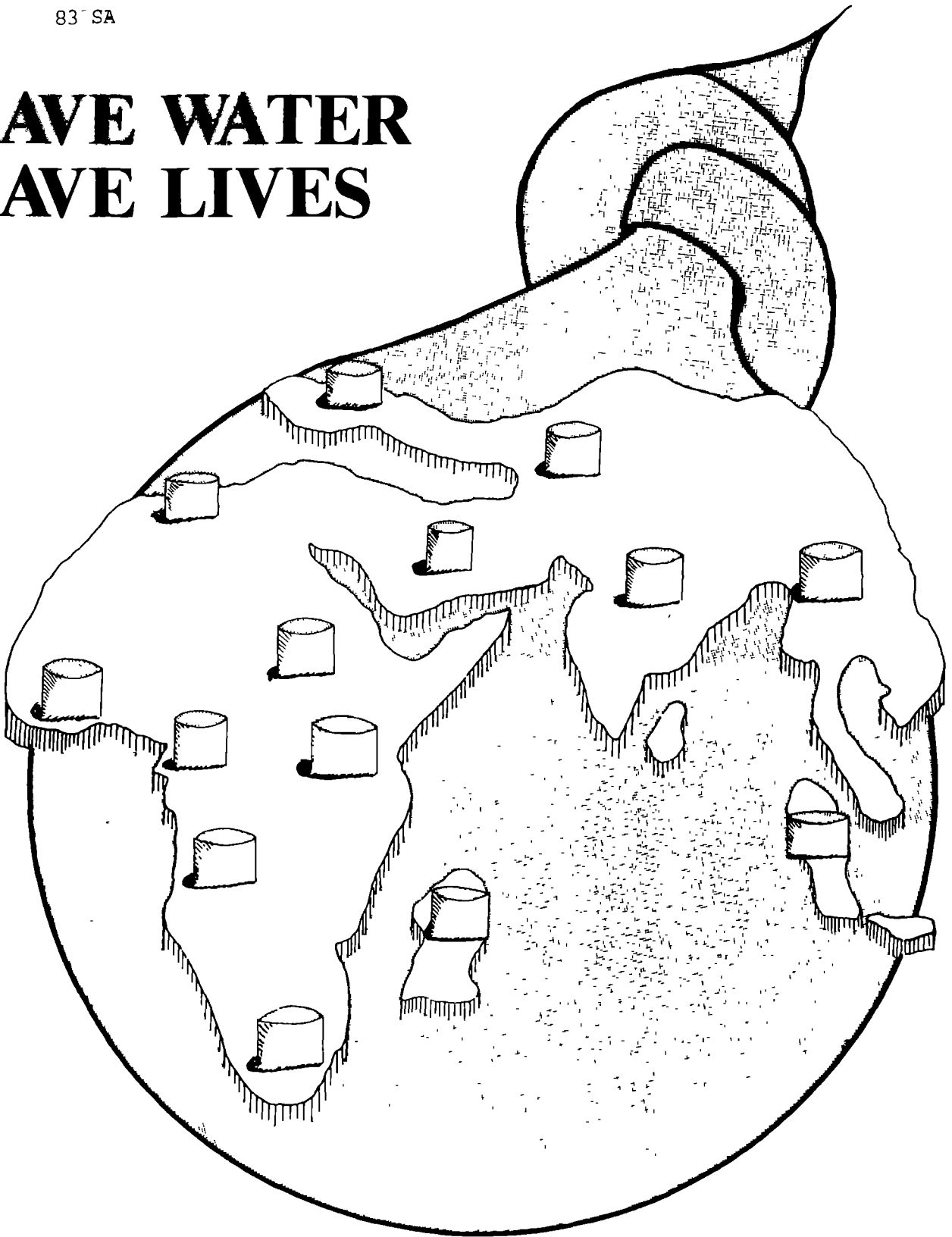


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SAVE WATER SAVE LIVES



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TECHNICAL DATA HANDBOOK

A SUPPLEMENT TO

SAVE WATER SAVE LIVES

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A step by step guide to the construction of a
Concrete Water Tank of 25000 litres (5500 gal)
capacity using a re-usable set of formwork.

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A. SITE SELECTION.

Prior to starting construction it is necessary to choose a suitable site for the location of the tank and a number of points need to be considered in the selection of the most suitable site.

It is important to determine the soil type; it may be sandy, firm, rocky or soft.

It is advisable that the site be well drained and near some trees to provide shade so that the tank is not directly exposed to the sun.

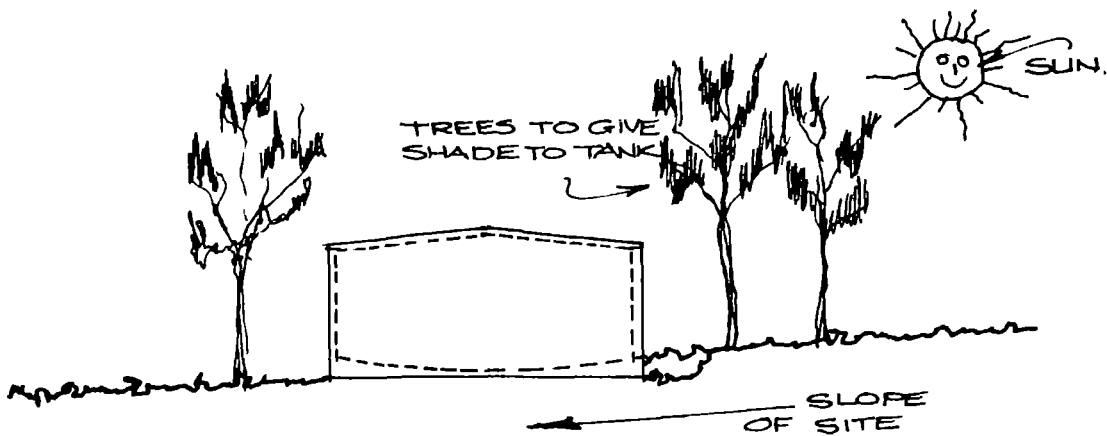


FIG. 1

From the inspection of the site proposed and the soil type it will be necessary to decide if it is required to excavate for the tank. Should this be necessary it is important that the tank either sit on undisturbed ground or a foundation provided for the tank.

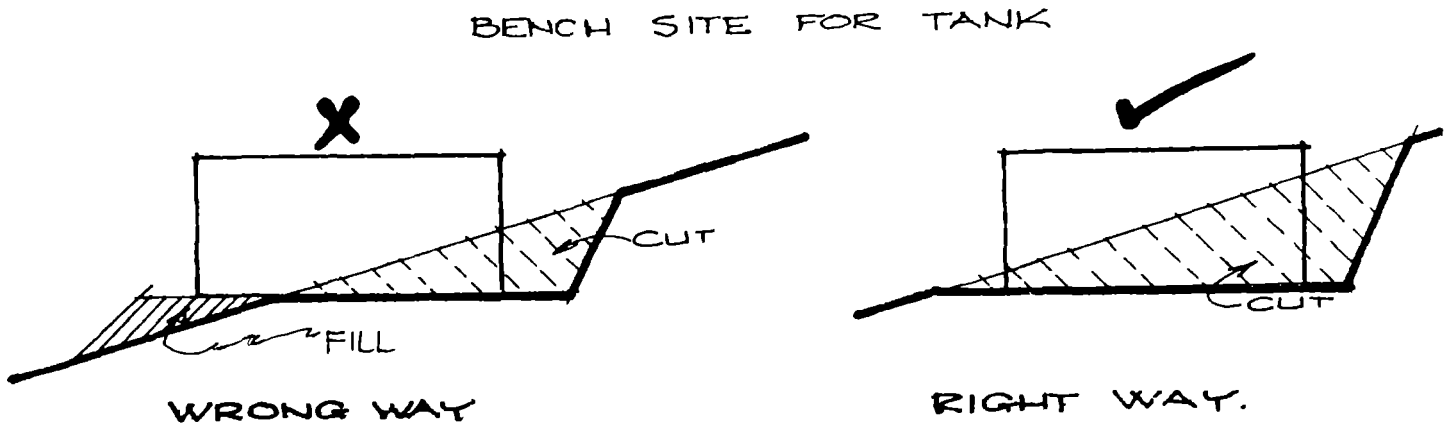


FIG. 2

In selecting the site you should consider the availability of a pipeline to fill the tank, or at least whether there is a spring in the area so that after construction the tank may be filled. (refer Figure 3).

If it is intended to collect rainwater from the roof of a building, the tank should be located to enable natural flow of water from roof gutters to the tank.

