UNITED NATIONS CHILDREN'S FUND

UNICEF

BANGLADESH DEEP-SET HANDPUMP MARK I

(TARA PUMP)

ALBUM OF DRAWINGS

March 1984 (First Revision)
January 1983

PARTICIPATING AGENCIES

D.P.H.E., Government of Bangladesh (Chief Engineer)
U N I C E F, Dhaka, Bangladesh (K. Gibbs)
WORLD BANK, Dhaka, Bang[illegible]
M.A.W.T.S., Mirpur, Dhaka, Ban

GENERAL NOTES : THE TARA PUMP

A. The "Bangladesh Deep Set Handpump Mk.I", alternatively referred to as the "Bangladesh Low Lift Handpump Mk I", will now be called the TARA PUMP. "Tara" means "Star" in Hindi and Bangla. In addition, maintenance can be performed very quickly (tara-taree in Bangla) on the pump, by the caretaker.

B. The Table of Drawings follows, T.00

C. All dimensions are in MM unless specifically otherwise stated.

D. For Concept of the Pump, see page T.101

E. For pipe sizes, types and specifications, see page T 102.

F. For sinking procedure, sequence and pipe orientations, see page T.103.

G. For maintenance procedure, see page T.104

H. For pump rod forces, see page T.105

I. In the initial stage of its development the pump is being manufactured soley by the MIRPUR AGRICULTURAL WORKSHOP AND TRAINING SCHOOL (MAWTS), Mirpur Section 12, Pallabi, Dhaka-16, Bangladesh. Each pump component on the drawings in this Album contains a reference number (MAWTS REF.), corresponding to the production number of MAWTS.

UNICEF
G.P.O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

DRG. NO.

SHEET OF

TABLE OF DRAWINGS

	NO.	REV.
GENERAL		
Complete Handpump and Tubewell Assembly	T 01	1
HANDLE & PUMP ROD		
Pump Handle Assembly	T 11	1
Finger Trap / End Cap / Handle Nut	T 12	1
Top Connector Assembly	T 13	1
Hexagonal Bolt / Retaining Ring / Locking Ring / Connector Bush	T 14	1
Locking Pin	T 15	-
Retrieving Rod	T 16	1
PISTON & CHECK VALVE		
Piston Assembly	T 21	1
Rubber Valve / Connector Bush / Connector Rod	T 22	1
Aluminium Plate	T 23	1
Leather Cup	T 24	1
Stiffener Ring	T 25	1
Grapple Assembly	T 26	1
Check Valve Assembly	T 27	1
Check Valve Guide	T 28	1
Washer (Top & Bottom) / Seal / Valve Seal	T 29	-
Check Valve Body	T 30	-
PUMP HEAD		
Pump Head Assembly	T 31	1
Top Guide	T 32	1
Bush / M8 Nut / Set Screw	T 33	1
Discharge Spout / Lug	T 34	1
Pump Body	T 35	1
Adaptor / Pipe Insert	T 36	1

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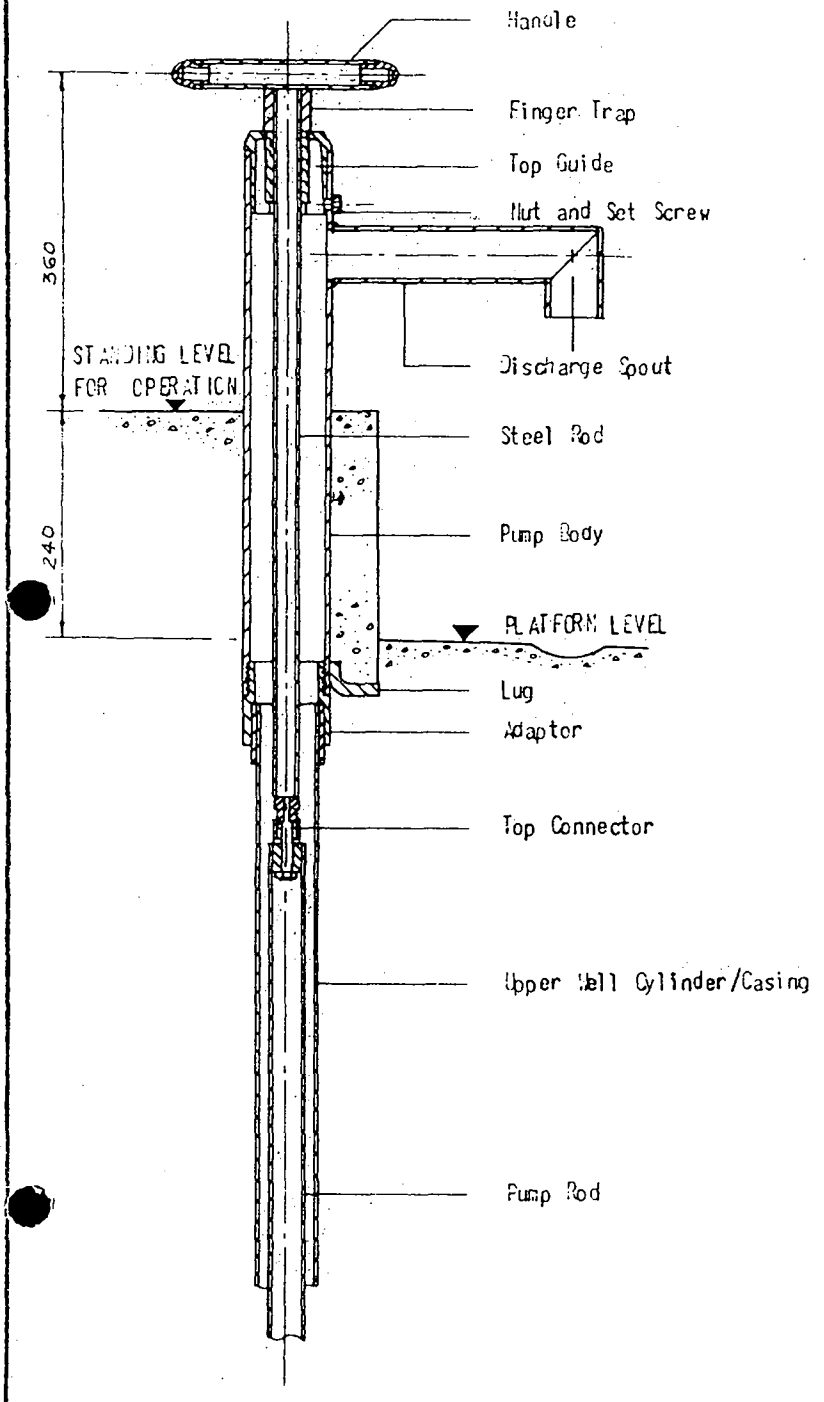
BANGLADESH DEEP-SET HANDPUMP MARK I

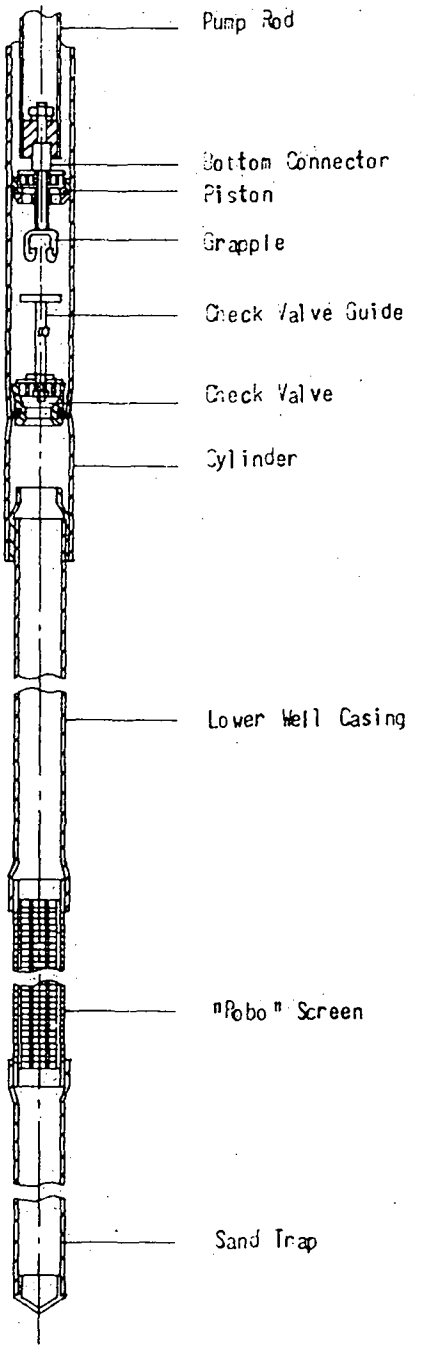
DRG. NO. T.00

TABLE OF DRAWINGS (contd.)

	NO.	REV.
ADAPTOR FROM UPPER TO LOWER WELL		
Cylinder Assembly	T 41	1
Cylinder Pipe	T 41	1
Bell Connector	T 41	1
ROBOSCREEN AND SAND TRAP		
Roboscreen	T 51	1
Sand Trap	T 52	-
PLATFORM	T 61	-



UPPER WELL



LOWER WELL

REVISIONS				SIGNATURE	DATE
NO.	DESCRIPTION	DATE	APPD.	DESIGNED BY	
1.	Connectors, Handle, Check Valve	Aug'83			
	Top Guide, Finger Trap, End			DRAWN BY	
	Cap, Grapple, Check Valve				6/11/83
	Guide, Discharge Spout,			CHECKED BY	
	Cylinder				6.11.83
				APPROVED BY	

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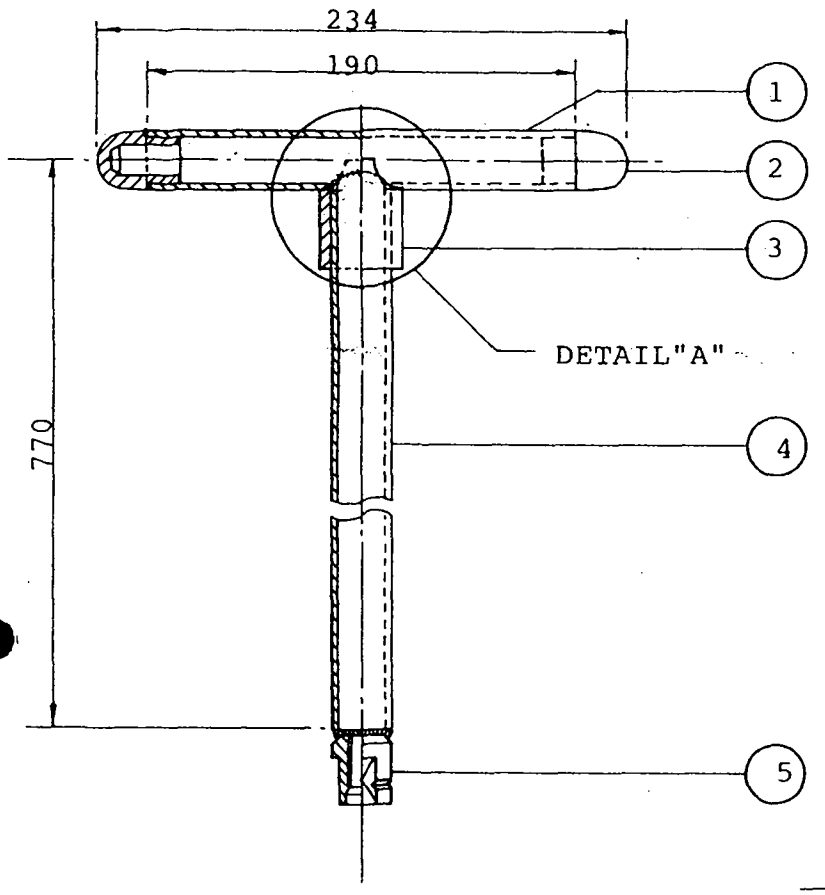
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE: COMPLETE HANDPUMP AND TUBEWELL ASSEMBLY

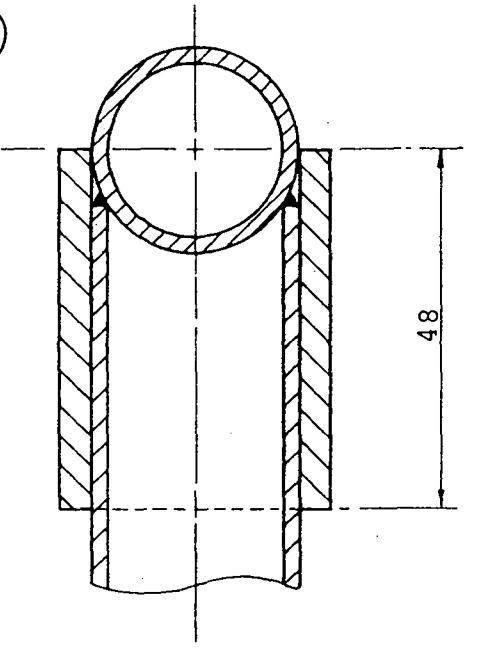
SCALE	DRG. NO.	REV.
1 : 8	T 01	1



(Scale:1:3)

NOTES

1. For General Arrangement see DRG.NO.T 01.
2. Handle and Steel rod to be from 20mm dia. heavy series mild steel tube.
3. Cut-off sizes:
   Handle:20x190mm
   Steel Rod:20x760mm



DETAIL"A"
(Cross Section)
(Scale:1:1)

No.	Description	Drg.Ref.
1	HANDLE	SeeNotes
2	END CAP	T 12
3	FINGER TRAP	T 12
4	STEEL ROD	SeeNotes
5	HANDLE NUT	T 12

MAWTS REF.-PD 345

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	End cap, Finger trap Steel rod, Handle nut.	Aug. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	Ed Hall	Mar. '84
CHECKED BY		
APPROVED BY		April '84

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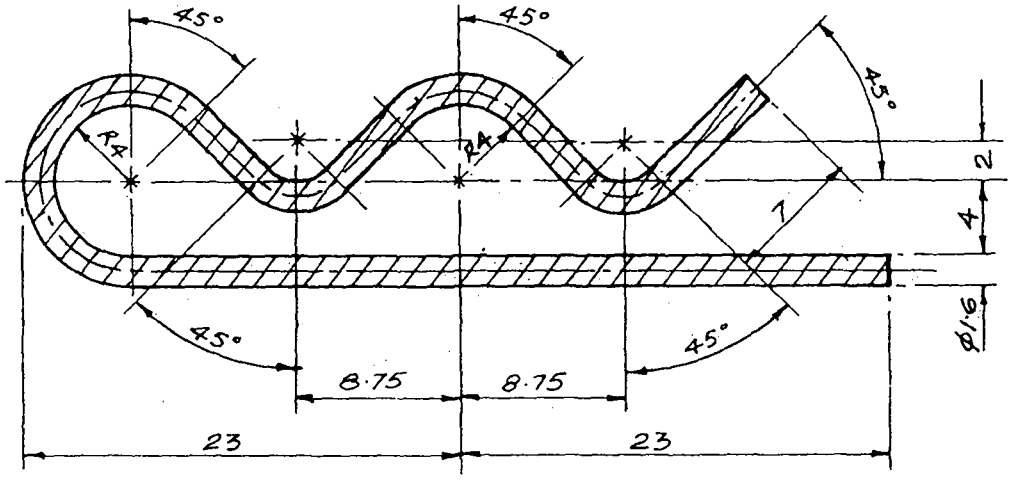
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
PUMP HANDLE ASSEMBLY

SCALE	DRG. NO.	REV.
As shown	T 11	1



NOTES:

1. Locking Pin manufactured from Spring Steel.
2. For General Arrangement see DRG. NO. T 21.

REVISIONS				SIGNATURE	DATE
NO.	DESCRIPTION	DATE	APPD.	DESIGNED BY	
				DRAWN BY	3/1/83
				CHECKED BY	
				APPROVED BY	24.1.83

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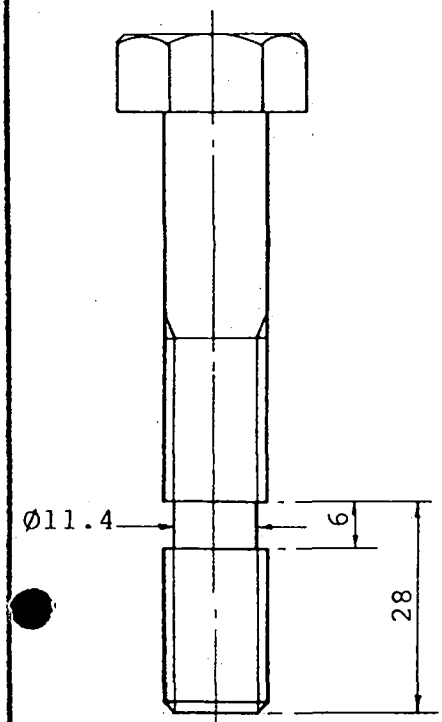
BANGLADESH DEEP-SET HANDPUMP MARK I

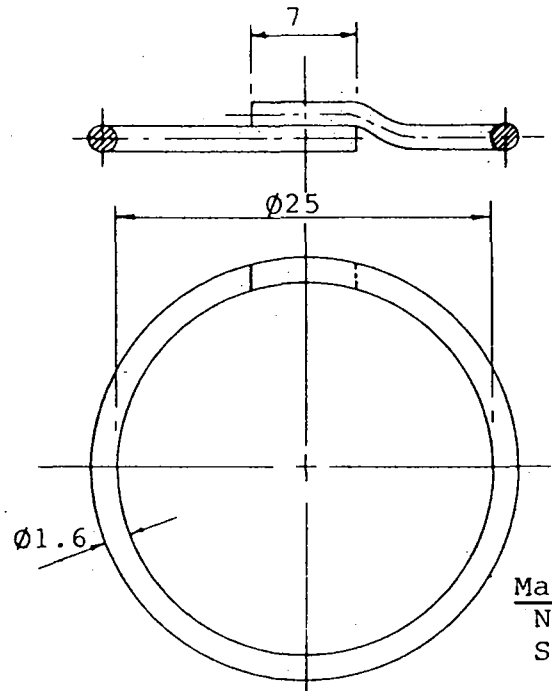
TITLE
LOCKING PIN

SCALE	DRG. NO.	REV.
4:1	T 15	



HEXAGONAL BOLT
Standard M14x80 Hex.Bolt
Thread length:45mm min.

