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Integrated rural water supply and sanitation programme



Client: National Water Supply & Drainage Board/Danish International Development Agency.

Consultant: Kampsax-Kruger, Copenhagen, Denmark.

1: BACKGROUND

The rural water supply and sanitation programme in Matale and Polonnaruwa districts in Sri Lanka which is financed by DANIDA, (Danish International Development Agency) started in 1981 with a Planning Phase. During this Phase, some 1,300 villages in the area were visited by teams who for each village made an assessment of the needs and the solution which would be appropriate for the village in terms of improving water supply and sanitation.

Based on this village inventory, where needs were weighed and cost estimates made, a priority list, based on need/costs, was worked out.

This list was the basis for the deliberations of the Governments of Denmark and Sri Lanka and the Executing Agencies when determining the total number of villages (300) which could receive assistance under this programme, given the limited funds available.

The allocation of funds, signatures on Contracts, Government Agreements etc., were ready by mid 1983, and the implementation of the programme started immediately afterwards in 1983.

The Implementation Organisation, National Water Supply & Drainage Board and Kampsax-Kruger faced the task of planning and executing a programme involving more than 1,000 Boreholes for Handpumps and approximately 24,000 latrines in 300 villages.

The organisational aspects of accomplishing this task before the expiry of the Project by 30th April, 1987 is discussed below.

A flow chart - fig. 1 shows the inter-relationship and the time involved for a typical village between the sections.

2: DRILLING OPERATION AND HANDPUMP INSTALLATION PROGRAMME

2:1 General Approach

The drilling operation and handpump installation programme is characterised by the following main features.

A: Production Speed

The necessary production rate of one borehole per day per drilling rig has been achieved under the current programme. This includes the installation of a handpump with a concrete apron for each. (See Fig.2)

B: Priority On Sociological Criteria

Primarily the location of a borehole is based upon sociological criteria. Thereafter it is tested for its hydrogeological suitability. Only if hydrogeological conditions are unsuitable a compromise is sought for by a joint team of Sociologists and Hydrogeologists.

C: Village Participation

Although the entire drilling operation (down the hole hammer) is highly technical, villagers involvement is important and therefore encouraged. Cleaning sites, assistance with apron installation and involvement of the future handpump caretaker is stimulated as much as possible.

D: Transfer Of Technology

Two workshops with training facilities have been established in the project area. Here intensive training in handpump maintenance is given. The drilling supervisors conduct courses in class rooms and in the field, on how to operate and maintain the drilling rigs and related equipment.

2:2 Planning

Thorough planning and efficient communication is the basis for the large number of wells completed each month. (approx. 60 with two rigs).

After the siting of all wells (see section 2:3) when an A.G.A. division has been completed, the Hydrogeologists prepare two documents for the drilling supervisors:

- a. Travel route for each rig.
- b. A drilling instruction sheet for each borehole.

Three days prior to the drilling rig's arrival a Hydrogeologist places a wooden peg at the selected site and requests the villagers to clean the area.

The drilling operation is normally completed during one afternoon and the next morning (see below). The following day a handpump installation crew constructs the concrete apron and install the handpump to a depth determined by the drilling supervisor.

Two weeks later when the geochemistry is back to normal, the chemist will analyse samples in the field (for Co₂, PH and Iron)* and collect a sample for detailed analysis in the office laboratory.

All collected data are stored in a ground water data bank and data pertaining to pump performance and water quality are updated each time the well monitoring team visits the site. (approx. once a month during the project period).

*Due to a high iron content in the pumped water and aggressive ground water (high Co₂ and low PH) a special programme has been established in order to monitor the water quality.

2:3 Siting Of The Boreholes

Siting of boreholes involves two phases:

- A: Planning and organising of a detailed village survey.
- B: Locating sites for drilling.

Detailed Village Survey

The Sociologist and the Hydrogeologist visit villages and study the physical set-up of the village, the number of houses and their locations.

The Sociologist then decides the location where boreholes should be situated and the necessary number of boreholes. This information is recorded on a village map and handed over to the Hydrogeologist.

