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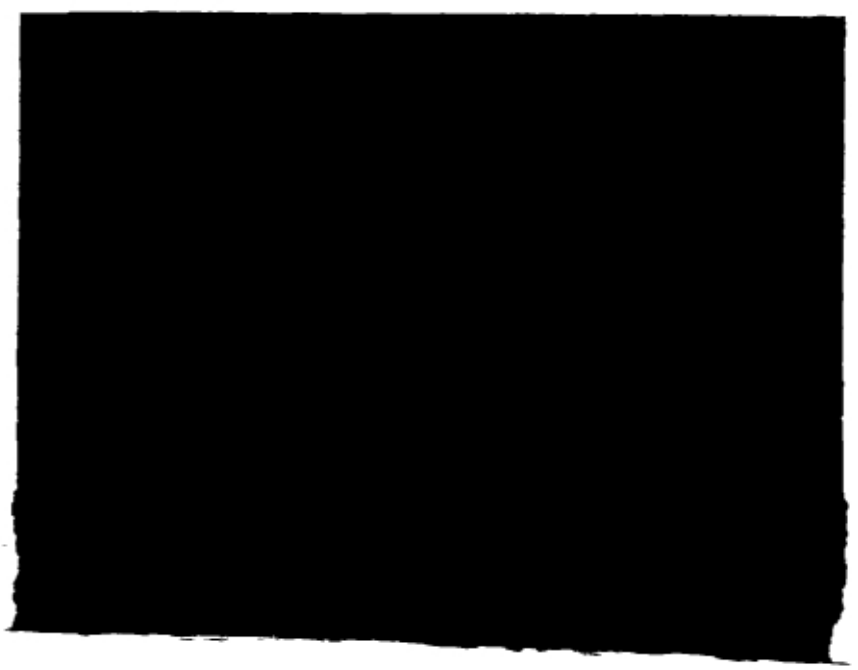
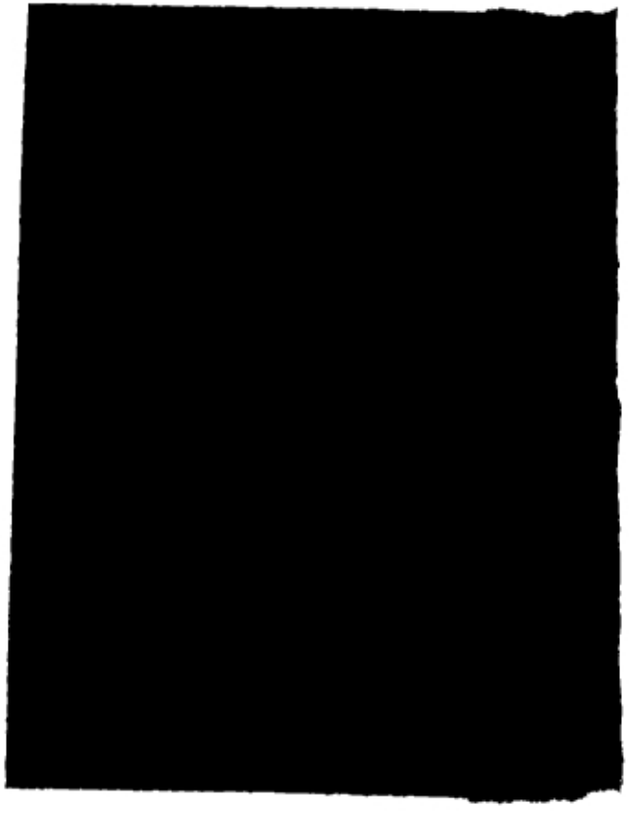
Rada' Integrated Rural Development Project





Republic of Yemen
Ministry of Agriculture
and Water Resources

Kingdom of the Netherlands
Ministry of Foreign Affairs
Development Cooperation
(Asia) Department

RADA INTEGRATED RURAL DEVELOPMENT PROJECT

MANUAL FOR THE IMPLEMENTATION OF SANITARY FACILITIES AT MOSQUES

Technical note 37

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CONTENTS

1 INTRODUCTION

In 1983 the RIRDP made an inquiry into the sanitation situation in the Al Bayda Province. From a villages survey in the province it appeared that over 90% of the people considered the existing sanitation systems unhealthy and there was a general interest in improvement of the existing sanitation systems (ref.1).
In March 1984 the RIRDP decided to start with the implementation of four types of sanitation pilot projects. The objectives of these pilot projects were to demonstrate new sanitation systems and to collect basic data for future sanitation projects (ref.2).
One of the selected pilot activities was the construction of sanitary facilities at mosques in villages with a water supply scheme. This means the construction of toilets, a washing place and a system for the treatment and final disposal of the wastewater.
The start was rather difficult and the first projects were implemented without any village contribution in order to have at least some examples. After a period of one year the programme became very popular, which was demonstrated by the big number of requests for new projects. It was not always clear whether these requests were initiated by the village or by a contractor who wanted to have a job.
In 1987 the procedures were changed and from 1988 on the RIRDP implemented a maximum of 8 projects per year with a standard village contribution of YR 15,000 per project. As the average construction costs are YR 75,000 per project, this means 20% of the total costs. The list with village requests for sanitary facilities at mosques (annex H) shows that 40% of the villages which submitted a request, actually paid the contribution and got a project. The other villages are not interested anymore or have other priorities.

May 1990, 45 projects with 156 toilets and 458 taps have been completed or are under construction for a total amount of YR 2,940,810. This is an average of YR 65,000 per project or YR 19,000 per toilet including the costs of the washing place and an improvement of the yard. The costs of the new projects are in general higher due to increased prices of the building materials. Details about the facilities implemented so far are given in annex G.

This report is based on five years experience and gives an overview of the existing knowledge. The first part of this report gives general information about the programme, the activities and the implementation procedures, while the second part (annexes) deals with the technical and financial details.

2 PROGRAMME IN GENERAL

2.1 Existing situation.

In Yemen the mosque has a central place in the community. The people are gathering there five times a day for praying and for other social events like weddings and funerals. In general people want to contribute to a prosperous mosque by means of money, land, labour or good behaviour.
The islam prescribes that before praying everyone has to clean face, hands, arms and feet. Most mosques have a special place for ritual washing and a system for the supply of water. In many villages in Al Bayda province old mosques have cisterns for the collection and storage of rainwater. Other old mosques have ingenious systems for the supply of clean water from springs or shallow wells. With the introduction of drilled deep boreholes and the subsequent dramatic fall of the groundwater table many of these systems are not functioning anymore. In most cases, the small quantity of wastewater from the washing places was disposed in a garden with some fig or grape trees.
The more important mosques usually also have toilet rooms. In the past it used to be a row of four or five dry (baladih) toilets in which the solid and liquid waste were separated. The solid waste was collected in a composting room and used as fertilizer on the land. The liquid waste was brought outside, where it evaporated or infiltrated. These toilets are not liked anymore because they cause nuisance like smells and fly breeding. Moreover, the compost is not safe for agricultural use due to the fact that it contains fresh faecal material and with that pathogens.
Nowadays many mosques have a row of five or six small 'washing rooms' with a gutter in the floor for urination. The walls of these 'rooms' are in general 1.40 m high and there are no roofs neither doors. Although it is forbidden to defaecate in these rooms, some people do so. The water for the washing should be brought with a bucket or is scooped out from a water basin inside each room. The wastewater of these 'toilets' is disposed to a place outside the mosque yard.

From a hygienic point of view the following elements of the existing sanitary facilities need special attention:
1. Toilets. The old baladih toilets are not maintained anymore, but in many cases they are not replaced by other toilets and the people with big need have to use them.
2. Washing places. The water basins inside the 'washing rooms' are often dirty and are a breeding place for mosquitos.
3. Wastewater disposal. The wastewater flows to a place just outside the yard. This is often near the houses or in the street and it is necessary to treat the wastewater in a proper way.
4. The old cisterns. They are often not used anymore and are almost empty with a dirty mixture of water, mud, algae and refuse at the bottom. These places are dangerous because it are good breeding places for malaria mosquitos.

2.2 Aims of the programme.

In order to remediate the above mentioned undesirable situations, the RIRDP has a programme for the construction of sanitary facilities at mosques.
This programme has some clear objectives like improvement of the mosque surroundings and the construction of public toilets for men.
Moreover there is a big impact on all sanitation activities of the RIRDP. The programme creates awareness among the people about the health hazards of wastewater and inspires confidence in the people for other sanitation activities. As such the mosques functioned as start activity for the whole sanitation programme of the RIRDP.
Another objective of the programme is the demonstration of toilet building and a spinn-off effect on household level. It is difficult to asses if this objective has been achieved, but a similar mosque toilet programme of the Support Rural Water Supply Department Project Dhamar (SRWSD) resulted in the construction of 45 private latrines in Bani Muwallad. The effects in the area of the RIRDP are smaller but certainly existing.
Another important result of the activity is that mosques with good sanitary facilities get a central position in a village or a cluster of villages. This results almost always in improved relations and better understanding between the people of the villages or parts of a village.

2.3. Design criteria.

The sanitary facilities at mosques include toilet rooms, washing places and pits and septic tanks for the treatment and disposal of the wastewater. These systems are discussed extensively in reference 4. For the calculations of the sizes of the pits and septic tanks (see annex A) the following design criteria have been used:

I = ESTIMATED INFILTRATION VELOCITY IN THE SOIL
Sewage in pit: 20 liter/m^2/day.
Effluent from septic tank: 50 liter/m^2/day.

N = INTERVAL BETWEEN DESLUDGING OPERATIONS SEPTIC TANK = 5 years.

N_P = NUMBER OF YEARS OF CONTINUOUS PIT USE = 5 years.

P = NUMBER OF PERSONS USING THE SANITARY FACILITIES = 50 / day

Q = WASTEWATER FLOW PER CAPITA PER DAY
From washing place: 15 liter.
From toilet: 5 liter.

S = SLUDGE ACCUMULATION PER CAPITA PER YEAR = 15 liter.

T_H = HYDRAULIC RETENTION TIME SEPTIC TANK = 5 days.

3 ACTIVITIES

3.1 Toilet rooms.

The standard design includes 3 toilet rooms with internal dimensions of 1.60 * 1.23 meter and a height of 2.00 meter. The walls are made of concrete blocks and are plastered and painted from inside. Each toilet has a window (40*40 cm), a steel door with bolts from in- and outside, a concrete floor with tyles, a ceramic squatting plate and a tap for filling the bucket for flushing and for personal cleansing after using the toilets. The water is supplied from a metal water tank (1.5 m^3) on the toilet roof which is connected to the village water supply system. The roofs of the toilets are made of reinforced concrete. The first projects had roofs of plywood with sheets of corrugated iron on top, but these were not very solid. As the costs of both systems are comparable, a reinforced concrete roof is preferable.
In special cases it is preferable to deviate from the standard design and to construct a different number of toilet rooms.

3.2 Wastewater treatment and disposal.

Two different systems for the treatment and disposal of the wastewater can be distinguished: a pour-flush system (paragraph 3.2.1) and an aqua-privy system (paragraph 3.2.2).

3.2.1 Pour-flush system.

Technical descriptions of this system are given in annex B and D.
The pour-flush toilets have squatting plates with a shallow water seal below which are flushed manually with 2 liter water from a bucket. The water seals, U-shaped pipes filled with 15-25 mm of water, prevent the passage of flies and odours. The wastewater is transported through a pipe to a pit outside the mosque yard. The solid wastes (sludge) settle on the bottom of the pit, where bacteria digest them and the volume is reduced with 70%. The liquids infiltrate through the walls of the pit into the ground. The size of the pit is based upon the volume needed for the storage of sludge and the surface needed for the infiltration of the liquids.
The standard design includes two pits for alternating use for a period of 5 years. At the moment that the first pit is full, the pipe to the second one will be opened. The contents of the first pit have then the time to digest and after 1 year they can be taken out without risk for the health of the labourers or the users of the compost. The system of alternating pit use has been demonstrated and promoted. At the moment the people are very hesitant towards this and the expectation is that the people prefer to dig a new pit instead of emptying the first one.
These pour-flush toilets are preferable above the below described aqua-privy system because the people like the system, it is easy to maintain and it can be copied at private houses.

3.2.2 Aqua-privy system.

See annex C for a technical description of this system.
An aqua-privy system means that the toilets are built on top of a septic tank. This can be either a newly built septic tank or an old cistern modified to a septic tank. The squatting plates in the toilets have vertical drop-pipes, extending some 100 mm below the liquid level in the septic tank, thus forming a water seal.
In the septic tank the solids settle on the bottom where they are digested anaerobically. On the surface of the water, a layer of scum is formed. After a retention time of five days the water is discharged to a soakaway outside the mosque yard. In most cases it is possible to excavate a soakaway, in special cases (rocky underground) it will be necessary to construct a superficial infiltration pit with blocks. See annex C for details.
Although digestion of the settled solids is reasonably effective, some sludge accumulates and the septic tank should be desludged once every 5 years. Also the wastewater from the washing place is brought to the septic tank in order to maintain the water seals below the squatting plates.
This aqua-privy system has been used in the first projects, but it appeared that there are important disadvantages:

- the people don't like to have a tank with wastewater near the mosque;
- maintenance of the water seal, necessary to prevent nuisance of mosquitos and smells, is difficult because a low inflow or a leak in the tank causes the water level to fall;
- the system is difficult to apply at individual houses and will not have any spin-off effect for better private toilets;
- the system is more expensive than the pour-flush system;
- the septic tank should be desludged. This will give problems because in many cases the mosque can not be reached by a vacuum-tanker.

Despite above disadvantages, an aqua-privy system will be the only possible solution in cases where it is not possible to dig pits due to the impermeable rocky underground or lack of space. Another situation in which an aqua-privy system should be preferred is when the distance between the mosque and the place of the pits is more than 40 meters. In these cases the risks of blockage of the sewers are rather big because the amount of water used for flushing is low. The aqua-privy tank is then necessary to catch the troublesome solids in order to avoid blockage of the sewers.

3.3 Washing place.

The design always includes a washing place for hands, feet and faces. This means a row of 6-14 taps attached to the wall with a gutter for the collection of the wastewater below it. A row of 'standing' concrete blocks in front of the taps is used for sitting. When the toilets have a pour-flush system the wastewater of the washing place is in general disposed in a draingarden with trees. In situations with an aqua-privy system, the wastewater of the washing place is brought to the septic tank in order to maintain the waterseal under the squatting plates.

In the first projects a feet wash basin was constructed for washing feet after leaving the 'dirty' part of the mosque yard with toilets and washing place. The idea was based upon examples of sanitary facilities at mosques in Saudi Arabia. In Yemen these feet washing basins don't function well because the stagnant water is always dirty due to dust blown in by the wind and the lack of maintenance. Moreover the people prefer to clean their feet with streaming water of the washing place.

3.4 General improvements.

The experience is that the facilities are better maintained and much more appreciated when the toilets are a part of a general upgrading of the mosque yard. This means a good wall around the yard and a slab of mass concrete on the surface. The costs of these improvements are approximately YR 10,000 and the rule is that the possibilities for upgrading are limited so that the total costs of a project are at most YR 75,000. In situations with big mosques it is necessary to deviate from this rule.

4. IMPLEMENTATION PROCEDURES

4.1 Selection of villages.

The implementation starts with a request from the representative of the village to the RIRDP. After approval by the General Manager of the RIRDP and the Head of the Engineering Section the requests are put on a special list for mosque sanitary facilities. Once a year this list is used for the selection of villages based upon the following criteria:

1. The availability of a reliable watersupply scheme (RIRDP or private) is an absolute requirement for implementation;
2. The location of the village. Villages in the areas around Al Bayda and Juban have first priority while villages less than 10 kilometers from Rada' have low priority;
3. Need for the facilities. Big mosques with a centre function have priority. Villages which have already improved facilities at a mosque nearby are excluded;
4. Villages which are cooperative and willing to pay the contribution get priority;

The selected villages receive a letter of intent with a request to pay YR 15,000 as contribution for the new facilities (see annex F). After receiving the contribution, the Section Finance/Administration informs the Engineering Section in writing and the survey can be carried out by the Subsection Sanitation.

4.2 Survey.

The survey is carried out in consultation with the village representative. The procedure is as follows:

1. General inspection of the existing situation.
2. Investigation of the water supply system of the mosque.
3. Selection of the place for the soakaway pits. This is in general the most difficult step. Points of attention are:
   - the nature of the underground;
   - the distance to the mosque: for pour-flush toilets the pits should be preferably not more than 15 meters away;
   - the distance to watersources, houses, etc;
   - the ownership of the land. In many cases the mosque has its own land, while in other places the landowner is willing to give up land for the mosque;
   - the need for lining of the pits (in cases with loose sand).

   All possible sites for soakaway pits should be visited. This has also the purpose to reveal problems about ownership of the land.
4. Selection of system. An aqua-privy system is only advisable in case:
   - the excavation of soakaway pits within a distance 40 meters from the mosque is impossible;
   - an old cistern can be changed into a septic tank;

   An absolute condition for an aqua-privy system is that the tank can be reached by a vacuum tanker for desludging.
5. Tentative selection of the location of the toilets and the washing place. The following points are important:
   - ask the people which place they have in mind;
   - a location close to the pits is preferable;

- places north of the mosque (direction of Mecca) and directly connected to the mosque should be avoided;
- looking in from neighbouring houses should be prevented;
- the entrance door to the mosque yard should be close to the facilities so that the people can clean themselves before entering the clean part of the yard;
- corners where dust can accumulate should be avoided as much as possible.

6. Measuring the existing situation with the location of the mosque, the existing facilities and the yard wall. The walls of the mosque could be taken as reference lines. In cases of limited available space it is good to measure the maximum area which can be used. The levels of the yard and the amount of backfill should be determined.
7. Measuring the distance to the soakaway pits and the watersupply system.
8. Examine which items are available (blocks, watertank etc.).

Annex I gives an example of the information collected during the survey.

4.3 Design and tendering.

The designs are standardised and it is only necessary to make a ground plan (drawing 1) of which examples are given in annex J. Standard drawings, technical specifications, bill of quantities and cost estimates for the different systems are given in the annexes B, C and D. These should be adapted to the situation.
The completed design with technical specifications and bill of quantities (no cost estimate!) should be translated. After this the tender procedure can start. The Head of the Engineering Section requests approval of the General Manager for tendering. After approval, the tender is announced and the contractors can collect the tender documents at a charge from the Head of Section Finance/Administration. The tender period is in general three weeks after which the envelopes are opened and the bids analysed. The contractor with a reasonable price and some experience is preferable. After approval of the tender analysis, the contract (see annex E) is signed.
The tender procedure is comparable with the procedure for watersupply schemes and more information is available in reference 3.

4.4 Construction.

The construction can start after signing of the contract and a visit to the site together with the contractor. During this visit special attention should be given to the levels of the toilet foundation and the yard and the locations of the walls.
The sequence of the payments is in general as follows:
- first payment (30%) after pouring the concrete for the foundation of the toilets;
- second payment (30%) after pouring the concrete of the roof of the toilets;
- third payment (30%) after completion of the job. This payment should only be given when everything has been completed.

- bank guarantee (10%) three months after completion of the works. After completion of the works the maintenance period starts during which the contractor is responsible for shortcomings. After 3 months the works are inspected again and when everything is in good condition, the bank guarantee can be released.

The contractors often want to have the third payment before the job is completed and try to leave the last small items of the contract for the visit for the release of the bank guarantee. Accepting this gives a lot of extra work because the bank guarantee is not big enough to push the contractors to execute the last small items and can lead to big problems.

During the construction the following points need special attention:
- the foundation of the toilets;
- the position of the water seals below the squatting plates of the pour-flush toilets;
- rainwater from the mosque yard should not be discharged to the pits;
- the construction of the pipes from the toilets to the pits;
- the covers of the pits;
- the quality of the taps;
- the plastering of the manholes;
- in case of aqua-privy system: levels of the pipes for maintaining the waterseals and the flyscreens on the ventilation pipes.

4.5 Time schedule.

After receiving the village contribution the schedule is as follows:

- survey:	1 day
- design, technical description, cost estimate:	1 day
- translation into arabic:	3 days
- tender procedure:	4 weeks
- signing contract:	2 weeks
- first payment (after pouring concrete foundation):	1 week
- second payment (after pouring concrete roof):	3 weeks
- third payment (after completion of the work):	5 weeks
	4 months = total = 16 weeks

- release bank guarantee: 3 months after third payment.

So, the implementation time from survey to completion is on average 4 months.

4.6 Costs.

The average costs of a project with 3 pour-flush toilets and a washing place with 10 taps are YR 75,000. The costs of a comparable project with 3 toilets and an aqua-privy system are YR 83,000. See annex K for details.
The contribution is standard YR 15,000 what means 20% of the construction costs.
The possibilities for extra toilets and walls are limited and the costs of a project should not be more than YR 75,000.

5. MAINTENANCE

Untill now there are no big problems with the maintenance of the facilities. A systematic survey has not been carried out, but incidental visits of the completed projects show that the facilities are in general well used and maintained.

The caretaker of the mosque is responsible for the daily cleaning. Big maintenance like excavation of new pits and desludging of septic tanks did not occur yet, but will be the responsibility of the whole village.

Problems with the pour-flush systems are limited to blockage of the waterseals. The reasons are the use of paper for anal cleansing and the fact that the people don't use enough water for flushing. Blockage with stones has not been observed.

The aqua-privy systems have more problems with smell and mosquito nuisance. The main reason is that the waterseals below the squatting plates are not well maintained. Another reason is that the flyscreens on the ventilation pipes of the aqua-privy tank are decayed what means that mosquitos can easily enter and leave the tank.