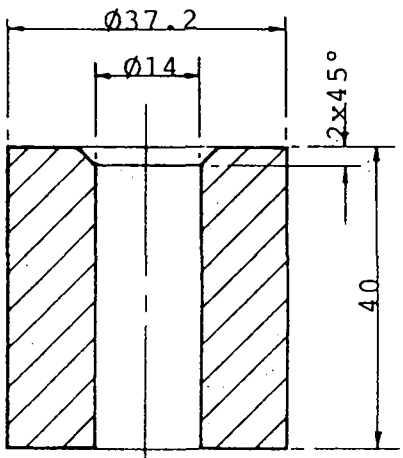
MAWTS REF.-PD 348



Material:
Nickel plate
Spring Steel

RETAINING RING
(Scale:2:1)

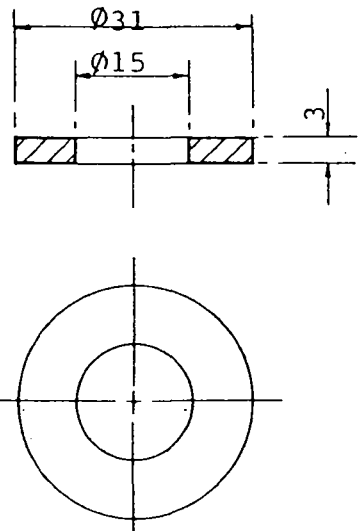
MAWTS REF.- PD 347



CONNECTOR BUSH

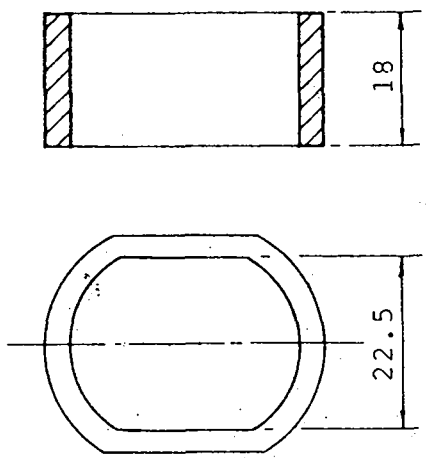
Material: PVC Rod Stock

MAWTS REF.-PD 350



WASHER (Mild Steel)

MAWTS REF.-PD 349



LOCKING RING

-Make from 1"Ø G.I.pipe
-Drill or bore inside to 27.5mm.
-To remove welding seam, form under press.

MAWTS REF.-PD 351

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	All units	Aug. 1983	

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	April '84

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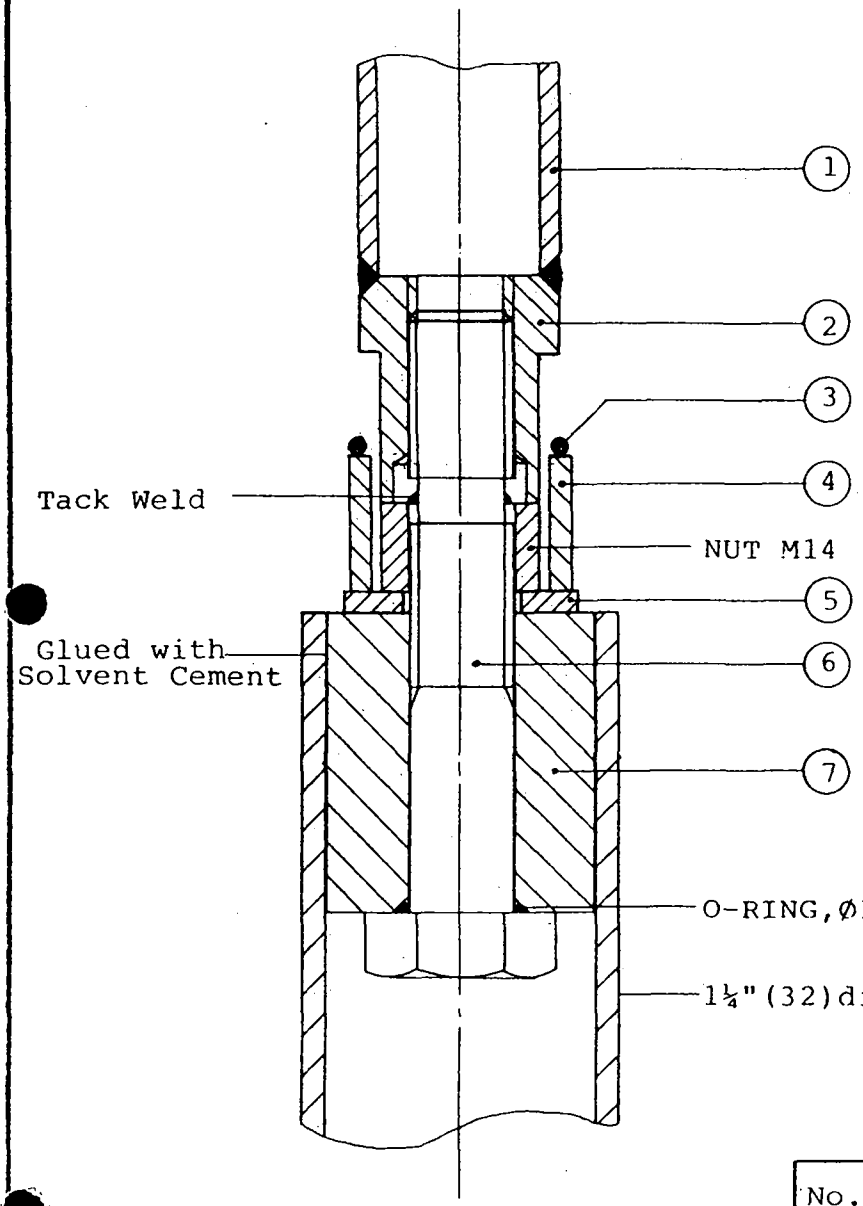
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE HEXAGONAL BOLT/ RETAINING RING/WASHER/ LOCKING RING/CONN.BUSH

SCALE	DRG. NO.	REV.
1:1	T 14	1



NOTES

1. For General Arrangement see DRG.NO.T 01.
2. 1¼"(32mm)nom.dia.pvc pipe to be B.S.3505 (1968)Class'D'.
3. Connector Bush to be solvent cemented into 1¼"pvc pump rod.

No.	Description	Drg.Ref.
1	STEEL ROD	T 11
2	HANDLE NUT	T 12
3	RETAINING RING	T 14
4	LOCKING RING	T 14
5	WASHER	T 14
6	HEXAGONAL BOLT	T 14
7	CONNECTOR BUSH	T 14

MAWTS REF.-PD 344

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Retaining Ring, Locking Ring, Connector Bush.	Aug. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		Mar. '84
CHECKED BY		
APPROVED BY		April '84

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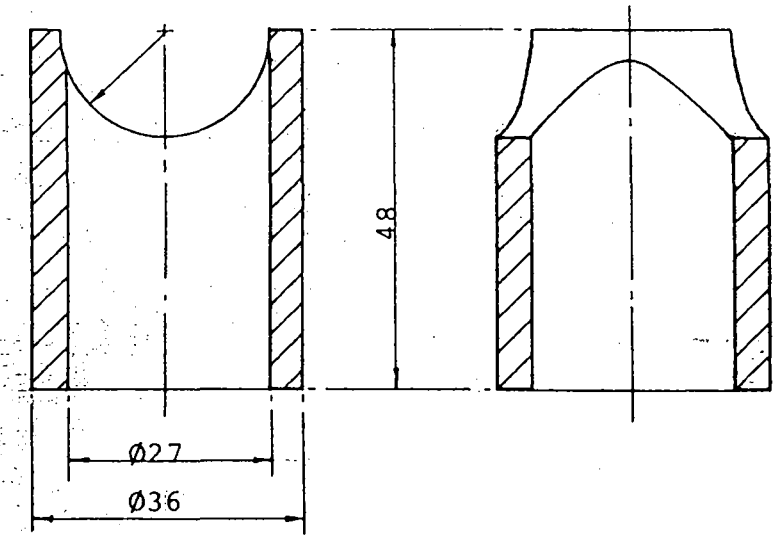
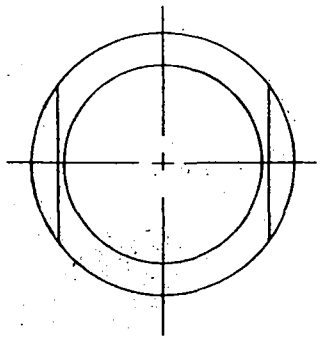
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

TOP CONNECTOR ASSEMBLY

SCALE	DRG. NO.	REV.
1:1	T 13	1

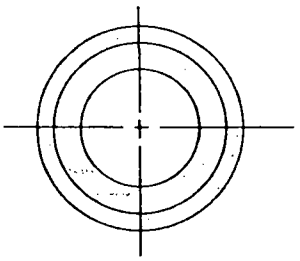


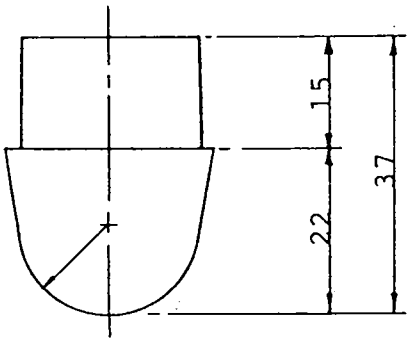


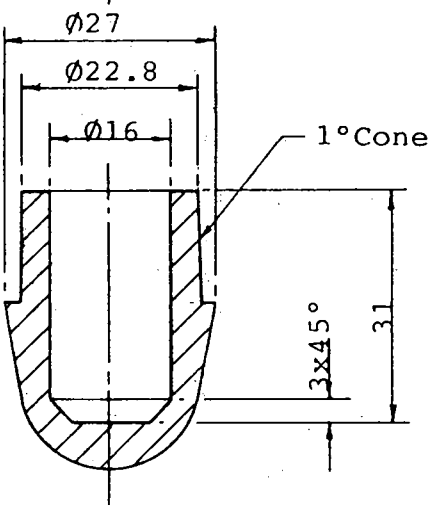
FINGER TRAP

Material: Plastic

MAWTS REF.-PD 272



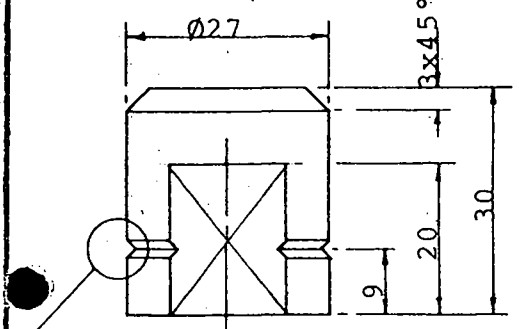


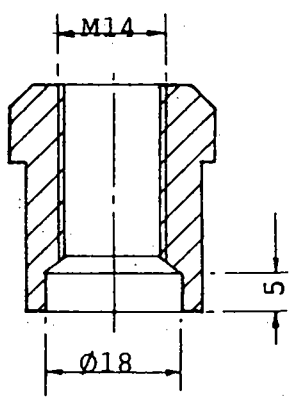


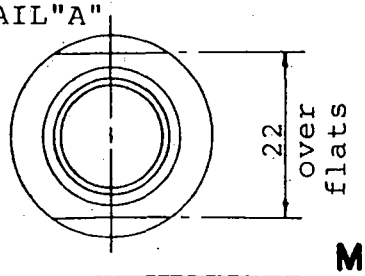
END CAP

Material: Plastic

MAWTS REF.-PD 271

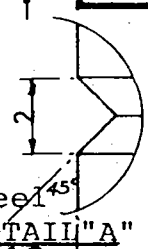






HANDLE NUT

Material: Mild Steel



MAWTS REF.-PD 346

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Finger Trap and End Cap material change; Handle Nut added.	Aug. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	E.K. Hall	Mar. '84
CHECKED BY		
APPROVED BY		April '84

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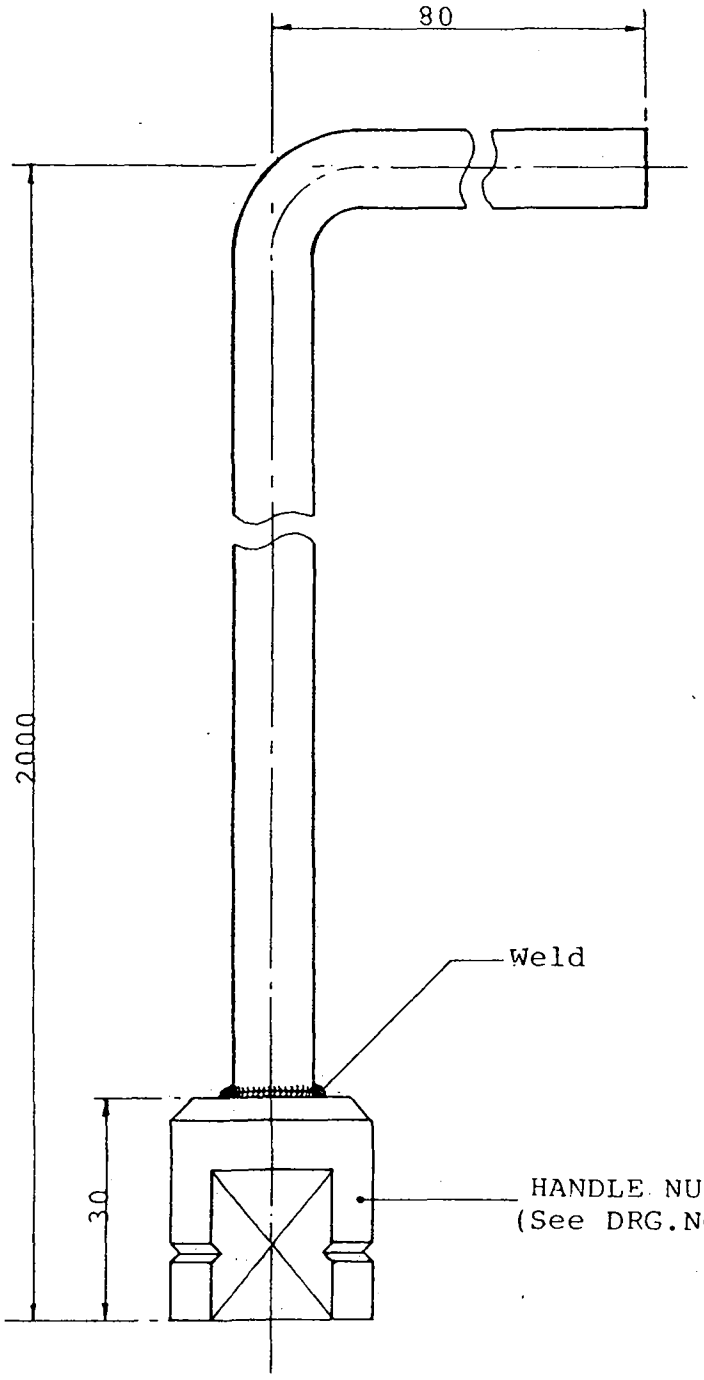
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
FINGER TRAP/END CAP/ HANDLE NUT

SCALE	DRG. NO.	REV.
1:1	T 12	1



NOTES

1. Retrieving Rod to be made from 10mm dia. mild steel round bar.
2. Handle to be bent 90° to the vertical.
3. For use of Rod see "Maintenance Procedures" page T104.

