean (0)

④ Free from smoke (8) ⑤ Easy cooking (0)

3d. Reduction of the consumption of firewood

Before Project 100 % → After Project (58 %) [average of 20 interviewees]

4. Improved Temascal

4a. Do you use the improved Temascal ? Yes (19) NO (1) *1

*1: He has iron box and is waiting a completion of construction of his Temascal

4b. How do you think about your improved Temascal ?

1. Very satisfied (19) 2. Satisfied little (0) 3. Not satisfied (0) 4. Do not like it (0)

4c. What is the most improved points ?

① Reduction of firewood (18) ② Much hot (0) ③ Clean (0)

④ Easy for burning firewood (1)

4d. Reduction of the consumption of firewood

Before Project 100 % → After Project (59 %) [average of 19 interviewees]

Table II Result of Questionnaire Survey (after Project) in Pachum (2/2)

- 4e. Because of reduction of firewood, how many times did you increase to take sauna bath Temascal ?
Before Project 1.3 times/week, → After Project 2.8 times/week, [average of 19 interviewees]
5. Trip to mountain for firewood
- 5a. Who goes to mountain for firewood ? (plural answer)
① Men (16), ② Women (17), ③ Children (2)
- 5b. With the improved facilities, did you reduce the trips to mountain because of reduction of the consumption?
Yes (17) NO (1)
- 5b. How many times do you go to mountain for firewood?
Before Project 4.2 times/week, → After Project 2.1 times/week, [average of 19 interviewees]
- 5c. If you decrease the trips to mountain, it can be said you have more time to do instead of going mountain for firewood. What kind of activities do you increase at the time you spent for firewood previously.
1. Business (5) 2. Care of children and housework (12) 3. Rest in house (1)
6. With the improved stove, do you think your quality of life and health condition are improved?
Yes (20) NO (0)
7. With the improved Temascal, do you think your quality of life and health condition are improved?
Yes (19) NO (0)

(Fin)

Table I2 Comparison of Firewood Consumption in the Cooking Facilities in Pachum, Totonicapan

(1) Weekly Firewood Consumption with Open Fire (without Project)

Family No.	Family Members			Firewood Consumption				
	Adult	Child.	Total	1st week	2nd week	3rd week	Average	
				(lb.)	(lb.)	(lb.)	(lb./week)	
A1	4	3	7	224	259	260	247.7	
A2	4	2	6	190	200		195.0	
A3	6	2	8	370	280		325.0	
A4	1	4	5	126	174		150.0	
A5	6	5	11	328	378		353.0	
A6	6	1	7			264	264.0	
A7	3	2	5			308	308.0	
A8	5	3	8			294	294.0	
A9	5	2	7			196	196.0	
							Average	259.2
							Max	353.0
							Min	150.0

(2) Weekly Firewood Consumption with Improved Stove (with Project)

Family No.	Family Members			Firewood Consumption				
	Adult	Child.	Total	1st week	2nd week	3rd week	4th week	Average
				(lb.)	(lb.)	(lb.)	(lb.)	(lb./week)
B1	3	6	9	140	130	140	135	136.3
B2	4	4	8	175	140	140	135	147.5
B3	2	3	5	70	80	80	85	78.8
B4	2	4	6	115	115	110	110	112.5
B5	4	4	8	175	150	150	165	160.0
B6	6	2	8	186	207			196.5
B7	4	9	13	150	171			160.5
B8	3	5	8	150	192	226	198	191.5
B9								
							Average	147.9
							Max	196.5
							Min	78.8

(with Project) / (without Project)	57.1%
------------------------------------	-------

Period of checking :

(1) Without Project Condition

1st week : Feb. 11-18, 2nd week : Feb. 18-25, 3rd week : Feb. 25-Mar04

(2) With Project Condition

several weeks from Jun05 to Sep03 '02

Note: A piece of normal size firewood weights 1.0-1.2 lb. approximately.

Table I3 Consumption of Firewood for Sauna "Temascal" in Pachum, Totonicapan

Family				(1) Firewood Consumption of "Traditional Tamascal" (lb.)													
No	Family Members			1st Check			2nd Check			3rd Check						Average	
	Adult	Child	Total	Wood	times	Ave.	Wood	times	Ave.	Wood	times	Ave.				(lb./time)	(total/week)
A1	4	3	7	92	2	46	92	2	46	112	2	56				49.3	98.7
A2	4	2	6	28	2	14	28	2	14							14.0	28.0
A3	6	2	8	101	2	51	101	2	51							50.5	101.0
A4	1	4	5	34	2	17	64	2	32							24.5	49.0
A5	4	9	13	102	2	51	102	2	51							51.0	102.0
A6	6	1	7							112	2	56				56.0	112.0
A7	3	2	5							112	3	37				37.3	112.0
A8	3	5	8							116	2	58				58.0	116.0
A9	5	2	7							112	3	37				37.3	112.0
Previous consumption																42.0	92.3
Max																58.0	116.0
Min																14.0	28.0

Family				(2) Firewood Consumption of "Improved Tamascal" (lb.)													
No	Family Members			1st Check			2nd Check			3rd Check			4th Check			Average	
	Adult	Child	Total	Wood	times	Ave.	Wood	times	Ave.	Wood	times	Ave.	Wood	times	Ave.	(lb./time)	(total/week)
B1	3	5	8	30	2	15	46	3	15	70	4	18	56	3	19	16.6	50.5
B2	1	3	4	34	2	17	33	2	17	46	2	23	30	3	10	16.6	35.8
B3	5	2	7	50	2	25	52	2	26	52	2	26	42	2	21	24.5	49.0
B4	2	3	5	33	3	11	44	4	11	64	4	16	74	4	19	14.1	53.8
B5	2	3	5	27	1	27	88	3	29	60	3	20	56	3	19	23.8	57.8
B6	4	3	7	-	-	-	62	4	16	76	5	15	96	5	19	16.6	78.0
Present consumption																18.7	54.1
Max																24.5	78.0
Min																14.1	35.8

Comparative consumption (1 time)	44.5%	= (present consumption)/(previous consumption)
Comparative consumption (total/week)	58.6%	= (present consumption)/(previous consumption)

Table I4 Calculation of the Benefit of Improved Stove and Improved Temascal

(1) Data of Firewood : 1 Tarea *1

a) Size: 1 Tarea = w:0.5m * h:1bara * L: 4bara = w:0.5m * h:0.84 * L: 3.36m

b) Net Volume: 1 Tarea = w:0.5m * h:0.84 * L: 3.36m * 0.784 = 1.11 m³
 (0.784: conversion factor derived from INAB)

c) Weight: 1 Tarea = 1.11m³ * 800kg/m³ = 885.1 kg = 1,951.3 lb.

d) Price: Price for 1 Tarea: around Q120-150 say, 1 Tarea = Q 130

(2) Reduction of Firewood with the Improve Stove and Improved Temascal

a) Reduction weight for 1 family for 1 week (Unit: lb.)

	w/o Project	w/ Project	Reduction
Improved Stove	259.2	145.7	113.5
Improved Temascal *2	92.3	54.1	38.2
Total	351.5	159.4	151.7

b) Reduction weight for 1 family for 1 year

1year = 52.14 weeks

	Reduction			Value
	(lb.)	(kgf.)	(Tarea)	(Q.)
Improved Stove	5,919.5	2,685.1	3.03	394.4
Improved Temascal	1,990.4	902.8	1.02	132.6
Total	7,909.9	3,587.9	4.1	527.0

