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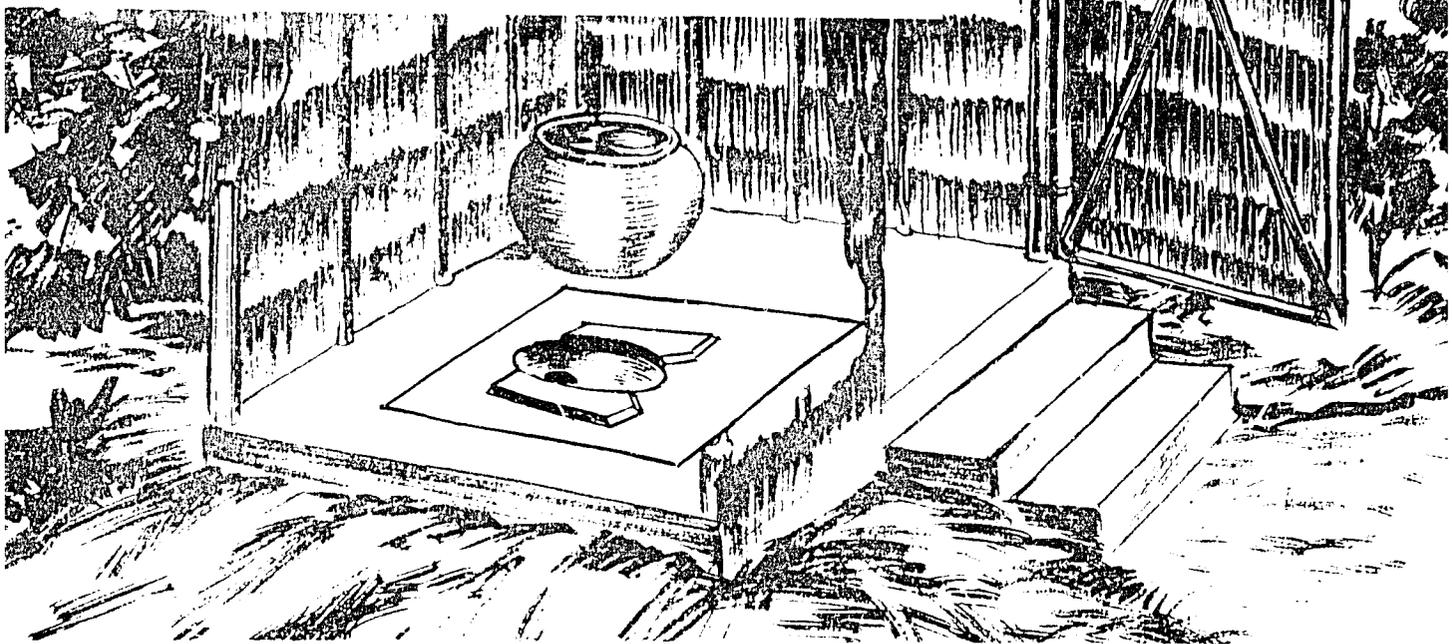
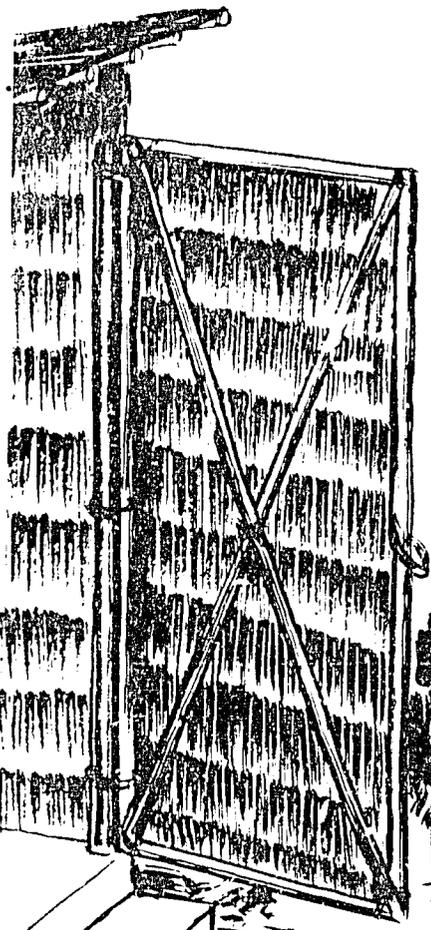
WATER-SEAL PRIVY PROGRAM

Thailand's water-seal privy program; interim terminal..

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K18 Thailand's water-seal privy program; interim
terminal report. Barry Karlin. July 1961.
24 p. illus.
Bibliography: p. 24.

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- 1. Privies - TH. 2. Sanitary engineering - TH.
- I. Karlin, Barry. II. Title.



A Procedural and Technical Review

A. I. I. HISTORICAL AND
TECHNICAL REFERENCE
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THAILAND'S WATER-SEAL PRIVY PROGRAM

A Procedural and Technical Review
and Interim Terminal Report of

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I. INTRODUCTION

A. Purpose of Report:

Thailand is now going through a remarkable change in the level of environmental sanitation within its villages. In slightly over one year, over 650 new villages began the process of cleaning up, installing sanitary water-seal privies for each house, and developing potable water supplies. Over 12,000 water-seal privies have been built in the Northeast alone. Only a few existed a year ago. These privies have been paid for by the village people, most of them were built by villagers, and there is evidence to show that most of them are being used.

The primary purpose of this report is to describe Thailand's privy program. It has been organized to allow the reader to make use of the experience which we have gained in Thailand. This is not to suggest that the procedures and techniques portrayed may be directly applicable for other countries. The development of a program for the introduction of a particular type of sanitary privy into a community must take into consideration conditions existing within that community. Still, it is felt that many of the basic methods used in Thailand can be easily modified to fits the needs elsewhere.

