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December 1987

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
DEPARTMENT OF PUBLIC HEALTH ENGINEERING
UNICEF-ASSISTED RURAL WATER SUPPLY AND SANITATION PROGRAMME

GUIDELINE AND SPECIFICATION FOR CONSTRUCTION OF IRON REMOVAL PLANTS (IRP)

1. INTRODUCTION

Ground water is the main source of rural water supply in Bangladesh. According to an assessment by DPHE/UNICEF the ground water in a part or all of 170 Upazilas contains iron in excess of 5 ppm. People are discouraged from using handpump tubewells sunk in the affected areas, particularly those yielding water having iron concentration over 10 ppm. Hence the programme objective of reduction of diarrhoeal morbidity by providing the safe water cannot be met.

It has therefore been a priority to develop a low cost, appropriate community type iron removal plant for tubewells yielding water with high iron concentration. In order to develop an appropriate Iron Removal Plant, research and development activities have been carried out in recent years. Finally, an appropriate successful design has been developed jointly by DPHE and UNICEF in Serajganj testing area. This design was approved in the DPHE's 87th Technical Committee Meeting held on 11 August 1987. The Technical Committee decided that this design should be adopted in the current ADP Programme (1987-88) in a limited area. Further expansion will be made gradually and over the next two or three years all affected Upazilas will adopt IRP construction as a regular programme.

The drawing of the IRP is shown at ANNEX - A.

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2. ADP 1987-88

60 IRPs will be constructed during 1987-88. The Upazilawise breakdown is shown below:

DPHE Division	Sub-Division	Upazilas	No. of IRPs
Pabna	Serajganj	Serajganj	15
		Ullapara	15
		Shahjadpur	15
	Pabna (Sadar)	Bera	15

The activities will be charged to the DPHE Project for Rehabilitation, Upgrading and Maintenance.

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3. SITE SELECTION CRITERIA

Selection of a proper site meeting the following requirements is very important and the key to proper construction, operation and maintenance.

a) An IRP will be constructed in an existing tubewell only. The tubewell must be one of those constructed under DPHE programme and iron content of the tubewell water should be more than 10 ppm.

b) The beneficiaries must complete an Application Form to build an IRP and must be willing to participate and contribute in the construction and take complete responsibility for operation and routine maintenance.

c) IRPs should be constructed in a minimum of 3 and a maximum of 5 unions of the Upazila, with an allocation of 3-5 IRPs to each union.

d) Applications from neighbouring areas should be given preference in order to have IRPs constructed fairly close to one another.

4. IMPLEMENTATION PROCEDURE

a) The SDE and DPHE/UNICEF R&D Officer will hold an orientation meeting with the SAE and all the Tubewell Mechanics of each Upazila to give them a thorough knowledge of:

- the design and drawing of the IRP;
- proper construction, operation and maintenance;
- the respective roles of DPHE and the beneficiaries;
- the roles of the SAEs and Mechanics;
- site selection;
- communication and motivation of the beneficiaries;
- training of the mason who will construct the IRP;
- training of the caretakers/maintenance group;
- supervision of implementation;
- monitoring performance;

b) SAE will select the first site in each Upazila, which will be used for demonstration and training.

c) On receipt of ADP allocation, the Chairman, Upazila Water Supply and Sanitation Committee will convene a meeting of the Committee to which the UP Chairmen of selected Unions, the SDE, DPHE and DPHE/UNICEF R&D Officer should be invited. The SAE DPHE will take the initiative to hold the meeting.

d) The SDE and DPHE/UNICEF R&D Officer will describe in detail the various aspects of implementation, the responsibilities of different persons and officials, the role of the beneficiaries and the benefits conditions and limitations of the IRPs. All queries of the participants should be answered in order to make it clear to everybody.

e) After the orientation, the SAE and Tubewell Mechanics will distribute information leaflets and Application Forms (ANNEX - B) among the prospective beneficiaries whose tubewells yield water having more than 10ppm iron. The applications should be distributed in one or two clustered areas in each selected union. At the time of distribution a group meeting of male and female prospective beneficiaries should be held at each tubewell site. The SAE or TWM should describe in detail the benefits, conditions and limitations of the IRP and the respective roles of beneficiaries and DPHE to construct and operate an IRP successfully. He will also guide them in making an application.

f) The beneficiaries should be instructed to submit their application to the SAE by a certain date.

g) The SAE will inspect each site from which an application has been received to check iron content, site selection criteria and willingness of beneficiaries to contribute.

h) During the site inspection visit the SAE will again inform the applicants of the following points on benefits,conditions and limitations of the IRP at a gathering of men and women beneficiaries at site:

Benefits

- Taste will be good
- Rice will be white
- Teeth and nail will be clean
- Water will smell good and not go cloudy
- Soap will lather well
- Clothes will be white after washing
- Water receptacle will stay clean
- Hair will be clean after washing (not sticky)
- Large platform will reduce mud around the tubewell and facilitate use of water for all purposes

Conditions:

- The beneficiaries must participate by supplying some materials, carriage and labour. All beneficiaries should make some contribution.

- The beneficiaries should provide two men and two women to be trained in maintenance of the IRP from the beginning.

- The beneficiaries must take full responsibility for maintenance and repair of the IRP.

Limitations:

- The IRP will have to be cleaned regularly by the beneficiaries (every 5-25 days depending on the usage and the iron content of the water).

- Unless the IRP is shaded, the water may be slightly warm in the late afternoon and evening, which is not harmful.

- Sometimes the water may be cloudy or contain lumps of iron (e.g. immediately after cleaning, when cleaning is needed or when the IRP has been over used).

i) The SAE will submit all applications received to a meeting of the UWSSC, with findings and priority list in accordance with the site selection criteria (see Section 3 above). Th UWSSC will select 20 sites.

j) The SAE will inform the successful applicant to procure the materials within their responsibility and collect all materials within two weeks of being informed by the SAE that materials are ready for collections.

k) If any group fails to collect the materials after long period, the next priority applicant group should be selected and informed accordingly.

5. DUTIES AND RESPONSIBILITIES FOR CONSTRUCTION

a) The Beneficiaries

The beneficiaries will provide the following:

1. Carriage of all materials (i.e. from beneficiaries and DPHE) up to the site. The SAE will advise the beneficiary group where to collect departmental materials.
2. 20 cft best quality sand, including carriage to site.
3. Labour for making 10 cft khoa for aggregate.
4. "Matia Tel" or creosote for wood preservative
5. Bamboo for lid prop
6. Helper for mason

b) DPHE

The DPHE will provide the following:

From Departmental Stock

1. 5 bags cement
2. 2 CGI sheets 26 SWG x 6 ft.
3. 2 nos. 8" x 1-1/2" dia GI drain pipe
4. 1 no. 8" x 1-1/2" dia PVC overflow pipe
5. 12 sft. 1/2" galvanised wire mesh
6. 25 ft. 1/8" dia or No. 10 gauge wire
7. Requisite binding wire

From Special Procurement

1.	350 nos.	1st class bricks
2.	5 cft.	1/8" - 5/8" 1st class khoa
3.	0.6 cft.	Mangoo wood of requisite size
4.	2 nos.	1-1/2" dia G I cap
5.	1 no.	12" x 1/2" dia G.I. delivery pipe, threaded one end (t.o.e.) with bung and chain
6.	1 no.	10" x 1/2" dia G.I. delivery pipe t.o.e.
7.	1 no.	1/2" dia G.I. elbow
8.	-	Nylon rope loop
9.	2 nos.	Lid hinges
10.	4 nos.	2" x 1-1/4" bolt, nut and flat washers
11.	1 no.	Hinge for lid prop
12.	1 no.	Hook for lid prop
13.	-	Mosquito netting
14.	Contingencies	

c) The EE of the Division concerned will procure all special materials required for the Division and have them delivered to the respective Upazila stores according to the requirement.

