MANUAL OF QUALITY CONTROL FOR HANDPUMPS AND SPARES

VOLUME I

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VOLUME I

UNICEF/SGS HAND PUMP TRAINING PROGRAMME

QUALITY IS NEVER AN ACCIDENT.
IT IS ALWAYS THE RESULT OF
INTELLIGENT EFFORT.

INDEX

ABOUT THIS MANUAL

This manual is prepared for the use of State Public Health Engineers, District Officers, Field / Stores Officers and installation personnel who are involved in the planning, procurement, quality control and monitoring of hand pumps, at the state and district levels.

The manual explains the systems and procedures for complete quality control, equipment requirements, methodology and checks to be followed during the production of hand pumps. It also provides the state governments and hand pump procurement personnel, with details of works and lot inspections in the factory as well as procedures and practices to be adopted in carrying out quality checks by the consignees themselves.

Further, this manual highlights the rust prevention methods – galvanising and electroplating for hand pumps and the basic storage facilities required at the consignee end, which will help field personnel store the material, in a systematic way. Standards are provided to guide procurement of pumps, spares, sub assemblies, tools and accessories at both state and district levels.

The common defects identified and described in detail will help in checking the critical parameters during manufacture, consignee end inspection and installation of hand pumps.

This manual enables state government personnel to participate in the implementation of quality control procedures to improve the rural water supply systems based on hand pumps.

This manual is in two volumes. Vol. I covers the concepts and procedures of quality control and gives details of technical specifications and drawings of various pumps, spares, tools and accessories. Vol. II provides the Engineering drawing specifications critical for the production of hand pumps based on BIS standards.

HANDPUMP DEVELOPMENT IN INDIA

Successful community water supply projects need to be planned as a package of measures designed to make the best use of available resources.

With this in mind, the Government of India and various agencies operating on the rural scene, have subscribed to the miracle combination of borehole/handpump as a source of drinking water to a large number of 'no-source' situations in the country.

Recurrent droughts in India since the mid 60s had made the Government conscious of the vital need to provide the rural population with an adequate and safe water supply, especially in a large number of villages dotting the peninsular part of India.

The drought-like conditions brought the high speed drilling rig, which could drill in a rocky formation and complete a borehole in almost 24 hours. Small quantities of water are available in rocky formations, although with deep static water level, which is enough for pumping out small quantities for domestic use.

The Government of India initiated a scaled-up rural water supply programme of borehole drilling and handpump installation. The handpumps installed over these boreholes were the usual cast-iron, suction mode pumps, hastily modified and fitted with brass cylinder at the end of a riser pipe and lowered into the newly constructed boreholes.

This use of cast iron handpumps continued from the mid 60s for almost 5 years until voluntary organizations from Maharashtra, such as the Jalna based Church of Scotland Mission initiated experiments to modify the cast-iron pumps, which had a high failure rate, into somewhat substantial and workable options. As a result of these efforts, the Jalna pumphead was developed into an all steel structure which was based on a single pivot instead of the multipivot handle of the cast-iron pump. The handle pivot of the handpump incorporated a bearing with chain link and joined together with the connecting rod. This ensured proper alignment and the connecting rod was kept in tension at all times without reversal of stresses.

The American Mission in Wadala, in Ahmednagar District, Maharashtra also contributed by modifying and improving the Jalna handpump to produce the "JALWAD" pump.

During the same period, a similar design effort made by the Sholapur Well Service, in Maharashtra, resulted in a handpump which was similar in many ways to the Jalna pump. The Sholapur Handpump was however more professionally engineered and accurately manufactured on jigs and fixtures. Further, the Sholapur Pump contained a completely new pivot design which in turn ensured longer bearing life. The Sholapur Pump incorporated the additional feature of the roller chain operating over a quadrant. The pump had a pedestal which fitted onto the bore well casing pipe to ensure a firm base and an effective sanitary seal.

At this stage, spot surveys carried out by Government of India for all handpumps installed, found that a large percentage were non-functional or in disrepair. The Surveys indicated that 75 percent of the handpumps were non-functional at any given time. The result of this survey brought into focus, the need for a concerted effort to develop alternatives to the existing handpumps.

The obvious next step was to identify an existing handpump which could replace the cast-iron models. Predictably, the search ended with the Sholapur handpump. The Government of India, Richardson & Cruddas, Madras, Sholapur Well Service in Maharashtra, MERADO (CMERI),

UNICEF and the Tamil Nadu Water and Drainage Board collaborated in improving the Sholapur handpump over a period of two years.

Towards this end, the Govt. of India and WHO organised a handpump workshop at Bangalore in 1975 where several recommendations were proposed based on the design of the Sholapur Pump.

With the concerted efforts of TWAD Board Madras, Government of India, UNICEF, MERADO and Richardson & Cruddas Madras, the development of the prototype and the field testing of India Mark II design pump was completed in 1976. This was the beginning of India Mark-II handpump era.

The development of India Mark II was a major break through in reliability and ease of operation. There was a dramatic increase in the number of pumps operating at any point of time, from a dismal 25% to an impressive 85%.

Although sturdy and reliable in design, the India Mark II handpump requires preventive and curative maintenance. This needs special skills, manpower and tools to make replacements. These may not always be available or feasible at the village level. Studies conducted so far indicate that the present maintenance systems have a high overhead cost. Further the community is not adequately involved during planning, execution and maintenance.

Further Developments and Improvements

In order to offset these maintenance problems and to increase meantime before failure (MTBF), further developmental efforts were made. As a result, a village level operation and maintenance (VLOM) version of India Mark II known as India Mark III was evolved between 1983 and 1987 through the combined effort of GOI, UNICEF and UNDP/World Bank Project.

This pump has now been standardised by Bureau of Indian Standards. More than 10,000 pumps are installed all over India and the performance is very encouraging.

Further developmental efforts have continued, to tackle field situations with static water levels from 7-20 metres and beyond depths of 50 metres. As a result an extra deepwell version has been added to the family of India Mark II Handpumps which has a functional range of 50-90 metres depth.

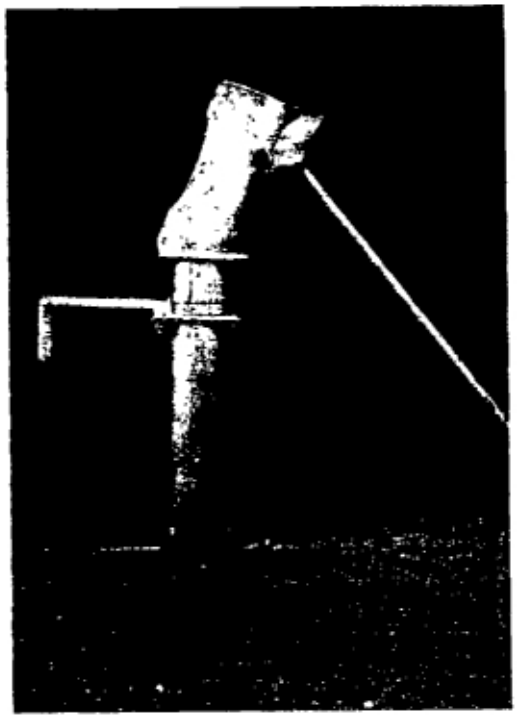
For static water levels of 7-15 metres a Direct Action handpump has been developed. The development and production capacity is now available to cater to the needs of alluvial areas with medium lifts upto 15 metres. It is a low cost option for both, community and household use. Based on the Tara handpump design of Bangladesh, it is upgraded to suit Indian conditions and specifications.

The Direct Action TARA handpump answers a long felt need for a VLOM handpump for the alluvial and coastal tracts of India.

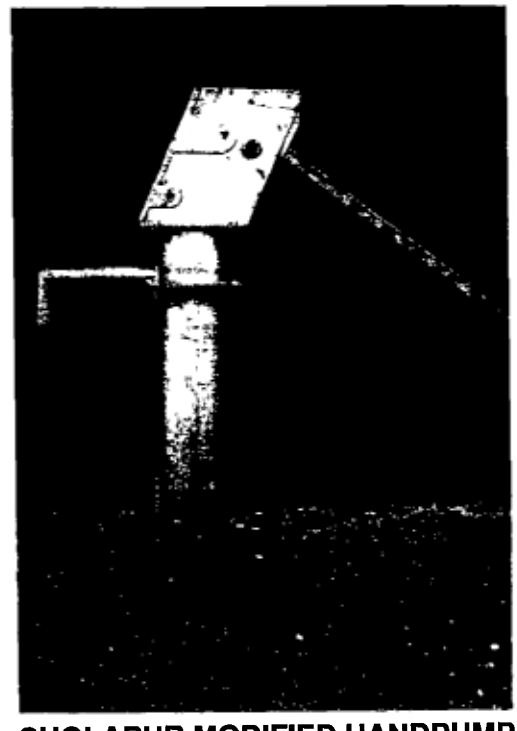
TYPES OF HANDPUMPS USED IN INDIA (YEAR 1960-1970)

DOUBLE GUIDE HANDPUMP

JALNA CONVERSION HEAD

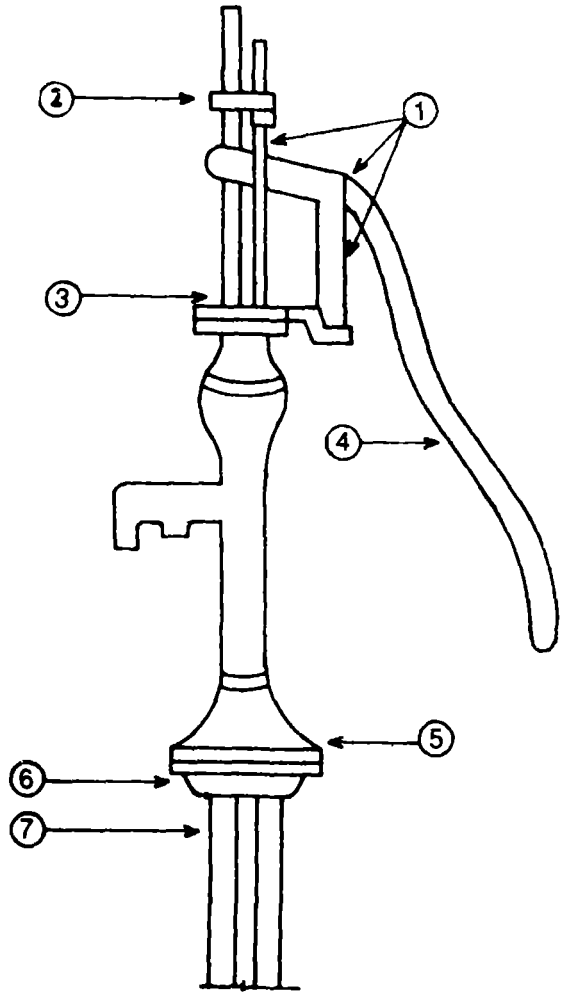


SHOLAPUR HANDPUMP



SHOLAPUR MODIFIED HANDPUMP

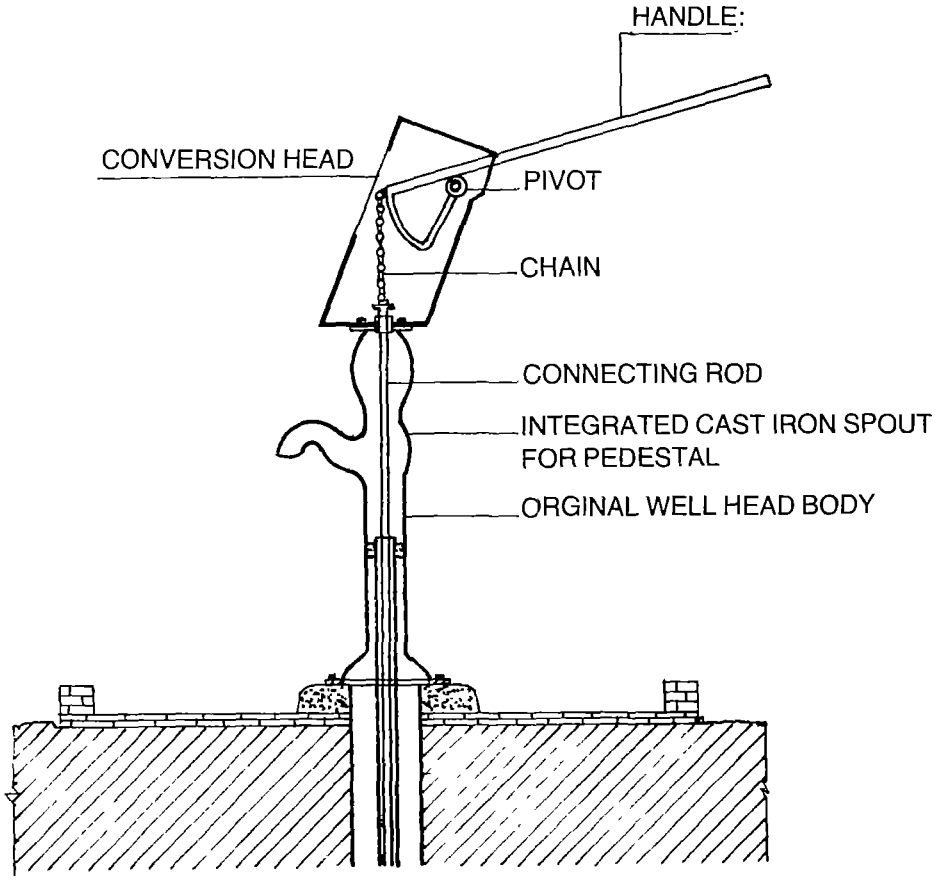
TYPES OF HAND PUMPS USED IN INDIA (YEAR 1960-1970)



