VIE / 86 / 020

CERPAD

Ninh Van pilot actions

June 1991

Technical dossiers

Development Workshop

Center for Rural Planning and Development
Hanoi-Vietnam

GRET

Credits

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1 US $ = 11 000 Dongs (October 1991)

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Disclaimer

1. Introduction

The development of the Technical Dossiers presented in this document have had a dual objective. The first has been to define the content of actions which were proposed for Ninh Van Commune, and to this end the dossiers, developed in most cases initially in Vietnamese, have been functional. But the second purpose of developing the technical dossiers has been to stress the importance of clearly stating the context and the problem to be solved, to state the specific objectives of the proposed action and to define the criteria on which its choice was made and against which it can be subsequently evaluated. CERPAD staff have been encouraged to take greater care in the presentation of working drawings and more accurate cost estimating. As such, the technical dossiers represent the development of a more rigourous approach to technical decision making and cost analysis. Although there remains scope for improvement, more recent dossiers reflect for the most part this improvement.

CERPAD are now starting to develop short reports on these actions, with an evaluation of real costs compared against original estimates, and an three examples are included following the actions 1.1, 1.2, and 2.2.

In parallel to the development of action oriented 'technical dossiers', CERPAD are also starting to prepare guide-line documents, of which three are provided under separate cover, as follows:

"Techniques of constructing and using water supply works in rural areas" CERPAD, Hanoi, 1991.

"Techniques on construction and using improved stove and biogas tank" CERPAD, Hanoi, 1991.

"Housing construction by rammed earth" CERPAD, Hanoi, 1991.

TECHNICAL DOSSIER FORMAT

NAME OF ACTION:

NAME OF VILLAGE:

1. Context

Physical...

Social...

Economic...

2. Problems identified

3. Objectives

4. What innovation is being proposed

5. Criteria for choosing this solution

(e.g. affordability, durability, use of local materials, etc.)

6. Drawings of proposed action (details, plans, sections)

List materials required and quantities

7. Construction process

8. Material quantities, cost and labour breakdown

9. How the technology will be operated and managed

10. Detailed implementation process step-by-step

11. Media used for wider dissemination

12. Budget breakdown

TOTAL	
COMMUNE	%
USERS	%
DISTRICT	%
PROJECT VIE/86/020	%

13. Signatures

Annex 2. Draft technical dossiers

Two draft technical dossiers, as prepared by CERPAD staff using the format proposed by DW/GRET (see Annex 1), are reproduced on the following pages. These represent the best dossiers prepared.

LIST OF ACTIONS

N°	ACTION	START ON
1.1	Dust stone concrete	July 91
1.2	Cement tile tests	April 91
1.3	Stone column	April 91
1.4	Stone masonry	April 91
2.1	Family water filter tank	April 91
2.2	Public well in Phu Lang	April 91
2.3	Rain water tank	
2.4	Public washing point	
2.5	Water filter research	April 91
2.6	Water testing programme	April 91
3.1	Latrine programme	
4.	Van Le new settlement	July 91
7.1	Road system : equipment	July 91
7.2	Road maintenance	October 91
8.	Credit system	
9.	Stone production	
10.	Commune market	
11.	Road Van Le / Tam Diep	April 91
12.	Improved stoves	
13.	Develop commune capacity	April 91

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Ninh Van pilot action 1.1

Technical dossier

Stone dust in concrete

1. Context

As a commune located in mountaine area, stone production is a major carrier in the commune, and stone dust is available and cheaper than sand bought from outside. Comparison the price as following:
- stone dust 10,000 d/m3
- sand 27,000 d/m3

Ninh Van commune has a very limited territory, meanwhile the population increase rapidly and the plot for a house only from 180 to 200 m2. By the pressure of land shortage, the people in Ninh van are obliged to extend their house to two storey one, so in the first phase of building they often construct reinforce concrete flat roof, that prepares for the second phase as first floor of the house.

Ninh van is also in the low-land area, during the rain season it is flooded, some time the flooding water go inside the houses, causes damage the ground floor surface, it have also bad influenced to the health of people.

2. Problem

The cost of reinforce concrete flat roof is high proportion in the total cost of a house; in typical traditional house, it is 25-30% depends on its quality as well as on standard of the house. The reduce of floor cost is remarcable.

The quality of ground floor surface of houses in general is very poor, it is easy broken and damaged especially after flooding .

3.Objectives

* Examine possibility to reduce concrete cost
* Demonstrate viability of using stone dust for (1) reinforce concrete floor and (2) concrete ground floor.

4. Innovation is being proposed

¤ Checking the possibility to replace sand by stone dust in reinforce concrete and in ground floor concrete.

5.Criterias for choosing

* Using local materials.
* Reduce the cost of concrete.
* The floor is easy to clean, suffering special load and flooding.
* Acceptable in the commune.

6.Drawing and materials require

¤ To determine the composition of concrete M150, it is necessary to test concrete samples at the age 3,7,14 and 28 days, with 3 different compositions using either local cement or Bimson cement, a group of sample needs 3 samples. In total the number of samples are:
- 3 samples x 3 compo. x 4 age = 36 samples

¤ To introduce a suitable technique for floor surface in flooding area, it is neccessary to construct a experimental ground floor 10-15 m2 that is easy to clean, can suffer specific loads and flooding.

MATERIALS REQUIRE:

Bimson Cement	50 kg
Heduong Cement	250 kg
Stone dust	2.5 m3
Sand	0.5 m3
Gravel 1 x 2	0.5 m3
Wasted lime	1.5 m3
Broken brick	1.2 m3

7. Research process

* At the IBM:
- Testing concrete samples composite by differente materials and proportions: press strengh
-Determining the best composition using stone dust and local cement.

* At the CERPAD:
- Determine granular diagram of stone dust in Ninhvan.
- Experimental construction 15 m2 ground floor, using stone dust, wasted lime and Heduong cement.
- Economic analise and compare the cost.
- Compile the procedure of concrete work using local materials.

* At Ninh van commune:
Traning the masons in Ninhvan commune by demonstrating 16 m2 ground floor and reinforce concrete lintels, ring beams of Ninhvan market.
- Evaluation based on the criterias mentioned above.

8.Materials/ cost/ labour breakdown

MATERIALS	UNIT	QUANTITY	UNIT COST	TOTAL	LABOUR SKILL	LABOUR COST	LABOUR TOTAL	TOTAL
1. Stone dust	m3	2.5	15,000	37,500				
2. B.son cement	kg	50	480	24,000				
3. Local cement	kg	250	420	105000				
4. Sand	m3	0.5	35,000	17,500				
5. Gravel 1x2	m3	0.5	23,000	11,500				
6. Wasted lime	m3	1.5	45,000	67,500				
7. Broken brick	m3	1.2	30,000	36,000				
8. Made & test concrete sample at IBM					36sam	4,000	144000	
9. Experiance floor at CERPAD					5	12,000	60000	
10.Training in Ninh van commune *								
				299,000			204000	503000

Note: * Training the local builders will carry out during construction process the Ninhvan market (Action 10)

9. Implementation process

Introducing the technology to the masons in the commune, analizing the advantages and economic effect that could be brough when using stone dust insteed of sand.
Training masons in the commune for using local materials and composition necessary.

10. Describe media for wide diffusion

Publish a sheet of the technology with:
- composition of concrete using local materials;
- technique notes of concerte works and ground floor surface.

11. Budget break down

From subcontract: for research and experimentation: 503,000 d

Training (budget of action 10):

- Training workers in Ninh van:
Trainer 60,000d x 10 day = 600,000 d .
Trainees 5 masons
48,000 x 5 masons x 10 days = 2,400,000 d
Total :3,000,000 d

REPORT OF ACTION 1.1 : USING STONE DUST IN CONCRETE

I. TESTING IN IBM

Concrete samples with 3 compositions as following have been produced and tested to determine the best composition by using stone dust replacing sand . The samples had been test to check the possibility of using local cement (He duong) instead of Bim son cement.

The results are as following:

Kinds of cement	Composition (volume)			Press strengt		
	Cement	Stone dust	Gravel.	R3	R7	R28
Bim son	1	2 under 5cm	3	158	196	228
He duong	1	2	3	132	142	240
He duong	1	2	3	78	152	255

The result will be better if stone dust through the mesh 5 cm, but for concrete structures in houses and public houses in the rural areas, the original stone dust could be used and it is quite reach to the requirements.

In IBM the additive PG2 have been used for easy mixing with the proportion 1.5% cement (weight).

2.EXPERIMENT IN CERDAD

1. Determining the granular of stone dust:
   - granular set up by set with electric shaker
   - the diagram shown enclosed hereby.
   - The proportion of stone dust as following:

under 0.5	21.3%
0.5 - 1	14.0%
1.0 - 2.0	22.6%
2.0 - 3.0	21.3%

2. Experimental construction of 15m2 ground floor using stone dust, powder lime and local cement

- From 4/12/1991 to 7/12/1991, 15m2 surface of car park have been done with experimental objectives to determine the composition of low-cost concrete for ground floor as well as to examin the possibility of easy cleaning and suffuring special loads and flooding as the criterias for choosing mentioned.

- Materials and proportions used shown in the table followed:

- Testing the samples at the age 28 days , results as following:

Samples	Composition		
	Cement	Powder lime	Stone dust
I	1	-	4
II	1	1 (wasted)	4
III		1	3
IV	1		3 sand

SAMPLE	PRESS STRENGTH
I	86,9
II	82,16
III	4,03

- Analysis of cost:

Materials	Unit	Quanti -ty	Unit price	Sub total	Total
COMPOSI.I					
Cement	kg	220	400	88,000	
Stone dust	m3	0.83	10,000	8,300	96,300
COMPOSI.II					
Cement	kg	180	400	72,000	
Wasted Lime	kg	120	50	6,000	
Stone dust	m3	0,70	10,000	7,000	85,000
COMPOSI.III					
Lime	kg	200	150	30,000	
Stone dust	m3	0,80	10,000	8,000	38,000
COMPOSI.IV					
Cement	kg	300	400	120,000	
Sand	m3	0,80	32,000	32,000	152,000

CONCLUSION.

1. Stone dust can replace sand in concrete.
2. For reinforce concrete, it is better if the stone dust only used the parts under mesh 2.5-3cm. The technology will be introduced in the lintels during the construction of Ninh van market.
3. For floor surface, stone dust can be used with cement and wasted lime, it can give a dure and easy cleaning surface with the cost reasonable.
4. The Ninh van market will be a demonstration and training site of the technology.

Hanoi, 5-1-1992

Ninh Van pilot applications — *Monitoring of costs*

Action 1.1 : USING STONE DUST IN CONCRETE

Operation : RESEARCH Estimation : / /91 Completion : 15 /10/91 to 10/12/91

Item	Estimated cost: Orig.	Unit	Quant.	Unitary cost	Sub-total	%	Real cost: Date	Supplier	Quant.	Current price	Sub-total	%	Difference: Quant.	Unit. cost	Sub-total
1. Stone dust	N Vân	m^3	2,5	15,000	37,500		10/91	N. Vân	2,5	12,000	30,000				
2. BSđn Cement	HN	kg	50	480	24,000		10/91		50	520	26,000				
3. Local Cement	N. Vân	kg	250	420	105,000		11/91		250	420	105,000				
4. Sand	HN	m^3	0.5	35,000	17,500		10/91		0.5	35,000	17,500				
5. Gravel 1x2	HN	m^3	0.5	23,000	11,500		10/91		0.5	23,000	11,500				
6. Wasted lime	–	m^3	1.5	45,000	67,500		12/91		0.5	50,000	25,000				
7. Broken brick	–	m^3	1,2	30,000	36,000		12/91		1,2	30,000	36,000				
8. Quick lime	–	kg	200				12/91		200	200	40,000				
9. Sample Test. (concrete)	–	sample	36	4,000	144,000		11+12/91		~~36~~ 9	4000	144,000 36,000				
10. Floor sample Test															
11. Experimental floor in CERPAD		w.day	5	12,000	60,000		12/91		5	12,000	60,000				
Total				(Dongs)	503,000		Total			(Dongs)	531,000		Total	(Dgs)	
				(US $)						(US $)				(US$)	

Estimated cost		Amount	%
Components			
* Labour			
*Building materials :	Local		
	National		
	Imported		
	Total		
Transport			
Others			
otal			

Real cost		Amount	%
Components			
* Labour			
*Building mat. :	Local		
	Nat.		
	Imp.		
	Total		
*Transport			
*Others			
Total			

Difference	%
Total	

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Ninh Van pilot action 1.2

Technical dossier

Cement tile tests

1. Context

Cement tiles in Ninh Van are now very popular, and most houses in the mountainous area of the Hoa Lu District are covered by cement tiles. Red tiles are expensive and rare. Cement tiles are made from local cement or Bimson cement, (in the market 10km away) and sand. Tile technology is very simple and popular, and so workers can produce it for selling or the consumers can hire the workers to produce tiles on site. One cement tile has a dimension of 0.35x0.21cm, 22 tiles/m^2, 2.2kg weight (45kg/m2).
Meanwhile, Ninh Van produces the stone therefore stone dust is available and cheap (10,000dg/m3). The Institute of Building Material (IBM) and the Ministry of Construction is currently in the application phase of the cement tile project using vibrators and special moulds that can produce other types of cement tiles with a lighter weight. An IBM tile has dimensions of 0.50x0.24 (13tiles/m^2), and a weight of 1.8kg, 24kg/m^2.

2. Statement of the problem

Ninh Van cement tiles are heavy and therefore requires a heavy roof frame. The price of a tile is 300 dg/tile and 6,600 dg/m^2: therefore the roof cost is a high proportion of the house cost. In Ninh Van, many houses have been built with foundations and walls but have to wait years for a roof.

3. Objectives

These are :
* to reduce the roofing costs by using stone dust and local cement to make cement tiles;
* to improve the quality of Ninh Van tiles;
* to check the possibility of IBM tiles using local materials.

4. Innovation being proposed

- To use vibrators to increase the density of mortar by IBM's method or by Ninh Van's method.
- to use additive "PG,2", the additive produced by IBM for ease in mixing the mortar when using stone dust replacing sand (1.5% cement).

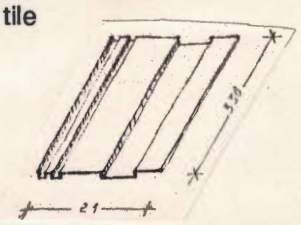
5. Criteria used for selection of innovation

* using local materials,
* reducing the roof costs including roof coverings and roof frames,
* making sure technology is easy and available,
* ensuring the quality of tile has reached the national standard: loading 50kg/tile, waterproofing viable for 24 hours under a water column of 50cm,
* typhoon resistance: easy to fix tiles to roof frame.

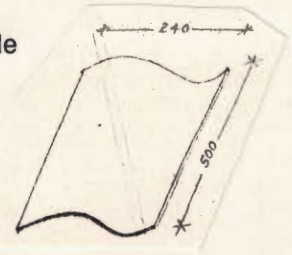
6. Design detail

Testing with two sorts of tiles.

Ninh Van tile



IBM tile



The materials required:

	IBM	Ninh Van tiles
1. Stone dust	0.2 m^3	0.2 m^3
2. Bimson cement	50 kg	50 kg
3. Heduong cement	50 kg	50 kg
4. Sand	0.3 m^3	0.3 m^3
5. Additive "PG2"	1.5 kg	1.5 kg
6. Tile mould		5
7. Red colour	1 kg	

7. Construction process

a. The engineer groups of IBM will test 5 samples of mortar compositions to chose the best one. They will produce 30 experimental tiles with chosen compositions. Loading, waterproof testing. Economic analysis of IBM tiles using local materials.
b. In Ninh Van, based on the chosen composition, a skilled worker will produce tiles in the Ninh Van method; Use a vibrator to improve the tile. Loading and waterproof testing (in IBM). Economic analysis.
c. Evaluation.

8. Materials quantities, cost and labour (Dongs / April 91)

ITEM	QTY	COST	TOTAL
1. Stone dust	0,4 m^3	10,000	4,000
2. Bimson cement	100 kg	400	40,000
3. Local cement	100 kg	260	26,000
4. Additive "PG2"	3 kg	1,800	5,400
5. Moulds	5	4,000	20,000
6. Produce tile	4 w.d	8,000	32,000
7. Test the tile	24	1,000	24,000
8. Select mortar			50,000
9. Red powder	1 kg	20,000	20,000
10. Rent of vibrator	10 d	5,000	50,000
TOTAL			271,000

9. Maintenance and operation

After the evaluation, if there are some advantages in the proposed solution, the critical points are the vibrator and composition as well as curing. Encourage a production group (it can be a family) to receive the technology, operate the vibrator, and organize the production process. The IBM group has a responsibility to control periodically parameters of vibrators and help for repairing it in case of damage.

10. Detailed implementation

Pilot application by experimental production can produce 120m2 of tiles for a market roof. This process is also the training course for tile makers. The commune can make a survey of tile consumption in surrounding areas to chose a reasonable organization for tile production.

11. Media proposed for wider dissemination

Cartoons/Pictures/Drawing sheets with indicators of new cement tiles, advantages; Economic comparisons.

12. Budget

PHASE 1. Research

Total	C/U/D/P	Sub-Contract
271,000		271,000

REPORT OF ACTION 1.2 (TRAINING PHASE)

Base on the agreement between CERPAD- The People's Committee of Ninh Van Commune- Mr Nguyen van Tuc, the tile productor, signed at 11/11/1991, a training workshop had been organized for tile production using stone dust and local cement.

1/ The trainees: selected from villages:
- Nguyen van Dai - He village;
- Duong van Ky- He village:
- Dinh thi Ly - Thuong village

The trainer is Mr Nguyen van Tuc, tile productor, who had produced some tiles by the chosen composition using stone dust and He duong cement.

2/ The training time:
In the first report , the training worksnop should last 3 days, but after 3 days, the trainees can not produce the tile as requirement, and the training workshop had been extended 2 days more.
The workshop had been organized from 15/11 to 19/11/1991.

3/ Result of training:

- After training, the trained villagers hand the technique to produce roof tile by cement and stone dust- from casting to curing and storage. They can make tile for their village by themselves.
- During the training workshop, 300 cement tiles were produced with materials supplied from the commune.

4/ Monitoring cost.

On the first report of action 1.2, one base table will be bough for training as well as for production later. At the time of preparing the workshop, no base tile table in the market or in ordering from elsewhere.

Expenditure:

- Trainer:	60,000d/day x 5days	= 300,000d
- trainees:	48,000d/day x 3 wor x 5days	= 720,000d
- Moulds :	8,000 d x 40 mould	= 320,000d
- Rent of base tile table:	5,000d/day x 5days	= 25,000d
	TOTAL	1,365,000d

5/ The tiles produced will be used in Ninhvan market, just now stored in the Commune store.

6/ CERPAD, the People's Committee of Commune, Trainer and trainees are very please about the result obtained and propose that the People's Committee give the trained villagers opportunities to performance their new job in the commune.

Ninh van, 30/11/1991

Representative of CERPAD	Trainer	People's Committee of NV Commune
Chief engineer	Ng.v.TUC	Chairman
La quang Binh		Dinh.quang.Khoai

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Stone column

1. Context

As a stone production commune, Ninhvan has a wide range of stone products made by artisans. One of the stone goods is the stone roll. By origin, the stone roll is used for taking rice from straw, but now it is useless because of simple machines replacing it. Besides which, stone columns are very popular in old houses and temples due to the beauty they lend.

2. Statement of the problem

Columns in houses have now been built in red brick or concrete which are expensive. Building stone columns can be cheaper but more difficult.

3. Objectives

To reduce building costs by using stone rolls.

4. Innovation being proposed

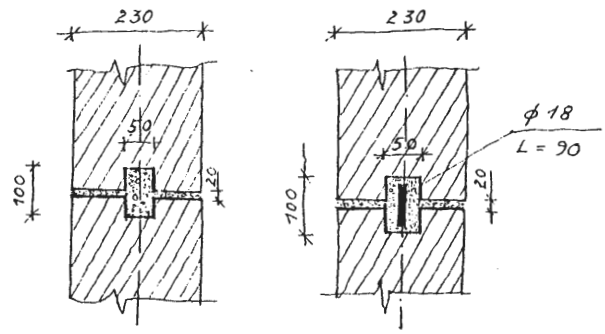
Join stone rolls to become a column.

5. Criteria for selection of innovation

There must be joint durability, an acceptance from the villagers, and it must be cheaper than red bricks or concrete columns.

6. Design detail

Materials required :20 stone rolls (for 4 columns); 280 bricks (for 2 columns); 0.4m3 of M200 concrete (for 2 columns and foundation); 10kg steel bars; 0.4m3 mortar.