6. REFERENCES

Ref. 1 ILACO, Rada Integrated Rural Development Project, 1984. Study into water resources in Al Bayda Province.

Ref. 2 ILACO, Rada Integrated Rural Development Project, 1984. Technical Note No. 16. Preliminary design of pilot sanitation projects in Al Bayda Province.

Ref. 3 ILACO, Rada Integrated Rural Development Project, 1986. Technical Note No. 21. Implementation of watersupply schemes in Al Bayda Province by the RIRDP.

Ref. 4 ILACO, Rada Integrated Rural Development Project, 1989. Technical Note No. 25. Alternative solutions for village wastewater disposal - Al Hajar village as case study -.

Technical specification PITS for pour-flush toilets

The pits are designed to provide space for two different functions:

1 Storage of solids:
The volume required for storage of solids is given by:

$$V_s = P * N_p * S \qquad (5)$$

where: V_s = volume required for storage of solids (liter)
P = number of persons = 50
N_p = number of years of continuous pit use (year) = 5
S = sludge accumulation/pc/pyear = 15

2 Liquid infiltration:
The area required for liquid infiltration is given by:

$$A = \frac{P * Q}{I} \text{ meter}^2 \qquad (6)$$

where: A = infiltration area of the pit (m^2)
P = number of persons = 50
Q = wastewater flow (lcd) = 5 (*)
I = infiltration rate ($l/m^2/d$) = 35 (#)

(*) This is less than for the septic tanks (20 lcd) because the pits only receive the wastewater of the toilets. The water of the washing place goes to a garden.
(#) This is less than for the infiltration in a soakaway (50 $l/m^2/d$) because the wastewater from the toilets will contain much suspended materials which will clog the sides of the pit.

This gives:
- a volume for solids storage, V_s: 3750 liter (equation 5)
- an area for infiltration, A: 7.1 m^2 (equation 6)

When two pits (for alternate use) with a diameter of 1.5 meter are constructed each pit should have:
- 2.2 m depth for solids storage (3709 liter);
- 1.5 m depth for liquid infiltration (7.1 m^2),
- 0.5 m depth on the top, which is not useful.

So the two pits should each have a depth of 4.0 m and a diameter of 1.5 meter.

Technical specification SEPTIC TANK SYSTEMS (Aqua-privy)

Septic tanks are designed to provide space for two different functions:

1 Solids retention:

The tank volume required for sedimentation is given by:

$$V_H = P * Q * T_H \qquad (1)$$

where V_H = volume needed for sedimentation (liter)
P = number of persons using the toilets = 50
Q = wastewater flow toilets + washing place = 20 lcd
T_H = hydraulic retention time = 5 days

2 Storage of solids:

The volume required for storage of solids is based upon the following formula:

$$V_S = P * N * S \qquad (2)$$

where V_S = volume required for storage of solids (liter)
P = number of persons using the toilets = 50
N = years between successive desludging operations = 5
S = sludge accumulation (liter/pc/pyear) = 15

So the total volume of the septic tank can be calculated with the following formula:

$$V = [(Q * T_H) + (N * S)] * P \text{ liter} \qquad (3)$$

This gives:
- a volume for sedimentation, V_H: 5000 liter (equation 1)
- a volume for solids storage, V_S: 3750 liter (equation 2)
- a total volume, V: 8750 liter (equation 3)

So a septic tank with overall internal dimensions of 4.0 m * 1.6 m * 1.8 m (L*W*H) and an effective volume of 8960 liter is suitable, see also the figure in the annex.

Soakaway:

The dimensions of a soakaway pit are based upon the following formula:

$$A = \frac{P * Q}{I} \text{ meter}^2 \qquad (4)$$

where: A = infiltration area of the soakaway (m^2)
P = number of persons = 50
Q = wastewater flow (lcd) = 20
I = infiltration rate ($l/m^2/d$) = 50

The soakaway should have a minimal infiltration area of 20 m^2.
A soakaway with a diameter of 2 m and a depth of 3.5 m, which has an infiltration area of 22 m^2 is good.
As the upper 0.5 m of the soakaway is not suitable for infiltration the soakaway should have a depth of 4 m.

TECHNICAL DESCRIPTION SANITARY FACILITIES FOR THE MOSQUE OF: .....

1 DEMOLISHING

1.1. Demolish existing yard wall as far as has been indicated on drawing 1 with I-I (length ... m).
1.2. Demolish existing toilet facilities.
1.3. Demolish existing washing facilities.

2 TOILET FACILITIES FOR THREE POUR FLUSH TOILETS

foundation

2.1.P. At the place indicated on drawing 1 an excavation has to be made 4.8 m long and 2.4 m wide. The depth should be 0.65 m or according to the instructions of the RIRDP supervisor.
2.2.P. On the bottom of this excavation a reinforced concrete floor has to be made, 4.6 m long, 2.2 m wide and 0.1 m thick. Concrete mixture: 1:1.5:2.5. Reinforcement: single cross net, diameter steel bars 6 mm, c.t.c 15 cm. Cover: 2 cm. Pouring of concrete may not start before approval of the RIRDP supervisor.
2.3.P. On top of this floor slab the foundation has to be built for the walls as indicated on drawing P2. The foundation consists of a double layer (width: 40 cm, height: 20 cm) of cement blocks, solid 40*20*20 cm. Openings should be kept for the 4" diameter cast iron waste pipes as indicated on drawing P2.

small yard wall

2.4.P. At the place indicated on drawing 1, a small wall has to be built with concrete blocks, size 40*20*15 cm, solid. Length of wall 4.4 m, height 1.0 m.
2.5.P. The foundation for this yard wall should consist of a double layer (width 0.40 m, height 0.20 m) of blocks, solid 40*20*20 cm.
2.6.P. The passage between this wall and the toilet rooms should be filled with compacted backfill.

toilet rooms

2.7.P. On top of the foundation the walls have to be built. Outside walls should consist of cement blocks, solid, dimensions 40*20*20 cm. Separation walls may consist of cement blocks, solid, 40*20*15 cm. In the top layers an opening should be kept per toilet room, size 40 * 40 cm, serving as window (ref. drawing P3). The toilet rooms should have the same size (1.23 * 1.60 m, internal) and should have a minimal height of 2.00 m.
2.8.P. In each toilet room a 4" cast iron pipe should be laid to the manholes at the backside of the toilets. To each pipe a cast iron siphon device ('water seal') with a squatting plate should be connected watertightly. Minimum slope of pipes should be 1:40.
2.9.P. After installation of the pipes compacted backfill has to be put on top of the mass concrete floor slab up to original ground level.
2.10.P. On top of the compacted backfill, mass concrete floor slabs for the toilet rooms and the passage have to be made, thickness: 5 cm. Concrete mixture: 1:3:4. The floors of the toilet rooms should slope towards the squatting hole, the floor of the passage should slope towards the mosque yard.
2.11.P. The floors of the toilet rooms and the passage have to be tyled with regular (non ceramic) tyles, size 20 * 20 cm.
2.12.P. At each toilet room a steel door has to be installed in a framework between the separation walls (ref. drawing P3).

2.13.P. On top of the walls a reinforced concrete roof, 4.4 m long, 2.0 m wide and 0.07 m thick has to be made. Concrete mixture 1:1.5:2.5. Reinforcement should consist of a single cross net, diameter bars 10 mm, c.t.c. 15 cm. Cover should be 2 cm. Concrete should be vibrated properly during and after pouring. The roof should slope slightly, 1 : 100, towards the back side of the building.
2.14.P. The inside of the toilet rooms should be plastered with plaster 1:3.5.
2.15.P. The toilet rooms should be painted inside with white, water resistent paint.
pipes and manholes
2.16.P. At the places indicated on drawing 1, trenches 0.4 m wide and 0.6 m deep have to be dug for the pipes from the toilets to the pits.
2.17.P. At the place of the manholes excavations have to be made. Length: 0.9 m, width: 0.9 m, depth should be 0.4 m or according to the instructions of the supervisor.
2.18.P. The pipes should be glued watertightly into regular connections inside the trench. Minimum slope of pipes 1:40.
2.19.P. At the bottom of the excavations for the manholes, mass concrete floor slabs have to be made, 70 cm long, 70 cm width and 6 cm thick. Mixture mortar: 1:3:4.
2.20.P. On top of the floor slabs the manholes have to be made by means of cement blocks, solid, size: 40*20*15 cm. Openings should be kept for the in- and outlet pipes (ref. drawing 6).
2.21.P. The manhole bottoms, after installing the pipes, have to be smoothly, watertightly plastered as such that undersides of pipes equal topside of plaster. The transition from pipes to plaster should be perfectly smooth.
2.22.P. The manholes should be covered with a concrete slab 70 cm square, 6 cm thick. Concrete mixture: 1:1.5:2.5. In each concrete slab a steel manhole lid should be installed, diameter 30 cm.

3 SOAKAWAY PITS POUR FLUSH TOILETS

3.1.P. At the place indicated by the RIRDP supervisor, two soakaway pits ("bayara") have to be dug, diameter 1.5 m, depth 4.0 m. Minimum distance between the two pits: 2 meter.
3.2.P.1. *(in case of limited traffic)*
Each pit should be covered with a reinforced concrete slab, 2 m square, 15 cm thick. Reinforcement: single cross net of steel bars, diameter 10 mm, c.t.c. 20 cm. Concrete mixture: 1:1.5:2.5.
3.2.P.2. *(in case of no traffic)*
Each pit should be covered with a reinforced concrete slab, 2 m square, 10 cm thick. Reinforcement: single cross net of steel bars, diameter 6 mm, c.t.c. 15 cm. Concrete mixture: 1:1.5:2.5.
3.3.P. In each concrete slab a manhole lid should be installed, diameter 50 cm. This lids should be placed just above the inlet pipes.
3.4.P. The pits should be used alternately by blocking one pipe in the manhole.

4 WASHING FACILITIES
construction
4.1. At the washing place, along the wall (ref. drawing 1), a mass concrete floor has to be made on groundlevel, .. m long, 1.2 m wide and 0.07 m thick (ref. drawing 5). Concrete mixture 1:2:3. This layer should have a minimal slope of 1:250 towards the outlet pipe.

4.2. On top of this mass concrete layer, concrete blocks, solid, size 40*20*20 cm have to be fixed in one line, parallel to the yard wall. As indicated on drawing 5, the blocks should be placed in an alternating 'standing' and 'laying' position. The 'standing' blocks (seats) should be covered with a tyle.
4.3. The inside of the yard wall, over the length of the washing place up to a height of 60 cm; the gutter between the yard wall and the line of blocks; and the line of blocks itself should be plastered with mortar, mixture 1:2.5; thickness of plastering: 1 cm.
4.4. At the lowest part of the washing place, a small pit, diameter 15 cm, depth 5 cm, has to be made, covered with a metal grate. From this pit a PVC pipe, diameter 3" should lead to the garden outside the yard (ref. drawing 1).
watersupply
4.5. A metal water tank should be placed on top of the toilets roof, supported by the outside and separation walls respectively. Minimum volume of tank: 1.5 m^3. The tank should be connected to the village water supply system and provided with an automatically closing valve (a "ball-valve").
4.6. From this tank a galvanized steel pipe, diameter 1.5", should lead to the washing place (ref. drawing 1). To this pipe .. taps have to be connected at a c.t.c. distance of 80 cm.
4.7. From the water tank also a galvanized steel pipe, diameter 0.5", should lead to the toilet rooms in each of which a tap should be installed at a distance of 70 cm from the corner (ref. drawing 3). This pipe should be fixed properly to the toilet walls.
draingarden
4.8. The water of the washing place should be led into an infiltration gutter, 10.0 m long, 0,40 m width and 0.60 m deep. This gutter should be filled with stones with a diameter of 10 cm. Along the gutter trees will be planted by the caretaker of the mosque.

5 YARD

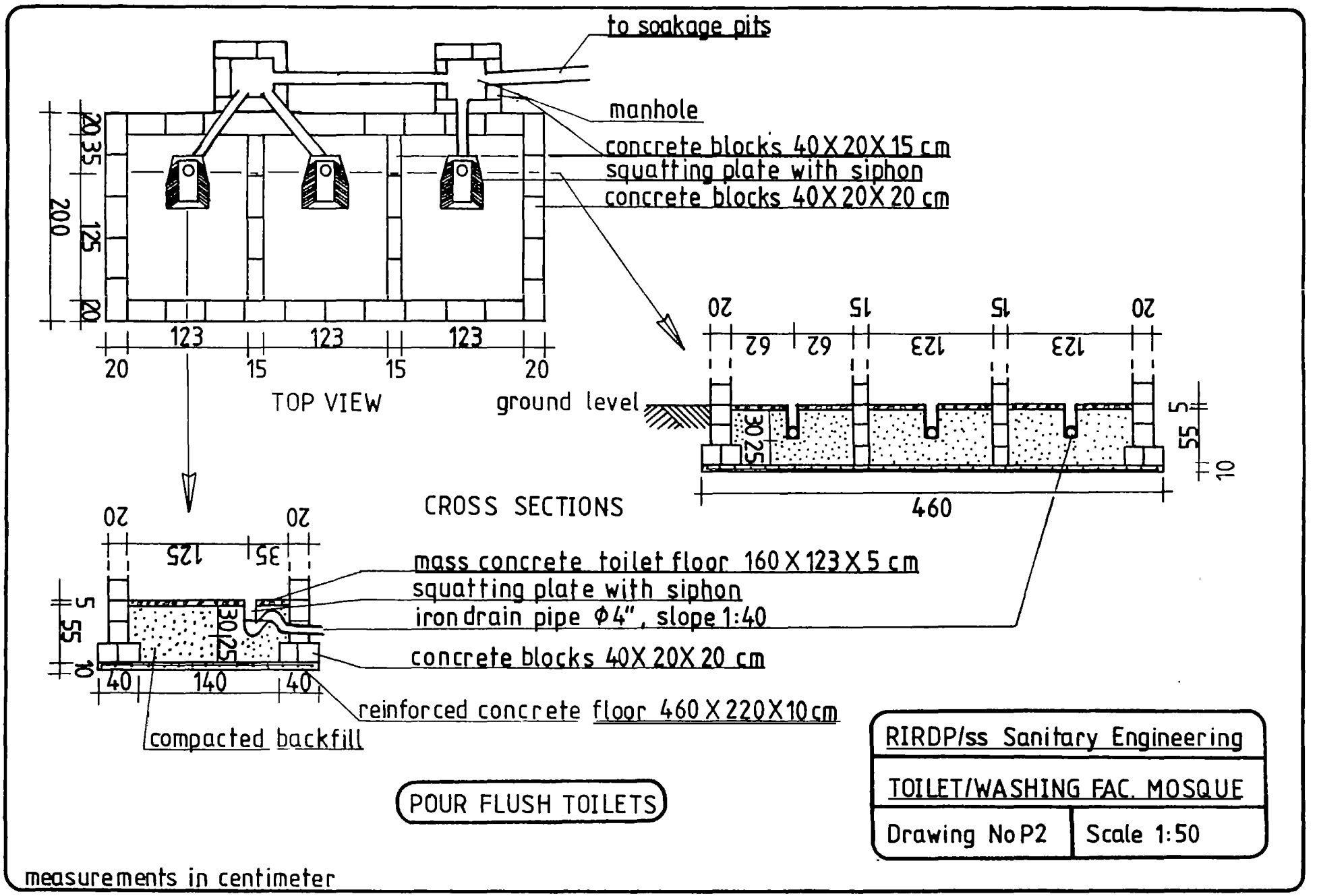
5.1. As indicated on drawing 1, a new yard wall has to be built with solid concrete blocks, size 40*20*20 cm, up to a level of 1.8 m above ground yard level. Total length of wall: ... m.
5.2. The foundation of this yard wall should consist of a double layer (width 0.40 m, height 0.40 m) of cement blocks, solid, 40*20*20 cm.
5.3. At the place indicated on drawing 1, a steel door ((1.00 * 1.80 m) should be fixed in the new yard wall.
5.4. The area created by the new yard wall should be backfilled up to the level of the mosque yard.
5.5. The surface of the yard should be covered with a smooth layer of mass concrete with a minimal thickness of 7 cm. Mixture mortar 1:3:4. The slope of the new floor inside the yard should be constructed so that the rainwater flows away from the washing place. In the yard wall an outlet for this rainwater should be made.
5.6. At the place indicated on drawing 1, steps should be made to connect the levels of the existing yard and the place with the sanitary facilities.
5.7. Apart from the inner toilet walls the following walls should also be plastered with plaster 1:3.5:

BILL OF QUANTITIES FOR THE MOSQUE OF: .....

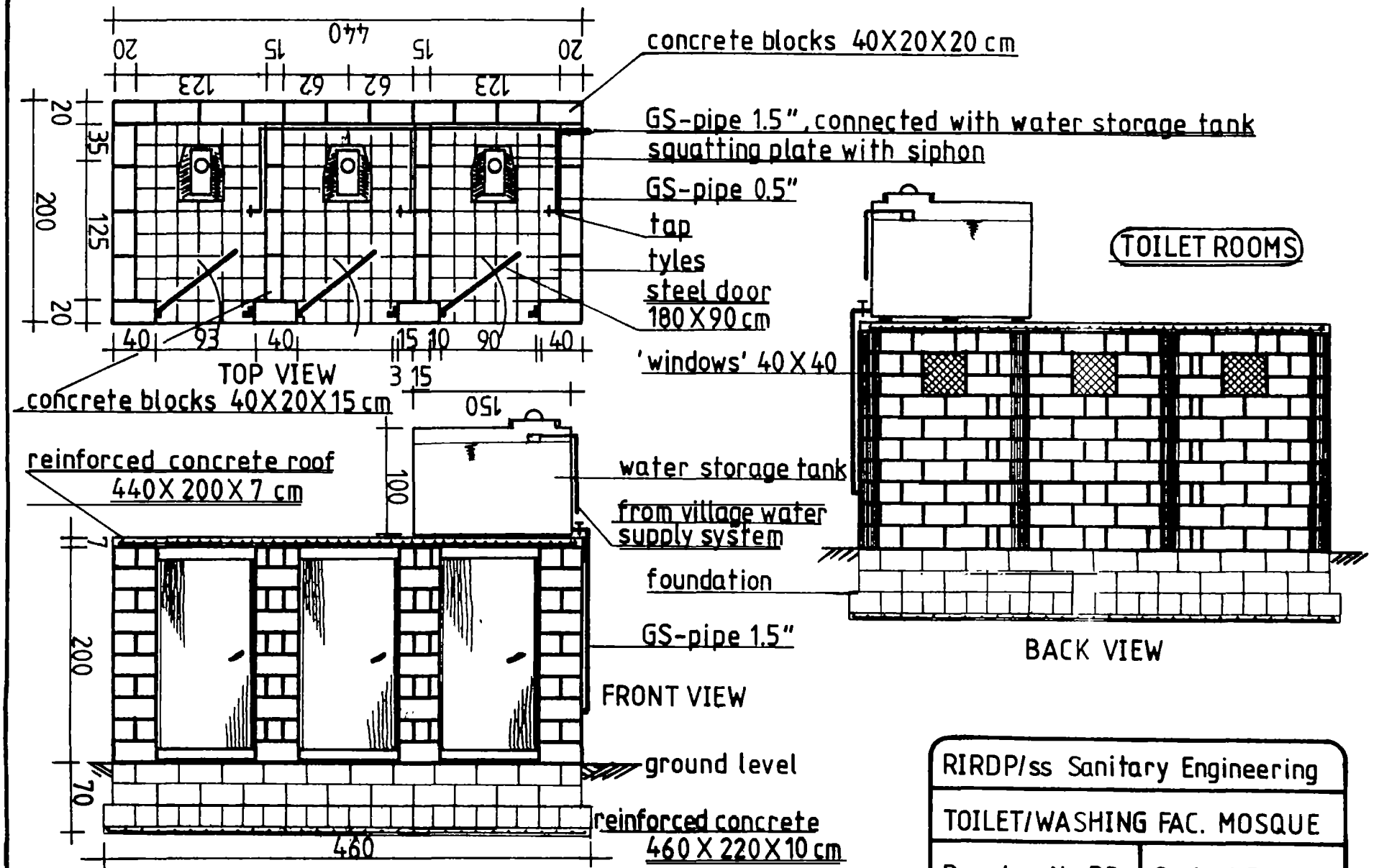
L = length of PVC pipes (meter) A = area of the yard (m2)
M = number of manholes W = length of yard wall (meter)
T = number of taps washing place
3 pour flush toilets, 2 pits, washing place.