STANDARD DOUBLE GUIDE HAND PUMP

PARTS -

1. LINKAGE 2. GUIDE CROSS HEAD 3. GLAND
4. HANDLE 5. FLANGE MOUNTING BASE
6. FLANGE THREAD 7. RISING MAIN CONNECTION



SHOLAPUR CONVERSION HEAD ADOPTED TO CAST IRON PUMP BASE

THIS CONVERSION SOLVED THE WEAK PARTS 1,2,3,4 COVERING 70% OF THE BREAKDOWN FACTOR

WATER QUALITY

WATER QUALITY CRITERIA

(Summarised from WHO International Standards for Drinking Water)

PARAMETERS (1)	UNDESIRABLE EFFECT THAT MAY BE PRODUCED (2)	HIGHEST DESIRABLE LEVEL (3)	MINIMUM PERMISSIBLE LEVEL (4)
A. PHYSICAL:			
Colour (Units)	Discolouration	5	50
Odour	Odours	Unobjectionable	Unobjectionable
Taste	Taste	Unobjectionable	Unobjectionable
Total Solids (mg/l)	Taste Gastrointestinal irritations	500	1500
Suspended Matter (Units)	Turbidity Gastrointestinal irritations	5	25
B. CHEMICALS:			
pH (Units)	Taste	7.0 to 8 5	6.5 to 9.2
Calcium (mg/l)	Excessive Scale formation	75	200
Chloride (mg/l)	Taste Corrosion in hot water systems	200	600
Fluoride (gm/l)	Mottling of teeth Disfiguring of skeletons	1 0	1.5
Total hardness as mg/l of $CaCo_3$	Excessive scale formation	100	500
Mineral oil (mg/l)	Taste Odour	0 01	0.30
Phenolic substances (mg/l)	Taste	0.001	0.002

(1)	(2)	(3)	(4)
C. TRACE ELEMENTS:			
Arsenic (mg/l)	Toxic	—	0.05
Copper (mg/l)	Astringent taste Discolouration Corrosion of pipes; fittings & utensils	0.05	1 5
Cyanide (mg/l)	Toxic	—	0.05
Iron (mg/l)	Taste Discolouration Constipation Turbidity Growth of iron Bacteria	0 1	—
Lead (mg/l)	Toxic	—	0.1
Manganese (mg/l)	Taste Discolouration Deposits in pipes Turbidity	0 05	0.05
Zinc (mg/l)	Astringent taste	5.0	15.0
D. PESTICIDES:			
DDT (mg/l)	Toxic	—	0.05
PCB	Toxic	—	Nil

Note: Only the most important parameters are presented.

It is seen from the table that the potable water should meet the various physico-chemical standards. The undesirable effect due to the presence of excessive concentration of various constituents is also summarised in the table. It can be seen that while excessive solids cause the gastrointestinal irritations, the pH, chloride, mineral oil, phenol, etc. change the taste of water. The presence of even a trace quantity of heavy metal ions imparts toxicity to water. Fluoride in excess concentration causes mottling of teeth and also disfigures the skeletons leading to "skeletal fluorosis". The presence of iron in the water which is normally observed in ground water besides imparting a brown colour to water also produces turbidity and enhances the growth of iron bacteria.

Besides, the physico-chemical standards the drinking water should also meet the bacteriological standard which is measured in terms of 'Coliform Count'. The bacteriologically safe water should be free from any pathogenic organism.

TEST CHARACTERISTICS FOR DRINKING WATER

SL. NO.	SUBSTANCE OR CHARACTERISTIC	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECT OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE	REMARKS
A. Essential Characteristics					
1)	Colour, Hazen Units, Maximum	5	Above 5, consumer acceptance decreases	25	Extended to 25 only if toxic substances are not suspected, in absence of alternate sources
2)	Odour	Unobjectionable	–	–	a) Test cold and when heated b) Test at several dilutions
3)	Taste	Agreeable		–	Test to be conducted only after safety has been established
4)	Turbidity	5	Above 5, consumer acceptance decreases	10	–
5)	pH value	6.5 to 8.5	Beyond this range the water will affect the mucous membrane and/ or water supply system	No relaxation	–
6)	Total hardness (as $CaCO_3$) mg/l, Maximum	300	Encrustation in water supply structure and adverse effects on domestic use	600	–
7)	Iron (as Fe) mg/l, Maximum	0.3	Beyond this limit taste and appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	1.0	–

TEST CHARACTERISTICS FOR DRINKING WATER

SL. NO.	SUBSTANCE OR CHARACTERISTIC	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECT OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE	REMARKS
8)	Chlorides (as ClO mg/1, Maximum	250	Beyond this limit, taste, corrosion and palatibility are affected	1000	–
9)	Residual, free chlorine, mg/1, Maximum	0.2	–	–	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, should be Min 0.5 mg/1.
B. Desirable Characteristics					
1)	Dissolved solids mg/1, Maximum	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	–
2)	Calcium (as Ca) mg/1, Maximum	75	Encrustation in water supply structure and adverse effects on domestic use	200	–
3)	Copper (as Cu) mg/1, Maximum	0.05	Astringent, taste, discolouration and corrosion of pipes, fittings and utensils will be caused beyond this	1 5	–
4)	Mangnese (as Mn) mg/1, Maximum	0.1	Beyond this limit taste and appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	–

TEST CHARACTERISTICS FOR DRINKING WATER

SL. NO.	SUBSTANCE OR CHARACTERISTIC	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECT OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE	REMARKS
5)	Sulphate (as SO4) mg/1, Maximum	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	May be extended upto 400 provided (as Mg) does not exceed 30
6)	Nitrate (as NO3) mg/1, Maximum	45	Beyond this metha emolobinemia takes place	100	–
7)	Fluoride (as F) mg/1, Maximum	1 0	Flouride may be kept as low as possible. High flouride may cause fluorosis	1.5	–
8)	Phenolic compounds (as C6H5OH) mg/1, Maximum	0.001	Beyond this, it may cause objectionable taste and odour	0.002	–
9)	Mercury (as Hg) mg/1, Maximum	0.01	Beyond this, the water becomes toxic	No relaxation	To be tested when pollution is suspected
10)	Cadium (as Cd), mg/1, Maximum	0.01	Beyond this, the water becomes toxic	No relaxation	To be tested when pollution is suspected
11)	Selenium (as Se), mg/1, Maximum	0.01	Beyond this, the water becomes toxic	No relaxation	To be tested when pollution is suspected
12)	Arsenic (as As), mg/1, Maximum	0.05	Beyond this, the water becomes toxic	No relaxation	To be tested when pollucted
13)	Cyanide (as CN), mg/1, Maximum	0.05	Beyond this limit, the water becomes toxic	No relaxation	To be tested when pollution is suspected

TEST CHARACTERISTICS FOR DRINKING WATER

SL NO.	SUBSTANCE OR CHARACTERISTIC	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECT OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE	REMARKS
14)	Lead (as pb), mg/1, Maximum	0.05	Beyond this limit, the water becomes toxic	No relaxation	To be tested wen pollution/plumbosolvency is suspected
15)	Zinc (as Zn) mg/1 Maximum	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	To be tested when pollution is suspected
16)	Anionic detergents (as MBAS) mg/1, Maximum	0.2	Beyond this limit it can cause a light froth in water	1.0	To be tested when pollution is suspected
17)	Chromium (as Cr6+) mg/1, Maximum	0.05	May be carcinogenic above this limit	No relaxation	To be tested when pollution is suspected
18)	Polynuclear aromatic hydrocarbons (as pAH) g/1, Maximum	–	May be carcinogenic	–	–
19)	Mineral oil mg/1, Maximum	0.01	Beyond this limit undesirable taste and odour after chlorination takes place	0.03	To be tested when pollution is suspected
20)	Pesticides mg/1, Maximum	Absent	Toxic	0.001	–

TEST CHARACTERISTICS FOR DRINKING WATER

SL. NO.	SUBSTANCE OR CHARACTERISTIC	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECT OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE	REMARKS
21)	Radioactive materials a) Alpha emiters Bq/1 Max	–	–	0.1	–
	b) Beta emiters pci/1, Maximum	–	–	1	–
22)	Alkalinity mg/1, Maximum	200	Beyond this limit taste becomes unpleasant	600	–
23)	Aluminium (as Al) mg/1, Maximum	0.03	Cumulative effect is reported to cause dementia	0.2	–
24)	Boron, mg/1, Maximum	1	–	5	–

Refer IS: 10500/1991 for Drinking Water Specification

TYPES OF HANDPUMPS

TYPES OF HANDPUMPS

The different types of handpumps being manufactured in India can be classified as follows:

A. Shallow Well Handpump

These pumps are used to draw water from Shallow depths (upto 15 m)

1) Suction Handpump
2) Direct action handpump (TARA)
3) India Mark III VLOM low lift

B. Deep Well Handpump

These pumps are widely used for drawing water from a depth of 20 to 50 m.

1) India Mark II
2) India Mark III (VLOM)

C. Extra Deep Well Handpump

The pump is used to draw water from a depth of 50 to 90 m.

1) India Mark II

The following are the main features of the above pumps.

A) SHALLOW WELL HANDPUMP

1) SUCTION HANDPUMP

The suction handpump is generally used for lifting water from a depth not exceeding 7 m. The principal components of the pump are:

a. Pump base with flapper valve and weight
b. Pump body, i.e. barrel
c. Pump head with fulcrum
d. Handle
e. Plunger rod assembly with bucket

Material of Construction

The pump body is made of cast iron. The piston rod is made of bright bar, electro galvanised. The flapper valve is made out of chrome/vegetable tanned leather, Nitrile rubber or PVC. The plunger bucket is made out of PVC or Nitrile Rubber. The total weight of the complete suction pump is approximately 30 kg.

REQUIREMENTS FOR BASE / PLATFORM

Tubewell Base

While installing, the upper most tubewell pipe should be suitably anchored in position so it does not deflect or swing while the pump is in use. Construction of a suitable base is very important to ensure the long life of any tubewell.

The pump is initially supported at the top-most tubewell pipe with a threaded joint between the tubewell G.I. pipe and the pump base. The pump base also is provided with an annular bearing support on the tube well base. Besides these the pump base gets frictional support from the encasement made of cement concrete. In fact, when the pump is in use the tubewell base (pump pedestal) also works as a foundation for the pump base.

Handpump/Tubewell Platform

Each tubewell must be provided with a concrete platform around the pump for the following reasons:

i) It provides a strong foundation around the pump pedestal.

ii) It prevents used water from entering the tubewell and thus, saves the tubewell water from contamination.

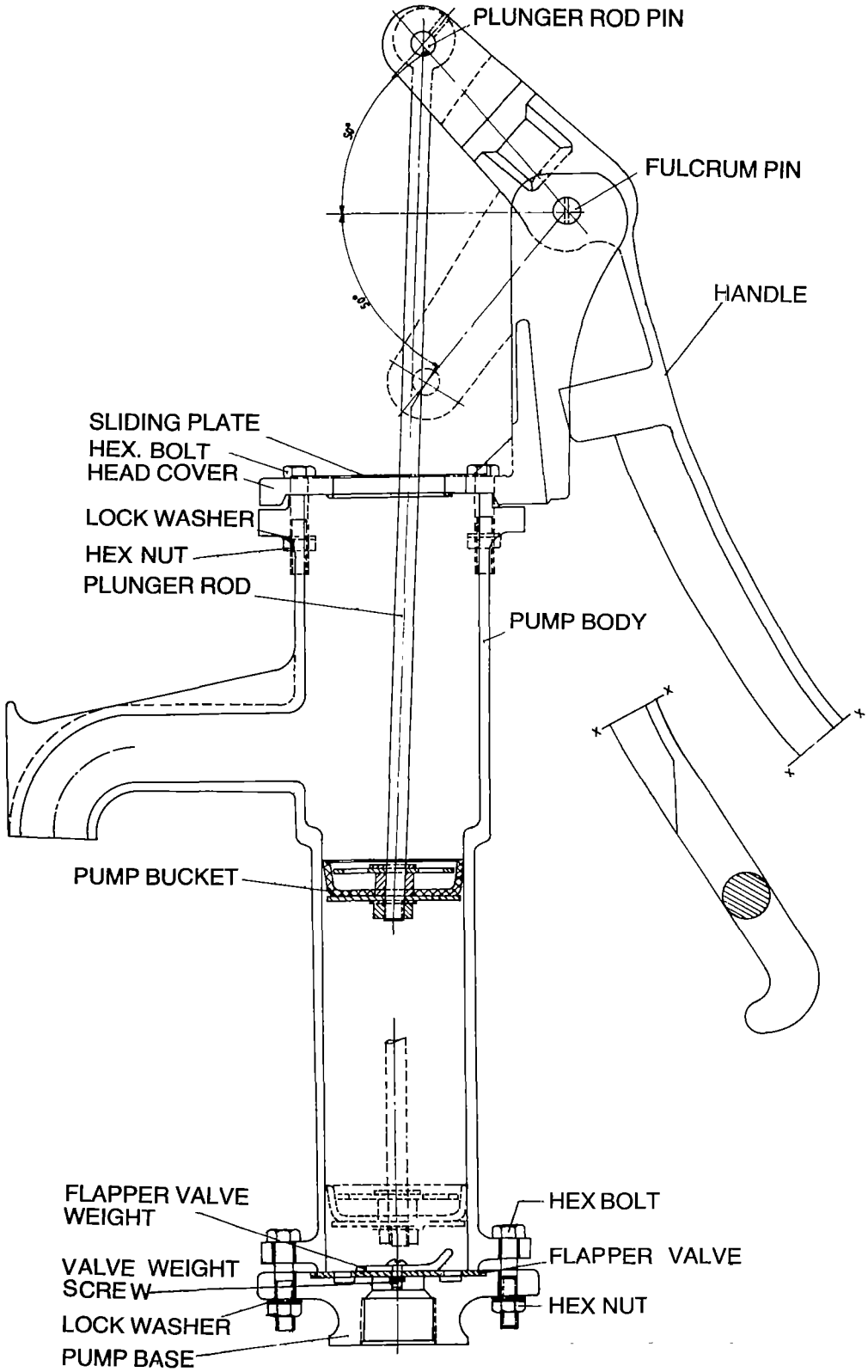
iii) It provides a good sanitary seal for the tubewell.

iv) It provides firm, dry, good operational area.