7. Construction process

Join the rolls by cement mortar only or by cement mortar with a steel bar. With the experimental building there are three kinds of column - stone roll, red brick and concrete. One must compare the costs and interview the people in the villages and the masons to see if the solutions are acceptable.

8. Material quantities, costs and labour (Dongs / April 91)

Item	Qty	Price	Roll column	Brick column	Concrete column
1. Stone roll	20	5,000	100,000		
2. Brick	280	100		28,000	
3. Concrete	0,4 m^3				
Cement	140 kg	260			36,400
Sand	0,2m^3	27,000			5,400
Gravel	0,4 m^3	16,000			6,400
4. Steel	10 kg	3,800	38,000		
5. Mortar	0,15 m^3	57,000	8,500		
	0,25 m^3	57,000		14,250	
6. Labour	4	8,000	32,000		
	2		16,000		
	2				16,000
Total			178,500	58,250	64,200

9. Detailed implementation

If the stone roll column has the advantage after the analysis and interviewing, the Ninhvan market will have the pilot application.There will be training for a joint usage of the stone roll as a column.

10. Media proposed for wider dissemination

A drawing sheet will be available with introductions for joining as a key pointer.

11. Budget

PHASE 1. Experiment and test buildings.

TOTAL	C/U/D/P	Sub-contract
300,950		300,950

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Ninh Van pilot action 1.4

Technical dossier

Stone masonry

1. Context

In Ninh Van, most houses are built in stone, with stone foundations, walls and columns. Old traditional houses and temples are built from dressed stone, lending a characteristic feel to the commune; they are also very durable. Houses built of undressed stone require plastering on both sides of the walls: without plastering, the houses have an unfinished appearance.
Estimated costs for the three types of masonry are as follows (costs in Dongs/m^3).

* Dressed stone masonry

- dressed stones 50 u x 500	25,000
- cement mortar 0,2 m^3 x 57,000	11,700
- labour 5 d x 8,000	25,000
- Total	76,700

* Half-dressed stone masonry

- half-dressed stones 1,2 m^3 x 12,000	14,400
- lime mortar 0,3 m^3 x 22,000	6,600
- internal plaster 0,06 m^3 x 57,000	3,400
- labour 3,5 d x 8,000	28,000
- Total	52,400

* Undressed stone masonry

- undressed stones 1,2 m^3 x 6,000	7,200
- lime mortar 0,45 m^3 x 22,000	9,900
- int. and exter.plaster 0,12 m^3 x 57,000	6,940
- labour 3 d x 8,000	24,000
- Total	48,040

Comparison of costs shows that emphasis should be placed in half-dressed and undressed stone masonry.

2. Statement of the problem

Undressed stone masonry requires a large amount of mortar for masonry as well as for plastering which actually reduces the durability of the masonry. At the same time, for undressed stones the thickness of the walls has to be 30 cm which is not otherwise necessary for one- or two-storey houses.

3. Objectives

- Check the possibility of economizing on mortar in undressed stones and half-dressed stone masonry;
- Stimulate the local economy by using half-dressed stone.

4. Criteria for selection of innovation

- Economies in mortar for masonry and plaster.
- Acceptance by local masons.
- Reduction in the thickness of walls form 30 cm to 25 cm by using half-dressed stones.

5. Construction process

* Set up a mason group to build an experimental wall, consisting of 2 elements:
  - 2.5 m^2 (= 1 m^3) undressed stone wall
  - 3 m^2 (= 1 m^3) half-dressed stone wall 25 cm thick
* Compare
  - cost of each kind of masonry;
  - productivity of masons;
  - volume of mortar required;
  - productivity of stone workers.

7. Material quantities, costs and labour (Dongs / April 91)

ITEM	QTY	COST	TOTAL
1. Half-dressed st.	1,2 m^3	10,000	12,000
2. Undressed st.	1,2 m^3	6,000	7,200
3. Lime mortar	0,8 m^3	22,000	17,600
4. Cement mortar	0,2 m^3	57,000	11,400
5. Labour	7	8,000	56,000
TOTAL			104,200

8. Detailed implementation

- After economic analysis and interviews with masons and end-users in the commune, conclusions will lead to recommendations for thte villages.
- Building part of Ninh Van market wall as demonstration. - Introduce the result of the economic analysis and testing to the masons in the commune.

9. Media proposed for wider dissemination

Simple sheet with drawings and pictures to introduce the technology.

10. Budget

Phase 1.Research

Total	C/U/D/P	Sub-Contract
104,200		104,200

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CERPAD

Ninh Van pilot action 2.1

Technical dossier

Family water filter tank

1. Presentation

Ninh Van commune is situated in a low-lying area of the north plains Delta. This results in the quality of underground water varying widely: in the villages near the mountains it is clean, but farther froom the mountains it is poor quality, with a high iron content. This is the case for example in Xuan Vu, Dong Zuan, a part of Chang Vu location and part of Phu Lang.

In general people use this water resource directly for washing, bathing and other activities. including sometimes cooking and drinking, particularly in the dry season when water storage tanks run dry.

Some families build simple filtration tanks, but these are not of the required design standard. Even after filtration in such tanks, the water is not adequate for living conditions.

2. Brief description of the problem

Water samples from 5 locations in Xu Vu village were tested. The results clearly demonstrated that the quality of the water was inadequate for rural living conditions.

3. Objectives

* To build family water filter tank capable of purifying water sufficiently for cooking and drinking, especially in the dry season.
* To introduce hand-pumps to reduce the labour needed and facilitate the easy and convenient collection of water.

4. Description of innovation being proposed

* To purify the water resource to the standard required by the health organization.
* To reduce the labour needed to collect water with ease.

5. Criteria for choice

* use of local materials to reduce need for building materials;
* clean water resource;
* ease of use;
* ease and reduction in labour for water collection.

6. Drawings

MẶT BẰNG BỂ LỌC NƯỚC
MẶT CẮT A-A
MẶT CẮT B-B
BẢNG TỔNG HỢP VẬT LIỆU XÂY DỰNG
GHI CHÚ:
BỂ LỌC NƯỚC GIA ĐÌNH

HƯỚNG DẪN KỸ THUẬT THI CÔNG VÀ SỬ DỤNG BỂ LỌC NƯỚC GIA ĐÌNH

A. CÔNG TÁC XÂY BỂ :

1_ Vữa xây dùng vữa tam hợp mác 50.

2_ Vữa trát dùng vữa xi măng mác 50, dày 1,5 cm.

3_ Tầng đan dùng vữa xi măng cát vàng mác 150 (1 xi măng + 2 cát).

4_ Thi công bể lọc được chia làm 2 giai đoạn :

Giai đoạn 1 : Xây tường đến độ cao 0,5 m thì ngừng xây và trát vữa mặt trong bể và đáy bể.

Giai đoạn 2 : Xây tiếp phần tường còn lại đến đủ độ cao thiết kế, trát tiếp vữa mặt trong phần tường mới xây và trát hoàn thiện mặt ngoài.

CHÚ Ý :

_ Cái lỗ thông nước giữa ngăn chứa nước thô (a) và ngăn nước lọc (b) phải để sát đáy bể.

_ Lỗ thông nước giữa ngăn lọc (b) và ngăn chứa nước sạch (c) phải cách đáy bể ít nhất 0,8 m.

B. LÀM TẦNG LỌC NƯỚC :

1_ Vật liệu lọc phải đổ theo trình tự sau :

_ Cát đen dày 25 cm.

_ Cát vàng dày 15 cm.

_ Sỏi hoặc đá 1_2 cm, dày 10 cm.

2_ Phải rửa sạch vật liệu trước khi đổ vào ngăn lọc nước (b), khi thấy nước rửa vật liệu trong là dùng được.

C. SỬ DỤNG BỂ LỌC NƯỚC :

_ Đổ nước vào trong ngăn chứa nước thô cho nước tự chảy sang ngăn lọc.

_ Lọc nước cho tới khi nước ở ngăn chứa nước sạch đủ nhu cầu sử dụng hoặc đầy bể.

_ Khi nước chứa ở ngăn nước sạch đủ nhu cầu sử dụng (hoặc đầy bể) thì tháo hết nước ở ngăn chứa nước thô (a) và ngăn lọc (b) để tiện rửa vật liệu lọc, không để nước chất bẩn tồng cặn trong bể.

_ Ít nhất thán rửa vật liệu lọc một tuần một lần.

7. Materials quantities/cost and labour breakdown (Dongs / April 91)

	Item	Material	Unit	Unit cost	Quantity	Total
Family water filter tank made of stone	Building materials	Cement	kg	400	60	24 000
		Iron 6	kg	3 500	0.5	1 750
		Steel net	m2	9 000	1	9 000
		Water tap 20	u	5 000	1	5 000
		Stone	m3	6 500	2	13 000
		Broken stone	m3	15 000	0.5	7 500
		Dust stone	m3	10 000	0.8	8 000
		Quick lime	kg	200	20	4 000
	Labour		w.d	5 000	8	40 000
	TOTAL					112 250
A scheme	Building materials	Cement	kg	400	10	4 000
		Steel net	m2	9 000	0.2	1 800
		Brick	u	120	50	6 000
		Dust stone	m3	10 000	0.2	2 000
		Broken stone	m3	15 000	0.02	300
	Labour		w.d	5 000	1.5	7 500
	TOTAL					21 600
B scheme	Building materials	Cement	kg	400	9	3 600
		Steel net	m2	9 000	0.2	1 800
		Brick	u	120	45	5 400
		Dust stone	m3	10 000	0.2	2 000
		Broken stone	m3	15 000	0.02	300
	Labour		w.d	5 000	1.5	7 500
	TOTAL					20 600
C scheme	Building materials	Cement	kg	400	12	4 800
		Steel net	m2	9 000	0.2	1 800
		Brick	u	120	64	7 680
		Dust stone	m3	10 000	0.3	3 000
		Broken stone	m3	15 000	0.02	300
	Labour		w.d	5 000	2	10 000
	TOTAL					27 580
Hand pump	Materials	Cement	kg	400	2	800
		Pipe 32	m	10 000	5	50 000
		Hand pump	u	80 000	1	80 000
			u	3 000	1	3 000
		Stick	u	2 000	1	2 000
	Labour			5 000	1	5 000
	TOTAL					140 800

8. Construction process

- ¤ select suitable location: near well or near river;
- ¤ prepare materials;
- ¤ make concrete slab;
- ¤ dig foundation;
- ¤ build water tank;
- ¤ cover tank with slab;
- ¤ install hand pump;
- ¤ complete.

9. How the technology will be operated and managed

- easy operation;
- frequent checks to ensure repairs made promptly;
- clean filter materials weekly;
- clean filter materials every 2 days for water with high iron content (yellow in colour).

10. Detailed implementation process step-by-step

1) Analysis and survey:	10-12/1990
2) Research, design:	1-4/1991
3) Construction agreement:	4/1991
4) Transfer technique, implementation:	4-6/1991
5) Remark, evaluation, wider diffusion:	7-12/1991

11. Media to be used for wider dissemination

* propaganda, public loud-speakers;

* mobilization of production groups and teams for the training programme;

12. Budget

Items	Materials	Qty	Unit cost	Total	Contribution		
					Users	Com.	Sub-Cont.
Family w.f.t. with h.pump	Cem,Iron,W.tap	5	39 800	199 000			199 000
	Stone,q.lime	5	32 500	162 500	81 200	81 300	
	Labour	5	40 000	200 000	200 000	200 000	
	Hand pump	5	141 000	705 000	352 500		352 500
	TOTAL			1 266 500	633 700	281 300	551 500
A scheme & hand pump	Cement,iron	3	5 800	17 400		17 400	
	Brick,stone	3	8 300	24 900	24 900		
	Labour	3	7 500	22 500	22 500		
	Hand pump	3	141 000	423 000	211 500		211 500
	TOTAL			487 800	258 900	17 400	211 500
B scheme & hand pump	Cement,iron	3	5 400	16 200		16 200	
	Brick,stone	3	7 700	23 100	23 100		
	Labour	3	7 500	22 500	22 500		
	Hand pump	3	141 000	423 000	211 500		211 500
	TOTAL			484 800	257 100	16 200	211 500
C scheme & hand pump	Cement,iron	5	6 600	33 000		33 000	
	Brick,stone	5	11 000	55 000	55 000		
	Labour	5	10 000	50 000	50 000		
	Hand pump	5	141 000	705 000	352 500		352 500
	TOTAL			843 000	457 500	33 000	352 500
TOTAL				3 082 100	1 607 200	347 900	1 327 000

VIE / 86 / 020

CERPAD

Ninh Van pilot action 2.2

Technical dossier

Public well in Phu Lang

1. Context

The well in Phulang village is now badly damaged as a result of poor maintenance. These is no outer wall, allowing water to flow into the well carrying with it rubbish and excrement.

As a result of natural land-sliding and banking-up of land, the dimension of the well is enlarged, the height from top to botton now being 2 metres. During December to Febraury, the well dries up and water is provided in the well thanks to channels across the fileds. The water carried in this way is very dirty, and carries various diseases, such as diarrhoea, trachoma etc.

People are accustomed to using unpurified water from the well, rather than have to make the effort to build their own water tanks or dig their own wells.

2. Brief description of the problem

The tests on a water sample taken from the well shows that it is not fit for household use and cooking for 37 families.

It is vital to improve and rebuild the well for the fanilies who have no alternative suplly of water.

3. Objectives

The improvement aims to serve poor families unable to undertake thier own construction, and thus improve people's health, increase their labour capability and contribution to society.

4. Innovations proposed

* Clean and purify the water source in accordance with he standards of the Ministry of Health;
* Lighten the burden of labour of the people (24% of the households);
* Disseminate among the people a new habit of using water and sanitation at the water source.

5. Criteria for selection

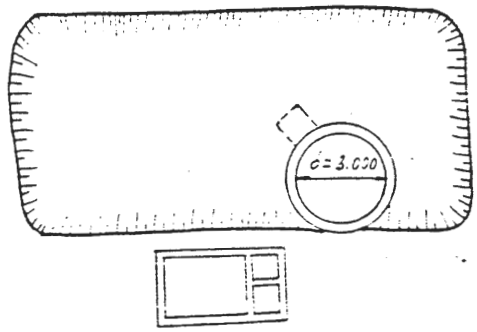
¤ Reduce cost of construction by using existing local materials;

¤ Ease of maintenance, operation and use of the construction;

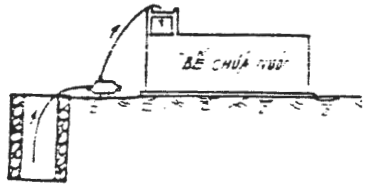
¤ Purify the water source up to standards of rural water laid down by the Ministry of Health

6. Construction design

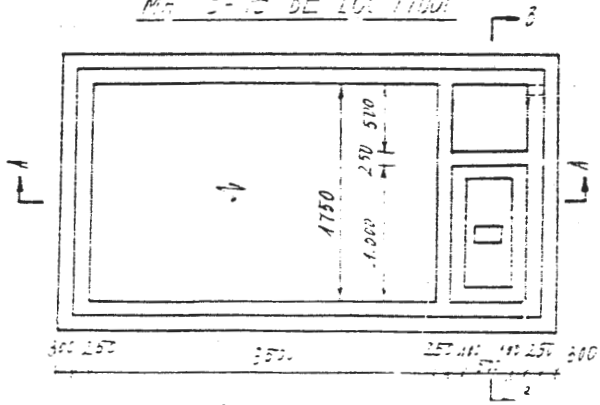
MẶT BẰNG CẢI TẠO



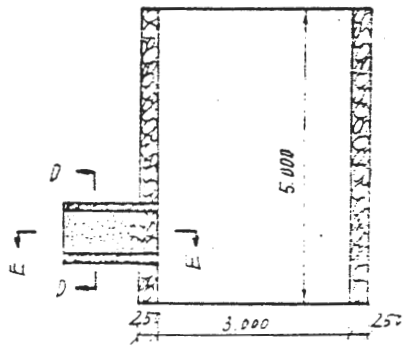
SƠ ĐỒ LỌC NƯỚC



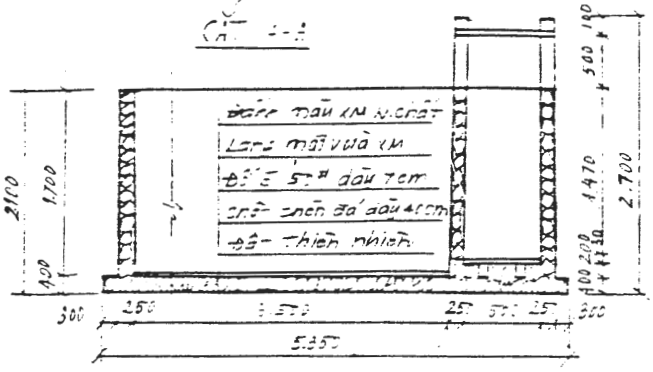
MẶT BẰNG BỂ LỌC NƯỚC



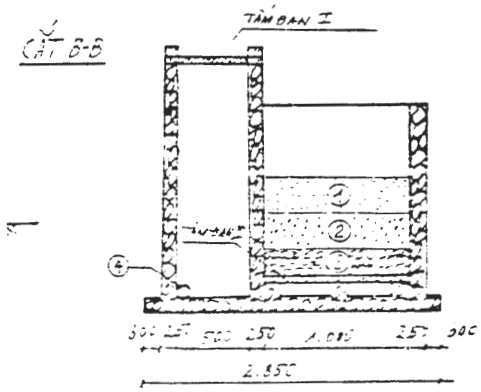
CẮT DỌC GIẾNG



CẮT A-A



CẮT B-B



TỔNG HỢP VẬT LIỆU X.D

STT	LOẠI VẬT LIỆU	Đ.VỊ	KHỐI LƯỢNG
1	Xi măng	tấn	2,8
2	Đá hộc	m^3	50
3	Đá dăm	m^3	6
4	Đá mạt	m^3	35
5	Vôi cục	tấn	1,8
6	Sắt ϕ4 ÷ ϕ6	kg	30
7	Lưới thép	m^2	1,5
8	Ống nước	mái	12
9	Van nước	chiếc	4
10	Vòng bơm điện	chiếc	1

7. Description of implementation

* 1st stage:
  - pump water out; scrape well bottom;
  - repair bank, bank up and increase height of existing bank by 0.5m;
  - build stone well 4m and 5m deep;
  - make a channel from the river to the well.
* 2nd stage:
  - make ground for tank construction;
  - build refinery tank and container;
  - build the tank surface;
  - completion.

8. Costs (Dongs / April 91)

Item	Estimated cost					
	Orig.	Unit	Quant.	Unitary cost	Sub-total	%
Labour						
-Scrape/bank up		d	80	5 000	400 000	8.3 %
-Build stone well		d	75	6 000	450 000	9.4 %
-Make channel		d	8	5 000	40 000	.8 %
-Build tank		d	70	6 000	420 000	8.7 %
-Tank surface		d	16	5 000	80 000	1.7 %
-Bank well wall		d	30	5 000	150 000	3.1 %
-Install pump		d	2	6 000	12 000	.2 %
-Finishing		d	10	5 000	50 000	1. %
Pumping water out		sh	5	100 000	500 000	10.4 %
Stone	L	m3	50	6 500	325 000	6.8 %
Gravel	L	m3	6	15 000	90 000	1.9 %
Stone powder	L	m3	35	10 000	350 000	7.3 %
Lime	L	t	1.8	200 000	360 000	7.5 %
Cement	N	t	2.8	400 000	1 120 000	23.3 %
Iron 06	I	kg	30	3 500	105 000	2.2 %
Steel net	I	m2	1.5	9 000	13 500	.8 %
Electric pump	N	u	1	200 000	200 000	4.2 %
Water pipeline	N	m	10	12 000	120 000	2.5 %
Valves and taps	N	u	4	5 000	20 000	.4 %
Total				(Dongs)	4 805 500	
				(US $)	641	

Components		Estimated cost		
			Amount	%
* Labour			1 602 000	33.3 %
*Building materials :	Local	1 125 000		
	National	1 460 000		
	Imported	118 500		
	Total		2 703 500	56.3 %
*Transport				
*Others			500 000	10.4 %
Total		(Dongs)	4 805 500	
		(US $)	641	

9. Technological operation and maintenance

* Assumed by the hamlet;
* aAsigned by individuals in
  - operation,
  - constant controlling and finding damages,
  - repairing in time.

10. Detailed step-by-step description of implementation

Investigation and survey:	9 - 12 1990;
Studying and design:	1 - 4 1991;
Negotiation of construction:	from 4 1991;
Directing techniques;managing:	4 - 7 1991;
Evaluation, appraisal and dissemination:	8 - 12 1991.