NR	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST (YR)
1	Mass concrete	m3	0.7 + 0.03 M + 0.07 A	850	
2	Back-fill	m3	4 + yard	70	
3	Brickwork(40*20*20, solid)	m2	28 + 1.8 W + 0.3 T	170	
4	Brickwork(40*20*15, solid)	m2	14 + 1.1 M	150	
5	Foundation yard wall(40 cm high, 40 cm wide)	m'	4.4 + W	150	
6	Plastering(1:2.5,water resistent)	m2	1.8 M + 1.7 T	75	
7	Plastering(1:3.5, not w.r.)	m2	50 + 1.8 W	70	
8	Painting, water resistent	m2	43	30	
9	Floor tyles(20*20 cm)	m2	15	200	
10	Reinforced concrete	m3	2.5	3300	
11	Wooden / steel doors plus frames (size: 1.80*0.90 m)	nr	3	1000	
12	Manhole lids, diameter 50 cm	nr	2	300	
13	Manhole lids, diameter 30 cm	nr	M	200	
14	Flyscreen protected vent pipes (PVC, diameter 6", 3 m')	nr	-	300	
15	Squatting plates with PVC drop pipes(diameter 4",50 cm)"	nr	-	500	
16	Squatting plate with CI siphon	nr	3	700	
17	Taps plus connections, 0.5"	nr	3 + T	60	
18	Metal tank with "ball valve", 1.5m3	nr	1	1500	
19	Metal grate plus pit	nr	1	150	
20	GS pipes, 0.5", 6m'	nr	2 + supply line	130	
21	GS pipes, 1.5", 6m'	nr	0.3 + 0.2 T	350	
22	Galvanized steel T's, bends, etc.		30% of no 20 + 21		
23	PVC pipes, 3", 6m'	nr	1	200	
24	PVC pipes, 4", 6m'	nr	0.17 L	300	
25	PVC T's, bends, etc.		20% of no 23 + 24		
26	Cast iron pipes, 4", 1 m'	nr	3	200	
27	Demolishing old structures		variable	500-2000	
28	Excavation	m3	24 + 0.3 M + 0.3 L	100-1250	
					+ _____
	SUB TOTAL				
	Unforseen and transport	%	variable (5-20%).		
					+ _____
	GRAND TOTAL				

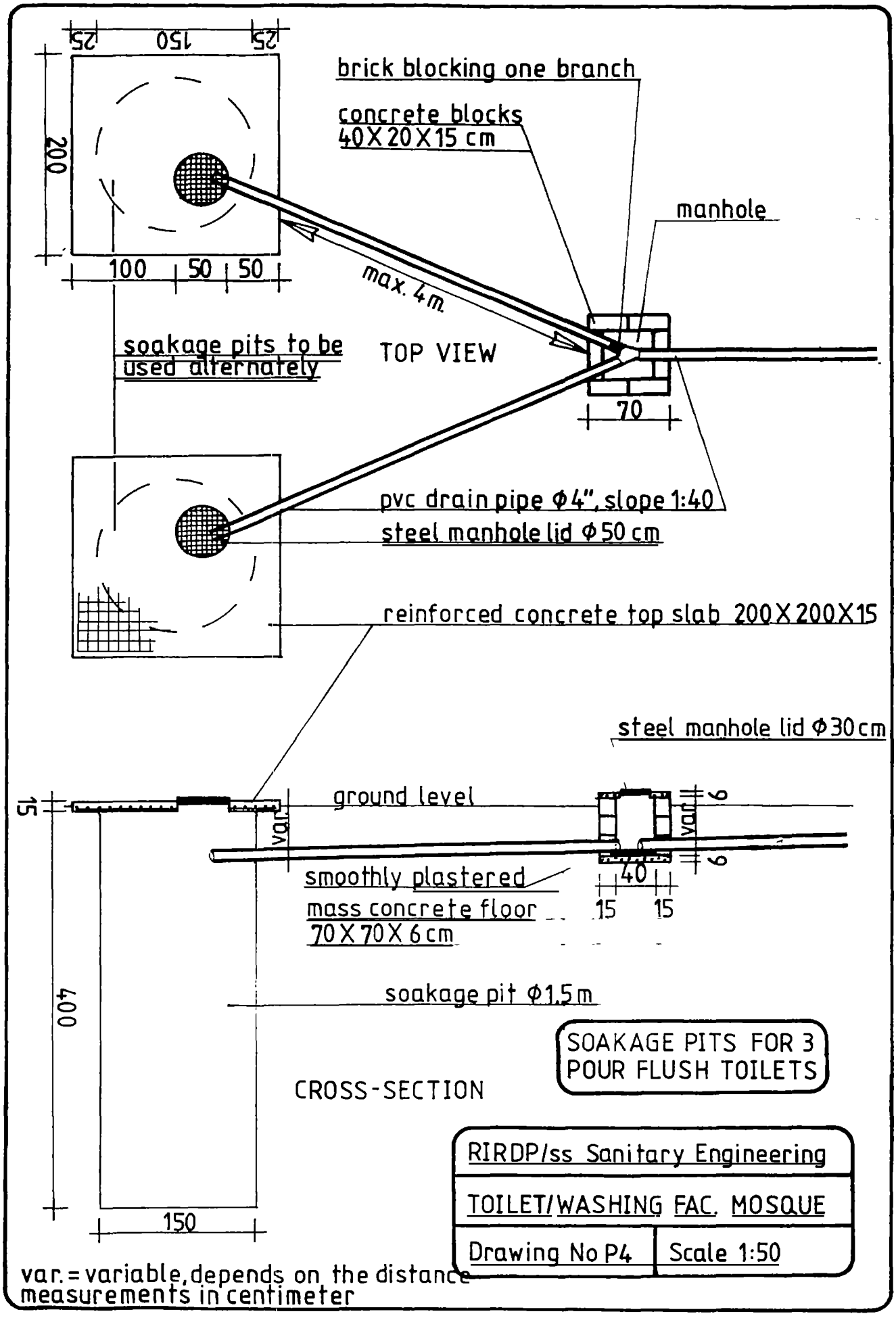
PRICE LEVEL:
April 1990

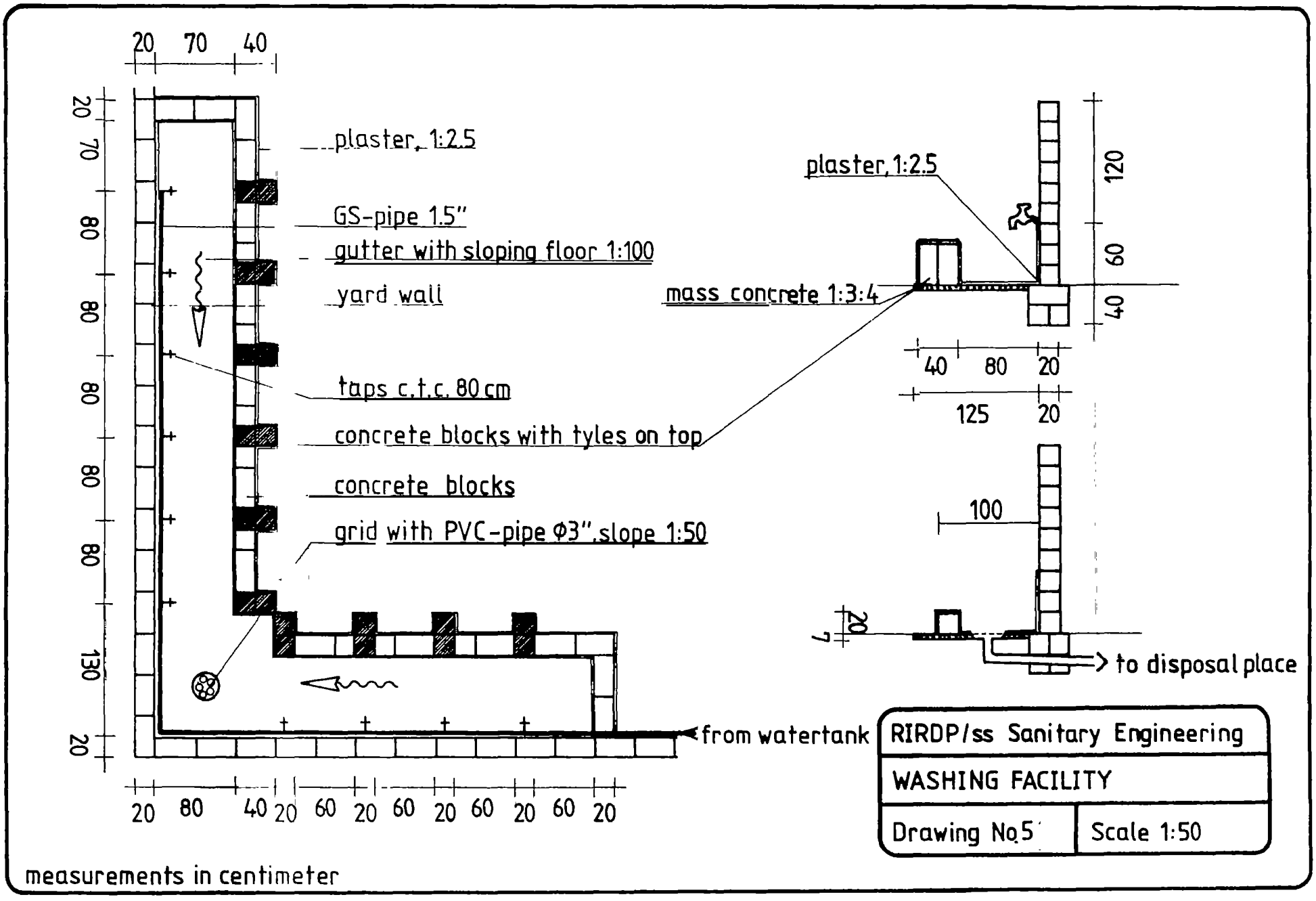

to soakage pits
manhole
concrete blocks 40X20X15 cm
squatting plate with siphon
concrete blocks 40X20X20 cm
200
20
35
125
20
123
123
123
20
15
15
20
TOP VIEW
ground level
CROSS SECTIONS
20
15
15
20
62
62
123
123
30
25
5
55
10
460
20
20
125
35
mass concrete toilet floor 160X123X5 cm
squatting plate with siphon
iron drain pipe Φ4", slope 1:40
concrete blocks 40X20X20 cm
reinforced concrete floor 460X220X10cm
compacted backfill
40
140
40
POUR FLUSH TOILETS
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No P2
Scale 1:50
measurements in centimeter

Annex B


concrete blocks 40X20X20 cm
GS-pipe 1.5", connected with water storage tank
squatting plate with siphon
GS-pipe 0.5"
tap
tyles
steel door
180X90 cm
'windows' 40X40
TOP VIEW
concrete blocks 40X20X15 cm
reinforced concrete roof
440X200X7 cm
water storage tank
from village water
supply system
foundation
GS-pipe 1.5"
FRONT VIEW
ground level
reinforced concrete
460X220X10 cm
TOILET ROOMS
BACK VIEW
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No P3
Scale 1:50
measurements in centimeter

Annex B

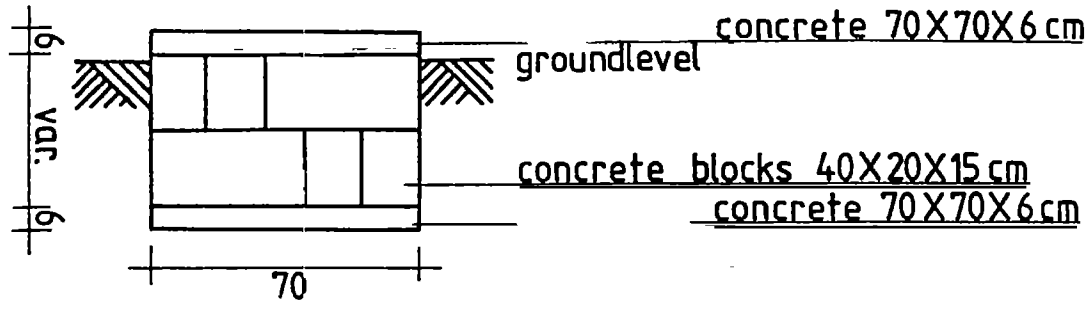

25
150
25
200
100
50
50
brick blocking one branch
concrete blocks
40X20X15 cm
manhole
max. 4m
soakage pits to be
used alternately
TOP VIEW
70
pvc drain pipe Φ4", slope 1:40
steel manhole lid Φ50 cm
reinforced concrete top slab 200X200X15
steel manhole lid Φ30 cm
15
var.
ground level
var.
6
6
smoothly plastered
mass concrete floor
70X70X6 cm
40
15
15
soakage pit Φ1.5 m
400
150
SOAKAGE PITS FOR 3
POUR FLUSH TOILETS
CROSS-SECTION
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No P4
Scale 1:50
var. = variable, depends on the distance
measurements in centimeter

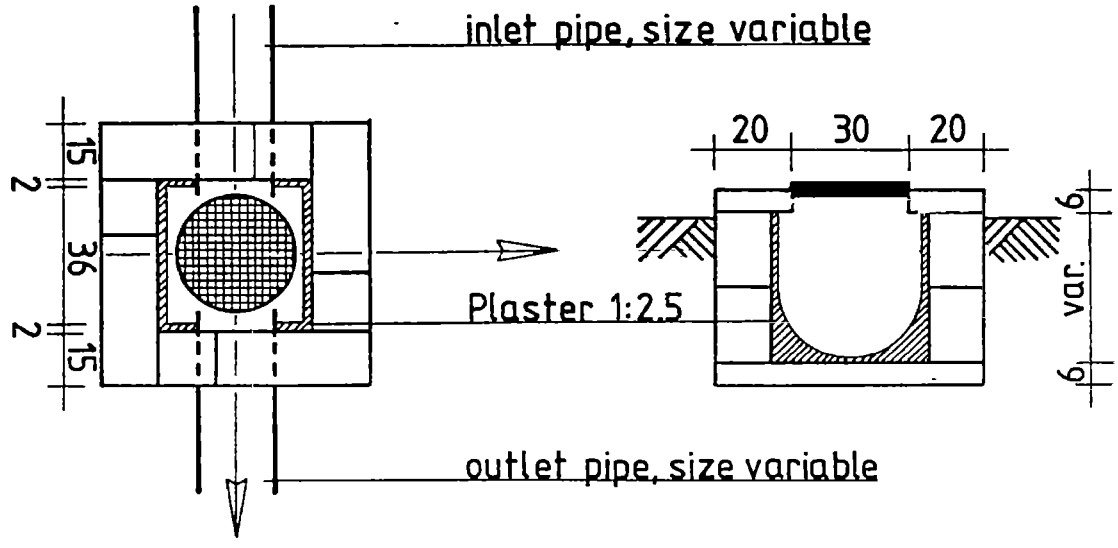


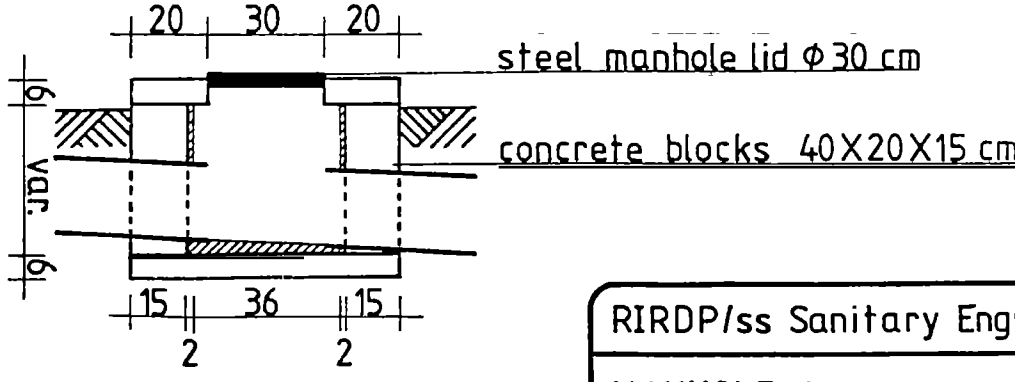
RIRDP/ss Sanitary Engineering	
WASHING FACILITY	
Drawing No.5	Scale 1:50

measurements in centimeter

Annex B







RIRDP/ss Sanitary Engineering	
MANHOLE 1	
Drawing No 6	Scale 1:20

var. = variable

measurements in centimeter

TECHNICAL DESCRIPTION SANITARY FACILITIES FOR THE MOSQUE OF: .....

1 DEMOLISHING

1.1. Demolish existing yard wall as far as has been indicated on drawing 1 with I-I (length ... m).
1.2. Demolish existing toilet facilities.
1.3. Demolish existing washing facilities.

2. AQUA PRIVY (SEPTIC TANK) SYSTEMS (3 possibilities).

2.I Septic tank with blocks.
2.1.SB. At the place indicated on drawing 1 an excavation has to be made, 5.1 m long, 2.7 m wide and 2.0 m deep.
2.2.SB. A reinforced concrete floor slab for the septic tank has to be made 4.9 m long, 2.5 m wide and 10 cm thick. Concrete mixture: 1:1.5:2.5. Reinforcement should consist of a single cross net, diameter steel bars 10 mm, c.t.c. 15 cm. Cover should be 2 cm. Concrete should be vibrated properly during and after pouring. Pouring of concrete may not start before approval of the RIRDP supervisor.
2.3.SB. On top of this floor slab, along the 4 edges, 1.8 m heigh walls have to be put up. These walls should be made with concrete blocks, size 40*20*20 cm, solid. The quality is subject to the approval of the RIRDP supervisor.
2.4.SB. At the place indicated on drawing S.2.1/S.2.2, a PVC pipe, diameter 3", has to be installed at a height of 1.40 m above floor slab level, serving as outlet.
2.5.SB. At the place indicated on drawing S.2.1/S.2.2, a PVC pipe, diameter 3", has to be installed at a height of 1.50 m above floor slab level, serving as inlet from the washing place.
2.6.SB. Onto the inlet and outlet pipes, inside the tank, T-connections should be fixed with 20 cm straight pipes pointing up and 40 cm straight pipes pointing down.
2.7.SB. The walls of the septic tank should be plastered from inside with cement mortar. Mixture: 1:2.5. Minimal thickness 1.5 cm.

2.II. Reinforced concrete septic tank.
2.1.SR. At the place indicated on drawing 1 an excavation has to be made, 5.1 m long, 2.7 m wide and .... m deep.
2.2.SR. A reinforced concrete floor slab for the septic tank has to be made 4.9 m long, 2.5 m wide and 10 cm thick. Concrete mixture: 1:1.5:2.5. Reinforcement should consist of a single cross net, diameter steel bars 10 mm, c.t.c. 15 cm. Cover should be 2 cm. Simultaneous with the floor slab, the first 20 centimeter of the walls (see 2.3.SR) has to be made. The reinforcement of the floor should be extended to a height of 50 cm into the walls. Concrete should be vibrated properly during and after pouring. Pouring of concrete may not start before approval of the RIRDP supervisor.
2.3.SR. On top of this floor slab, along the 4 edges, 1.8 m heigh walls have to be put up. These walls should be made of reinforced concrete, 12 cm thick. Concrete mixture: 1:1.5:2.5. Reinforcement should consist of a single cross net, diameter bars 10 mm, c.t.c. 10 cm. Cover should be 2 cm from the outside. Reinforcement should be bended at the corners of the wall over a length of minimum 30 cm. Pouring of concrete may not start before approval of the RIRDP

supervisor. Concrete should be vibrated properly during and after pouring.
2.4.SR: see 2.4 SB.
2.5.SR: see 2.5 SB.
2.6.SR: see 2.6 SB.
2.7.SR: not applicable.

2.III Septic tank in old cistern.
2.1.SC. The proper part of the existing old cistern has to be made watertight: all gaps and cracks should properly be filled with mortar, mixture: 1:2.5.
2.2.SC. At the place indicated on drawing 1 with "d-d", a brickwork wall has to be built with concrete blocks, size 40*20*20, solid, up to the top level of the cistern wall. This wall has to be connected properly to the existing cistern wall.
2.3.SC. At the place indicated on drawing 1 with "a", a hole should be made through the existing cistern wall at a height of 0.40 m below top level in order to let through a PVC pipe, diameter 3", serving as outlet.
2.4.SC. At the place indicated on drawing 1 with "b", a hole should be made through the existing cistern wall at a height of 0.30 m below top level in order to let through a PVC pipe, diameter 3", serving as inlet from the washing place.
2.5.SC. The pipes mentioned under 2.3.SC and 2.4.SC should be cemented in watertightly in the cistern wall. Onto these pipes, inside the tank, T-connections should be fixed with 20 cm straight pipes pointing up and 50 cm straight pipes pointing down.
2.6.SC. The walls of the septic tank should be plastered from inside with cement mortar. Mixture: 1:2.5. Minimal thickness 1.5 cm.
2.7.SC. As indicated on drawing 1, the part of the old cistern that will not be used as septic tank should be backfilled and compacted up to the new ground yard level.

General for all septic tank systems.
2.8.S. On top of the walls, a reinforced concrete top slab, dimensions 4.4 * 2.0 * 0.10 m should be made. Mixture of concrete: 1:1.5:2.5. Reinforcement: single cross net, diameter steel bars 10 mm, c.t.c. 10 cm. Cover: 2.5 cm. Pouring of concrete may not start before approval of the RIRDP supervisor. Concrete should be vibrated properly during and after pouring.
2.9.S. In the reinforced concrete top slab openings should be kept for 3 PVC drop pipes, diameter 4", 50 cm long (ref. drawing S.2.1/S.2.2). This drop pipes should be fixed properly to the reinforcing cross net.
2.10.S. In the reinforced concrete top slab 2 openings should be kept for the PVC vent pipes, diameter 6", 3.0 m long. This vent pipes should be fixed to the reinforcing cross net. The vent pipes should be covered with a flyscreen (2 mm meshes) and should be painted black.
2.11.S. In the reinforced concrete top slab an opening should be kept for a manhole lid, diameter 50 cm, placed above the outlet pipe.
2.12.S. In the reinforced concrete top slab an opening should be kept for a manhole lid, diameter 30 cm, placed above the inlet pipe.
small yard wall
2.13.S. At the place indicated on drawing 1, a small wall has to be built with concrete blocks, size 40*20*15 cm, solid. Length of wall 4.4 m, height 1 m.