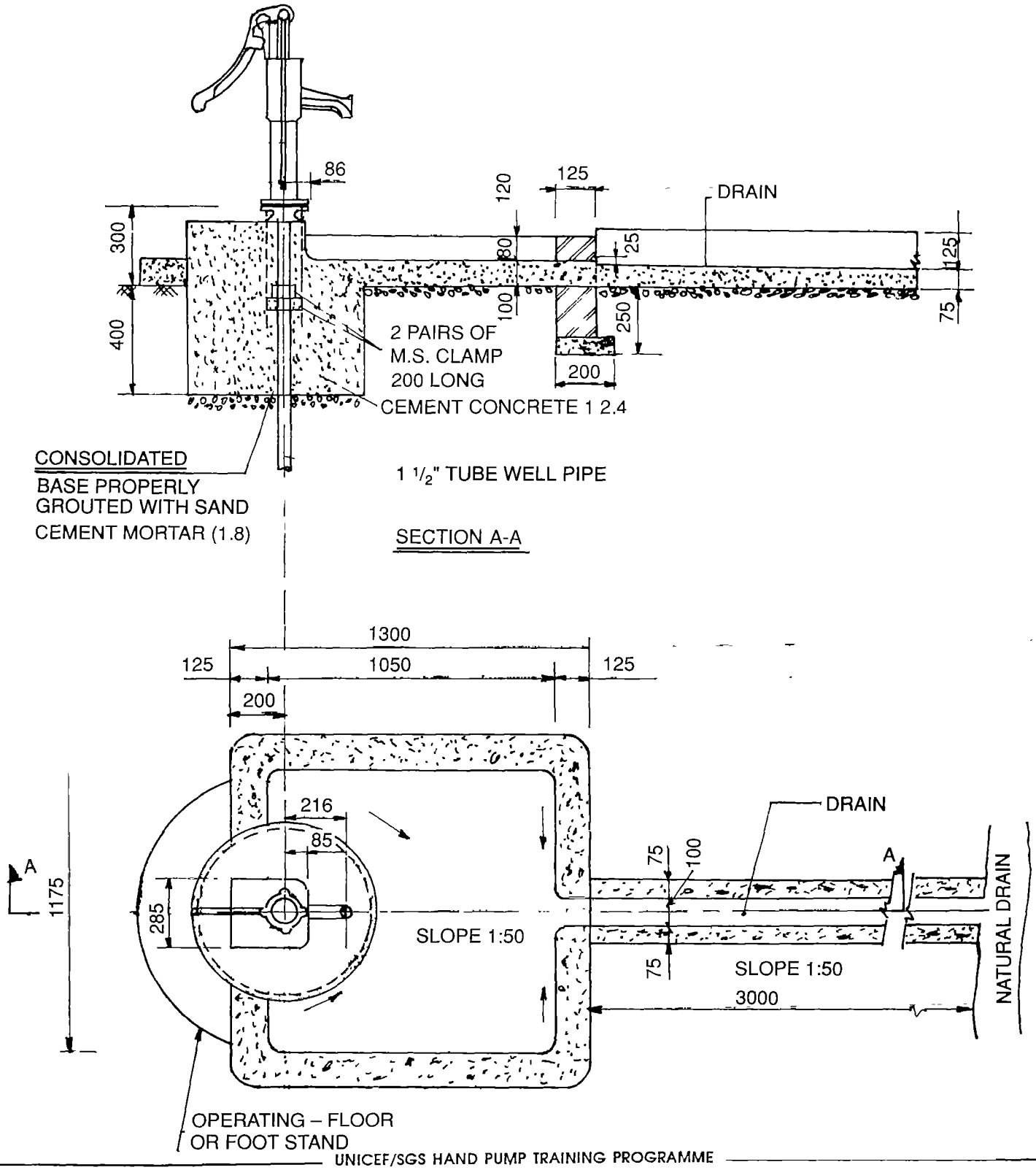
The platform is constructed to the required size and dimension. The operating floor and the waste water drain are inescapable parts of the tubewell platform.

The tubewell platform has an overall size of 1,300 mm. x 1,300 mm. bounded by a single layer standard brick laid on flat. Thus, it offers a usable

SUCTION HAND PUMP FOR SHALLOW WELL DEPTHS



PLATFORM FOR SUCTION HANDPUMP



platform floor of approximately 1,050 mm. x 1,050 mm. The tubewell base (pump pedestal) extends a little over 250 mm. above ground level. The floor from which the user operates the pump handle lies at 180 mm. above the ground level. Thus, the operating floor (foot stand) is proposed at about 120 mm. below the base of the pump body. The platform floor would be 100 mm. above ground level permitting good drainage of excess water.

The sewage water should not accumulate around the tubewell. A 3 m. long drain having an adequate slope is considered part of the platform.

TECHNICAL DETAILS OF SUCTION MODE HANDPUMP – (IS 8035 – 1976)

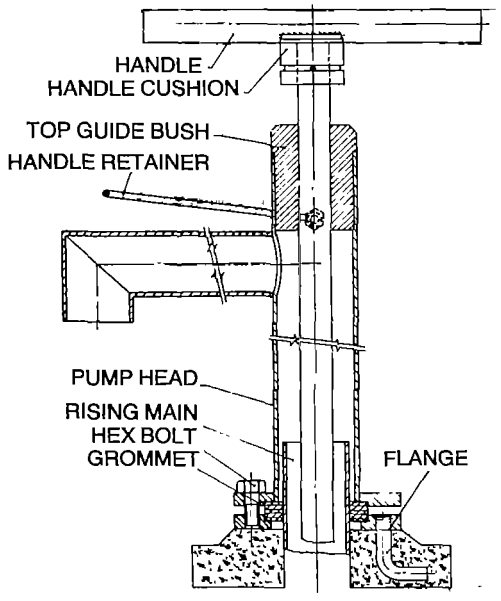
Name of Part	Material	Relevant Specification
Pump base with flapper valve weight	Cast Iron	FG-150 of IS 210 (1978)
Pump body	Cast Iron	FG-150 of IS 210 (1978)
Pump head	Cast Iron	FG-150 of IS 210 (1978)
Handle	Cast Iron	FG-150 of IS 210 (1978)
Piston rod	Bright Steel	IS 9550 (1980)
Eye of piston rod	Mild Steel	EN 9 or equivalent Case hardened to 35-45 HRC as per IS 4432 of 1988
Bush in the eye of the piston rod	Mild Steel	Hardened to 33-35 HRC
Sliding plate at pump head	Mild Steel	galvanised as per IS 4759 (1984)
Flapper valve	Chrome tanned leather or Vegetable tanned leather or PVC or Nitrile Rubber	IS 1273 (1958) IS 1015 of 1987 IS 8683 of 1977
Mild Steel plunger disk etc.	Mild Steel	galvanised as per IS 4759 (1984)
Plunger bucket	P.V.C /Nitrile/leather	IS : 8683 / IS . 1015 / IS : 1273
Bolts, nuts, washers, pins	Bright Steel/Mild Steel	IS · 1363 (Part I) and IS . 1363 (Part 3) of 1984

2) DIRECT ACTION HANDPUMP (TARA)

These handpumps are designed for lifting water from bore wells with static water level not exceeding 15 m. They are more cost effective than the Deep well handpumps for medium lifts and are safer from bacteriological contamination and corrosion problems.

The term 'Direct Action' for a handpump refers to a vertical pumping action using a 'T' bar handle connected to a buoyant PVC pump rod. The load is transmitted directly from the user to the pump rod and piston during operation. The buoyant pump rod, of a relatively large diameter, displaces water in both the upward and downward stroke and the buoyancy of the pump rod makes pumping operation easy. The above mechanism eliminates the complications of a lever action handpump such as bearings, axle etc. The direct action handpump

PUMP HEAD ASSEMBLY



is designed for easy installation, construction and maintenance.

Construction Details

1. Pump head assembly
2. Pump rod assembly
3. Rising main
4. Cylinder assembly
5. Tube well assembly
6. Retrieving rod assembly

Pump Head Assembly

The above ground structure consists of pump body, and a T-bar handle for direct applications to operate the plunger. The height of the pump body from the platform and the length of handle is designed to suit the stature of different users with comfortable movement of handle for a stroke length of 300-400 mm at various positions. Manufactured from high quality steel, this assembly is given a protective zinc coating by hot dip galvanising for effective corrosion resistance.

The pump is fabricated from 65 mm and 50 mm NB standard mild steel water pipe and a base flange. The two flanges compress a rubber grommet around the upper well casing as they are tightened, and this forms a sanitary seal between the pump-stand and the casing.

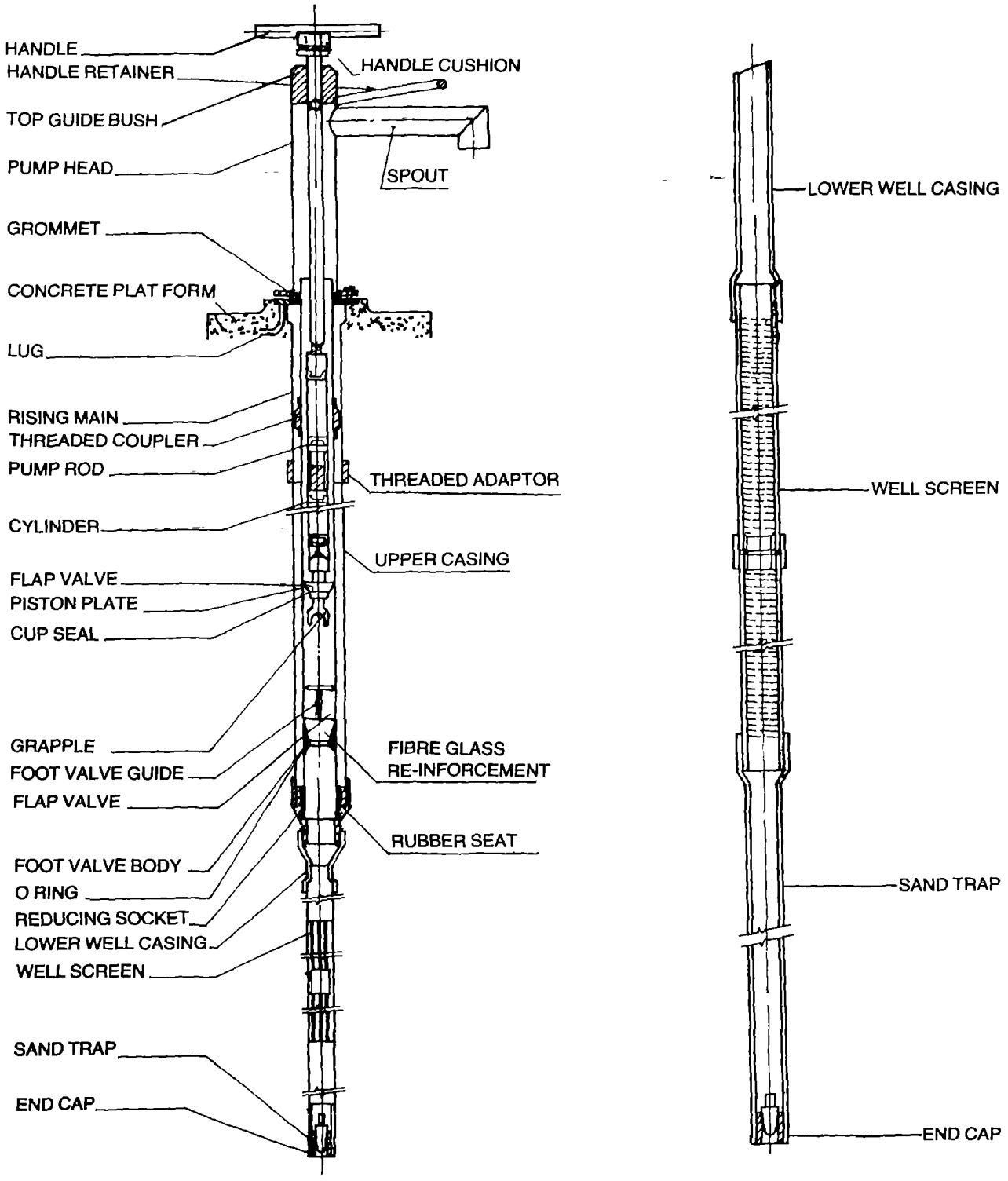
The T-bar handle assembly fabricated from 20mm NB mildsteel pipe by welding the cross-piece to the shaft and the handle nut to the bottom. The assembly is then hot-dip galvanised. It has an overall length of 760 mm, after allowing for the length of the bush and permits a random stroke length of upto 400 mm. The guide bush is made from HDPE material.

Pump Rod Assembly

The pump rod assembly transmits the mechanical force applied by the user from the pump handle to the piston assembly. In the case of the Tara-Direct Action handpumps, the pump rod has another important function: it divides the operating force between the up and down strokes, making it easier for the user.