11. Description of media to be used for wider dissemination:

¤ Loud-speakers;
¤ Organization and mobilization of working groups/units.

12. Budget

ITEM	TOTAL	COM.	POP.	SUB-CT
Materials	2,703,500	703,500		2,000,000
Labour	1,602,000	602,000	1,000,000	
Machine	500,000	500,000		
TOTAL	4,805,500	1,805,500	1,000,000	2,000,000

REPORT ON ACTION 2.2

1. Work : Improvement public well in PHULANG village .

Duration : Step 1 : 2/5/91 - 5/6/91 : finished digging up the soil, cleaning, building the well and building the filter bo

Step 2 : 25/6/91 - 17/7/91 : Diging and covering th the soil and finishing the dam .

Step 3 : 5/10 - 10/10/91 : Building the wall , repairing some places (crack) and finishing .

2. Construction :

- Start and finish following the proposed work program
- The commune supplied materials
- Labour : Commune : 30%
  People : 70%
- Machine : Commune : 100%

3. Water sesources :

- The quantity of unfiltered water : enough for use year around .
- The quality of water after filtering : good

4. Maintainance :

The village nominated one person who in charged of maintainance and operating the filter following the gnidance .

5. People's point of news :

- It is very glad to have safety water from naw on , specially having enough water for use in drying season .
- Filtered water used for cooking, dringking, washing .

6. Expenditane for step 2 and 3 :

1	2	3 Unit	4 Quantity	5 Price/ unit	6 Sub-tota

1	2	3	4	5	6
Material	Stone	m3	80	8.000	640.00
	Cement	ton	2	400.000	800.00
	Broken stone	m3	8	15.000	120.00
	Dust stone	m3	10	11.000	110.00
	Quick lime	ton	1	80.000	80.00
	Lime (class 3)	ton	1	30.000	30.00
	Hoisting system taking water	set	1	400.000	400.00
					2.180.00
Labour	Pumping water out	working/ day	3		
	Clean the well	-	15	5.000	
	Diging the soil	-	21		
	Building foundation the w wall	-	25		
	Flating the foundation	-	10		
	Building the wall (dam)	-	90		
	Building the ring	-	20		
	Building defective wall	-	22		
	Finishing	-	12		
			218		1.090.00
Machines	Pumping water	shift	3	100.000	300.00
				Total	3.570.00

7. Total of expenditure :

	Material	Labour	Machine	Total
Step 1	1.865.000	1.095.000	400.000	3.360.000
Step 2	2.180.000	1.090.000	300.000	3.570.000
Total	4.045.000	2.185.000	700.000	6.930.000

Quantity of material, labour, machine for 3 steps

		Unit	Quantity
Material	Bỉm son cement	ton	4
	Stone	m3	115,5
	Broken stone	m3	12
	Dust stone	m3	24
	Black sand	m3	5
	Yellow sand	m3	4,5
	Quick lime	ton	3
	Lime (class 3)	ton	1
	Ashy coal	m3	2
	Hoisting system for taking water	set	1
labour	Clean the well, diging the soil,		
	flating	working day	204
	Building	-	217
			421working
Machine	Pumping water	Shift	7

9. Remark - Evaluation

- Design : Right following the design

- Estimated cost : 6.518.000 đ - Balanced cost 6.930.000

- Balanced cost in fact rised 6,3% compared with estimated cost, The balanced cost is receiptable, it is in permited limitation .

- The water quality after filtering is safety water for family consumption (if cleaning the filter carefully and frequently) .

- With this demostration the commune can apply widely model for improvment of other public wells within commune .

NINHVAN people commune

Name of construction : Phu Lang village

DIARY OF CONSTRUCTION

MOC

PROJECT VIE 86/020

Date	Items of work	People number	Results	Remarko	
25/6/91	pump water	3 shift +			Quantity
26/6/91		3 labour			
27/6/91	Extracting mud	15 labour	18 m3	mud +stone	square stone 80 m^3
28/6/91	Dig ground foundation	21 -	25 m3	stone+earth- stone	Quick lime : 2ton
29/6/91	Build fundation	25 -	15 m3	quick	Grave :10 m^3
1/7/91	Expand graund foundation	10 -	13 m3	good	Cement : 2 ton
2/7 - 3/7	Build wall	40 -	15 m3	good	Grave stone : 8m^3
4/7/91	Build wall	35 -	12 m3	good	
5/7	Build + trower	15 -		good	
7/7	Embank edge of well	20 -	25 m3	Stisnf	
/10 -					
6/10	Build wall + trower	22 -	10 m3	good	
/10	Expand earth	5 -	6 m3	good	
	Vam earth and clean	7 -			
	Total	218 labour			
		(132 labour build)			

MACHINE

BOAD OF LEADERS OF NINHVAN COMMUNE

Hoang Ban

Pham Duc May

VIE / 86 / 020

CERPAD

Ninh Van pilot action 4

Technical dossier

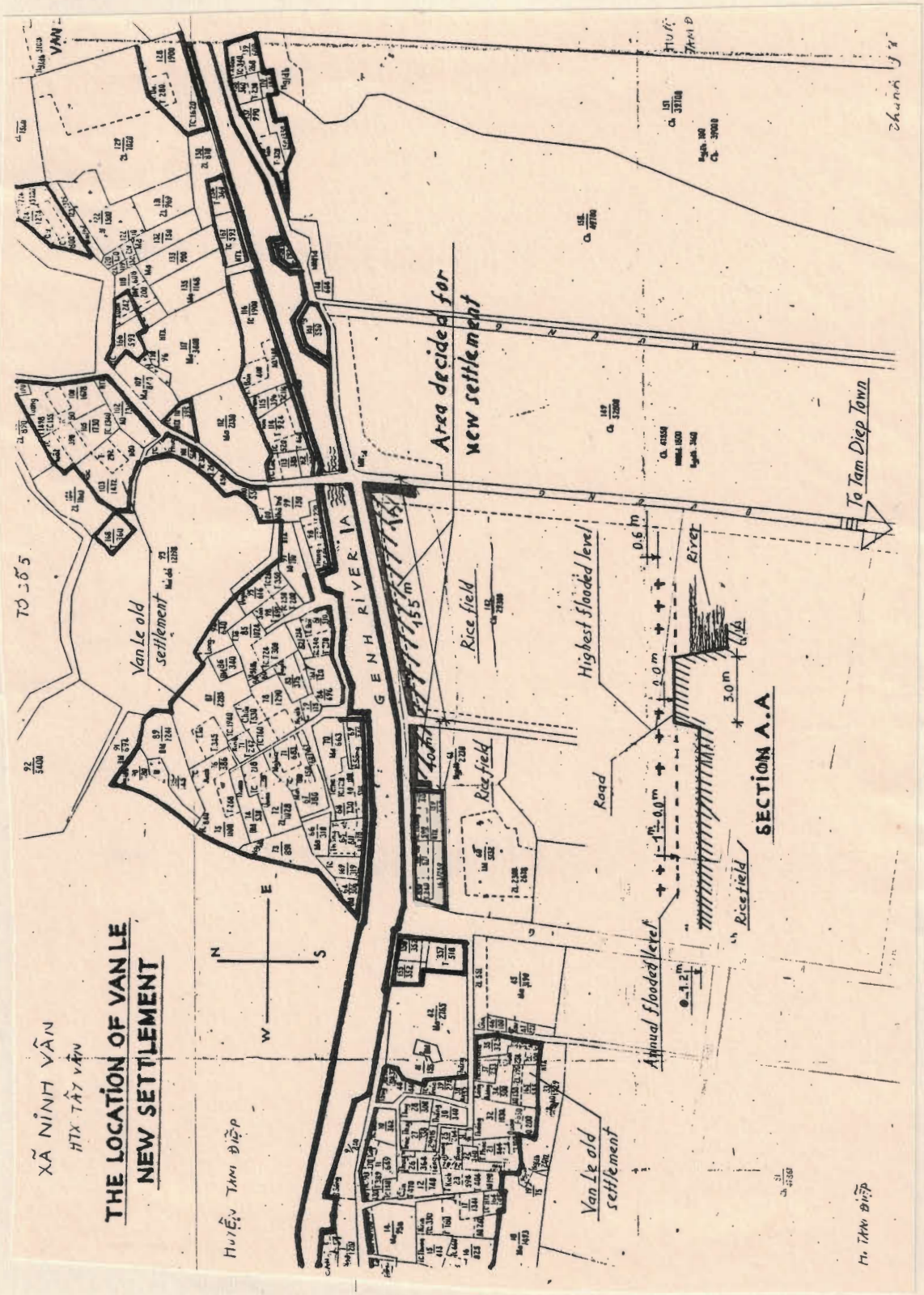
Van Le New settlement

Development Workshop

Center for Rural Planning and Development
Hanoi-Vietnam

GRET

Location of Van Le new settlement



Examples of plots in Ninh Van

Some remark :

+ Arrangement of household plot : The house is almost placed in the middle of plot, so it makes pleasant sensation on side of spatial relationship to the dweller. But on side of land utilization it is not good (Garden area is from 70 ÷ 90 m², but plantable garden area is from 40 ÷ 60 m² only)

+ Based on the 'core - The living room, other components of house is developed in direction by long dimension of the living room

+ Aspect of the house : From south east to south west

f/ Existing situation of housing construction

1.A few of household plot obtain in N.V commune
See opposite page

2.Components of household plot
See below table 1

3.Significant relationship of components
- The main house, veranda, from yard in linked how is it that they are able to create a larger space in cases of necessity.
- The pigsty and latrine is usually arranged at places of the end of fresh wind current in comparison with the others.

4.Trend of current housing construction in the commune
- Type of house: the houses of one storey are at the most (90%), they are roofed with flat roof of reinforced concrete and tiled roof, but the type of flat roof have been appealing to people there.
- Aspect of house: from south east to south west
- Process of building: take place gradually, even.

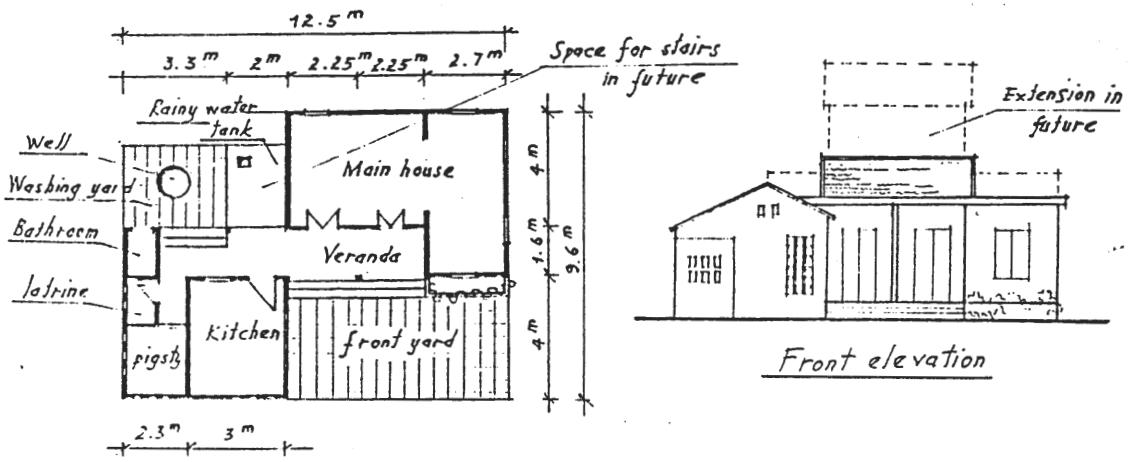
Table 1

Components	Areas	Function	Type of construction
Main house	25-30	As multi function space	With stone wall, flat roof of reinforced concrete and tiled roof
Veranda	10-15	As buffer space between outside and inside. It is used with multipurpose,besides it makes the house be ventilated better	Roofed with flat roof of reinforced concrete
Kitchen	10-12	Used for cooking may be the dining place daily, besidesit is used as a storage	With thatched or tiled roof
Washing place + well + rain water tank +bathroom	10-15	For washing	Open space
Front yard	20-25	Used with multipurpose as empty space in front of the main house for ventilating	Open space
Pigsty	4-6	Raise two or three pigs	Thatched or tiled roof
Latrine	1-1,5		Thatched or tiled roof
Sub-total of components	80-105		
Room for sleeping	10-12	Used for sleeping and for keeping food grains and valuable properties	Just like the main house
Study room for children	10-12	Used for children learning	Just like the main house
Total of construction area	100-130 m2		
Garden and way		These areas depend on the size of householdplot and on the way to arrange components in household plot	

Last within 7-8 year. It prove that the local people capacity of affording money to build their own house in a short time is very low.

House : Designs A and B

Design A



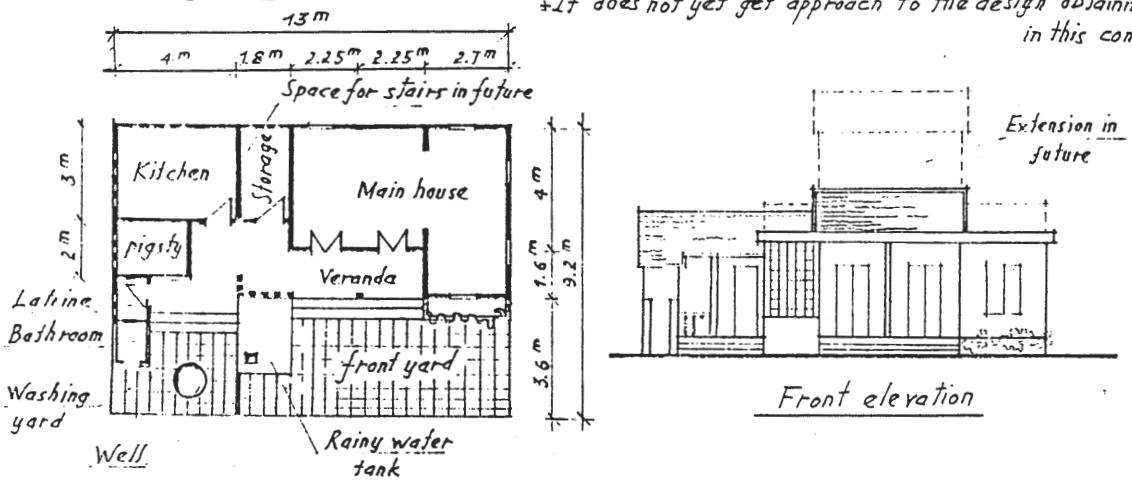
Total of construction area : 115 m²

Area of not getting flooded completly : 68 m²

Advantages and disadvantages

+ Reasonable linkage of components
+ Its flexibility in arranging the house is rather high
+ The inside relationship between components is ensured.
+ It does not yet get approach to the design obtaining in this commune

Design B



Total of construction area : 120 m²

Area of not getting flooded completly : 74 m²

Advantages and disadvantages

+ Reasonable linkage of components
+ Its flexibility in arranging the house is not high
+ The inside relationship between components is ensured
+ It gets approach to the design obtaining in this commune

g/ Resource of surface fresh water in the area

All of families, that have their plots near by the road (lie along the river), in the first range of house, is naturally able to get fresh water from their own well. But the others is not (only able to get water with bad quality).

2. Problems

Across above general situation, following problems is laid out:

¤ Protect new settlement area from flood

¤ Solutions of new settlement arranging in order to economize to the dweller and to be suitable to essential living usages in the commune.

3. Objectives

* Solution of protecting against flood has to serve to meet:
  - Cost at the least
  - To be convenient to living activities

* Solution of new settlement has to get following:
  - As for the house: limit construction areas on the ground as much as possible.
  - As for household plot: Find out reasonable dimensions of household plot and arrange components in household plot in order to get optimal land utilization.
  - As for laying out plan of new settlement: Ensure that all of the house have good aspect. Use up existing road and reduce generation of new road.

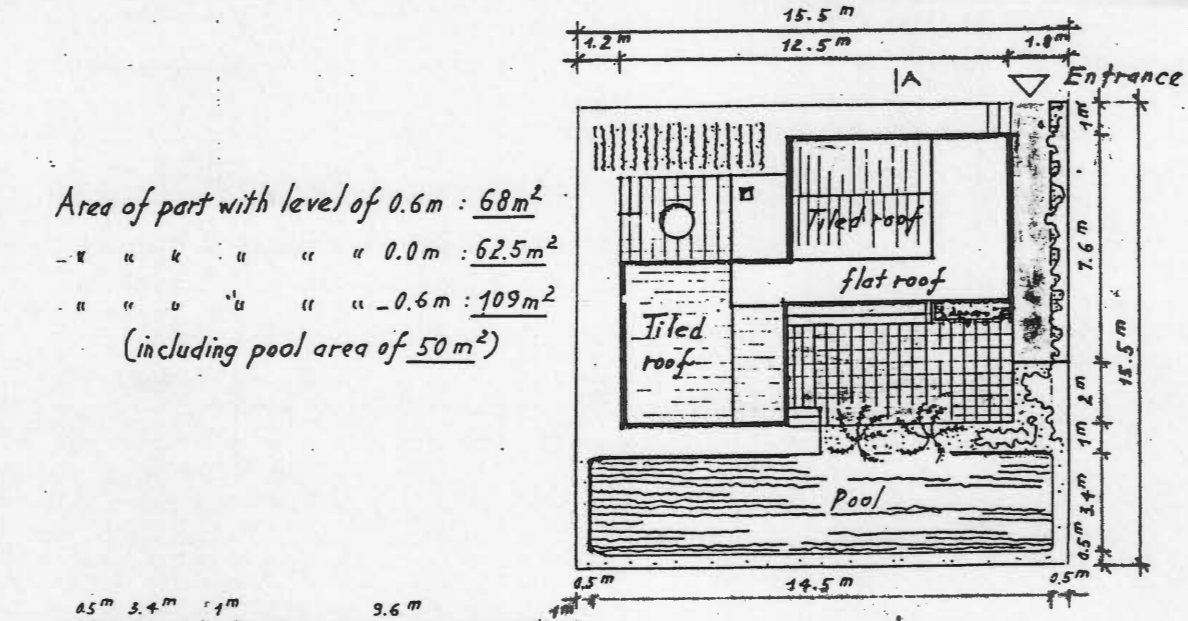
4. Proposed innovation

¤ Raising the ground in different levels and the way to arrange household plot with different levels of ground in order to reduce cost and to be suitable for living usages

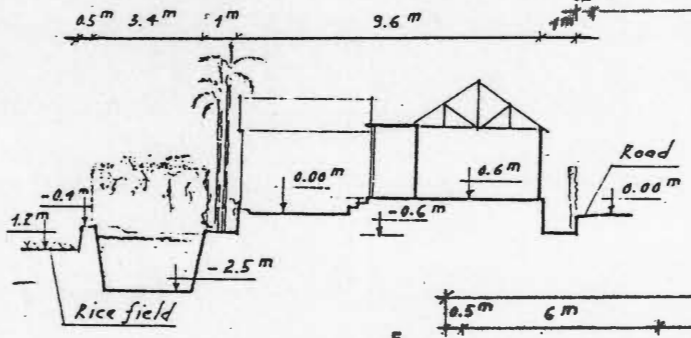
5. Criteriafor selection of innovation

* Cost at the most
* Suitable and convenient to living activities in household plot

Plot with house design A

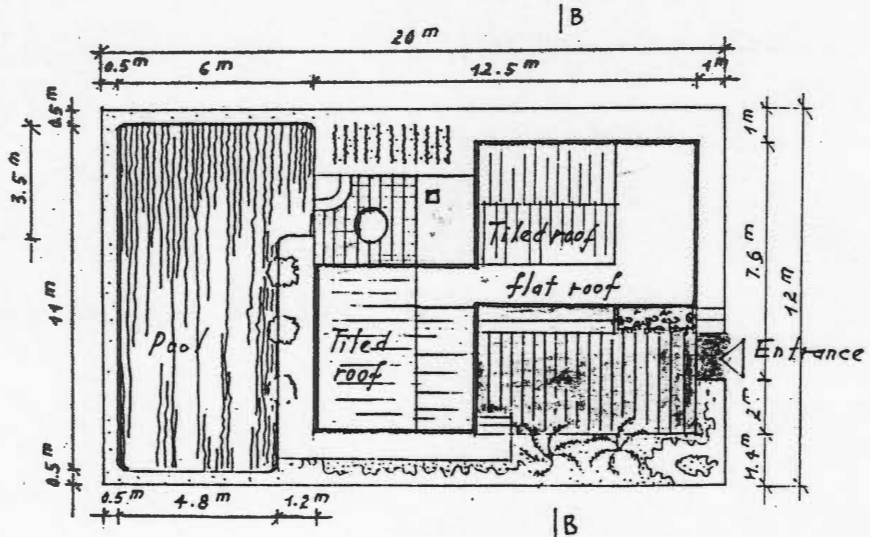


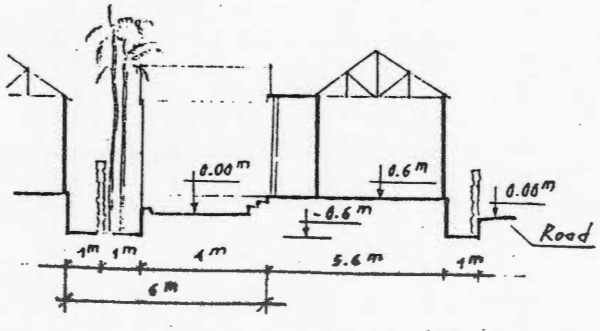
Area of part with level of 0.6 m : 68 m²
" " " " 0.0 m : 62.5 m²
" " " " -0.6 m : 109 m²
(including pool area of 50 m²)



Part with level of 0.6 m
" " " " 0.0 m
" " " " -0.6 m

B





Area of part with level of 0.6 m : 68 m²
" " " " 0.0 m : 49 m²
" " " " -0.6 m : 123 m²
(including pool area of 57 m²)

6. Solutions

a/ As for the house

1.Different degrees of components to protecting from flood.