B. Background:

In January, 1960, a project agreement was signed by USOM/Thailand and the Government of Thailand which created a Village Health and Sanitation Project (VHS). Recognizing that the so-called "filth diseases" were the leading cause of illness and death among the predominately village-dwelling Thai people, the VHS Project was established to assist in alleviating these conditions through: (a) community organization, (b) intensive health education of the community through their organization, and, (c) organized community action to result in the protection of drinking water supplies, privy installation and use by each household, and the improvement of premise sanitation. It should be pointed out that the creation of the VHS Project was preceded by and in many respects dependent upon a long history of related activities. The following were of special significance:

1. In 1950, USOM and the Ministry of Health entered into a close working relationship for the promotion of the health of the Thai people.

2. The Cholburi Health Training and Demonstration Center was opened in 1952 and has now served to train over 2000 health workers. The availability of trained workers in the field has contributed a great deal to the success of the Project.

3. USOM assistance to strengthen the Division of Health Education of the Ministry began in 1954 and involved problems of organization, training of professional and technical personnel, space and equipment needs, and the demonstration of community health education techniques.

4. Since 1950, special emphasis has been given to the development of model provincial health departments, model health centers and villages, the provision of field vehicles, and educational upgrading through training in the USA and third countries, as well as at Cholburi, Thailand.

5. During 1957-8, five months of research was conducted in pilot health-development villages by an American cultural anthropologist.

6. The "Manual for Rural Community Health Workers in Thailand" was produced in 1958 and now serves as a basic guide for the VHS staff.

II. THE VILLAGE HEALTH AND SANITATION PROJECT

In early 1960, the Government of Thailand assigned some of its most skillful health workers to the project. There are now 2 physicians, 3 sanitary engineers, 15 sanitarians, 5 health educators, draftsmen, secretaries, accountants and laborers actively involved in the project. These people were organized into four groups: a small administrative group in Bangkok, a follow-up team with a sub-headquarters in Korat (Northeast Thailand), and two training teams. A second sub-headquarters was later established in Songkhla to serve the Southern provinces. USOM assigned four public health advisors to this project: a senior sanitarian and a health educator were stationed in Bangkok, a sanitation advisor was stationed in Korat and one in Songkhla. Work began in the Northeast with a conference of health officers and sanitarians from each of the 15 provinces.

A VHS staff conference was then called for the development of project plans and discussion of training techniques. The plan of operation agreed upon consisted of the holding of two-week workshops throughout the Northeast to train all provincial sanitation workers in the basic sanitation skills. Functional teaching methods which included careful preparation by the trainer, a brief introduction and demonstration, long periods of practice, testing, and evaluation were to be used. The skills to be taught included human relations, such as the organizing of a village health committee, as well as technical skills.

Immediately after a workshop, members of the follow-up team were to begin assisting the provincial workers to use the skills which they had recently been taught. During this time, the staff at the Korat sub-headquarters was busy developing a satisfactory line of sanitation materials for use as teaching aids at the workshops and for distribution during and after these workshops.

The privy building techniques now in use in the Northeast resulted largely from the research carried out in Korat, in Chiangmai (Thailand) and India. The research in Korat is under the direction of Mr. Manop Subhabhandhu, Sanitary Engineer, Chief of Korat Sub-headquarters of VHS Project.

It was decided that the privy program would be based on the self-help approach. Village people desiring sanitary privies would have to pay for the privies themselves. The workshop trainees were encouraged to teach villagers in the communities being developed how to make their own privies in the village.

To get the privy program under way, a revolving fund of up to \$50. per sanitation worker was made available on a loan basis for the initial purchases of cement, gravel, sand and steel reinforcing. This money was to remain available to the sanitation worker as the people paid for their privies, and could be used in new villages. A complete set of sanitation molds was given to each trainee at the workshop and a second set was to be sent from Korat. It was later decided to make available one master mold set for each province. (A master mold is used to produce secondary molds: a secondary mold is used to make finished privies.)

It can be seen, then, that Thailand's program consisted of a number of important features: the existence of a sound approach to village health development emphasizing health education techniques and providing the framework for a privy program, a past history of sanitation training and pilot projects which supported the effective teaching of sanitation skills and the motivation of trainees; the availability of privy building techniques which were simple, inexpensive, efficient, could be performed in the villages, and were acceptable to the people; the continued stimulation of field workers by a trained follow-up team, and a combined water-development program. This summarization of activities that have been going on in Thailand for many years points up the fact that a firm foundation had been developed favorable to the acceptance of the privy-building project. (For detailed descriptions, see references (1-6) on the last page.)

III. THE WATER-SEAL PRIVY

The water-seal privy, which is also called the pour-flush or hand-flush latrine, consists of a bowl made of concrete or other durable material which is attached to a concrete slab. The lower part of the bowl is designed so that water will remain in the inverted P-shaped or S-shaped trap or gooseneck at all times, forming a water seal. A superstructure is used for privacy but is not needed to exclude flies and it may be very simple. The pit is located directly below the slab in Thailand although India has done some work with indirect pits (7, 8, 9.).

McDonald (10) cites anthropological excavations north of Baghdad which revealed that 4500 years ago the citizens of ancient Ashunna used water-seal privies which were connected by drains to a main sewer. Prof. Abhayartne introduced into Ceylon in 1936 a hand-flush system built directly over a sewage pit, thus making it practical for village houses. The advantages of this system are many;

1. If properly operated, the water-seal privy will meet the commonly recognized criteria of Ehlers and Steel (11), i.e.,
 - a. No contamination of ground water that may enter springs or wells.
 - b. No contamination of surface water.
 - c. The surface soil is not contaminated.
 - d. Excreta is not accessible to flies or animals.
 - e. Freedom from odors and unsightly conditions.
 - f. Simple and inexpensive in construction and operation.
2. The privy can be installed near, inside or below a house, school, etc.
3. It is safe for children.

Disadvantages might include the following:

1. Water is required after each use and water may be scarce.
2. The cost is slightly higher than with the pit privy.
3. Burning or burial of certain types of cleaning materials which cannot be flushed is required.
4. It cannot be used in freezing climates. (Not applicable in Thailand.)