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Length increased; Handle Nut added	Aug. 1983	

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	April 84

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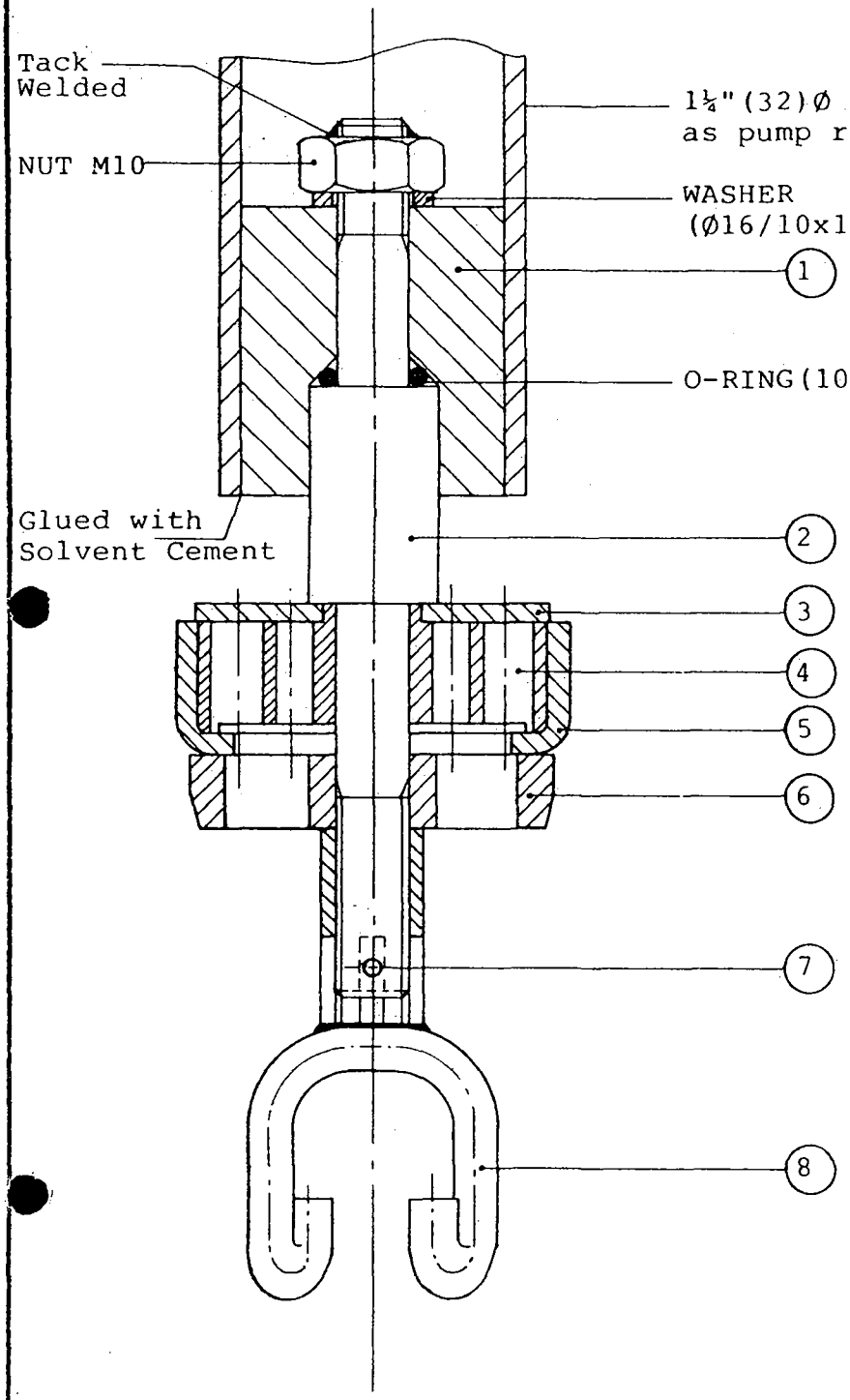
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

RETRIEVING ROD

SCALE	DRG. NO.	REV.
1:1	T 16	1



NOTES

1. For General Arrangement see DRG.NO.T 01

No.	Description	Drg.Ref
1	CONNECTOR BUSH	T 22
2	CONNECTOR ROD	T 22
3	RUBBER VALVE	T 22
4	ALUMINIUM PLATE	T 23
5	LEATHER CUP	T 24
6	STIFFENER RING	T 25
7	LOCKING PIN	T 15
8	GRAPPLE ASSEMBLY	T 26

MAWTS REF.-PD 352

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Connector bush and rod, Leather cup, Aluminium plate, Stiffener ring, Grapple.	Aug. 1983	

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	April 3

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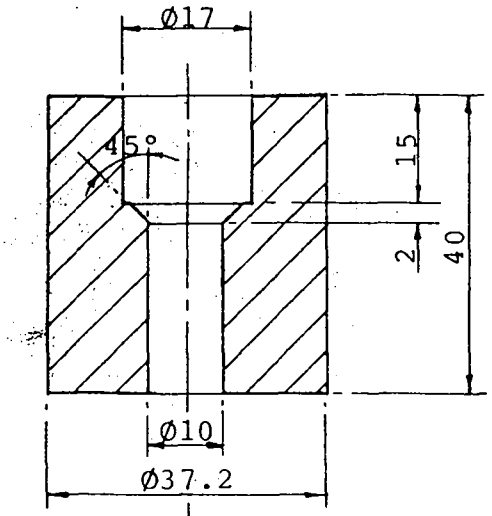
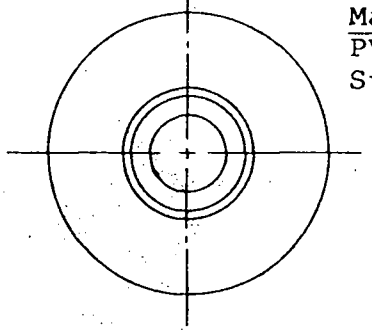
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE: PISTON ASSEMBLY

SCALE	DRG. NO.	REV.
1:1	T 21	1

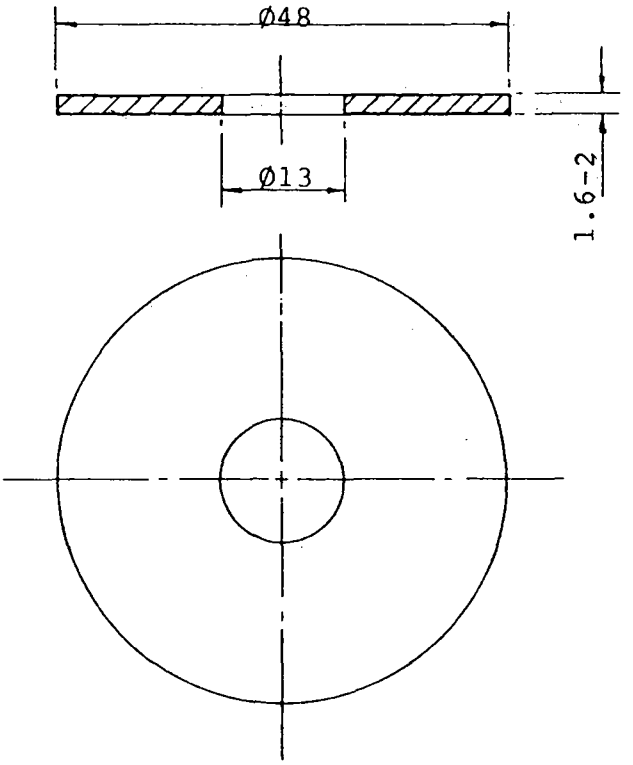


Material:
PVC Rod
Stock.



CONNECTOR BUSH
(Scale:1:1)

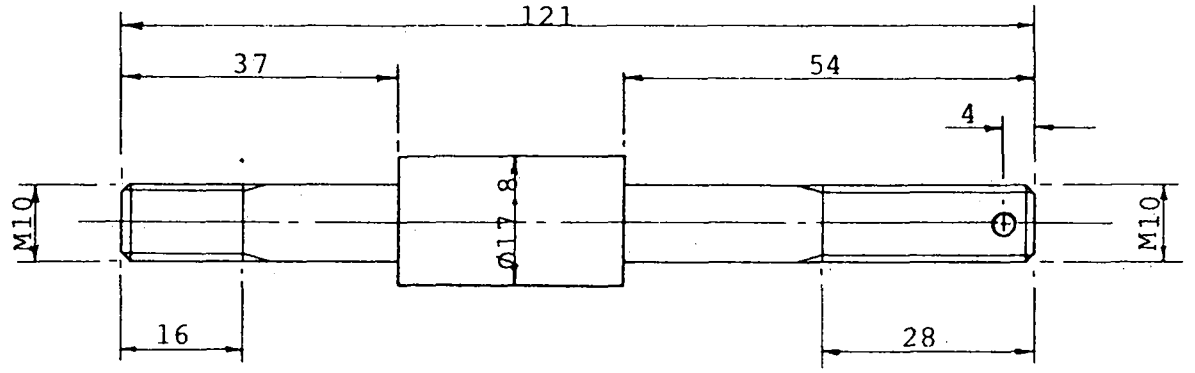
MAWTS REF.-PD 254



RUBBER VALVE
(Scale:1.25:1)

Material:Inner Tube

MAWTS REF.-PD 252



CONNECTOR ROD
(Scale:1:1)

Material:Mild Steel

MAWTS REF.-PD 353

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Connector rod and bush redesigned	Aug. 1983	

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	

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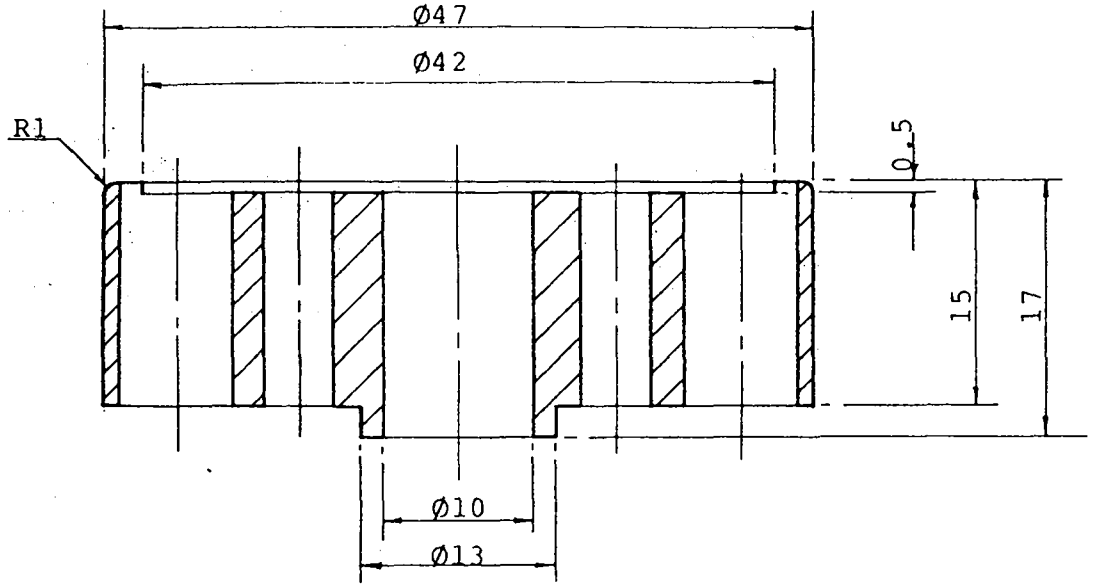
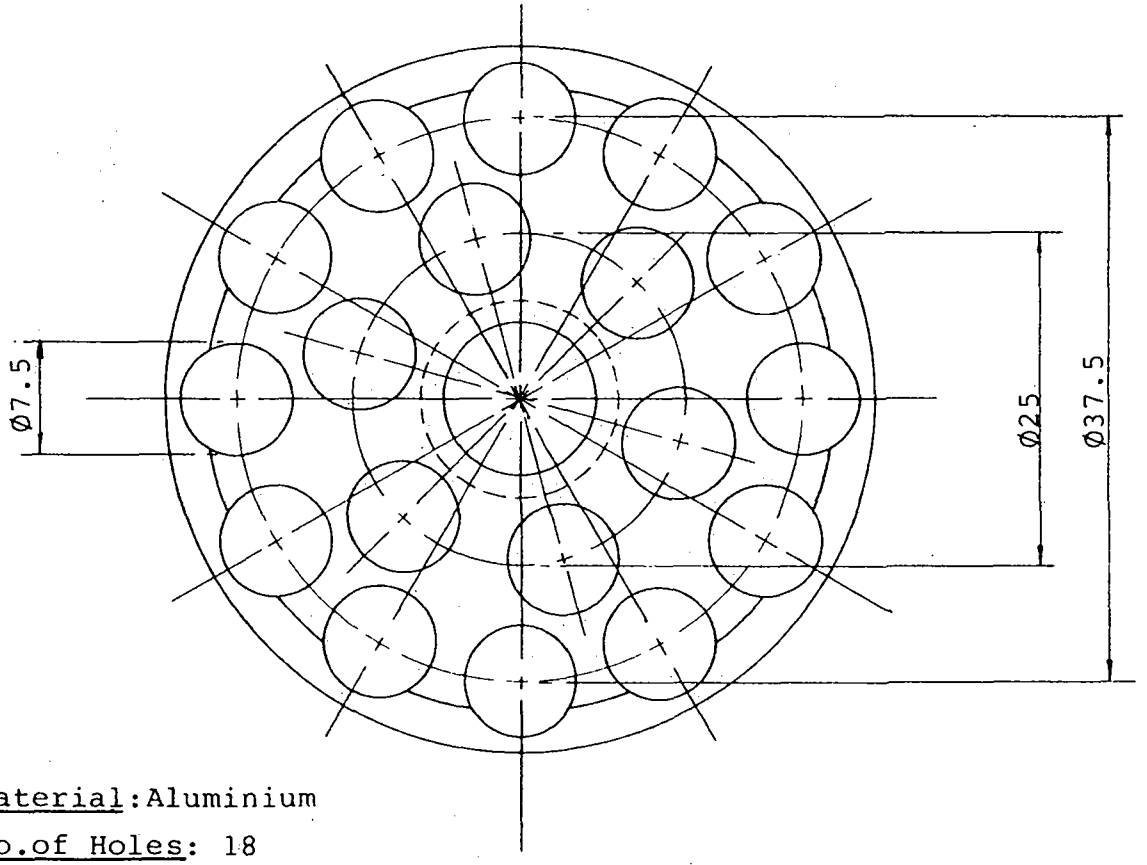
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
CONNECTOR BUSH/
CONNECTOR ROD/RUB.VALVE

SCALE	DRG. NO.	REV.
As shown	T 22	1





Material: Aluminium

No.of Holes: 18

MAWTS REF.-PD 339

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Plate and hole dia. decreased; thickness increased.	June 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		Mar. '84
CHECKED BY		
APPROVED BY		April '84

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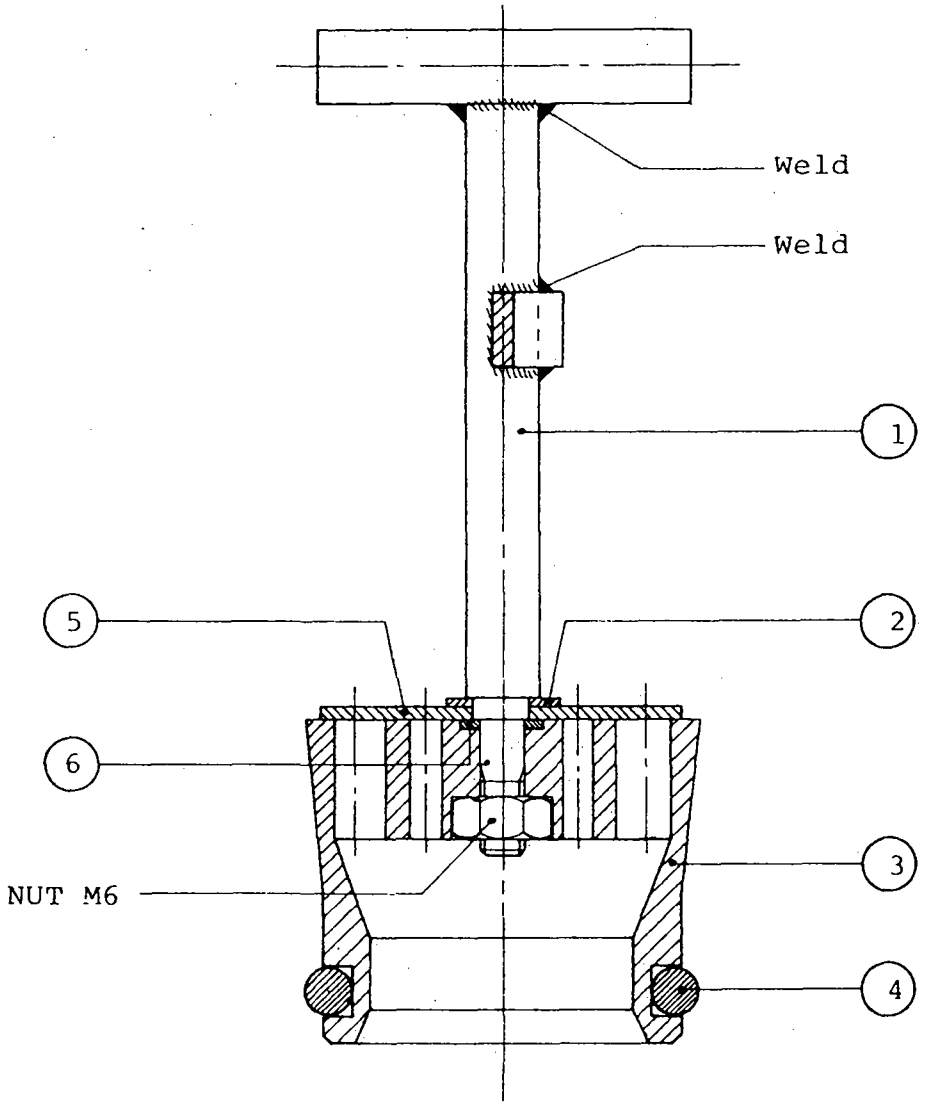
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

ALUMINIUM PLATE

SCALE	DRG. NO.	REV.
2:1	T 23	1



NOTES

1. For General Arrangement see DRG. NO.T 01.

No.	Description	Drg.Ref.
1	CHECK VALVE GUIDE	T 28
2	WASHER(TOP)	T 29
3	CHECK VALVE BODY	T 30
4	RUBBER SEAL	T 29
5	VALVE SEAL	T 29
6	WASHER(BOTTOM)	T 29

MAWTS REF.-PD 357

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	April '84

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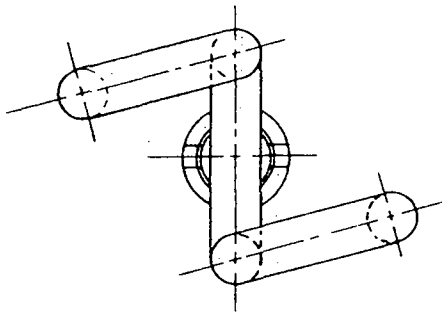
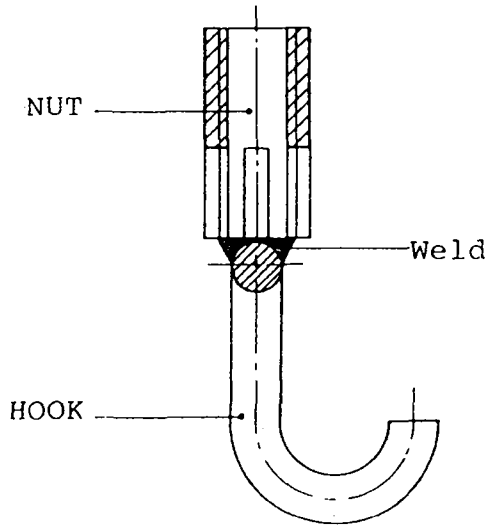
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
CHECK VALVE ASSEMBLY