The pump rod assembly consists of top and bottom connectors permanently joined. The top connector

DIRECT ACTION HAND PUMP (TARA)
EXTRACTABLE MODE SYSTEM ASSEMBLY



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joins the uppermost PVC pipe segment to the handle. The connector is a threaded bolt inserted into a PVC bush, machined to fit into the end of the pump rod. The threaded connector is locked with a wing jam-nut.

The bottom connector joins the piston assembly to the lower end of the pump rod. It consists of a stainless steel spindle threaded at both ends.

The 3m-long PVC pipe segments are solvent-cemented together using internal connectors consisting of short pieces of a specially extruded PVC pipe.

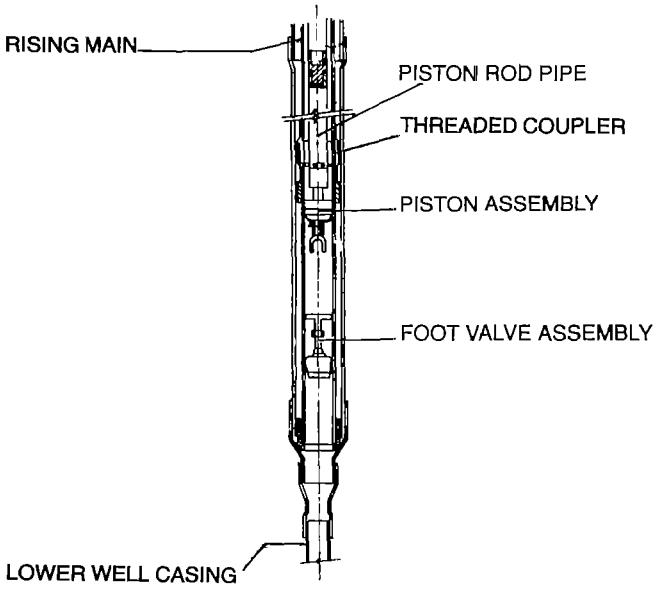
Made up of sealed PVC pipes, this assembly provides the linkage between the pump handle and the piston in the cylinder. With their light weight and high displacement capacity these rods help in reducing the efforts required for the upward stroke due to buoyancy. These rods are inter-connected with the help of an injection moulded PVC threaded adapter which seals the ends of the rod. The top connector bolt provided at one end is locked in position by the wing check nut.

Rising Main/Cylinder Assembly

The rising main is connected at the bottom to the cylinder assembly and carries water from the cylinder to the pump head. These are 3 m of PVC pipes joined together with a threaded coupler.

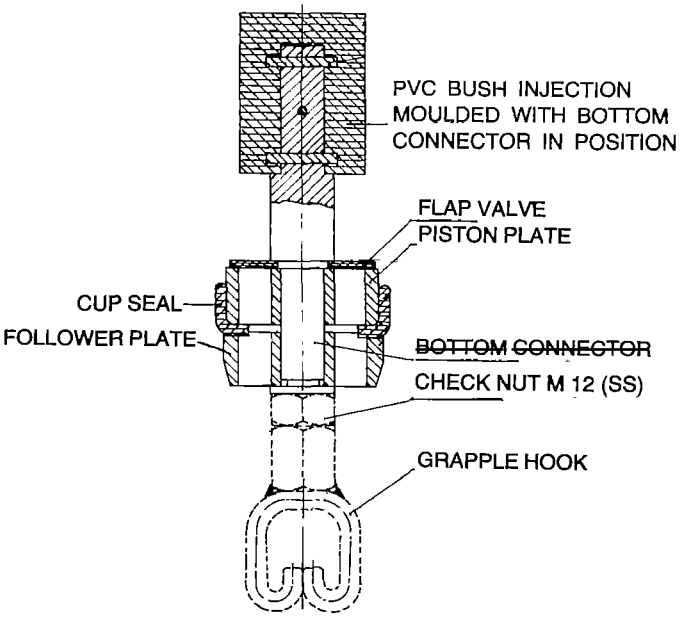
The cylinder assembly contains the piston rod, piston, foot valve, etc. to provide the necessary pumping action. This mechanism lifts the water upward through the rising main at each stroke. The cylinder body is basically a PVC pipe of 54.3 mm ID crimped at the bottom to support the foot valve. The foot valve receiver is a tapered section at the

CYLINDER ASSEMBLY
(EXTRACTABLE MODE)

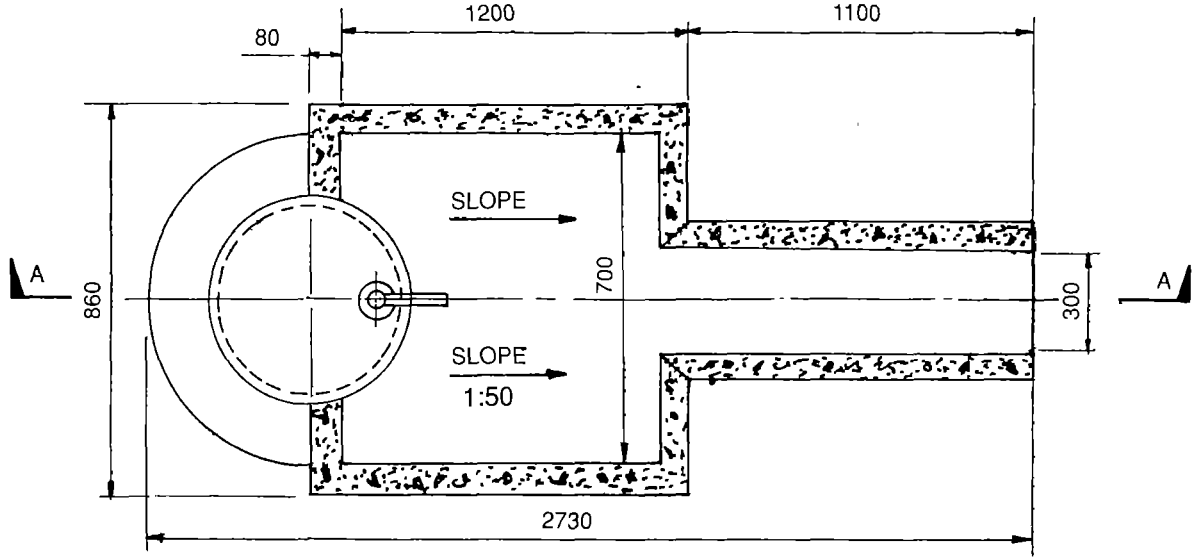


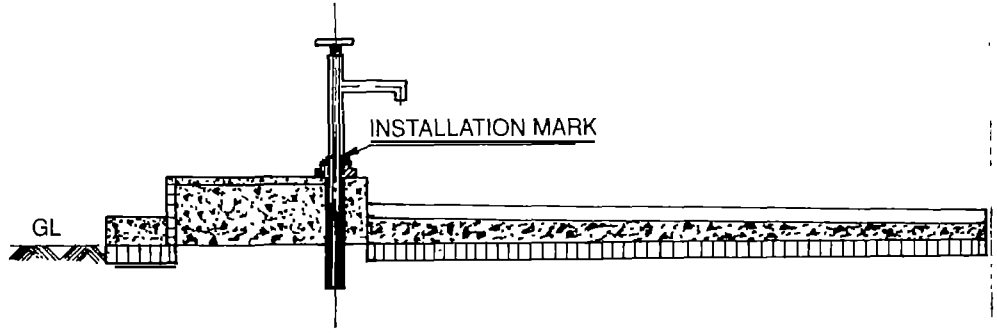
bottom of the cylinder, which is heated and formed in a mould and then reinforced on the outside with fibre glass. At its base the cylinder is connected by

PISTON ASSEMBLY



PLATFORM FOR DIRECT ACTION (TARA) HAND PUMP





SECTION-A-A

NOTES:-

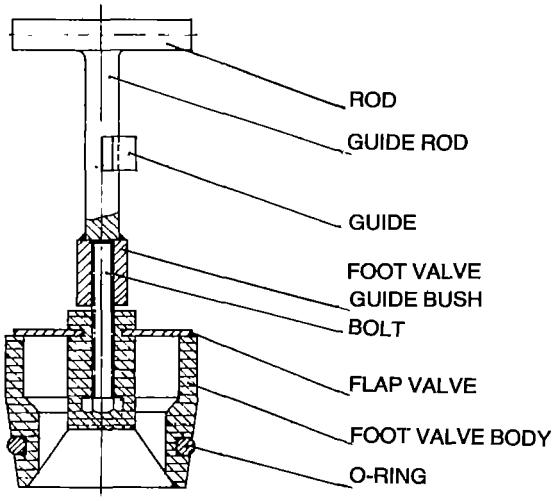
1. ALL DIMENSIONS IN MM.
2. THE FREE END OF CASING PIPE SHALL BE-
   MINIMUM 50MM ABOVE THE INSTALLATION MARK
3. PUMP SUITABLE FOR TUBE WELLS WITH FINISHED DIA 80MM.

a reducer to the lower well casing. The cup washer made from high quality vegetable tanned leather provides easier pump operation. Other components are made from stainless steel, thermoplastic mouldings and nitrile rubber. A grapple is provided with the piston assembly to facilitate the extraction of the foot valve for repair work without removing the riser main.

The piston assembly bears the load of the column of water on the upward stroke of the pumping cycle. The rubber flap valve closes on the upstroke to seal the piston parts and opens on the downward stroke to let water pass through to repeat the cycle.

The foot valve assembly bears the weight of the column of water and prevents it from leaking while the piston is moving down. The foot valve then opens to allow water into the cylinder on the

FOOT VALVE SUB ASSEMBLY



upward stroke. The assembly consists of a moulded body of high density polyethylene with triangular apertures covered by a flap valve. A bolt moulded into the valve body connects to the double T-bar guide and an O-ring makes a static seal against the walls of a tapered receiver at the lower end of the cylinder.

The angle of seating in the receiver is provided to prevent the O-ring from rolling out when the foot valve is extracted for repair. The tapered foot valve seat at the base of the cylinder was reinforced on the outside with fibreglass to prevent creep of the plastic.

Tube Well Assembly

It consists of upper well casing, lower well casing and well screen assembly. The rising main itself acts as the upper well casing. The lower casing is provided to place the well screen at the correct underground aquifier. The upper end of the lower casing is cemented to the cylinder through the bell connector. The lower end is attached to the screen. The pipes are interconnected by the cementing, bell and the spigot joint. The well screen, made out of PVC ribbed pipe, is specially designed to provide increased open area and less sand penetration.

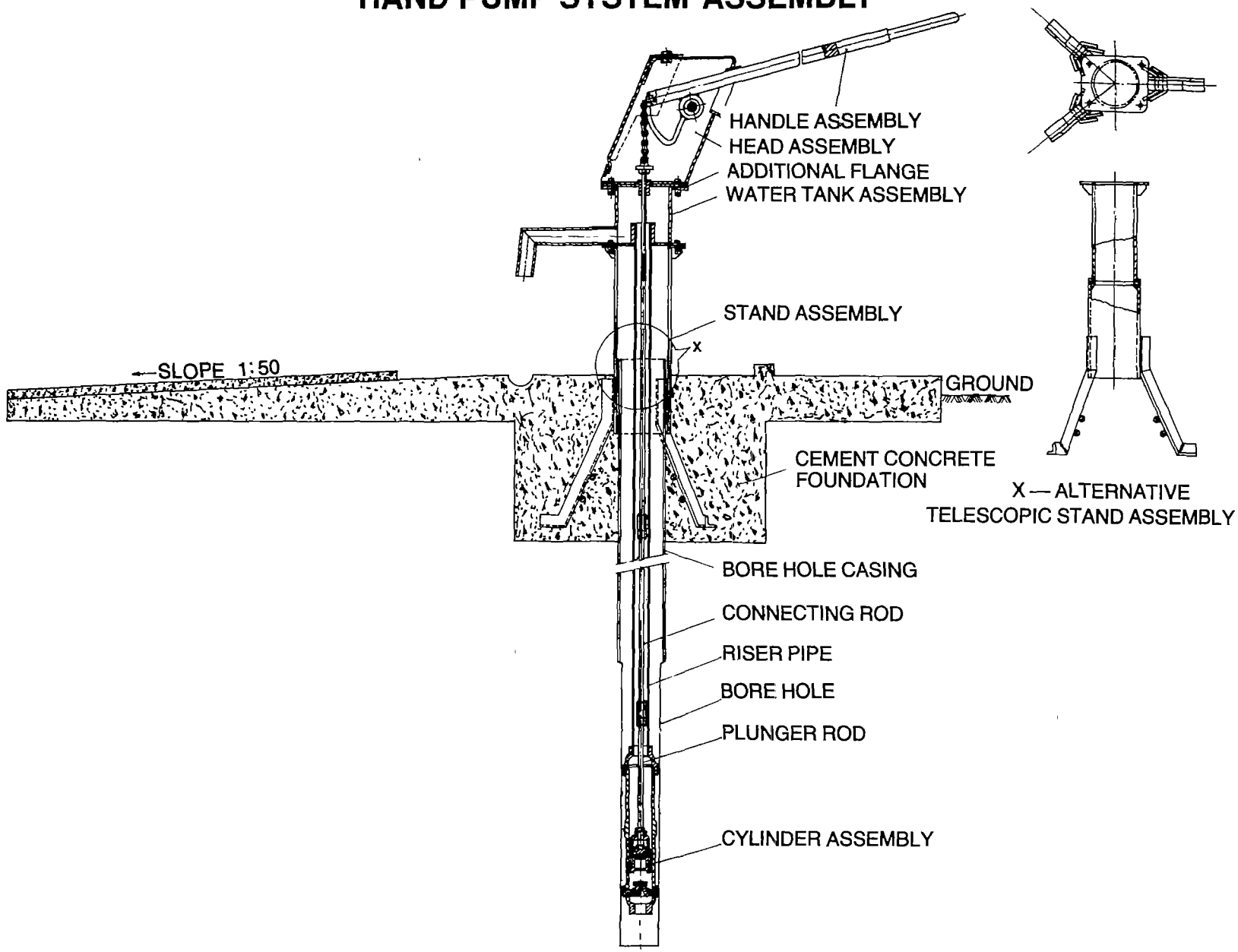
Retrieving Rod Assembly

This rod assembly helps in extracting the foot valve assembly from cylinder for maintenance. This rod is manufactured out of 12 mm Ø M.S. Rod and is electroplated.