Experience in Thailand has shown conclusively that water-seal privies are well accepted by the Thai people, they can be kept clean and completely free of odors, and do not attract or permit the breeding of flies. A complete slab with bowl costs 65¢ for materials in Korat and about \$1.00 in areas where materials are expensive and transportation costs high. This price is not excessive for Thai village people. The cost of the super-structure and pit-liners is the same as with the pit privy and will depend upon the availability of local materials and the wishes of the householder. While there is an acute shortage of water in some areas of the Northeast during the dry season, this problem has not been critical. Furthermore, the VHS Project combines privy promotion with ground water development at every opportunity.

IV. HOW TO BUILD A WATER-SEAL PRIVY

No attempt will be made in this report to discuss superstructures, pit liners, privy locations, or pit depths, for a number of fine texts are already available (11, 12, 13.). Only a few tips will be given regarding working with concrete mixtures. For more detailed reports, the publications of the Portland Cement Association will be found to be useful (14). We are not suggesting that the privy designs described here are superior to those used in other countries. The primary advantage of using the Korat type privy lies in the ease of construction and ease of making the molds necessary for a widescale program. Since the entire slab, bowl and trap are made in one step, there is less chance that the depth of seal will be altered as is the case when grouting of separate parts is required.

It will be assumed that the builder will have to make his own clay molds, master molds and secondary molds. The most difficult technical phase of starting a privy program is the making of the first master mold. Once the master mold is made, the secondary molds can be turned out very rapidly and additional master molds can be made from these secondary molds. **FOR THIS REASON, USOM/THAILAND, DIVISION OF PUBLIC HEALTH, IS PREPARED TO SEND ONE FREE SET OF SECONDARY MOLDS MADE OUT OF ALUMINUM TO ANY USOM MISSION THAT SUBMITS A REQUEST.** Other interested agencies may contact the Village Health and Sanitation Project, Ministry of Public Health, Department of Health, Bangkok Thailand. An aluminum set weighs 24 lbs. boxed and costs \$7.50 before shipping.

HOW TO MAKE MOLDS OF BOWL

HOW TO MAKE A GOOSENECK

HOW TO MAKE THE PLATFORM

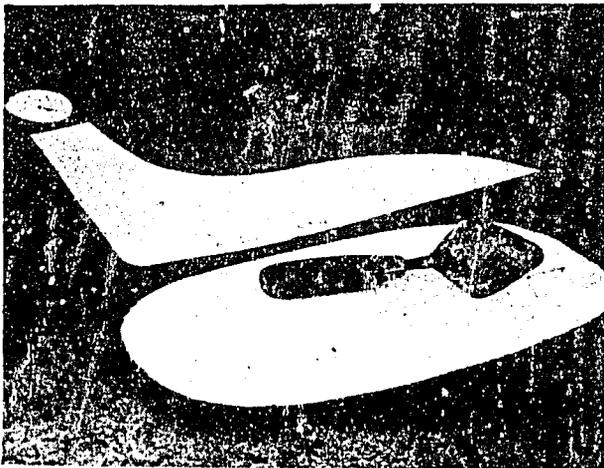
AND

HOW TO MAKE THE COMPLETE

SLAB & BOWL

I. HOW TO MAKE MASTER AND SECONDARY MOLDS OF BOWL

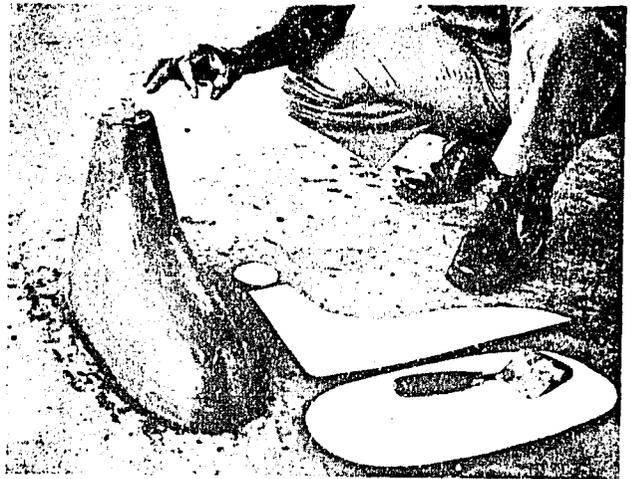
A. Master molds (material required in capital letter)



1. Cut out **CARDBOARD PROFILES** of the bowl showing side, bottom and top views. (Profiles drawn to size are included on page 20 of this report)

2. Shape the bowl out of **CLAY** using cutouts as guides. An outline of the bottom can be drawn on the work floor below the clay.

3. Place a hollow $\frac{3}{4}$ " CUBE of TIN (Inside Diameter) on top of the molds, fill with clay and press it into the mold a little bit. Make more than one of these tins as they will be used later. We use $\frac{3}{4}$ " because $\frac{3}{4}$ " steel rod is available in Thailand.



4. Use an ordinary PAINT BRUSH and OIL the bowl. Old crankcase oil is fine.



5. Cover the bowl with a pasty mixture of CEMENT and WATER to a thickness of $\frac{1}{2}$ ". This mixture excludes air bubbles and eliminates the need for finishing the concrete. Let set for 30 minutes.





6. Cover with a 1 cement: 1 sand mixture by volume to a total thickness of $1\frac{1}{2}$ ". Use clean sand. Allow to dry for at least 24 hours and lift carefully off clay. Clay can be reused a few more times. Inside may be smoothed with sandpaper if necessary.



B. Secondary molds of bowl.

1. Remove cube of clay from bottom of master mold, oil the inside of the mold and insert a $\frac{3}{4}$ " x $\frac{3}{4}$ " x 5" piece of STEEL into the bottom.



2. Add a fairly loose mixture of cement and water to a depth of about 6". Then fill to brim with a 1 cement: 1 sand mixture. The 1:1 should be firm, not runny, and should be laid into the loose neat cement without stirring.

3. Insert two steel hooks. They should extend about $1\frac{1}{2}$ " from bottom and be about 9" apart. (See Appendix B)

4. Allow to dry at least 24 hours and separate the molds. This secondary mold can be used to make masters, and vice versa.