- Main house:	Don't get flooded completely
- Veranda:	"
- Kitchen:	"
- Latrine:	"
- Pigsty:	"
- Other rooms:	"
- Washing place + Well + rain water tank + bathroom:	Get flooded not completely
- Front yard:	"
- Garden or pool, way:	Get flooded completely

(Except the way from the gate to front yard)

Through this above, it's found that spaces of building should be compacted to be easy for setting up different ground levels in household plot.

2.Components of house necessary for laying out on the ground and their areas.

Through the living usages in the commune and component functions, following components have to be laid out on the ground:

- Main house:	30 m2
- Veranda:	12 m2
- Kitchen:	12 m2
- Washing place + well + rainwater tank + bathroom:	12 m2
- Latrine:	15 m2
- Pigsty:	6 m2
- Front yard:	22 m2
Sub - total:	109 m2

3.Current of spatial combination

As the new settlement area lie along the road in East and West direction, and in order to ensure the houses to face good aspect (from south east to south west), So there is only one type of arranging the house, it is as follow:

The back of the house faces the road. Thus building spaces should be developed in direction by long dimension of the main house, but not in direction by wide dimension of the main house.

Because of the size of plot is small, spatial extension in the future should be developed in vertical direction. Components, that is given into designing for first stage isessential for living activities.

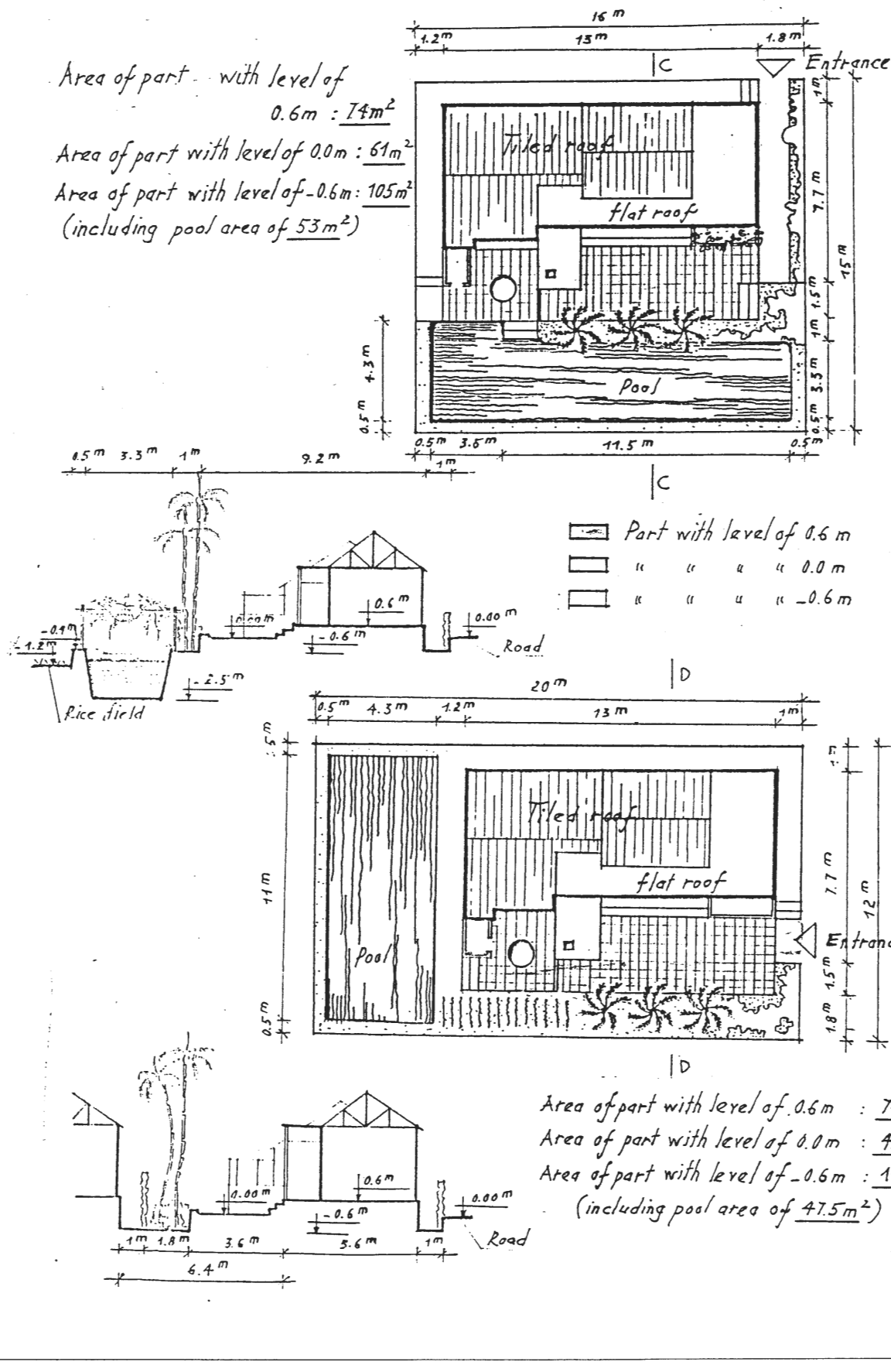
4.Designs of house

Based on above analysis, following designs are proposed.

5. Approval from local side

After discussing with People Committee and referring to local people's ideas, we got the result is as follow: Two designs was accepted but most of local people had a bias in favor of design B

Plot with house design B



b/ As for household plot

1.Reasonable dimensions of plot

Based on the accepted designs and on size of plot, it is found that:
* The dimension of plot by long dimension of the main house is 16 m for design B and is 15.5 m for design A at the least.
* The dimension of plot by wide dimension of the main house is 11.6m at the least.

Thing above result in following types of plot:
- 16m x 15m (for the B)
- 15.5m x 15.5m (for the A)
- 12m x 20m
- 13m x 18,5m
- 14m x 17m

If the house is arranged with it's back turned to the road, the type of 16m x 15m (for the B) and 15.5m x 15.5m (for the A) will be suitable as long as there is only one range of house arranged.
If the house is arranged with its back turned to the road and there are from two range of house up arranged,the type of 12m x 20m will be suitable. Because this kind will be able to have plantable garden area much more than other kinds.

2.Arrangements of household plot

Following arrangements is based on designs A,B and on kinds of plot chosen above.

c/ As for protecting against flood

There are two way to solve this problem:
¤ Raise the floor over flooded level
¤ Raise the ground over flooded level

As for first way, it costs much more than the second way and is not suitable to living usage, so the second is applicable.
As for second way, we propose to raise the ground in three level in comparison with the ground of rice farming :
* Level of 1.8m: enable to protect against flood completely
* Level of 1.2m: enable to protect against annual flood only.
* Level of 0.6m: get flooded

The creating difference of 0.6m between levels serve to meet:
- To economize to the dweller
- To be convenient to living activities
- Not to affect garden area.

In the area with level of 0.6m it is proposed to set up a pool in order to contribute earth on site to raise other levels.
It is below comparison on cost of ground filling variances
(See Table 2)
Calculation of cost is based on the price at the time of 1/4/1991 7500 dongs per 1m3 of mountain earth and 5000 dongs per 1m3 of digging earth on site.
Through the Table 2, it is found that the three levels- filling variance with contribution of digging earth on site costs at the lowest.

Table 2

Variances	Filling quantity								Digging quantity (pool)		Total of filling quantity	Cost (F)
	For level of 0.6m		For level of 1.2m		For level of 1.8m							
	Area m2	Quantity (A)- m3	Area m2	Quantity (B)- m3	Area m2	C' m3	C" m3	Quantity (C)- m3	Area m2	Quantity (D)- m3	(E)- m3	(dong)
1	2	3	4	5	6	7	8	9	10	11	12	13
Household plot by design A												
+With pool:												
- 15.5 x 15.5m	59	46	62.5	97.5	68	122.4	45	100.6	50	65	244.1	1,522,000
- 12 x 20m	66	51.5	49	76.4	68	122.4	45	100.6	57	74	228.5	1,362,250
+Without pool:												
- 15.5 x 15.5m	109	85	62.5	97.5	68	122.4	45	100.6	0	0	283.1	2,123,250
- 12 x 20m	123	95.9	49	76.4	68	122.4	45	100.6	0	0	273	2,047,500
+Without different levels												
- For both	0	0	171.5	267.5	68	122.4	45	100.6	0	0	368.1	2,760,750
Household plot by design B												
+With pool:												
- 16 x 15m	52	40.5	61	95.1	74	133.2	45	114.6	52	69	250.2	1,548,750
-12 x 20m	70.5	55	48	74.9	74	133.2	45	114.6	47.5	62	244.5	1,539,250
+Without pool:												
- 16 x 15m	105	81.9	61	94.9	74	133.2	45	114.6	0	0	291.4	2,185,500
- 12 x 20m	118	92	48	74.7	74	133.4	45	114.6	0	0	281.3	2,109,750
+Without different levels												
-For both:	0	0	166	258.9	74	133.4	45	114.6	0	0	373.5	2,801,700

Note: 1/ C': 1.8 metter block volume
2/ C": Volume of foundation
3/ A or B = Area x height x 1.3
4/ C =[(Area x height) - C"] x 1.3
5/ E = A + B + C
6/ D = Area x 1.3 (depth)
7/ +With pool:
F = [(E - D x 1.3) x 7500 d] + D x 5000 d
+The others: F = E x 7500 d

d/ As for laying out plan of new settlement

Across above solutions and local people's ideas, it is proposed to give all (design B, household plot arrangements with design B and three level-filling variance with a pool) into laying out plan of new settlement. Based on this, two variances are presented

Comparison between two variances:
A part from ensuring good aspect of houses in two variances, we find chosen variance more dominant than the other, it is as follow:
- Not create new road
- The number of household, that will be able to get fresh water, is more.
- New settlement area is naturally ventilated better.

7. Estimated cost for accomodation unit

(Take example of plot of 16 x 15m with design B / Costs in Dongs - April 1991)

- Ground filling (with pool):	1,548,750
- Foundation of house:	1,899,000
- Wall :	1,740,750
- Tiled roof :	840,000
- Flat roof of reinforced concrete:	1,089,000
- Others (for building of house) :	1,277,000
- Total:	8,394,500

8. Construction process

* First step : Dig pool + well, fill ground of level of o.6m
* Second step : Fill ground of level of 1.2m
* Third step : Fill ground of level 1.8m

(In above steps empty spaces has to be reserved for building of foundation + well)

* Fourth step : Build the foundation
* Fifth step : Build the wall
* Sixth step : Build the roof
* Seventh step : Build the others(including building of yard and of rain water tank)
* Eighth step:Build the stair and the extension

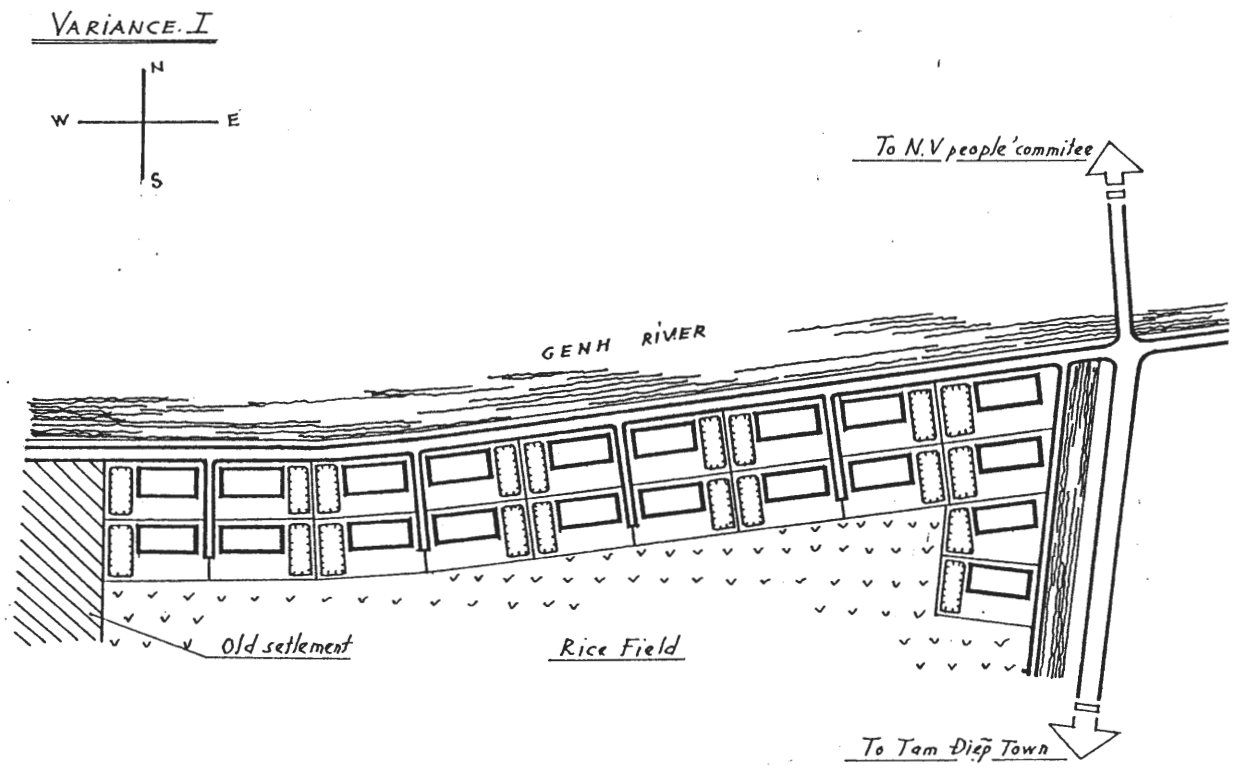
This process, that is long or short, depend on each household'affording money for building)

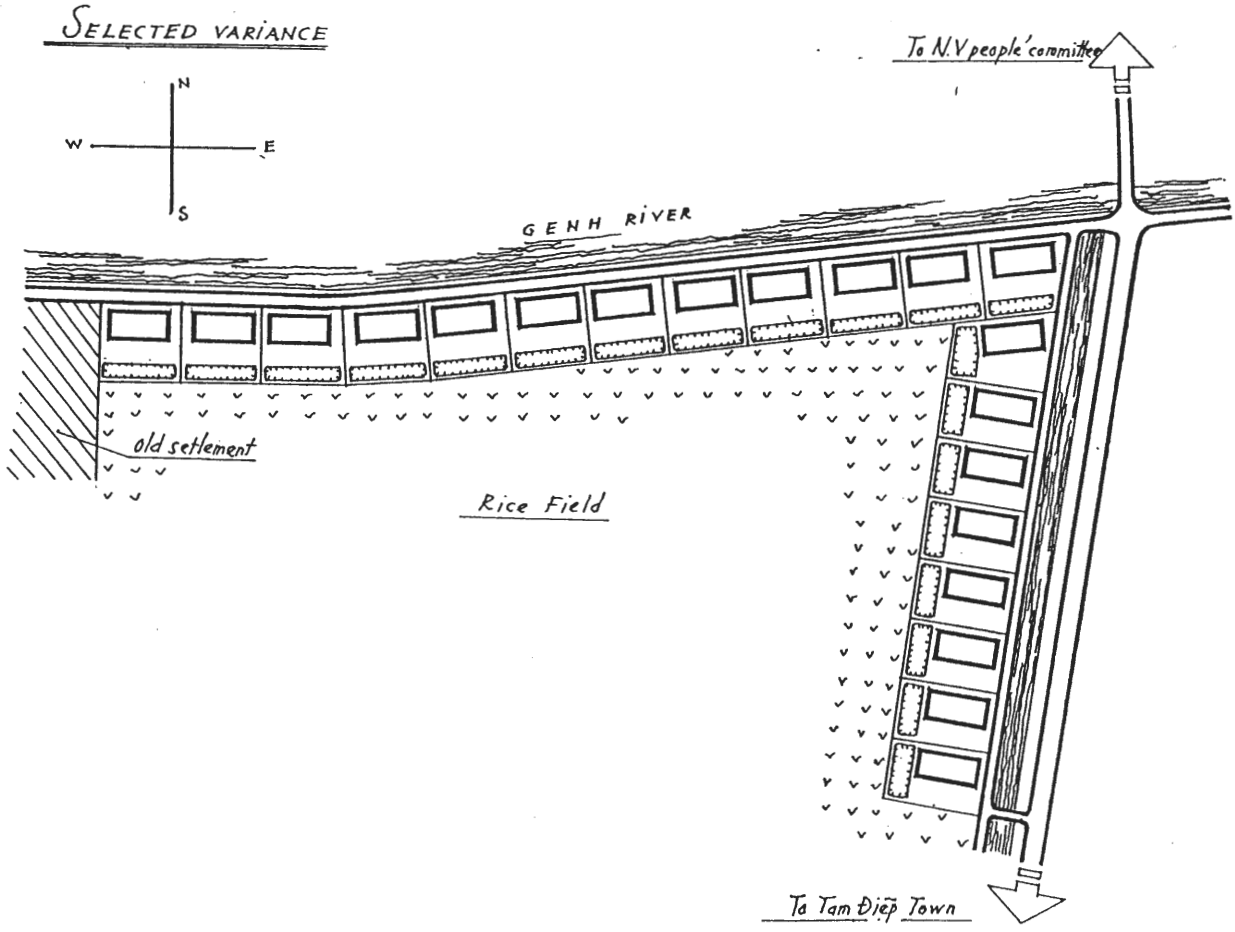
9. Implemetation process

¤ Phase 1 : Survey & reseachJune/91
¤ Phase 2 : Organize the new settlememt with local authorities
¤ Phase 3 : Organize with new householders & the local authorities on
- Technical proposal
- Process of construction
- Training local technician to develop new settlememt

The date of phase 2,3 depends on the Commune authority decision of implememtation)

New settlement : two solutions





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Ninh Van pilot action 7.1

Technical dossier

Road system : equipment

1. Context

Ninh Van commune has a road system of more than 60 kms, 27.5 kms of which are inter-village and inter-commune roads.

The commune has a potential advantage in the supply of materials for road surface construction. It has a limestone range with great potential to supply enough stone for the construction of the whole system with a gravel surface.

The main difficulty remians that it is impossible to construct a durable and solid gravel road surface without a road roller.

The commune cannot afford a road roller, and in spite of the potential raw material, the road system is of poor quality.

2. Statement of the problem

The problem is to upgrade the quality of the road system. To address this the commune needs road rolling equipment in order to be able to undertake the work themsleves, and moreover to rent out the equipment to other communes to cover operational and maintenance costs.

3. Objectives

To enable Ninh Van commune to undertake road construction and maintenance activities thanks to a road roller, and to cover operational costs through economic collaboration.

4. Innovation being proposed

With a road roller, Ninh Van can meet technical requirements of road construction and maintenance and upgrade the quality of their road systems.

Revenues from renting to other communes will cover operational costs.

5. Criteria for selection of innovation

Equipment requirements :

* appropriate to the situation of the building materials of the commune;
* enough pressure for road construction and maintenance;
* multi-functional;
* can be repaired and replaced with local spare parts.