2:4 Locating Sites For Drilling

When the Sociologist has decided the sociologically most suitable locations of the tube well, planning of hydrogeological and geophysical investigations takes place.

The geological features which normally imply safe yield are fractured/fissured and weather zones of precambrian basement crystalline rocks. The Hydrogeologists goal is therefore to localise such zones in the project area.

To achieve this a study of geological and tectonic maps, aerial photographs and landsat imageries is carried out. Study of water quality from existing sources is also important e.g. when predicting the quality of water in the new boreholes. These studies are mainly done in the office and the general geological and geomorphological model of the area is tested by field reconnaissance.

Following this, a geophysical investigation is carried out.

Variation of a selected physical property of the subsurface is measured in relation to the variation of hydrogeological properties. Electrical resistivity methods and very low frequency electro-magnetic methods have proven useful in this project.

Up to now the number of successful boreholes, i.e. wet boreholes yielding more than 0.5 m³/hr., in the Metamorphic rock is 90%

When siting of the boreholes is completed a location data sheet is prepared for each borehole showing the exact location of the borehole, required drilling depth, estimated depths to water bearing zones and depth of overburden (for estimating the length of casing required etc.). Finally a route through the A.G.A. division is prepared showing all the villages proposed for drilling indicating the sequence of drilling in order to minimize the logistic problems.

2:5 Drilling Operation

The drilling rig demobilises from the completed borehole around 12.00 o'clock and proceeds to the new site, (as indicated on the Drillers Instruction Form). A 6" hole is drilled in the overburden, and penetrates the first meter or so of the weathered hard rock. A 5" P.V.C. casing is installed in the borehole and the lower part will be cemented if required.

In case the casing itself can provide sufficient seal drilling will continue. Otherwise next morning (7.00 o'clock) drilling operation continues with a 4" bit in the P.V.C. casing through the hardened cement to a depth, average 50M, until sufficient discharge is obtained (0.5M³/hr.) The hole is abandoned if dry (maximum depth 80M). Demobilization is at 12.00 o'clock and the procedure is repeated on a new location.

2:6 Recording Of Data

A simple computerised data storage and retrieval system has been developed. During the drilling operation a pre-printed computer form is filled out by the supervisor, these forms with a sample box of cuttings are delivered (every 5 days) to the office and analysed by the Hydrogeologist. All relevant data regarding hydrogeology, drilling and geochemistry are entered in the data bank. All parameters can be retrieved in any required combination.

3:0 SOCIAL AND CULTURAL ASPECTS OF BUILDING TOILETS

The Sanitation Programme has the following main characteristics:

- Strong material incentive is offered - cash in hand.
- Limited resources available and selection criteria of villages and families create a competitive atmosphere around the programme which increases motivation and encourages participation.
- Family status and prestige is given to having a toilet, this is as a strong, if not stronger motivating factor than direct health benefits to most villagers because having a toilet is associated by villagers with material and social development and progress.
- Maximum use is made of local technical knowledge and resources.
- The Project Team functions as a "watchdog" against discrimination, bias in the distribution of plates and other malpractices.
- Volunteer Health Workers (VHW's) from the village who are loyal to Project Principles and Goals play a key role in the "Village" administration of the sanitation programme, and in progress reporting and monitoring. The VHW is also a valuable "informant" regarding any malpractices occurring in his/her village.

- The VHW is also the principal Data Collector regarding the functioning and use of the toilets after completion.

Problems Encountered

The programme has not been without its problems and "mistakes". Among some of the most important are:

- There is a strong "over-response" to the programme, putting the Project in a defensive position with regard to potential beneficiaries and producing some resentment among those being "left out" of the programme.
- Lapse of time between delivery of Squatting Plates in the Village and distribution has already resulted in added pressure on the health worker to distribute plates before having a meeting with the recipients to explain the conditions of the programme.
- Because of the immediate administrative demands of the programme, there has been a shortage of time for conducting independent monitoring and evaluation of the programme. Because of heavy work load of professional staff at the Project Office, as much as possible of the "field work" involved in monitoring and evaluation will be done by the Volunteer Health Worker, who is a full-time resident of the village.
- Caution should be exercised in attempting to replicate the programme in other organisational/cultural settings, since the programme, being part of a foreign-funded and administered project is "high-resource" and money and organisationally intense, advantages which other programmes/projects may not enjoy.