d) The SAE in consultation with the SDE will engage a mason for 5 days.

e) The mason will be responsible for engaging and paying a carpenter to make the lid.

f) The mason will be paid Tk. 100 at commencement of work, Tk. 200 on completion of physical work and Tk. 125 upon acceptance of the IRP, one month after the completion of physical work, making a total of Tk. 425. The SDE will draw cash from the EE and make it available to the SAE to make payment to the mason. The SAE will submit the vouchers to the SDE who will adjust the advance with the EE.

g) The SAE and/or Tubewell Mechanic must inspect the progress at least twice during construction.

h) The SAE will inspect the work upon completion of construction and commission the plant. He will fill a completion report form.

i) A representative of UNICEF will inspect each IRP and certify completion to the desired standard and specifications.

j) The SDE and DPHE/UNICEF R&D Officer will check the completion report and authorize final payment, depending on final inspection one month after physical completion of work.

6. RESPONSIBILITY FOR OPERATION, CLEANING AND MAINTENANCE

a) The beneficiaries must take full responsibility for operation and cleaning and maintenance of the IRP from the date of completion.

b) After 1 month from the date of completion the beneficiaries will also take full responsibility for repair of the IRP as and when required.

c) The beneficiaries should select a caretaker family for overall upkeep of the IRP; the caretaker family should be involved in the construction from the very beginning. Two men and two women of the caretaker's family will be selected for training.

d) The caretaker family will be trained at the IRP site by the Tubewell Mechanic and the SAE at the time of completion of the IRP. Training will include explanation and demonstration of the operation, cleaning and maintenance of the IRP and handpump. Other beneficiaries should be invited to participate in the training of the caretaker family.

7. OPERATION OF IRP

At the time of caretaker training, the following points should be explained carefully to the beneficiaries, with a practical demonstration:

a) Keep the lid closed at all times unless cleaning the IRP.

b) Pump an equivalent amount into the tank, as water is drawn from the outlet.

c) Always replace the wooden bung to prevent loss of water.

d) Never block the overflow to store more water as this will reduce aeration and the effectiveness of the IRP.

e) Do not allow any one to put their hands in the water or to get inside the tank unless they are clean and have a good reason to. Especially do not allow any one to stand on the filter bed as this could break the ferro-cement perforated plates underneath.

f) Be careful when handling the ferro-cement aeration channel and channel lid as they can be broken easily. Also always shut the IRP lid gently to avoid damage to the lid, tank and hinges or to any children in the way !

g) Use the IRP water for all purposes.

A simple explanation of the operating principles of the IRP should be given, e.g.:

a) Iron is dissolved in underground water and so the water looks clean.

b) The water is mixed with air by dropping into the tank from the channel.

c) The air and iron combine in a chemical reaction and the iron is separated from the water.

d) The iron is removed by sedimentation in the large chamber and filtration through the brick chips.

8. CLEANING OF IRP

It is essential that the Caretaker Family is trained to clean the IRP. Both men and women should be trained. The IRP should be cleaned whenever the treated water becomes too cloudy, has lumps of iron floc or the flow is too slow.

The cleaning procedure is as follows:

a) Open lid and slide aeration channel clear of handpump to allow water to be drawn by bucket direct from the handpump.

b) Remove filter drain cap with wrench.

c) Using a bucket flush the filter with water from the sedimentation tank, then with clean tubewell water, until the filter drain water is fairly clean.

d) Remove sedimentation chamber drain cap and flush with clean water from the tubewell.

e) Replace drain caps using jute or cloth on the threads to prevent leaks.

f) Wash the platform and platform drain.

g) Clean dust and insects from inside the tank and lid.

h) Replace the channel, fill the tank and close the lid.

It is quite possible for one person to clean the IRP and refill the tank in under 3/4 hour. Periodically, it may be necessary to remove the filter media, wash it with clean water on the platform and replace it in the filter chamber.

9. MAINTENANCE OF IRP

If the IRP has been properly constructed, the only items likely to need repair are the movable parts, i.e. the ferrocement channel, ferrocement filter plates and the lid. The repair of the lid should be within the competence of any local carpenter. Advice should, however, be given on the repair of the ferrocement parts, namely to clean of all traces of iron deposit, chip the edges to an angle, soak in water, grout, repair with strong cement mortar and cure.

The pump handle fulcrum pins should be oiled regularly with any type of oil (mustard oil works well). This will prevent the handle from wearing out so fast and make pumping very easy.

10. MONITORING PERFORMANCE OF IRP

a) The SAE will record the following on the date of completion:

(1) Flow of the IRP, (2) raw water iron content, (3) treated water iron content, (4) approximate no. of beneficiaries.

b) The SAE will then make bi-weekly visits to each IRP and record the findings as per proforma attached in ANNEX - C.

c) The SAE will prepare quarterly reports based on the above data as per following proforma attached in ANNEX - D and send it to SDE, DPHE, UNICEF Zone office, Bogra, the EE VS II DPHE, Dhaka and WES Section, UNICEF - Dhaka.

Colin Glennie
Chief, WES Section
UNICEF, Dhaka
10/12/87

M H Khan
Chief Engineer
Department of Public Health Engg.
Dhaka, Bangladesh
10.12.87

CG/psb
ref: IRP.DOC/CG-8

IRON REMOVAL PLANT
PERFORMANCE RECORD

ANNEX – C

Particular and location	Date first put into operation	Date of visit	Raw water iron content ppm	Treated water iron content ppm	% iron removal	Discharge * gpm	Dates of cleaning done since last visit	Approx. no. of beneficiaries	Remarks, if any, particularly on maintenance

* Discharge in gallons per minute measured when IRP filled to overflow level.

One sheet should be kept for each IRP so that findings of all visits to a particular IRP can be recorded chronologically in the same sheet.

A parallel sheet should be kept with caretaker family and filled in after each inspection.

ANNEX - D

IRON REMOVAL PLANTS
QUARTERLY SUMMARY OF PERFORMANCE

REPORTS OF THE QUARTER ENDING .....