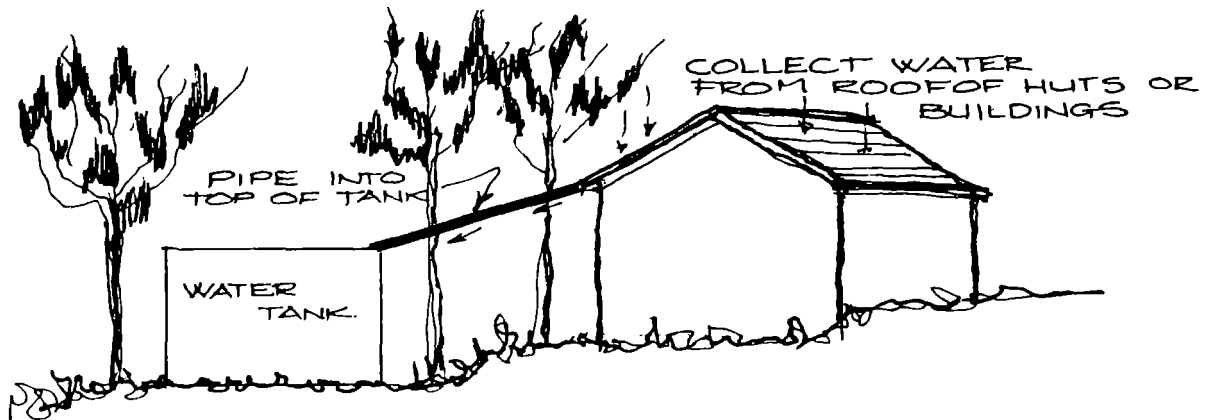


FIG. 3

If from the survey it is evident that all conditions are fulfilled, you may proceed to construct the circular water tank from reinforced concrete.

PRIOR TO CONTINUING YOU SHOULD CHECK ALL MATERIALS AND EQUIPMENT AGAINST THE LISTS ON PAGES 17 - 20 TO ENSURE ALL EQUIPMENT AND MATERIALS ARE ON SITE.

B. FOUNDATION.

Having selected the site, the construction of the foundation should be made according to the condition of the site.

For stable sites, that is sand, firm soil or rock, no specific foundation preparation is required other than levelling of the area for the tank. (refer Figure 4).

For filled or unstable sites a foundation should be formed from stones set in cement as a foundation around the perimeter of the tank base and some internal supports. (refer Figure 5).

* NOTE: IT IS NOT DESIRABLE TO BUILD TANKS ON UNSTABLE GROUND.

FOUNDATION FOR STABLE SITES.

Tank base can be set on a level area. Cover area to be site for tank with 50 mm. of sand or fine stone to act as base for tank.

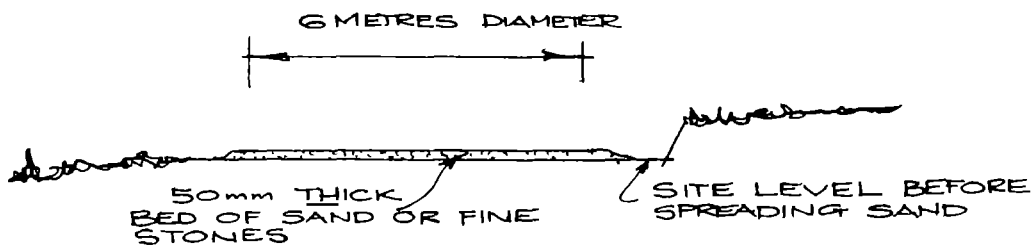


FIG. 4

FOUNDATION FOR UNSTABLE SITES OR ELEVATED TANKS.

If tanks must be constructed on unstable sites you must construct a foundation as indicated in Figure 5.

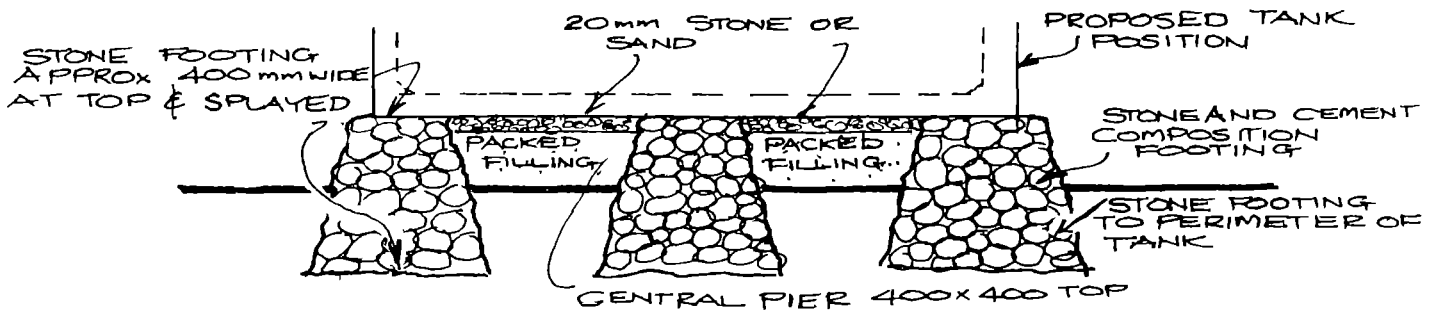


FIG. 5

Having prepared the site you can now proceed to the next stage of construction.

PIPE FOR CLEANING PURPOSES.

It is necessary to position the pipe in the base of the tank as indicated in Figure 6.

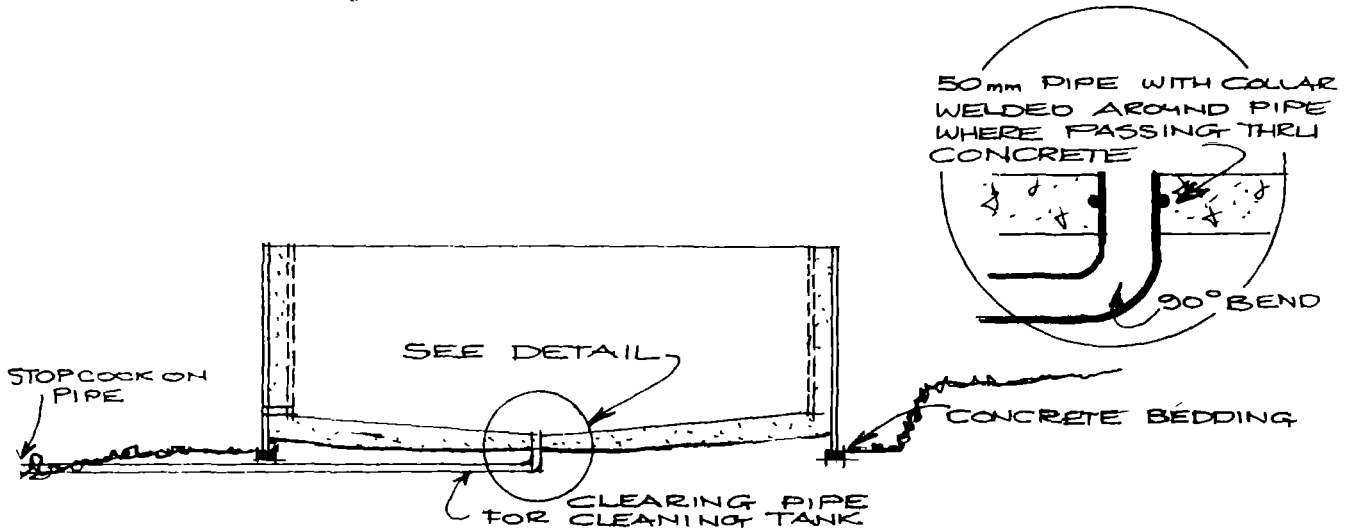


FIG. 6

It is important that this pipe be positioned accurately to ensure proper operation of completed tank. It is desirable to fill cleaning pipe trench with concrete after positioning pipe.

C. WALLS AND FLOOR, EXTERNAL FORMWORK,

Your next step in the construction is to position support for external forms. This should be a concrete strip to the perimeter of the tank as indicated in Figure 6 to provide a level base for erection of formwork. (NOTE: This is not done to provide a structural support for tank but only as a level base for forms).

Next step is to construct the external formwork. This is done by the inter-connection of external wall panels, these are the larger of the two panels supplied and are 1800 x 580. Each panel has four ribs and edge ribs are interlocked with abutting panel by means of keys and wedges. (refer Figure 7).