Note:

*1: normal commercial unit for firewood at rural area

*2: Weekly total consumption volume (taking into consideration of increased frequency of bathing)

Conversion data

1lb. = 0.4536 kg
1bara = 33 inch = 0.84m
Specific Gravity of Firewood : 800kg/m ³

FIGURES

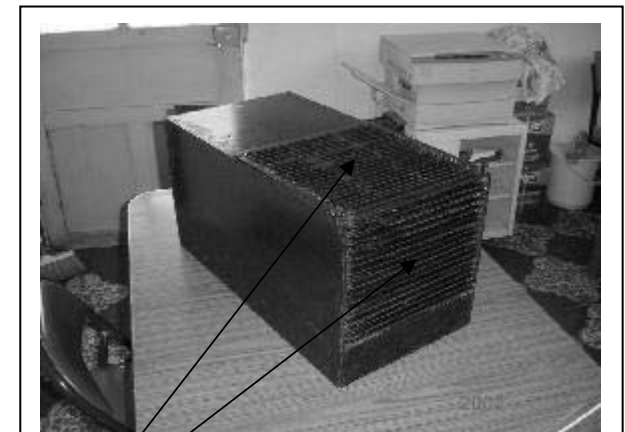
(1) Old Design



Characteristics:

This design is a closed-combustion type which allows to burn wood efficiently and moderately. However its emission of heat is not so strong as the open fire. The chimney let smoke out smoothly and safety, but also hot air will escape with smoke through chimney. On the top of the box, small cans will be put in order to generate high temperature vapor.

(2) New Design



Characteristics:

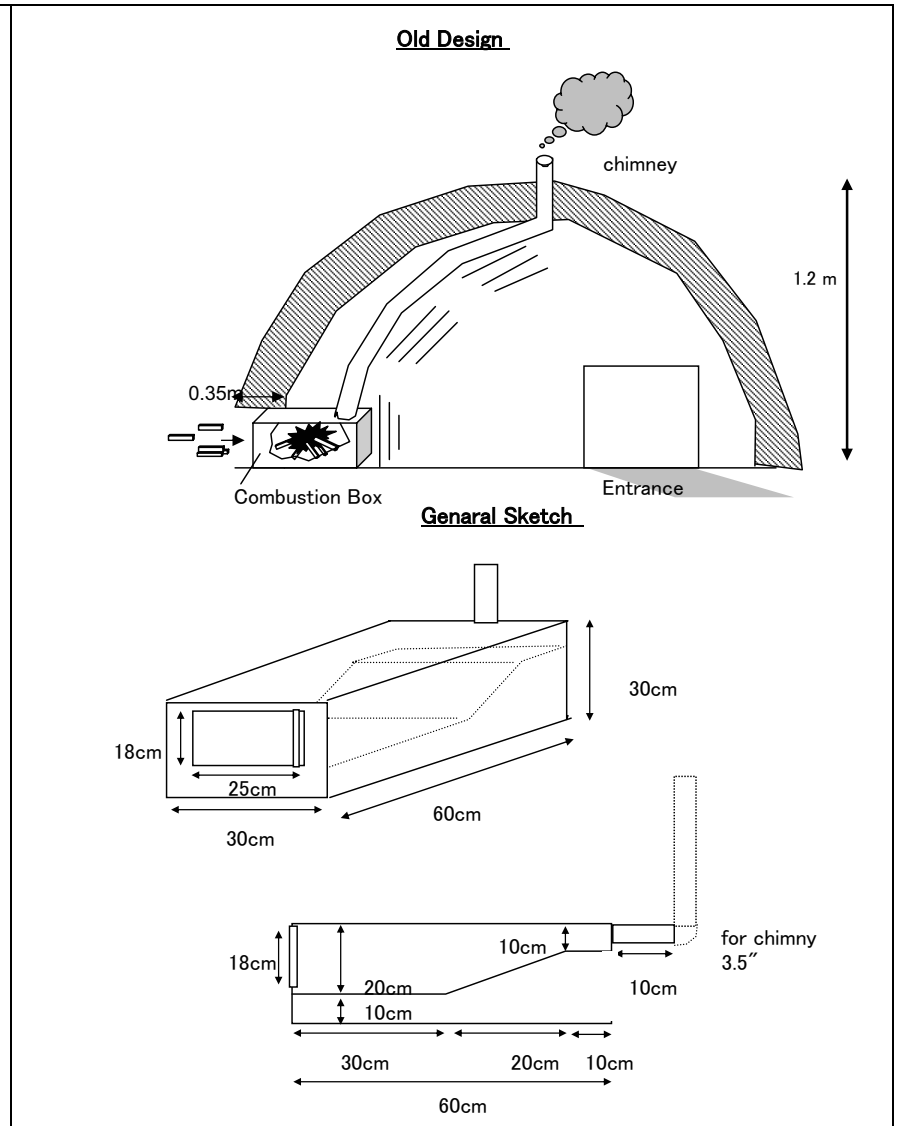
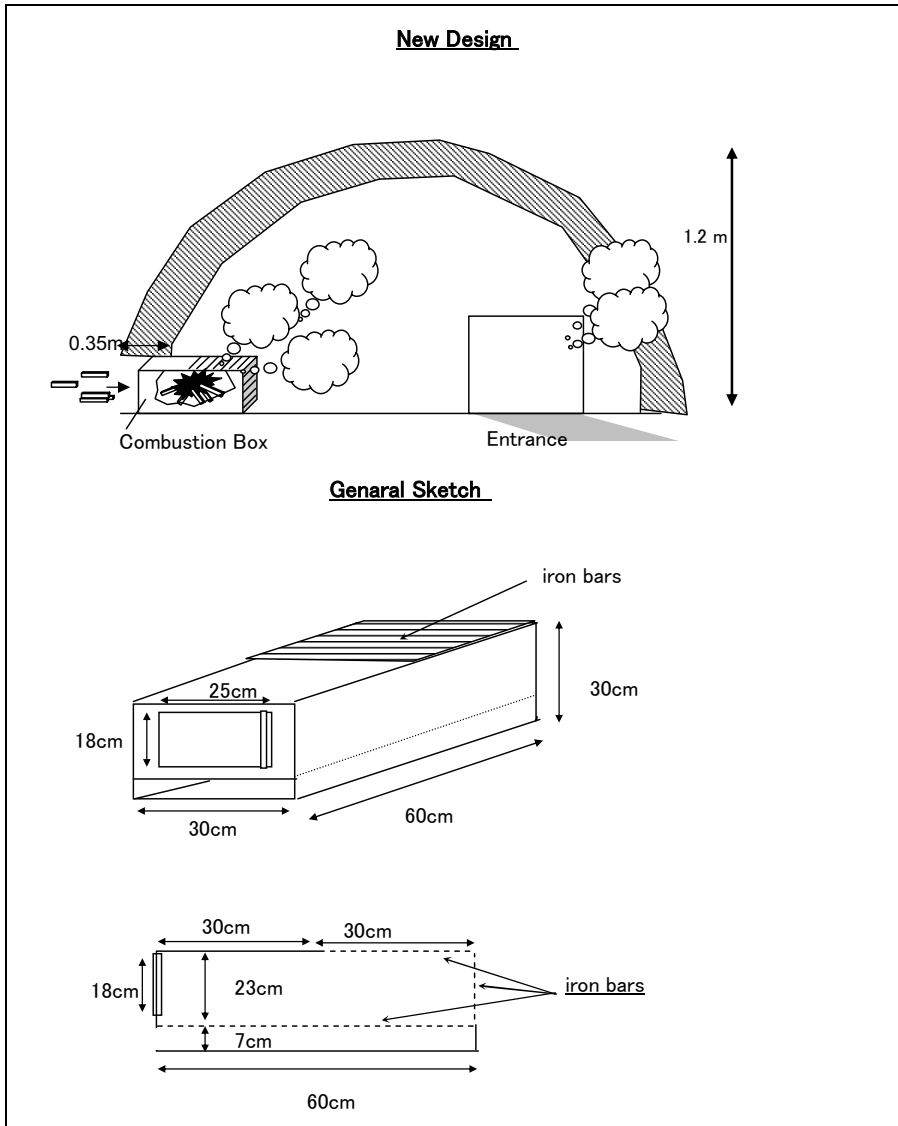
Top and end of the combustion box are opened with iron bars. There are iron bars in the middle of the box in order to supply air into the box smoothly. This design allows to emit a lot of heat from the top and the end, and fulfil hot air inside the Temascal quickly. An improvement of air supply makes firewood burned strongly with high temperature. Consumption of firewood might increase, but its amount is still far less than that of the traditional one. In order to provide the required high temperature of heat, this design abandons a function of chimney to discharge smoke.