Location/ Particulars of the IRP	Average raw water iron content (ppm)	Average treated water iron content (ppm)	% iron removal (average)	Average filter run (days)	Approx no. of benefi-ciaries	Any other useful information (merits and demerits) and on maintenance

Copy to: EE, PHE, ...
SDE, PHE, ...
UZO, Bogra
EE VS-II, Dhaka
UNICEF, WES, Dhaka

জনস্বাস্থ্য প্রকৌশল অধিদপ্তর ও ইউনিসেফের সহায়তায়
" নলকূপ আয়রন রিমুভ্যাল প্লান্ট "
নির্মাণের আবেদন পত্র

সংযোজনী-খ

" ক বিভাগ "

চেয়ারম্যান,
উপজেলা পানি সরবরাহ ও সেনিটেশন কমিটি
_____উপজেলা।
_____।

_____ইউনিয়নের _____গ্রামের _____
দাগে অবস্থিত সরকারী নলকূপের তত্ত্বাবধায়ক আমি _____পিতা_____
উপকারভোগীগণের পক্ষে জানাইতেছি যে আলোচ্য নলকূপের পানিতে মাত্রাতিরিক্ত আয়রন হওয়ায় স্বচ্ছন্দে ব্যবহার করা যায় না, ফলে আমরা সকলেই অসুবিধা ভোগ করিতেছি। নলকূপটিই আমাদের পানির প্রধান উৎস।

এমতাবস্থায় উক্ত নলকূপটির পার্শ্বে প্রচলিত নিয়মকানুন মোতাবেক স্বেচ্ছাশ্রমের ভিত্তিতে একটি আয়রন রিমুভ্যাল প্ল্যান্ট নির্মাণ করিতে ইচ্ছুক। আমরা অংগীকার করিতেছি যে :-

১। উল্লেখিত আয়রন রিমুভ্যাল প্ল্যান্ট নির্মাণের প্রয়োজনীয় মালামাল পরিবহণ খরচ আমরা বহন করিব।

২। ২০ ঘন ফুট ভাল বালু, প্রয়োজনীয় মাটিয়া তৈল ও বাঁশের খুঁটি সরবরাহ করিব।

৩। নির্মাণ কাজে এবং ১০ ঘনফুট খোয়া ভাঙ্গানোর জন্য শ্রম দিব পূর্ণ সহযোগিতা দান করিব।

৪। নির্মাণ সামগ্রীর পূর্ণ হেফাজত করিব। মালামাল আমাদের নিকট থাকাকালীন কোনরূপ চুরি বা নষ্ট হইলে ক্ষতিপূরণ দিতে বাধ্য থাকিব।

৫। প্ল্যান্টটি রক্ষণাবেক্ষণ, মেরামত ও ব্যবহার করিব। ইহার কোনরূপ ক্ষতি সাধন করিব না।

৬। প্ল্যান্ট নিয়মিত পরিস্কার রাখিব ও ইহার পানি সকলে সকল কাজে ব্যবহার করিব এবং অন্যান্যদেরকে ইহার সুফল সম্বন্ধে অবগত করিব।

৭। জনস্বাস্থ্য প্রকৌশল বিভাগের নিয়মকানুন মানিয়া চলিব এবং এ সম্পর্কে তাহাদের দেয় পরামর্শ মানিয়া চলিব এবং কোন শর্ত খেলাপ করিলে জনস্বাস্থ্য প্রকৌশল বিভাগের সিদ্ধান্ত মানিয়া চলিব।

৮। আমরা আয়রন রিমুভ্যাল প্ল্যান্ট এর উপকারীতা সম্পর্কে পূর্ণ সজাগ আছি।

-: উপকারভোগীগণের পক্ষে :-

ক্রমিক নং	নাম	পিতার নাম	দস্তখত/টিপসহি
১।			
২।			
৩।			
৪।			
৫।			
৬।			
৭।			
৮।			
৯।			
১০।			

"খ" অংশ

আমি _____ চেয়ারম্যান _____ ইউনিয়ন পরিষদ, উপজেলা _____ সুপারিশ করিতেছি যে স্বেচ্ছাশ্রমের ভিত্তিতে আয়রন রিমুভ্যাল প্ল্যান্টটি নির্মাণ করা যাইতে পারে। আমি এই মর্মে নিশ্চয়তা প্রদান করিতেছি যে তত্ত্বাবধায়ক ও উপকারভোগীগণ উল্লেখিত শর্তাবলী মানিয়া চলিবে এবং তাহার যদি কখনও উক্ত নিয়মাবলী হইতে বিচ্যুত হন কিংবা জনস্বাস্থ্য প্রকৌশল বিভাগের কোন আলাপালের ক্ষতি সাধন করেন তাহা হইলে জনস্বাস্থ্য প্রকৌশল বিভাগের সিদ্ধান্ত মানিয়া লইতে তাহাদিগকে বাধ্য করিব

চেয়ারম্যান
_____ ইউনিয়ন পরিষদ

"গ" অংশ

(নলকূপের বর্তমান অবস্থা সরেজমিনে পরিদর্শনান্তে লিপিবদ্ধ করিতে হইবে)

১। নলকূপটি সরকারী কি না _____

২। নলকূপ রেজিষ্টার অনুযায়ী ক্রমিক নং _____

৩। পানির আয়রনের পরিমান _____

৪। উপকারভোগীগণের আনুমানিক সংখ্যা _____

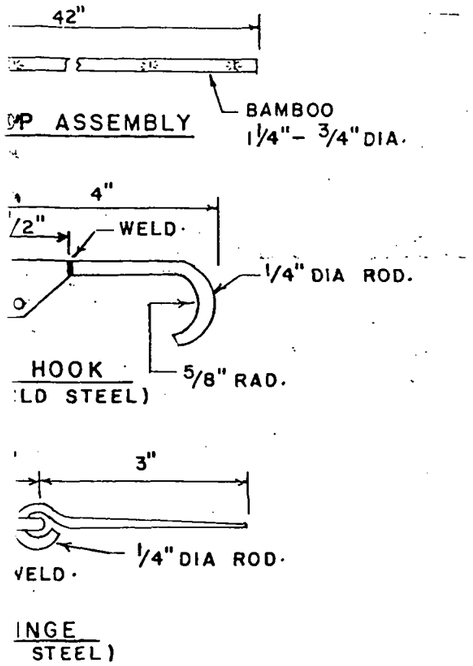
উপসহকারী প্রকৌশলী
জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
_____ উপজেলা

"ঘ" অংশ

অনুমোদন করা হইল/অনুমোদন করা হইল না।

চেয়ারম্যান
উপজেলা পরিষদ
ও
উপজেলা পানি সরবরাহ সেনিটেশন কমিটি
_____ উপজেলা।

ফয়েজার রহমান



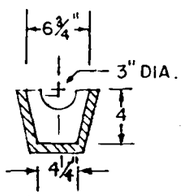
USE DOVETAIL JOINTS ON CORNERS.

'X1"
"WOODEN

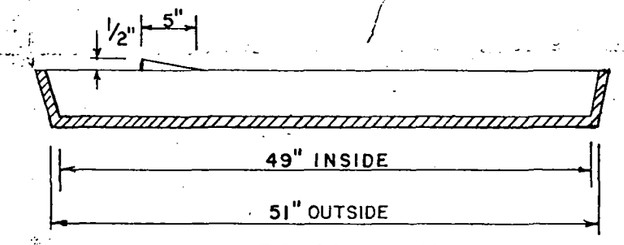
USE MANGO WOOD FOR THE FRAME. PAINT WITH LOCALLY AVAILABLE WOOD PRESERVATIVE.

-Y SEALED & FLATTENING.

HEET
S".