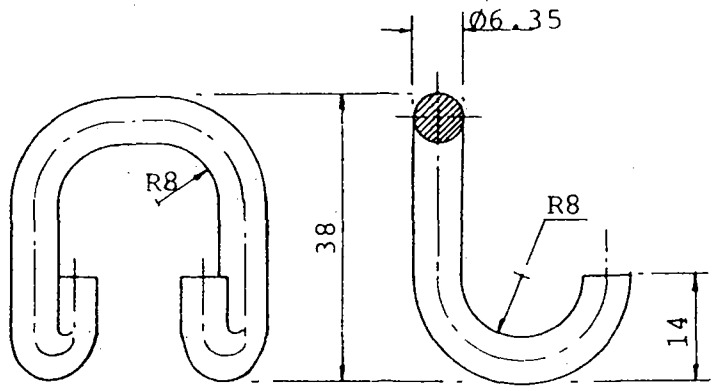
SCALE	DRG. NO.	REV.
1:1	T 27	

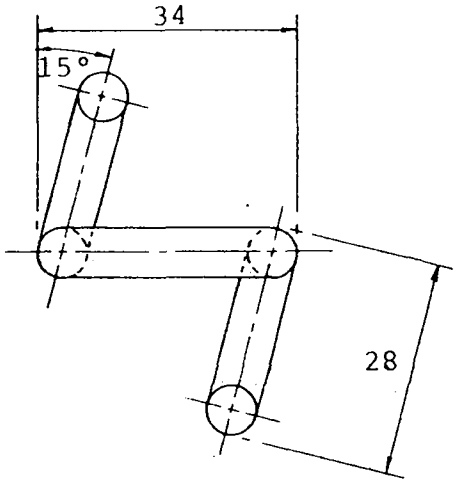




GRAPPLE ASSEMBLY

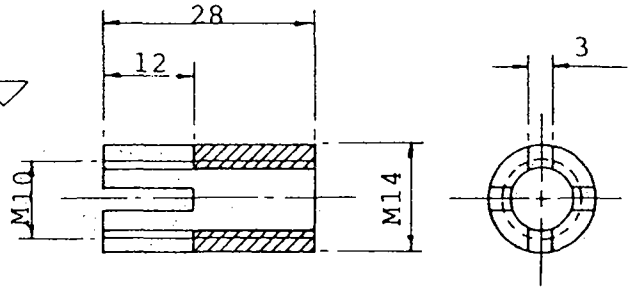
MAWTS REF.-PD 354





HOOK

MAWTS REF.-PD 356



NUT

MAWTS REF.-PD 355

NOTES

1. HOOK:
   Material:Mild Steel
   Cut-off size: Ø6.35x130

2. NUT:
   Material:Mild Steel
   Cut-off size: Ø15.8x32

3. For General Arrangement see DRG.NO.T 21.

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	HOOK-Larger dia.	Aug.	
	NUT- Redesigned	1983	

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	

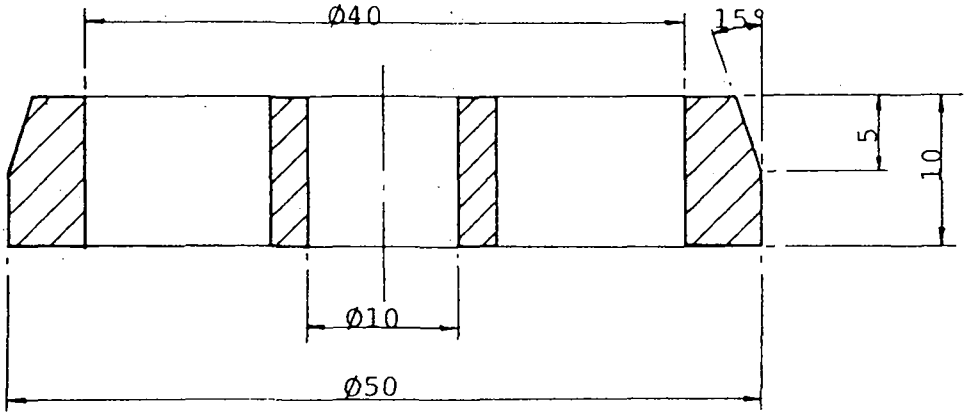
UNICEF
G. P. O. BOX 58
DHAKA
BANGLADESH

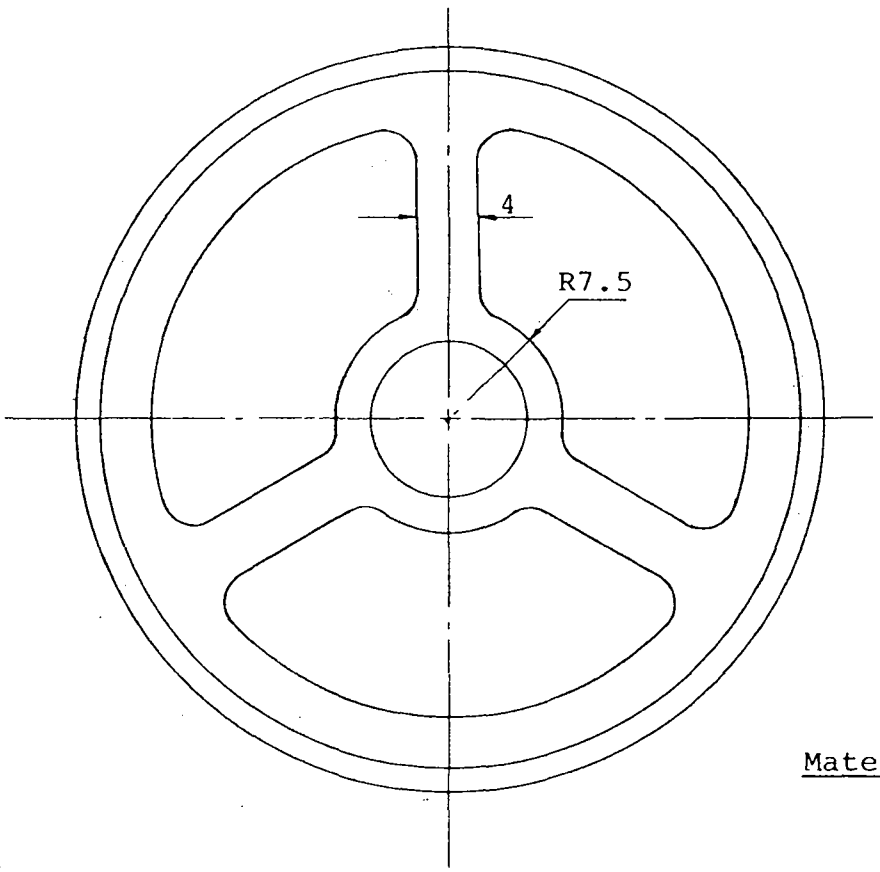
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

GRAPPLE ASSEMBLY

SCALE	DRG. NO.	REV.
1:1	T 26	1





Material: Aluminium

MAWTS REF.-PD 340

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Centre hole modified	Jun.	
	Bevel edge thickened.	1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		Mar. '84
CHECKED BY		
APPROVED BY		April '84

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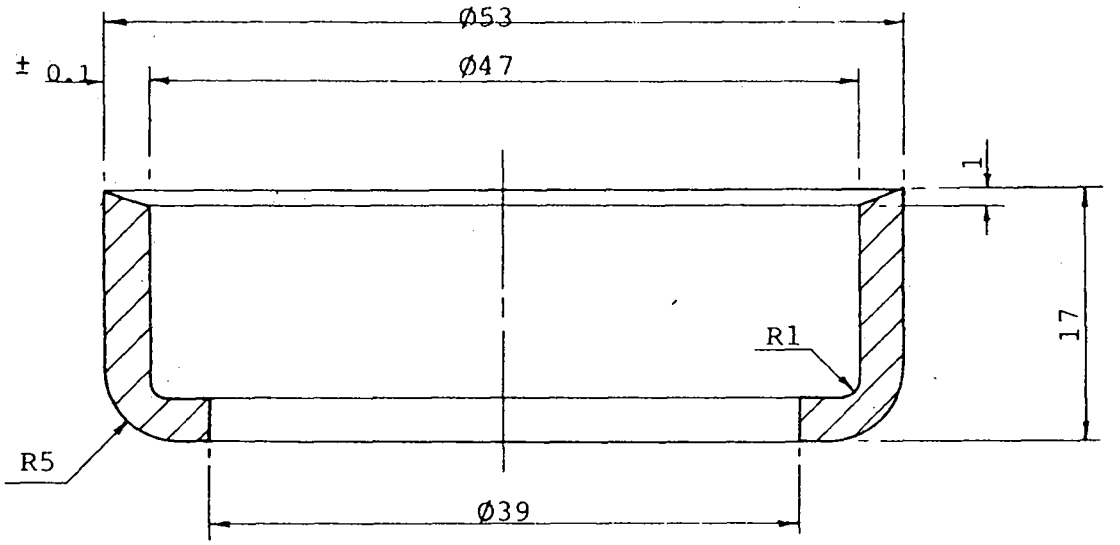
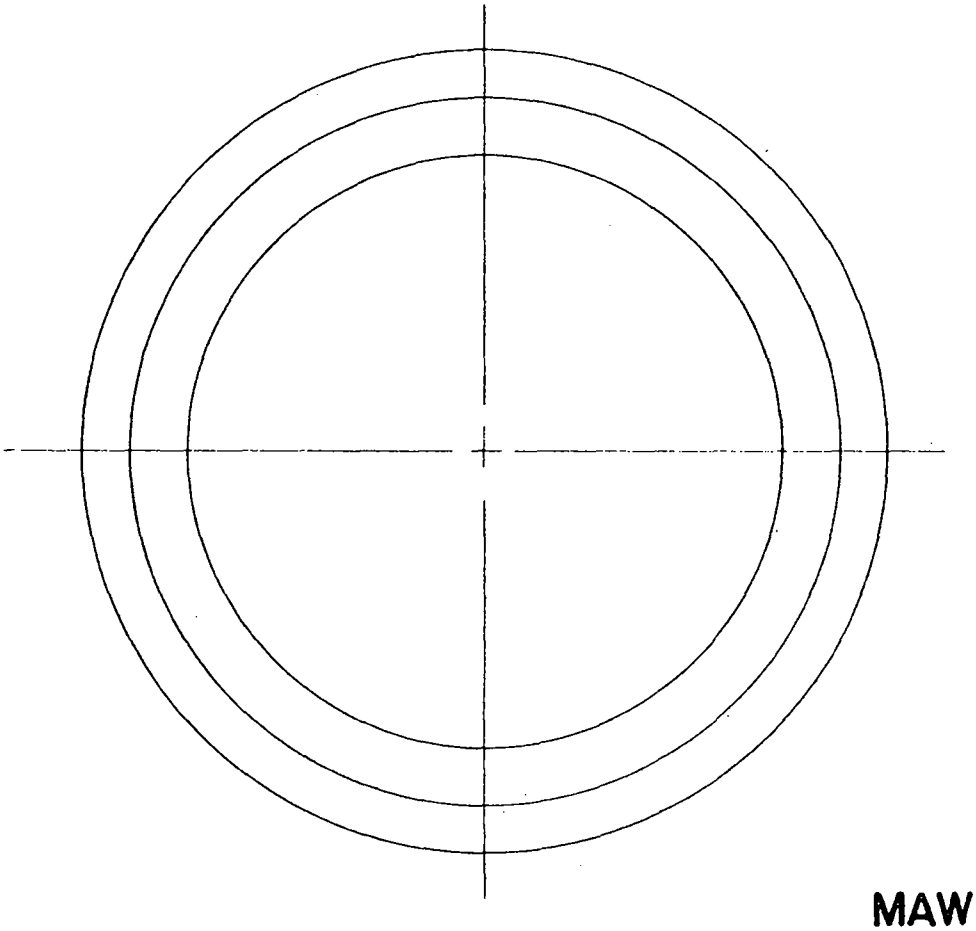
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
STIFFENER RING

SCALE	DRG. NO.	REV.
2:1	T 25	1





MAWTS REF.-PD 341

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Cup thickness and width increased.	June 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	S.A. Hall	Mar. '84
CHECKED BY		
APPROVED BY		April '84

U N I C E F
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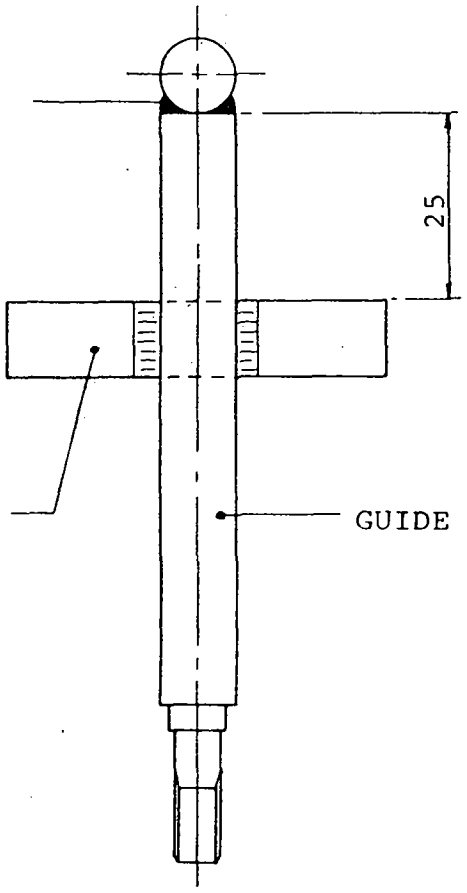
BANGLADESH

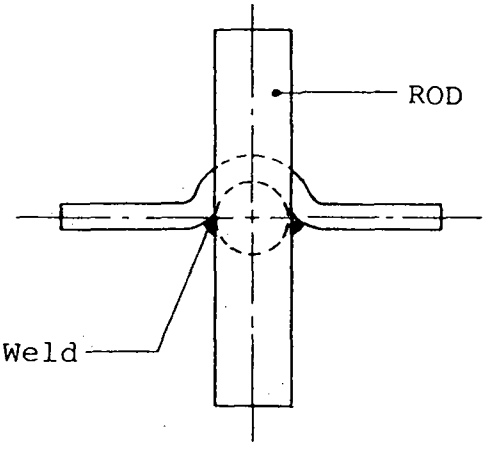
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

LEATHER CUP

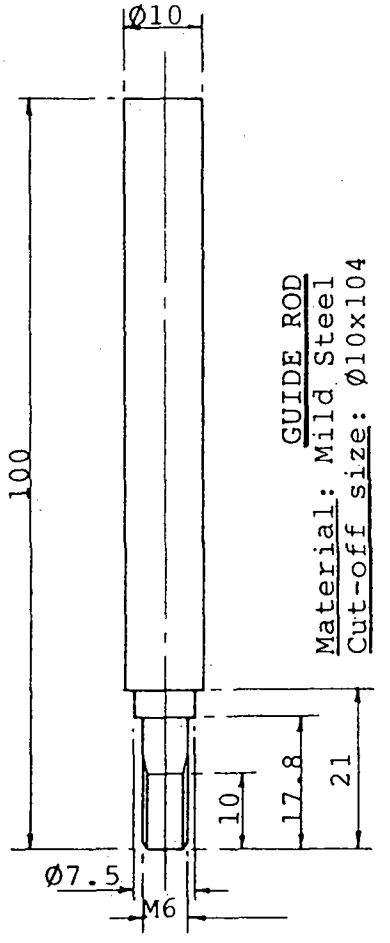
SCALE	DRG. NO.	REV.
2:1	T 24	1



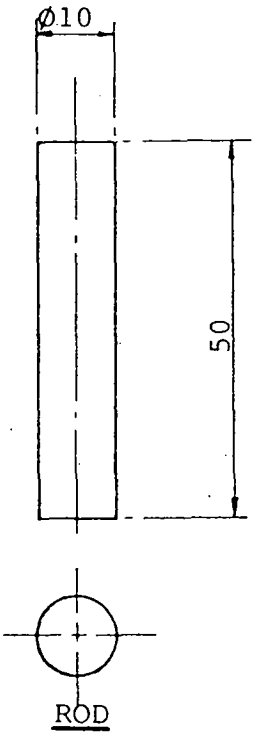


CHECK VALVE GUIDE

MAWTS REF.-PD 358

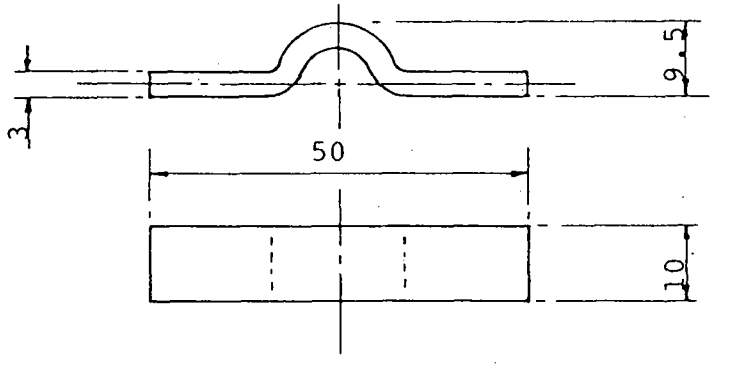


MAWTS REF.-PD 359



Material:Mild steel
Cut-off size:
Ø10x50

MAWTS REF.-PD 360



GUIDE

Material:Mild Steel
Cut-off size:
3x10x57

MAWTS REF.-PD 361

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Guide shape changed Guide rod redesigned.	Aug. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		Mar. '84
CHECKED BY		
APPROVED BY		April '84