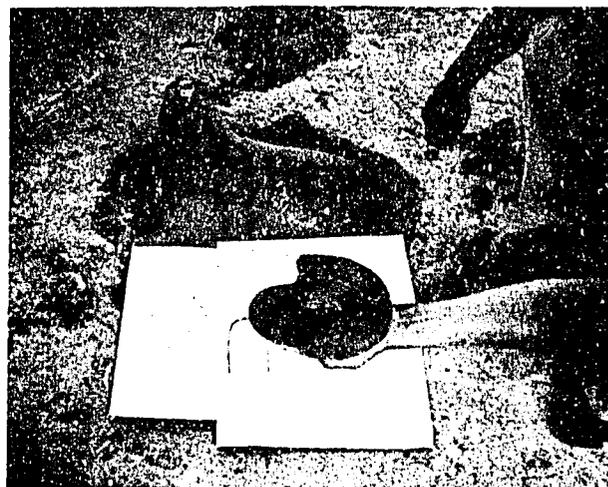
II. HOW TO MAKE A GOOSENECK

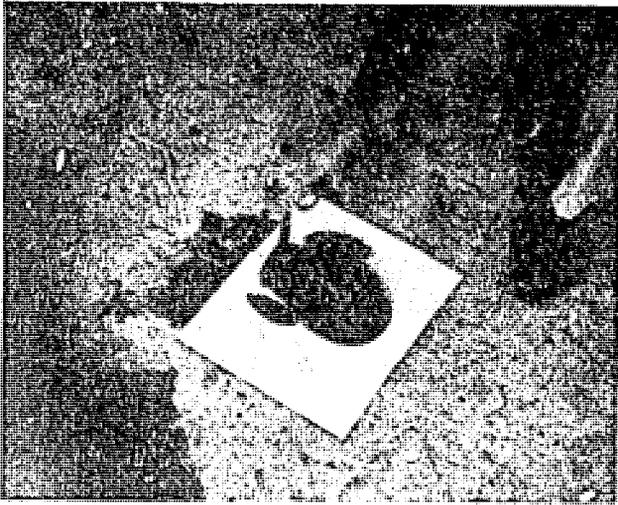
A. Master molds.

1. Cut out profiles and shape gooseneck out of clay (page 21). Make bottom flat at first and then slice out back as shown. Oil and let harden overnight.

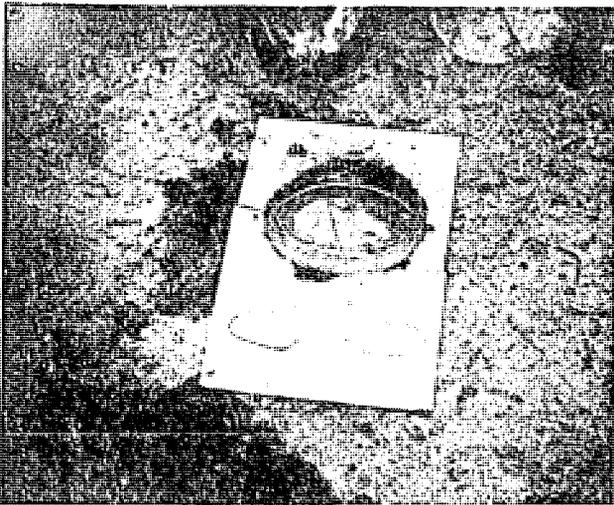


2. Shape underside with trowel and hand using profile on page 21 as guide. Press in hollow tin cube and scoop out clay. To be sure of location of tin, hold gooseneck over mold of bowl so back is even.

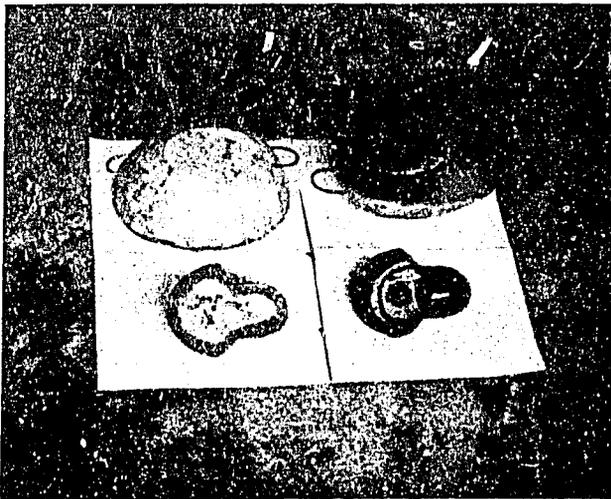




3. Insert heel-shaped clay plug under mold, trim and oil.

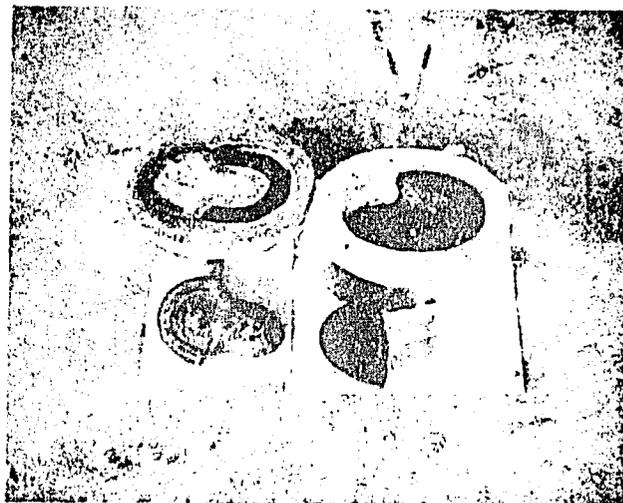


4. Cover with mixture of cement and water to thickness of $\frac{3}{4}$ " and add steel reinforcing. Cover with 1:1 to total of $1\frac{1}{2}$ ".



5. Flatten top and insert wire handles. Let dry at least 24 hours.

6. To make the insert section of master molds, turn the mold over carefully and remove the clay plug as shown in picture, right. Oil all inner surfaces and fill to brim with 1:1. Insert a small wire handle and allow to dry at least 24 hours.