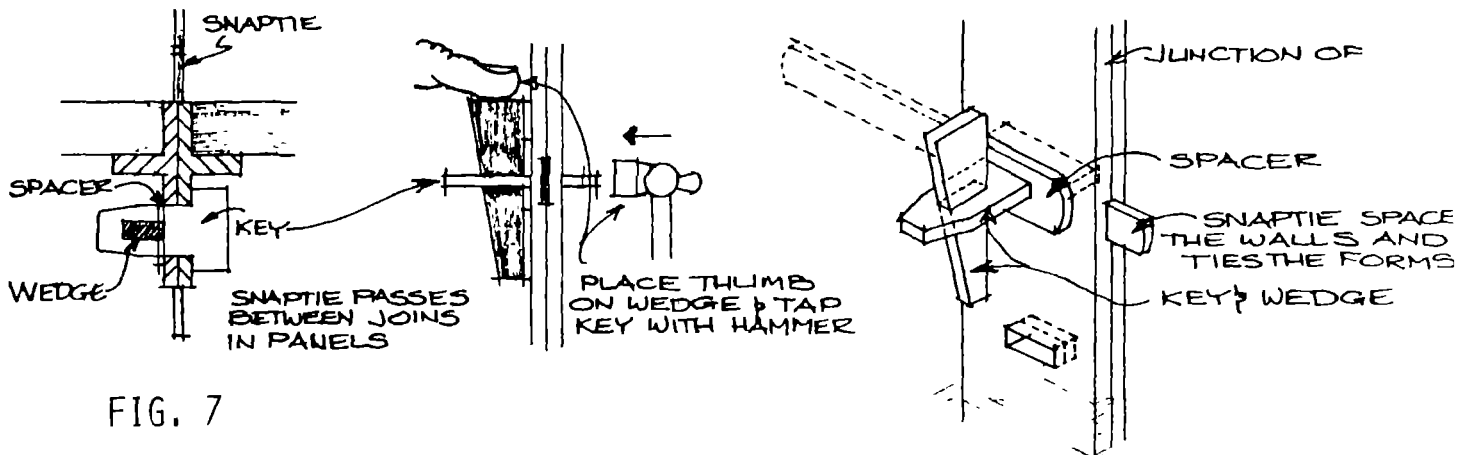


FIG. 7

With all panels interlocked to a full circle the next step is to connect the tube supports to the formwork.

Connection of tube to formwork is by means of the system illustrated in Figure 8, 9 and 10 (and Photos Page 22).

The panels should be fully interlocked to prevent leakage of concrete during the pouring of the tank. (It is essential that forms are clean and free from cement and oiled prior to connection).

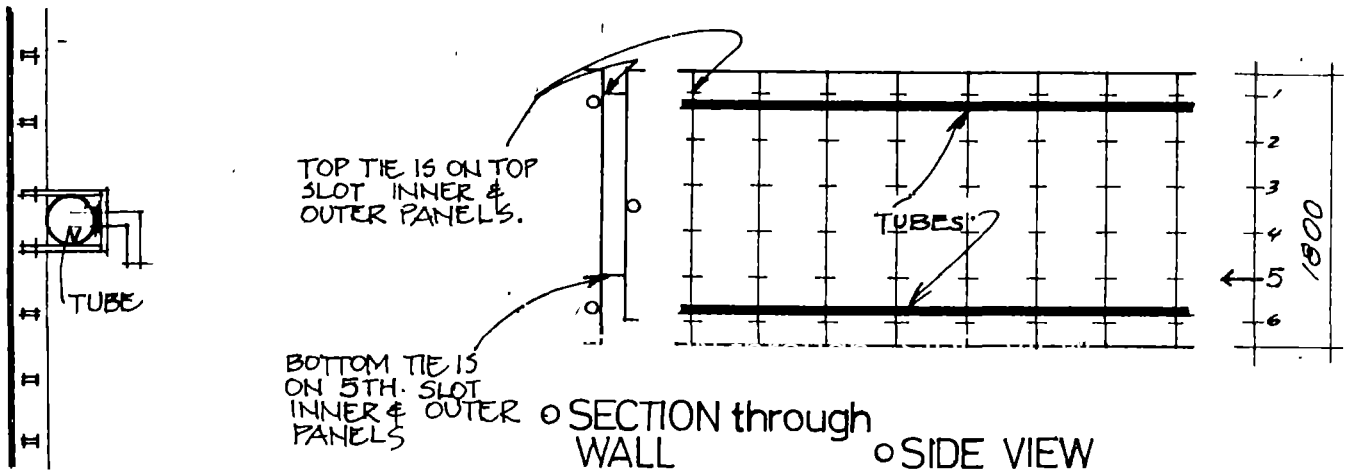


FIG. 9

FIG. 8

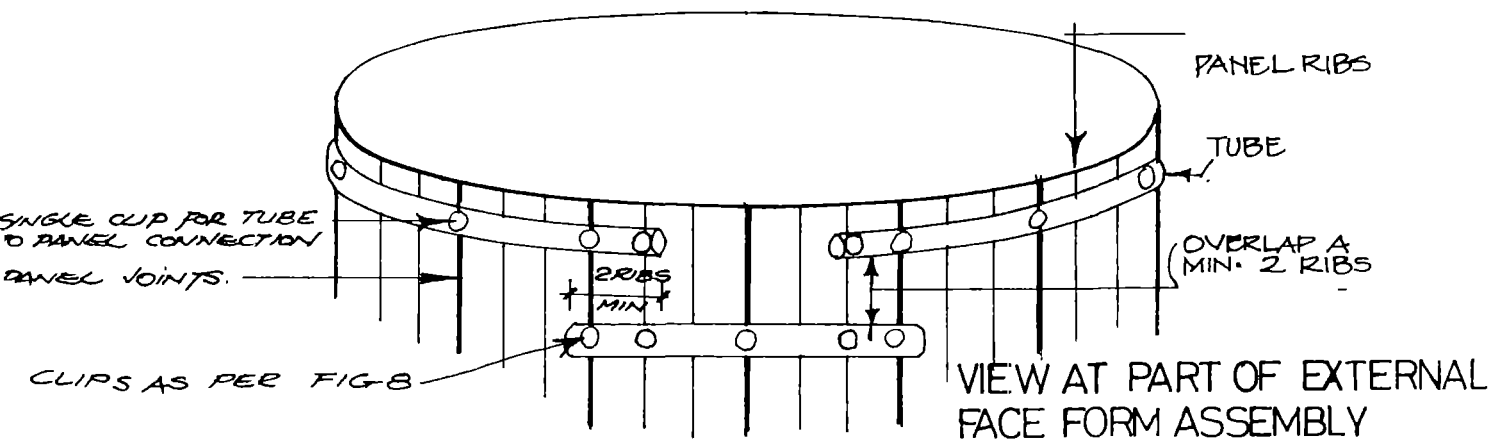


FIG. 10

At the completion of assembly of the outer formwork it is necessary to oil the face of the forms to ensure easier stripping of the form panels after curing of the tank. (Any oil can be used including old engine oil. Oil can be diluted with kerosine).

REINFORCEMENT.

After setting up the outside formwork the next step will be the placing and tying of reinforcement. Place wall reinforcing first.

Figure 11 - 13 shows the layout for reinforcement. The reinforcing for the base must be shaped as indicated and must be turned up 600 mm. for connection to wall reinforcement.