UNICEF
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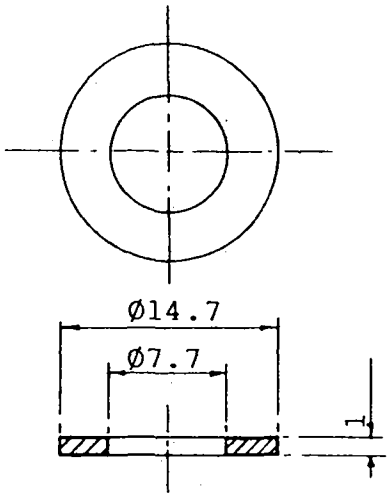
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

CHECK VALVE GUIDE

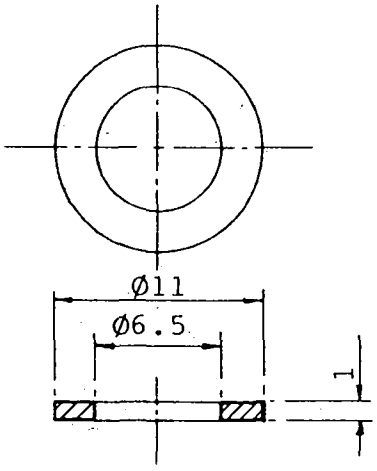
SCALE	DRG. NO.	REV.
1:1	T 28	1



WASHER (TOP)
(Scale: 2:1)

Material: Mild Steel

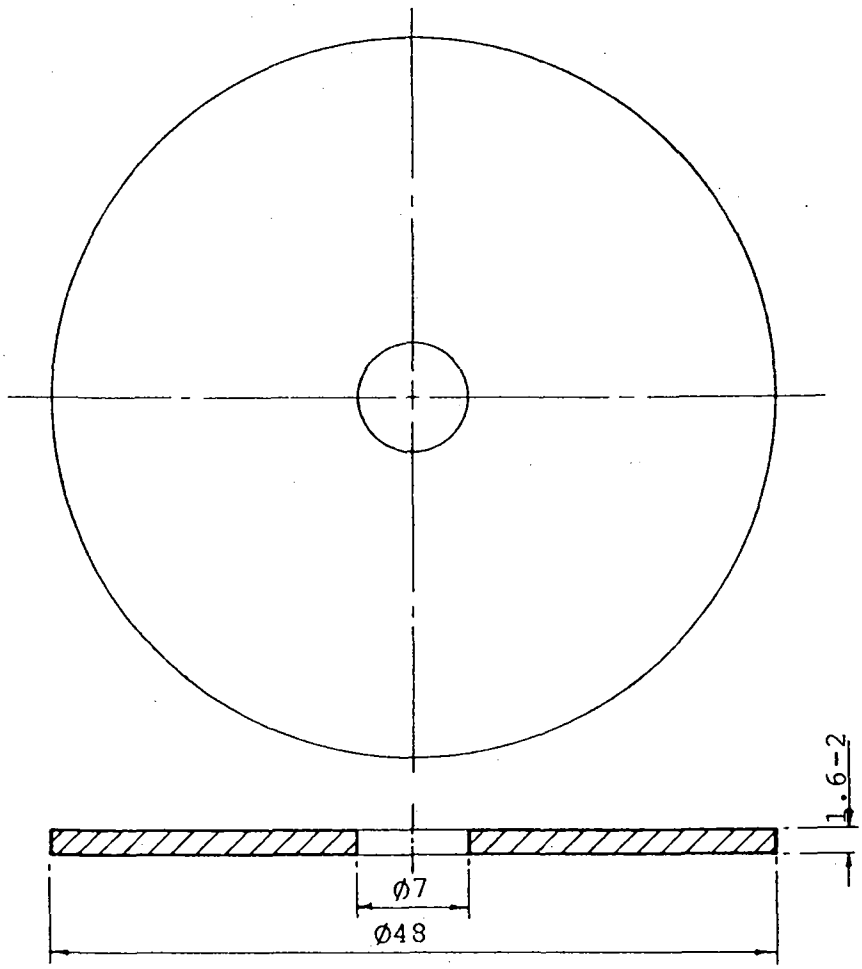
MAWTS REF.-PD 337



WASHER (BOTTOM)
(Scale: 5:1)

Material: Mild Steel

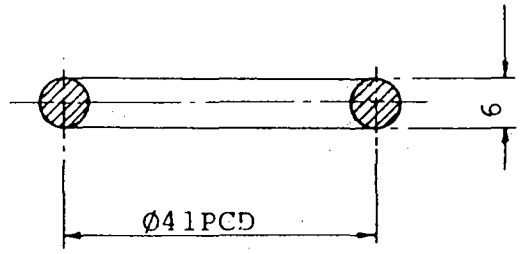
MAWTS REF.-PD 023



VALVE SEAL
(Scale: 2:1)

Material: Inner Tube

MAWTS REF.-PD 021



SEAL
(Scale: 1:1)

Material: Rubber

MAWTS REF.-PD 301

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.

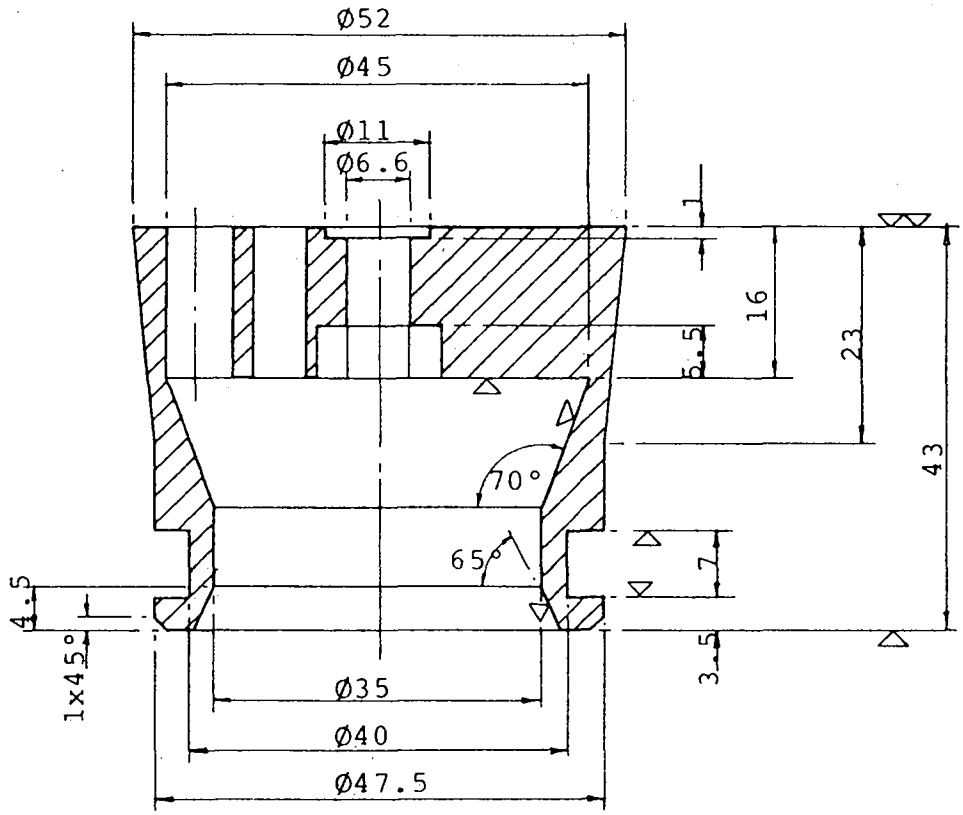
SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	S.A. Hall	Mar. '84
CHECKED BY		
APPROVED BY		April '84

UNICEF
G. P. O. BOX 58
DHAKA
BANGLADESH

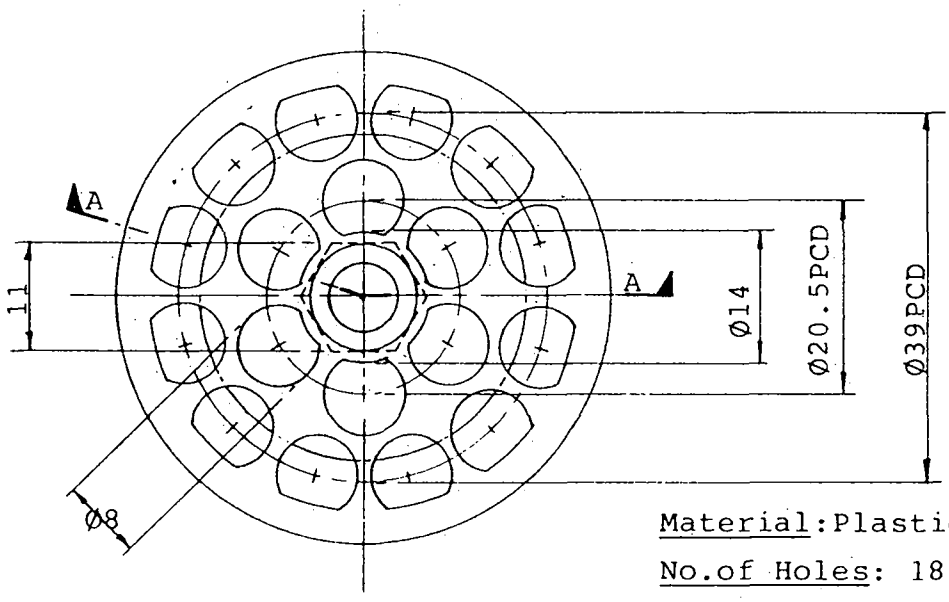
BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
WASHER (TOP&BOTTOM) / SEAL/VALVE SEAL

SCALE	DRG. NO.	REV.
As shown	T 29	



-SECTION A-A-



Material: Plastic (Moulded)

No. of Holes: 18

MAWTS REF.-PD 300

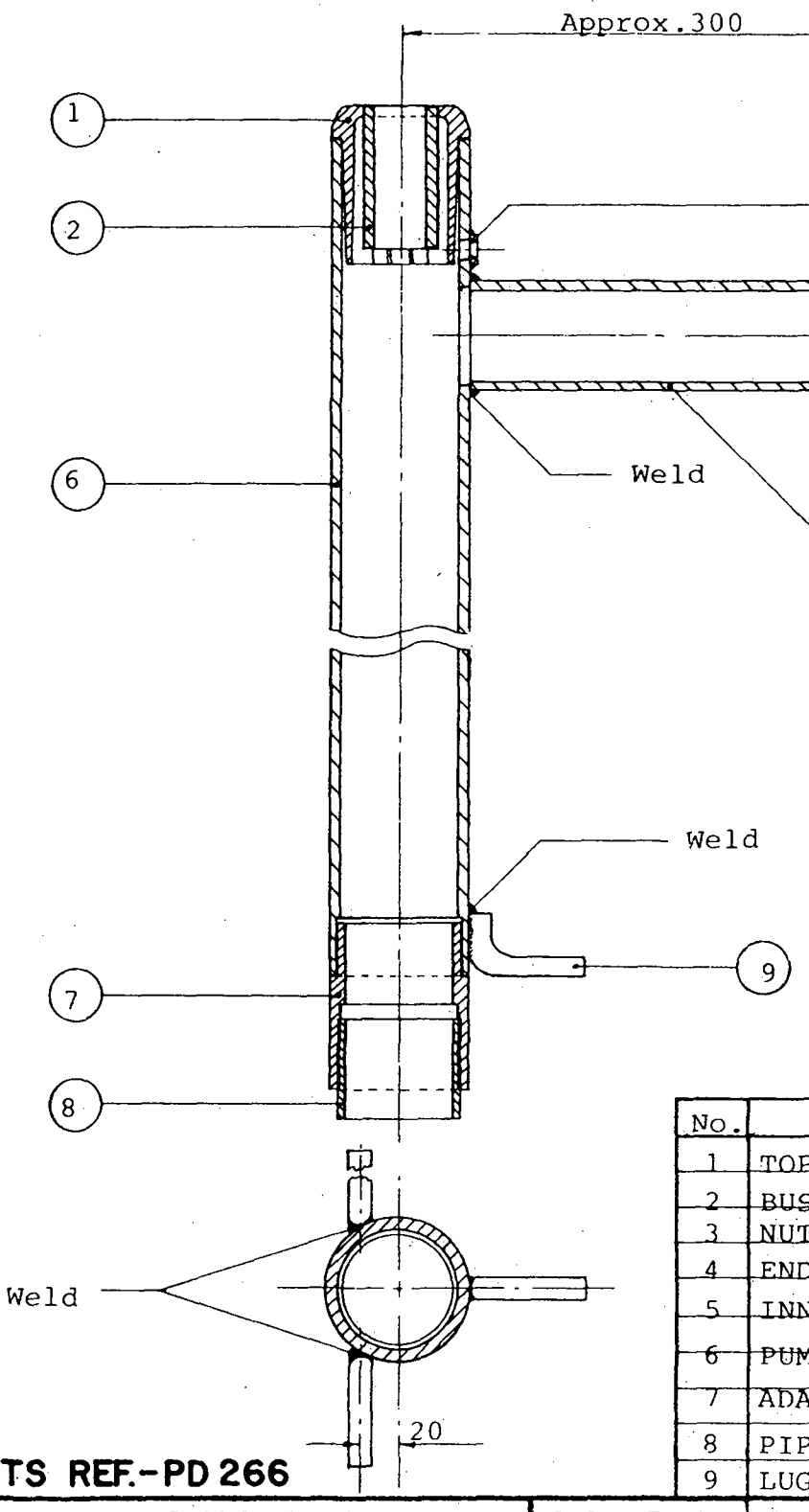
REVISIONS				SIGNATURE	DATE
NO.	DESCRIPTION	DATE	APPD.	DESIGNED BY	
				DRAWN BY	Mar. '84
				CHECKED BY	
				APPROVED BY	April 84

UNICEF
G. P. O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE: CHECK VALVE BODY

SCALE	DRG. NO.	REV.
1.25:1	T 30	



NOTES

1. For General Arrangement see DRG.NO.T01.

No.	Description	Drg.Ref.
1	TOP GUIDE	T 32
2	BUSH	T 33
3	NUT M8	T 33
4	END PIPE	T34
5	INNER PIPE [Discharge]	T34
6	PUMP BODY	T35
7	ADAPTOR	T 36
8	PIPE INSERT	T 36
9	LUG	T 34

MAWTS REF.-PD 266

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Bush, Discharge spout, Pump Body, Adaptor, Lug.	Jan. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	[signature]	Mar. '84
CHECKED BY		
APPROVED BY	[signature]	April 84

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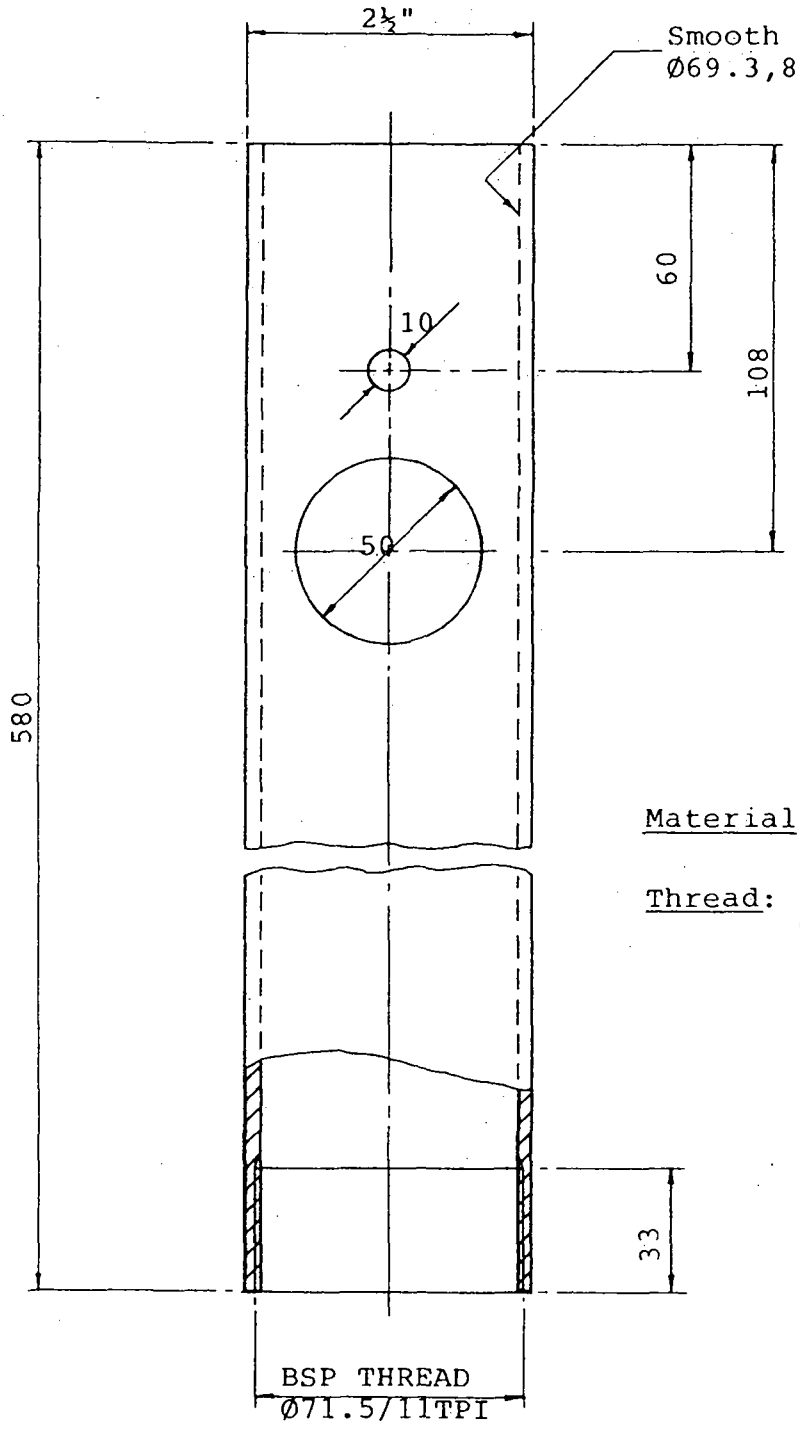
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
PUMP HEAD ASSEMBLY

SCALE	DRG. NO.	REV.
1:4	T 31	1



Material: 2½"nom.dia.medium mild steel tube.