2.14.S. The foundation for this yard wall should consist of a double layer (width 0.40 m, height 0.20 m) of blocks, solid 40*20*20 cm.
2.15.S. The passage between this wall and the toilet rooms should be filled with compacted backfill.
toilet rooms
2.16.S. On top of the reinforced concrete top slab the walls of the toilet rooms have to be built. Outside walls should consist of cement blocks, solid, dimensions 40*20*20 cm. Separation wallls may consist of cement blocks, solid, 40*20*15 cm. In the top layers an opening should be kept per toilet room, size 40 * 40 cm, serving as window (ref. drawing S3). The toilet rooms should have the same size (1.23 * 1.60 m, internal) and should have a minimal height of 2.00 m.
2.17.S. On top of the drop pipes mentioned under 2.9, squatting plates have to be installed.
2.18.S. The floors of the toilet rooms should slope towards the squatting hole and have to be tyled with regular (non ceramic) tyles, size 20 * 20 cm.
2.19.S. The floor of the passage should also be tyled and should slope towards the mosque yard.
2.20.S. At each toilet room a steel door has to be installed in a framework between the separation walls (ref. drawing S3).
2.21.S. On top of the walls a reinforced concrete roof, 4.4 m long, 2.0 m wide and 0.07 m thick has to be made. Concrete mixture: 1:1.5:2.5. Reinforcement should consist of a single cross net, diameter bars 10 mm, c.t.c. 15 cm. Cover should be 2 cm. Concrete should be vibrated properly during and after pouring. The roof should slope slightly, 1:100, towards the back side of the building.
2.22.S. The inside of the toilet rooms should be plastered with plaster 1:3.5.
2.23.S. The toilet rooms should be painted inside with white, water resistant paint.
2.24.S. Before putting the system into use, the septic tank has to be filled with clean water.

3 SOAKAWAY PITS (2 possibilities).

3.1 Soakaway in the ground.
3.1.S. At the place indicated by the RIRDP supervisor, a soakaway pit has to be dug, diameter 2.0 m, depth 4 m. See also drawing S.4.1.
3.2.S. The pit should be covered with a reinforced concrete slab, 3 m square and 0.15 m thick. Reinforcement: single cross net of steel bars, diameter 10 mm, c.t.c. 10 cm. Concrete mixture: 1:1.5:2.5.
3.3.S. The outlet PVC pipe from the septic tank should be connected to the pit at least 50 cm below ground level and a minimum slope of 1:100.
3.4.S. In the concrete top slab of the pit, a manhole lid should be installed, diameter 50 cm. This manhole lid should be placed just above the pipe from the septic tank.
3.5.S. Around the manhole lid, a protection against rainwater inflow, 90 cm square, 10 cm high should be made of small concrete blocks (ref. drawing S.4.1).

3.II Soakaway pit of blocks.

3.1.SP. At the place indicated by the RIRDP supervisor an excavation, 4.8 m long, 2.8 m wide and ... m deep has to be made.

3.2.SP. On top of the bottom of this excavation, walls (6 layers) have to be put up with concrete blocks, size 40*20*20 cm, solid. Between the blocks 10 cm wide openings should be kept. The top layer should be made without openings (ref. drawing S.4.2).

3.3.SP. The space between the walls and the ground should be backfilled with small stones with a diameter between 5 and 10 cm.

3.4.SP. According to the instructions of the supervisor, the lowest side of the pit should be mounded up to the level of the concrete top slab. At the top, the layer of soil should have a minimum thickness of 50 cm and the slope of the new soil surface should be at most 1:3.

3.5.SP. The pit should be covered with a reinforced concrete slab, 4.2 m long, 2.2 m wide and 0.10 m thick. Reinforcement: single cross net of steel bars, diameter 10 mm, c.t.c. 20 cm. Concrete mixture: 1:1.5:2.5.

3.6.SP. The outlet GS pipe from the septic tank should be connected to the pit with a minimum slope of 1:100.

3.7.SP. In the concrete top slab of the pit, a manhole lid should be installed, diameter 50 cm. This manhole lid should be placed just above the pipe from the septic tank.

3.8.SP. Around the manhole lid, a protection against rainwater inflow, 90 cm square, 10 cm high should be made of small concrete blocks (ref. drawing S.4.2).

4 & 5 WASHING FACILITIES + YARD: see annex B, pour-flush toilets.

BILL OF QUANTITIES FOR THE MOSQUE OF: .....

L = length of PVC pipes (meter) A = area of the yard (m2)
T = number of taps washing place W = length of yard wall (meter)

Septic tank (blocks), soakaway (normal), washing place.

NR	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST (YR)
1	Mass concrete	m3	0.07 A	850	
2	Back-fill	m3	yard	70	
3	Brickwork(40*20*20, solid)	m2	42 + 1.8 W + 0.3 T	170	
4	Brickwork(40*20*15, solid)	m2	11	150	
5	Foundation yard wall(40 cm high, 40 cm wide)	m'	4.4 + W	150	
6	Plastering(1:2.5,water resistent)	m2	22 + 1.7 T	75	
7	Plastering(1:3.5, not w.r.)	m2	50 + 1.8 W	70	
8	Painting, water resistent	m2	43	30	
9	Floor tyles(20*20 cm)	m2	15	200	
10	Reinforced concrete	m3	4.5	3300	
11	Wooden / steel doors plus frames (size: 1.80*0.90 m)	nr	3	1000	
12	Manhole lids, diameter 50 cm	nr	2	300	
13	Manhole lids, diameter 30 cm	nr	1	200	
14	Flyscreen protected vent pipes (PVC, diameter 6", 3 m')	nr	2	300	
15	Squatting plates with PVC drop pipes(diameter 4",50 cm)"	nr	3	500	
16	Squatting plate with CI siphon	nr	-	700	
17	Taps plus connections, 0.5"	nr	3 + T	60	
18	Metal tank with "ball valve", 1.5m3	nr	1	1500	
19	Metal grate plus pit	nr	1	150	
20	GS pipes, 0.5", 6m'	nr	2 + supply line	130	
21	GS pipes, 1.5", 6m'	nr	0.3 + 0.2 T	350	
22	Galvanized steel T's, bends, etc.		30% of no 20 + 21		
23	PVC pipes, 3", 6m'	nr	0.17 L	200	
24	PVC pipes, 4", 6m'	nr	-	300	
25	PVC T's, bends, etc.		20% of no 23 + 24		
26	Cast iron pipes, 4", 1 m'	nr	-	200	
27	Demolishing old structures		variable	500-2000	
28	Excavation	m3	43 + 0.3 L	100-1250	
					+
	SUB TOTAL				
	Unforseen and transport	%	variable (5-20%).		
					+
	GRAND TOTAL				

PRICE LEVEL:
April 1990

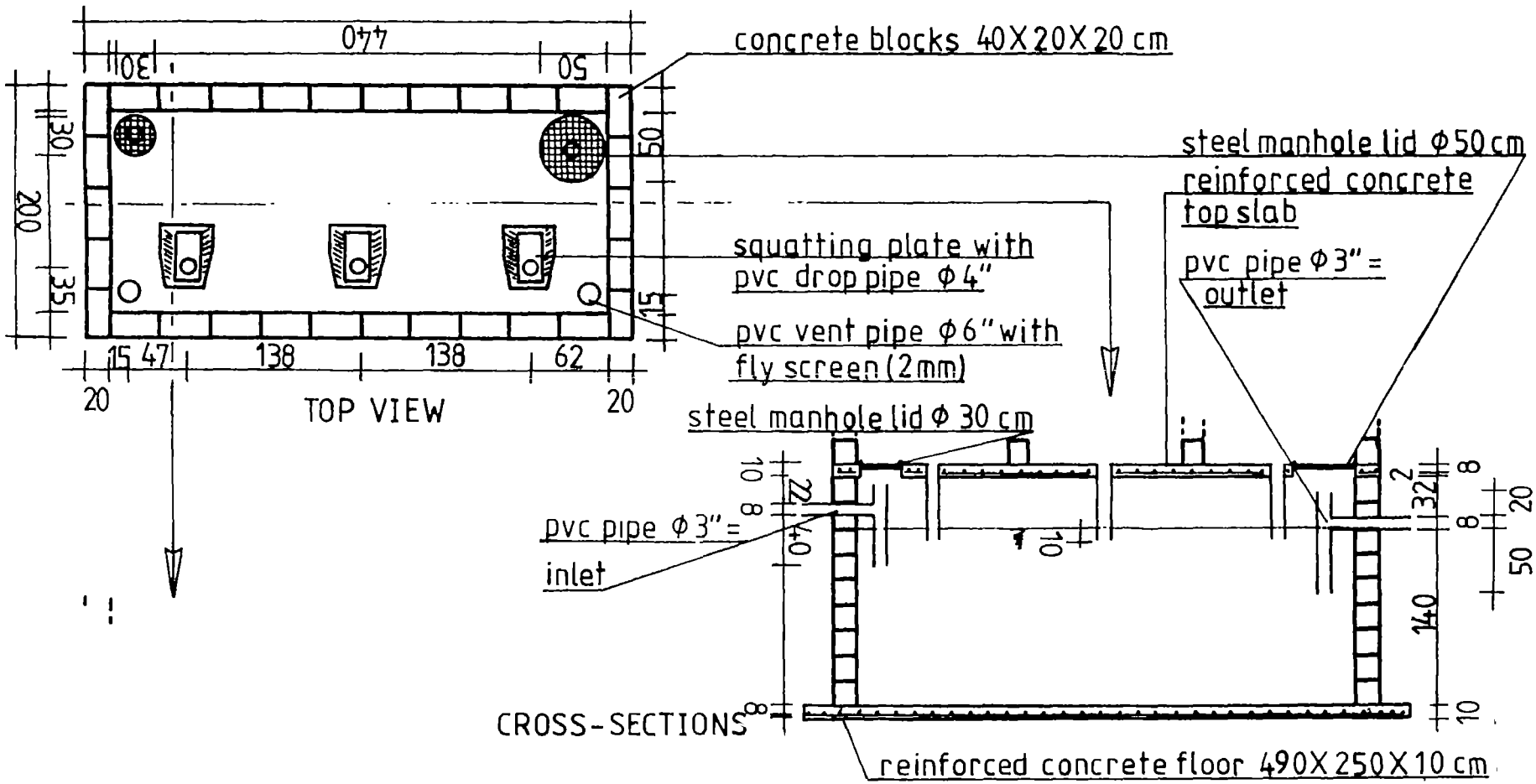
BILL OF QUANTITIES FOR THE MOSQUE OF: .....

L = length of PVC pipes (meter) A = area of the yard (m2)
T = number of taps washing place W = length of yard wall (meter)

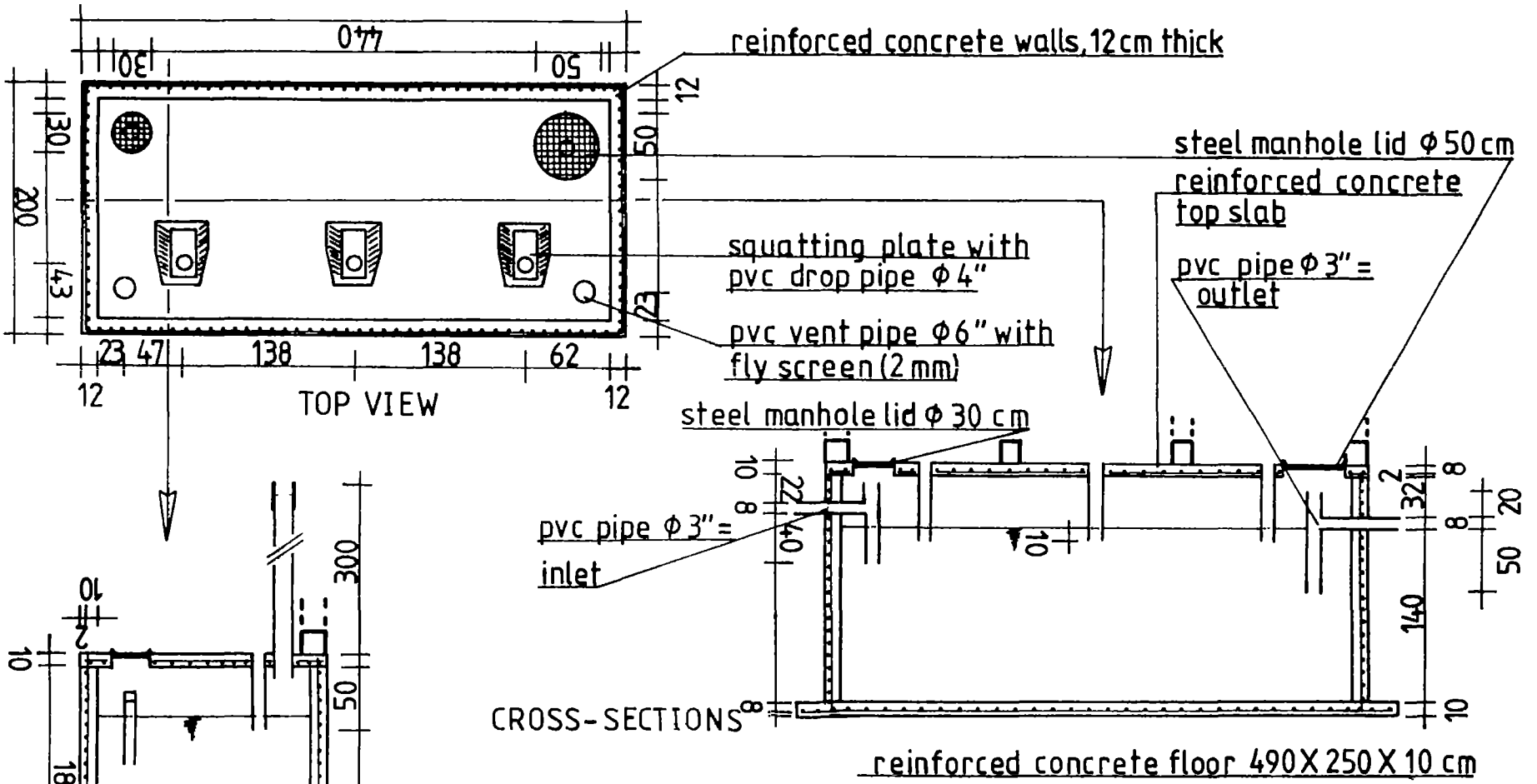
Septic tank (reinforced concrete), soakaway (normal), washing place.

NR	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST (YR)
1	Mass concrete	m3	0.07 A	850	
2	Back-fill	m3	yard	70	
3	Brickwork(40*20*20, solid)	m2	20 + 1.8 W + 0.3 T	170	
4	Brickwork(40*20*15, solid)	m2	11	150	
5	Foundation yard wall(40 cm high, 40 cm wide)	m'	4.4 + W	150	
6	Plastering(1:2.5,water resistent)	m2	1.7 T	75	
7	Plastering(1:3.5, not w.r.)	m2	50 + 1.8 W	70	
8	Painting, water resistent	m2	43	30	
9	Floor tyles(20*20 cm)	m2	15	200	
10	Reinforced concrete	m3	7.0	3300	
11	Wooden / steel doors plus frames (size: 1.80*0.90 m)	nr	3	1000	
12	Manhole lids, diameter 50 cm	nr	2	300	
13	Manhole lids, diameter 30 cm	nr	1	200	
14	Flyscreen protected vent pipes (PVC, diameter 6", 3 m')	nr	2	300	
15	Squatting plates with PVC drop pipes(diameter 4",50 cm)"	nr	3	500	
16	Squatting plate with CI siphon	nr	-	700	
17	Taps plus connections, 0.5"	nr	3 + T	60	
18	Metal tank with "ball valve", 1.5m3	nr	1	1500	
19	Metal grate plus pit	nr	1	150	
20	GS pipes, 0.5", 6m'	nr	2 + supply line	130	
21	GS pipes, 1.5", 6m'	nr	0.3 + 0.2 T	350	
22	Galvanized steel T's, bends, etc.		30% of no 20 + 21		
23	PVC pipes, 3", 6m'	nr	0.17 L	200	
24	PVC pipes, 4", 6m'	nr	-	300	
25	PVC T's, bends, etc.		20% of no 23 + 24		
26	Cast iron pipes, 4", 1 m'	nr	-	200	
27	Demolishing old structures		variable	500-2000	
28	Excavation	m3	22 + 0.3 L	100-1250	
					+
	SUB TOTAL				
	Unforseen and transport	%	variable (5-20%).		
					+
	GRAND TOTAL				

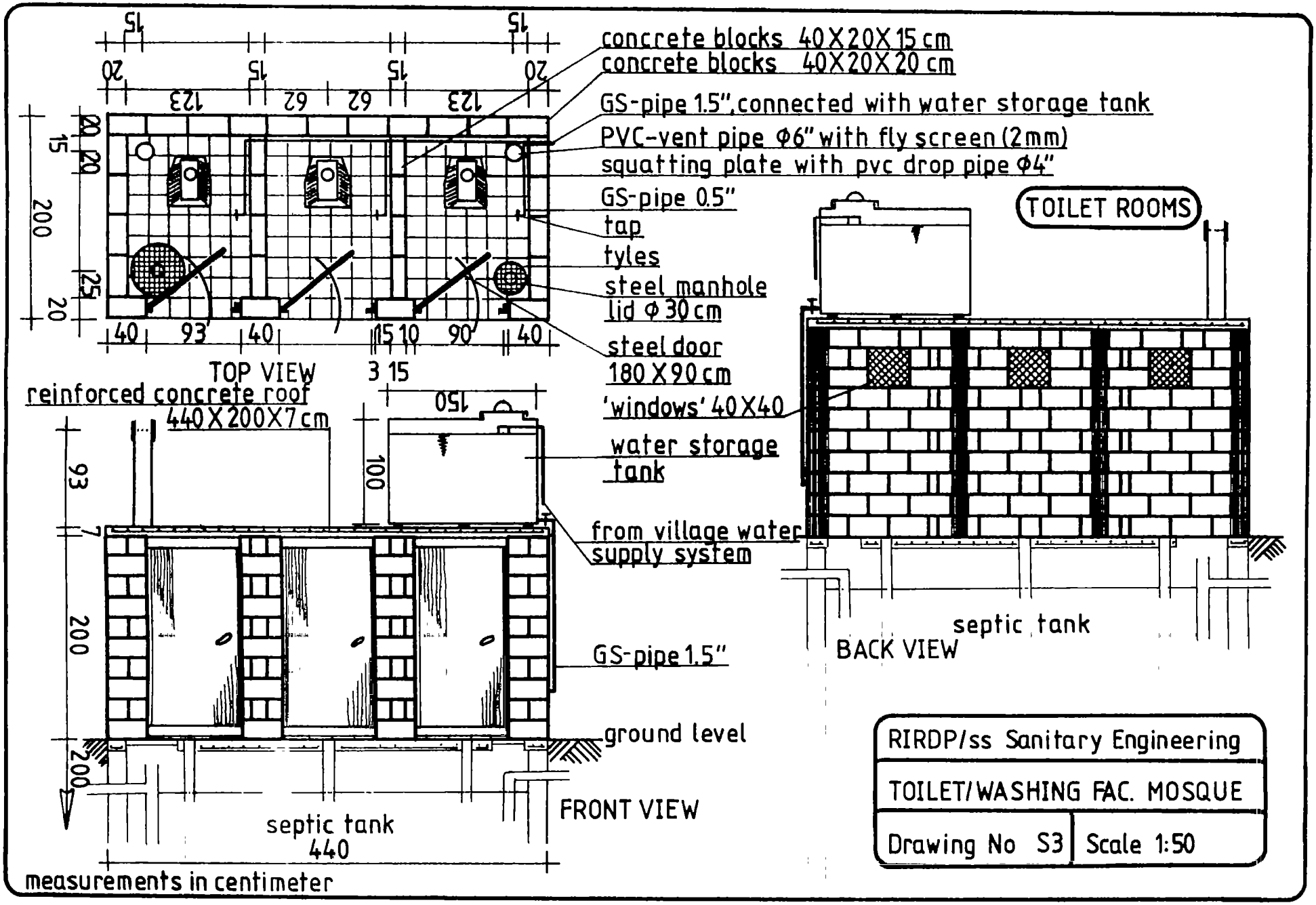
PRICE LEVEL:
April 1990


concrete blocks 40X20X20 cm
steel manhole lid Φ50 cm
reinforced concrete top slab
squatting plate with pvc drop pipe Φ4"
pvc pipe Φ3" = outlet
pvc vent pipe Φ6" with fly screen (2mm)
steel manhole lid Φ 30 cm
pvc pipe Φ3" = inlet
TOP VIEW
CROSS-SECTIONS
reinforced concrete floor 490X250X10 cm
SEPTIC TANK
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No S2.1
Scale 1:50
measurements in centimeter