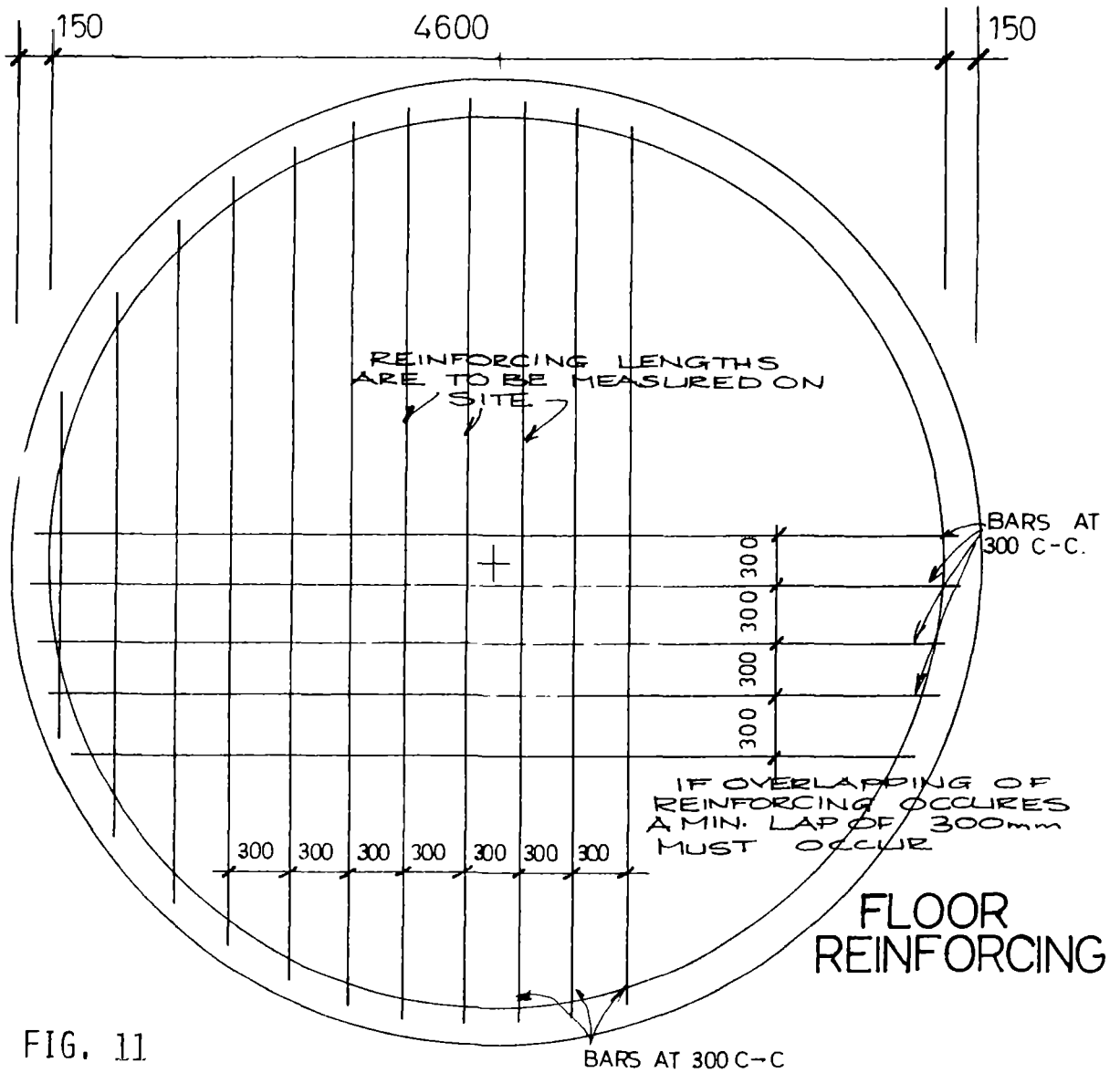


FIG. 11

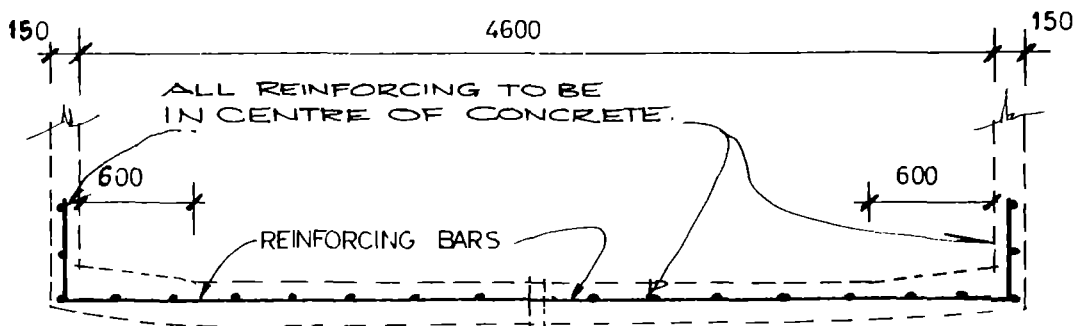


FIG. 12

FLOOR SECTION.

Reinforcing bars must be tied at each intersection and shaped to base of tank. Support floor (base) reinforcing temporarily with stones. (Remove these while pouring concrete in base).

Wall bars should be placed 300 mm. apart and horizontal bars should be bent to the shape of the formwork and fixed at 300 mm. centres and tied to vertical bars.

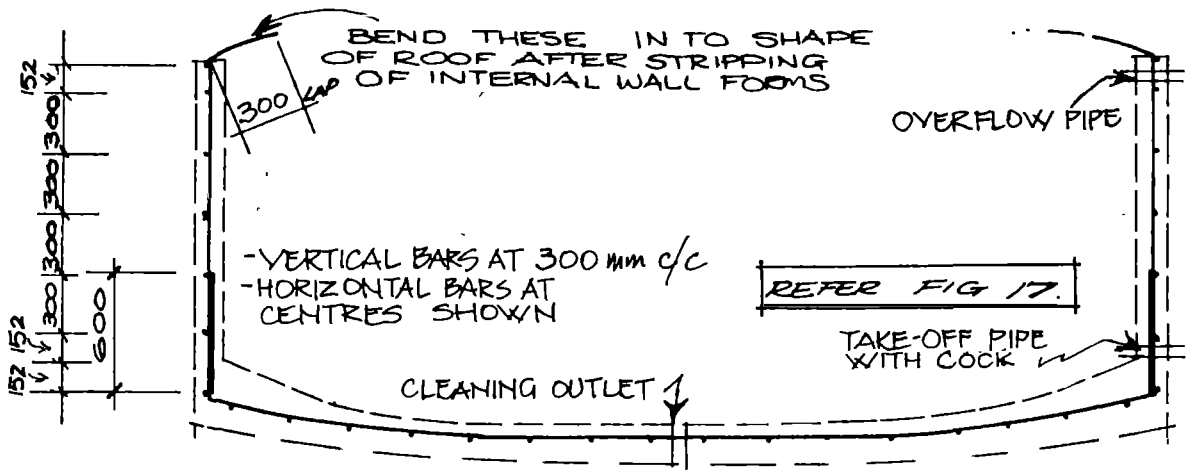


FIG. 13

WALLS AND FLOOR: INNER FORMWORK.

With all floor and wall reinforcement correctly positioned and tied, your next step is to erect inner formwork.

The forms must be oiled before erection and then the procedure for assembly of forms is the same as that used for outer forms.

Snap ties ensure correct spacing between inner and outer forms.

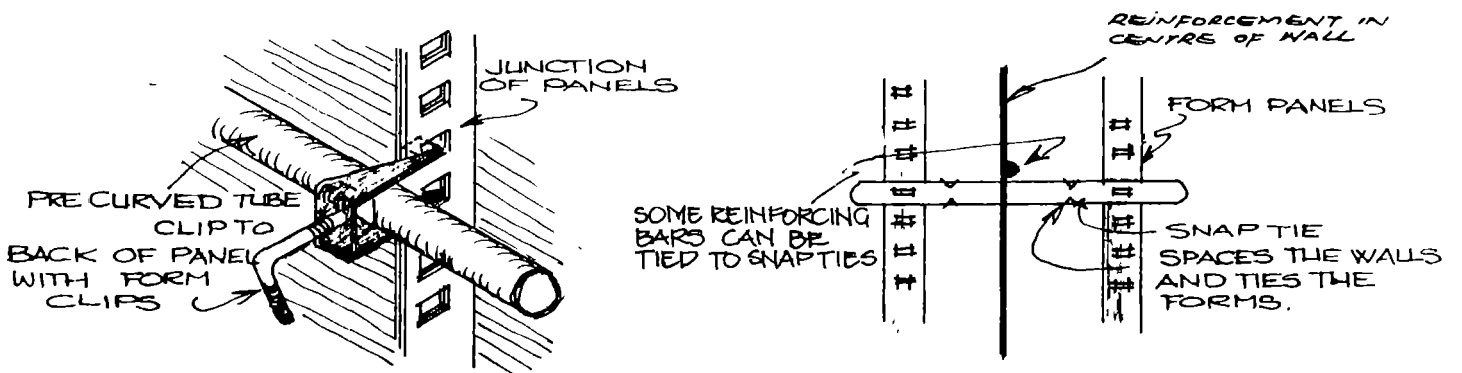


FIG. 14

SCAFFOLDING.

To assist in pouring of concrete it is advisable to erect scaffolding around the assembled formwork. See alternative method A and B below.