4:0 SANITATION PROGRAMME

4:1 General Approach

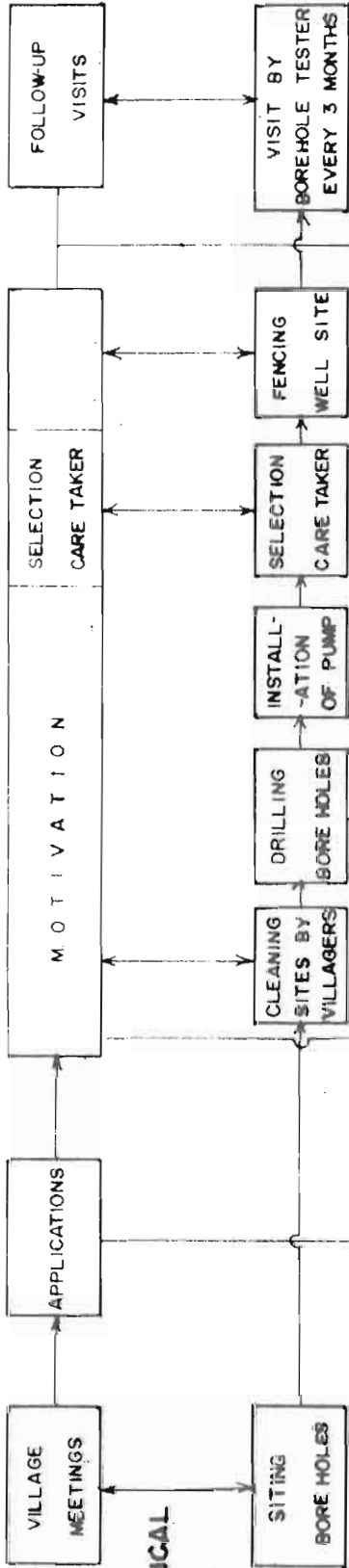
The principles related to technical matters which have been adopted for this part of the programme are:

- A: All households without sanitation facilities should be offered a latrine from the project.
- B: The Sanitation Programme should not be introduced in a village before adequate water supply is available.
- C: The design should be kept so simple that the ordinary villagers can construct the latrines themselves.