THE VERIFICATION STUDY OF MASTER PLAN ON
SUSTAINABLE RURAL DEVELOPMENT FOR THE
REDUCTION OF POVERTY IN THE CENTRAL
HIGHLAND REGION

Japan International Cooperation Agency (JICA)

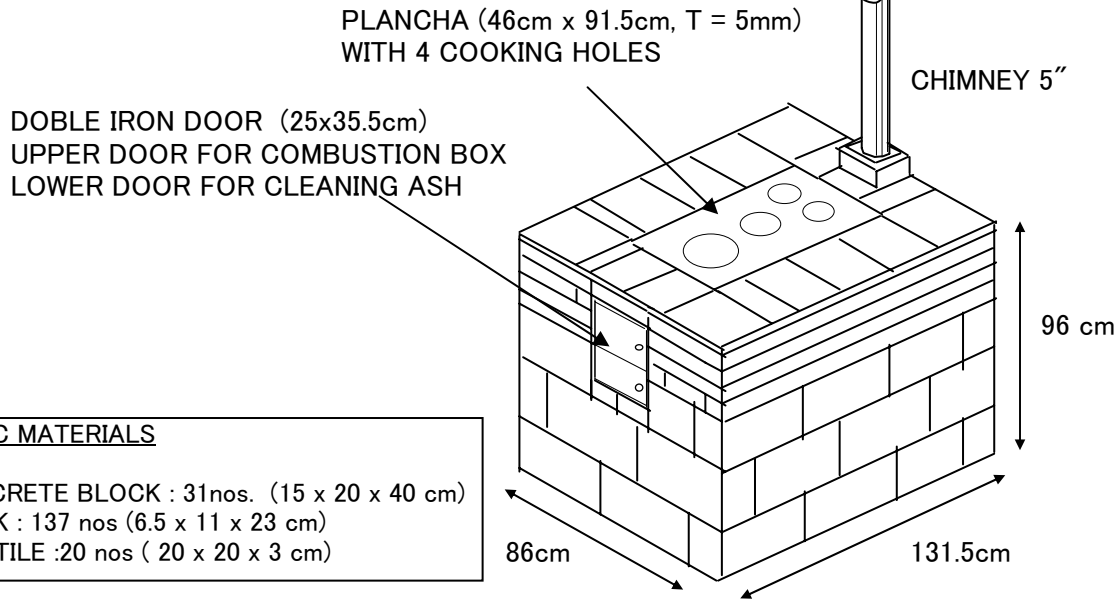
Figure I 1
Design Review and Comparison of the Temascal's
Combustion Box (1/2)

Figure 11
Design Review and Comparison of the Temascal's
Combustion Box (2/2)



ATTACHMENTS

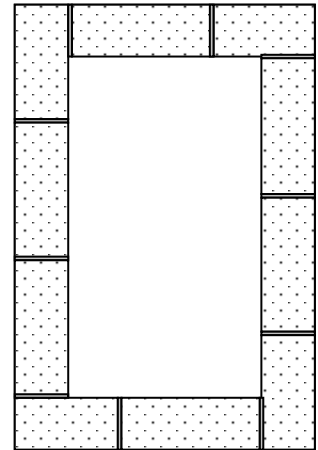
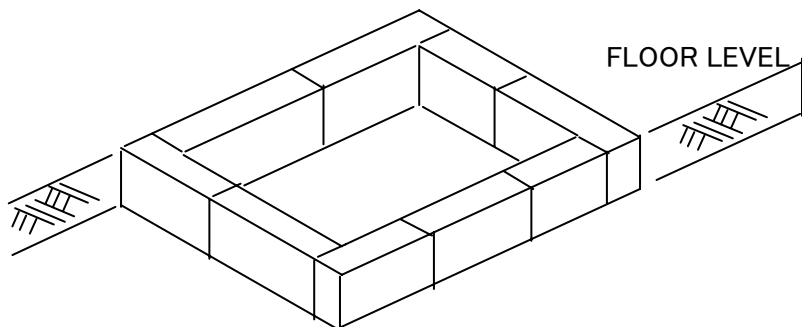
(Rendering)



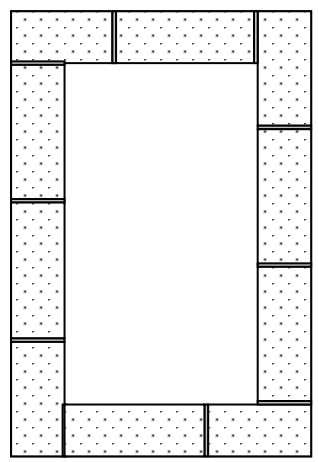
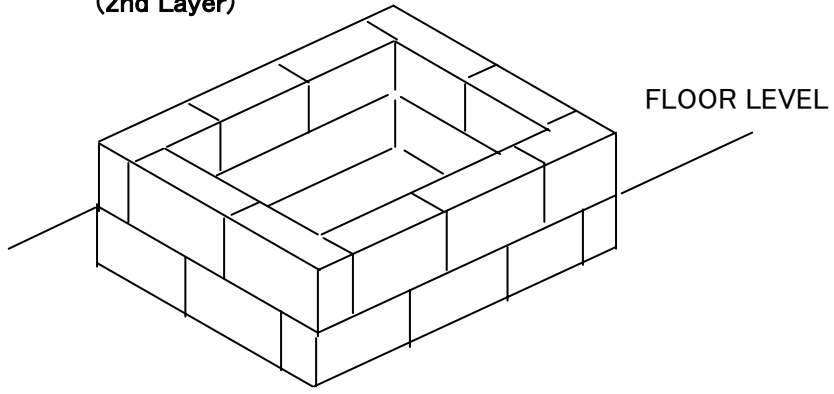
BASIC MATERIALS