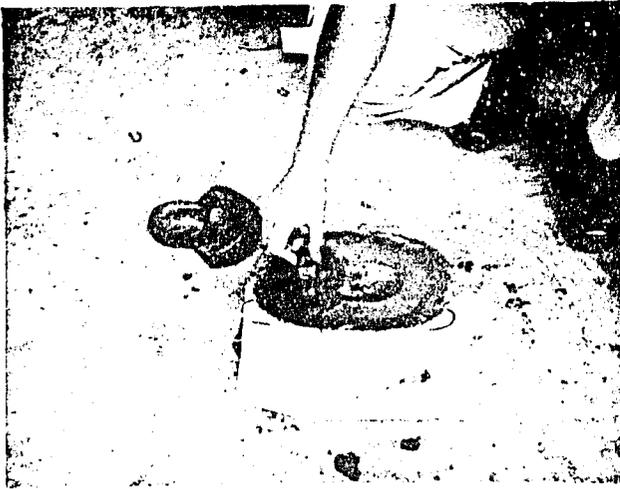
B. Secondary mold of gooseneck.

1. Add about 1" of 1:1 into the oiled master gooseneck mold and insert some steel wire reinforcing. Then fill with 1:1 almost to brim.



2. Put the oiled master mold insert into place and scrape off excess.





3. After 45 minutes, remove the insert and add the tin cube. Dry 24 hours.



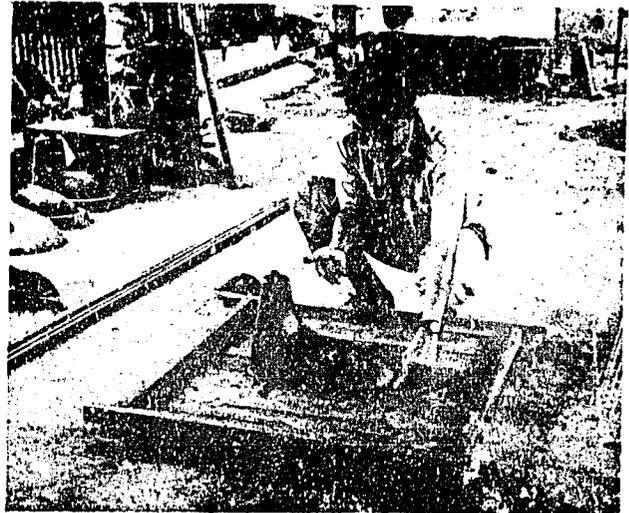
4. Hold both molds in one hand and tap gently with wood. Molds will separate easily. You now have a complete set of master and secondary molds.



III. MAKING THE PLATFORM

1. The size of slab used in Thailand is 80 cm. x 80 cm. ($31\frac{1}{2}$ " x $31\frac{1}{2}$ ") and $1\frac{1}{2}$ " thick. In order to make this size, build a platform 90 cm. x 90 cm. Since footrests $\frac{1}{2}$ " deep will be gouged into the platform, 1" thick planks are advisable.

2. Make a frame of $1\frac{1}{2}$ " x $1\frac{1}{2}$ " wood with an inside diameter of 80 cm. x 80 cm. A notch and single nail on each corner works well.



3. Leave a 4" x 13" hole for the hooks to extend into. The back of the hole should be 11" from the back of the platform. The proper location for the hole can be determined by placing the bottom bowl profile 9" from the back of the platform. A small notch can be cut on each side of the bowl for future locating of mold.

4. Gouge out the footrests with a wood chisel. The inside of the footrest should be about $\frac{1}{2}$ " from the outline of the bowl. Note that the heel of the footrest is even with the center of the trap.

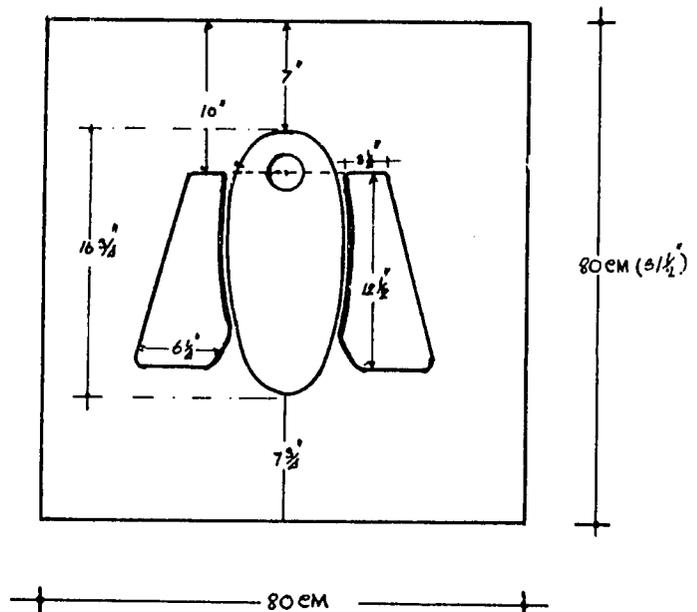
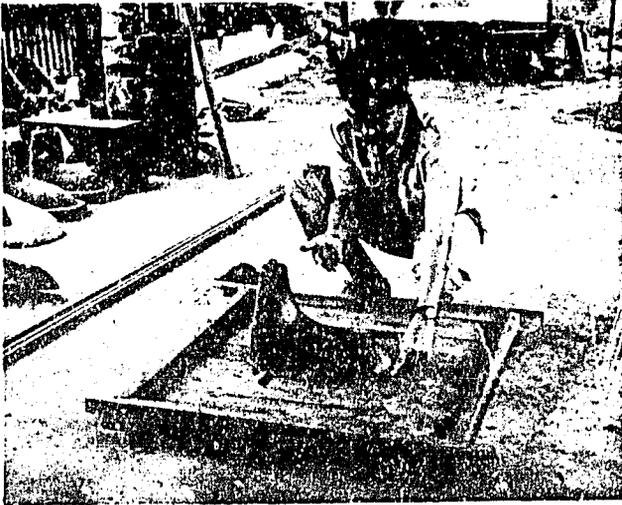


DIAGRAM OF PRIVY SLAB



IV. MAKING THE COMPLETE SLAB AND BOWL

ONE STEP METHOD

1. Cover the secondary molds of bowl and gooseneck with melted WAX. (Appendix A) Place bowl mold and frame on platform and fill all cracks with clay. Oil bowl, platform and frame.