- D: Locally available materials should be used where possible. Where prefabricated items are used they should be produced within the project area to generate income for the target group.
- 4:2 Overall Planning
 Before establishing a water supply (normally a handpump) the Sociological unit will collect applications from eligible villagers. These applications are collected by Voluntary Health Workers (VHW) as described in Section 3. After the Sociologists have processed the application a request is made to the technical section for the number of Squatting Plates to be delivered in the village and where these plates shall be delivered.
- 4:3 Delivery Schedule
 In order to ensure early delivery, a delivery plan is made, based on the requests received. This plan also serves to minimize transport costs. The suppliers of Squatting Plates receive their delivery schedule at the end of each month. To facilitate the suppliers long term planning they have each received a standing order of the number of plates they are expected to supply each month.
- 4:4 Distribution
 After delivery to a village has taken place the VHW arranges for the successful applicants to collect their Squatting Plates. For easy transport the plates are octagonal so that they can be rolled.
- 4:5 Construction Of Latrines
 A very simple type of water sealed pit latrine (See Fig. 3) is being promoted. This enables the unsophisticated villager to construct their own latrine without being assisted. Where villagers express the wish to construct a more sophisticated latrine such as VIP or off-set latrines, the technical advice and guidance is given by the Implementation Organisation.
- 4:6 Subsidies
 The target group belongs to the poorest part of the population. It is therefore necessary to give a cash subsidy covering the cost of materials.
 This subsidy amounts to Rs. 500/= (20 US\$) and is paid in two installments. The first installment Rs. 200/= (8 US\$) is paid when the pit has been dug and the Squatting Plate has been placed.
- The second installment Rs. 300/= (12 US\$) is paid when the superstructure is completed. The total average cost of each latrine is approx. Rs. 750/= (30 US\$) including transport but excluding extra lining in low lying areas.
- 4:7 Technical Advice
 Quality control of the Squatting Plates is carried out by the Technical Assistants who also ensure that the correct number has been delivered. They advise the villagers on technical matters and supervise their work, making sure that the specifications are met. They also certify the completion of each step of the construction.
 Each Technical Assistant is responsible for the supervising of approximately 15 villages.
- 4:8 Payment Of Subsidies
 At agreed intervals each village is visited by a Payment Team. Apart from payments the team is responsible for carrying out sample checks as a control for the certificates issued by the Technical Assistant.
 All payments are made in the presence of a Village Official who certifies the identity of each recipient.
 Depending on the size of the villages and the distance of travelling it is our experience that each payment team can make approximately 1,000 payments per month, corresponding to a completion rate of approx. 500 latrines monthly.
- 4:9 Achievements So Far
 Using a total staff of less than 15 full time employed, an average of 1,000 completed latrines per month has been achieved with a maximum of 1,500 latrines in one month.
 Close co-operation between the technical and sociological staff and a high degree of community participation and motivation is essential for success. The Implementation Organisation is expecting to complete 24,000 latrines in approx. 2 years.