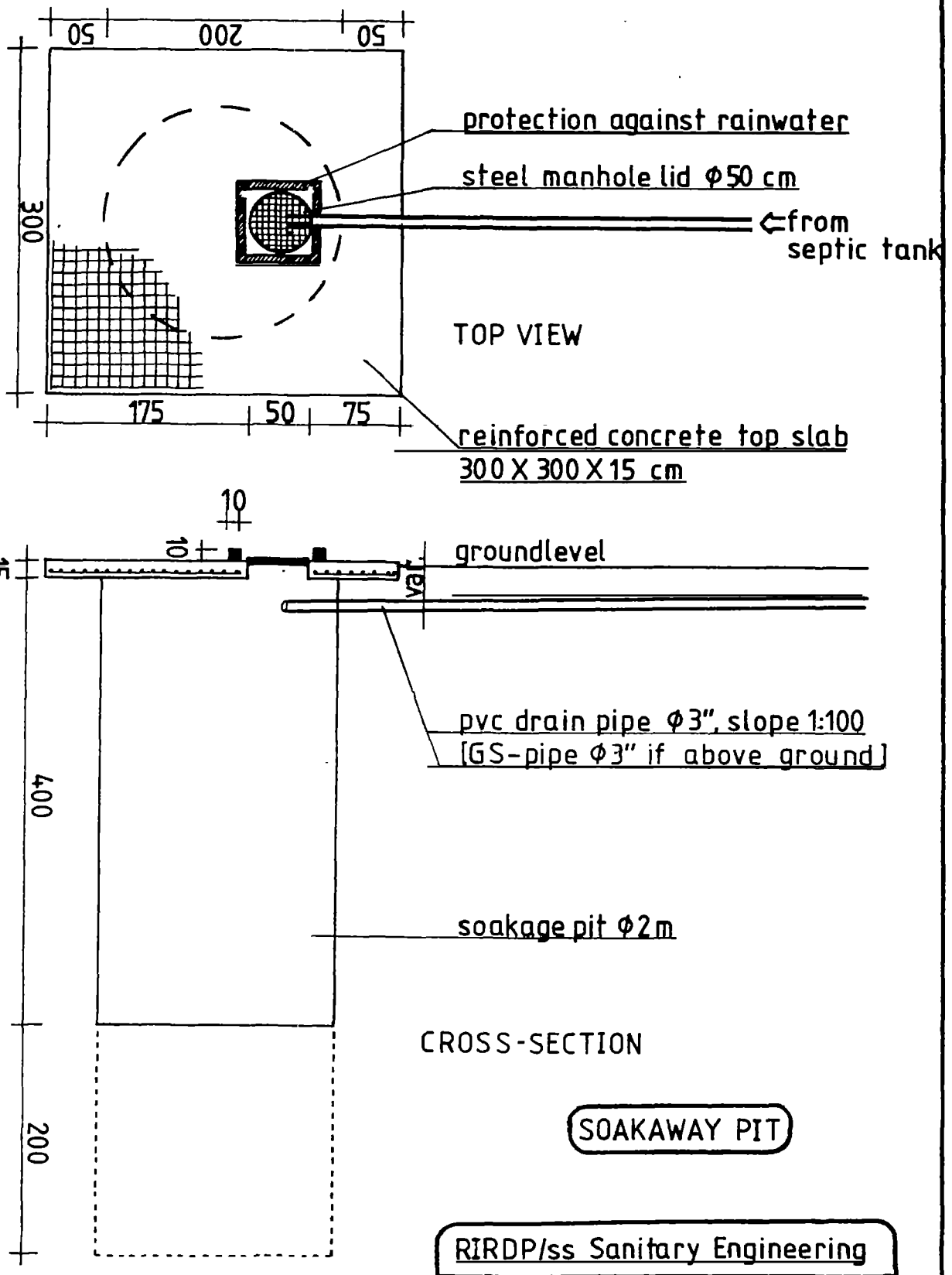
Annex C


reinforced concrete walls, 12 cm thick
steel manhole lid Φ 50 cm
reinforced concrete top slab
squatting plate with pvc drop pipe Φ 4"
pvc pipe Φ 3" = outlet
pvc vent pipe Φ 6" with fly screen (2 mm)
steel manhole lid Φ 30 cm
pvc pipe Φ 3" = inlet
TOP VIEW
CROSS-SECTIONS
reinforced concrete floor 490 X 250 X 10 cm
CONCRETE SEPTIC TANK
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No S2.2
Scale 1:50
measurements in centimeter

Annex C


concrete blocks 40X20X15 cm
concrete blocks 40X20X20 cm
GS-pipe 1.5", connected with water storage tank
PVC-vent pipe Φ6" with fly screen (2mm)
squatting plate with pvc drop pipe Φ4"
GS-pipe 0.5"
tap
tyles
steel manhole lid Φ 30 cm
steel door 180 X 90 cm
'windows' 40X40
water storage tank
from village water supply system
GS-pipe 1.5"
ground level
TOILET ROOMS
TOP VIEW
reinforced concrete roof 440X200X7 cm
septic tank
BACK VIEW
FRONT VIEW
septic tank 440
measurements in centimeter
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No S3
Scale 1:50

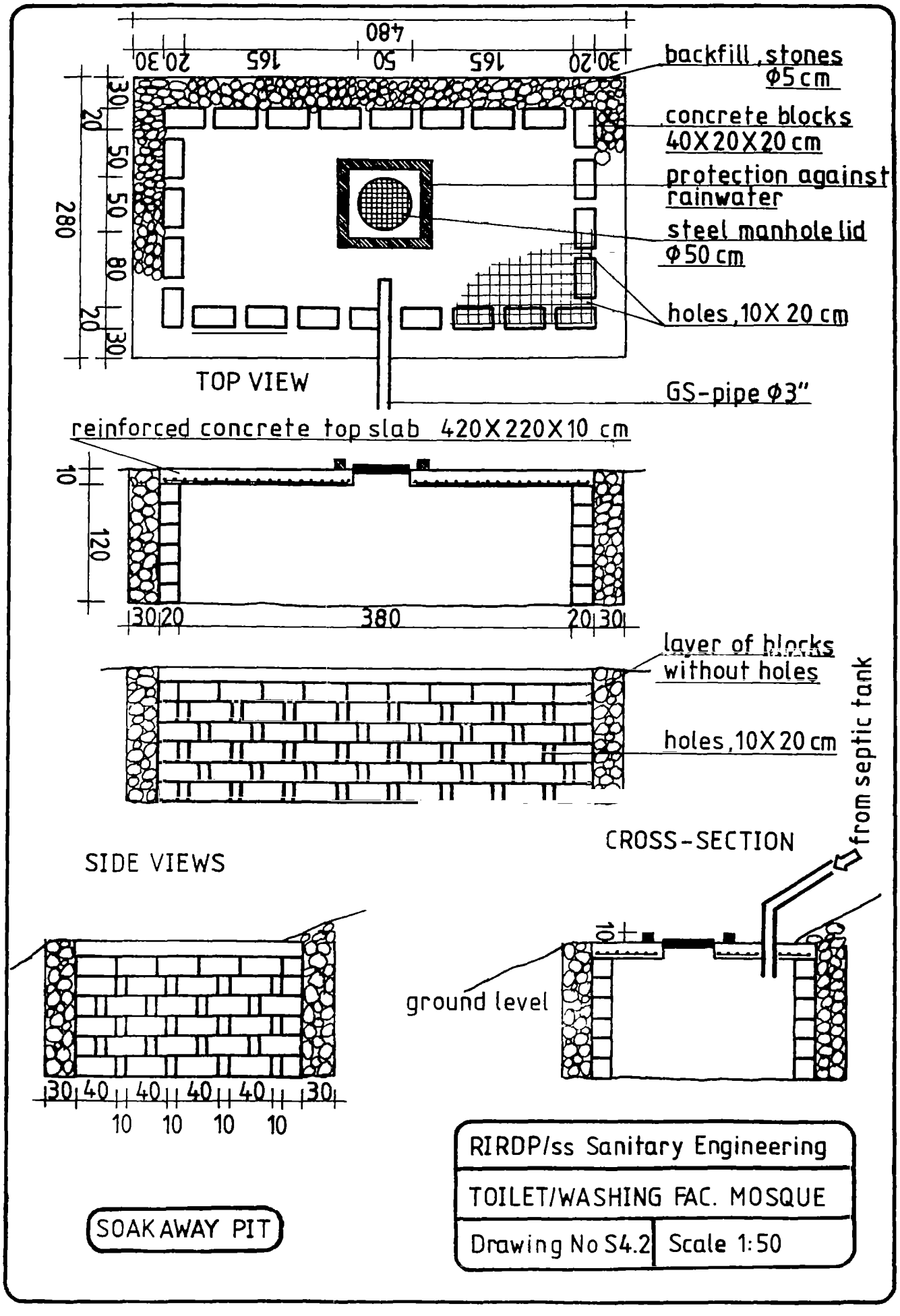
Annex C



SOAKAWAY PIT

RIRDP/ss Sanitary Engineering	
TOILET/WASHING FAC. MOSQUE	
Drawing No S4.1	Scale 1:50

var=variable, depends on the slope
measurements in centimeter


480
30 20 165 50 165 20 30
backfill, stones Φ5 cm
concrete blocks 40X20X20 cm
protection against rainwater
steel manhole lid Φ50 cm
holes, 10X 20 cm
GS-pipe Φ3"
30 20 50 50 80 20 30
280
TOP VIEW
reinforced concrete top slab 420X220X10 cm
10
120
30 20 380 20 30
layer of blocks without holes
holes, 10X 20 cm
SIDE VIEWS
CROSS-SECTION
from septic tank
ground level
10
30 40 40 40 40 30
10 10 10 10
SOAK AWAY PIT
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No S4.2
Scale 1:50

TECHNICAL DESCRIPTION SANITARY FACILITIES FOR THE MOSQUE OF: .....

1 DEMOLISHING

1.1. Demolish existing yard wall as far as has been indicated on drawing 1 with I-I (length ... m).
1.2. Demolish existing toilet facilities.
1.3. Demolish existing washing facilities.

2 TOILET FACILITIES 2 POUR FLUSH TOILETS

foundation

2.1.D. At the place indicated on drawing 1 an excavation has to be made 3.4 m long and 2.4 m wide. The depth should be 0.65 m or according to the instructions of the RIRDP supervisor.
2.2.D. On the bottom of this excavation a reinforced concrete floor has to be made, 3.2 m long, 2.2 m wide and 0.1 m thick. Concrete mixture: 1:1.5:2.5. Reinforcement: single cross net, diameter steel bars 6 mm, c.t.c 15 cm. Cover: 2 cm. Pouring of concrete may not start before approval of the RIRDP supervisor.
2.3.D. On top of this floor slab the foundation has to be built for the walls as indicated on drawing D2. The foundation consists of a double layer (width: 40 cm, height: 20 cm) of cement blocks, solid 40*20*20 cm. Openings should be kept for the 4" diameter cast iron waste pipes as indicated on drawing D2.

small yard wall

2.4.D. At the place indicated on drawing 1, a small wall has to be built with concrete blocks, size 40*20*15 cm, solid. Length of wall 3.2 m, height 1.0 m.
2.5.D. The foundation for this yard wall should consist of a double layer (width 0.40 m, height 0.20 m) of blocks, solid 40*20*20 cm.
2.6.D. The passage between this wall and the toilet rooms should be filled with compacted backfill.

toilet rooms

2.7.D. On top of the foundation the walls have to be built. Outside walls should consist of cement blocks, solid, dimensions 40*20*20 cm. In the top layers an opening should be kept per toilet room, size 40 * 40 cm, serving as window (ref. drawing D3). The toilet rooms should have the same size (1.23 * 1.60 m, internal) and should have a minimal height of 2.00 m.
2.8.D. In each toilet room a 4" cast iron pipe should be laid to the manholes at the backside of the toilets. To each pipe a cast iron siphon device ('water seal') with a squatting plate should be connected watertightly. Minimum slope of pipes should be 1:40.
2.9.D. After installation of the pipes compacted backfill has to be put on top of the mass concrete floor slab up to original ground level.
2.10.D. On top of the compacted backfill, mass concrete floor slabs for the toilet rooms and the passage have to be made, thickness: 5 cm. Concrete mixture: 1:3:4. The floors of the toilet rooms should slope towards the squatting hole, the floor of the passage should slope towards the mosque yard.
2.11.D. The floors of the toilet rooms and the passage have to be tyled with regular (non ceramic) tyles, size 20 * 20 cm.
2.12.D. At each toilet room a steel door has to be installed in a framework between the separation walls (ref. drawing D3).

2.13.D. On top of the walls a reinforced concrete roof, 3.0 m long, 2.0 m wide and 0.07 m thick has to be made. Concrete mixture 1:1.5:2.5. Reinforcement should consist of a single cross net, diameter bars 10 mm, c.t.c. 15 cm. Cover should be 2 cm. Concrete should be vibrated properly during and after pouring. The roof should slope slightly, 1 : 100, towards the back side of the building.
2.14.D. The inside of the toilet rooms should be plastered with plaster 1:3.5.
2.15.D. The toilet rooms should be painted inside with white, water resistent paint.
pipes and manhole
2.16.D. At the places indicated on drawing 1, trenches 0.4 m wide and 0.6 m deep have to be dug for the pipes from the toilets to the pits.
2.17.D. At the place of the manhole an excavation has to be made. Length: 1.0 m, width: 1.0 m, depth should be 0.4 m or according to the instructions of the supervisor.
2.18.D. The pipes should be glued watertightly into regular connections inside the trench. Minimum slope of pipes 1:40.
2.19.D. At the bottom of the excavation for the manhole, a mass concrete floor slab has to be made, 90 cm long, 90 cm width and 6 cm thick. Mixture mortar: 1:3:4.
2.20.D. On top of the floor slab the manhole has to be made by means of cement blocks, solid, size: 40*20*15 cm. Openings should be kept for the in- and outlet pipes (ref. drawing D4).
2.21.D. The manhole bottom, after installing the pipes, has to be smoothly, watertightly plastered as such that undersides of pipes equal topside of plaster. The transition from pipes to plaster should be perfectly smooth.
2.22.D. The manholes should be covered with a concrete slab 80 cm square, 6 cm thick. Concrete mixture: 1:1.5:2.5. In each concrete slab a steel manhole lid should be installed, diameter 30 cm.

3 SOAKAWAY PITS POUR FLUSH TOILETS

3.1.D. At the place indicated by the RIRDP supervisor, two soakaway pits ("bayara") have to be dug, diameter 1.5 m, depth 3.0 m. Minimum distance between the two pits: 2 meter.
3.2.D.1. *(in case of limited traffic)*
Each pit should be covered with a reinforced concrete slab, 2 m square, 15 cm thick. Reinforcement: single cross net of steel bars, diameter 10 mm, c.t.c. 20 cm. Concrete mixture: 1:1.5:2.5.
3.2.D.2. *(in case of no traffic)*
Each pit should be covered with a reinforced concrete slab, 2 m square, 10 cm thick. Reinforcement: single cross net of steel bars, diameter 6 mm, c.t.c. 15 cm. Concrete mixture: 1:1.5:2.5.
3.3.D. In each concrete slab a manhole lid should be installed, diameter 50 cm. This lids should be placed just above the inlet pipes.
3.4.D. The pits should be used alternately by blokking one pipe in the manhole.

4 & 5 WASHING FACILITIES + YARD: see annex B, pour flush toilets.

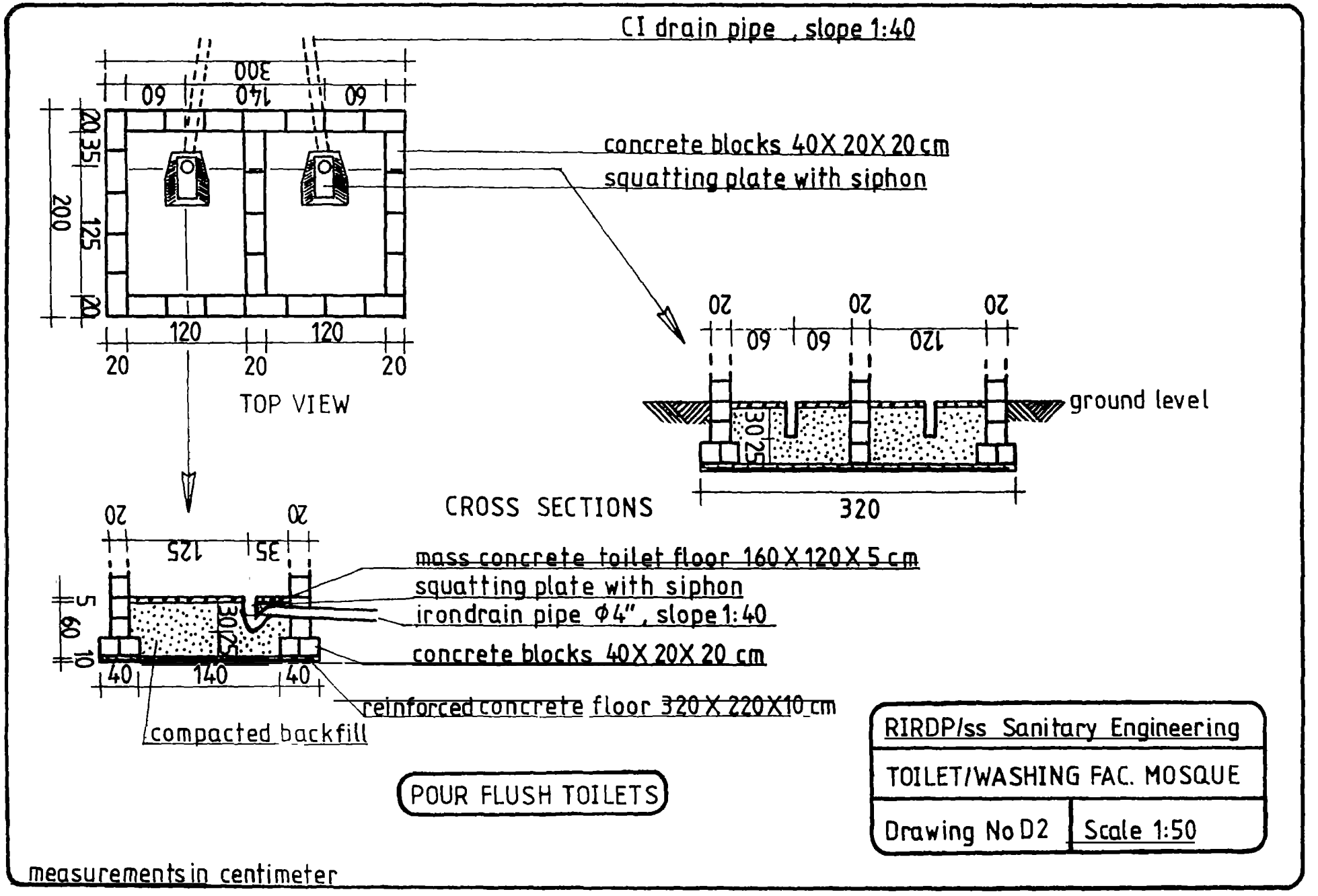
BILL OF QUANTITIES FOR THE MOSQUE OF: .....

L = length of PVC pipes (meter) A = area of the yard (m2)
T = number of taps washing place W = length of yard wall (meter)

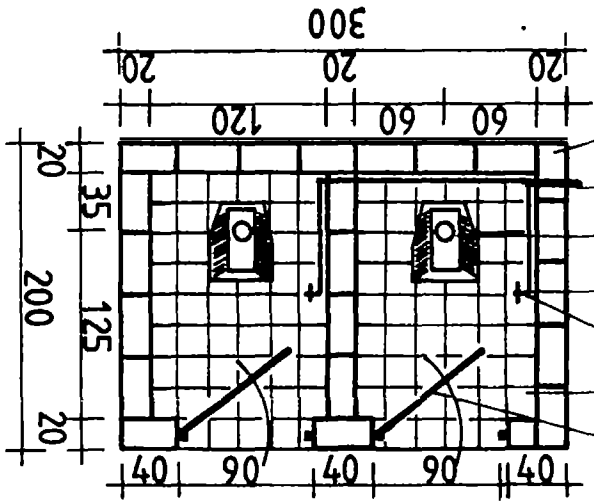
2 pour flush toilets, 2 pits, washing place.