- CONCRETE BLOCK : 31nos. (15 x 20 x 40 cm)
- BRICK : 137 nos (6.5 x 11 x 23 cm)
- TOP TILE :20 nos (20 x 20 x 3 cm)

(1st Layer)



(2nd Layer)

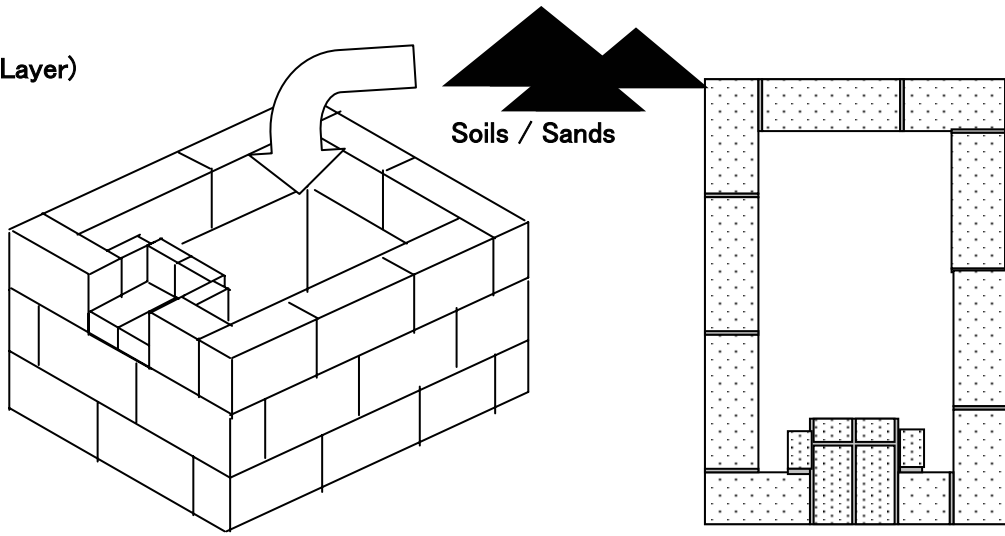


THE VERIFICATION STUDY FOR THE MASTER PLAN STUDY ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION OF THE REPUBLIC OF GUATEMALA

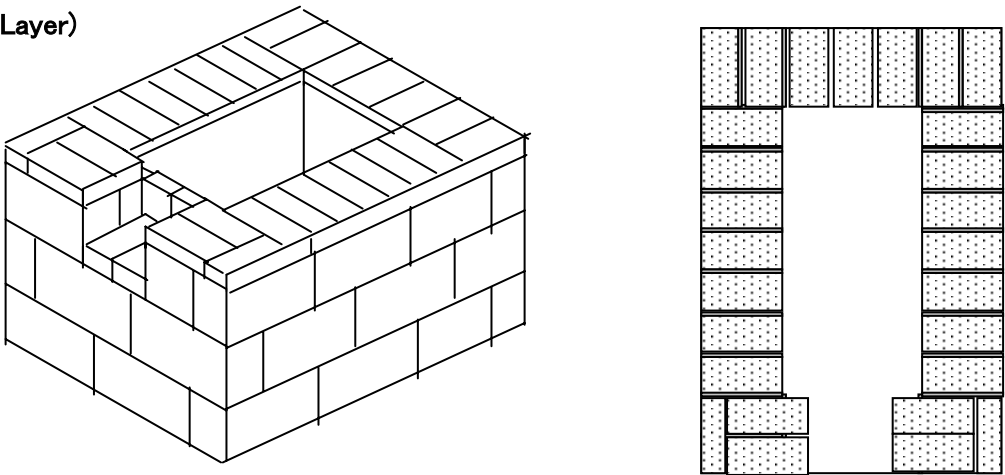
Japan International Cooperation Agency (JICA)

Figure
Design and Building Procedure of Improved Stove (1/3)

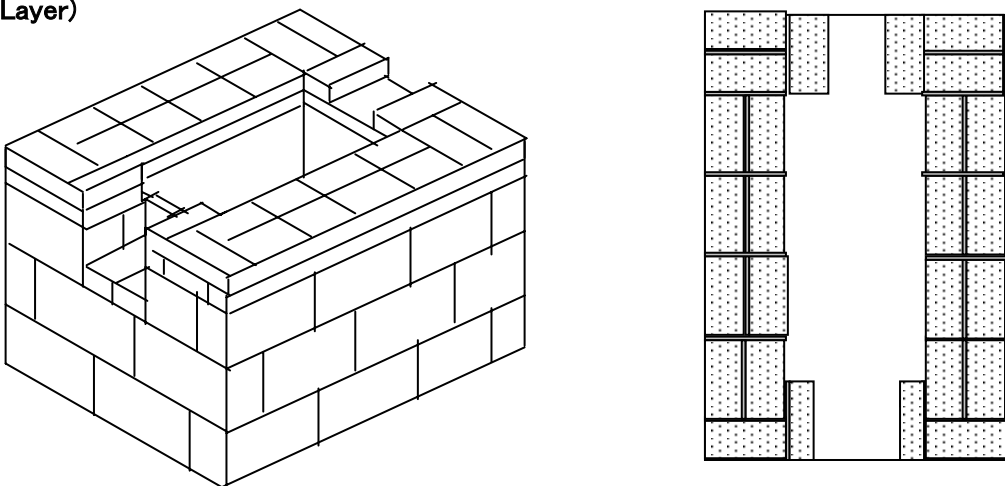
(3rd Layer)



(4th Layer)