Figure 1

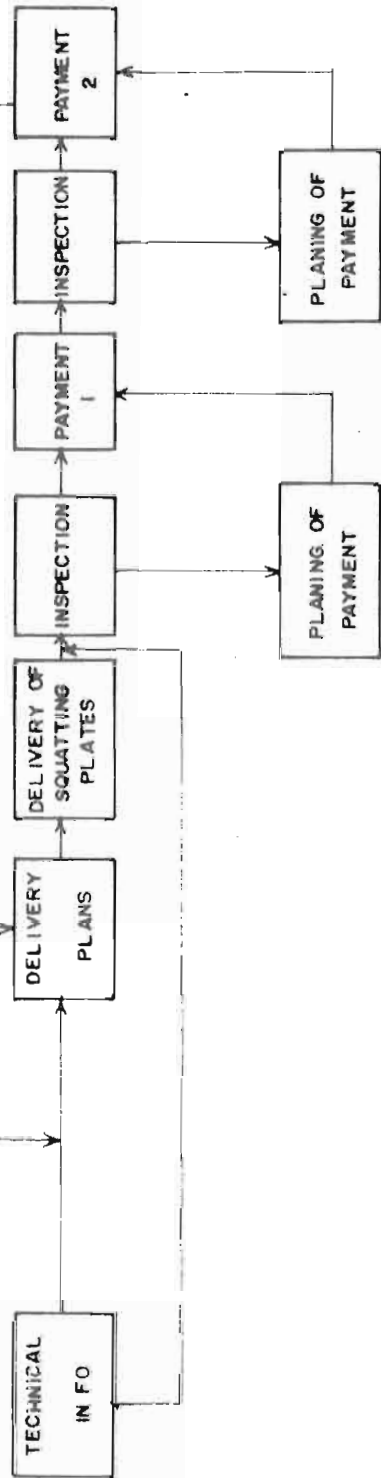
SOCIOLOGICAL SECTION



HYDROGEOLOGICAL SECTION



ENGINEERING SECTION



WATER SUPPLY AND SANITATION PROGRAMME
FLOW CHART SHOWING ACTIVITIES FOR A VILLAGE

TYPICAL TIME SCHEDULE FOR COMPLETION OF ONE BOREHOLE WITH HANDPUMP