3. INDIA MARK III VLOM LOW LIFT

These pumps are commonly used for tube wells or open wells where the static water level is less than 20 m. The pump used is the same as Mark III except for the handle assembly which is made from a 25 mm square bar fitted with a T-arrangement to equalise the weight of the handle for easy pumping and to work without chain clinkage. The connecting rod used is of 12 mm diameter and the VLOM open top cylinder is used for pumping water. The approximate discharge of this pump is not less than 15 litres per minute in 40 strokes of handle.

SECTIONAL DETAILS OF INDIA MARK II HAND PUMP SYSTEM ASSEMBLY



B. DEEPWELL HANDPUMP

1) INDIA MARK II HANDPUMP

These pumps are manufactured as per IS 9301-1990, covering handpumps for lifting water from wells of depth 20 to 50 m. Above 50 m the efforts put in for pumping may not give adequate results in terms of discharge of water. The specifications for deepwell handpumps first published as IS 9301-82, has undergone many changes, on individual components for better performance of the pump. The specification has been revised in the years 1984 and 1988. The latest Indian standard for deepwell handpumps – specification (third revision) brought out by BIS,IS 9301-1990 covers all latest amendments for different parts. The main sub-assemblies for the India Mark II handpumps are as follows

(I) Pump Head Assembly

The main parts of the pump head assembly are –

1.	Pump head flange	6mm H.R. sheet
2.	Side plate	4mm H.R. sheet
3.	Back plate	4mm H.R. sheet
4.	Axle bush (right)	Machined out of 45 mm round M.S. bar
5.	Axle bush (left)	Machined out of 45 mm round M.S. bar
6.	Bracket	4mm H.R. sheet
7.	Gusset	Machined from solid triangular bars
8.	Front bottom end plate	4 mm H.R. sheet
9.	Front top end plate	4 mm H.R. Sheet
10.	Front cover	2 mm C.R. sheet
11.	Hexagonal bolt	M12 x 20
12.	Hexagonal nut	M12
13.	Washer	To suit M12 bolt
14.	Third plate with guide bush welded	6 mm H.R. sheet/guide bush machined out of 35 mm solid bars.

(II) Handle Assembly:

The main parts of handle assembly are –

1.	Handle bar	Machined from 32 mm sq. bar
2.	Bearing housing	Machined out of 76/80 mm round M.S. bar
3.	Roller chain guide (or Handle Sector)	Manufactured out of 12 mm sq. M.S. bar
4.	Chain	25.4mm pitch roller chain with 7 links
5.	Chain coupler	Forged or machined out of 60 mm M.S. round bar
6.	Handle axle	Machined out of 26mm stainless steel round bar
7.	Spacer	Machined out of 26 mm Solid M.S. bar
8.	Washer	4 mm thick
9.	Nuts	M12
10.	Two bearings–single side shielded	SKF 6204 Z or equivalent
11.	High tensile hexagonal bolt	M10 x 40 mm
12.	Nyloc nut	M10
13.	Grease for chain	Graphite grease
14.	Grease for bearing	Lithon 3 (Lithium Base)

(iii) Water Tank Assembly:

The main parts of water tank assembly are –

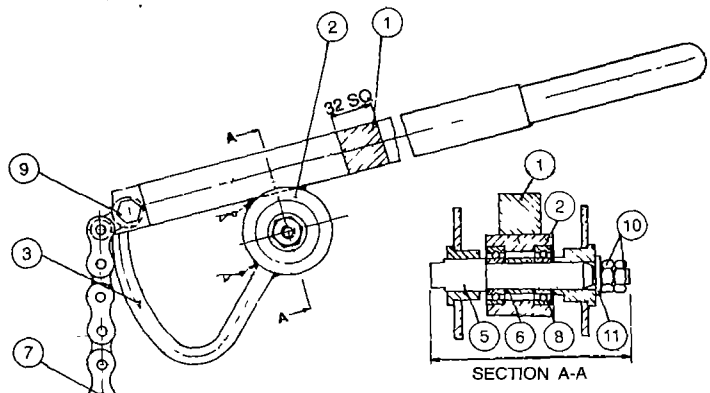
1.	Tank pipe	150 mm N.B. ERW medium grade black pipe
2.	Tank bottom flange	6 mm plate
3.	Tank top flange	6 mm plate
4.	Riser pipe holder	Machined out of 55 mm solid rounds
5.	Spout	40 mm N.B. ERW medium grade black pipe
6.	Gusset	Sheared out of 6 mm plate

(iv) Pump Stand Assembly:

The main parts of pump stand assembly are as follows :

1.	Stand pipe	Made out of 150 mm N.B./175 mm N.B. (for telescopic stand) ERW M.S. Black pipe, medium grade
2.	Stand flange	Made out of 6 mm plate
3.	Legs	Made out of 40 x 40 x 6 mm angle
4.	Gussets	Sheared out of 6 mm plates
5.	Spikes	Made out of 12 mm diameter rod of length 150 mm.

HANDLE ASSEMBLY FOR INDIA MARK II HANDPUMP



11	WASHER (4 MM THICK) TO SUIT M-12
10	HEX NUT M-12
9	HEX BOLT M 10 × 1 5 × 40 - WITH NYLOC NUT
8	SINGLE SIDE SHIELDED BEARING
7	ROLLER CHAIN (25 4 MM PITCH)
6	SPACER
5	HANDLE AXLE
4	CHAIN COUPLING
3	ROLLER CHAIN GUIDE
2	BEARING HOUSEING
1	HANDLE BAR

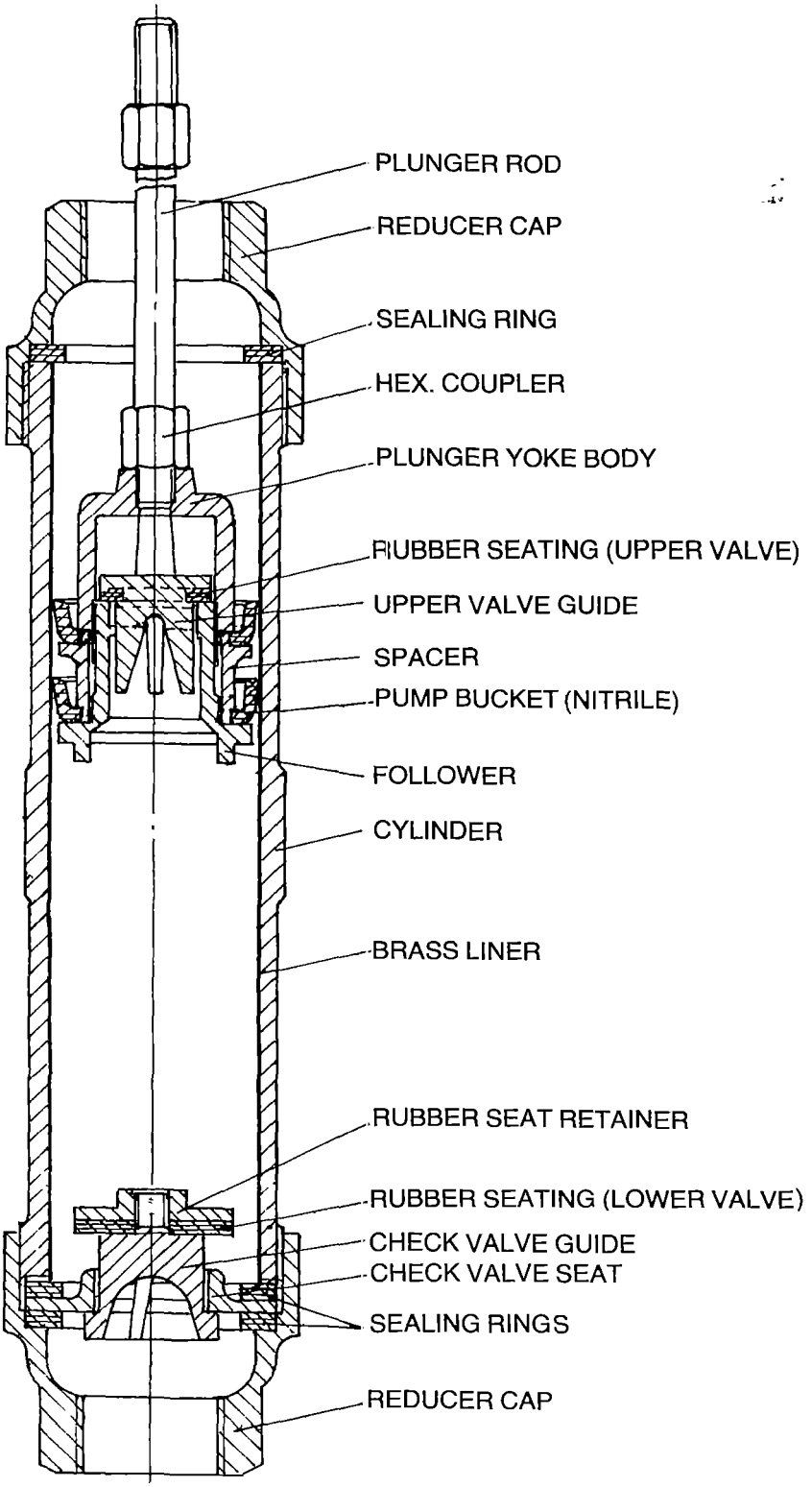
(v) Cylinder Assembly

The main parts of the cylinder assembly are –

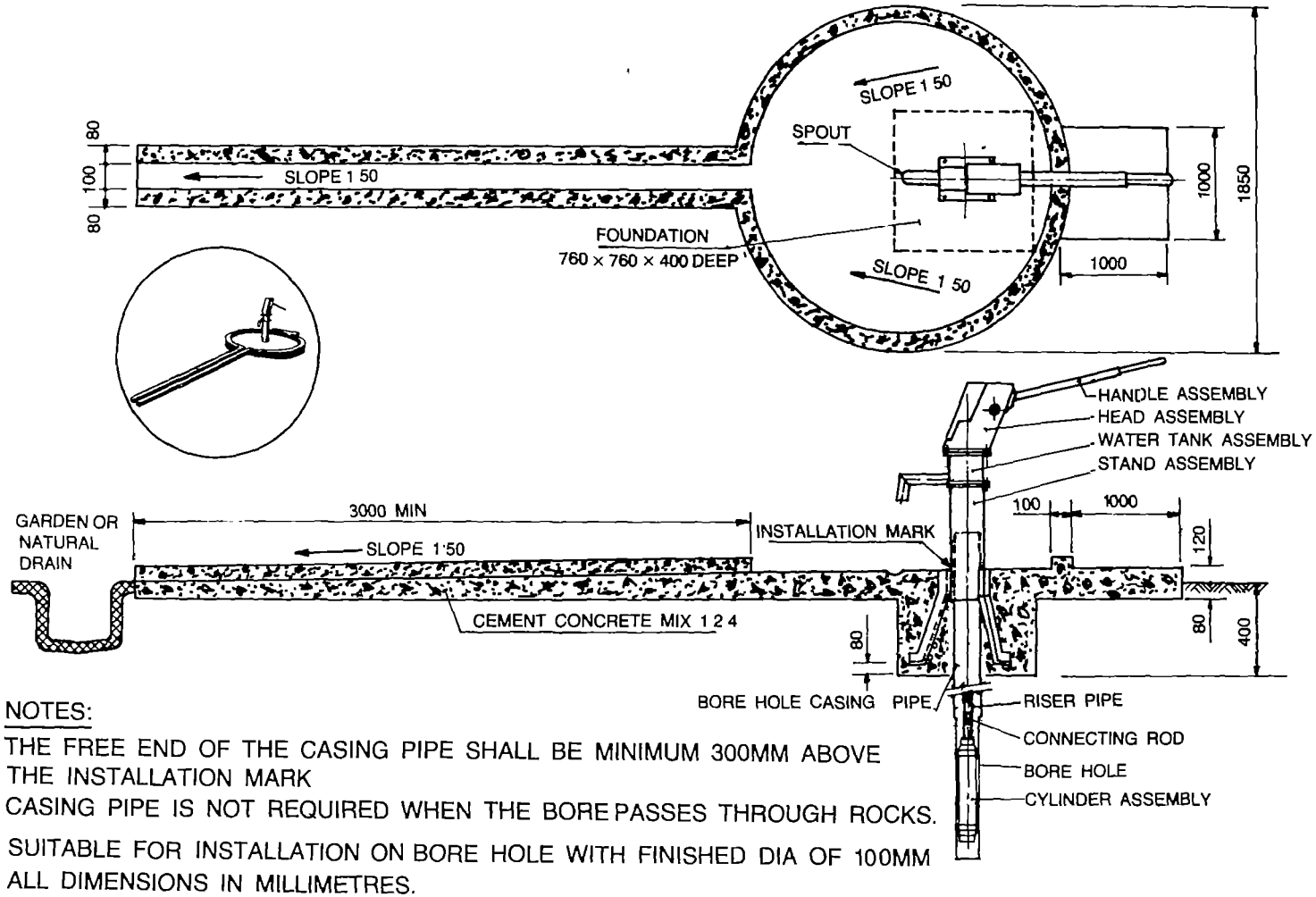
1.	Plunger rod	Machined from stainless steel round bars
2.	Reducer cap	Cast iron
3.	Sealing ring	Chrome tanned leather / nitrite
4.	Plunger yoke body	Made from gun metal or naval brass
5.	Hexagonal coupler M12 x 1.75	Machined from stainless steel round bars
6.	Rubber seating for (Upper valve)	Nitrile rubber
7.	Upper valve	Made from gun metal or naval brass
8.	Pump bucket	Vegetable tanned leather or nitrile rubber
9.	Spacer	Made from gun metal or naval brass
10.	Follower	Made from gun metal or naval brass
11.	Cylinder body	Cast iron
12.	Brass liner	Brass tube
13.	Rubber seat retainer	Made from gun metal or naval brass
14.	Rubber seating for (Lower valve)	Nitrile rubber
15.	Check valve	Made from gun metal or naval brass
16.	Check valve seat	Made from gun metal or naval brass

The cylinder assembly consists of a cast iron cylinder body with two caps, and the operating mechanism like plunger yoke body with follower, spacer, upper valve assembly along with the check valve assembly. The upper valve assembly or plunger assembly moves up inside the cylinder. At this point, the lower valve which is the check valve will start opening and the upper valve will close, thus allowing the water from the well to flow inside the cylinder. On the return stroke when the handle is moved up, the plunger assembly starts coming down inside the cylinder. The check valve at the bottom will close thereby forcing the water through the follower upwards opening the upper valve. Thus when the plunger moves up and down in the cylinder, the water is displaced and finds its way to the water tank.