2. Apply a $\frac{1}{4}$ " coat of pasty cement and water mixture to bowl and platform. (Appendix C)



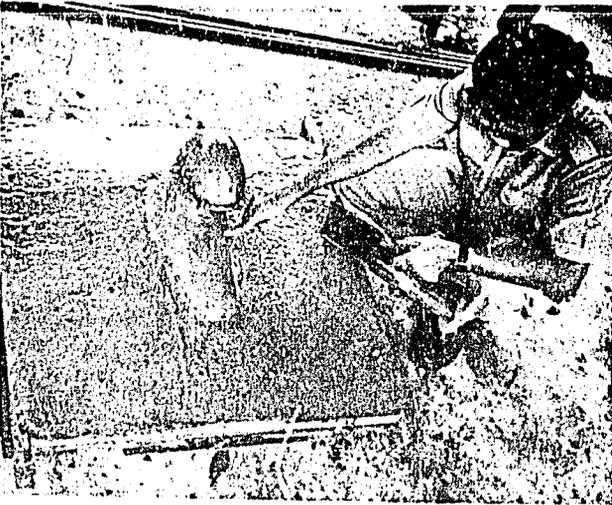
3. Cover bowl with a mixture of 1 cement : 2 sand to total thickness of $\frac{1}{2}$ ". Be very careful to leave a smooth lip $\frac{3}{8}$ " (1 cm.) from top of bowl as in picture. This lip is your water seal. Use fairly dry cement and allow to set for 15 minutes before cutting the $\frac{3}{8}$ " lip (1 cm.).



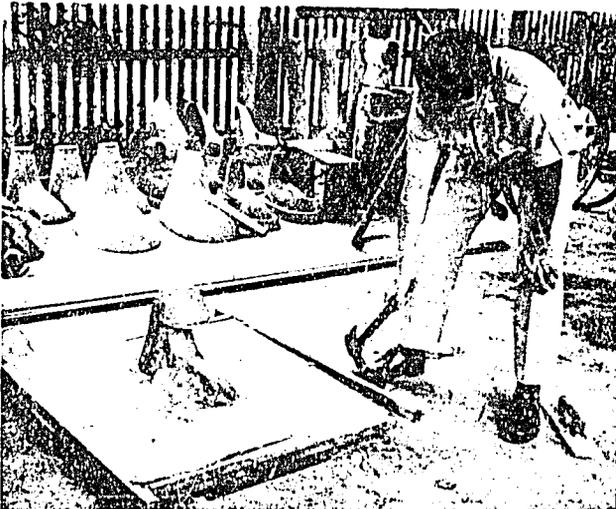
4. Place gooseneck mold on bowl and seal crack with clay. Also add a little clay on each side of the gooseneck (at point of thumb in picture) to prevent cement from getting to the front lip. Cover with 1:2 to thickness of $\frac{1}{2}$ ". CAUTION: Don't exceed $\frac{1}{2}$ " at bowl below gooseneck or you will not be able to remove mold.

5. Fill platform with mixture of 1 cement : 2 sand : 3 clean gravel or crushed rock almost to top. In preparing the concrete, first mix cement and sand and then add gravel and water. Use water conservatively. The looser the mixture the weaker the concrete will be.

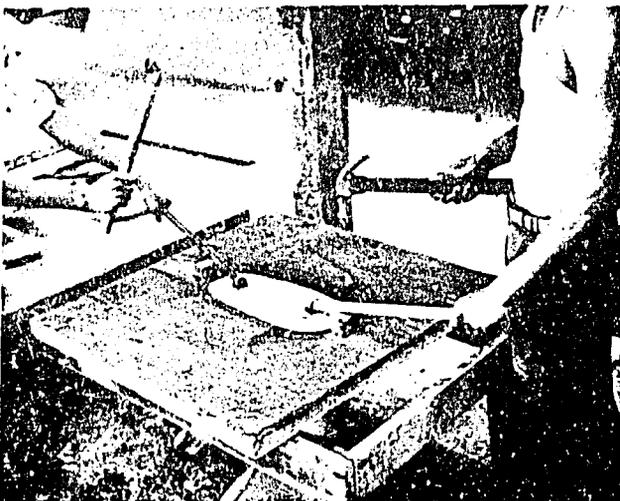
6. Press in 4 pieces of $\frac{1}{4}$ " STEEL ROD reinforcing.