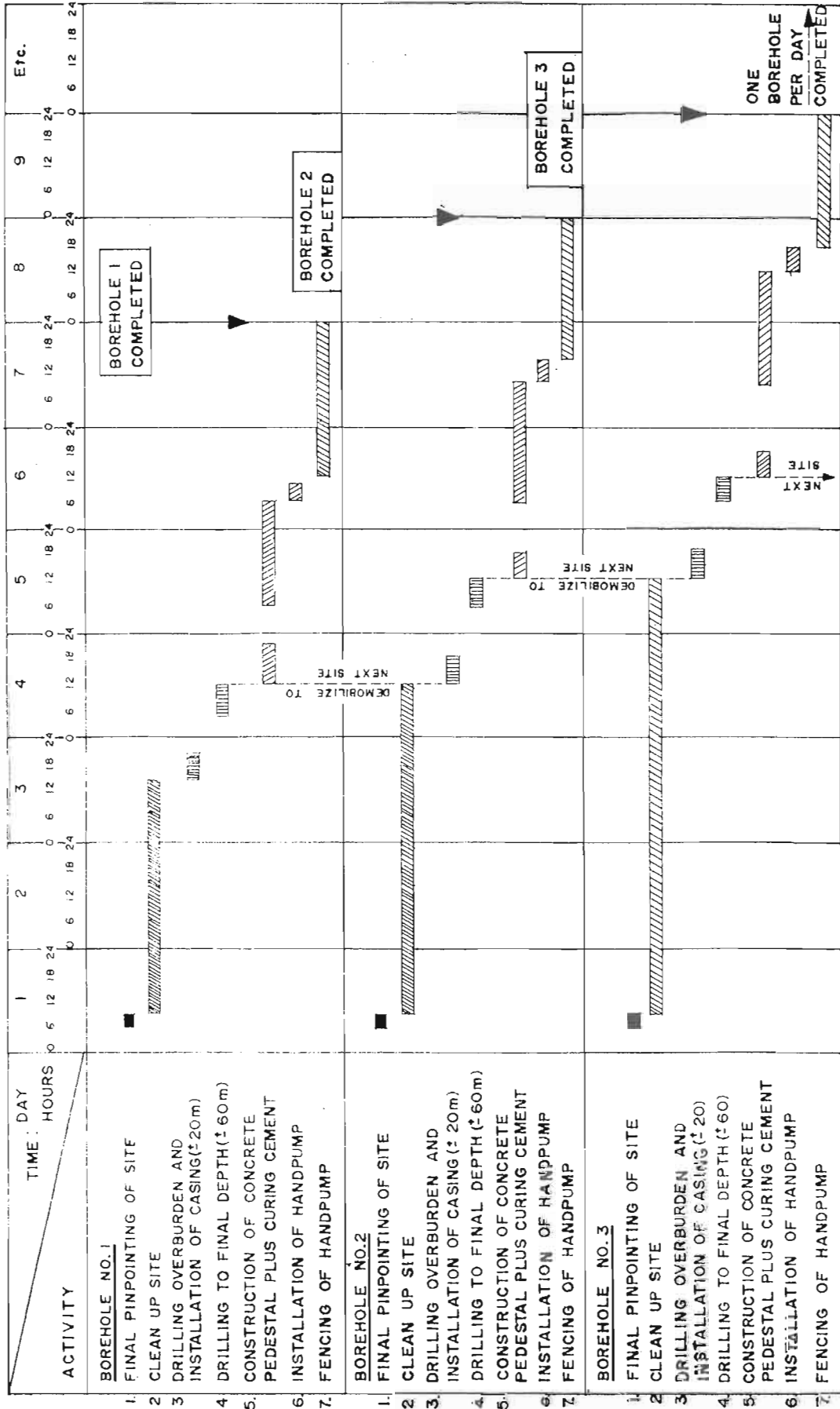
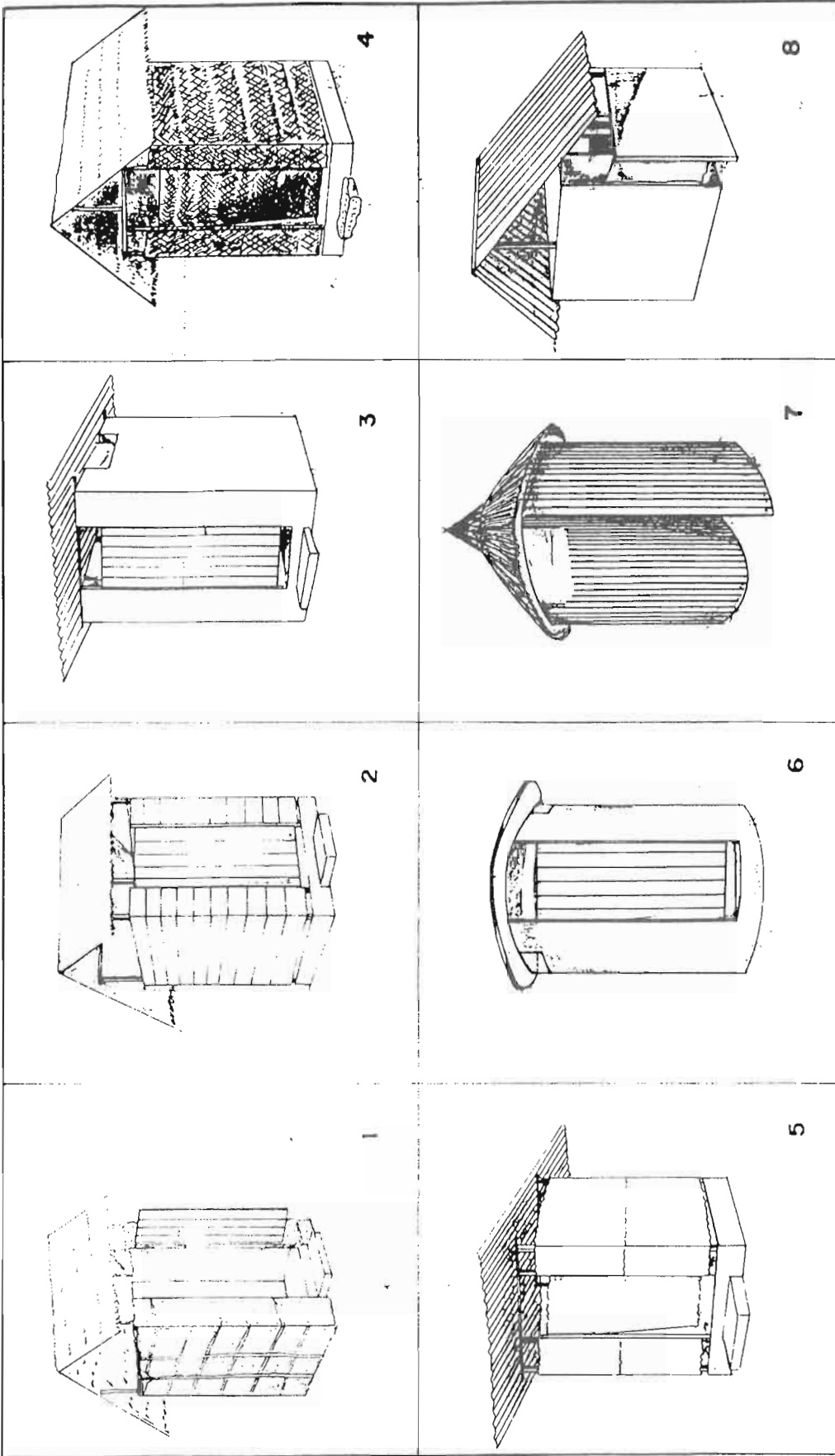


Figure 2

LEGEND: ACTIVITY BY

- [Hatched: Hydrogeologist]
- [Hatched: Villagers]
- [Hatched: Drilling Crew]
- [Hatched: Handpump Installation Crew]



EXAMPLES OF RECOMMENDED SUPERSTRUCTURES FOR VILLAGE SANITATION