NR	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST (YR)
1	Mass concrete	m3	0.8 + 0.07 A	850	
2	Back-fill	m3	2 + yard	70	
3	Brickwork(40*20*20, solid)	m2	26 + 1.8 W + 0.3 T	170	
4	Brickwork(40*20*15, solid)	m2	6	150	
5	Foundation yard wall(40 cm high, 40 cm wide)	m'	4.4 + W	150	
6	Plastering(1:2.5,water resistent)	m2	2 + 1.7 T	75	
7	Plastering(1:3.5, not w.r.)	m2	35 + 1.8 W	70	
8	Painting, water resistent	m2	29	30	
9	Floor tyles(20*20 cm)	m2	10	200	
10	Reinforced concrete	m3	2.0	3300	
11	Wooden / steel doors plus frames (size: 1.80*0.90 m)	nr	2	1000	
12	Manhole lids, diameter 50 cm	nr	2	300	
13	Manhole lids, diameter 30 cm	nr	1	200	
14	Flyscreen protected vent pipes (PVC, diameter 6", 3 m')	nr	-	300	
15	Squatting plates with PVC drop pipes(diameter 4",50 cm)"	nr	-	500	
16	Squatting plate with CI siphon	nr	2	700	
17	Taps plus connections, 0.5"	nr	2 + T	60	
18	Metal tank with "ball valve", 1.5m3	nr	1	1500	
19	Metal grate plus pit	nr	1	150	
20	GS pipes, 0.5", 6m'	nr	1 + supply line	130	
21	GS pipes, 1.5", 6m'	nr	0.3 + 0.2 T	350	
22	Galvanized steel T's, bends, etc.		30% of no 20 + 21		
23	PVC pipes, 3", 6m'	nr	1	200	
24	PVC pipes, 4", 6m'	nr	0.17 L	300	
25	PVC T's, bends, etc.		20% of no 23 + 24		
26	Cast iron pipes, 4", 1 m'	nr	2	200	
27	Demolishing old structures		variable	500-2000	
28	Excavation	m3	19 + 0.3 L	100-1250	
				+	
	SUB TOTAL				
	Unforseen and transport	%	variable (5-20%).		
				+	
	GRAND TOTAL				

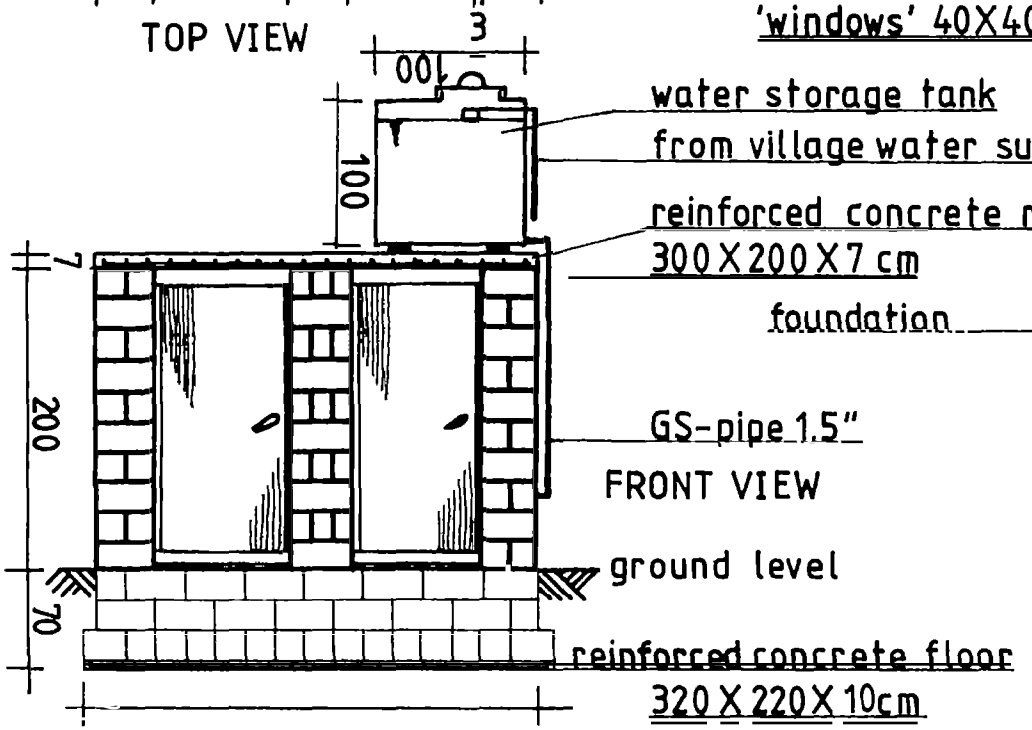
PRICE LEVEL:
April 1990


CI drain pipe , slope 1:40
300
60
140
60
20
35
125
20
200
120
120
20
20
20
concrete blocks 40X20X20 cm
squatting plate with siphon
TOP VIEW
20
20
20
60
60
120
ground level
30
25
320
CROSS SECTIONS
20
20
125
35
mass concrete toilet floor 160X120X5 cm
squatting plate with siphon
irondrain pipe Φ4", slope 1:40
concrete blocks 40X20X20 cm
5
60
10
30
25
40
140
40
reinforced concrete floor 320X220X10 cm
compacted backfill
POUR FLUSH TOILETS
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No D2
Scale 1:50
measurements in centimeter

Annex D



TOP VIEW



FRONT VIEW

concrete blocks 40X20X20 cm

GS-pipe 1.5", connected with water storage tank

squatting plate with siphon

GS-pipe 0.5"

tap

tyles

steel door 180X90 cm

'windows' 40X40 cm

water storage tank
from village water supply

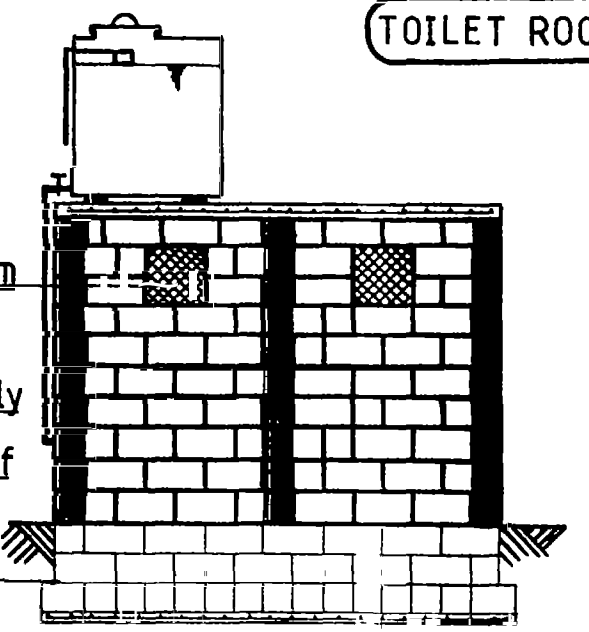
reinforced concrete roof
300X200X7 cm

foundation

GS-pipe 1.5"

ground level

reinforced concrete floor
320X220X10cm



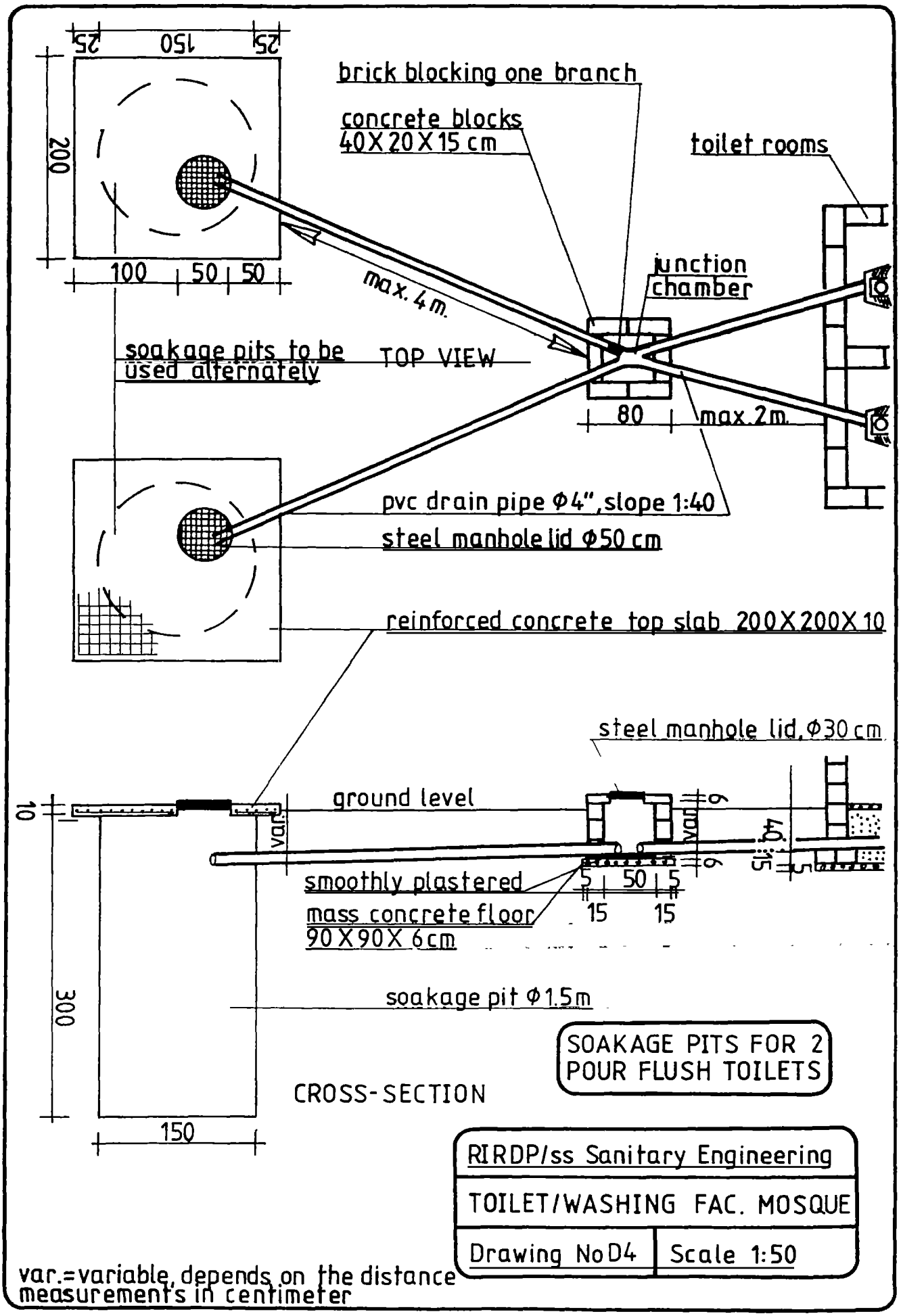
BACK VIEW

TOILET ROOMS

RIRDP/ss Sanitary Engineering	
TOILET/WASHING FAC. MOSQUE	
Drawing No D3	Scale 1:50

measurements in centimeter

Annex D


25
150
25
200
100
50
50
brick blocking one branch
concrete blocks
40X20X15 cm
toilet rooms
junction
chamber
max. 4 m.
soakage pits to be
used alternately
TOP VIEW
80
max. 2m.
pvc drain pipe Φ4", slope 1:40
steel manhole lid Φ50 cm
reinforced concrete top slab 200X200X10
steel manhole lid, Φ30 cm
10
var.
ground level
var.
6
6
40
15
5
smoothly plastered
mass concrete floor
90X90X 6cm
5
50
5
15
15
300
soakage pit Φ1.5m
CROSS-SECTION
150
SOAKAGE PITS FOR 2
POUR FLUSH TOILETS
RIRDP/ss Sanitary Engineering
TOILET/WASHING FAC. MOSQUE
Drawing No D4
Scale 1:50
var.=variable, depends on the distance
measurements in centimeter

In the name of Allah the most merciful and beneficent

Date .....

CONTRACT FOR CONSTRUCTION OF TOILET AND WASHING FACILITIES IN THE MOSQUE OF ..... VILLAGE.

This contract is between the two parties:
1. The Rada' Integrated Rural Development Project (first party)
2. The contractor ..... (second party)

According to this contract the above mentioned parties have agreed to and are bounded by the following terms of contract:

1) The second party has agreed to construct toilet and washing facilities at the mosque of ..... village according to the specifications and instructions given by the first party represented by the engineering section.

2) The second party has accepted to do the job with the price agreed upon.

3) The second party agreed to supply all materials and equipment which should be inspected by the RIRDP before starting the work.

4) The second party should start the work within two weeks starting from the date of signing this contract.

5) The work has to be completed by the second party within three months after signing of this contract.

6) The second party will remain responsible for a period of three months after completion of the work (as guarantee period).

7) The second party should deposit a bank guarantee of 10% of the contract sum as an execution guarantee valid for a period of eight months to be released after a period of three months after completion of the work.

8) The second party will pay a fine of YR 500 per day if the work is over due.

9) The first party reserves the right to stop the second party in case works are not done satisfactorily.

10) The first party will not be liable for any accident or injury that might occur during the contract period.

11) The first party will not be responsible for any financial loss of the second party.

12) The first party has the right to change the quality of the work when necessary and according to the instruction of the engineers.

13) If the second party could not complete the work within the period as a result of certain acceptable problems beyond his control, he will be requested to extend the validity of the bank-guarantee for an equivalent period of the delay. In such case he will not pay delay fine, provided that, the first party should be informed in time.

14) The second party has no right to ask for any compensation if the work is delayed due to internal dispute or village problems.

15) The second party should clean the site after completion of the work.

16) The payments will be as following:
A) YR ..... (30%) after demolishing the existing structures.
B) YR ..... (35%) after construction of the toilet rooms.
C) YR ..... (35%) after completion of the work.
Total: .....

30/30
+ 10% ...
3 months

First party:
The RIRDP:

Second party:
The contractor:

Engineering Section:
Head of section, ...

Adviser of section, ...

.....

Administration and Financial Section:
Head of section,

.....

General Manager:

.....

Ministry of Agriculture

Rada Integrated Rural Development Project
P.O.Box 816, Sana'a
Yemen Arab Republic

Date: .....

To: Brother People of ..... village,

After compliments,

We have the pleasure to inform you that your village is one of the villages that are recommended to have mosque facilities within the programme of the RIRDP.
The village contribution is about 20% of the total costs of the project.
So you are requested to pay YR 15,000 as basic contribution on our account no ..... in the Yemen Bank for Reconstruction and Development.
The validity of this letter of intent is 2 months from the date of signing.
We expect your full and quick cooperation and without receiving the contribution your village will be excluded from the programme.

Note: priority will be given to villages that pay first.

Thanks,

Head of Section Engineering

.....

Advisor of Section Engineering

.....

Teamleader Technical Assistance Unit

.....

Head of Section Finance and Administration

.....

General Manager of the RIRDP

.....

VILLAGES WITH SANITARY FACILITIES AT THE MOSQUE
DATE: 900501, Aart van der Horst

Year	Nr	Village name	Regio	System	Total costs (YR)(*)
1985	1	Jubayr	Sabah	Pour flush with 2 pits	33,710
1986	2	Al Khabar 1	Al Arsh	Pour flush with 1 pit	18,800
1986	3	Al Hajar	Sabah	Aqua privy	35,860
1986	4	Al Khilaw	Qaifah	Aqua privy	50,000
1986	5	Assara	Qaifah	Aqua privy	53,555
1986	6	Uteifa 1	Al Arsh	Aqua privy	41,716
1986	7	Majlain	Sabah	Aqua privy in old cistern	57,798
1986	8	Uteifa 2	Al Arsh	Aqua privy	63,905
1986	9	Bait Al Majrab	Al Arsh	Aqua privy	63,395
1987	10	Maswarah	Sabah	Pour flush with septic tank	66,552
1987	11	Furghan	Sabah	Aqua privy in old cistern	74,970
1987	12	Hawat	Sabah	Aqua privy in old cistern	83,699
1987	13	Al Qauz	Qaifah	Aqua privy	50,177
1987	14	Al Lahbi	Qaifah	Aqua privy in old cistern	77,968
1987	15	Yahmum	Ar Riashiyah	Pour flush with 1 pit	56,029
1987	16	Biut As Salama	Ar Riashiyah	Aqua privy	80,614
1987	17	Hanakah Al Masu'd	Qaifah	Aqua privy	93,068
1987	18	Mawr 1	Al Arsh	Aqua privy	58,626
1987	19	Al Qabl	Sabah	Aqua privy in old cistern	61,523
1987	20	Al Asha	Qaifah	Aqua privy	77,105
1987	21	Surm al Shadadi	Al Arsh	Aqua privy in old cistern	57,299
1987	22	Augatah	Ar Riashiyah	Aqua privy	69,251
1987	23	Azzan	Al Arsh	Aqua privy in old cistern	73,464
1987	24	Hawat 2	Sabah	Pour flush with 1 pit	16,052
1987	25	At Tahlah	Ar Riashiyah	Pour flush with 2 pits	57,668
1988	26	Al Qadry	Qaifah	Pour flush with 2 pits	70,200
1988	27	Ash Sharaf	Sabah	Pour flush with 2 pits	64,297
1988	28	Al Goraishia	Qaifah	Pour flush with 1 pit	74,012
1988	29	Baqarat	Qaifah	Pour flush with 2 pits	64,321
1988	30	Mawr 2	Al Arsh	Pour flush with 2 pits	61,485
1988	31	Safi Al Ma	Qaifah	Pour flush with 2 pits	62,266
1988	32	Mallah	Al Arsh	Pour flush with 1 pit	31,894
1988	33	Al Hamra	Qaifah	Pour flush with 2 pits	72,236
1988	34	Sarar Al Jism	Qaifah	Pour flush with 2 pits	72,195
1989	35	Al Khabar 2	Al Arsh	Pour flush with 2 pits	79,867
1989	36	Sudan	Al Arsh	Pour flush with 2 pits	74,547
1989	37	Hajd Al Majl	Wadi Tha	Pour flush with 2 pits	92,683
1989	38	Mughala	Wadi Tha	Pour flush with 2 pits	79,652
1989	39	Habban	Qaifah	Pour flush with 2 pits	91,592
1989	40	Bait Haddash	Sabah	Pour flush with 2 pits	67,331
1989	41	Qarn Qasad	Sabah	Pour flush with 2 pits	106,994
1989	42	Ad Darb	Ar Riashiyah	Pour flush with septic tank	80,357
1990	43	An Nubbah	Qaifah (Matar)	Pour flush with 2 pits	83,104
1990	44	Safiah	Qaifah (Amad)	Pour flush with 2 pits	65,351
1990	45	Khalagah	Ar Riashiyah	Pour flush with 1 pit	73,622
				Total:	YR 2,940,810

(*): costs according to the cost estimate + additional work, the real costs were difficult to retrieve, but the difference is at most 5-10%.

VILLAGES WITH SANITARY FACILITIES AT THE MOSQUE. CONT'D

Nr village	No of toilets	No of taps	shower	feet basin	Separate drainage washing water	final disposal	Drainage washing water
1	3	9	no	no	no	excavated pits	pit
2	4	8	yes	no	no	excavated pit	pit
3	3	9	no	no	no	garden	septic tank
4	3	9	no	no	no	excavated pit	septic tank
5	3	9	no	yes	no	excavated pit	septic tank
6	4	9	no	yes	no	excavated pit	septic tank
7	3	9	no	yes	no	excavated pit	septic tank
8	4	12	no	yes	no	excavated pit	septic tank
9	4	12	no	yes	no	excavated pit	septic tank
10	3	6	no	yes	no	excavated pit	septic tank
11	3	8	no	yes	no	pit with blocks	septic tank
12	4	12	no	yes	no	excavated pit	septic tank
13	3	9	yes	yes	no	garden	septic tank
14	3	9	no	yes	no	excavated pit	septic tank
15	3	9	no	yes	no	pit with blocks	soakaway pit
16	3	8	no	yes	no	excavated pit	septic tank
17	6	13	no	yes	no	excavated pit	septic tank
18	3	11	no	yes	no	excavated pit	septic tank
19	3	9	no	yes	no	excavated pit	septic tank
20	4	11	no	yes	no	excavated pit	septic tank
21	3	11	no	yes	no	excavated pit	septic tank
22	3	10	yes	no	no	pit with blocks	soakaway pit
23	4	12	no	yes	no	excavated pit	septic tank
24	3	8	no	no	no	excavated pit	excavated pit
25	2	6	no	no	no	excavated pits	soakaway pit
26	3	11	no	no	yes	excavated pits	garden
27	3	12	no	yes	yes	excavated pits	garden
28	4	12	no	no	yes	old shallow well	garden
29	5	15	no	no	yes	excavated pits	garden
30	3	11	no	yes	yes	excavated pits	garden
31	3	10	no	no	yes	excavated pits	garden
32	6	9	no	no	no	existing pit	soakaway pit
33	3	14	no	no	no	excavated pits	soakaway pit
34	3	12	no	no	no	excavated pits	soakaway pit
35	5	12	no	no	yes	excavated pits	garden
36	3	10	no	no	yes	excavated pits	garden
37	4	10	no	no	yes	excavated pits	garden
38	3	10	no	no	no	excavated pits	soakaway pit
39	3	9	yes	no	yes	excavated pits	garden
40	3	7	no	no	yes	excavated pits	trees
41	6	13	no	no	yes	excavated pits	garden
42	3	10	no	no	yes	excavated pit	garden
43	3	12	no	no	yes	excavated pits	garden
44	3	11	no	no	yes	excavated pits	garden
45	3	10	?	?	yes	excavated pit	garden

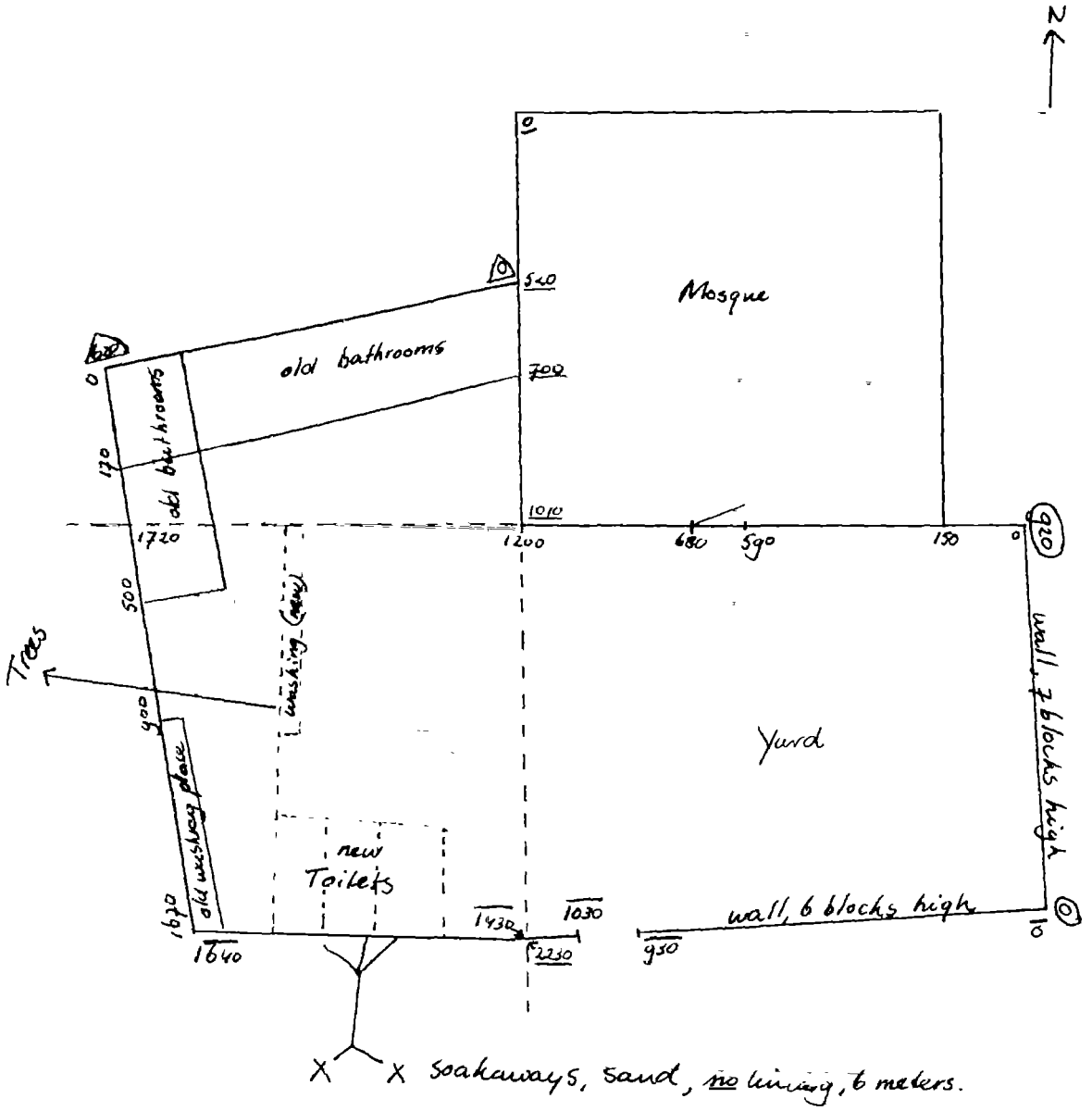
VILLAGES WHICH REQUESTED FOR SANITARY FACILITIES AT THE MOSQUE
DATE: 900501, Aart van der Horst