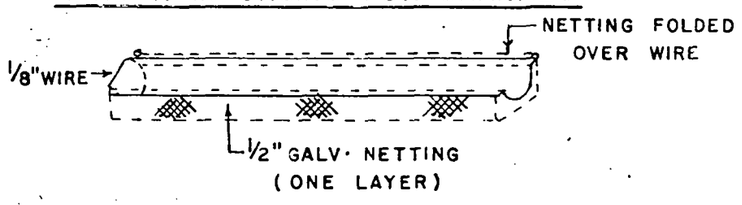


SECTION Y-Y



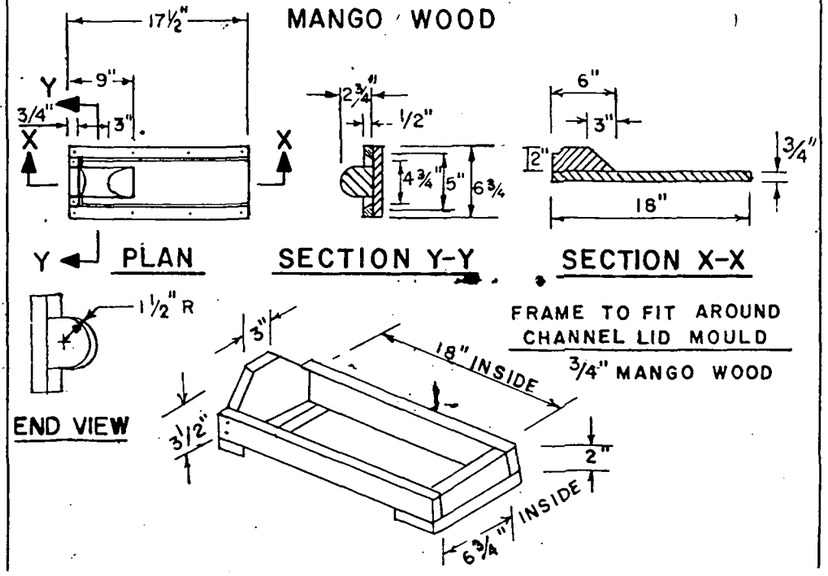
SECTION X-X

WIRE REINFORCING FOR CHANNEL



① USE MOULD TO FORM REINFORCING WIRE SHAPE.
② OIL INSIDE MOULD OR USE POLYTHENE SHEET.
③ PLASTER INSIDE MOULD - 1 CEMENT : 2 SAND ¾" THICK.
④ LAY IN REINFORCING & PLASTER TO ¾" THICKNESS. LEVEL WITH TOP OF MOULD.
⑤ MAKE 32 HOLES ⅝" DIA. AS IN MAIN DRAWING.
⑥ CURE FOR 2 WEEKS.

CHANNEL LID MOULD – FERROCEMENT OR JUTE CEMENT MANGO WOOD



FRAME TO FIT AROUND CHANNEL LID MOULD
¾" MANGO WOOD

3'-6" HINGE FITTED BAMBOO LID PROP		1 ,,
HOOK FOR LID PROP		1 ,,
½"X8" WOOD SCREWS		2 ,,
COAL TAR PAINT		1 seer.
½" GALV. WIRE NETTING	CHANNEL 1'-6"X 4'-6"	1 piece.
	PERFORATED PLATE 1'-6"X1'-10"	2 ,,
⅛" OR 10 GAUGE WIRE	CHANNEL 5'-4"	2 ,,
	PERFORATED PLATE 6'-4"	2 ,,
MOSQUITO COMPLETE WITH WEIGHTS & STRING		as reqd.
NYLON STRING		as reqd.
BINDING WIRE		as reqd.

TOOLS / MOULDS REQUIRED

CHANNEL MOULD	1 nos.
CHANNEL LID MOULD	1 ,,
PERFORATED PLATE MOULD	2 ,,
MIXING PLATFORM	1 ,,
SMALL FLOAT FOR CHANNEL MOULD	1 ,,
⅛" SIEVE	1 ,,
⅝" SIEVE	1 ,,

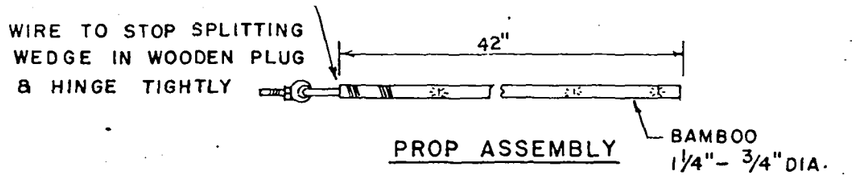
S.E/P.C
May be abandoned
E.E PHE V.S-II

DPHE
GOVERNMENT OF BANGLADESH
DHAKA

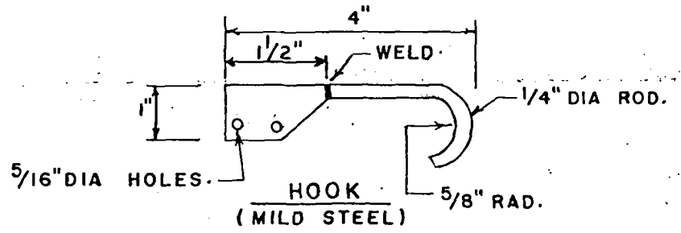
UNICEF
G.P.O BOX 58
DHAKA
BANGLADESH

IRON REMOVAL PLANT

DRAWN BY : MD. SALIM / BEN YOUNG	SCALE: MAIN DRGS: 1"=1'-0"	OTHERS: NOT TO SCALE
APPROVED BY: C. E. DPHE		
APPROVED BY: C. E. GLENNIE UNICEF	DRG. NO. IRP-01	DATE:

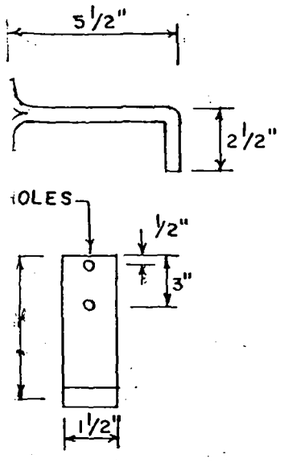


PROP ASSEMBLY

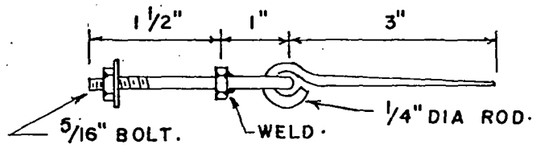


HOOK
(MILD STEEL)

ILS

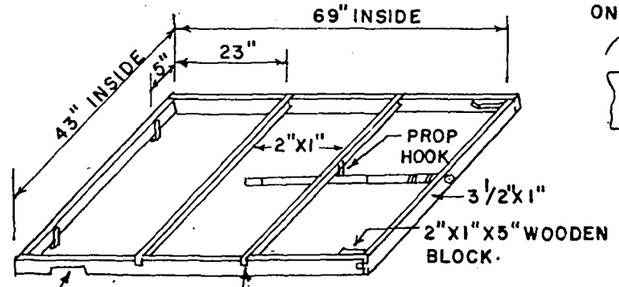


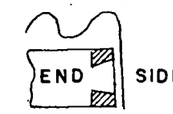
"x 5/16" BOLT
& FLAT WASHER.



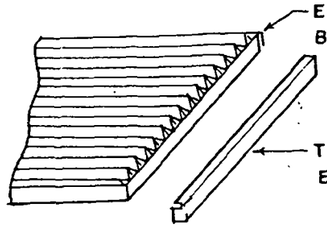
HINGE
(MILD STEEL)

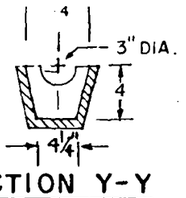
LID ASSEMBLY



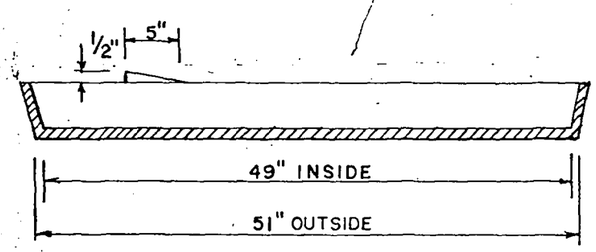


USE MANGO WOOD FOR THE FRAME. PAINT WITH LOCALLY AVAILABLE WOOD PRESERVATIVE.