6. Economical comparaison of rollers

	6 tons roller	Tractor	4 tons roller	Shaking roller	Roller cycline
Productivity (m2/day)	80	80	50	30	15
Energy					
* fuel	46 000	80 500	34 500	30 500	
*oil	3 500	4 500	3 000	1 800	
*fuel				15 000	
total (dgs/day)	49 500	85 000	37 500	47 300	
Labour (driver dgs/day)	20 000	20 000	20 000	20 000	20 000 (2x10 000)
Maintenance (dgs/day)	21 322	34 609	24 423	10 065	
Total Op.cost / day	90 822	139 609	81 923	77 365	20 000
Total Op.cost / m2	1 135	1 745	1 638	2 579	1 333
Rental cost (dgs/day)	200 000	200 000			
Investment	20 000 000	22 000 000	17 000 000	7 000 000	6 000 000
Evaluation	Use for new road const. and maintenance		Use for road maintenance, lack of pressure for road construction		

7. Operation

Use of the equipment will be as follows:
- roll the surface and ground of newly-built roads of hte commune;
- maintenance work;
- work with neighbouring communes to cover fuel and driver costs;
- a tractor with improved reinforced concrete wheels can be used multi-functionally, e.g. in transportation for periods of flooding;

(See economic comparison for justification of supply of tractor with improved concrete wheels)

Calculation for proposal (all costs in Dongs)

For each day working for the commune, 5,000 m2 can be maintained.
For the maintenance of 81,000 m2 of road surface, 16 days.
Estimated time for raod construction and repair: 45 days
Time for rolling the road of the commune: 16 + 46 = **61 days**

Acquired costs 61 x 140,000 = **8,540,000**
To have this sum, the roller willl need to be let out to other communes:

Rent per day: 200,000 - 140,000 = **60,000**
For 61 days' work in the commune, the roller would need to be let out :
8,540,000 : 60,000 = **142 days**
Outside the rainy season, the roller can work for 250 days per year.

Number of days for earning extra money:
250 - (61 + 142) = 47 days
The sum of money to be saved
47 x 60 = **2,820,000**

If a tractor can be supplied it can be used for a number of different functions for 300 days per year, giving the following extra days:
300 - (61 + 42) = **97 days**
giving a potential income of:
97 . 60,000 = **5,820,000**

This calculation would enable capital to be amortised over 4 years.

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Ninh Van pilot action 7.2

Technical dossier

Road maintenance

1. Context

a) In Ninh Van commune, human settlements are linked to each other by raod systems, total length over 60 kms. These include:

* inter-village and inter-commune roads: 27,450 m
* inter-village roads in commune: over 30,000 m, including 3 types of frame:
  - earth roads (without spreading material for surface): 7,250m;
  - roads surfaced with earth and broken stone: 12,200m;
  - roads surfaced with gravel: 8,000m.

The quality of roads (with the exception of the Dong Quan - Cement factory road which have been improved and repaired in early 1990) is not satisfactory for the volume of traffic. Others are in a very poor state of repair, with many large holes hindering traffic.

b) The activities of the commune are being hampered by the poor quality of the roads, particularly stone production and construction.

c) The reasons for the poor quality of the roads are multiple, but mainly the economic difficulties of the commune have meant that it could not afford prompt maintenance of the road system.

2. Problems to be addressed

Given the limited investment capacity of the commune, it is necessary to provide basic equipment and to master technical and appropriate plans, as well as organize maintenance of this road system.

3. Objectives

To help the commune obtain the necessary equipment and to master technical and organisational skills needed to ensure year-round maintenance.

4. Implementation details

- equip the commune with one roller for compressing surface and foundation of roads in the course of maintenance;
- excessive technical maintenance for the commune;
- teach specialized units how to maintain roads.

5. Basic aims

* use materials available in the commune;
* durability;
* prompt implementation.

6. Construction work to be undertaken

The entire road system of the commune must be maintained periodically: weekly or monthly.

- broken stone is need for maintenance (standards: 20 L/m2);
- gravel is needed for repair work (quantity will vary with the degree of damage.)

7. Building process

Priorities will be as follows:
1) inter-commune roads;
2) inter-village roads;
3) internal commune roads.

8. Costs (Dongs / April 91)

Costs of maintenace must be calculated according to the actual degree of damage.
For maintaining 100 m^2:

- Broken stone: 2 m^3 x 10,000d = 20,000
- Labour: 2 w.days x 5,000d = 10,000
- Roller: 2,800 (having roller equipped)
- Total: 32,800 (3,28d/m2)

9. Organization

¤ Every year the quality of every road link must be assessed in order to determine which roads require maintenance;
¤ The following year's maintenance plan can then be drawn up, with priority given to links carrying the most traffic;
¤ Materials and labour are organized according to the plan.

10. Implementation process

* Exercise technical and methods of maintaining cardles and units specializing in transportation and irrigation of the commune.
* Equip means for the commune. This phase will be implemented in Dec 1991.
* Experiment moldels of maintaining 1 km of Dong Quan - Thuong village road in Oct 1991;
* Evaluate experimentation and ensure wider diffusion;
* Make plans for operation and maintenance.

11. Dissemination

¤ Use public loudspeakers to disseminate information about methods of operation and maintenance;
¤ Hold seminars, school meetings, production groups to propagandize and mobilize.

12. Unit investment

Items	Qty	Unit cost (1000 d)	Total (1 000 d)	Contribution (1 000 d) Com	People	Sub-Cont.
Maintenance	81 000 m2					
* materials						
(broken stone)	1 620 m3	10	16 200	16 200		
* labour						
(spread stone)	1 620 w.d	5	8 100		8 100	
*roller	81 000 m2	0.028	2 268	2 268		Roller
TOTAL			26 568	18 468	8 100	Roller

The investment required is high, if the commune if to maintain the whole road system annually. Currently, the commune can contribute only 1/3 of this annual budget, i.e. maintain over a three-year cycle.
The project will bear the cost of prototypes for 1000m (984,000d) and supply a roller.

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Ninh Van pilot action 10

Technical dossier

Commune market

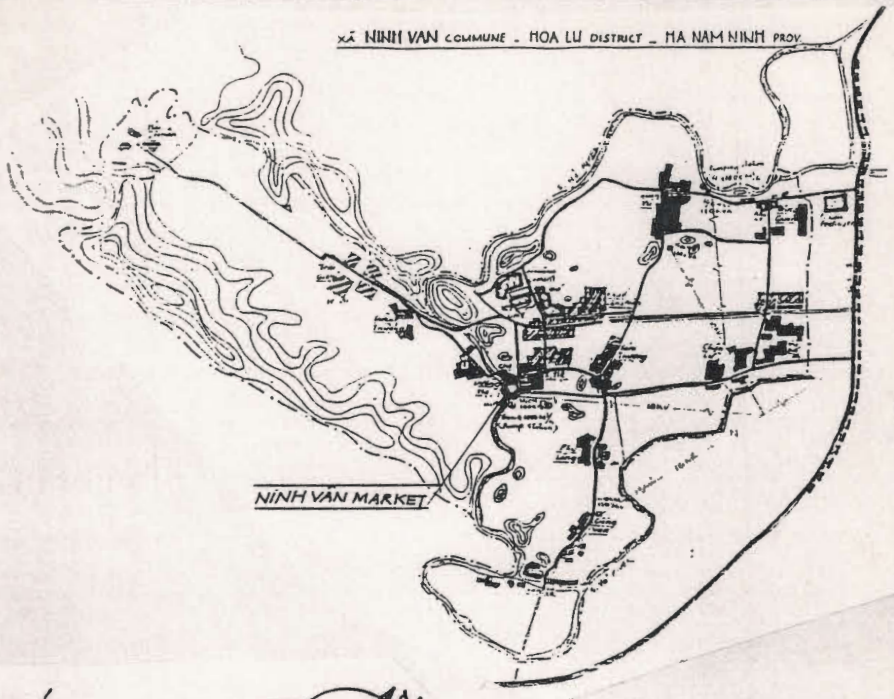
I. PRESENTATION

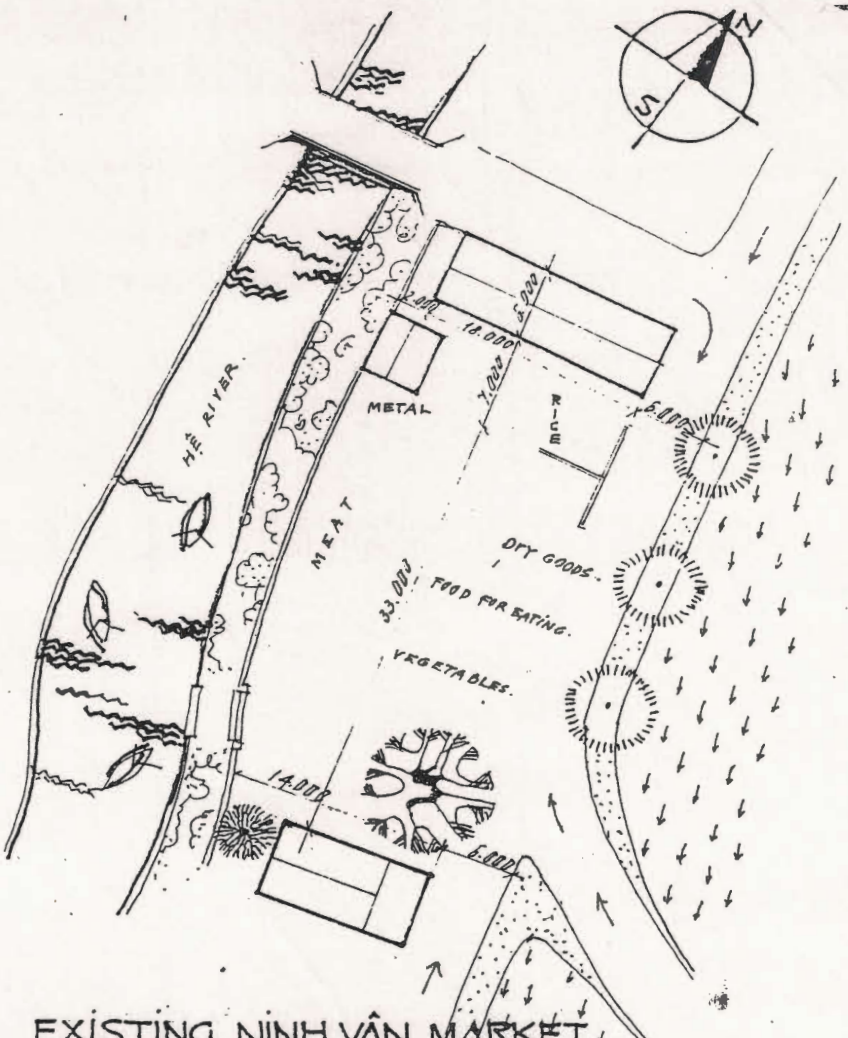
Development Workshop

Center for Rural Planning and Development
Hanoi-Vietnam

GRET

Location of Ninh Van Market





EXISTING NINH VÂN MARKET
HIỆN TRẠNG CHỢ NINH VÂN

1. The context

Ninh Van market is an old market, and the only one in the Commune. It is located near the inter-commune road and beside the Hé river, as well as being close to the Hé Dung settlement which has a large population. There are sufficeintly good conditions to justify developing the existing market to be the trade centre of the commune, serving some 10,000 people from the commune and neighbouring villages.
The market is sited on a narrow plot of land about 900 m2 in size, with no shelter nor sanitation or clean water supply.
At present in the market there are an old building with 7 rooms and a smaller building with two rooms belonging to the Commune Trade Cooperative. These buildings are damaged, and nearly half of the structure needs to be repaired or restored. Most of the rooms are empty or used as stores, and the one shop that is operating has a moderate turnover.
At the southern end of the market site, a tailor and a pharmacy shop have been built by a family.

The usual goods which are sold in the market are as follows:
- meat 6 tables each occupying 1.5m2;
- fish 2 places, 1.5 m2 each;
- egg 10 places, 1 m2 each;
- chicken and duck 2 places, 1.5 m2 each;
- fruit and vegetables 17 places, 1.5 m each ;
- dry cooking foods wood and fuel; 25 places;
- tailor/sewing 5 places and one shop;
- nails and tools 1 place;
- smithy/metal working 1 x 9 m2
- food for eating 7 places;
- a bicycle park.

In total ther are between 80 and 90 places for selling, and about 200 to 250 people actually selling things. A t present the number of registered sellers, on the increase, is about 30, whilst the rest are people who sell when they have time to spare from farming, have something to sell, and are thus irregular sellers.

The capital at present invested in a selling place rages from:
- largest capital: 60,000 to 100,000 VN dong/place;
- medium capital: 30,000 to 50,000 VN dong/place;
- smallest capital: 5,000 to 20,000 VN dong/place.

The market generates about 1,000,000 VN dong/year in tax profit.

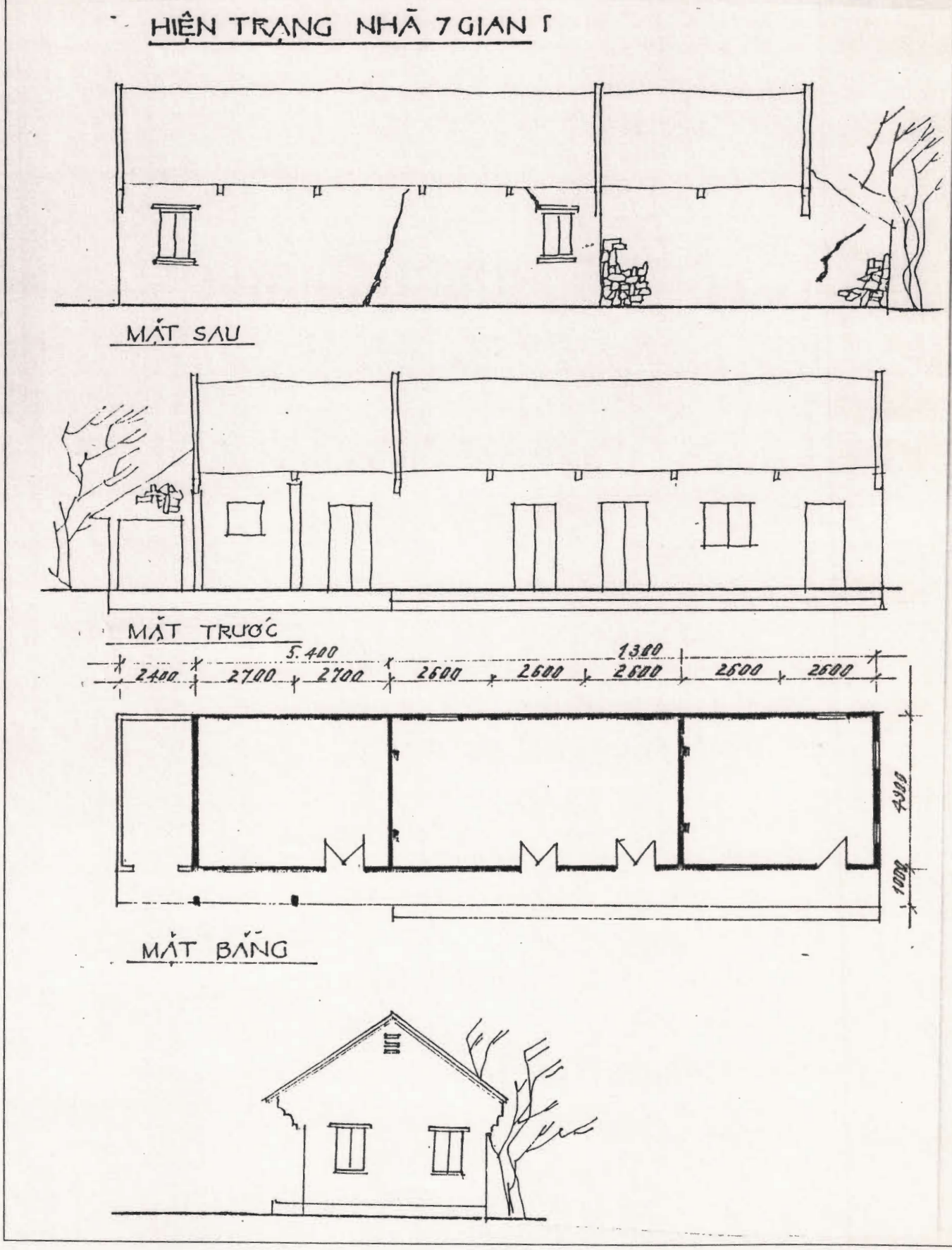
The market operates from 6 to 8 am on the odd days of the month.

Conclusion

Ninh Van market has ben a small and poorly developed market for a long time, and as such it is typical of the plains of the nothern delata area.

Now, with the new economic developemnt policy, Ninh Van commune does have the potential and conditions to develop a garden economy for every family, and to develop artisan crafts such as stone carving. These are the basic resources which can be promoted in the market. If the market activity is good, then it willl stimulate all production activities in the economic sector of the commune. In turn it will help to increase incomes, profits from taxes, and contribute to an improvement in living conditions.

Old building



2. Advantages and disadvantages for the market construction

* Ninh Van market is situated in an area whihc is very convenient for construction and development.
* Materials are available, such as stone, He Duong cement, bamboo and wood.
* As labour force, masons and builders are available. They have good experience of building in stone and wood.
* Especially, in the commune there is now a development of building concrete floored structures, with stone walls, and reinforcement in the concrete.
* The Committee of commune leaders are young and active, involved in production, economy and the well being of the society, and are thus a good dynamic force.

Finally, to improve and expand the market is an urgent need for all the inhabitants,and has large popular support.

3. Objectives

Ninh Van market construction aims at providing a demonstration of using local and appropriate technical solutions:

- make use of materials available in the commune: stone, cement, lime, wood, bamboo.
- demonstrate good stone building techniques.
- demonstrate typhoon resistant construction and flood resistant construction techniques.
- improve experience in mobilizing and making use of capital resources for community building such as a market.

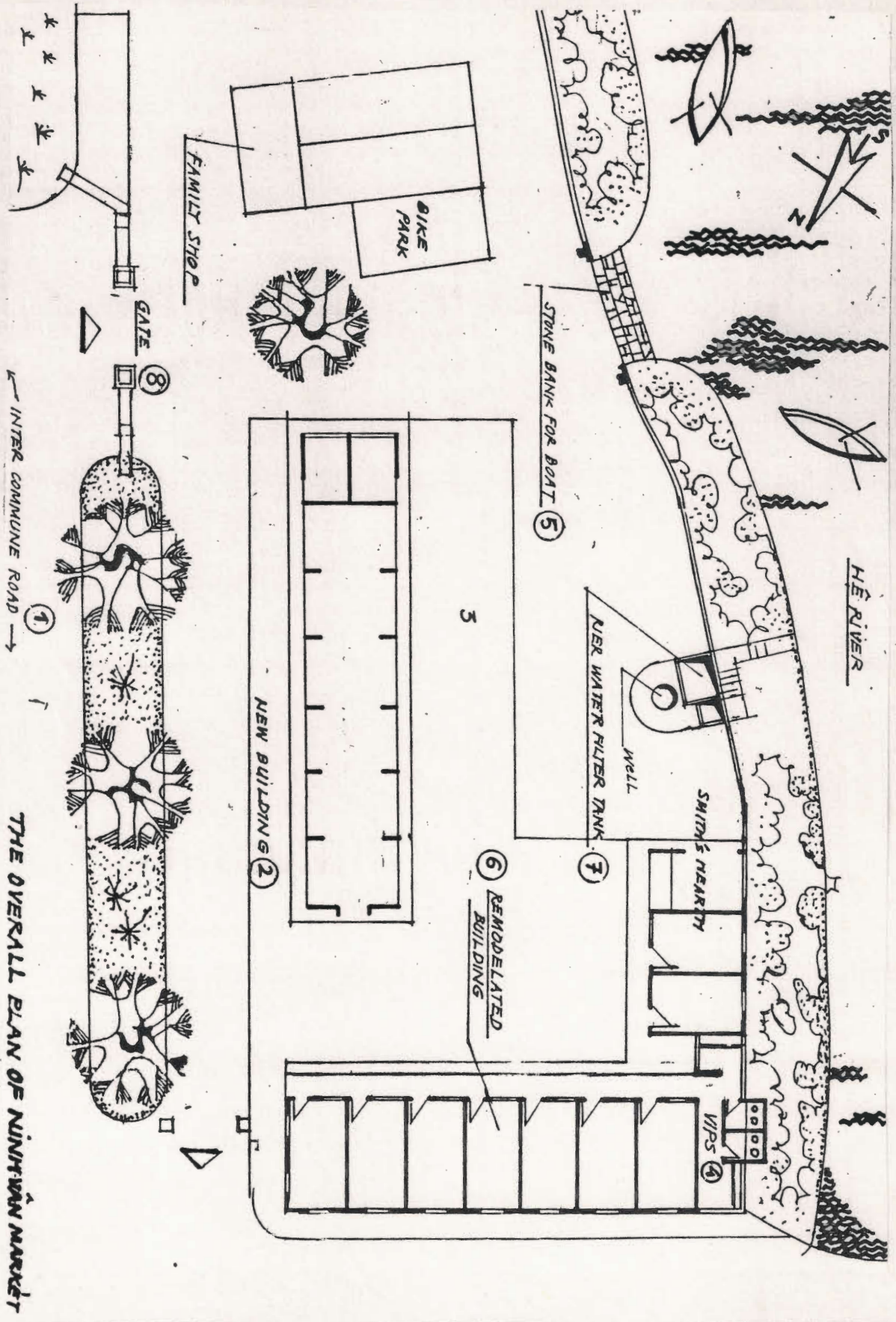
4. The main problems to be studied

* Build the foundations with stone.
* Construct stone arches instead of large span wooden lintels, which cost the same but are less durable.
* Combine wood frame structures and stone wall structures.
* Develop the use of stone dust and cement tiles.
* Combine different types of roofing structure.