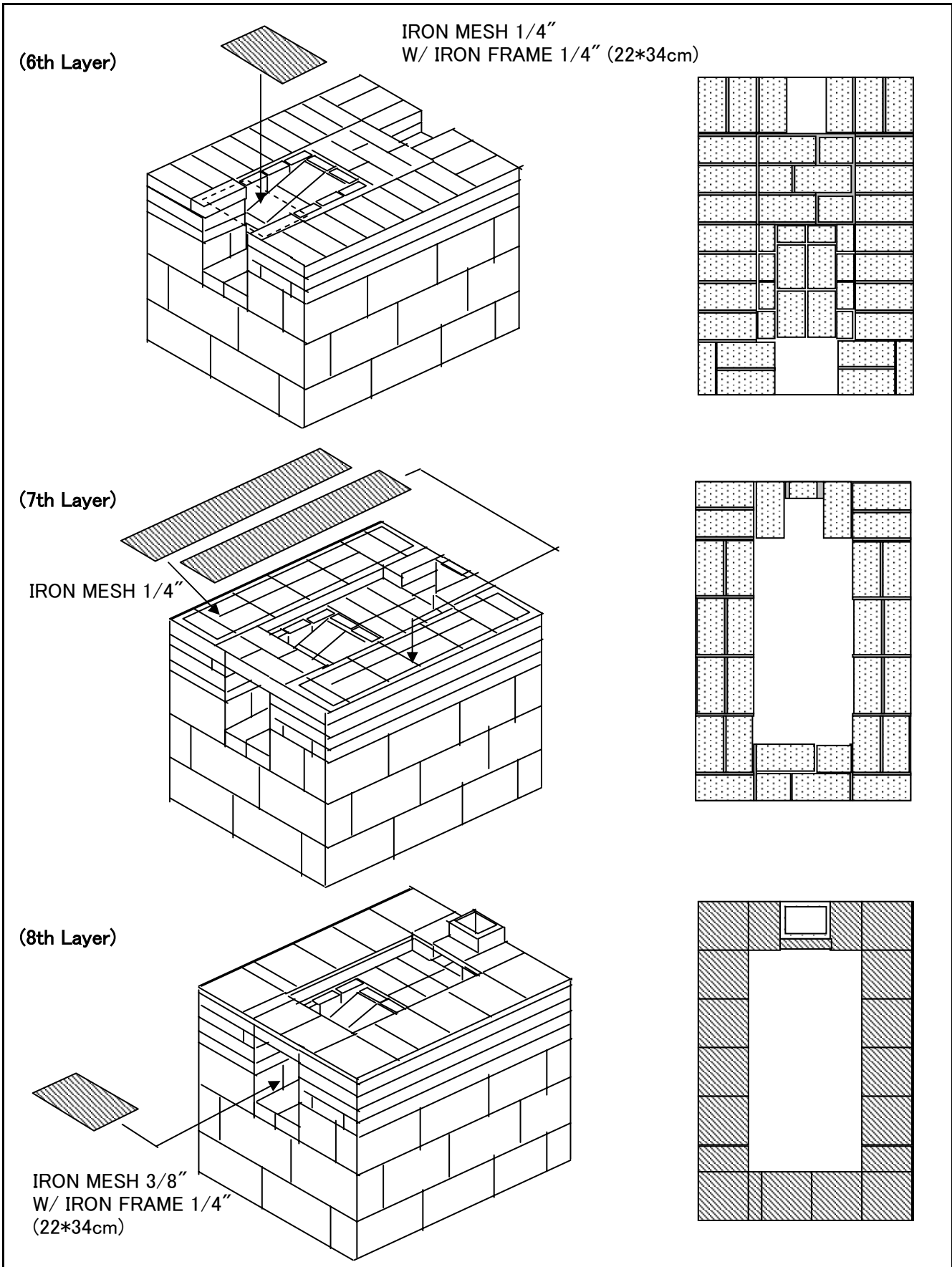
(5th Layer)



THE VERIFICATION STUDY FOR THE MASTER PLAN STUDY ON
SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF
POVERTY IN THE CENTRAL HIGHLAND REGION OF THE
REPUBLIC OF GUATEMALA

Japan International Cooperation Agency (JICA)

Figure
Design and Building Procedure of
Improved Stove (2/3)



THE VERIFICATION STUDY FOR THE MASTER PLAN STUDY ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION OF THE REPUBLIC OF GUATEMALA

Japan International Cooperation Agency (JICA)

Figure
Design and Building Procedure of Improved Stove (3/3)

CUESTIONARIO

PROYECTO DE ESTUFAS MEJORADAS Y TEMASCALES MEJORADOS EN LA COMUNIDAD DE PACHUM, TOTONICAPÁN

Nombre: _____

Sector: _____

Cuantos miembros son en su familia:

Adultos: _____ Niños: _____

1. ¿Se preocupa o esta interesado de la situación actual y futura del cuidado y preservación del bosque en su comunidad?

Nada Poco Algo Bastante

Por que

2. ¿Antes de la recibir las capacitaciones cual era su opinión acerca del cuidado y preservación del medio ambiente?

Nada Poco Algo Bastante

3. ¿Luego de recibir las capacitaciones tienen diferentes opiniones acerca del cuidado y preservación del medio ambiente?

Cuales son:

4. ¿Cuántas veces usted va a traer leña a la montaña por semana?

Ninguna Una vez Dos veces Tres veces o más veces

5. **¿Aproximadamente cuantas horas y que distancias tiene que caminar para ir a traer su leña.**

6. **¿Qué tan difícil trabajo es para usted ir a traer leña a la montaña comparado con las demás actividades diarias del día?**

Muy difícil difícil Fácil Muy Fácil Ningún problema

7. **¿Le preocupa mucho el humo dentro de su casa cuando hace su comida?**

SI NO

Por que

8. **¿Si NO, cree que le hace daño el humo a sus hijos, cocinado con el fuego abierto dentro de su casa?**

9. **¿Cuales son los problemas y/o (riesgos) al tener fuego abierto dentro de su casa? Ordenen los siguientes problemas según su importancia, del 1 al 4.**

Humo Quemarse Caerse los alimentos Dificultad al cocinar

10. **¿Cuales son los problemas y/o (riesgos) al utilizar fuego abierto (brasas o piedras calientes) dentro del temascal?**

Quemarse Intoxicarse (ahogarse) Enfermarse Morirse

11. **¿Cuantas veces se baña en el temascal a la semana?**

Ninguna Una Dos Tres Cuatro

12. **¿Son suficientes estos baños para usted?**

SI NO

13. ¿Si No, cual es la razón de no poderlos tomar. Ordenenar las siguientes razones según su importancia, del 1 al 3.

Falta de leña Falta de agua Otra causa _____

Si es falta de leña, porque:

Muy cara difícil de conseguir

14. ¿Si se reduce la cantidad de leña que se usa en el temascal, tomaría más baños en el temascal por semana?

SI NO

Si, sí cuantas veces más tomaría el baño en el tamascal en cada semana?

Tres Cuatro Cinco o mas veces

15. ¿Le cuesta conseguir u obtener la leña mas en?

Época de Verano difícil Fácil

Cuantas veces a la semana consigue leña en esta época: _____

Época Invierno difícil Fácil

Cuantas veces a al semana consigue leña en esta época: _____

16. ¿Usted espera que la implementación de estufas mejoradas mejorara su vida en su hogar y salud. ?

Nada Talvez Mucho Bastante

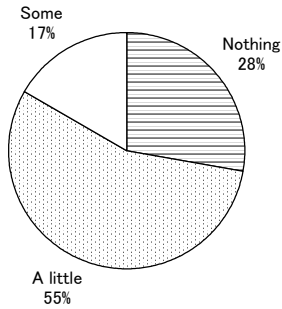
17. ¿Usted espera que la implementación de los temascales mejorados mejorara su vida en su hogar y salud. ?

Nada Talvez Mucho Bastante

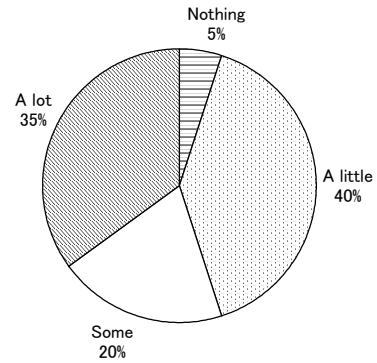
Figure Summary of Answer of Questionnaire –before Project (1/2)

(Total interviewees : 20 persons)

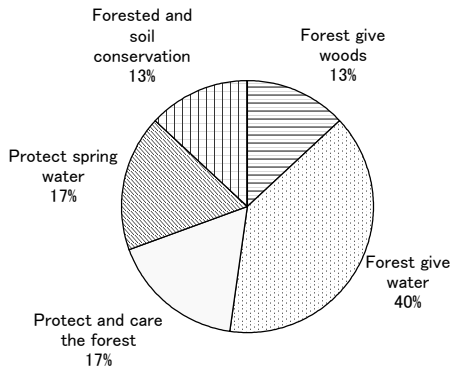
Q1. Before receiving the capacitation did you have anxious or interests in the present and future forest condition in your community?