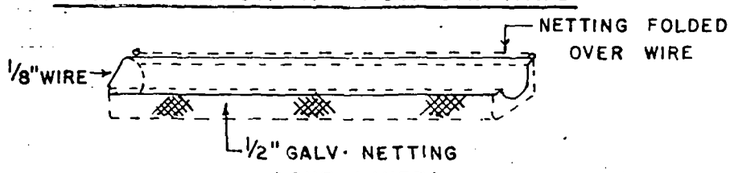


SECTION Y-Y



SECTION X-X

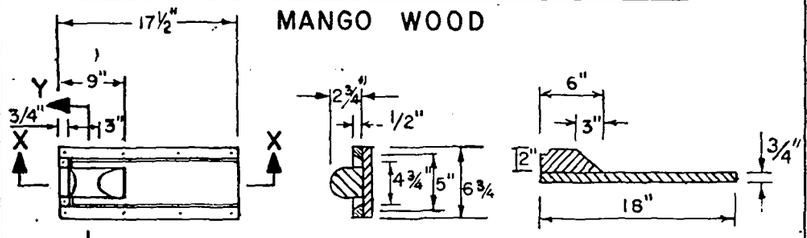
WIRE REINFORCING FOR CHANNEL



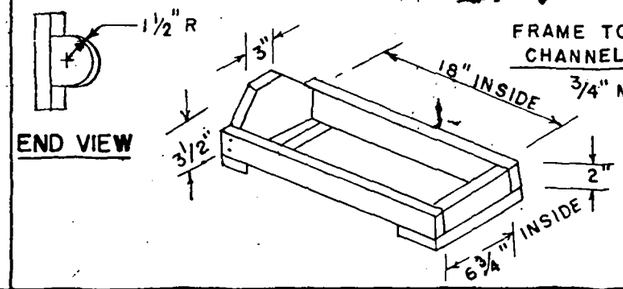
1. USE MOULD TO FORM REINFORCING WIRE SHAPE.
2. OIL INSIDE MOULD OR USE POLYTHENE SHEET.
3. PLASTER INSIDE MOULD – 1 CEMENT : 2 SAND ¾"THICK.
4. LAY IN REINFORCING & PLASTER TO ¾" THICKNESS. LEVEL WITH TOP OF MOULD.
5. MAKE 32 HOLES 5/16" DIA. AS IN MAIN DRAWING.
6. CURE FOR 2 WEEKS.

CHANNEL LID MOULD – FERROCEMENT OR JUTE CEMENT

MANGO WOOD



Y PLAN — SECTION Y-Y — SECTION X-X



FRAME TO FIT AROUND CHANNEL LID MOULD
¾" MANGO WOOD

3'-6" HINGE FITTED BAMBOO LID PROP ·

HOOK FOR LID PROP · · · · · · · · · · · · · · · ·

½"X8" WOOD SCREWS · · · · · · · · · · · · · · ·

COAL TAR PAINT · · · · · · · · · · · · · · · · ·

½" GALV. WIRE NETTING — CHANNEL 1'– PERFORATED P

⅛" OR 10 GAUGE WIRE — CHANNEL 5'– PERFORATED P

MOSQUITO COMPLETE WITH WEIGHTS & ST

NYLON STRING · · · · · · · · · · · · · · · · · ·

BINDING WIRE · · · · · · · · · · · · · · · · · ·

TOOLS / MOULDS REQU

CHANNEL MOULD · · · · · · · · · · · · · · · · ·

CHANNEL LID MOULD · · · · · · · · · · · · · · ·

PERFORATED PLATE MOULD · · · · · · · · · ·

MIXING PLATFORM · · · · · · · · · · · · · · · ·

SMALL FLOAT FOR CHANNEL MOULD · · ·

⅛" SIEVE ·

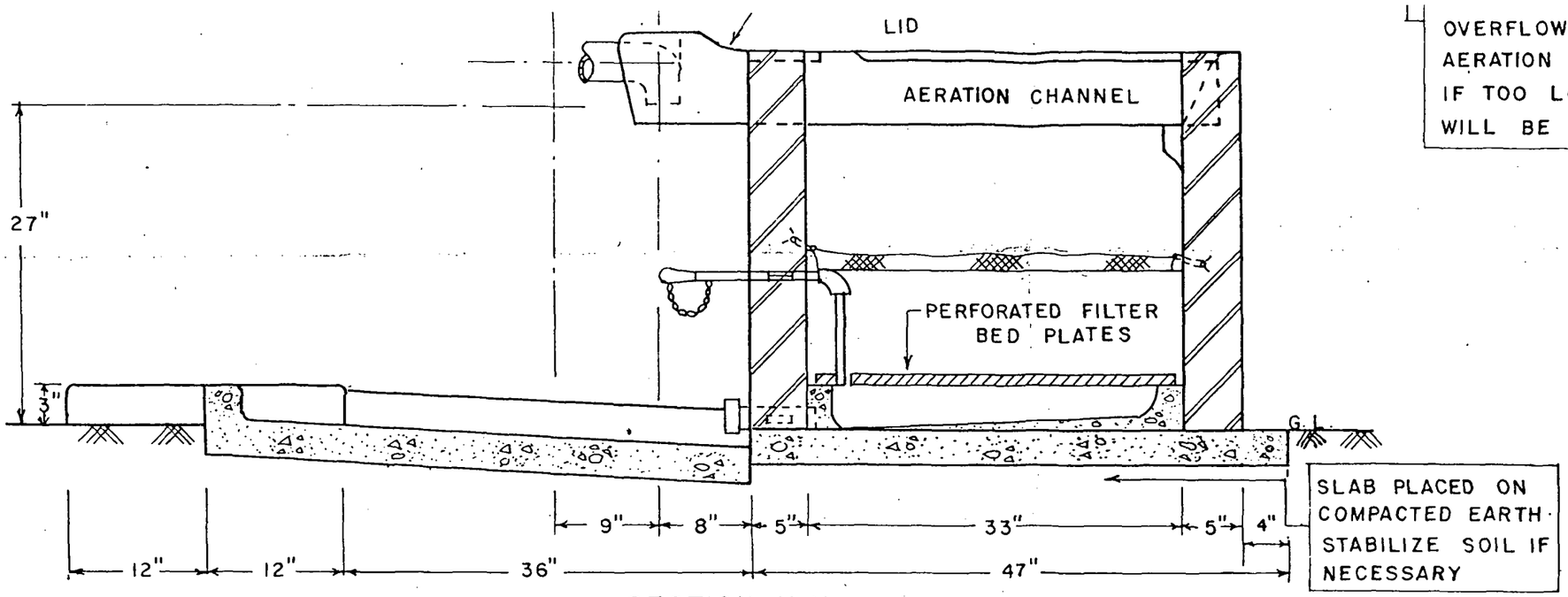
⅝" SIEVE ·

S.E/P.C
May be approved
E.E PHE V.S-II

DPHE
GOVERNMENT OF BANGLADESH
DHAKA

UNICEF
G.P.O BOX 58
DHAKA
BANGLADESH

DRAWN BY : MD. SALIM / BEN YOUNG	SCALE: MAIN DRGS:
APPROVED BY: C. E. DPHE	
APPROVED BY: C. E. GLENNIE UNICEF	DRG. NO. 1



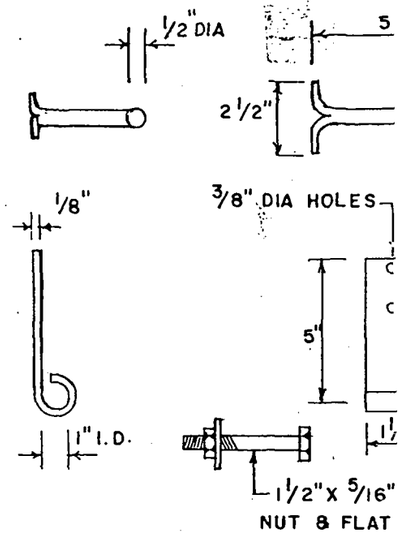
OVERFLOW PLACED TOO HIGH, AERATION WILL BE REDUCED. IF TOO LOW, DELIVERY FLOW WILL BE REDUCED.