7. Fill to top of frame and smooth. Allow at least 24 hours for drying.

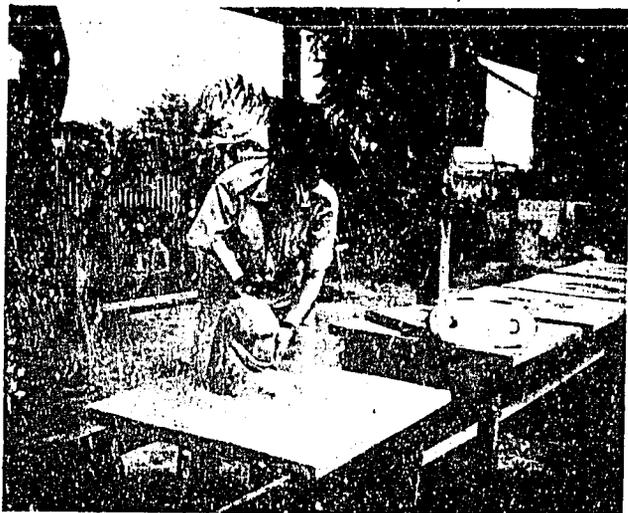


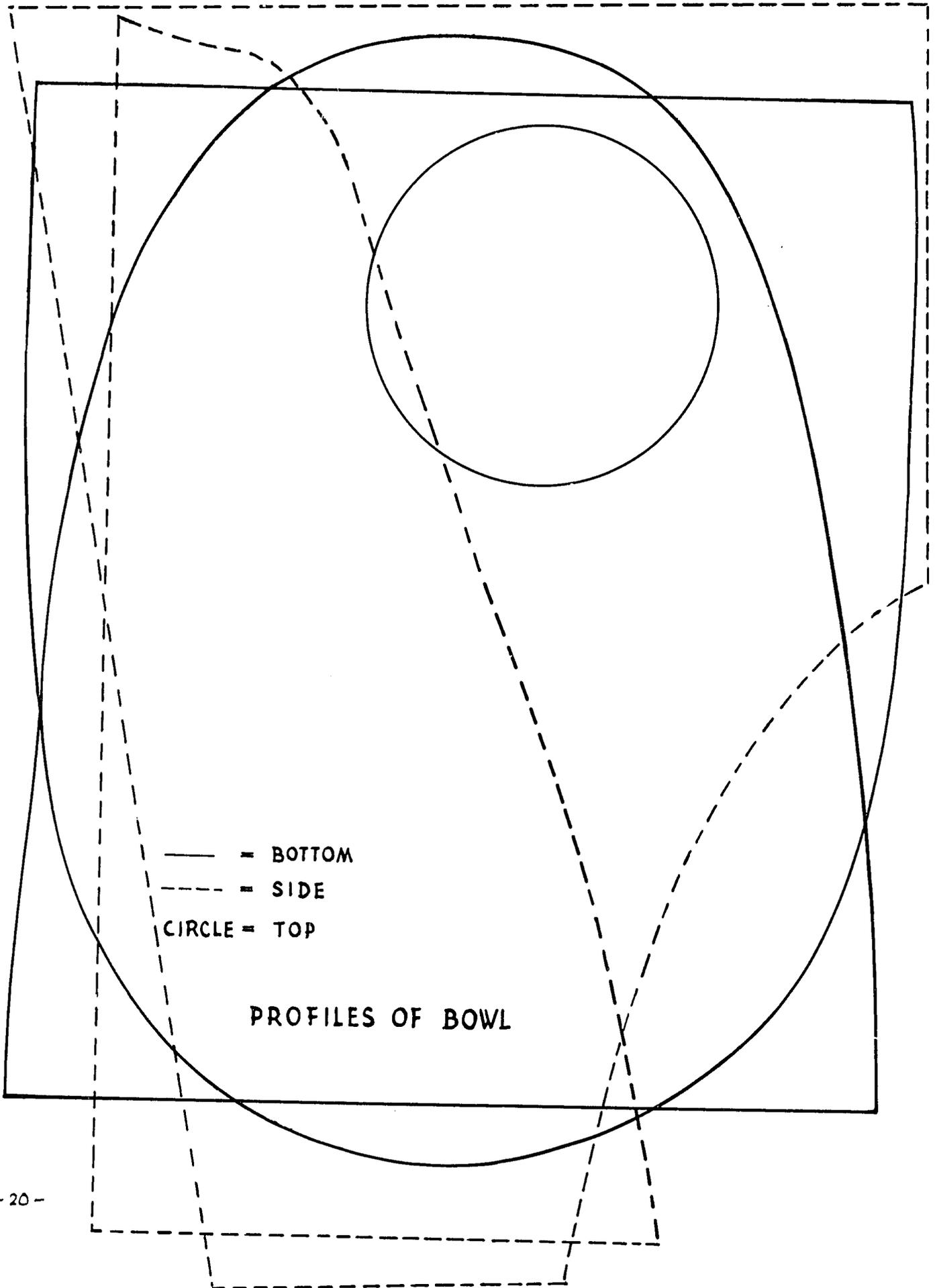
8. Remove the frame by tapping lightly with hammer.