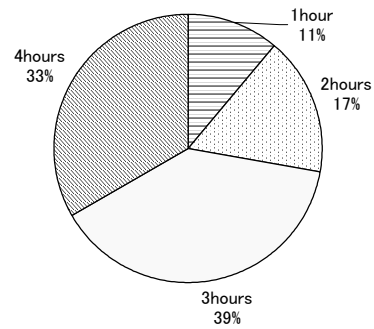
Q2. Now that (after capacitation), are you interested in the preservation of the environment/forest?



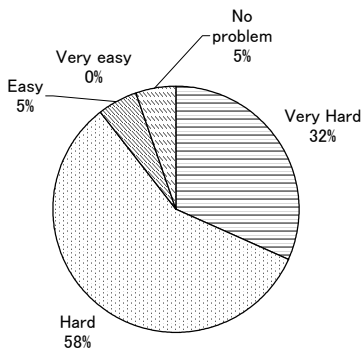
Q3. In the capacitation of preservation of forest, which point do you have more interest ?



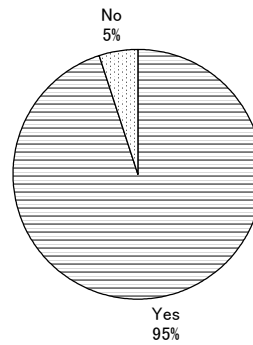
Q4. Approximately how many hours do you have to work to bring the wood? (walking hours and working hours in mountain)



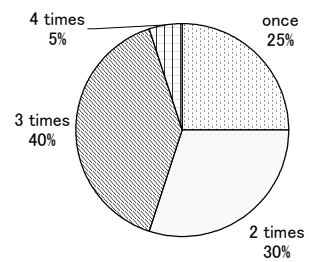
Q5. How hard is it for you to bring the wood from the mountain?



Q6. Do you worry about the smoke inside your house while you are cooking ?



Q8. How many times per week do you take a bath Temascal ?



Q7. What is problem of smoke?

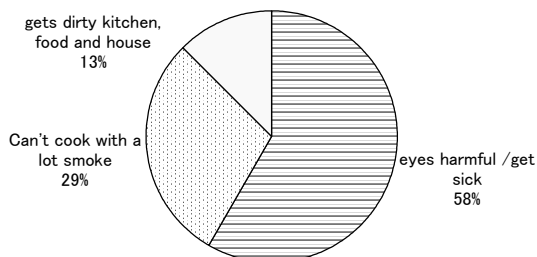
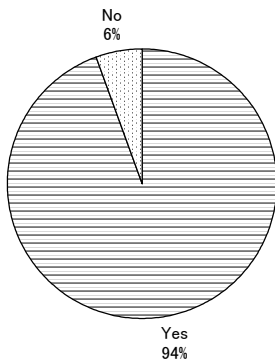
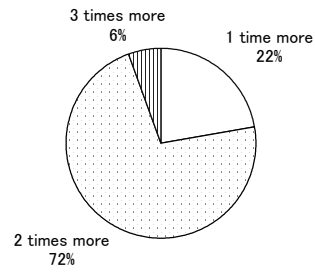


Figure Summary of Answer of Questionnaire –before Project (2/2)

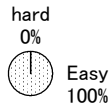
Q9. If you could decrease the consuming amount of woods, you would use the Temascal more often?



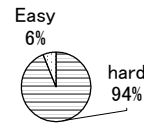
Q10. If you could decrease the consuming amount of woods, How often do you want to increase bath taking ?



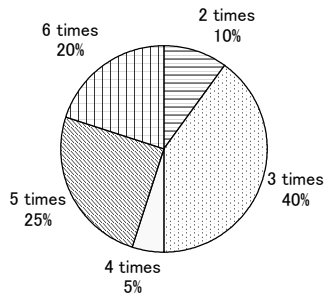
Q11-1. Is it hard to get the wood in dry season?



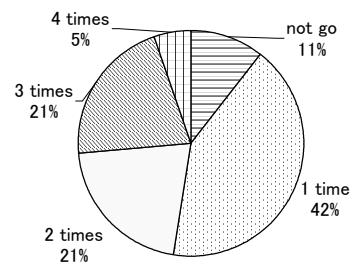
Q12-1. Is it hard to get the wood in wet season?



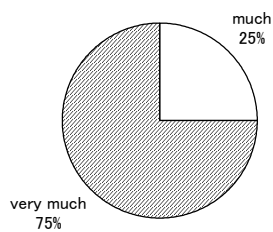
Q11-2. How many time per week do you go mountain to get the wood in dry season?



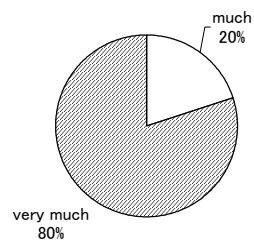
Q12-2. How many time per week do you go mountain to get the wood in wet season?



Q13. Do you expect that the implementation of the improved stove project will improve your life, your home and your health?



Q14. Do you expect that the implementation of the improved Temascal project will improve your life, your home and your health?



CUESTIONARIO

PROYECTO DE ESTUFAS MEJORADAS Y TEMASCAL MEJORADOS EN LA COMUNIDAD DE PACHUM, TOTONICAPAN

Nombre: _____

Sector: _____ Cédula _____

Cuanto miembros son en su familia

Adultos : _____ Niños _____

1. Tiene estufa mejorada (SI NO)

2. Tiene temascal mejorado (SI NO)

3. Sobre ESTUFA MEJORADA

3a. Esta usando su estufa mejorada ? (SI NO)

(Si, no esta usando, Porque _____)

3b. Que piensa de su estufa mejorada ?

1. Muy contento 2. Poco contento 3. No contento 4. No le gusta

3c. Que puntos han mejorado, comparado con anterior?. Ordene los siguientes puntos según su importancia.

①() Usa poca leña (SI / NO)

②() Mas seguro : ningún accidente de quemarse y caerse sobre la comida (SI / NO)

③() Mas limpio (SI / NO)

④() No humo en casa (SI / NO)

⑤() Mas cómodo para cocinar (SI / NO)

⑥()Otros _____

3d. Con la estufa mejorada, cuanto por ciento de la leña disminuyo, comparado con anterior el uso de leña sin estufa ?

Antes 100 % → Ahora (_____ %)

4. Sobre TEMASCAL MEJORADO

4a. Esta usando su Temascal mejorado ? (SI NO)

(Si, no esta usando, Porque _____)

4b. Que piensa de su Temascal mejorado?

1. Muy contento 2. Poco contento 3. No contento 4. No le gusta

4c. Que puntos han mejorado, comparado con anterior. Ordene los siguientes puntos según su importancia?