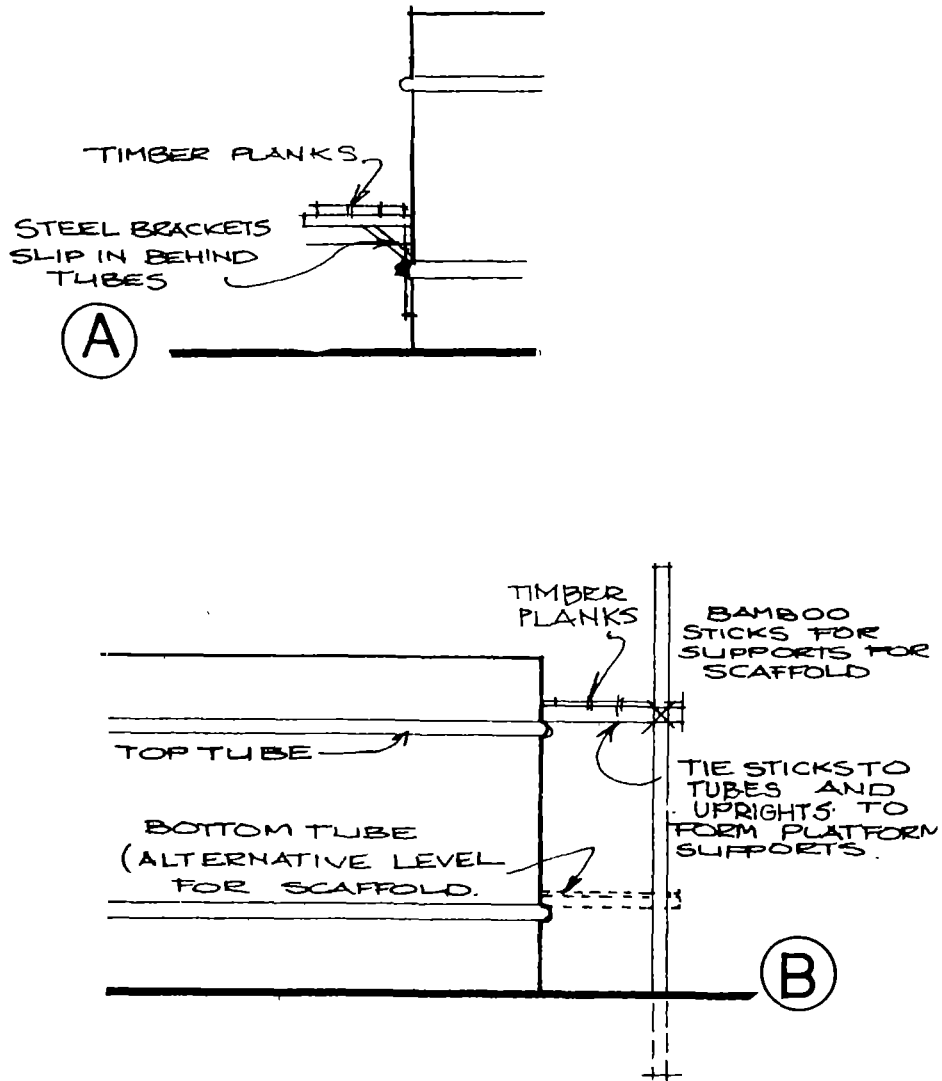


FIG. 15

This can usually be done by using natural local materials such as sapplings or bamboo etc. and deck this out with planks as indicated in Figure 15 (No materials are provided with the kit for scaffolding).

D. WALLS AND FLOOR: CONCRETE POUR.

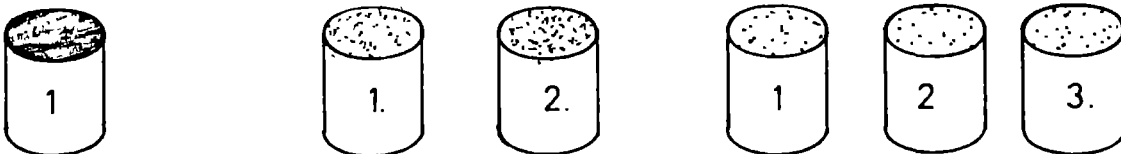
Having completed forming the tank walls and placing of floor and wall reinforcement, it is now in order to mix concrete and pour the floor and walls.

NOTE: You must continue to pour floor and walls once you have started and you can not stop at any point before completing the pour. You should check the weather before starting and pouring should not be done in the hottest part of the day or if it is likely to rain. It will take you approximately 6 - 10 hours to mix the concrete and pour the tank.

MIXING:

Concrete will be mixed in the concrete mixer provided and should be mixed in the following proportions - or in proper proportions obtained from local experience to produce waterproof concrete, and mixed with fresh water in the mixer for six minutes per batch of concrete. Concrete should be mixed to a firm stiff consistency but should not be too dry.

1. Part Cement. 2. Parts Sand. 3. Parts Stones.
Maximum stone size 18 mm.



Concrete should be mixed close to tank and transported in wheelbarrows provided. It may be necessary to shovel or bucket concrete into some positions.

FLOOR: POURING.

The floor of the tank should be poured first with the pour commencing at the walls and working toward the centre of the floor.

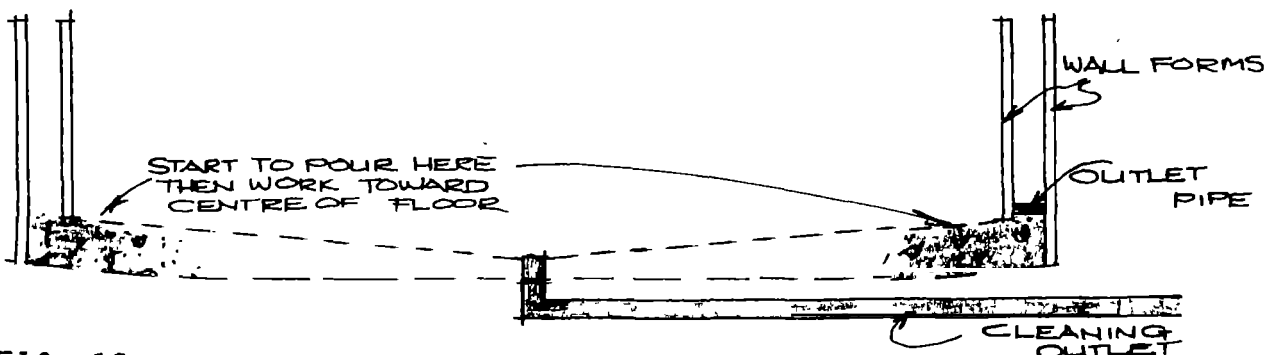


FIG. 16

As pouring proceeds the vibrator should be used to vibrate concrete around the reinforcement and to prevent air pockets.

NOTE: Excessive vibrating should be avoided as this separates the stones out of the concrete. Well placed and vibrated concrete will ensure that no rendering is required. (Rendering will not stick to smooth surface of stripped concrete tank).

WALLS:

Having poured the floor first you will find that the concrete will have sufficiently set to allow pouring of the walls to commence.

Prior to pouring the walls check outlet and overflow pipes to ensure they are in the correct positions.

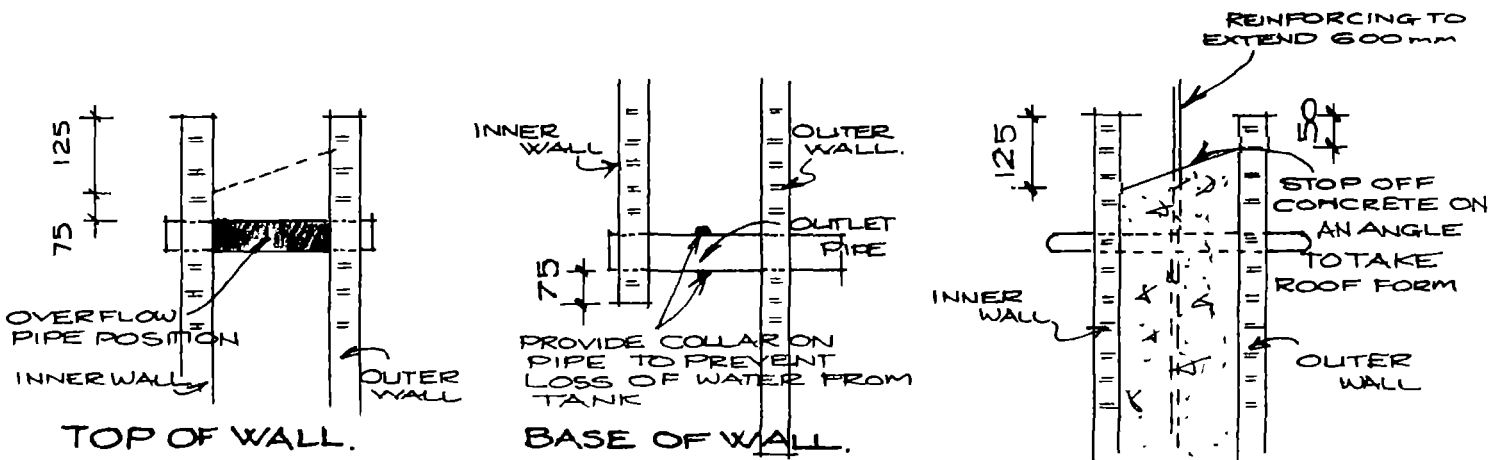


FIG. 17

After completion of pouring and vibrating of walls you must thoroughly clean the concrete mixer, vibrator and all other wheelbarrow and tools used prior to concrete setting on the equipment.