5. Performance criteria for the choice of technical solution

* Materials must be as much as possible from Ninh Van commune, in order to reduce transport costs.
* Costs must be low.
* Construction must be durable and safety
* Building must be suitable for commune abalities

Plan of Ninh Van Market



THE OVERALL PLAN OF NINH VÂN MARKET

6. Proposed actions

* The old building will be improved and transformed into shops by the trade cooperative, then sold to people having booked their place in the market (Action 6). These shops (average 11 m2) are suitable for dry mix goods, tailorshop...

* To extend the area of the market plot, it is necessary to build a new road (70 m length, 6.5 m width), so the area will be 1 200 m2 (Action 1)

* A new building (7 rooms, 24 places, 100 m2) is needed for selling food (rice, meat, eggs), tools...(Action 2)

* A market yard of about 50-60 selling sites outside (300 m2) will be used for the remaining goods, as fish, chicken, fruits and vegetables, woods and fuel...(Action 3)

* To improve the facilities of the market site, 2 twin latrines (Action 4), and a well with water filter and tank (Action 7)will be built.

* Access from the river (Action 5) and from the road (Action 8) will also be improved.

7. Costs estimate (Dongs / October 1991)

(See detailed costs in Part II)

Action 1. Expand market		**8 652 000**
Building materials:	7 665 000	
Labour :	987 000	
Action 2. Construction of new building with 7 rooms by stone and cement tiles.		**10 998 000**
Built area	115 m2	
Veranda area	52 m2	
Building materials :	8 421 000	
Labour :	2 577 000	
Action 3: plaster outside market yard (300 m2).		**945 000**
Building materials :	690 000	
Labour :	255 000	
Action 4: Twin latrine: (for man and woman)		**1 732 000**
Building materials :	1 338 000	
Labour :	394 000	
Action 5: River stone bank (l=4,5m)		**612 000**
Building materials :	432 000	
Labour :	180 000	
Action 6: Improvement the old building		**6 808 000**
Building materials:	5 024 000	
Labour :	1 784 000	
Action 7: Water filter tank (V = 10 m3).		**2 505 000**
Building materials :	1 815 000	
Labour :	690 000	
Action 8: Market gate.		**430 000**
Building materials :	348 000	
Labour :	82 000	
Action 1:	8 652 000	
Action 2:	10 998 000	
Action 3:	945 000	
Action 4:	1 732 000	
Action 5:	612 000	
Action 6:	6 808 000	
Action 7:	2 505 000	
Action 8:	430 000	
TOTAL		**32 682 000**

8. Construction process

According to commune report:

* The old building will be improved and transformed into shops by the purchasing cooperative capital and then sold to people having booked their seats in the market. this building will be carrying out in 1992 - 1993.
* User capital (1991 - 1992): 30 x 50.000 = 1 500 000 Dgs
* The market tax: 1 000 000 Dgs
* The commune labour is about 2000 working day = 10 000 000 Dgs

This budget is limited so the market construction process will be divided two phases:

Phase 1: carry out in 1991 - 1992: actions 1, 2, 3, 4, 5.

Total:	22 939 000
Material:	18 546 000
Labour:	4 393 000

Phase 2: carry out in 1992 - 1993: actions 6, 7, 8.

Total:	9 743 000
Material:	7 187 000
Labour:	2 556 000

Note: action 1 start in September - October /1991.

9. Manage market operation:

The board of management must be stabilized in order to understand good market operation, including 1 - 2 persons.

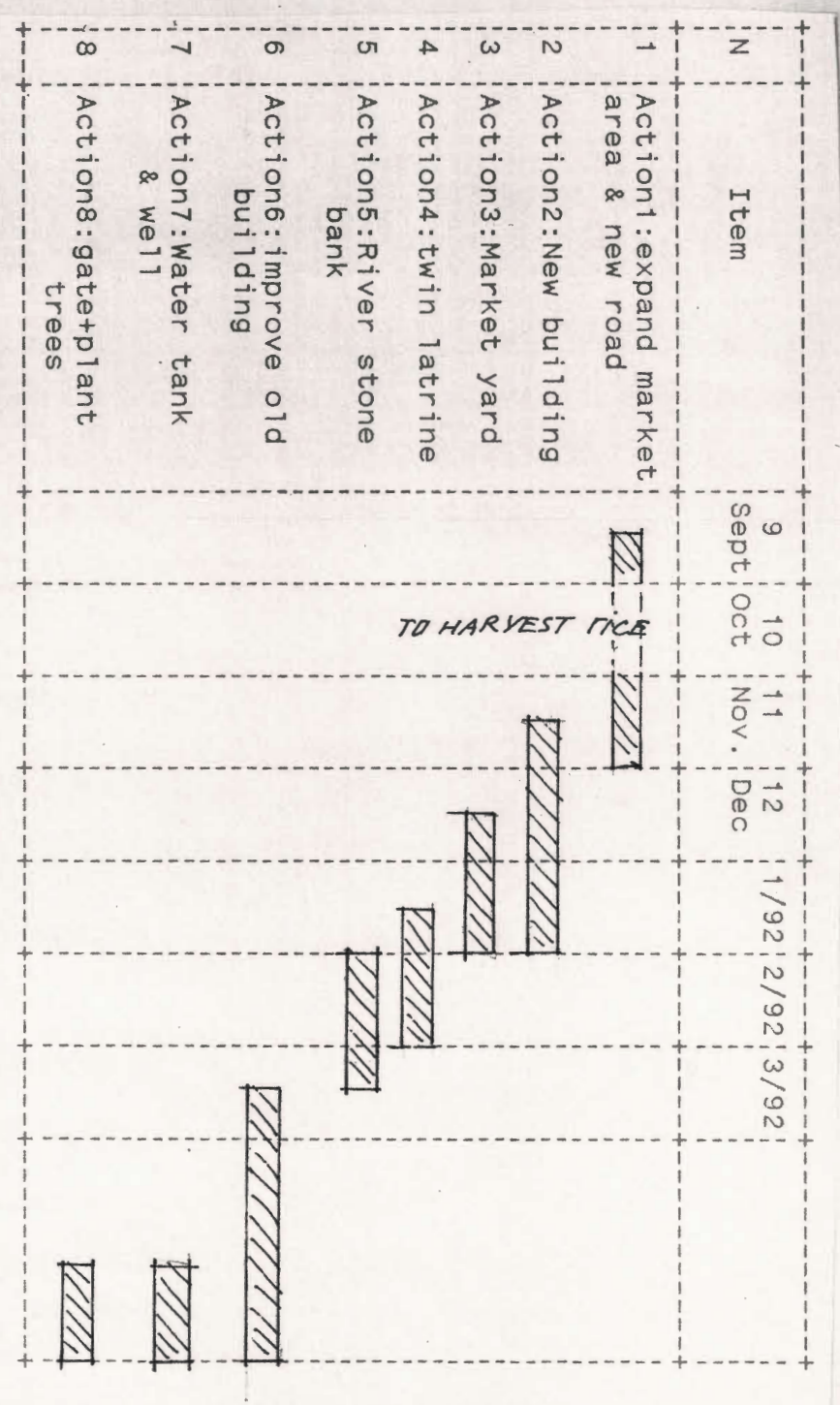
- Task's management board:

Maintain market operation everyday, make market clean and in order
after market day (control, water filter tank, sanitation).
Collect and pay taxes.
Every year, market should be maintained and repaired when needed.

10. Budget breakdown

N	Item	User		Commune		Project		TOTAL	%
1	Expand plot/road			7 662 000	89%	990 000	11%	8 652 000	26%
2	New building	1 500 000	14%	2 700 000	24%	6 798 000	62%	10 998 000	34%
3	Market yard			445 000	47%	500 000	53%	945 000	3%
4	Latrines			1 032 000	60%	700 000	40%	1 732 000	5%
5	River bank			212 000	35%	400 000	65%	612 000	2%
6	Improve old building	6 308 000	93%			500 000	7%	6 808 000	21%
7	Well and filter/tank			1 205 000	48%	1 300 000	52%	2 505 000	8%
8	Market gate	200 000	47%	230 000	53%			430 000	1%
All		8 008 000	25%	13 486 000	41%	11 188 000	34%	32 682 000	100%

11. Construction process 1991 - 1992



II/ Costs and plans

1.Detailed costs

Action 1. Expand market

New road with 70 m length, 6,5 m width, 2 m height, levelling market plot.V = 70 x 6,5 x 2 x 1,3 = 1183 m3.
Labour : 1183 x 5000 = 5 915 000 d
(a Working day - 5 000d without transport cost)
Surface of road with stone ; 0,2 m high ; 70 m length ; 3 m width.
Material : 70 x 3 x 4700 = 987 000 d
Total: 6 902 000 d
Filling up old market yard (0.3 m high, resistance flood and run-water easily)
Labour: 0.3 x 40 x 26 x 5000 = 1 750 000 d

Action 2. Construction of new building with 7 rooms by stone and cement tiles.

Ninh Van Market : Cost estimate (Dongs/October 1991) ***Action : 2***

N	Item	Unit	Qty	Unitary cost		Total		TOTAL
				B. mat.	Labour	B.M.	Labour	
1	Dig foundation	m3	25		6 000		150 000	150 000
2	Spread b.sand (0.05)	m3	1.5	36 000	3 600	54 000	5 400	59 400
3	Stone foundation	m3	21	48 000	20 000	1 008 000	420 000	1 428 000
4	Filling up found. earth	m3	15		5 000		75 000	75 000
5	Filling up over found.	m3	35		6 000		210 000	210 000
6	Stone wall	m3	12	48 000	28 000	576 000	336 000	912 000
7	Stone arch	m	22	32 000	5 000	704 000	110 000	814 000
8	Concrete beam	m3	2.5	308 400	5 800	771 000	14 500	785 500
9	Bambou frame		100	6 000	500	600 000	50 000	650 000
10	Cement tiles	m2	150	12 000	2 500	1 800 000	375 000	2 175 000
11	Hipped roof forms	m	22	5 000	500	110 000	11 000	121 000
12	Ribs	m	50	2 500	550	125 000	27 500	152 500
13	Wooden bracket		16	8 000	3 000	128 000	48 000	176 000
14	Cement joint finishing	m2	100	2 400	500	240 000	50 000	290 000
15	Plaster wall	m2	18	3 800	850	68 400	15 300	83 700
16	Steel 6-10	kg	270	450	400	121 500	108 000	229 500
17	Broken stone / floor	m3	8.4	70 000	10 000	588 000	84 000	672 000
18	Floor finishing	m2	84	5 000	850	420 000	71 400	491 400
19	Veranda	m2	52	2 700	3 000	140 400	156 000	296 400
20	Door	m2	8.5	67 500	10 000	573 750	85 000	658 750
21	Painting door	m2	17	1 500	500	25 500	8 500	34 000
22	Drain	m	45	8 000	3 500	360 000	157 500	517 500
23	Painting walls	m2	18	400	500	7 200	9 000	16 200
	TOTAL					8 420 750	2 577 100	10 997 850

Action 3: plaster outside market yard (300 m2).

Material: stone 1 x 2 . (o,1m) - 300 x 0,1 x 23000 = 690 000 d
Labour: 300 x 850 = 255 000 d
Total: 945 000 d

Action 4: Twin latrine: (for man and woman)

Ninh Van Market : Cost estimate (Dongs/October 1991) *Action : 4*

N	Item	Unit	Qty	Unitary B. mat.	cost Labour	Total B.M.	Labour	TOTAL
1	Cement	kg	65	480		31 200		31 200
2	Undressed stone	m3	5	13 000		65 000		65 000
3	Stone 1x2	m3	1	23 000		11 500		11 500
4	Stone dust	m3	2.5	15 000		37 500		37 500
5	Steel 6	kg	2	4 500		9 000		9 000
6	Lime	kg	220	200		44 000		44 000
7	Net steel	m2	14	12 000		168 000		168 000
8	Tiles	u	50	400		20 000		20 000
9	Bamboo	u	3	6 000		18 000		18 000
10	Door	u	1	40 000		40 000		40 000
11	Labour	d	22		6 000		132 000	132 000
	TOTAL					444 200	132 000	576 200

Latrines	2		888 400	264 000	1 152 400
Finishing			450 000	130 000	580 000
TOTAL			1 338 400	394 000	1 732 400

Action 5: River stone bank (l=4,5m)

V = 4,5 (1,6 x 1,2 + 0,2 x 0,4) = 9m3.
Material: 9m3 x 48000d/m3 = 432 000d
Labour: 9 x 20.000 = 180 000d
Total = 612 000d

Action 6: Improvement the old building

Ninh Van Market : Cost estimate (Dongs/October 1991) *Action : 6*

N	Item	Unit	Qty	Unitary B. mat.	cost Labour	Total B.M.	Labour	TOTAL
1	Foudation	m3	16.3		6 000		97 800	97 800
2	Spread b.sand	m3	5	36 000	3 600	180 000	18 000	198 000
3	Stone foundation	m3	9	48 000	20 000	432 000	180 000	612 000
4	Fill up foundation	m3	7.3		5 000		36 500	36 500
5	Stone walls	m3	27	48 000	28 000	1 296 000	756 000	2 052 000
6	Pastering inside	m2	187	3 700	800	691 900	149 600	841 500
7	Floor finished	m2	113	4 900	850	553 700	96 050	649 750
8	Windows/doors	m2	30	60 000	10 000	1 800 000	300 000	2 100 000
9	Repair							
	- tiles	u	176	400		70 400		70 400
	- labour	d	30		5 000		150 000	150 000
	TOTAL					5 024 000	1 783 950	6 807 950

Action 7: Water filter tank (V = 10 m3).

Ninh Van Market : Cost estimate (Dongs/October 1991) *Action : 7*

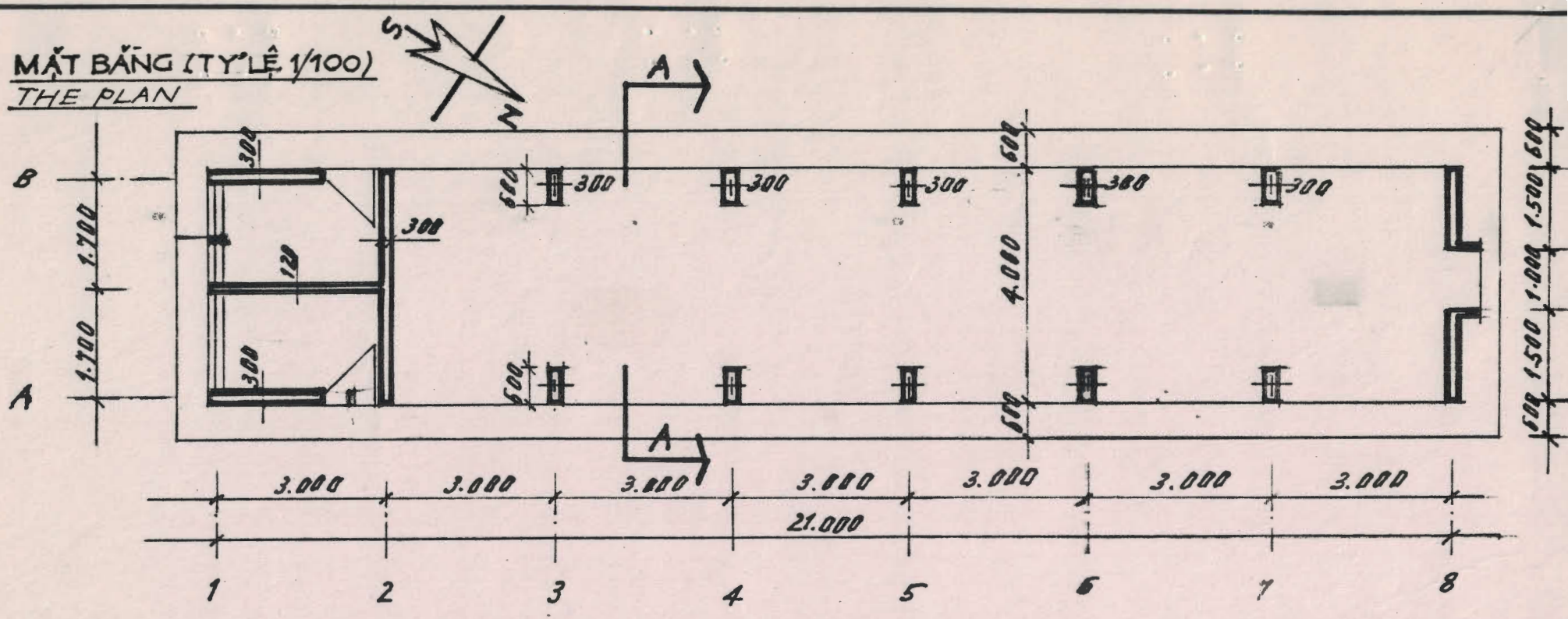
N	Item	Unit	Qty	Unitary cost		Total		TOTAL
				B. mat.	Labour	B.M.	Labour	
Water tank								
1	Cement	kg	1580	480		758 400		758 400
2	Undressed stone	m3	14.5	13 000		188 500		188 500
3	Stone 4x6	m3	2.5	16 000		40 000		40 000
4	Stone dust	m3	7.5	15 000		112 500		112 500
5	Lime	kg	500	100		50 000		50 000
6	Steel 6	kg	30	4 500		135 000		135 000
7	Steel net	m2	0.04	15 000		600		600
8	Tap	u	2	5 000		10 000		10 000
9	Brick	u	45	200		9 000		9 000
10	Bambou	u	4	6 000		24 000		24 000
11	Labour	d	75		6 000		450 000	450 000
	TOTAL					1 328 000	450 000	1 778 000
Well (5.5 m deep)								
1	Undressed stone	m3	8	13 000		104 000		104 000
2	Stone 1x2	m3	1	23 000		23 000		23 000
3	Stone dust	m3	4	15 000		60 000		60 000
4	Quick lime	kg	300	200		60 000		60 000
5	Cement	kg	500	480		240 000		240 000
6	Labour	d	40		6 000		240 000	240 000
	TOTAL					487 000	240 000	727 000
	TOTAL					1 815 000	690 000	2 505 000

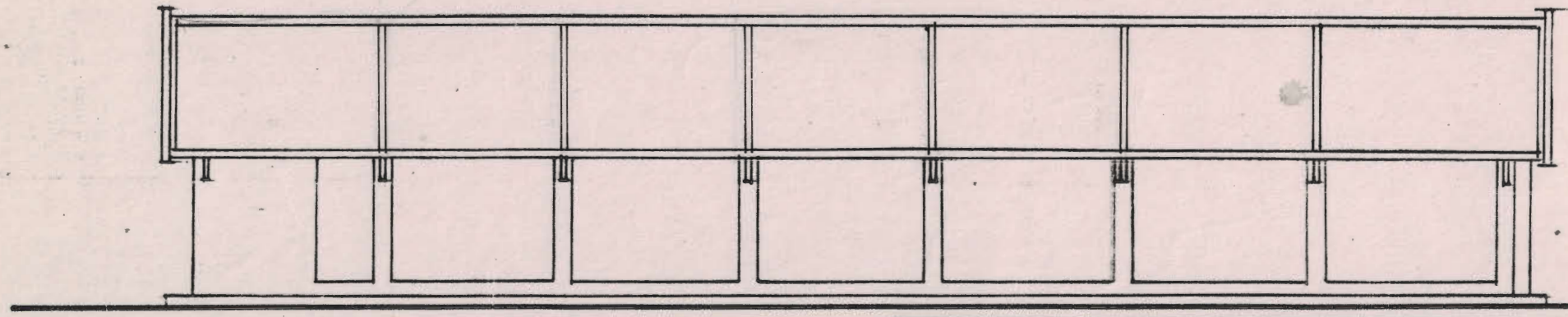
Action 8: Market gate.