Thread: BSP Internal Parallel Thread to B.S.21:1957.

MAWTS REF.-PD 267

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	~~Length shortened;~~ spout hole dia.de-creased.	Jan. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	S.M.Hall	Mar. '84
CHECKED BY		
APPROVED BY		April 84

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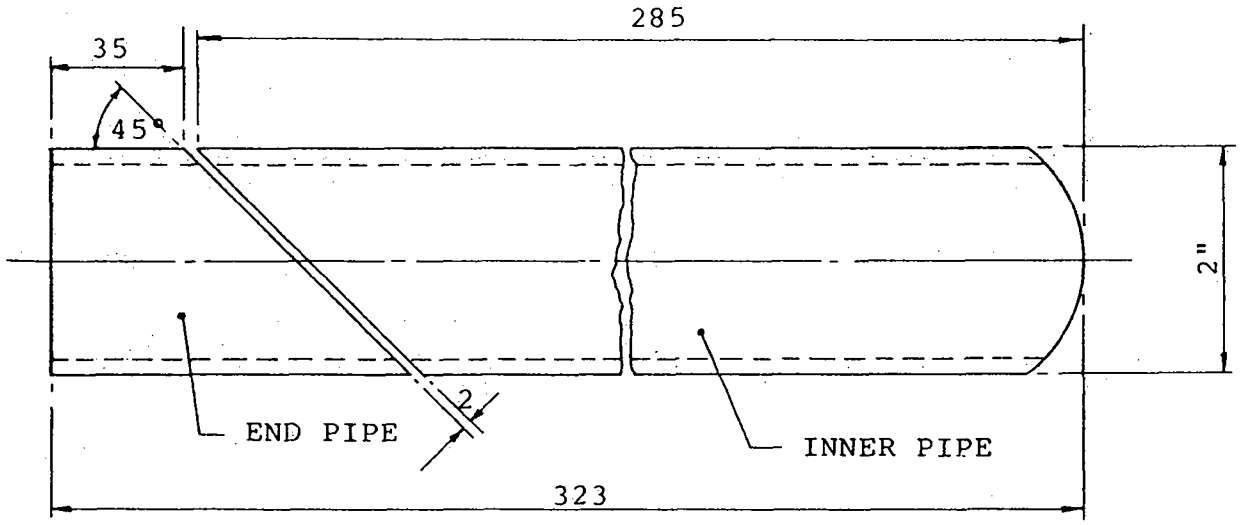
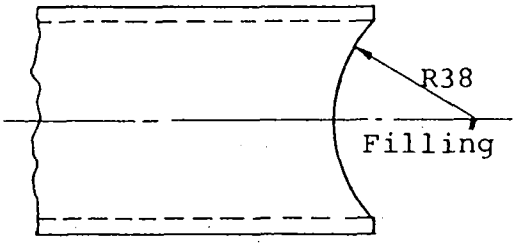
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE: PUMP BODY

SCALE	DRG. NO.	REV.
1:2	T 35	1





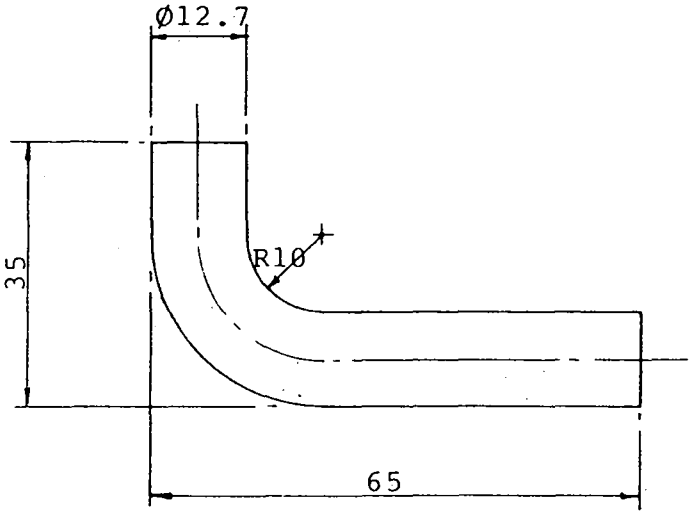
-DISCHARGE SPOUT-

(Scale:1:2)

Material:Mild Steel Tube

Cut-off size: 2"x323mm

MAWTS REF.-PD 268



-LUG-

(Scale:1:1)

Material:Mild Steel Rebar

Cut-off size: Ø12.7x110mm

MAWTS REF.-PD 269

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Discharge Spout- Dia.increased; Length decreased.	Jan. 1983	
	Lug- Length increased	Aug. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		Mar. '84
CHECKED BY		
APPROVED BY		April 84

UNICEF
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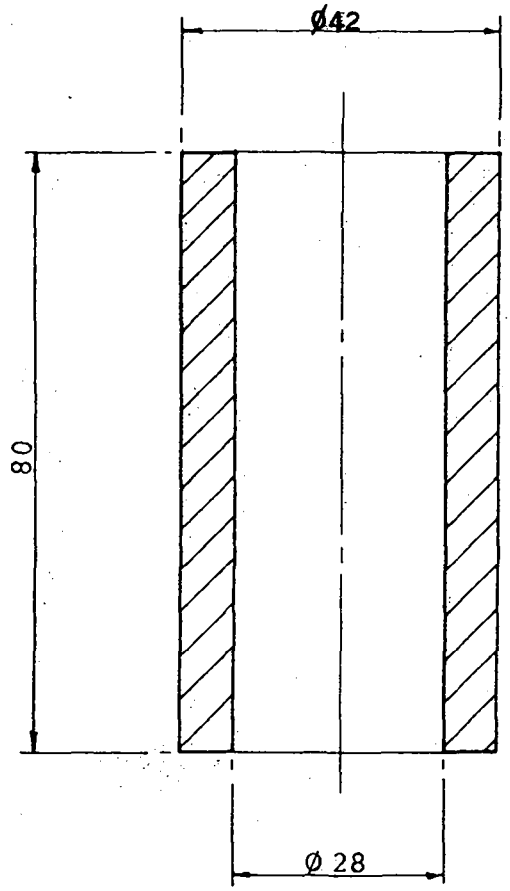
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE: DISCHARGE SPOUT/LUG

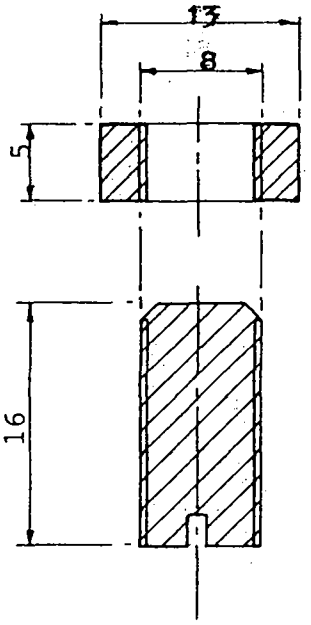
SCALE	DRG. NO.	REV.
As shown	T 34	1



BUSH
(Scale:1:1)

NOTES

1. Bush to be impregnated in oil.
2. Material: Wood
   Cut-off size: Ø50 x 84



M8 NUT AND SETSCREW
(Scale:2:1)

MAWTS REF.–PD 343

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Bush- smaller out-side diameter.	Aug. 1983	

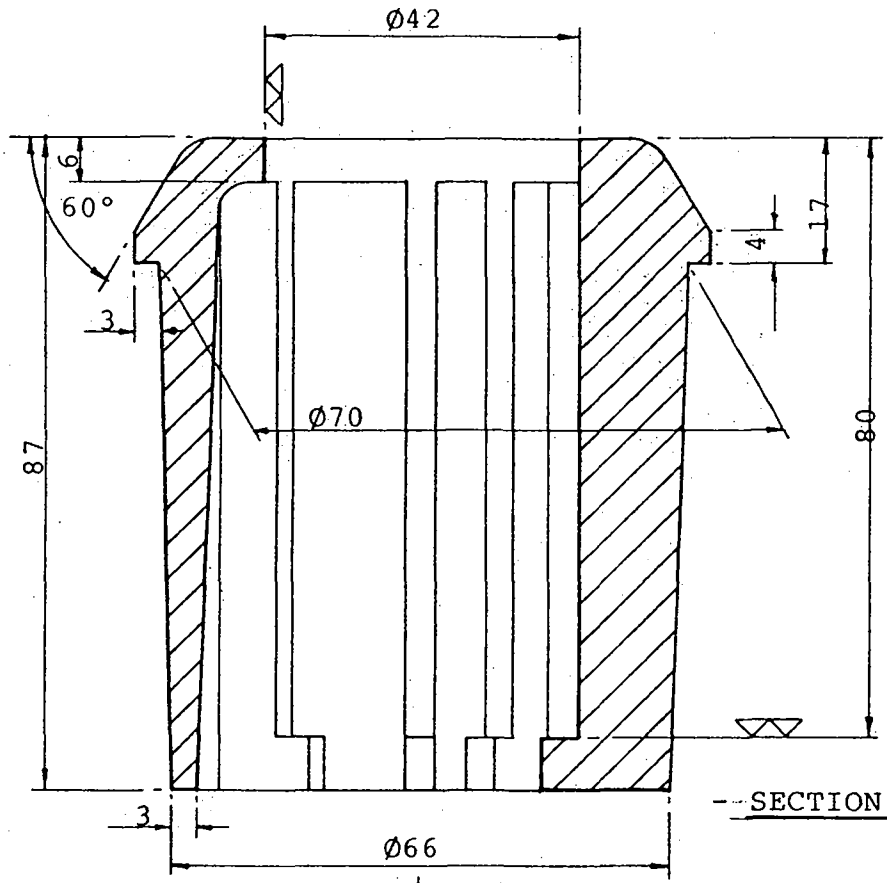
SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar. '84
CHECKED BY	
APPROVED BY	April '84

UNICEF
G. P. O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

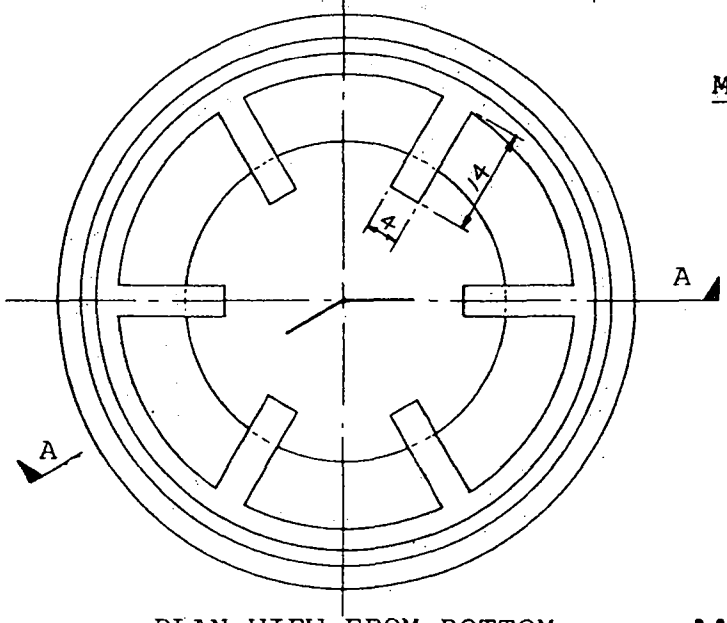
TITLE
BUSH/M8 NUT/SET SCREW

SCALE	DRG. NO.	REV.
As shown	T 33	1



-SECTION A-A-

Material: Plastic



-PLAN VIEW FROM BOTTOM-

MAWTS REF.-PD 342

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Material change; shape redesigned.	Aug. 1983	

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY	S.K. Hall	Mar. '84
CHECKED BY		
APPROVED BY		April '84

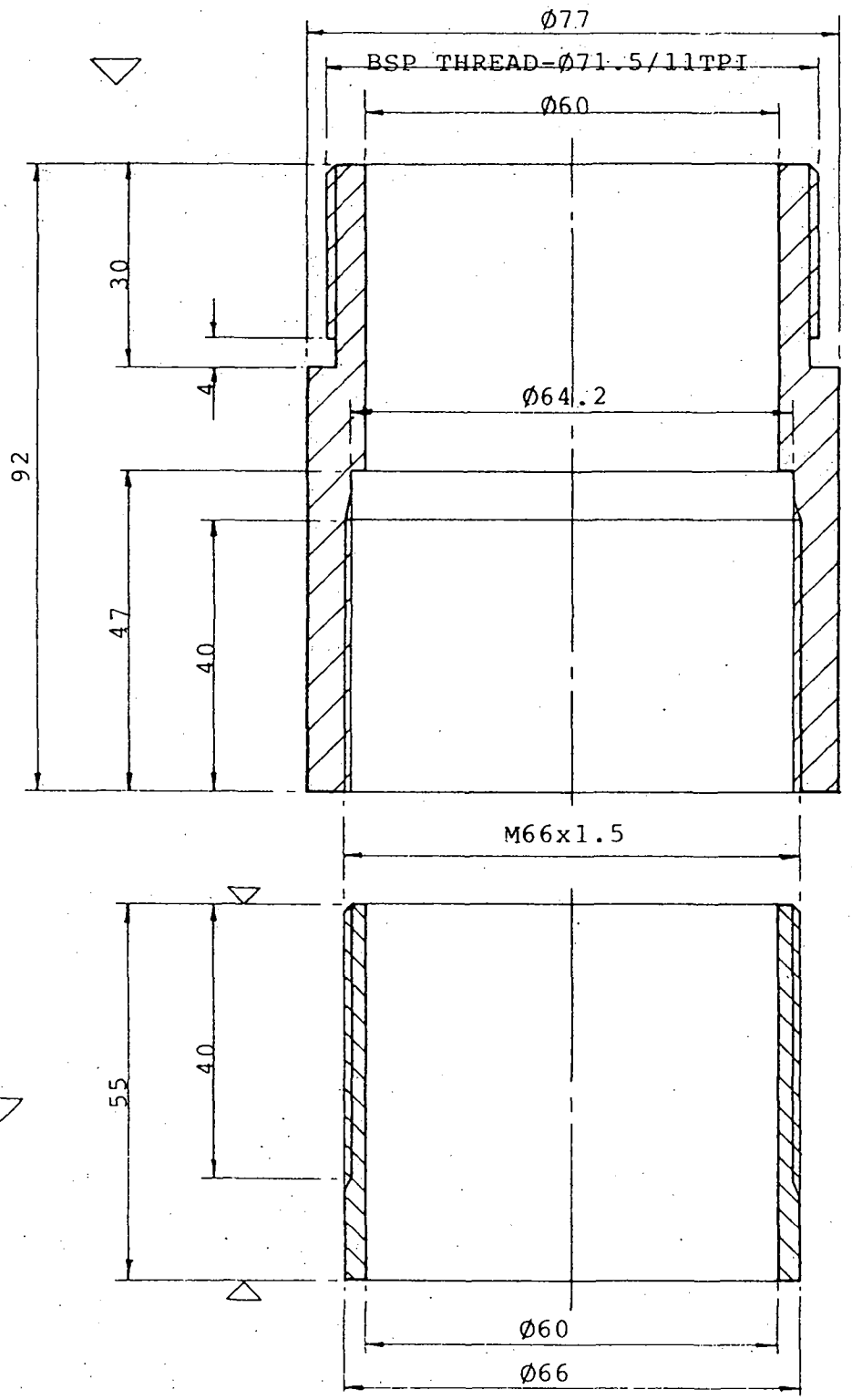
UNICEF
G.P.O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE

TOP GUIDE

SCALE	DRG. NO.	REV.
1:1	T 32	1



ADAPTOR

Material: Cast Iron

Note: No blowholes allowed in casting.

MAWTS REF.-PD 283

PIPE INSERT

Material: PVC pipe
Cut-off size: 2"x55mm

Note: 2"pvc pipe to be flared to bell end dimensions.