After the initial cure of the walls (approximately the next day) the inner formwork around the tank should be taken apart. Forms should be thoroughly cleaned and stacked for re-use. (Concrete should be scraped from forms and tubes; NOT HAMMERED OFF).

All internal forms and tubes should be removed from inside tank, however one section of the tubes should be positioned on top row of snap ties to support formwork for the roof of tank (Figure 18).

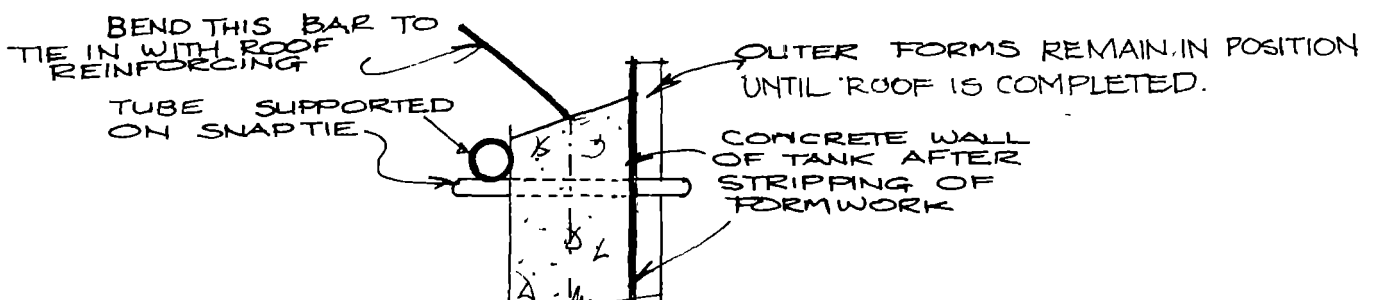


FIG. 18

E. ROOF - FORMWORK.

Around the top of the inside of the walls of the tank, you should set up one of the internal tubes and rest this on the top row of snap ties. (Refer Figure 18).

At a distance of approximately 1.00 m. in from the walls the adjustable props should be positioned to support the formwork for the roof. (Refer Figure 19 and 20).

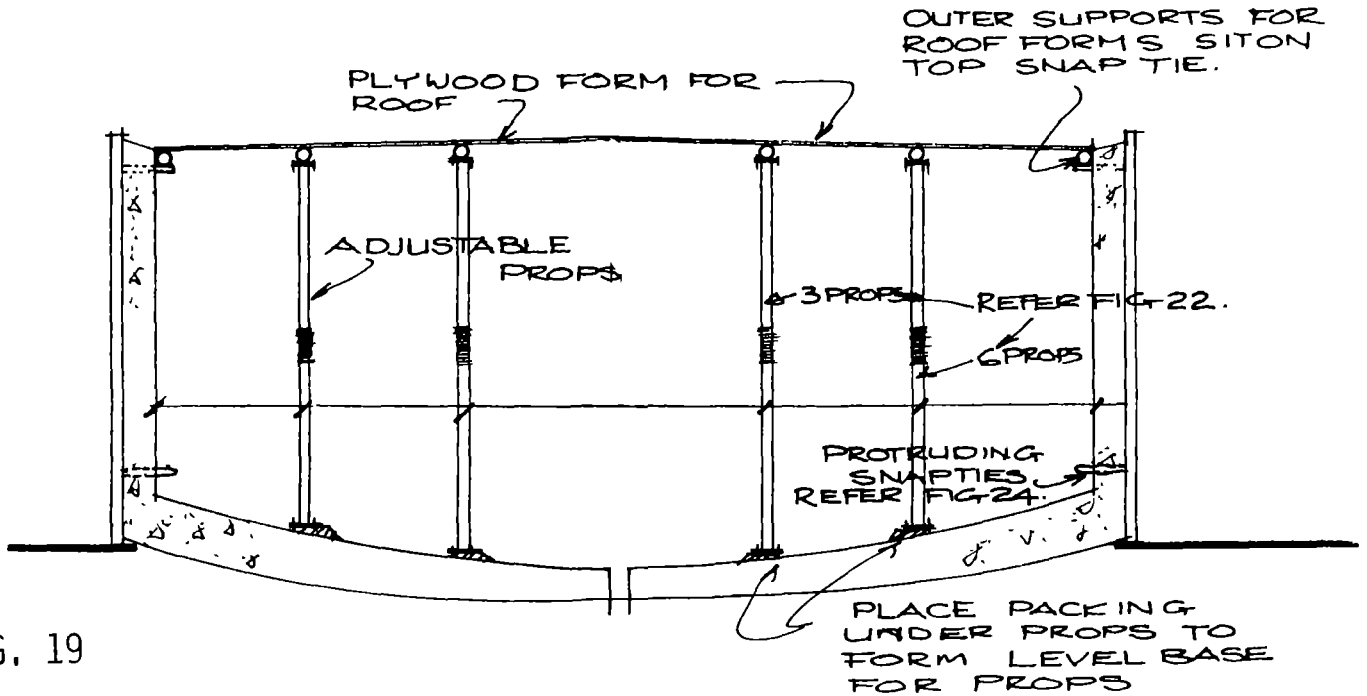


FIG. 19

Formwork for the roof of the tank is supplied as part of the kit and is in the form of six cut sheets of plywood 2442 x 1220 x 20 mm. marine plywood. It is necessary to cut the 24 segments for the roof form from the sheets in the manner indicated in Figure 21.

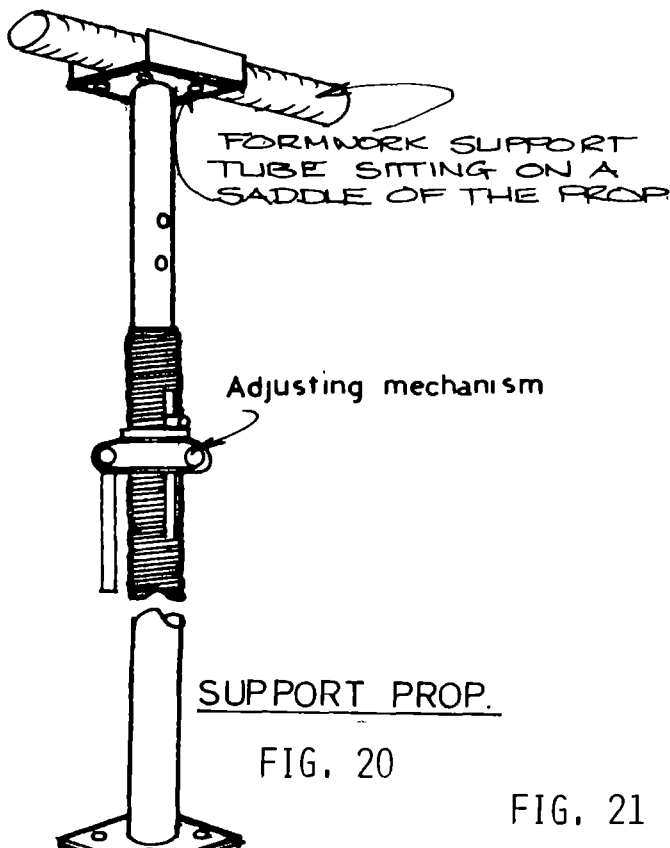


FIG. 20

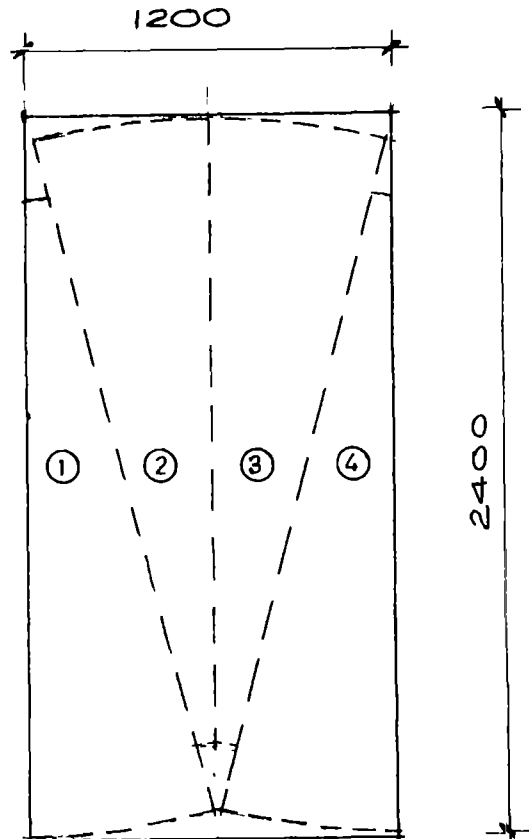


FIG. 21

With all segments cut for the roof form you can position these as indicated in Figure 22. It will be necessary to cut the 24th panel on site to suit the remaining segment.