SECTION X-X

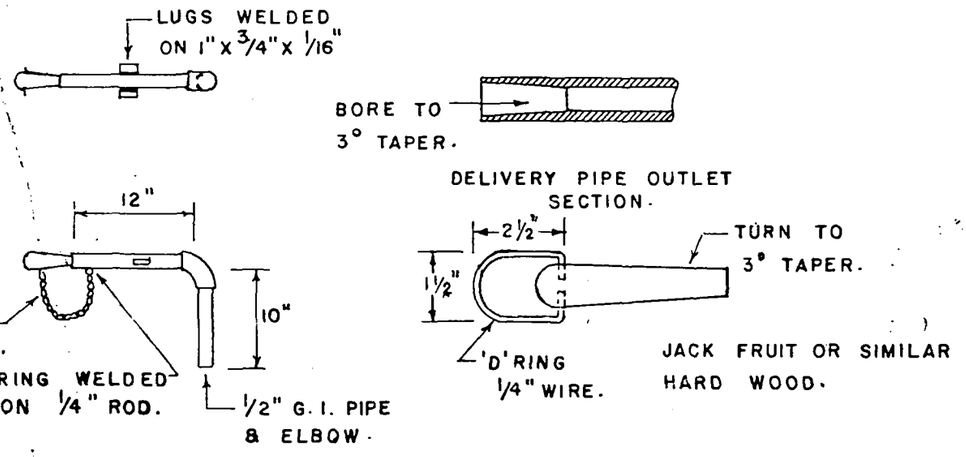
WITHOUT LID
OR BRICK CHIPS

LID HINGE DETAILS

(MILD STEEL)



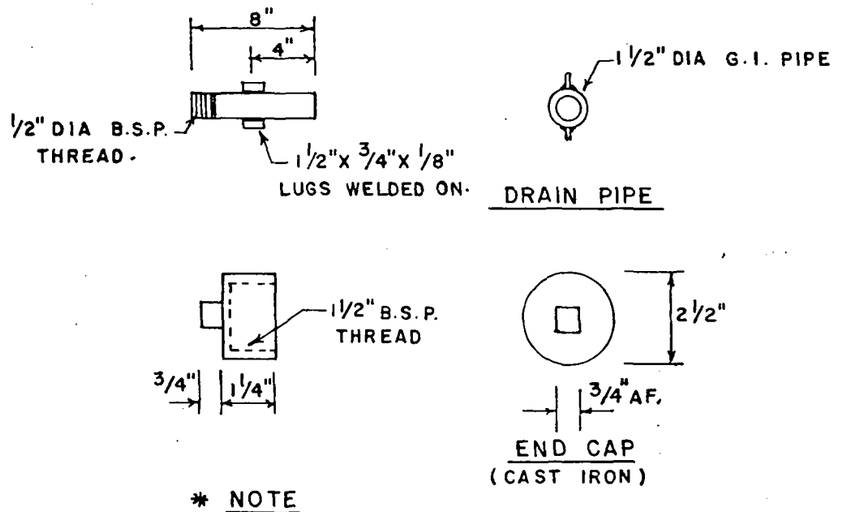
DETAILS OF DELIVERY PIPE



* NOTE

ENSURE THE PIPE IS CLEAN & FREE OF GREASE BEFORE CEMENTING.

DETAILS OF FLUSHING DRAIN

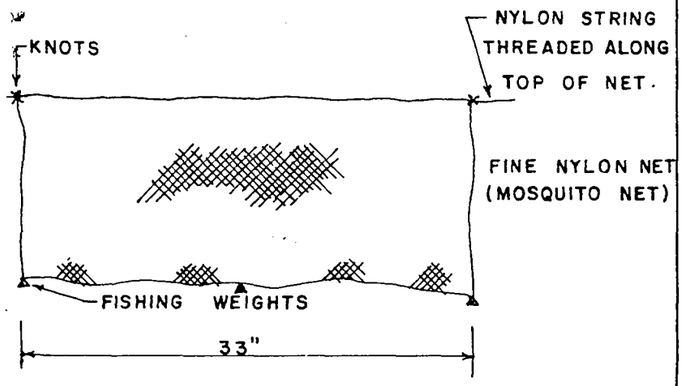


* NOTE

ENSURE THE PIPE IS CLEAN & FREE OF GREASE BEFORE CEMENTING.

CUT R
FOR C
LID.

DETAILS OF NETTING



* NOTE

THESE NETS NEED ONLY BE USED WHERE RAW WATER IRON CONTENT EXCEEDS 15 P.P.M.

BRICK CHIP FILTER DETAILS

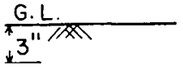
8" DEEP	MADE OF FIRST
1/8"- 5/8"	CLASS BRICKS

GRAVEL SHOULD WORK JUST AS WELL. A MORE EVEN GRADING SHOULD GIVE BETTER PERFORMANCE. i.e. 1/8"- 1/4"

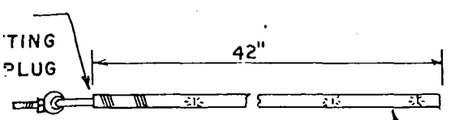
pprox.

* NOTE

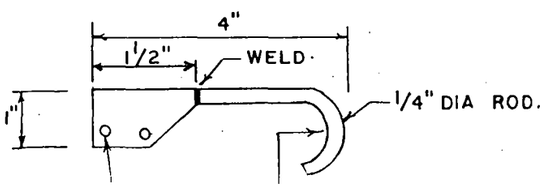
DO NOT USE A SIZE LESS THAN 1/8"



LID PROP DETAILS



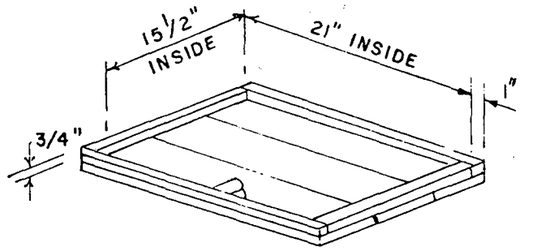
PROP ASSEMBLY



FERROCEMENT ITEMS

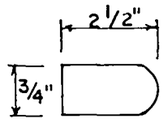
PERFORATED PLATE DETAILS—2 REQD.

REINFORCEMENT — MAKE 1/8" WIRE FRAME AROUND EDGE AND COVER WITH ONE LAYER OF 1/2" GALVANISED WIRE MESH. MAKE PLATES USING THE METHOD DESCRIBED IN FERROCEMENT CHANNEL DETAILS. MAKE 80 HOLE 1/4" DIA AS SHOWN IN THE MAIN DRAWING.