() Usa poco leña (SI / NO)

() Mas caliente (1)que el temascal tradicional: (SI / NO), (2) que la caja vieja: (SI / NO)

() Mas limpio (SI / NO)

() Mas fácil para quemar la leña (SI / NO)

() Otros _____

4c. Con el Temascal mejorado, cuanto por ciento de la leña para prepararla, disminuyo que anteriormente?

Por una preparación de temascal : Antes 100 % → Ahora (_____ %)

4d. Con el Temascal mejorado, aumenta frecuencia de tomar baño por semana? (SI / NO)

Cuantas veces ? (1) Antes _____ veces por semana, → (2) Ahora _____ veces por semana

5. Traer leña a la montaña

5a. Quien va a traer leña a la montaña?

Hombre (SI / NO), Mujer (SI / NO), Niños (SI / NO)

5a. Con la estufa mejorada y el temascal mejorado, piensa que disminuyo de frecuencia de traer leña a la montaña, porque ha disminuido el uso de la leña?

(SI / NO)

5b. Cuantas veces menos que anteriormente usted va a traer leña a la montaña por semana?

Cuantas veces ? (1) Antes _____ veces por semana, → (2) Ahora _____ veces por semana

5c. El tiempo para ir a traer leña ha disminuido, entonces que tipo de actividad usted realiza para aprovechar ese tiempo?

Toma su tiempo para: 1. Negocio 2. Cuidado de sus niños 3. Lavar, cocinar, limpiar

4. Descansar en la casa

6. Usted piensa que la implementación de estufas mejoradas ha mejorado su vida en su hogar y salud?

(SI / NO)

7. Usted piensa que la implementación de Temascal mejorados ha mejorado su vida en su hogar y salud?

(SI / NO)

(Fin)

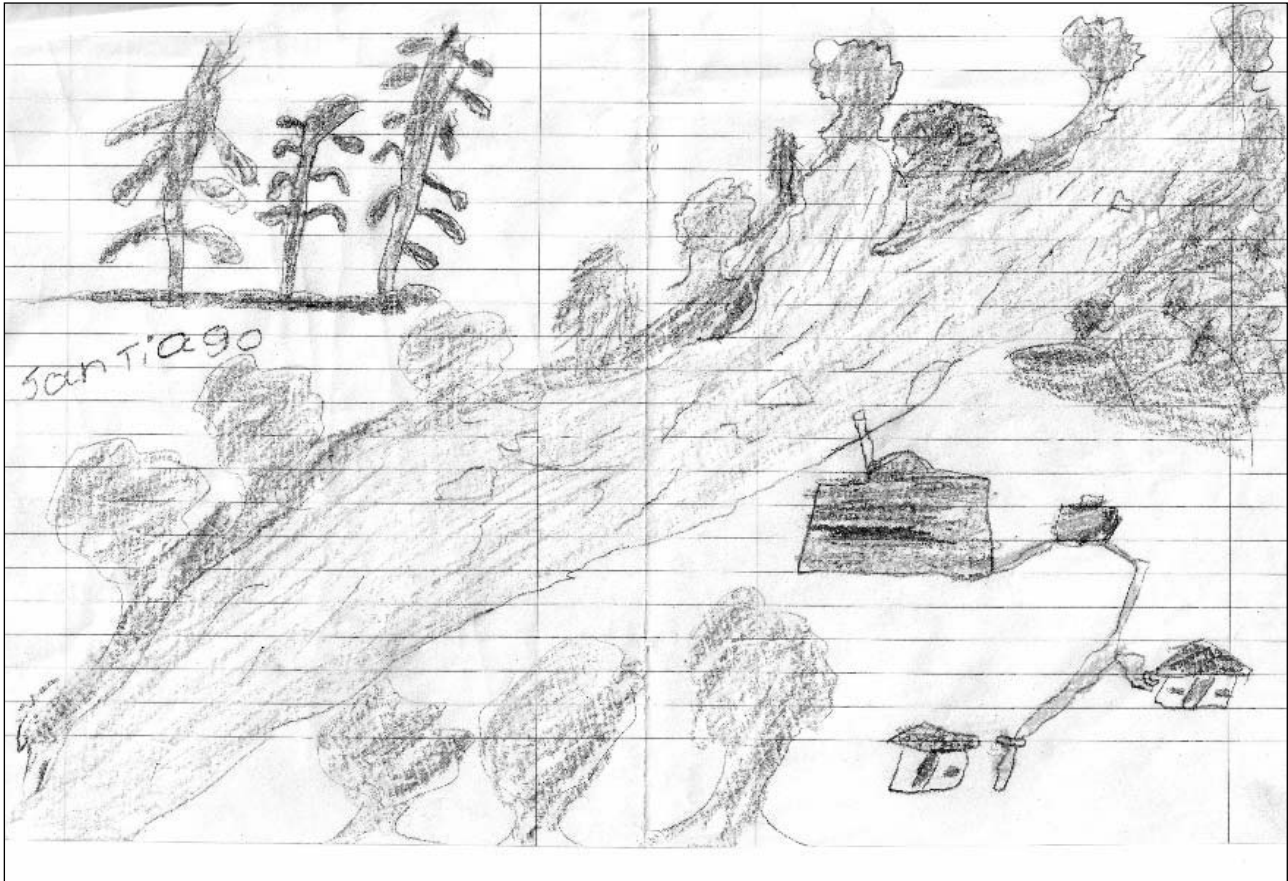
Table Result of Questionnaire Survey after Project in Pachum (1/2)

No.	Nombre	Sector	Cedula	Familia		1	2	3a	3b	3c						3d	4a		
				Adalto	Nino					si,NO comment	1	2	3	4	5		6	6 otro	%
1	Maria Pú López	2	H8 29,290	2	3	Si	Si	Si	1	5	4	3	1	2			50	Si	
2	Juana Mejia López	2	F83 y P84,P93-L43	5	1	Si	Si	Si	1	1	4	2	3	5			60	Si	
3	Magdalena Lux Lopez	2	F-065-P-238-L50	2	3	Si	Si	Si	1	1	5	3	2	4			70	Si	
4	Maria Chiti Lux	2	H8 25,837	2	3	Si	Si	Si	1	1	5	3	2	4			60	Si	
5	Catarina Pu Chacaj	2	Lost	4	2	Si	Si	Si	1	2	5	3	1	4			25	Si	
6	Magdalena Lopez Lux	2	H8 32,262	2	6	Si	Si	Si	1	2	5	3	1	4			70	Si	
7	Catarina Lopez Lux	2	No	2	3	Si	Si	Si	1	2	5	3	1	4			50	Si	
8	Ana Lux Mejia	3	H8 27,871	2	4	Si	No	Si	1	2	5	3	1	4			50	No	waiting cor
9	Cristina Lux Uz	3	H8 21,902	3	4	Si	Si	Si	1	1	4	3	2	5			60	Si	
11	Maria Leon Lux	2	L15-F240-P409	3	5	Si	Si	Si	1	1	5	3	2	4			60	Si	
12	Catarina lux Mejia	2	H8 32,274	2	3	Si	Si	Si	1	1	4	3	2	5			60	Si	
13	Catarina Muz Mejia	2	L5-F293-P587	2	8	Si	Si	Si	1	2	5	3	1	4			50	Si	
15	Juana Lux Ordoñez	2	L4-F225-P1109	2	7	Si	Si	Si	1	2	5	3	1	4			60	Si	
16	Estela Lopez Uz	3	L22-F66-P131	4	5	Si	Si	Si	1	2	5	3	1	4			50	Si	
17	Antonia Chacaj Tzoy	2	L13-F278-P162	4	3	Si	Si	Si	1	1	4	3	2	5			70	Si	
19	Juana Lux Lopez	1	H8 24,649	2	5	Si	Si	Si	1	1	4	3	2	5			70	Si	
21	Maria Teresa Batten Vicer	1	H8 27,463	2	3	Si	Si	Si	1	1	5	3	2	4			50	Si	
23	Isabel Lux Uz	1	H8 28,145			Si	Si	Si	1	1	5	3	2	4			70	Si	
24	Elia Magdalena Lux Castr	1	H8 26,107	2	3	Si	Si	Si	1	1	5	3	2	4	6	Less illness	70	Si	
31	Catarina Muz Lux	1	L17-F108-P215	2	3	Si	Si	Si	1	1	4	3	2	5	6	Less illness	60	Si	
	Average			2.58	3.89				1.00	1.55	4.65	2.95	1.65	4.20	6.00		58.3		
	Sum																		