With formwork in place you should provide additional form for the provision of a manhole for access to the tank for recovery of formwork and for cleaning of tank.

NOTE: This manhole must be of sufficient size to allow removal of formwork.

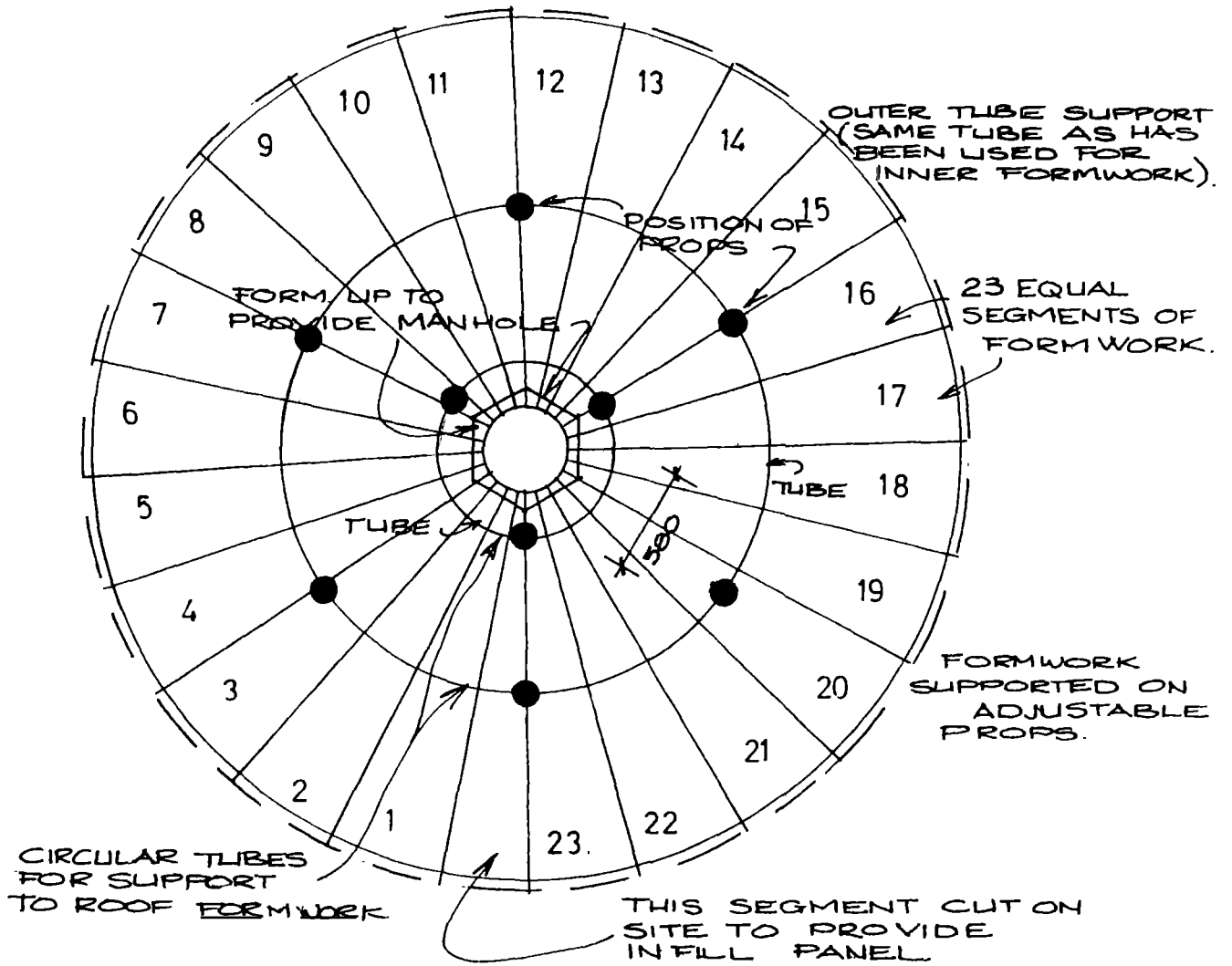


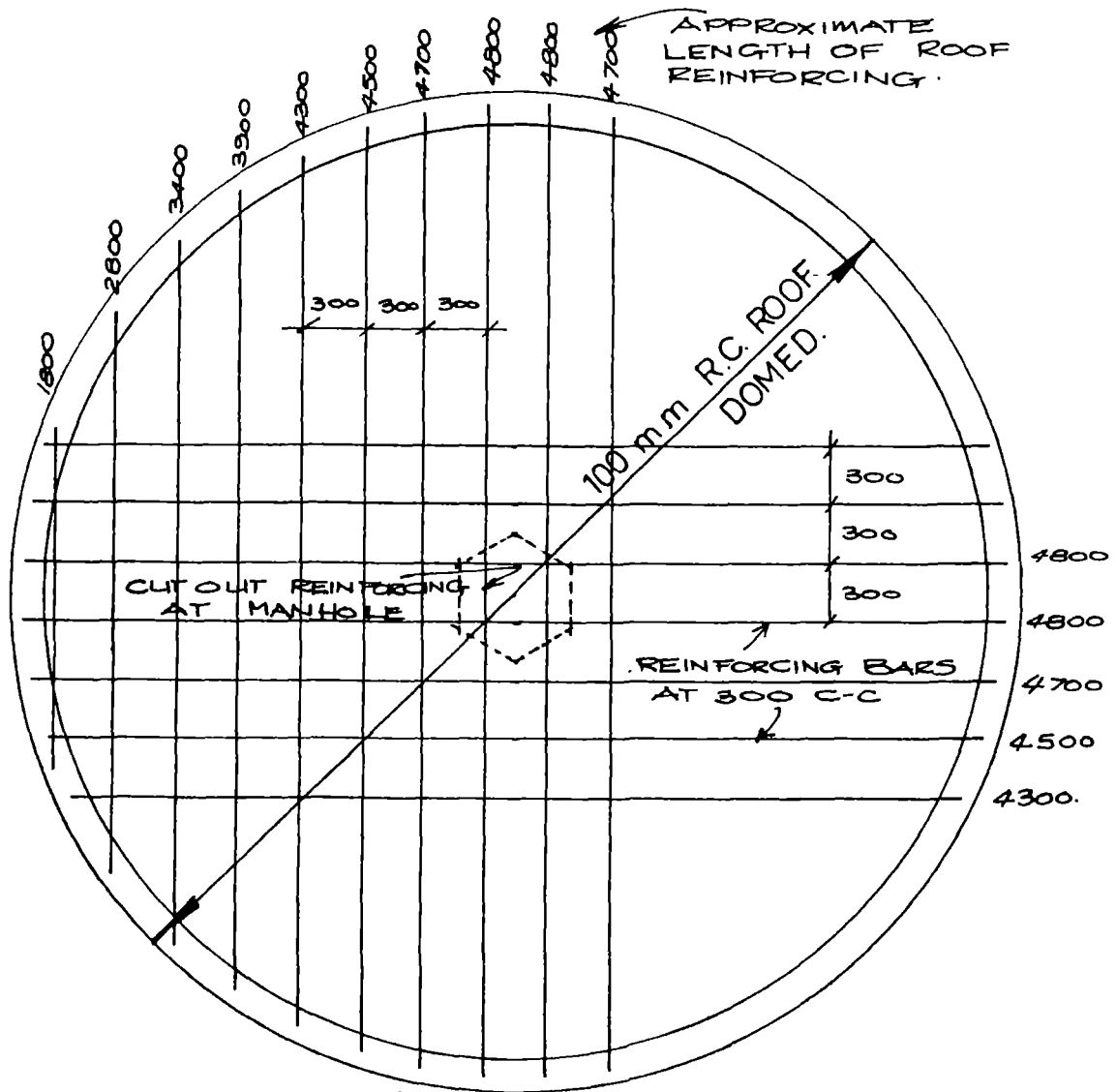
FIG. 22

ROOF - REINFORCEMENT.