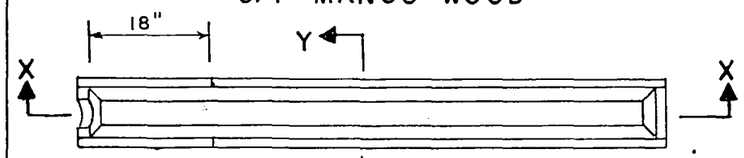


PERFORATED PLATE MOULD

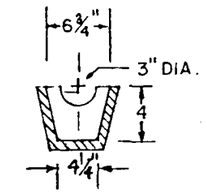
ONE MOULD IN CENTRE OF LONG SIDE (TO PROVIDE GAP FOR DELIVERY PIPE)



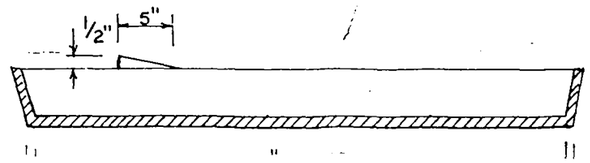
CHANNEL MOULD DETAILS
3/4" MANGO WOOD



Y PLAN



SECTION Y-Y



MATERIALS REQUIRED FOR CONSTRUCTION OF AN IRON REMOVAL PLANT

FIRST CLASS BRICKS	FOR MASONRY	200	350 nos.
	FOR AGGREGATE CHIPS (10 cft)	100	
	FOR FILTER CHIPS (5 cft, 1/8"-5/8")	50	
CEMENT			5 bags.
SAND			20 cft.

CEMENT RATIOS	
CONCRETE	5 : 2 1/2 : 1
MORTAR	4 : 1
FERROCEMENT	3 : 1
PLASTER (OUTSIDE)	4 : 1
PLASTER (INSIDE)	3 : 1

NEAT CEMENT FINISHING.

OUT SIDE

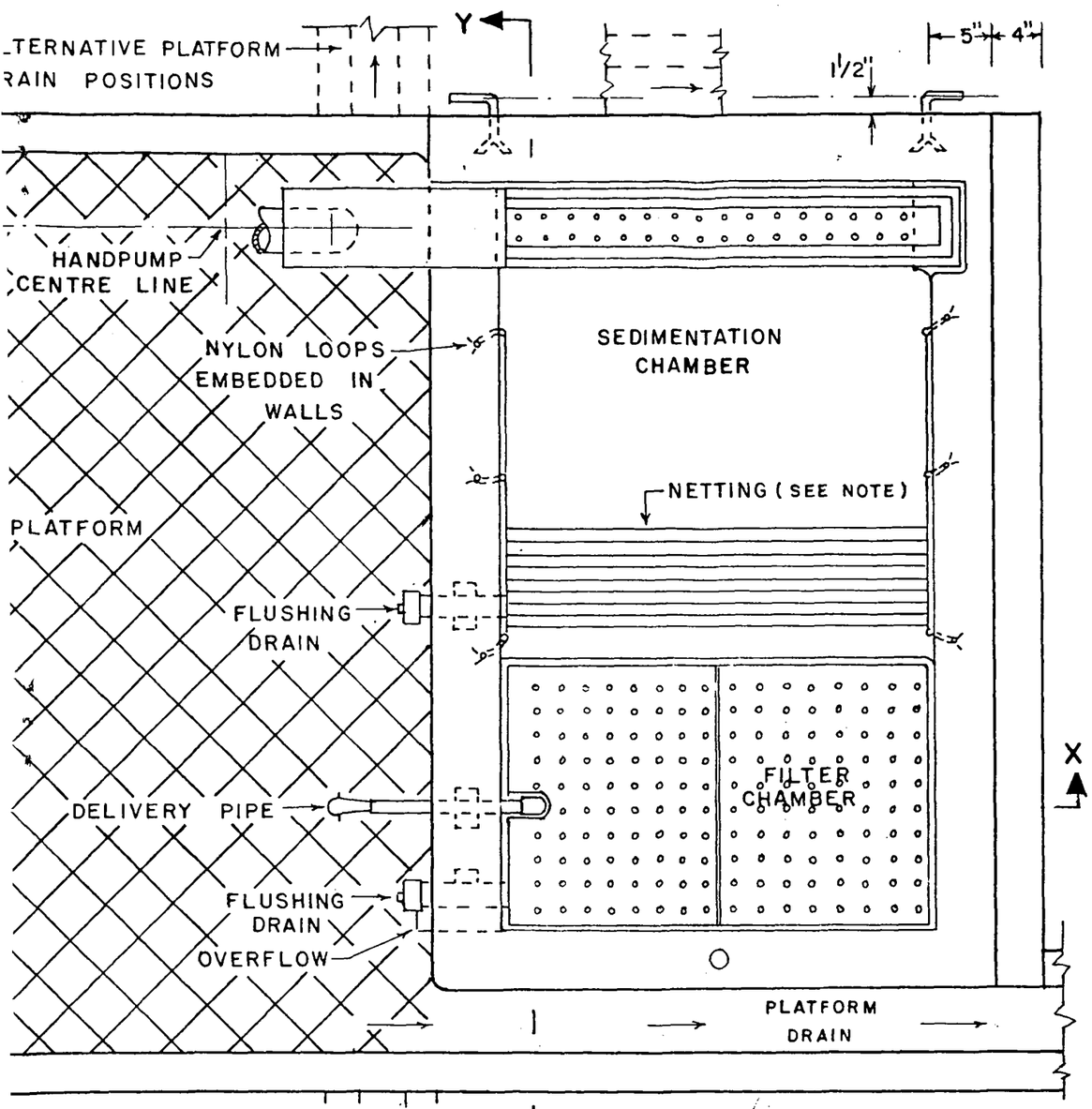
PLATFORM & ALL FRONT WALL. THREE SIDES 10" HIGH.