Village name	Regio	Date request	Date letter of intent	Contri-bution	Remarks
Riyam		870117			people not cooperative
Al Ganha	Rada	870711			part of Rada' town
Zarar	Sabah	870901			no water supply yet
Sharief Al Jauf		870917			people not cooperative
Rubat	Dhi Naim	880224			
Al Haida	Rada	880530			near 2 other mosques
Al Sharba	Rada	880901			near 2 other mosques
Rahban	As Sawadiyah	881001			no watersupply
Nate	Nate	881101			no watersupply
Al Dhaharia	As Sawadiyah	881201			no watersupply
Ghawlays Sayanum	Rada	891123			second request
Al Basir	Qaifah	900203			?
Al Lijuw	Ar Riashiyah	900317			interested
Al Luma'an (2)	Qaifah	900404			second request
Al Maghraba	Al Arsh	861118	8709	no	no interest
Al Luma'an	Al Arsh	870119	8709	no	requested again
Al Qadry	Rada	860601	8709	15,000	implemented
Ash Sharaf	Sabah	861224	8709	15,000	implemented
Nughala	Wadi Tha	860720	8709	15,000	implemented
Dhikalib Al Asfal	Qaifah	860726	8709	10,000	contribution too low
Al Goraishia	Qaifah	870308	8709	15,000	implemented
Shurm Ash Shadady	Wadi Tha	861113	8802	no	already one mosque
Al Gerar	Qaifah	870317	8802	no	?
Sara' Ghunam	Qaifah	860612	8802	no	?
Jayf Al Homaydy	Al Arsh	861124	8802	no	?
Al Gharagh	Al Arsh	861125	8802	no	?
Ghawlays	Rada	861126	8802	no	requested again
Meskufa	Sabah	861202	8802	no	?
Bani Ziad	Qaifah	870108	8802	no	?
Al Fuqa	Al Arsh	870216	8802	no	?
Bayt Al Oashy	Al Arsh	870226	8802	no	?
Al Kharbh	Ar Riashiyah	870228	8802	no	?
Al Zuab	Qaifah	870307	8802	no	no need anymore
Al Ganak	Sabah	870310	8802	no	?
Abi	Sabah	860712	8802	no	?
Baida Sabah	Sabah	870312	8802	no	no watersupply
Dhikalib Al Ala	Qaifah	860823	8802	no	?
Quradha	Ar Riashiyah	860915	8802	no	?
Qariah As Sawda	Wadi Tha	861029	8802	no	?
Khabran	Qaifah	870317	8802	no	?
Mailah Gadar	Rada	870223	8802	in kind	implemented
Al Khabar(2)	Rada	861118	8802	15,000	implemented
Mawr(2)	Al Arsh	870201	8802	15,000	implemented
Al Hamra	Wadi Tha	870104	8802	15,000	implemented
Hajd Al Majl	Wadi Tha	860720	8802	15,000	implemented
Baqarat	Qaifah	870226	8802	15,000	implemented
Sarar Al Jism	Qaifah	870324	8802	15,000	implemented
Bayt Haddash	Sabah	870128	8802	15,000	implemented
Sudan	Al Arsh	880408	8811	15,000	implemented

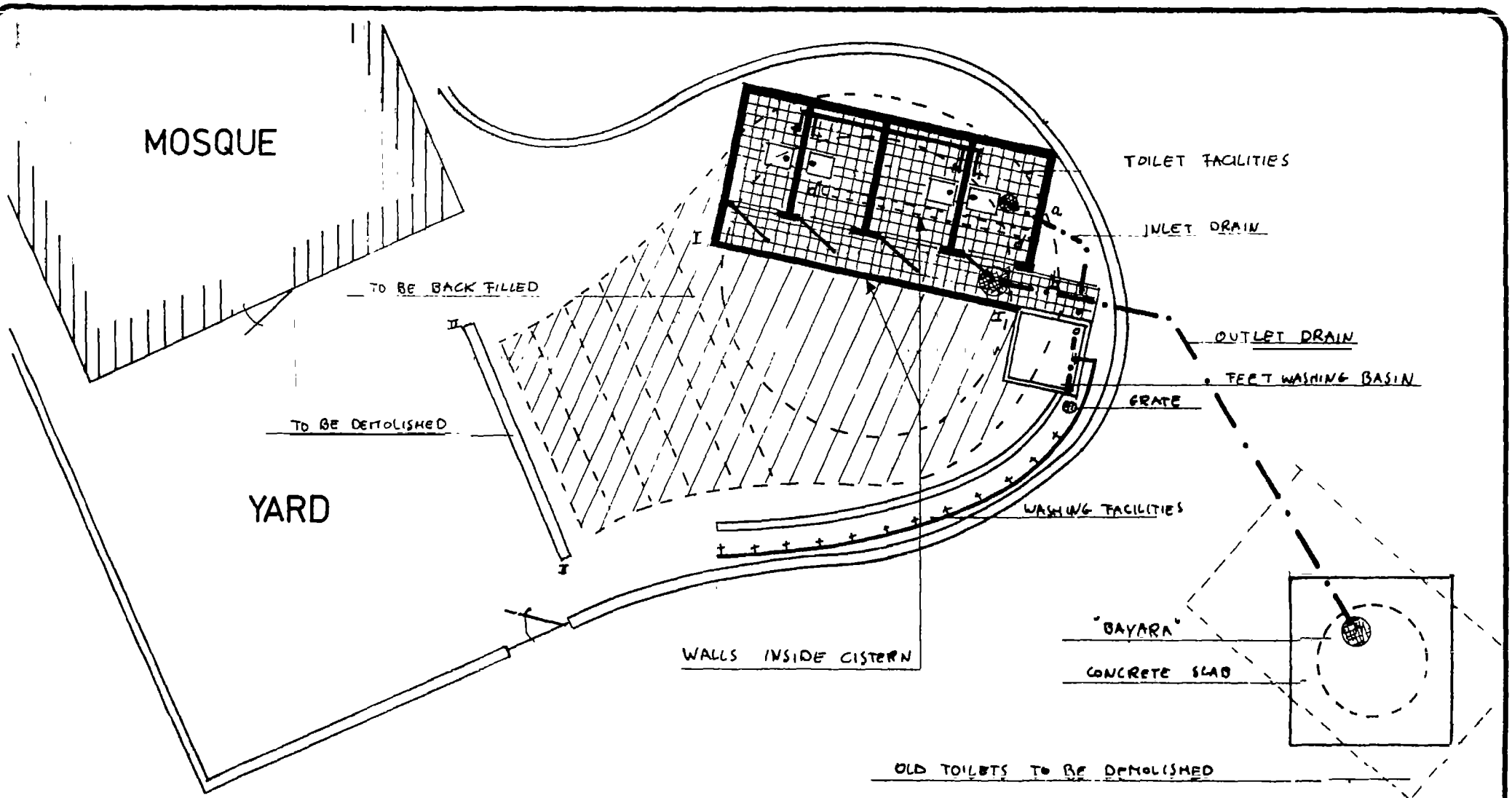
VILLAGES WHICH REQUESTED FOR SANITARY FACILITIES AT THE MOSQUE
DATE. 900501, Aart van der Horst

Village name	Regio	Date request	Date letter of intent	Contri-bution	Remarks
Al Zaher		880405	8906	no	?
Ar Rawq	Qaifah	880828	8908	no	abandoned watersupply
Al Kawlah	Ar Riashiyah	881101	8908	no	?
Ishaq	Ar Riashiyah	890401	8908	no	people interested
Shihat	Qaifah	870604	8908	no	people not cooperative
Homeida	Wadi Tha	870620	8908	no	?
Qarn Madar	Ar Riashiyah	880109	8908	no	private watersupply
Bait Ettekh	Rada	880320	8908	no	people interested
Qarn Qasad	Sabah	860803	8908	15,000	implemented
Haban	Qaifah	880109	8908	15,000	implemented
An Nubah (Matar)	Qaifah		8908	15,000	implemented
Ad Darb	Ar Riashiyah	880123	8908	15,000	implemented
As Safiah	Wadi Amad	880524	8908	15,000	implemented
Khubza	Qaifah	891126	9001	15,000	planned

Survey mosque Sufyah, Wadi Amad
12-12-1989
Aart 't Hart & Saif Ahmed

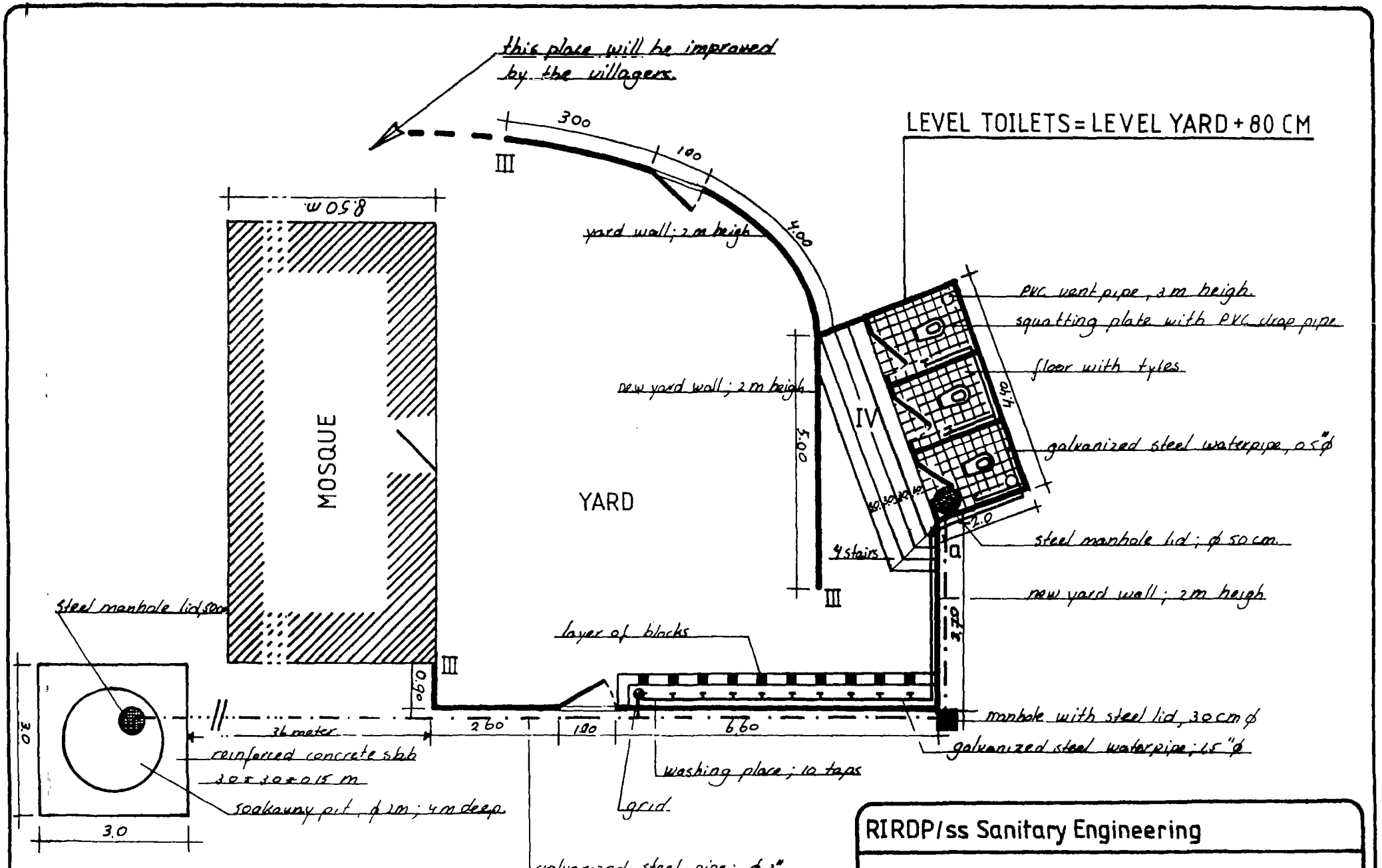


from reservoir to mosque = 100 meter
from new washing place to trees = 20 meter.
no backfill
watertank, 2000 L, present.
no buildings around, enough space.

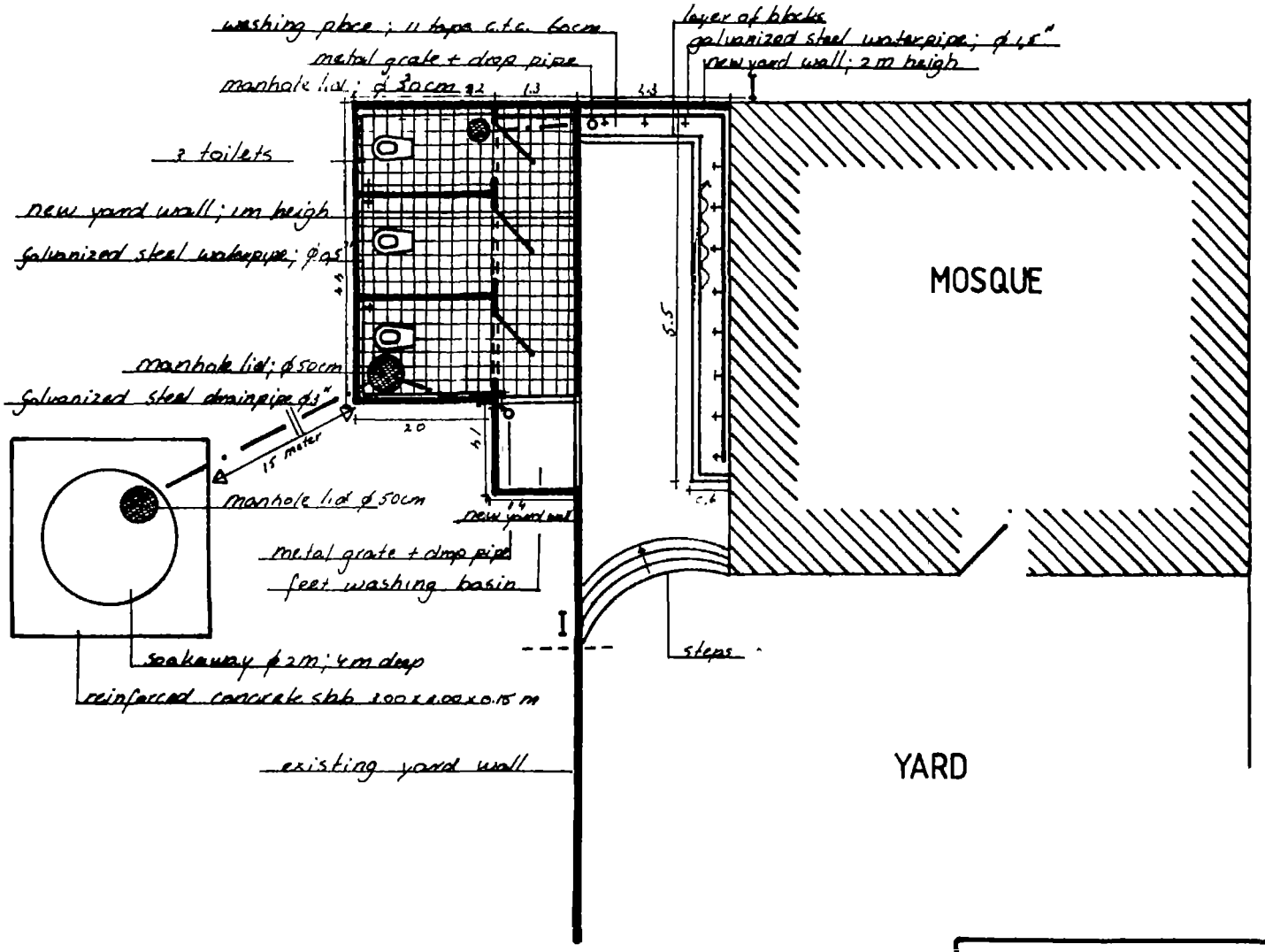


RIRDP /ss Sanitary Engineering	
Mosque HAWAT	
Drawing No. 1	Scale 1:100

Annex J

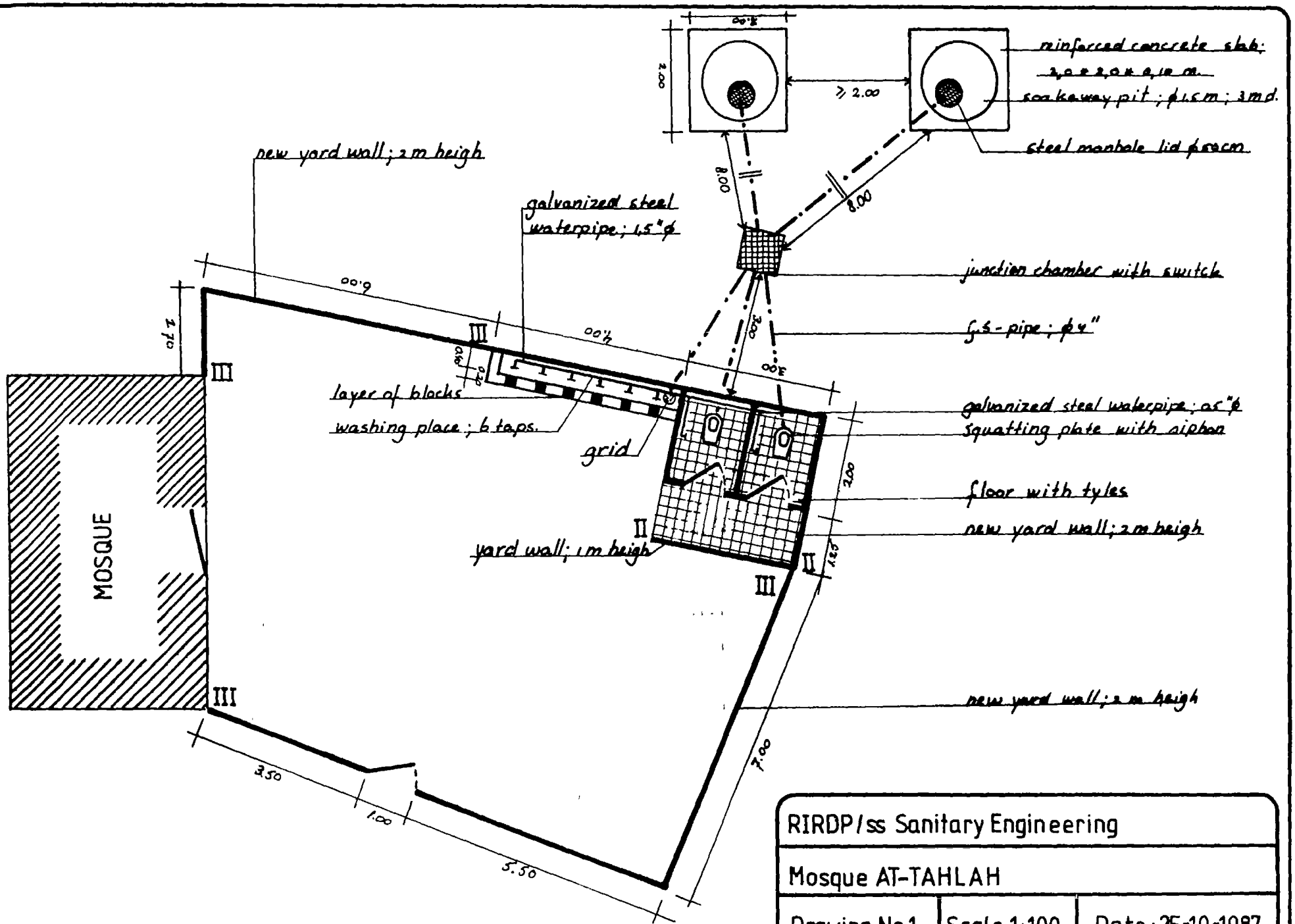

this place will be improved by the villagers.
LEVEL TOILETS = LEVEL YARD + 80 CM
300
100
400
8.00
MOSQUE
YARD
yard wall; 2 m heigh
new yard wall; 2 m heigh
5.00
IV
III
PVC vent pipe, 3 m heigh
squatting plate with PVC drop pipe
floor with tyles
galvanized steel waterpipe, 0.5" ϕ
steel manhole lid; ϕ 50 cm
4 stairs
new yard wall; 2 m heigh
Steel manhole lid, 50cm
layer of blocks
0.60
3.20
manhole with steel lid, 30 cm ϕ
galvanized steel waterpipe; 1.5" ϕ
3.0
36 meter
2.60
1.00
6.60
reinforced concrete slab
3.0 x 3.0 x 0.15 m
soakaway pit, ϕ 2m; 4m deep
3.0
washing place; 10 taps
grid
galvanized steel pipe; ϕ 3"
total length 50 meter
RIRDP/ss Sanitary Engineering
Mosque AUGATAH
Drawing No1
Scale 1:100
Date: 28-10-1987