MAWTS REF.-PD 284

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Adaptor shortened, material changed. Pipe insert added.	Feb. 1983	

SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar '84
CHECKED BY	
APPROVED BY	April '84

UNICEF
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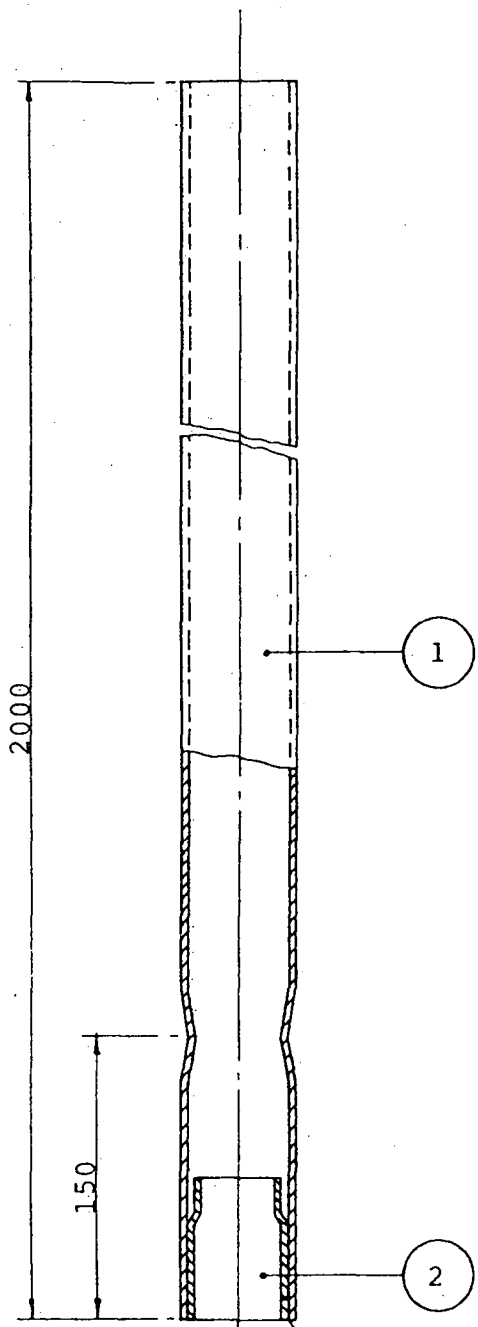
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
ADAPTOR/PIPE INSERT

SCALE	DRG. NO.	REV.
1:1	T 36	1

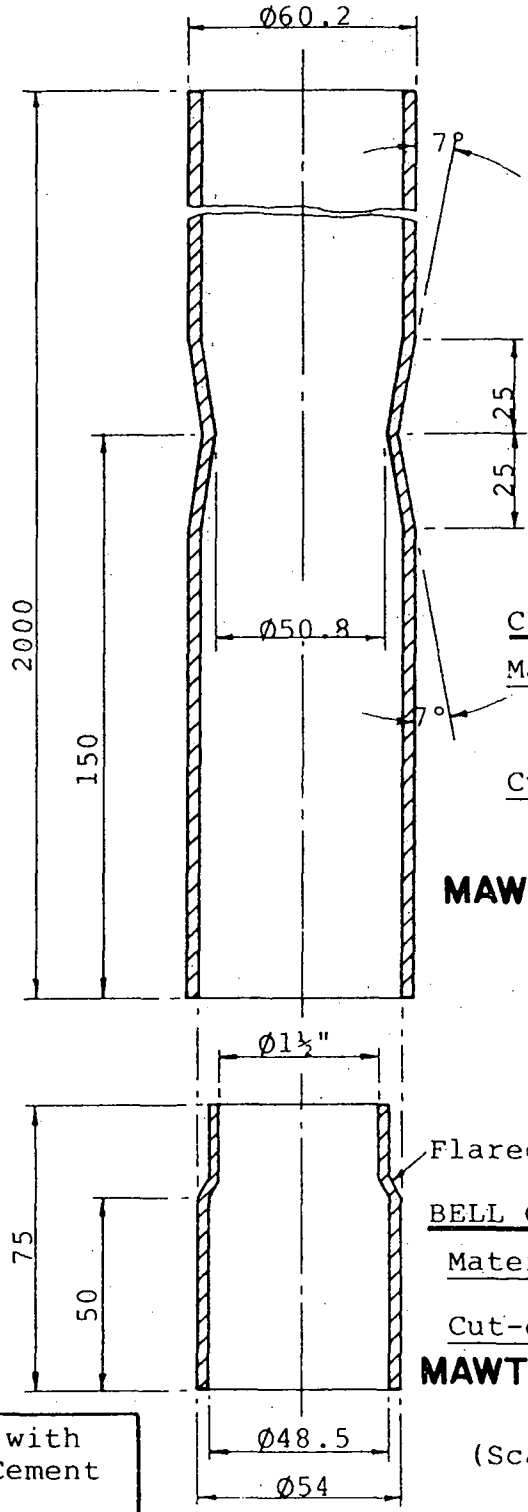
MAWTS REF.- PD 276



1. Cylinder Pipe
2. Bell Connector

(Scale:1:4)

Glued in with Solvent Cement



CYLINDER PIPE

Material: Class "C" pvc pipe.

Cut-off Size: Ø2"x2000

MAWTS REF.-PD 277

BELL CONNECTOR

Material: Class"C" pvc pipe.

Cut-off size: 1½" x75

MAWTS REF.-PD 278

(Scales:1:2)

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Cylinder Pipe lengthened; Bell Connector added.	Feb. 1983	

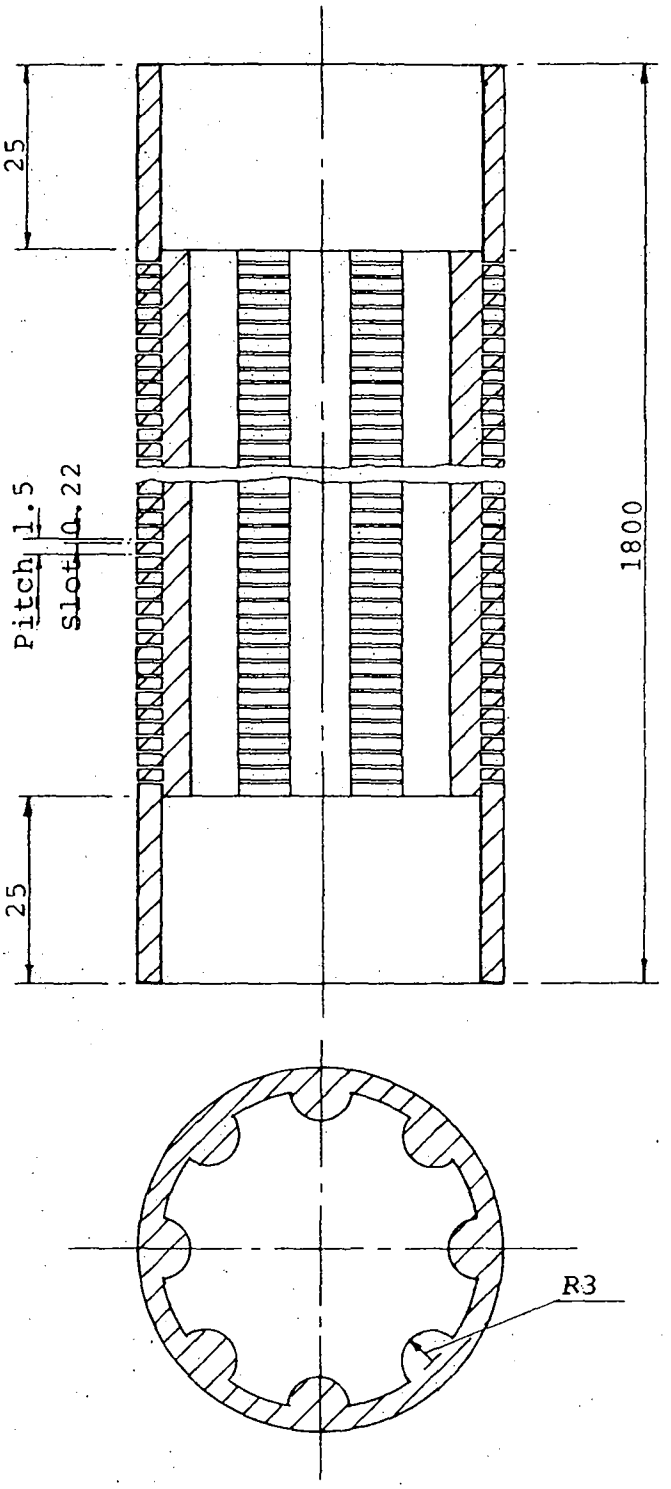
SIGNATURE	DATE
DESIGNED BY	
DRAWN BY	Mar '84
CHECKED BY	
APPROVED BY	April '84

UNICEF
G. P. O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
CYLINDER

SCALE	DRG. NO.	REV.
As shown	T 41	1



NOTES

1. For General Arrangement see DRG.NO.T01.
2. Material: 1½"dia.Class"C" pvc pipe to B.S.3505(1968); with 8no.internal ribs.
3. Open Area: 11%
4. Slot Width: 0.22mm
5. Pitch: 1.5mm
6. Slotting: Continuous spiral cutting on outside of pipe.
7. Standard Length: Modules of 600 and 1200mm

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.
1	Slot width decreased ~~Number of internal ribs increased.~~	Feb. 1983	

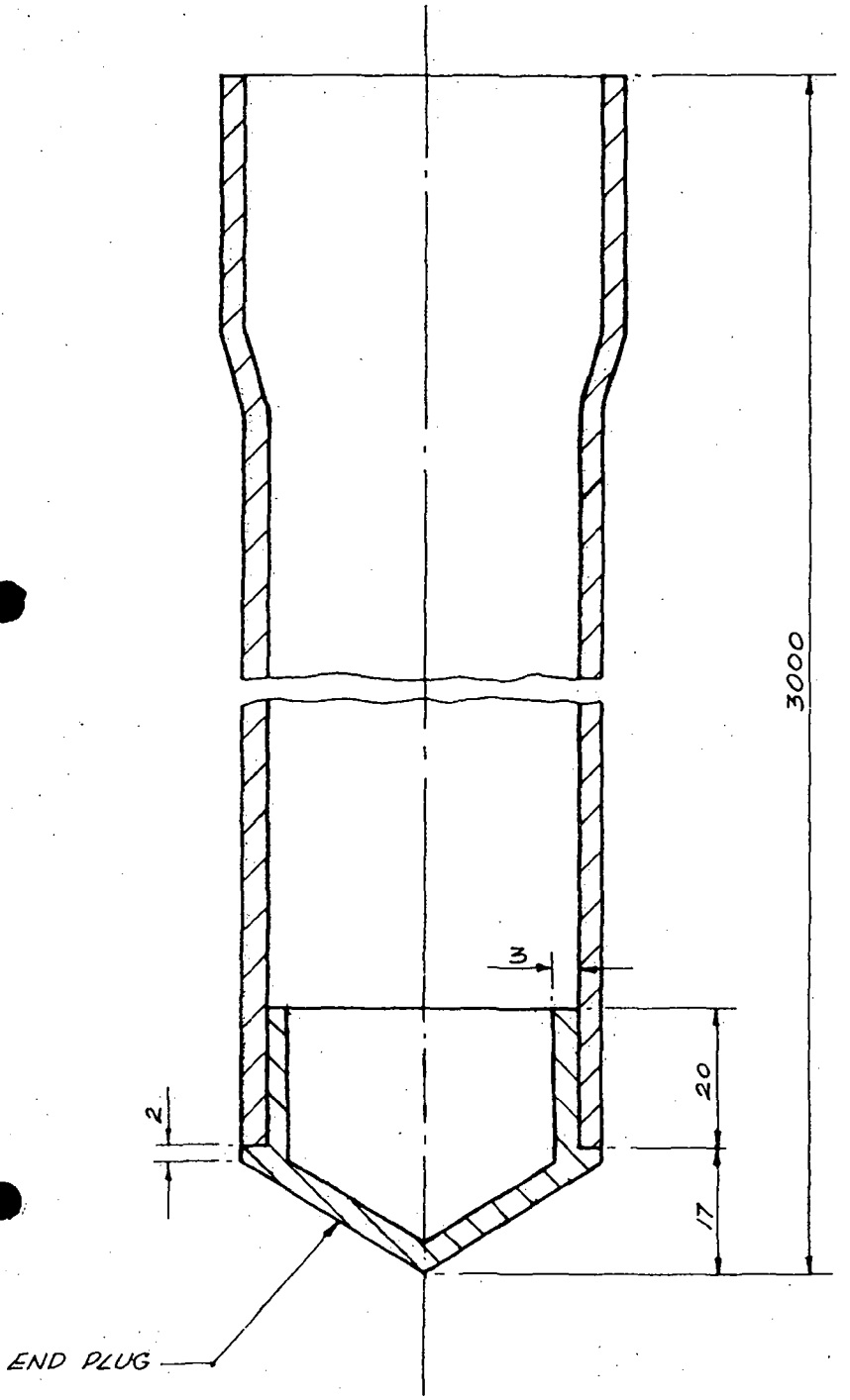
SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		Mar.'84
CHECKED BY		
APPROVED BY		April'84

UNICEF
G.P.O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
"ROBO" SCREEN

SCALE	DRG.NO.	REV.
1:1	T 51	1



NOTES:

1. For General Arrangement see DRG. T01.
2. MATERIAL: Standard 1½" dia. u-PVC Spigot and Socket pipe to BS: 3505 : 1968 (Class 'D').
3. END PLUG: From u-PVC material. Plug to be solvent cemented into spigot end of pipe to form a water-tight seal.

REVISIONS			
NO.	DESCRIPTION	DATE	APPD.

SIGNATURE		DATE
DESIGNED BY		
DRAWN BY		1/11/82
CHECKED BY		
APPROVED BY		24.1.83

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BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
SAND TRAP

SCALE	DRG. NO.	REV.
1:1	T 52	

PIPE SIZES, TYPES AND SPECIFICATIONS

Pipe sizes have generally followed a direct conversion from imperial equivalent nominal diameters. Drawings must thus be read in conjunction with the following table for precise pipe details:

G. I. Pipes (BS 1387 : 1967)
(Threads to BS 21:1957 And 1959)

Drawing Notation mm	Pipe Nominal Diameter inches	Outside Diameter mm	Wall Thickness mm	Remarks
65	2½	76.6 - 75.4	3.65	Medium
50	2	60.8 - 59.8	3.65	Medium
20	¾	27.2 - 26.6	2.65	Medium

PVC Pipes (BS 3505 : 1968 And 1972 and 1975)
(Threads to BS 21 : 1957 And 1959)

Drawing Notations mm	Pipe Nominal Diameter inches	Outside Diameter mm	Wall Thickness mm	Remarks
32	1¼	42.1 - 42.4	2.2 - 3.2	Class D
40	1½	48.1 - 48.4	2.5 - 3.0	Class D
50	2	60.2 - 60.5	2.5 - 3.0	Class C

CONCEPT OF THE TARA PUMP (BANGLADESH)(Contd)

- The Tara has been designed with all these factors in mind:-

(i) Total, in place cost, inclusive of materials, transport, labour, storage, establishment etc., is around US$300;

(ii) The upper well casing is 2" nominal pvc pipe. This can be manually sunk very quickly using the sludger method. By 1990, finances permitting, it should be possible to sink 50,000 units annually;

(iii) The ergonometric requirements of six year old children have been met by using a pedestal; and older, bigger people can operate at whatever height suits them. Also, buoyant pump rods greatly reduce the forces required to lift the water;

(iv) It is direct drive, eliminating rotating parts. No lubrication is required;

(v) The complete maintenance cycle can be undertaken by the caretaker and one helper in less than 15 minutes - which is in line with the concept of the VLOM (Village Level Operation & Maintenance) pump;

(vi) With the exception of pvc solvent cement and ordinary cement, everything can be made locally;

(vii) The yield of the pump is very high compared with other force mode pumps.

The pump is aimed at improving health. Attention has been paid to both platform size and geometry, since both lead to an increase in water use which in turn leads to a reduction in diarrhoea. Because both hands are required for pumping, far less handling (and thus contamination) of the spout appears to take place.

The concept of the pump is thus one of a health intervention; and all aspects focus on its ability to deliver the intervention well and reliably.

CONCEPT OF THE TARA PUMP (BANGLADESH)

- The Bangladesh Government wishes to supply its rural population with safe water at the earliest date possible. To do this, handpumps have been found to be the only feasible method, and an aggressive programme to place suction mode handpumps in the rural areas has been very successful to date. It is estimated that around 500,000 exist which have been placed by the Government for the purpose.

- An analysis shows that the rural population will probably reach and stay substantially static at 90 million from around 1990. Research has indicated that an acceptable user group size is 75 per well (although fewer would be more beneficial), and, for the present, this is being used for planning purposes. This implies that 1.2 million working tubewells with handpumps will be required for an adequate coverage. To allow for maintenance, replacement etc., plans allow for a total of 1.5 million.

- Unfortunately, suction mode handpumps are only applicable where water tables are within 7 metres of the surface at the driest time of year. Because of the priority accorded by the Government to self sufficiency in agricultural production, many deep, motor driven pumps are being placed which will eventually lower the water table beyond 7 metres in large areas of the plains of Bangladesh. It is thought that up to 50% of the area will be affected this way; implying a need for over 700,000 deep set (force mode) pumps in those areas.

- Existing force mode pumps are expensive, and have a very poor maintenance record. They are difficult to sink quickly, and caretakers cannot be involved in their maintenance. Total coverage cannot be achieved using such pumps. Obviously, what is needed is an <u>inexpensive pump</u>, which,

  - can be quickly installed
  - can be used by children
  - requires minimum maintenance
  - can be entirely maintained by village caretakers
  - and, can be locally manufactured.

NOTE FOR THE RECORD

7 May,1984

An update on the development of the TARA Deep-set Hand Tubewell

Sites: Mirzapur and Joydebpur Upazillas,Bangladesh

AT MIRZAPUR

Six prototype wells have been installed in two adjacent villages (Dehura and Baimail) in the deepset area of Gorai U.P., Mirzapur. The wells are under the general caretakership of Save the Children Fund (USA). The depth varies between 170 and 190 feet, with good aquifers encountered between 140 and 170 feet.

The area has an average water table level of between 30 and 36 ft. below ground during the dry season, when most of the nearby deep, motorized, irrigation tubewells are in use.

The wells have been in use since December 1983, and were sunk using the "sludger" method (a local jet boring form of well drilling), incorporating the latest design components of the TARA pump to date.

Each well is serving an average user group of 12 households (70-80 persons), whose reaction so far has been totally positive in terms of the yield of the pump (up to twice that of the No.6 Shallow Handpump), water quality, ease of operation (initial stiffness is overcome by constant usage), and size of platform (three times that at the No.6 pump). The wells are being used for all domestic purposes: laundering, cooking, bathing and drinking.

AT JOYDEBPUR

The sinking of a further six prototypes has now been completed in the Salna U.P. area of Joydebpur, under the Government's Department of Public Health Engineering caretakership.

This particular deepset area is somewhat difficult for well construction by the "sludger" method. Top layers of very fine clay have been experienced up to 110 ft. below ground and this difficult overburden has contributed to the loss of two wells due to collapse of the soil during lowering of the pipes. The use of a locally made double acting reciprocating pump (popularly known as the "donkey") overcame this problem.