CYLINDER ASSEMBLY FOR INDIA MARK-II DEEP WELL HAND PUMP



PLATFORM FOR INDIA MARK II DEEPWELL HAND PUMP



NOTES:

THE FREE END OF THE CASING PIPE SHALL BE MINIMUM 300MM ABOVE THE INSTALLATION MARK

CASING PIPE IS NOT REQUIRED WHEN THE BORE PASSES THROUGH ROCKS.

SUITABLE FOR INSTALLATION ON BORE HOLE WITH FINISHED DIA OF 100MM

ALL DIMENSIONS IN MILLIMETRES.

(vi) Connecting Rod Assembly

Connecting rods are three metres in length. The rods are manufactured from bright bars, which are rerolled from the nearest round section. The couplers M12x50 and M12 x 20 are welded to the rods and then electro-galvanised. The connecting rod is the main link between pump head and cylinder.

The main components of India Mark - II Hand Pump such as head, handle, water tank, and stand assemblies are hot dip galvanised after fabrications are over.

Platform

Each tubewell must be provided with a good platform around the pump for the following reasons:

i) It provides a strong foundation around the pump pedestal.

ii) It prevents used water from entering the tubewell and, saves the water from contamination.

iii) It provides a good sanitary seal for the tubewell.

iv) It provides firm, dry, good operational area.

The platform is to be constructed to the required size and dimension. The operating floor and the waste water drain are inescapable parts of the tubewell platform.

The tubewell platform is circular in shape with an outer diameter of 1850 mm and 280 mm thick concrete raised to a level of 80 mm above the ground level on the periphery. The platform is constructed so that the water tank spout pipe centre is the centre of the platform. The operating floor or the foot stand from which the user operates the pump handle lies at 200 mm above the ground level measuring 1000 mm x 1000 mm. The cement concrete is made with the use of 20 mm gravel metal, coarse sand and cement at the ratio 1:2:4. The approximate material used for the construction of good platform is cement 6 bags – 50 kgs each, sand – 0.4 cubic meter and metal 0.8 cubic meter.

The pump stand is grouted above the borewell in a pit having dimensions, 760 mm x 760 mm x 400 mm. The cement concrete on the platform is to be given 7 days minimum for setting to have a uniform strength and in case setting of concrete is urgently required quick setting compound can be mixed with the concrete.

To drain out the spent water easily a 3 metre long drain having slope of 50 : 1 towards the drain side is constructed.

2) INDIA MARK - III (VLOM) DEEP WELL HANDPUMP

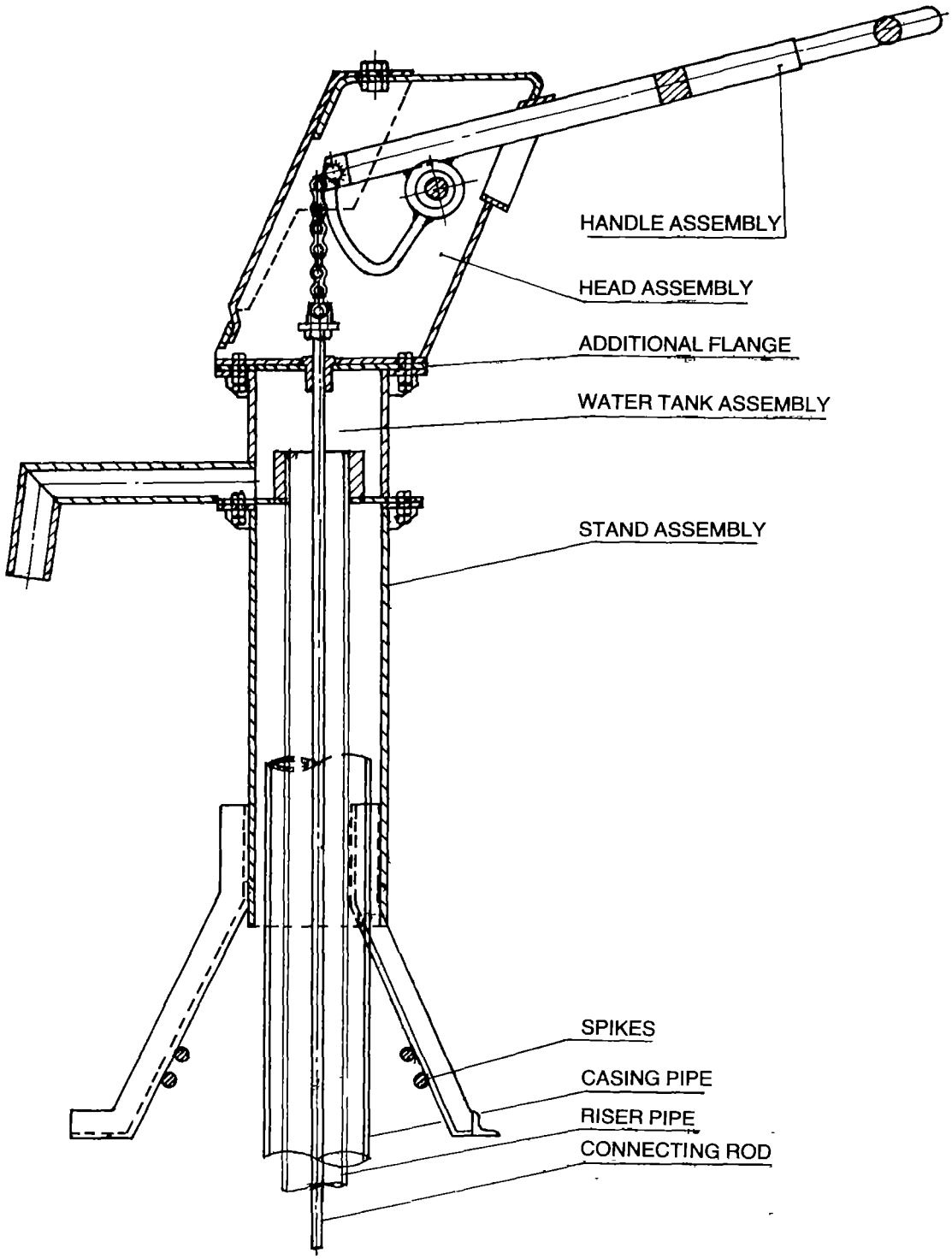
This pump is also called as 'Village level operation and maintenance pump', which can be used in deepwell conditions upto 50 mtrs depth. The main sub-assembly for the India Mark-III handpump is as follows:

(i) Pump Head Assembly

The pump head is similar to that of India Mark II handpump head assembly having the main components as under:

1.	**Pump head flange**	**6 mm H.R. sheet**
2.	**Side plate**	**4 mm H.R. sheet**
3.	**Back plate**	**4 mm H.R. sheet**
4.	**Axle bush (right)**	**Machined out of 45 mm round bars**
5.	**Axle bush (left)**	**Machined out of 45 mm round bars**
6.	**Bracket**	**4 mm H.R. sheet**
7.	**Gusset**	**Machined from solid triangular bars**
8.	**Front bottom end plate**	**4 mm H.R. sheet**
9.	**Front top end plate**	**4 mm H.R. sheet**
10.	**Front cover**	**2 mm C.R. sheet**
11.	**Hexagonal bolt**	**M12 x 20**
12.	**Hexagonal nut**	**M12**
13.	**Washer**	**To suit M12 bolt**
14.	**Third plate with guide bush welded**	**6 mm H.R. sheet / guide bush machined out of 35 mm solid bars**

PUMP HEAD ASSEMBLY FOR INDIA MARK III (VLOM) DEEPWELL HAND PUMP



(II) Handle Assembly

The handle assembly will be as similar to India Mark II handle assembly having the main components as under:–

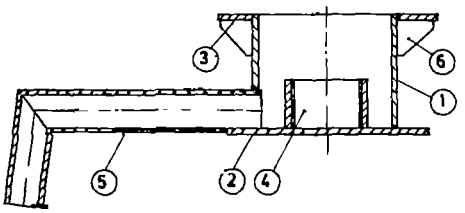
1.	Handle Bar	Machined from 32 mm sq. bar
2.	Bearing housing	Machined out of 76/80 mm round bars
3.	Roller chain guide (or handle sector)	Manufactured out of 12 mm square bar
4.	Chain	25.4 mm pitch roller chain with 7 links
5.	Chain coupler	Forged/machined out of 60 mm round bar
6.	Handle axle	Machined out of 26 mm stainless steel round bar
7.	Spacer	Machined out of 26 mm solid bar
8.	Washer	4 mm
9.	Nuts	M12
10.	Two bearings –	SKF 6204 Z or equivalent single side shielded
11.	High tensile hexagonal bolt	M10 x 40 mm
12.	Nyloc nut	M10
13.	Grease for chain	Graphite grease
14.	Grease for bearing	Lithon 3 (Lithium Base)

(III) Water Tank Assembly

The main parts of the water tank assembly are

1.	Tank pipe	150 mm N.B. ERW medium grade black pipe
2.	Tank bottom flange	6 mm plate
3.	Tank top flange	6 mm plate
4.	Riser pipe holder	Machined out of 100 mm solid rounds to suit 65 mm N.B. riser pipe
5.	Spout	40 mm N.B. ERW medium grade black pipe
6.	Gusset	Sheared out of 6 mm plate

WATER TANK ASSEMBLY



1 TANK PIPE 2 BOTTOM FLANGE
3 TOP FLANGE 4 RISER PIPE HOLDER
5. SPOUT 6. GUSSET

(iv) Pump Stand Assembly

The pump stand assembly is similar to that of India Mark - II hand pump. The main parts are :

1.	Stand pipe	This is made out of 150 mm N.B./175 mm N.B. (for telescopic stand) ERW M.S. pipe medium-grade.
2.	Stand flange	Made out of 6 mm plate
3.	Legs	Made out of 40 x 40 x 6 mm Angle
4.	Gussets	Sheared out of 6 mm plates
5.	Spikes	Made out of 12 mm dia rod of length 150 mm.