V = 2(0,4 x 0,4)4,5 + 0,3(3,5 x 1,8) = 4,1 m3
Dressed stone: 30 x 5000 = 150 000
Undress stone: 4,1 x 48 000 = 198 000
Labour: 4,1 x 20 000 = 82 000
Total 430 000 d

2.Plans

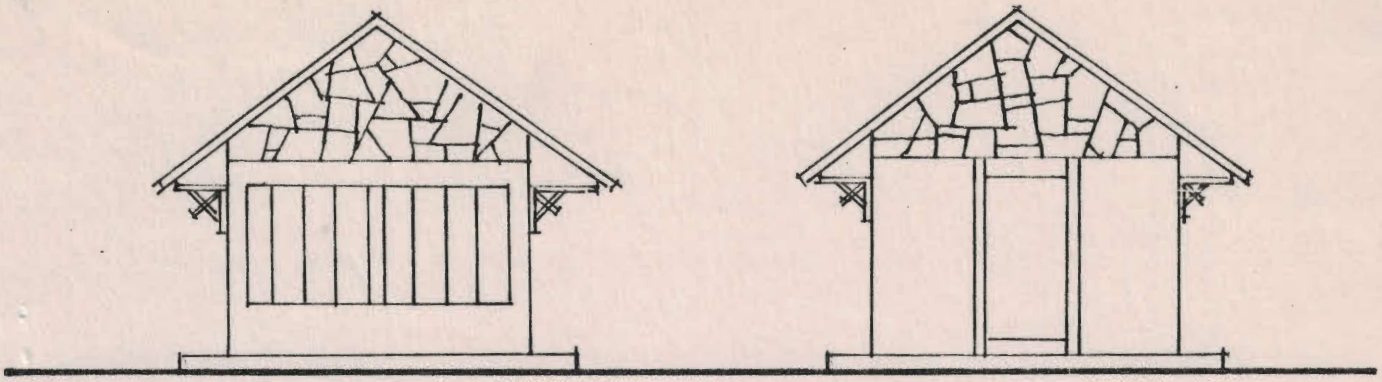
MẶT BẰNG (TỶ LỆ 1/100)
THE PLAN





MẶT ĐỨNG TRUC 1-8
(Tỷ lệ: 1/100)
THE ELIVATION

TRUNG TÂM PHÁT TRIỂN NÔNG THÔN VIE B6/020	XÂY DỰNG CÔNG TRÌNH MỚI **CHỢ NINH VÂN**	BẢN VẼ S... 01
GIÁM ĐỐC	CHỦ NHIỆM - KIỂM - THIẾT KẾ	NGÀY 26 6

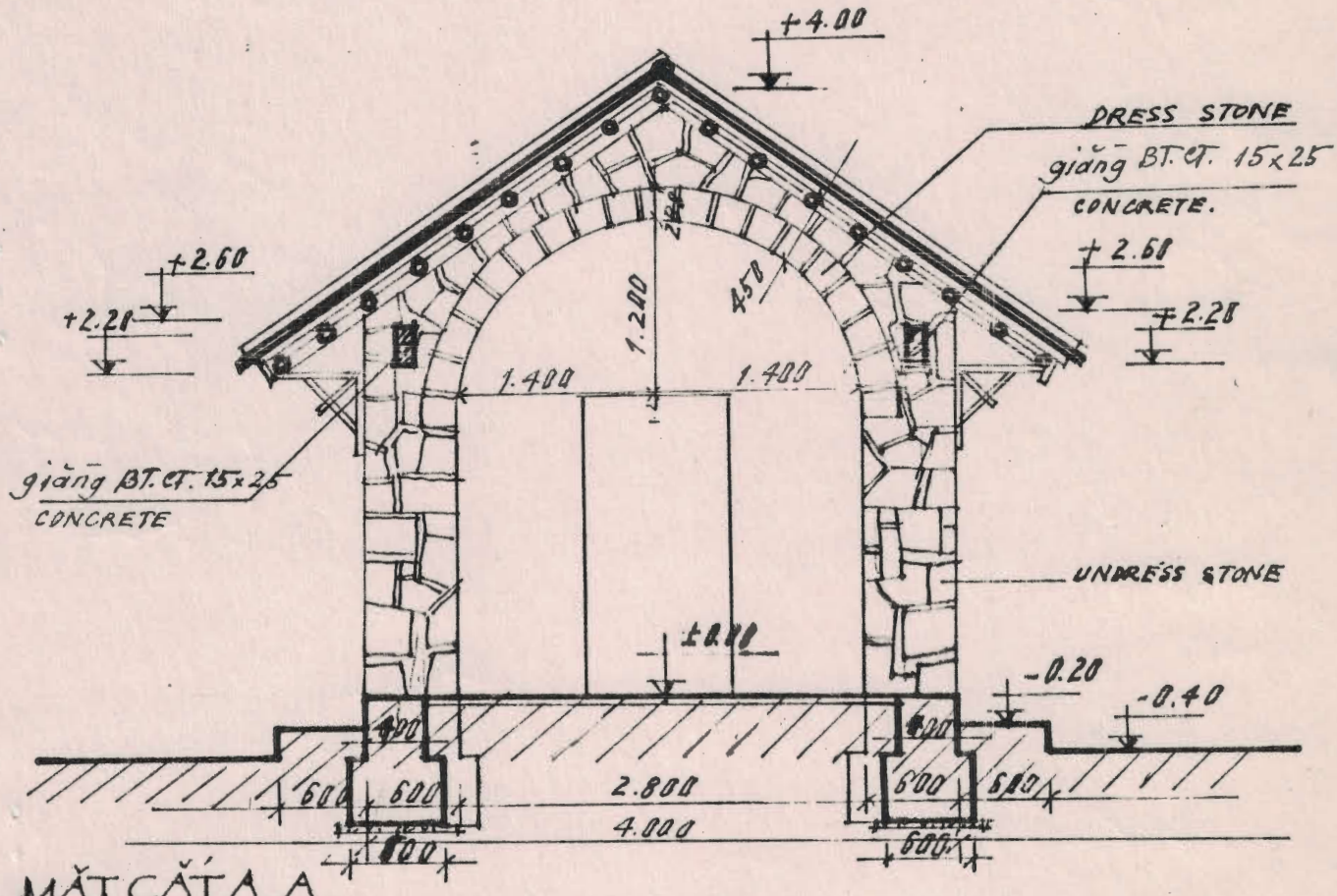


MẶT ĐỨNG TRỤC B-A

THE ELIVATION B-A Tỷ lệ 1/100

MẶT ĐỨNG TRỤC A-B

THE ELIVATION A-B Tỷ lệ 1/100



MẶT CẮT A-A

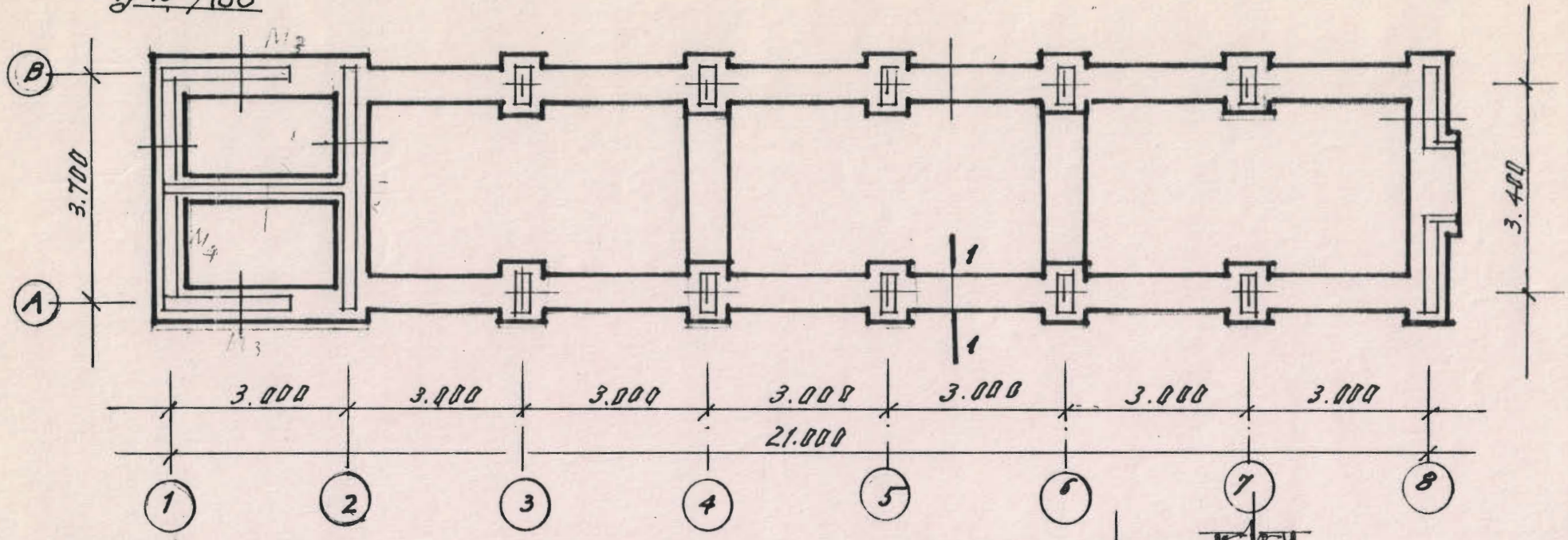
(Tỷ lệ 1/50)

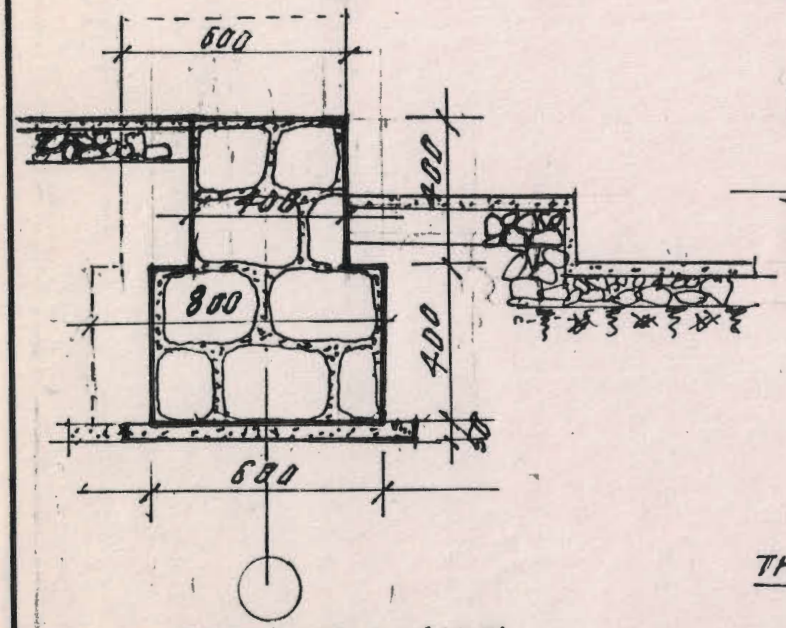
SECTION A-A

TRUNG TÂM PHÁT TRIỂN NÔNG THÔN VIE 86/020	CHỢ NINH VAN CÔNG TRÌNH MỚI. MẶT CẮT - CÁC MẶT BÊN	BẢN VẼ SỐ 02 NGÀY 26.6.1991
GIÁM ĐỐC	CHUNHIEM KIEM THIET KE	CAN HOA

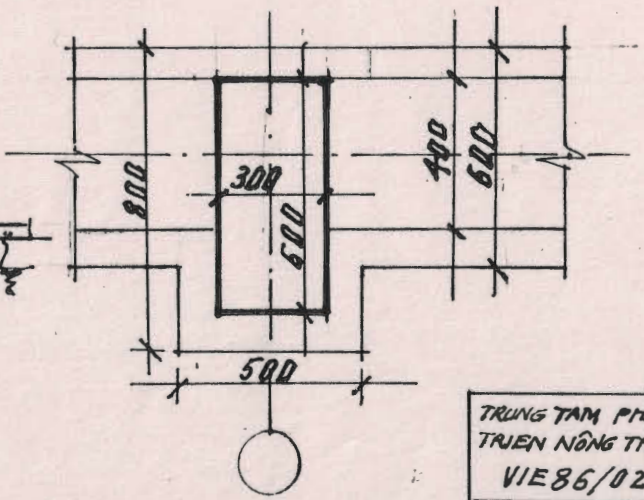
MẶT BẰNG MÓNG FOUNDATION PLAN

Tỷ lệ 1/100

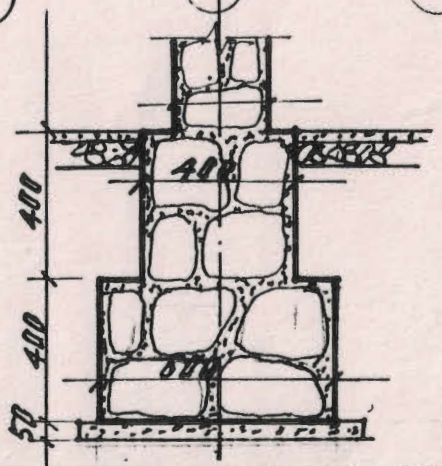




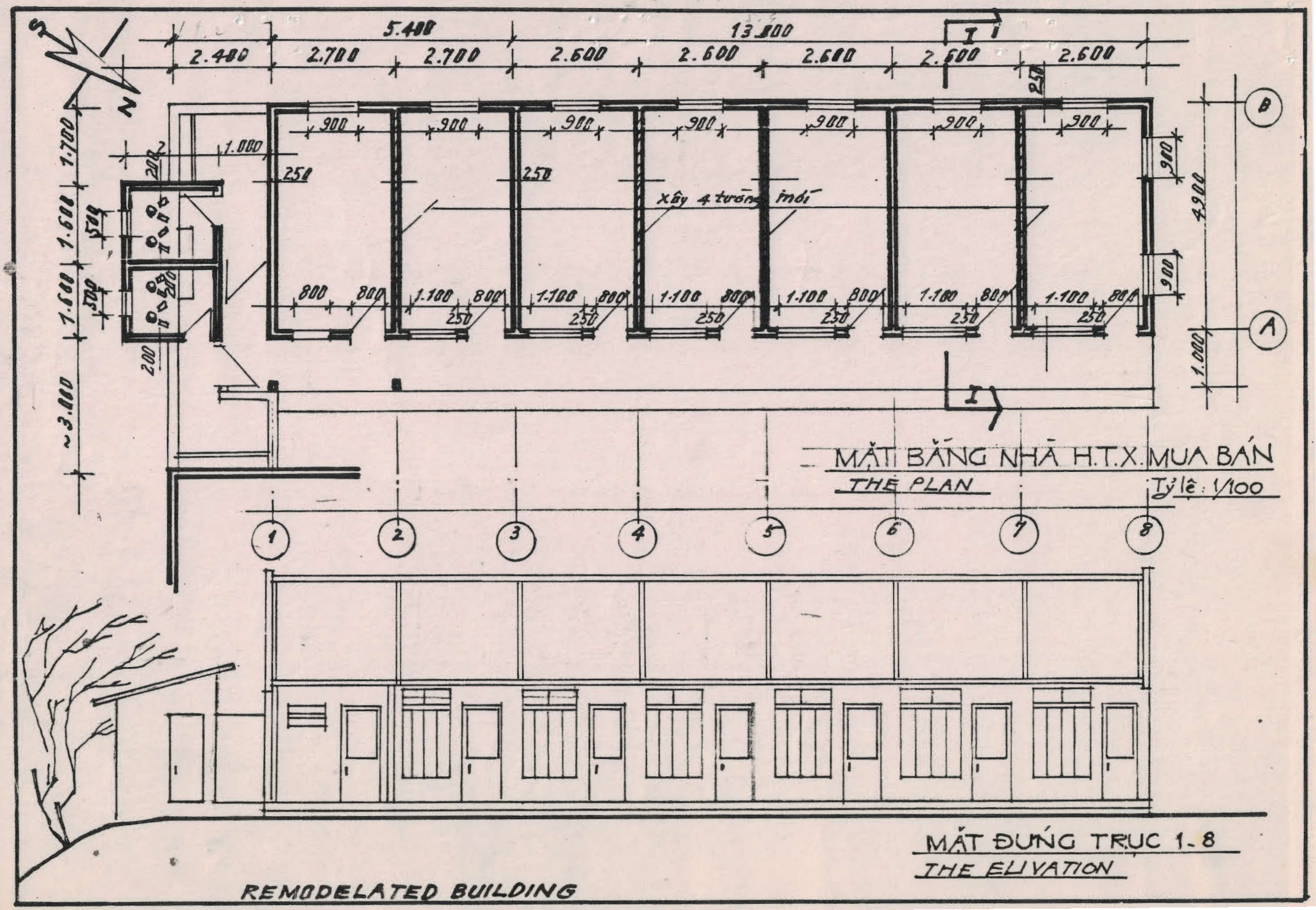
SECTION 1-1 (1/20)



THE PLAN OF STONE WALL



TRUNG TAM PHAT TRIEN NÔNG THÔN VIE86/020	CHỢ NINH VÂN CÔNG TRINH MỚI	BẢN VẼ SỐ 01
GIÁM ĐỐC	MẶT BẰNG MÓNG	NGÀY 26.6.1991
	CHỦ NHIỆM KIEM THIẾT KẾ	CAN HOA