Annex J

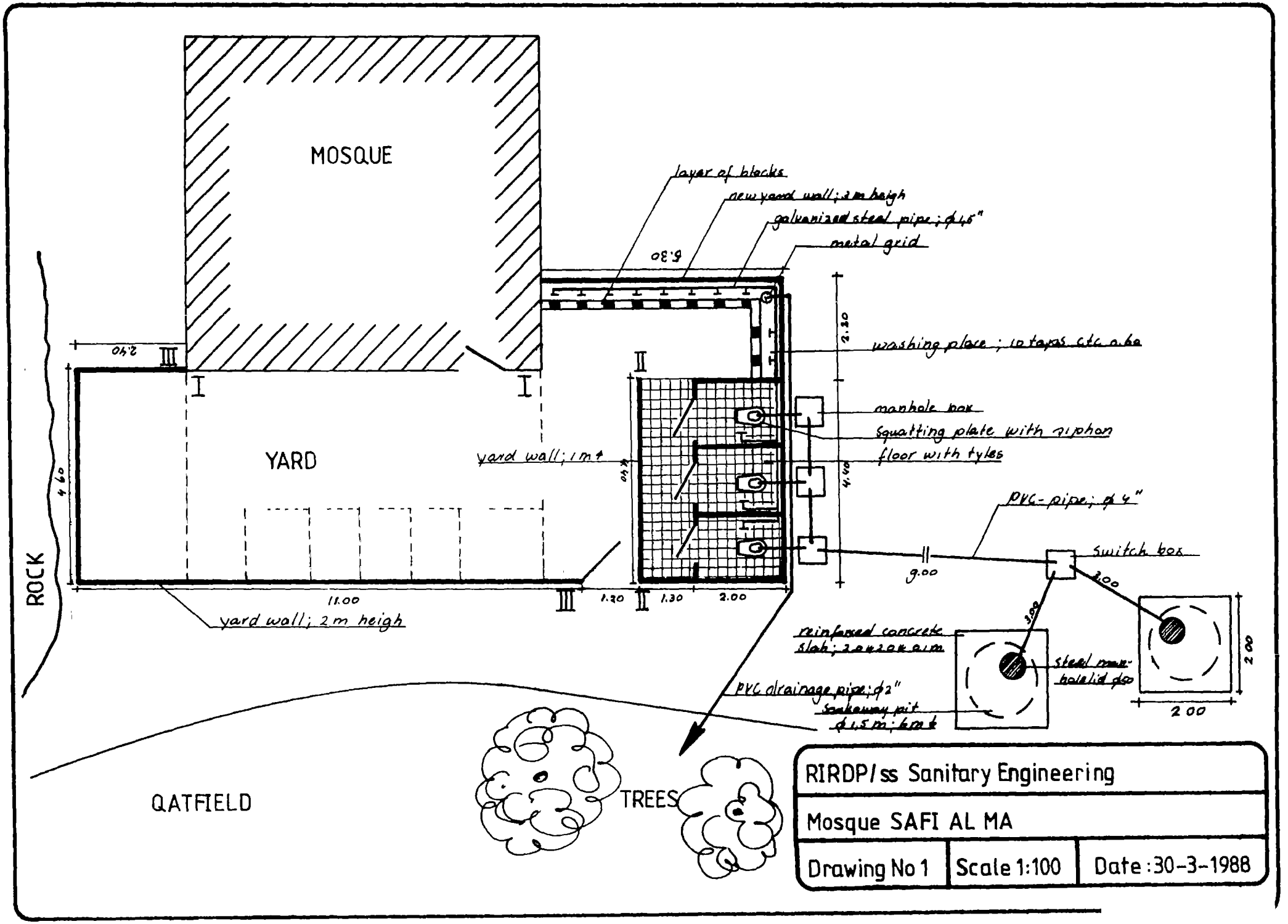


RIRDP/ss Sanitary Engineering		
Mosque SURM ASH SHADADY		
Drawing No1	Scale 1:100	Date: 20-3-1987

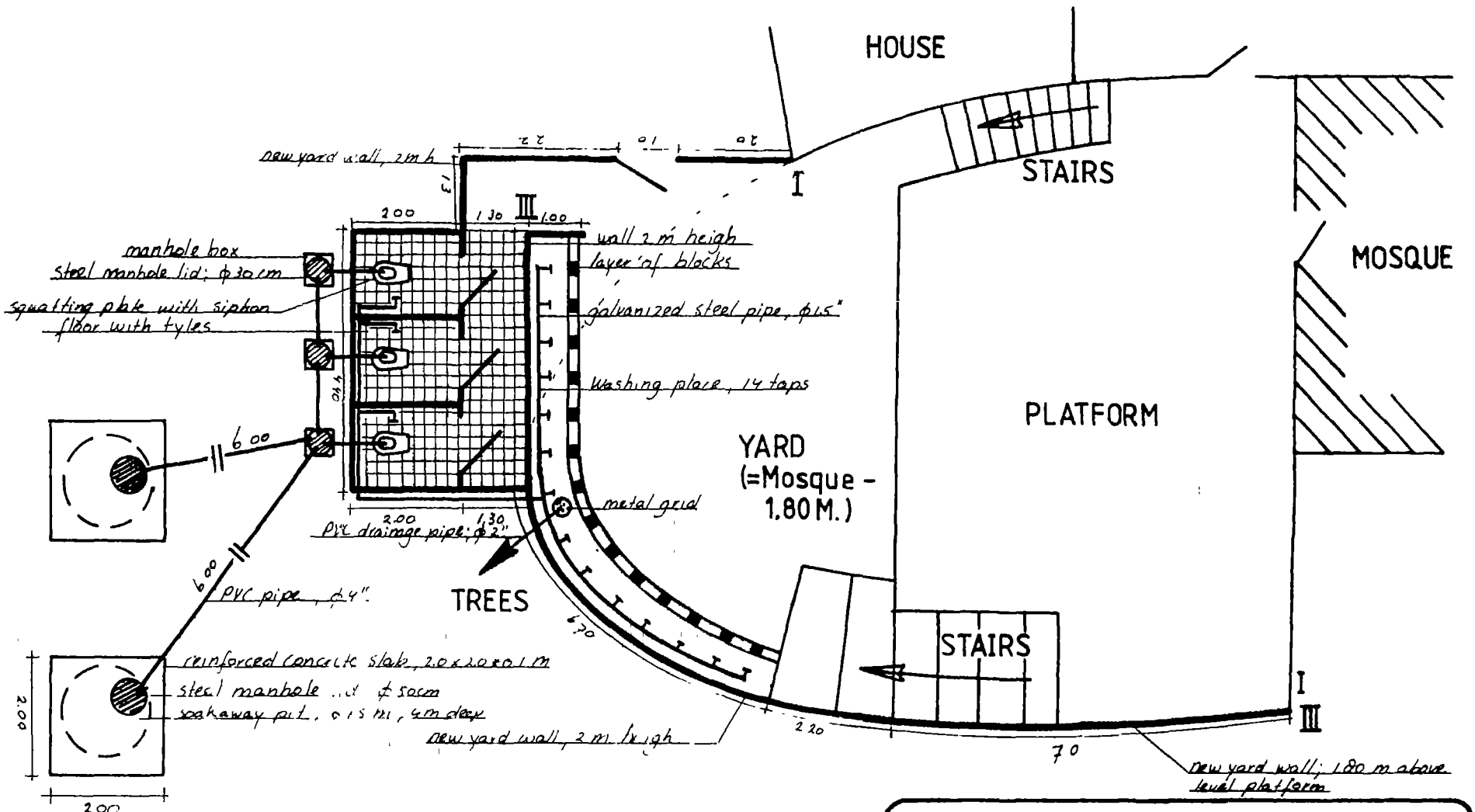
Annex J


reinforced concrete slab;
soakaway pit ; ϕ1.5 m ; 3 m d.
steel manhole lid ϕ 80 cm
new yard wall ; 2 m heigh
galvanized steel waterpipe ; 1.5" ϕ
junction chamber with switch
G.S - pipe ; ϕ 4"
galvanized steel waterpipe ; as" ϕ
squatting plate with siphon
layer of blocks
washing place ; 6 taps.
grid
floor with tyles
new yard wall ; 2 m heigh
yard wall ; 1 m heigh
new yard wall ; 2 m heigh
MOSQUE
III
II
2.00
8.00
8.00
3.00
3.50
1.00
5.50
7.00
RIRDP/ss Sanitary Engineering
Mosque AT-TAHLAH
Drawing No 1
Scale 1:100
Date : 25-10-1987

Annex J


MOSQUE
YARD
ROCK
QATFIELD
TREES
layer of blocks
new yard wall; 2m heigh
galvanized steel pipe; ϕ4.5"
metal grid
6.30
2.20
washing place ; 10 taps c/c 0.80
manhole box
Squatting plate with siphon
floor with tyles
4.00
PVC-pipe; ϕ 4"
Switch box
9.00
2.00
3.00
2.00
2.00
yard wall; 1m +
yard wall; 2m heigh
11.00
1.20
1.30
2.00
2.40
4.60
reinforced concrete slab; 2.00x2.00 x 0.10
steel manhole lid ϕ60
PVC drainage pipe; ϕ2"
Soakaway pit ϕ1.5m; hard
RIRDP/ss Sanitary Engineering
Mosque SAFI AL MA
Drawing No 1
Scale 1:100
Date : 30-3-1988

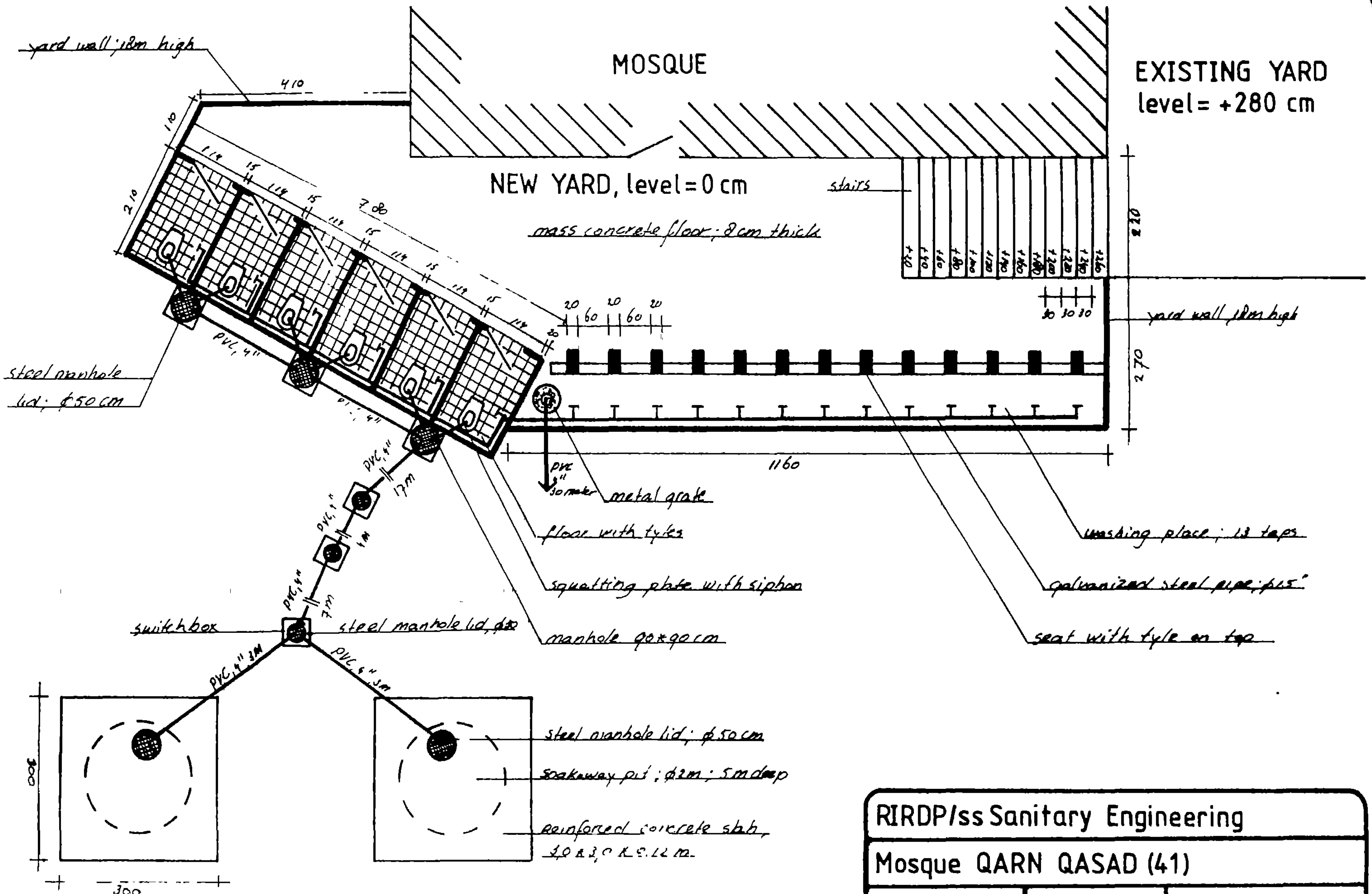
Annex J



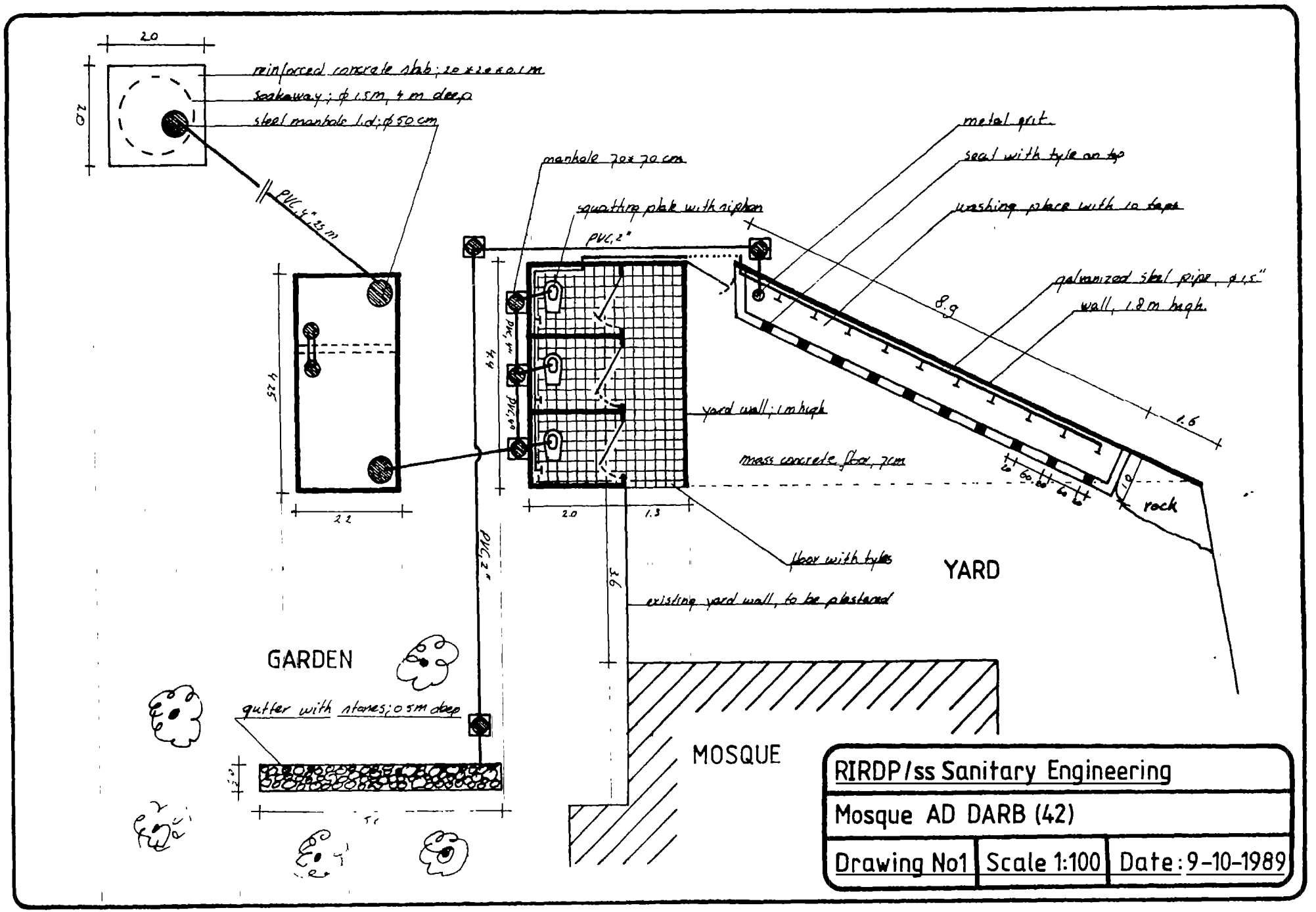
RIRDP/ss Sanitary Engineering		
Mosque AL HAMRA		
Drawing No 1	Scale 1:100	Date : 19-7-1988

Annex J

Annex J



RIRDP/ss Sanitary Engineering		
Mosque QARN QASAD (41)		
Drawing No1	Scale 1:100	Date: 18-9-1989


reinforced concrete slab; 1.0 x 1.0 x 0.1 m
soakaway; ϕ 1.5 m, 4 m deep
steel manhole lid; ϕ 50 cm
PVC, 4" 25 m
manhole 70 x 70 cm
squatting plate with siphon
PVC, 2"
metal grit
seat with tyle on top
washing place with 10 steps
galvanized steel pipe, ϕ 1.5"
wall, 1.8 m high
8.9
2.6
yard wall; 1 m high
mass concrete floor, 7 cm
rock
floor with tyles
YARD
existing yard wall, to be plastered
GARDEN
gutter with stones; 0.5 m deep
MOSQUE
RIRDP/ss Sanitary Engineering
Mosque AD DARB (42)
Drawing No1
Scale 1:100
Date: 9-10-1989

Annex J

Comparison of the costs of three different systems for a standard mosque

L = length of PVC pipes = 12 meter A = area of the yard = 50 m2
T = taps washing place = 10 W = length of yard wall = 30 meter
M = number of manholes = 3 Price for excavation = YR 200/m3
Backfill yard = YR 0 Demolishing = YR 1500
Supply line = 6 meters

NR	DESCRIPTION	UNIT	UNIT PRICE	Cost (YR) (*) system 1	system 2	system 3
1	Mass concrete	m3	850	3825	2975	2975
2	Back-fill	m3	70	280	0	0
3	Brickwork(40*20*20, solid)	m2	170	14450	16830	13090
4	Brickwork(40*20*15, solid)	m2	150	2700	1650	1650
5	Foundation yard wall(40 cm high, 40 cm wide)	m'	150	5250	5250	5250
6	Plastering(1:2.5,water resistent)	m2	75	1725	2925	1275
7	Plastering(1:3.5, not w.r.)	m2	70	7280	7280	7280
8	Painting, water resistent	m2	30	1290	1290	1290
9	Floor tyles(20*20 cm)	m2	200	3000	3000	3000
10	Reinforced concrete	m3	3300	8250	14850	23100
11	Wooden / steel doors plus frames (size: 1.80*0.90 m)	nr	1000	3000	3000	3000
12	Manhole lids, diameter 50 cm	nr	300	600	600	600
13	Manhole lids, diameter 30 cm	nr	200	600	200	200
14	Flyscreen protected vent pipes (PVC, diameter 6", 3 m')	nr	300	0	600	600
15	Squatting plates with PVC drop pipes(diameter 4",50 cm)"	nr	500	0	1500	1500
16	Squatting plate with CI siphon	nr	700	2100	0	0
17	Taps plus connections, 0.5"	nr	60	780	780	780
18	Metal tank with "ball valve", 1.5m3	nr	1500	1500	1500	1500
19	Metal grate plus pit	nr	150	150	150	150
20	GS pipes, 0.5", 6m'	nr	130	390	390	390
21	GS pipes, 1.5", 6m'	nr	350	1050	1050	1050
22	Galvanized steel T's, bends, etc.			432	432	432
23	PVC pipes, 3", 6m'	nr	200	200	400	400
24	PVC pipes, 4", 6m'	nr	300	600	0	0
25	PVC T's, bends, etc.			160	80	80
26	Cast iron pipes, 4", 1 m'	nr	200	600	0	0
27	Demolishing old structures		500-2000	1500	1500	1500
28	Excavation	m3	100-1250	5800	9400	5200
	SUB TOTAL			67512	77632	76292
	Unforseen and transport	%		6751	7763	7629
	GRAND TOTAL			74263	83395	83921

PRICE LEVEL: April 1990

(*): 1 = 3 pour flush toilets, 2 pits, washing place
2 = septic tank (blocks), soakaway (normal), washing place
3 = septic tank (reinforced concrete), soakaway (normal), washing place

ALBAYDA PROVINCE

Villages with sanitary facilities at mosques, numbers are referring to annex G

Annex L