I-I-11

Table Result of Questionnaire Survey after Project in Pachum (2/2)

No.	Nombre	4b	4c-1					4c-2	4d (veces/semana)		5a				5b (veces/semana)		5c	6	7
			1	2	3	4	5		5 otro	%	antes	ahora	hombre	mujer	nino	compro			
1	Maria Pú López	1	4	3	2	1		50	1	2	Si	Si	No	No	2	1	2	Si	Si
2	Juana Mejia López	1	1	4	2	3		60	1	2	Si	Si	No	No	3	1	4	Si	Si
3	Magdalena Lux Lopez	1	1	2	3	4		70	1	3	No	No	No	Si	3	2	1	Si	Si
4	Maria Chiti Lux	1	1	4	2	3		60	1	3	No	No	No	Si	4	2		Si	Si
5	Catarina Pu Chacaj	1	1	4	3	2		25	2	3	No	Si	No	No	3	2	2	Si	Si
6	Magdalena Lopez Lux	1	1	4	3	2		70	1	3	Si	Si	No	No	5	2	2	Si	Si
7	Catarina Lopez Lux	1	1	4	2	3		50	1	2	Si	Si	No	No	5	2	1	Si	Si
8	Ana Lux Mejia																	Si	
9	Cristina Lux Uz	1	1	4	2	3		60	2	3	Si	Si	No	No	4	2	2	Si	Si
11	Maria Leon Lux	1	1	4	2	3		60	1	2	Si	Si	No	No	4	2	2	Si	Si
12	Catarina lux Mejia	1	1	4	2	3		60	2	3	Si	Si	No	No	4	2	1	Si	Si
13	Catarina Muz Mejia	1	1	4	2	3		50	3	5	Si	Si	Si	No	2	1	2	Si	Si
15	Juana Lux Ordoñez	1	1	4	2	3		70	1	2	Si	Si	No	No	5	3	1	Si	Si
16	Estela Lopez Uz	1	1	4	2	3		50	1	2	Si	Si	Si	No	5	2	2	Si	Si
17	Antonia Chacaj Tzoy	1	1	4	2	3		70	1	3	Si	Si	No	No	5	3	2	Si	Si
19	Juana Lux Lopez	1	1	4	2	3			1	3	Si	Si	No	No	5	3	1	Si	Si
21	Maria Teresa Batten Vicer	1	1	3	2	4		50	2	3	Si	Si	No	No	5	2	2	Si	Si
23	Isabel Lux Uz	1	1	4	2	3		70	1	3	Si	Si	No	No	4	2	2	Si	Si
24	Elia Magdalena Lux Castr	1	1	2	4	3		70	1	3	Si	Si	No	No	6	2	2	Si	Si
31	Catarina Muz Lux	1	1	4	2	3		60	1	3	Si	Si	No	No	5	3	2	Si	Si
	Average	1.0	1.2	3.7	2.3	2.9		58.6	1.3	2.8					4.2	2.1			
	Sum																		



Comment :

The capacitation in school of Pachum aimed for providing an conception of a series of connection among their communal forest, firewood, ground & surface water and their drinking water.

After the capacitation, we asked students to express in drawings what they learned in the capacitation and about 40 drawings were gathered from the students.

The above drawing were selected as the first prize of such drawings by school teachers, students and MAGA staff.

This drawing shows thick forest, deforested hills, rivers, an intake tank of drinking water (a box in center of the drawing), drinking water pipelines to their houses, and expresses those connections simply, but directly.

It is our wishes that all the children have such view of looking at nature, specially at forest, as a important part of their lives, and growing up to adults.

THE VERIFICATION STUDY FOR THE MASTER PLAN STUDY
ON SUSTAINABLE RURAL DEVELOPMENT FOR THE
REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND
REGION OF THE REPUBLIC OF GUATEMALA

Japan International Cooperation Agency (JICA)

**Student's Drawing after the
Capacitation of Forest Conservation**

Table : Size and Number of Block, Brick and Tile for 1 Improved Stove –Detailed

Materials	Size (cm)			Number of Materials (nos.)								
	Width	Height	Length	1st layer	2nd layer	3rd layer	4th layer	5th layer	6th layer	7th layer	8th layer	Total
Concrete Block type 1*	15.0	20.0	40.0	6	6	5					0.5	17.5
Concrete Block type 2	15.0	20.0	29.0	2	2	1						5
Concrete Block type 3	15.0	20.0	33.5	2	2	2						6
Concrete Block type 4	15.0	20.0	30.5			1						1
Concrete Block type 5	15.0	20.0	14.5			1						1
Total												30.5
Brick type 1*	4.5	11.0	22.0			6	25	24	41	27		123
Brick type 2	4.5	7.5	22.0				2	2	2			6
Brick type 3	4.5	11.0	17.0						3	2		5
Brick type 4	4.5	5.0	22.0						3			3
Total												137
Tile type 1	20.0	20.0	1.0								14	14
Tile type 2	20.0	12.6	1.0								2	2
Tile type 3	20.0	5.0	1.0								1	1
Tile type 4	20.0	5.2	1.0								1	1
Tile type 5	20.0	10.3	1.0								2	2
Total												20

Note: * original size

Table : Materials for 1 improved Temascal

Materiales	Cantidad	Unidad	Discripcion
Tubo de Chimenea	4	no	de 3.5 pulgada
Sombrero	3	no	de 3.5 pulgada
Codos de Chimenea	1	no	de 3.5 pulgada
Caja de Combucion	1	no	
Lamina para techo	5	sheet	de 10 pies
Clavos	2.0	lbs	de 6 pulgada
Clavo para lamina	1.5	lbs	
Vigas	3	no	de 5 pie
Adobe (sun-dried bricks)	210	no	

Table : Manpower for 1 improved Temascal

Monpower	Cantidad	Unidad	Discripcion
Plasterer (skilled)	5	man-day	
Assistant (un-skilled labor)	5	man-day	