Prior to placing reinforcement for the roof of the tank, it is necessary to place building paper or similar material over the timber form to ensure easy stripping of formwork and to prevent leakage of concrete through any small cracks between forms. (Cement bag paper will do).

It is now necessary to bend the protruding wall reinforcement over the formwork and to position the reinforcement for the roof. See Figure 18.

The roof reinforcement should be placed at 300 mm. centres both ways as was done with the floor reinforcing. The reinforcing should be supported on stone supports and securely tied to the protruding wall reinforcing.



PLAN OF ROOF OF TANK

FIG. 23

F. ROOF - CONCRETE POUR.

With all reinforcing in place it is now in order to pour the concrete for the roof of the tank.

SNAPTIES.

After the stripping of the formwork of the tank it is necessary to "knock-off" the protruding snapties. This is done with the use of a hammer and it will then be necessary to fill the remaining holes with a mixture of sand and cement mortar and trowel off flush with the face of the tank.

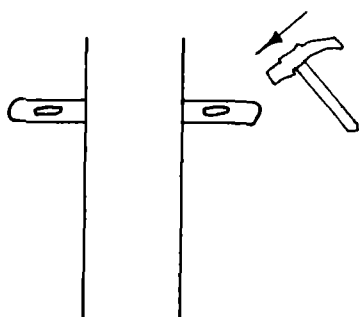


FIG. 24

CURING.

The tank will not obtain its full strength for a period of approximately seven (7) days after pouring of the roof dome.

To assist with curing you should add about 200 mm. of water to the tank the day after pouring of the floor and you should wet down the outside of the tank three (3) times a day for the three(3) days after stripping of each section.

* * * * *

LIST OF QUANTITIES.

A. REINFORCEMENT SCHEDULE.				
BAR LOCATION.	LENGTH.	NO:	TOTAL LENGTH.	TYPE.
Vertical wall bars.	2.000 m.	50	100.00 m.	S12
Perimeter wall bars.	15.300 m.	7	107.00 m.	S12
Floor bars (both ways).	To suit.	32	170.00 m.	S12
Roof bars (both ways).	To suit.	32	122.00 m.	S10

- B. Sand. - Five (5) cubic metres.
- C. Cement. - Seventy (70) bags (50 kg).
- D. Stones. - Eight (8) cubic metres.

1. Total amount of concrete for pour \pm 9.5 cubic metres.
2. Total number of mixer batches is 111 based on 0.005 cubic metres (3 cubic feet) per batch.
3. Total mix time 11 hours based on six (6) minutes per batch.
4. Concrete to be mixed in following proportions by volume:
 - (i) part cement.
 - (ii) parts fine sand.
 - (iii) parts stones. - 18 mm. stones. (Maximum size).

OR: Check with local experienced contractor for suitable local materials and proportions.

SPECIFIED EQUIPMENT FOR A COMPLETE TOOL KIT.

- A. TRAILER:
- * Tray deck type with steel frame and wooden floor and sides.
 - * Dimensions - 12'0" x 6'0" (3.66 m x 1.82 m.) or 11'0" x 7'0" (3.35 m x 2.13 m.) with 18" (38 mm.) sides.
 - * Capacity - 3 tonnes (loading capacity).
 - * Tandem axle with 750 x 16 tyres and tubes (heavy springs to be fitted).
 - * Trailer tools comprising - hydraulic jact, four-way wrench, hand pump, bead breaker, rubber mallet, 2 x 24" tyre levers, tube repair kit, two spare tubes and 100 feet (30 metres) of light chain to secure load. This chain should be secured with spot welds to load and trailer for greater security, while being transported by ship.
- B. FORMWORK:
1. WALL FORMS:
- * 25 flexible steel concrete formwork panels, 1830 or 2000 x 616 mm. (Outside boxing).
 - * 25 flexible steel concrete formwork panels, 1525 or 1730 x 578 mm. (Inside boxing).
 - * Eight (8) radiused (2540 mm) scaffold tubes (outside formwork).
 - * Four (4) radiused (2210 mm) scaffold tubes (inside formwork).
2. ROOF FORMWORK:
- * Seven (7) sheets of plywood 2442 x 1220 mm, marine class, 20 mm. thick. (includes on extra).
 - * Four (4) radiused tubes (2 x 0.50 m. and 2 x 1.4 m. radiused).
 - * Eight (8) adjusted props (see Figure 20).
 - * One steel mould for prefabricated manhole lid.
3. GENERAL:
- * 250 wedges and keys to secure snap ties to formwork. (formwork fixing tools).
 - * 120 clips to secure radiused tubes to formwork. (formwork fixing tools). The 250 wedges and keys and 120 clips include spares to provide up to 20% replacement.
 - * 1000 snapties. (Construction of one water tank requires 50 - 150 mm. snapties. The snaptie ends can be welded together for re-use a few times. A supply of 1000 snapties can cater for about 50 tanks).
- Other methods may be used instead of snapties to hold the two layers of formwork in place.

CONT' SPECIFIED EQUIPMENT FOR A COMPLETE TOOL KIT.

C. CONCRETE MIXER.

- * One concrete mixer with petrol driven motor, approximately the size and type of the one illustrated (3.5 cubic feet). This particular model is well suited to this task because of its robust design, with 16 inch wheels which allow it to be moved over rough terrain. The feeding hopper for this model can be loaded while the previous load is being mixed, saving time. It also helps to ensure the right batching of materials.

D. VIBRATOR.

- * Vibrator complete with 20 feet (6 metres) of 1½" vibrator shaft petrol driven; It is recommended that you include the necessary spare parts in duplicate as this unit is very much subject to wear and tear.

E. PUMP.

- * For pumping water into the drums, approximately 2 h.p. capacity; petrol driven; with 25 feet (8 metres) suction hose and approximately 150 feet (50 metres) delivery hose. It is recommended that sufficient spare parts are included and a strainer fitted to the end of the suction hose.

F. GENERAL TOOLS.

- * Two wheelbarrows with pneumatic wheels and spare tubes.
- * Four 44 gallon (200 litre) drums, preferably galvanised, for water storage during the mixing of concrete. They can also be used for storing smaller tools during transport.
- * Four mattocks or picks.
- * Four small square mouthed shovels.
- * Two spades.
- * One wrecking bar.
- * One hacksaw with 3 dozen blades.
- * Carpenter's hand saw.
- * Three shifting spanners (6, 9 and 12 inches).
- * Two pairs of pipe wrenches.
- * Four pairs of pliers.
- * One claw hammer.
- * One sledge hammer.
- * One block hammer.
- * One pipe vice.
- * One engine vice.
- * Six files.
- * Three cold chisels of different sizes.

CONT' SPECIFIED EQUIPMENT FOR A COMPLETE TOOL KIT.

F. GENERAL TOOLS. CONT'

- * Three screwdrivers of different sizes.
- * One pair of tin snips.
- * One measuring tape.
- * One metre spirit level.
- * Four wooden trowels.
- * Four steel trowels.
- * Four small to medium sized tool boxes, with padlocks.
- * Medium size crowbar.
- * Large size crowbar.
- * Large boltcutter or guillotine for cutting 12 mm.
Reinforcing bars (include spare set of cutters).

REMARKS.

The engines of mixer, vibrator and pump should be by preference of the same make and use the same type of fuel preferably petrol. Also spare parts such as carburetors, grease nipples, spark plugs, vee belts, vibrator heads and nozzles etc., whatever the manufacturer recommends, will be needed to cover wear and tear, should also be included together with any special tools to fit same. Also instructions regarding the equipment and detailed cut-outs should be included in triplicate with parts clearly identified. (Figure 25).

Depending on where the equipment package will be sent to, one should give consideration to the packaging of same. If pilfering is expected, it is wise for all tools and smaller equipment be packed inside the four 44 gallon (200 litre) drums and then spot weld the lids on; toolboxes to be supplied with padlocks and equipment on trailer to be spot welded together to the chains used to tie up the total load on the trailer. All tools and equipment to be painted in the same colour for identification.

It should be stressed to the locally appointed co-ordinator, that equipment should stay together and it is a good policy to instruct the co-ordinator that these tools should only be used for the one purpose: that is the construction of water tanks.

Also the supply of 10 to 20 scaffolding planks is to be considered for those areas where timber is impossible to obtain. Scaffolding braces (See Figure 15A on drawings) are a practical commodity to be supplied, twelve of each should be sufficient.

All the above specified tools except the concrete mixer can be carried on the trailer.

Not included in specified tool kit are: scaffolding materials, water pipes and stop cocks.

Also needed and not provided are: petrol and oils for engines; wire for tying of reinforcements; sump oils for work, nails, etc.