MẶT BẰNG NHÀ H.T.X. MUA BÁN

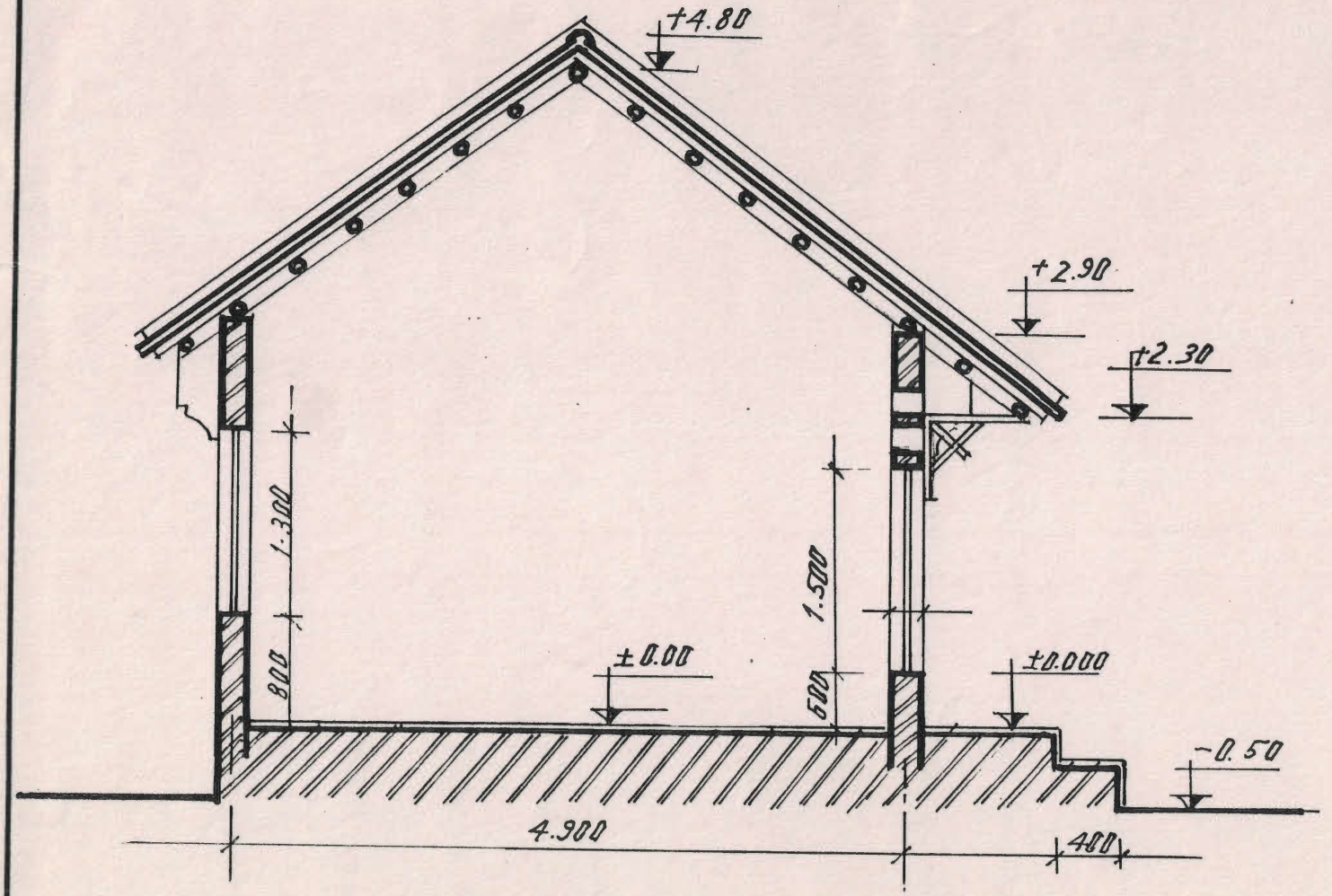
THE PLAN

Tỷ lệ: 1/100

MẶT ĐỨNG TRỤC 1-8

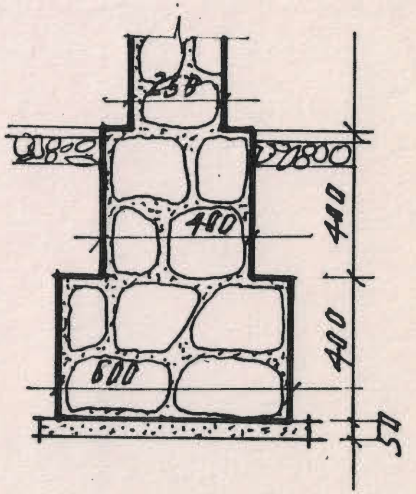
THE ELIVATION

REMODELATED BUILDING



MẶT CẮT I.I

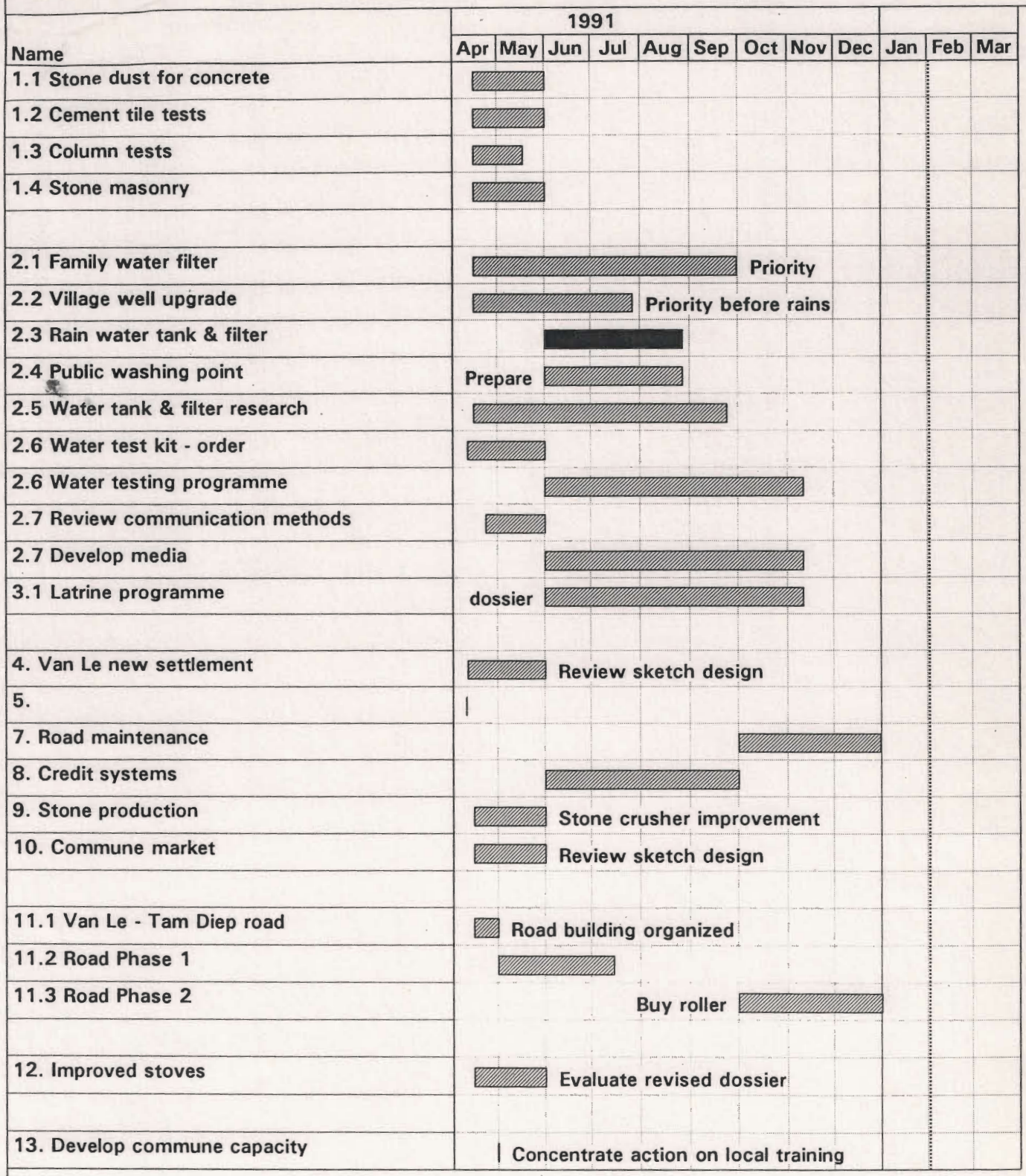
SECTION I-I Tỷ lệ: 1/100



FOUNDATION

TRUNG TAM PHAT TRIEN NONG THON VIE 86/020	CHỢ NINH VÂN CẢI TẠO CÔNG TRÌNH CŨ	BẢN VẼ SỐ 02 NGÀY 26.6.1991
	MẶT CẮT - MÓNG.	
GIÁM ĐỐC	CHỦ NHIỆM KIỂM THIẾT KẾ	CAN HOA

VIE/86/020 "RURAL SETTLEMENTS PLANNING"
BAR CHART
WORKPLAN BY PROJECT OBJECTIVES



Project:
Date: 1/2/92

Critical
Noncritical
Progress
Milestone
Summary

NATIONAL CENTRE FOR RURAL PLANNING AND DEVELOPMENT (CERPAD)

VIE / 86 / 020

CERPAD

Ninh Van pilot action 11

Technical dossier

Road Van Le / Tam Diep

1. Context

a) Van Le - Tam Diep road links Van Le Village, Ninh Van commune with Tam Diep township has a total length of 1100 m, 800 m of which belong to Ninh Van commune and 300 m belong to Tam Diep township, through 1A national road.

The road, which runs through 2 shallow fields of Ninh Van commune, is always flooded and now remains unoperational. The total area of this field is up to 135 ha. In Van Le village, there is a stone mountain range, which at present remains unexploited because of inadequate transport facilities. The Van Le - Tam Diep road cannot provide the transport faciltiy required because its foundations are too narrow and low-lying, it is made of earth, and often covered in water in the rainy season.

b) People are confronted with difficulties of organization for improving their economy, quarriying and processing stone in the area, as well as developing new settlements, because of bad roads.

c) If Van Le - Tam Diep road were expanded and improved, 135 ha of this area could be reclaimed, stone production would be improved and supply to the south of Ninh Van commune could be increased to 50 tons per day. And the distance of road can be reduced to 10 km so far.

2. Statement of the problem

Despite its usefulness, the Van Le - Tam Diep road has not so far been built by the commune, which can afford only an earth footpath, being unable to afford the materials for the feeder road and culvert construction.

The authorities and the people need help with the budget for buying materials and equipment, and labour. This road link would improve the living conditions and help development productive activities in the commune.

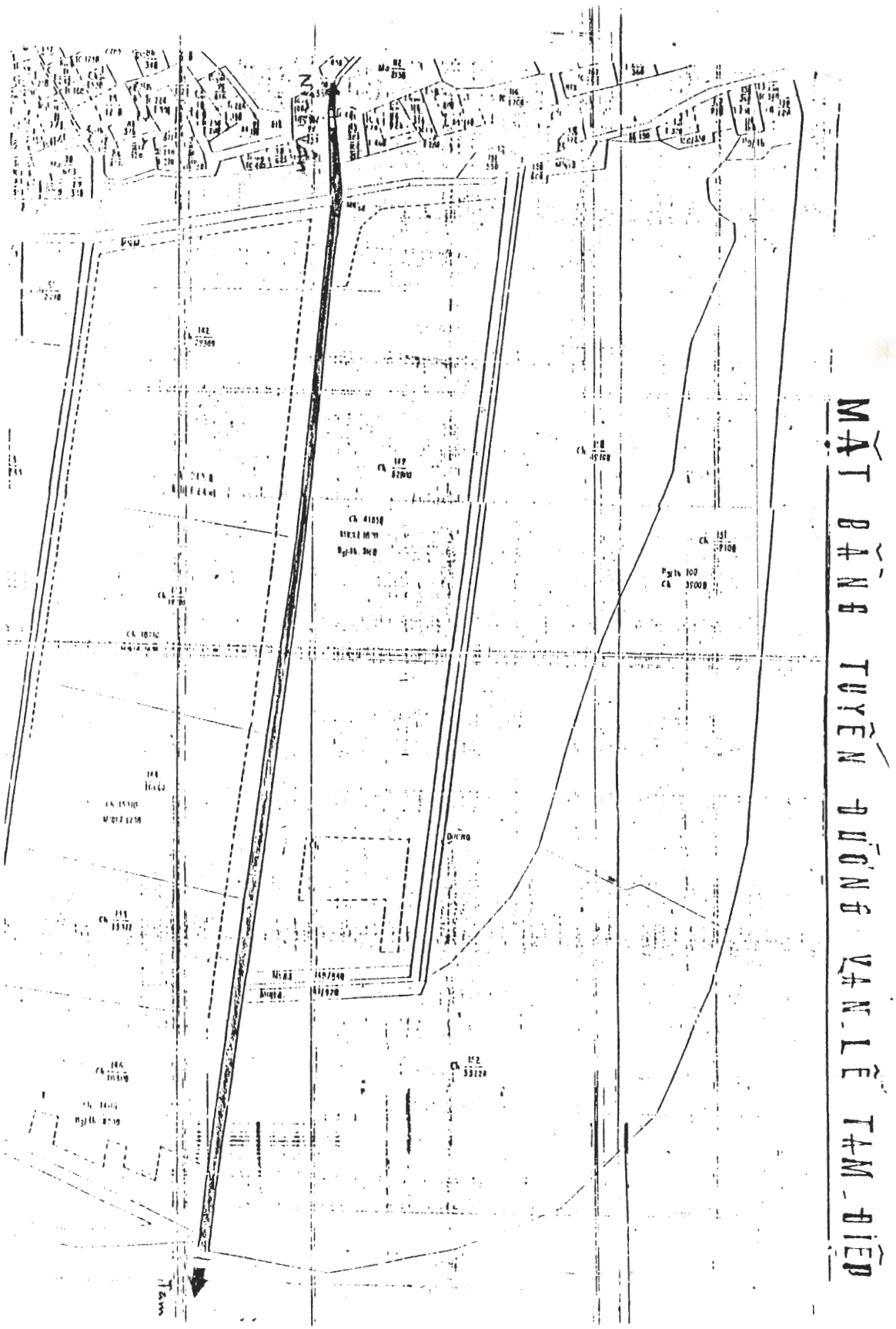
3. Objectives

* To build this road link, reclaiming 135 ha of land along the road, by building roads as well as irrigating;
* To provide a key basis for the stone production industry in Van Le and transport facilities to the southern areas of the commune. The transport distance will reduce by 10 kms and the annual load of transportation reduce to 180,000 tons.km.
* To improve the new settlement of the commune.

4. Innovation being proposed

Given the existing foundation of the road, it is proposed to widen the foundation from 3.50m to 4.50m for lorries, to embank the foundation higher than the surface of the field by 1.50m to prevent flooding in the rainy season, and to spread stone on the road for transporting every season.

5. Design



6. Criteria for selection of innovation

- ¤ To carry cars or lorries up to nearly 10 tons.
- ¤ To allow year-round traffic.
- ¤ To be wide enough for cars or other traffice to pass.
- ¤ To be suitable for the investment capacity which it is possible to mobilize.
- ¤ To be durable for 5 years.
- ¤ To use materials which are available in the commune.
- ¤ To allow both transport and irrigation.

7. Construction process

* 1st phase: (Apr - Jun 1991)
  - widen and make road foundation higher, as designed
  - build culvert system

* 2nd phase: (Oct - Dec 1991)
  - build road surface with stone

8. Maintenance and operation

Once completed, the road will carry traffic of any kind under 10 tons form Tam Diep to Van Le bridge. Improvement of the bridge (to be implemented 1992) will enable traffic to reach production areas and rural settlements in the commune.

Annual maintenance will be spread amongst the following phases:
- spread materials such as broken stone for preventing corrosion : 0.02m3/m2
- repair holes without delay while operating
- fill up and embank broken points on the roads.

9. Detailed implementation

a) Survey:	Oct - Dec 1990
b) Study designs:	Jan - Apr 1991
c) Construction agreement:	Apr 1991
d) Technical exercise:	Apr 1991
e) Build road foundation and culvert:	Apr - Jun 1991
f) 1st Phase building :	Jul 1991
g) Surface road:	Oct - Dec 1991
h) 2nd phase:	Dec 1991

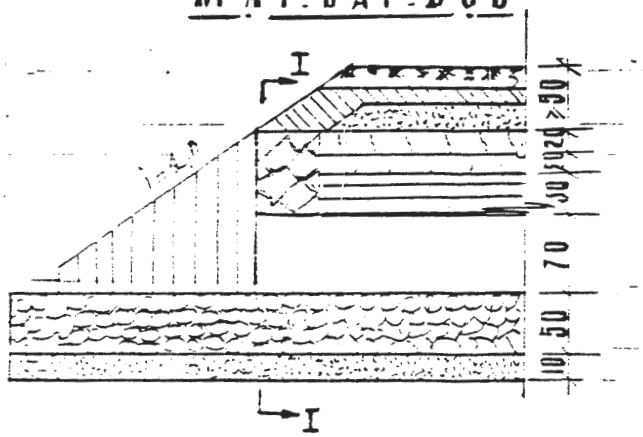
i) Practise operational level and maintenance of roads.

10. Media proposed for wider dissemination

- ¤ public loudspeakers
- ¤ meetings
- ¤ mobilization of production groups

CỐNG VÒM ĐÁ

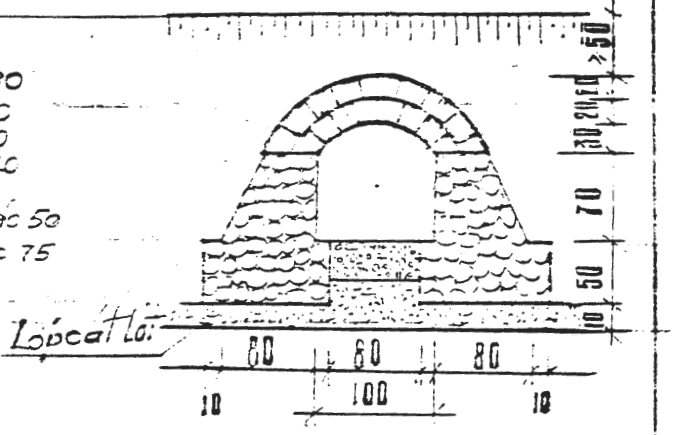
MẶT CẮT DỌC



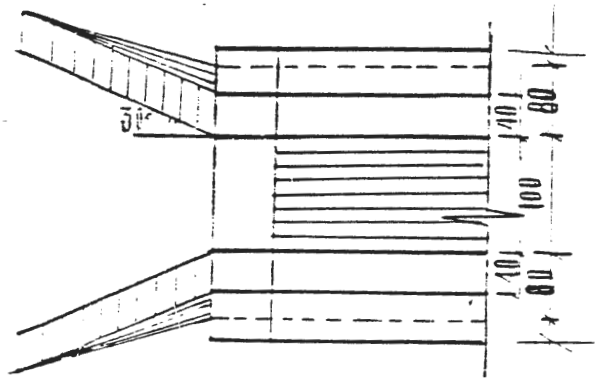
Qui cách xây cống

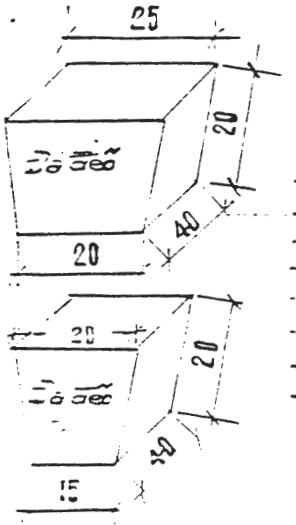
- Khẩu độ cống : 1m
- Vòm cống :
- Chiều cao cống 0m70
- Chiều dài cống 5m50
- Chiều dầu thông cống 0m80
- Chiều dầy vòm 0m20
- Chiều dầy tường 0m50
- Chiều dầu lát đầy cống 0m40
- Xây vữa xi măng cát
  Tường cống mác 50
  Vòm cống mác 75

MẶT CẮT H



MẶT BẰNG





KHỐI LƯỢNG VẬT LIỆU

- Xây móng cống : 0,5×1×8×2 = 8,00 m^3 đá hộc
- Xây tường cống : 0,7×0,8×5,5×2 = 6,160 m^3 đá hộc
- Xây vòm cống : 0,4×1,63×5,50 = 5,60 m^3 đá dẽo
- Xây đầu cống : 4,60 m^3 đá hộc
- Lát đầu cống : 0,4×1×5,5 − 0,4×0,5×1,6×2 = 3 m^3
- Vữa xi măng < mác 50 > 9,00 m^2
- Vữa xi măng < Mác 75 > 2,00 m^3
- Đá hộc 20 m^3 : 132.000 đ Đá dẽo : 5,60 m^2 : 65.000 đ
  Xi măng 3200 kg : 1280.000 đ

11. Material quantities, costs and labour (Dongs / April 91)

Foundations

Item	Orig.	Unit	Quant.	Unitary cost	Sub-total	%
Dig, embank, widen		m3	3345	5 000	16 725 000	41.1 %
Take earth from m.		m3	1650	7 500	12 375 000	30.4 %
Ram earth		m2	6600	1 000	6 600 000	16.2 %
Transport earth		m3	1650	3 000	4 950 000	12.2 %
Total				(Dongs)	40 650 000	
				(US $)	5 420	

Estimated cost

Components			Amount	%
* Labour			35 700 000	87.8 %
*Building materials :	Local			
	National			
	Imported			
	Total			
*Transport			4 950 000	12.2 %
*Others				
Total		(Dongs)	40 650 000	
		(US $)	5 420	

Culvert

Item	Orig.	Unit	Quant.	Unitary cost	Sub-total	%
Labour						
*Dig ground		d	60	5 000	300 000	9. %
*Build foundations		d	205	5 000	1 025 000	30.6 %
*Build vault		d	30	5 000	150 000	4.5 %
*Fill up earth		d	33	5 000	165 000	4.9 %
*Embank frame		d	5.5	5 000	27 500	.8 %
Stone	L	m3	21	6 500	136 500	4.1 %
Square stone	L	m3	3.6	18 000	64 800	1.9 %
Cement	N	t	3.2	400 000	1 280 000	38.3 %
Sand	L	m3	9.5	10 000	95 000	2.8 %
Transport stone		t	51	2 000	102 000	3. %
Total				(Dongs)	3 345 800	
				(US $)	446	

Estimated cost

Components			Amount	%
* Labour			1 667 500	49.8 %
*Building materials :	Local	296 300		
	National	1 280 000		
	Imported			
	Total		1 576 300	47.1 %
*Transport			102 000	3. %
*Others				
Total		(Dongs)	3 345 800	
		(US $)	446	

12. Budget

Items	Qty	Unit cost	Total (1 000)	Contribution (1 000 Dgs) Com	People	District	Project	Sub-Cont.
1. Foundations	1 100 m	36.955	40 650	5 000	25 650	10 000		
2. Surface road	3 300 m2							
* Materials	3 300 m2	5.41	17 845	5 000			12 845	
*Labour	3 300 m2	9.6	31 680		31 680			
*Roller	3 300 m2	1.86	3 069	3 069				
(roller)			22 000					22 000
*Transport	1 840 m3	3	5 520	5 520				
3. Buid culvert								
*Materials			1 576					1 576
*Labour			1 667	1 667				
*Transport	51 t	2	102	102				
TOTAL ROAD			102 109	20 358	57 330	10 000	12 845	1 576
ROLLER			22 000					22 000