INSIDE

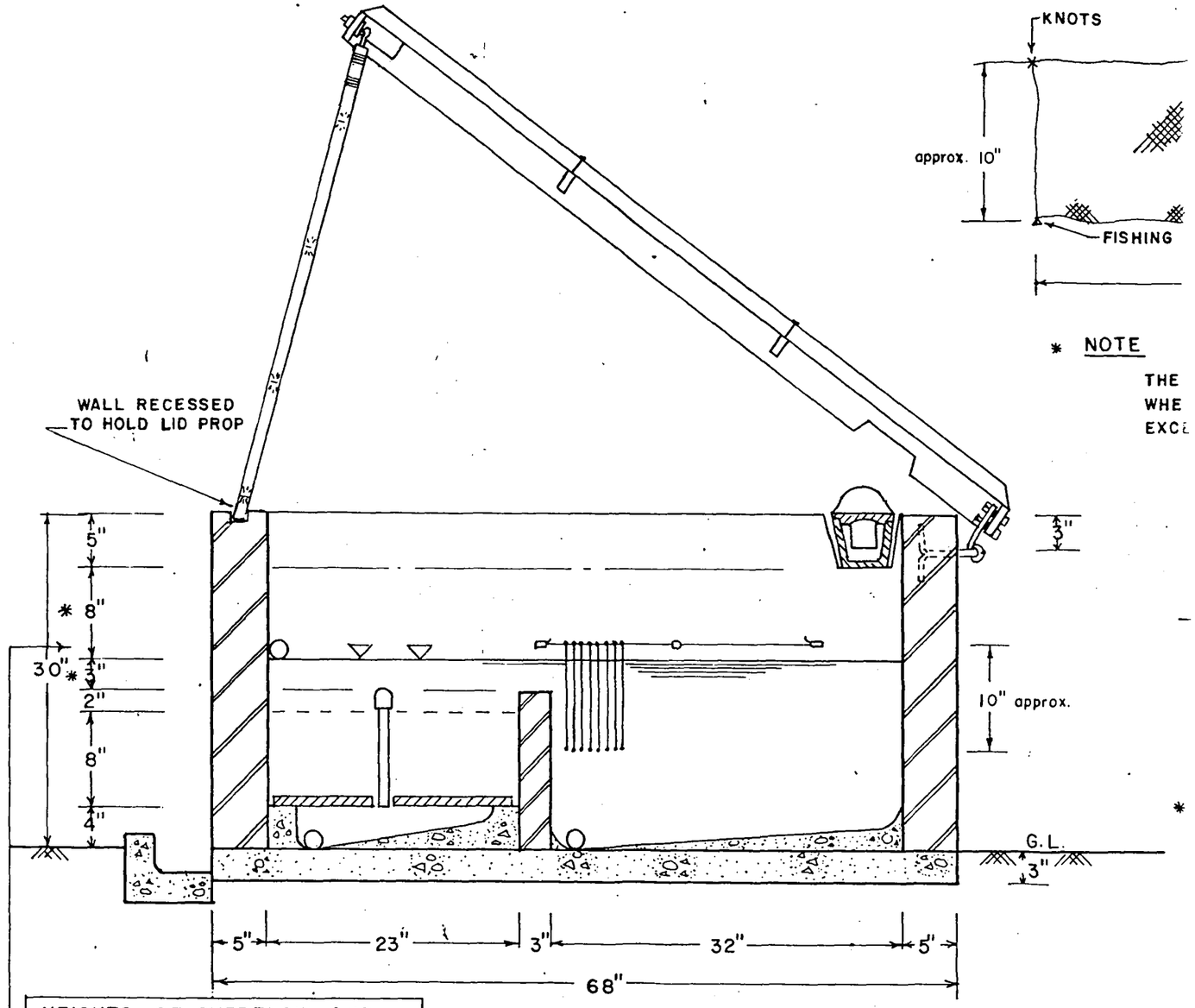
CHANNEL AREA FULL HEIGHT. REMAINING WALLS 19" HIGH.

WOOD : (Mango or similar inexpensive variety)	3 1/2" x 1" x 72"	: 2 pieces.
	2" x 1" x 48"	: 4 pieces.
CORRUGATED G.I. SHEET 6' x 3' x 26 SWG		2 pieces.
1 1/2" Ø G.I. DRAIN PIPE		2 nos.
1 1/2" Ø G.I. END CAP		2 nos.
12" x 1/2" Ø G.I. DELIVERY PIPE (Complete with wooden bung & chain)		1 ,,
10" x 1/2" Ø G.I. DELIVERY PIPE		1 ,,
1/2" Ø G.I. ELBOW		1 ,,
6" x 1 1/2" Ø P.V.C. OVERFLOW PIPE		1 ,,
NYLON ROPE LOOP		4 ,,
LID HINGE		2 pairs.
BOLT, NUT & FLAT WASHER (2" x 1/2")		4 nos.
3'-6" HINGE FITTED BAMBOO LID PROP		1 ,,
HOOK FOR LID PROP		1 ,,
1/2" x 8" WOOD SCREWS		2 ,,
COAL TAR PAINT		1 seer.
1/2" GALV. WIRE NETTING	CHANNEL 1'-6" x 4'-6"	1 piece.
	PERFORATED PLATE 1'-6" x 1'-10" ..	2 ,,
1/8" OR 10 GAUGE WIRE	CHANNEL 5'-4"	2 ,,
	PERFORATED PLATE 6'-4"	2 ,,

DETAI

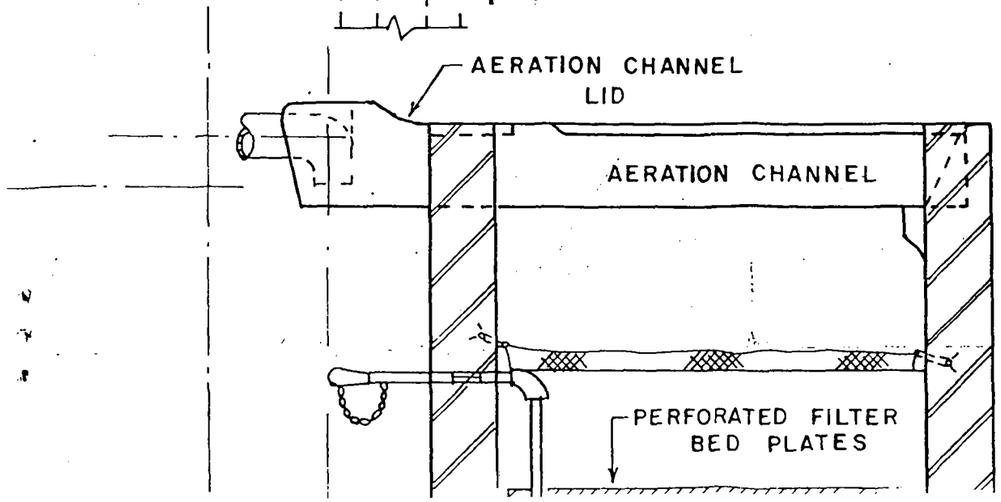


PLAN

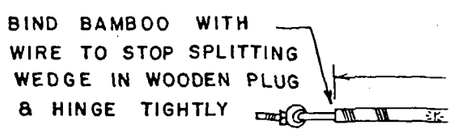


SECTION Y-Y

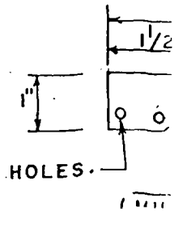
HEIGHTS OF OVERFLOW AND DELIVERY PIPE ARE CRITICAL FOR PLANT PERFORMANCE. IF OVERFLOW PLACED TOO HIGH, AERATION WILL BE REDUCED. IF TOO LOW, DELIVERY FLOW WILL BE REDUCED.



LID



PROP



LID HINGE DETAILS

ALTERNATIVE PLATFORM DRAIN POSITIONS

Y

5" 4"

1½"

9"

9"

75"

HANDPUMP CENTRE LINE

NYLON LOOPS EMBEDDED IN WALLS

SEDIMENTATION CHAMBER

NETTING (SEE NOTE)

PLATFORM

FLUSHING DRAIN

FILTER CHAMBER

X

DELIVERY PIPE

FLUSHING DRAIN

OVERFLOW

3"

PLATFORM DRAIN

PLAN

AERATION CHANNEL LID

AERATION CHANNEL

27"

PERFORATED FILTER BED PLATES

WALL RECESSED TO HOLD LID PROP

5"

* 8"

30" * 3"

2"

8"

4"

5" 23"

HEIGHTS OF OVERFLOW AND DELIVERY PIPE ARE CRITICAL FOR PLANT PERFORMANCE. IF OVERFLOW PLACED TOO HIGH, AERATION WILL BE REDUCED. IF TOO LOW, DELIVERY FLOW WILL BE REDUCED.