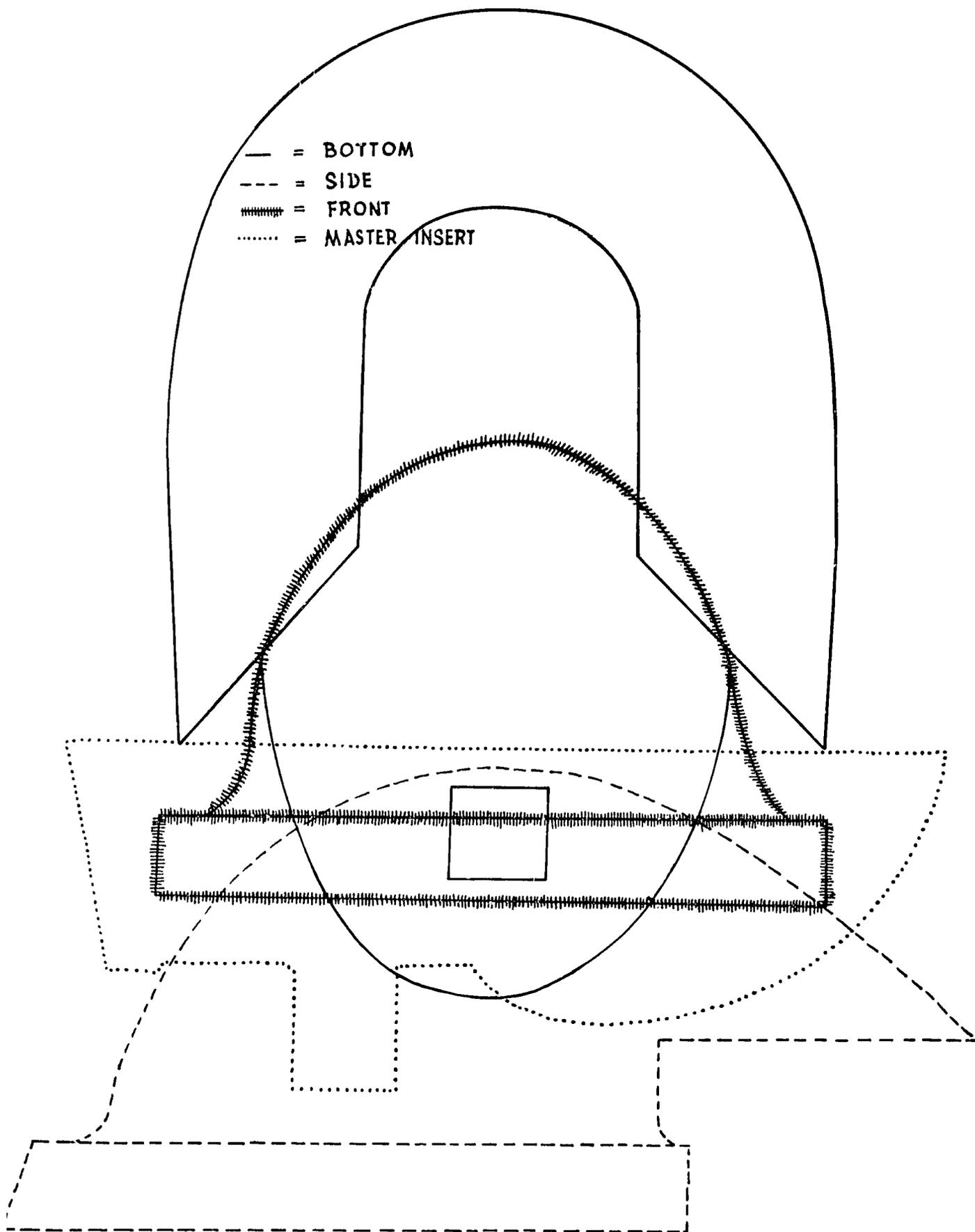


9. Separate slab from mold and place on stand. Use simple lever inserted in hook to remove bowl mold. **YOU MUST REMOVE MOLD OF BOWL FIRST.**

10. Tap the gooseneck mold gently and slip it out. Add a little water and check to see if your seal is $3/8$ " (1 cm.).







PROFILES OF GOOSE NECK

V. APPENDIX

A. Technique of Waxing Secondary Molds

It has been found that coating the secondary molds with beeswax before oiling makes the removal of molds much easier. One kilogram of wax plus 1/2 liter of kerosine will coat 8 sets. Melt the wax, add the kerosine and brush on molds with paint brush to thickness of about 1/8". Allow to dry before oiling. The molds may be used 5 or 6 times before recoating. The added cost is one penny per finished privy.

B. A Modified Secondary Bowl Mold

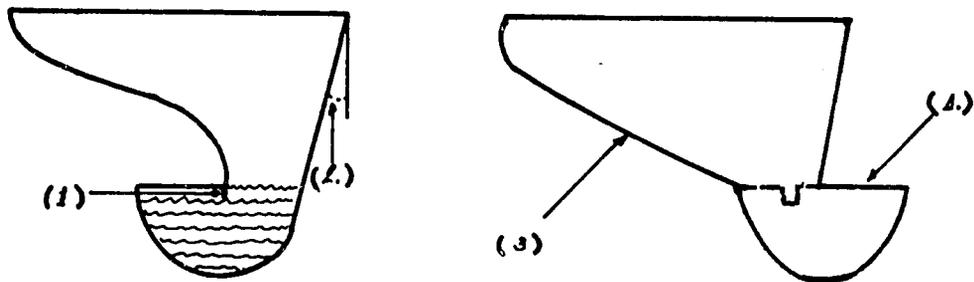
The privy described has two extending hooks on the bottom of the secondary mold and a hole in the platform for these hooks to go through. An even simpler technique is to scoop out a little of the bottom of the mold and have the hooks sit in the mold without extending beyond the bottom. Removal technique is the same but no hole is needed in the platform.

C. The Use of Color and Granite Chips

Many Thai people prefer to spend an extra 25 cents for an attractive polished slab. To do this, instead of using a mixture of cement and water in step 3., Part IV, use a mixture of 5 cement; 5 color; 1 granite chips and proceed as directed. After the molds are removed, polish with a carborundum stone and plenty of water.

D. Notes Concerning Water-Seal Privy

When the trap contains water, the depth of the seal is the depth that the water must drop before gasses can escape (arrow 1.). If experiments using new bowl designs are to be attempted, note that the back wall must slope slightly inward if the building technique described is to be used. Otherwise, the mold of the bowl cannot be removed. (arrow 2.). A more desirable angle to the bowl is possible if the bowl is made deeper or if the gooseneck is reversed (arrow 3,4). A reversed gooseneck is being tested now for easier flushing and improved slope of bowl.



BIBLIOGRAPHY

1. Zobel, R.L. "Assistance to Public Health in Thailand." Report on completion of assignment. USOM, Thailand. July, 1958.
2. McCullough, J.C. "Thailand's Public Health Education Program During a Five-Year Period of Transition." Report on completion of assignment. USOM, Thailand. June, 1959.
3. Haynal, A.P. "Thailand's Rural Health Program and the Role of U. S. Assistance in its recent Development." Report on completion of assignment. USOM, Thailand. February, 1959.
4. Robertson, A.A. "Assistance to the Cholburi Health Training and Demonstration Center." Report on completion of assignment. USOM, Thailand. April, 1959.
5. Textor, R.B., McCullough, J.C. Kanitayan, K., Wasi, S. "Manual for the Rural Community Health Worker in Thailand." Health Division, USOM, Thailand. March, 1958.
6. ICA-Thai Technical and Economic Committee Project Agreement. 1959, 1960, 1961. Project No. 493-59-192.
7. Anon. Rural Health Experiments on Latrines for Rural Homes. (Planning Department, Uttar Pradesh. India. 1958.)
8. Anon. Latrines for Rural Homes. *ibid.* 1959.
9. Anon. Rural Latrine Program. (Ministry of Health, New Delhi. 1961.)
10. MacDonald, O.J.S. Small Sewage Disposal Systems. (H. & C. Press, Colombo, 1951.)
11. Ehlers, V.M., Steel, E.W. Municipal and Rural Sanitation. (McGraw-Hill Book Co., 1950, 4th Ed.)
12. Wagner, E.G., Lanoix, J.N. Excreta Disposal for Rural Areas and Small Communities. (W.H.O. Monograph Series No.39, Geneva, 1954.)
13. Salvato, J. Environmental Sanitation. (Wiley and Sons, 1958.)
14. Anon. Design and Control of Concrete Mixtures. (Portland Cement Assoc. 33 W. Grand Ave. Chicago 10, Ill.,).