The wells vary in depths between 180 and 210 ft., with good aquifers starting at 160 ft. The static water level lies between 30 and 45 ft. in extreme dry conditions.

Each well is centred around an average user group of 18 households (110-120 persons). Tubewells are virtually non-existent in the project area, and the main sources of water are ponds and ring wells.

The first pump which was installed at Masterbari (completed March 1) has since shown a very high degree of wear on the galvanized iron handle and around the platform area. There is a constant trek of womenfolk, from as far away as 3/4 mile, at the pump daily.

contd.....2

These observations have pointed to the fact that the pump is accepted and is being used costantly by the womenfolk, despite concern from other quarters on the unusual body action during pumping.

An interesting experiment is being undertaken at these wells in collaboration with the Socio-Economic Study group (SES), headed by a DANIDA Advisor, to determine what attractions would be necessary at the pump to bring about maximum usage from the primary users, viz. women. Facilities for laundry (a scrubing slab), bathing (an enclosure), and water storage (a concrete ring), have been or will be installed on the platforms of three wells and the usage pattern monitored by the SES group. A comparison will be made with the usage pattern at the other three wells (also to be monitored), where the above facilities will not be provided.

SUMMARY

The picture so far is one of satisfaction, both from the users and the designers.

Monitoring of time usage is being done in conjunction with the World Bank, Dhaka. Ways of improving usage, with a view of creating a positive health impact are being studied by DANIDA.

Technically, only minor problems have been encountered so far and these have been easily repaired within short periods of time. These problems have been:

i. Damaged top guides: Shearing of the internal ribs at the support for the wooden bush, caused when force is transmitted from the handle to the bush.

ii. Worn leather cups: Usually when abrasion between the leather cup and the cylinder occurs only over a portion of the cup.

iii. Heavy pump rods: Due to faulty solvent cement joints which allow the entrance of water in the pump rod.

iv. Rusting set screw: When not oiled periodically.

v. Non-functioning Check Valve: Due to loose sealing between the valve and cylinder.

The pump is now at the stage where field testing and monitoring can be undertaken over a long period of time without further major design changes, and the next phase of the TARA development, i.e., training of contractors for installation, training of caretakers for maintenance, and development of the health education approach arround the pump, is now ready for institution.

The revised ALBUM OF DRAWINGS for the TARA pump, showing the latest design features as used in the prototypes, is now completed and may be distributed on request.

Stanley R. Hall
Project Officer
WES Section, UNICEF-Dhaka

DISTRIBUTION

1. Mr. M. M. Hosain, Chief Engineer, DPHE, Dhaka
2. Mr. A. R. Mridha, Superintending Engineer, Planning Cell, DPHE, Dhaka
3. Mr. A. H. Molla, Additional Chief Engineer, DPHE, Dhaka
4. Mr. Nigel Ringrose, UNDP, Dhaka
5. Mr. Larry Maramis, UNDP, Dhaka
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18. Mr. Otto Langenegger, World Bank, Abidjan
19. Mr. Md. Ikramullah, MAWTS, Dhaka
20. Mr. Ken Foreman, Save the Children Fund (USA), Dhaka
21. Mr. Jerry Gill, BARC, Dhaka
22. Mr. David Sorrill, CARE, Dhaka
23. Dr. Kristian Laubjerg, DANIDA Adviser & Coordinator-MC.

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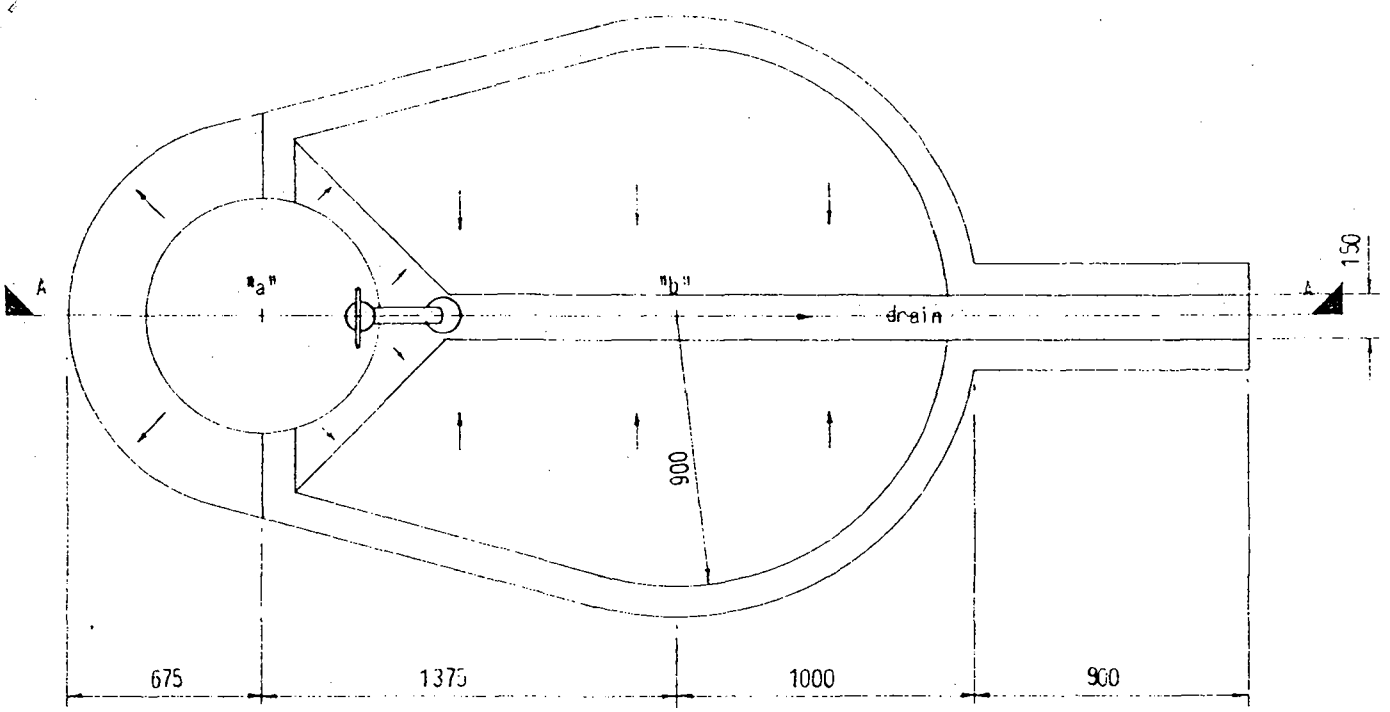
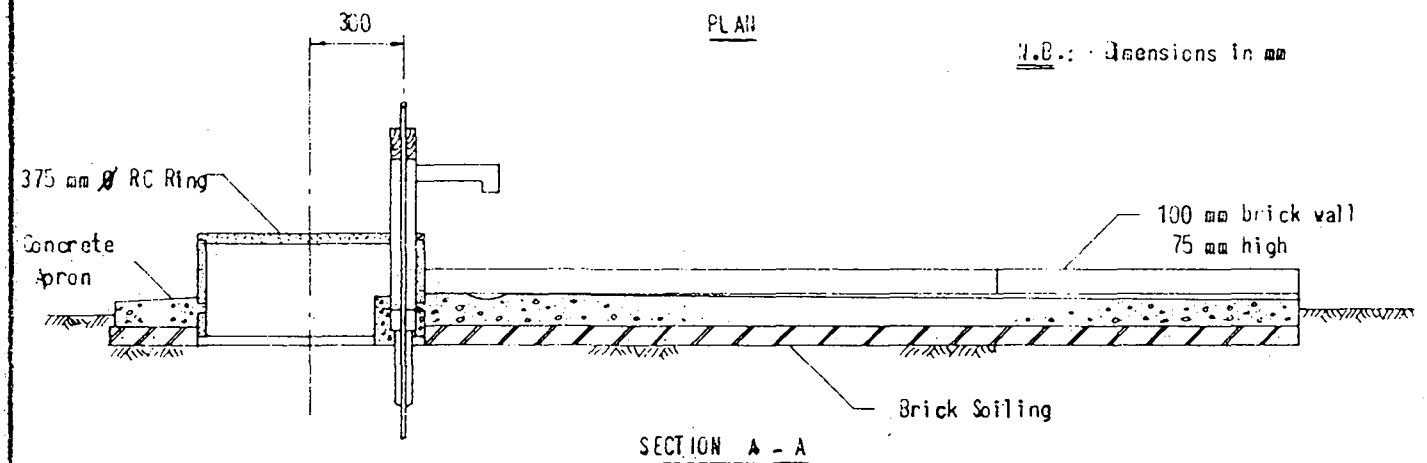


PLAN

N.B.: Dimensions in mm



SECTION A - A

SETTING OUT PROCEDURE

1. Establish point "a" (centre of concrete apron and RC Ring) by measuring 0.3 m back from centre of well in line with centre line of proposed drain.
2. Establish point "b" by measuring 1.375 m from point "a" in front of well on centre line of proposed drain.
3. Mark out circle with centre "a" and radius 0.675 m.
4. Mark out circle with centre "b" and radius 1.0 m.
5. Draw tangents to both circles to establish outer limit of platform and apron areas.

REVISIONS				SIGNATURE	DATE
NO.	DESCRIPTION	DATE	APPD.	DESIGNED BY	
				DRAWN BY	
				BKHall	16.11.83
				CHECKED BY	
				APPROVED BY	

UNICEF
G. P. O. BOX 58
DHAKA
BANGLADESH

BANGLADESH DEEP-SET HANDPUMP MARK I

TITLE
PLATFORM

SCALE	DRG. NO.	REV.
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WELL SINKING PROCEDURE, SEQUENCE AND PIPE ORIENTATION

- The procedure followed for sinking wells refers only to those placed in a homogeneous alluvium, such as that found in Bangladesh. The "Sludger method" is used, cutting the hole to around 2 to 4 metres deeper than required, using 1½" ∅ steel pipes. On completion of the hole, the top 15 metres is cut using a 1½" ∅/2" ∅ adaptor to open the hole to around 2¼" diameter. Cuttings from the top 15 metres may thus fall into the bottom of the hole without causing restrictions during installation of the tubewell.

- The plastic pipes are inserted, the joints being bonded with quick drying solvent cement. Around 20 seconds is allowed for drying of each joint. The orientation of pipes for the lower well casing is not important, since the pipes act purely as a conduit. However, the upper well casing pipes must be oriented to have their bells facing downwards. If this is not done, the piston will not be able to be extracted for servicing.

- The top pipe is not cut immediately; and water is poured down the pipe to ensure that the screen is kept clear until development is to start. If sand is available, it should be poured down the side of the hole in quantities adequate to provide a gravel pack around the screen. The top of the hole around the pipe is closed using bags or similar packing to avoid having water the well in the annular space between the pipe and the alluvium.

- The check valve is inserted. The piston and pump rods follow; and the check valve is "bumped" into position using the grapple cross-bar. The pump rod is finally cut to allow at least 150 mm clearance between the grapple and check valve T-bar in the lowest pumping position. The well is then pumped until the water is clear.

- It is noted that the forces in the pump rod are high, and thus it is adviseable to solvent cement the pump rod pipes and connectors some hours in advance of installation to allow full bonding to take place. Only a thin film of solvent cement is needed; too much makes for a weak joint. Joints must be waterproof, since the pump relies on the buoyancy of the pump rods for its ease of pumping.

- As there is no "stop" on the PVC parts of the pump head, care should be taken when solvent cementing the pump head onto the top pipe of the upper well casing. It is, perhaps, adviseable to mark a line 50 mm from the top of the cut pipe, and to ease the pump head down to this mark slowly.

- The construction of the platform which is usually undertaken one or two days later, presents no real problems. Only one item should be very carefully done - ensuring that the relative levels of the platform, pedestal and pump head are correct. It is recommended that the mason undertaking the work both signs his name and dates (day, month, year) the construction, as this has been found to be very useful later.

MAINTENANCE PROCEDURES : THE TARA PUMP

- The flap-valve (rubber disc seal) on the piston and check valve is intended as scavenger technology type, so that a replacement might be found in almost any village anywhere in the world. This will reduce the problem of procurement of spares, since it can be made by anyone, anywhere, at very little cost.

- To undertake a complete overhaul of all seals on the Tara pump, the following procedure should be adopted :

  (1) loosen the top guide by unscrewing the set screw.

  (2) lift the pump rod to the top connector, and remove the T-bar handle.

  (3) in its place, screw in the retrieving rod (which is slightly longer than the T-bar handle).

  (4) push the pump rods down until contact is made between the grappling hooks on the piston and the check valve.

  (5) pick up the check valve by rotating the pump rod in the clockwise direction.

  (6) lift the check valve and pump rods from the well. They will be heavy, since there is now an effective double piston at the end of the pump rods.

  (7) extract everything from the hole, taking care not to kink the pump rods.

  (8) replace seals as necessary.

  (9) to reinstall, apply the reverse procedure.

- The whole operation can be performed without tools, except for the set screw, which requires a screw-driver (available anywhere). This screw has been kept to avoid vandalism by children, or pilferage by others. A small, simple, locking device can even be placed over the screw, if necessary.

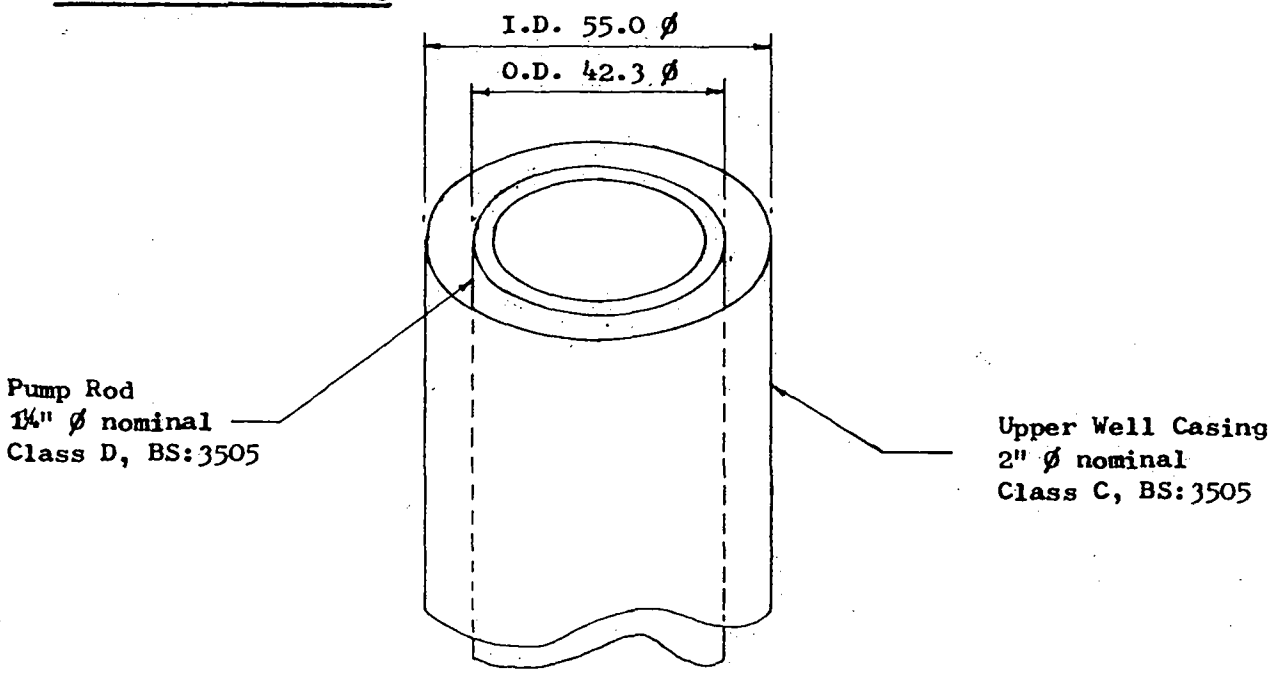
- Full maintenance should take two people no more than thirty minutes. With experience, it can be done in ten minutes.

- It is advisable to oil the set screw at least once weekly to avoid rusting.

PUMP ROD FORCES : THE TARA PUMP

- Pump rod forces are calculated below to indicate what is happening both above and below the water table. A full analysis is not presented, since water tables vary from site to site and season to season. These forces will purely show how to obtain a reasonable arrangement for any particular site; although it is not recommended that each facility be individually designed.

Above the water table



Total mass of water column in upper well casing without pumprod

$$= \frac{\pi\ (55.0)^2 \times 1 \times 1 \times 1000}{4 \times 1000 \times 1000} \text{ kg/m}$$

$$= \underline{2.376} \text{ kg/m}$$

Mass of pumprod (1¼" ø) = 0.462 kg/m

Mass of displaced water

$$= \frac{\pi\ (42.3)^2 \times 1 \times 1 \times 1000}{4 \times 1000 \times 1000} \text{ kg/m}$$

$$= \underline{1.405} \text{ kg/m}$$

Effective mass of arrangement = 2.376 - (1.405 - 0.462)

$$= \underline{1.433} \text{ kg/m}$$

Below the water table

Effective mass of arrangement	=	- (1.405 - 0.462)
	=	- 0.943 kg/m
This implies upthrust	=	0.943 kg/m

...

- From the calculations, it may be seen that a column mass of 1.4 kg/m occurs above the water table. This means that it should be possible to achieve 15 m using the direct drive system before contemplating having to apply leverage. Since 15 m or less applies to nearly 100% of the intended facilities for Bangladesh at the present time, no provision for leverage has been made. Also, it can be seen that for every metre of submergence, 0.9 kg upthrust can be obtained. This can be used to advantage, although the use of long upper well casings is not recommended.

- It should be noted that communities appear willing to work hard on a pump that has a high yield; and thus only sparing use need be made of the submergence upthrust.