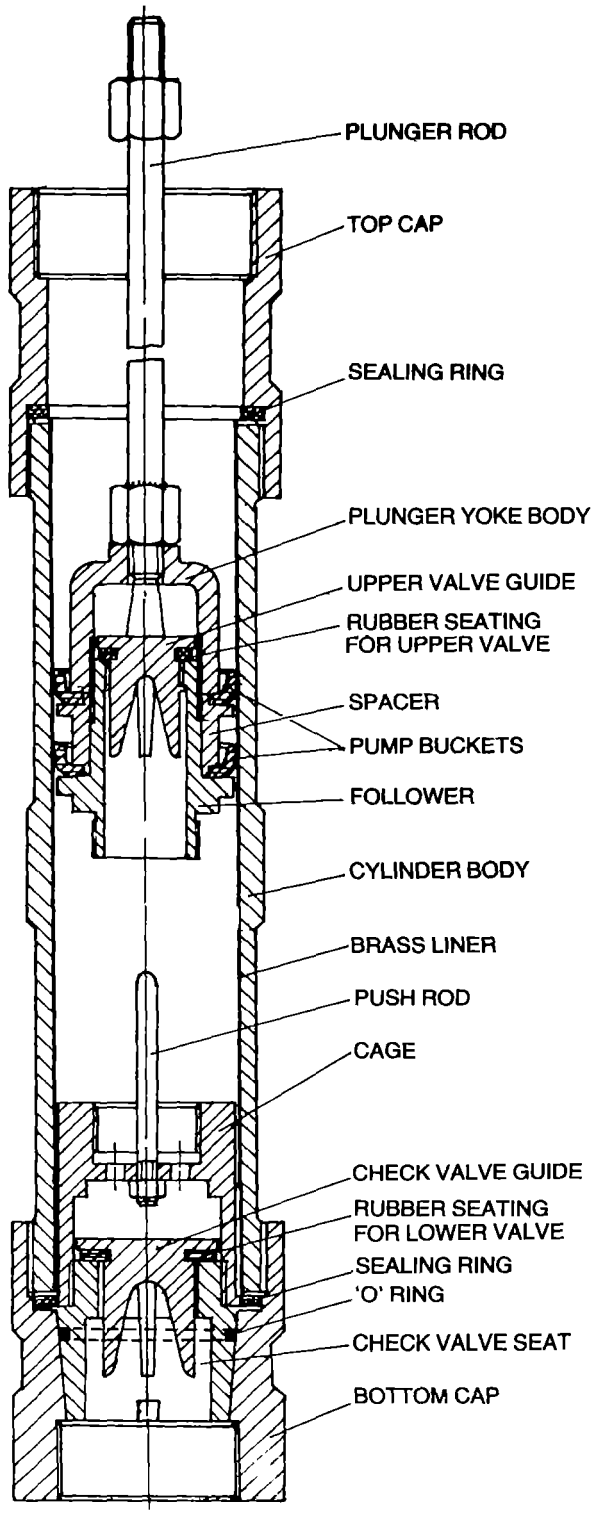
(v) Cylinder Assembly

The main parts of the cylinder assembly are –

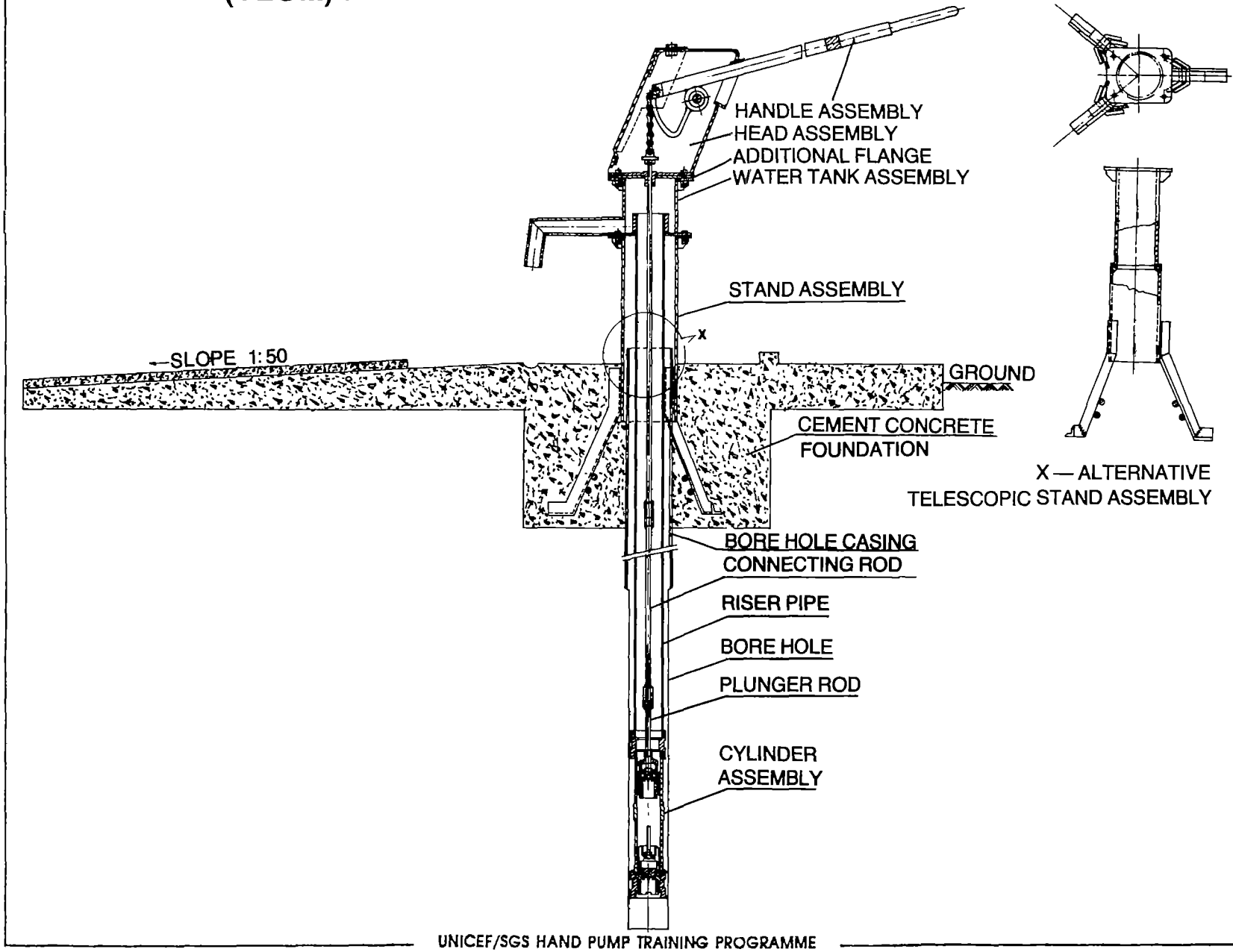
1.	Plunger rod	Machined from stainless steel round bars
2.	Upper cap	Cast iron
3.	Sealing ring	Nitrile rubber
4.	Plunger yoke body	Made out of gun metal or naval brass material
5.	Push rod	Machined from stainless steel round bars
6.	Rubber seating (upper valve)	Nitrile rubber
7.	Upper valve guide	Made out of gun metal or naval brass material
8.	Pump bucket	Nitrile Rubber
9.	Spacer	Made out of gun metal or naval brass material
10.	Follower	Made out of gun metal or naval brass material
11.	Cylinder body	Cast iron
12.	Brass liner	Brass tube
13.	'O' Ring	Nitrile Rubber
14.	Rubber seating for Lower valve	Nitrile Rubber
15.	Check valve guide	Made out of gun metal or naval brass material
16.	Bottom cap	Cast Iron
17.	Cage	Made out of gun metal or naval brass material
18.	Check valve	Made out of gun metal or naval brass material
19.	Check nut	Stainless steel material

The India Mark III Handpump cylinder assembly is different from that of India Mark II. The main

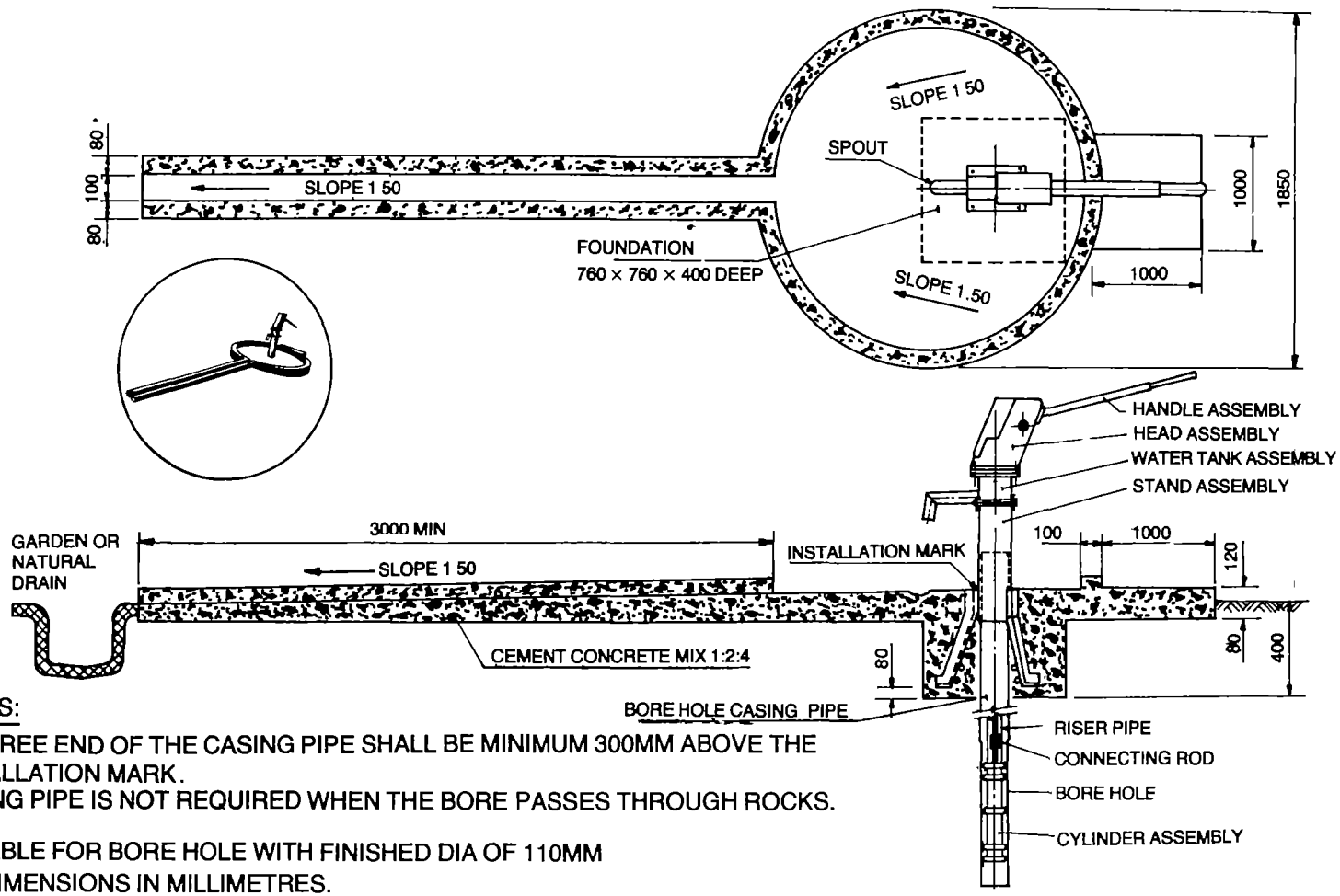
CYLINDER ASSEMBLY FOR INDIA MARK-III (VLOM) DEEP WELL HANDPUMP



SECTIONAL DETAILS OF INDIA MARK III (VLOM) DEEPWELL HAND PUMP SYSTEM ASSEMBLY



PLAT FORM FOR INDIA MARK III (VLOM) DEEP WELL HAND PUMP



NOTES:

THE FREE END OF THE CASING PIPE SHALL BE MINIMUM 300MM ABOVE THE INSTALLATION MARK.
CASING PIPE IS NOT REQUIRED WHEN THE BORE PASSES THROUGH ROCKS.

SUITABLE FOR BORE HOLE WITH FINISHED DIA OF 110MM
ALL DIMENSIONS IN MILLIMETRES.

part of the cylinder assembly is the cylinder body and caps which are manufactured from cast iron. The bottom cap is to suit the check valve and top cap is to facilitate extraction of the plunger and check valve assemblies for repairs without lifting the riser main. All other components are manufactured from gun metal. The pump bucket, is made of nitrile rubber. The plunger rod is of SS 12 mm diameter. The brass liner is manufactured from temper annealed materials Cu Zn 30. Cylinders are painted with the redoxide primer and two coats of metal enamel paint.

(vi) Connecting Rod Assembly

The connecting rod assembly is similar to that of India Mark II, handpump connecting rod. The connecting rod is three metres in length. The rods are manufactured from bright bars, which are rerolled from the nearest round section. The couplers M12 x 50 and M12 x 20 are welded to the rods and then electro-galvanised.

The main components of India Mark - III handpump such as head, handle, water tank, and stand assemblies are hot dip galvanised after fabrications are over.

The riser pipes used for these pumps are of 65 mm N.B. medium grade, and the coupler used for the pipe is made from seamless tubes or machined from a solid bar.

Platform

The platform for the India Mark III handpump can be constructed like that of India Mark II. The construction procedure and requirements of materials are similar to the India Mark II.

C. EXTRA DEEPWELL HANDPUMP

1) INDIA MARK II HANDPUMP

These pumps are exclusively used for extracting water from greater depths. They are suitable for static water levels varying between 50 and 90 metres where placement of cylinders can be upto 85 metres. The inner diameter of the borewell, where these pumps are installed, should not be less than 100 mm.

(i) Pump Head Assembly

There is no change in the pump head assembly when compared to the India Mark II handpump except that the bracket opening is made to suit a 40 mm square handlebar. The main parts are flanges, slide plates, back plate and cover. The material used for flanges is 6 mm plates. The side plates and back plates are 4 mm HR sheet and the cover is 2 mm CR sheet. These plates and sheets are manufactured by SAIL, TISCO or ISCO who are the main producers of steel in the country at present. The other parts like axle bush (left and right) and guide bush are manufactured by machining from steel rounds of 45 and 35 mm diameter or nearest section rounds. The pump head is provided with a centre hole of 75 mm diameter at the bottom flange where a guide bush is welded. An additional 6 mm plate welded with the guide bush is provided separately. The bracket is made out of 4 mm HR sheets and the solid gusset is manufactured from a rerolled triangular bar. A standard M12 bolt and nut is used for fixing.

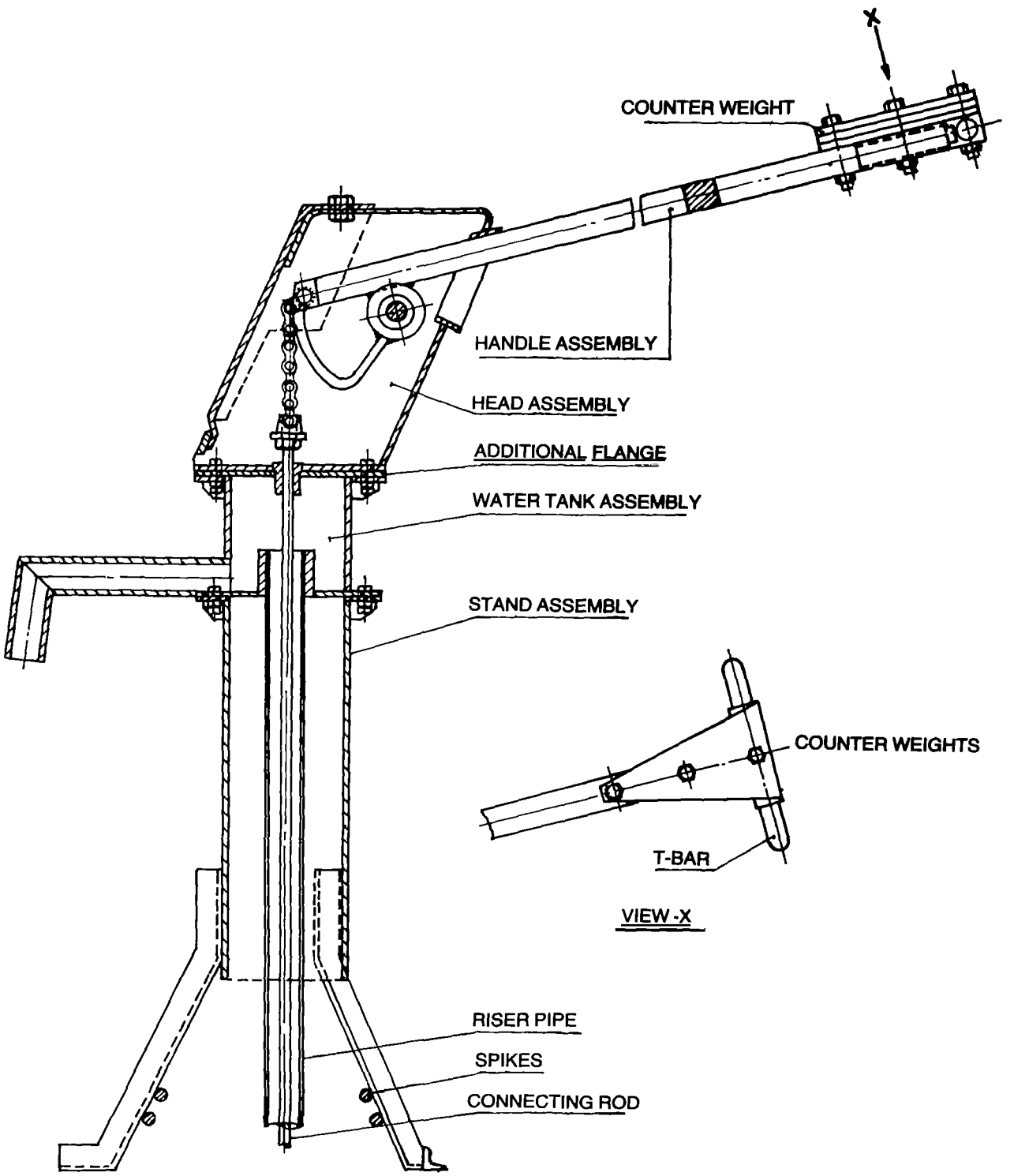
(ii) Handle Assembly:

The main part of handle assembly are

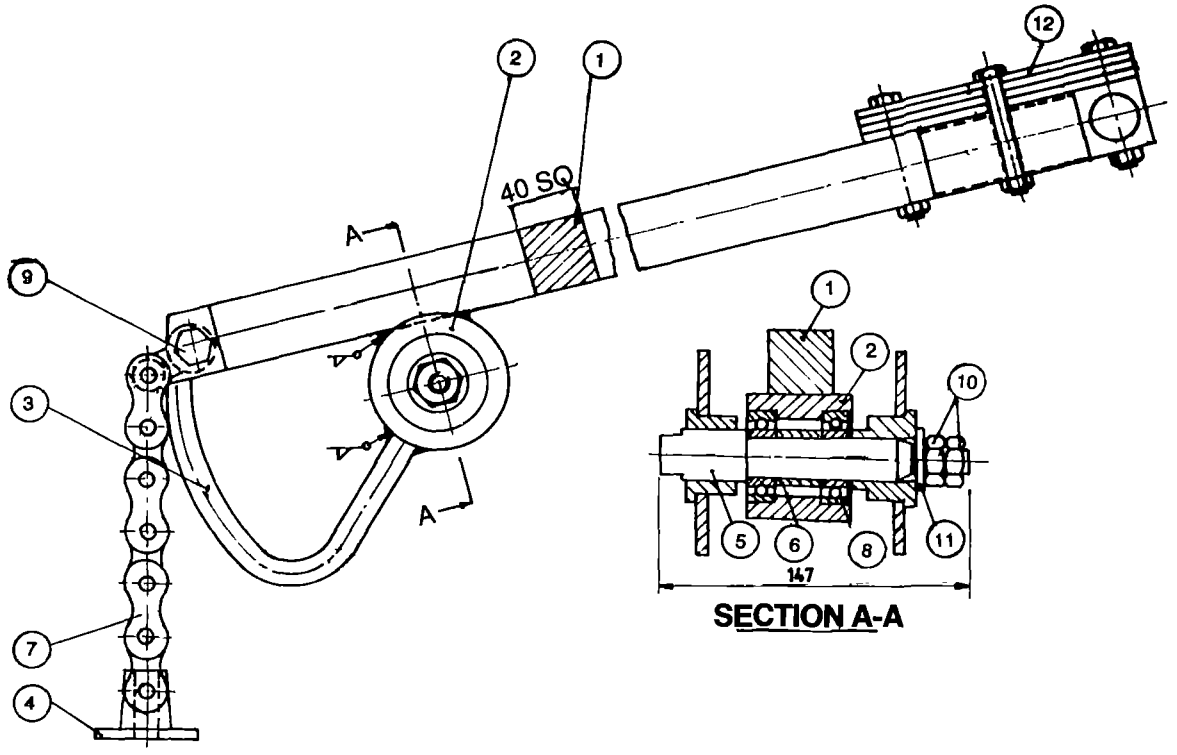
a.	Handle Bar	Machined out of 40 m sq. bar
b.	Bearing Housing with holder plates	Same in the case of Mark II Handpump
c.	Roller chain guide (or handle sector)	–do–
d.	Chain assembly	–do–
e.	Handle axle	–do–
f.	Spacer	–do–
g.	Washer along with 2 nuts	–do–
h.	Two bearings-single side shielded	–do–
i.	High tensile Hexagonal bolt M-10 with nyloc nut	–do–

The main parts of the handle assembly are similar to that of India Mark II handpump except that of the handle bar is made out of solid 40 mm M.S. square bar, with T-bar arrangements. Additional plates are provided depending upon the depth at which the cylinder is placed. The other parts are

PUMP HEAD ASSEMBLY FOR INDIA MARK-II EXTRA DEEP WELL HANDPUMP

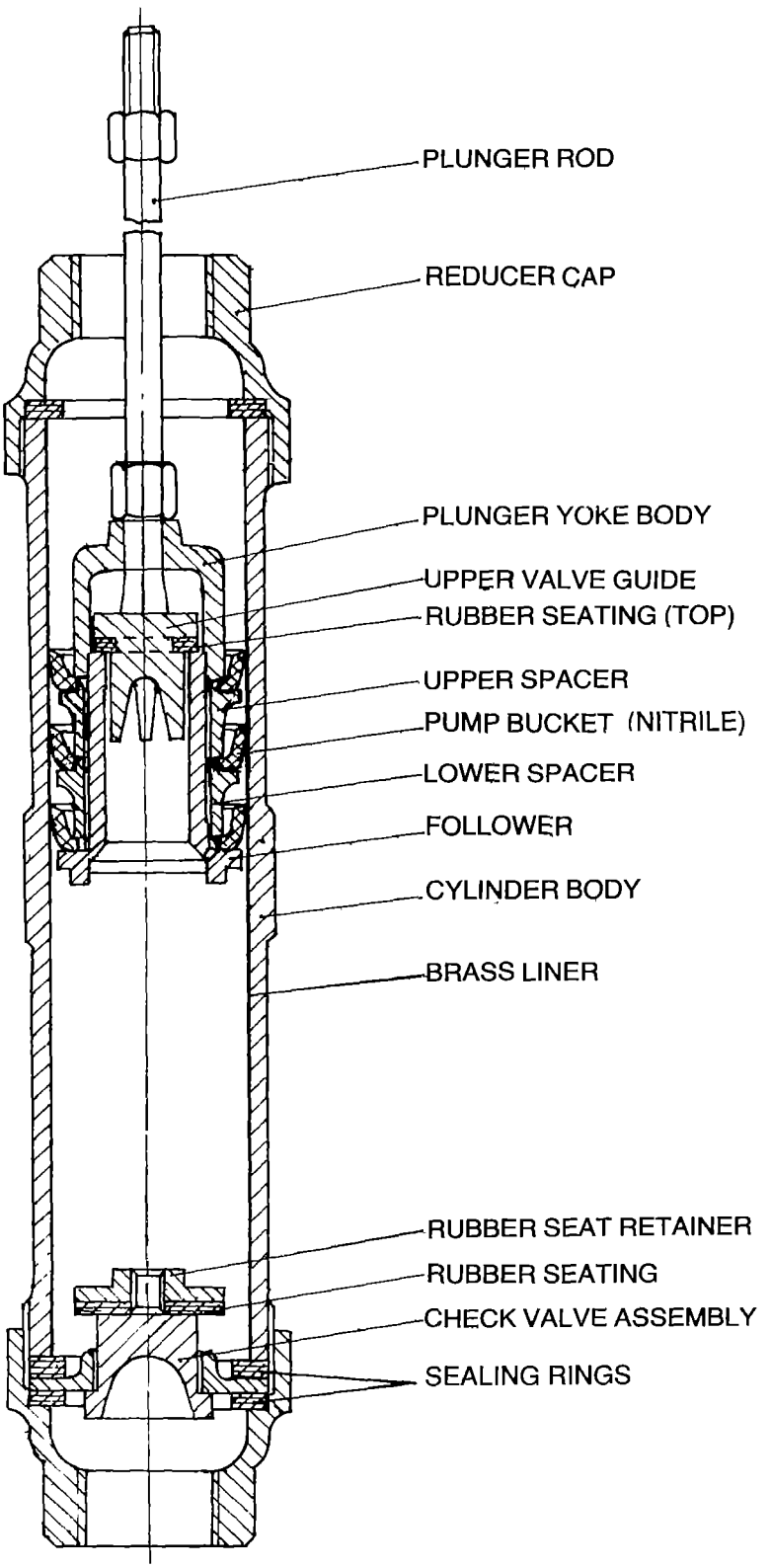


HANDLE ASSEMBLY FOR INDIA MARK-II EXTRA DEEP WELL HAND PUMP



12	ADDITIONAL WEIGHTS
11	WASHER (4 MM THICK) TO SUIT M-12
10	HEX. NUT M-12
9	HEX. BOLT M 10 × 1.5 × 40 - WITH NYLOC NUT
8	SINGLE SIDE SHIELDED BEARING
7	ROLLER CHAIN (25.4 MM PITCH)
6	SPACER
5	HANDLE AXLE
4	CHAIN COUPLING
3	ROLLER CHAIN GUIDE
2	BEARING HOUSING
1	HANDLE BAR

INDIA MARK-II EXTRA DEEPWELL CYLINDER ASSEMBLY



similar to the India Mark II handpump handle assembly. The bearing housing is a single piece turned out from 76 mm or 80 mm rounds. The spacer is bored out from 26 mm solid rounds. The handle sector is made from 12 mm square bar, rerolled from nearest section. The housing holder is also sheared out of 4 mm plates. The handle axle is made of stainless steel materials to eliminate corrosion. This is machined out of 26 mm SS rounds. The bearings used are single side shielded of SKF 6204 Z or any equivalent make. The bearing and bearing housing should be filled with Lithium base grease (LITHON-3), for easy movements. The chain assembly consists of a heavy duty industrial chain with a pitch of 25.4 mm welded with a chain coupler made either out of forging, or machined from a solid round of 50 mm diameter bar. The high tensile bolt used will be M10 x 40 mm.

(III) Water Tank Assembly:

There is no difference in the water tank assembly of Extra Deepwell Handpump and India Mark II handpump. The main parts of water tank assembly are tank bottom and top flange, tank pipe, spout pipe, riser pipe holder and gussets. The tank bottom and top flange are made from 6 mm plates. The water tank pipe is made out of 150 mm N.B. ERW black pipe, medium grade. Riser pipe holder which is the important part of the water tank is manufactured by machining out of 55 mm M.S. rounds. The gussets are sheared out of 6 mm plates.

(Iv) Pump Stand Assembly:

There is no difference in the pump stand assembly of the Extra Deepwell handpump and India Mark II handpump The main parts of pump stand assembly are as follows:

1.	Stand pipe	This is made out of 150 mm. N.B./175 mm N.B. (for telescopic stand) ERW M.S. Pipe-Medium Grade
2.	Stand flange	Made out of 6 mm plate.
3.	Legs	Made out of 40 x 40 x 6 mm angle
4.	Gussets	Sheared out of 6 mm plates
5.	Spikes	Made out of 12 mm diameter of length 150 mm

(v) Cylinder Assembly:

The cylinder assembly consists of a cast iron cylinder body with two caps, and the operating mechanism like plunger yoke body with follower, spacer-upper valve assembly along with the check valve assembly moves up inside the cylinder. At this point, the lower valve is closed, thus allowing the water from the well to flow inside the cylinder. On the return stroke when the handle is moved up, the plunger assembly starts coming down inside the cylinder. The check valve at the bottom will close thereby forcing the water through the follower upwards opening the upper valve. Thus when the plunger moves up and down in the cylinder, the water is displaced and find its way to the water tank.

The main part of cylinder assembly are cylinder body (longer) and caps which are manufactured from cast iron. All other components are manufactured from gun metals. The three pump buckets are made from nitrile leather. The plunger rods are 500 mm long of SS 12 diameter. The brass liners are manufactured from temper annealed materials Cu Zn 30. Cylinders are painted with the redoxide primer and two coats of finish with metal enamel paint.

(vi) Connecting Rod Assembly:

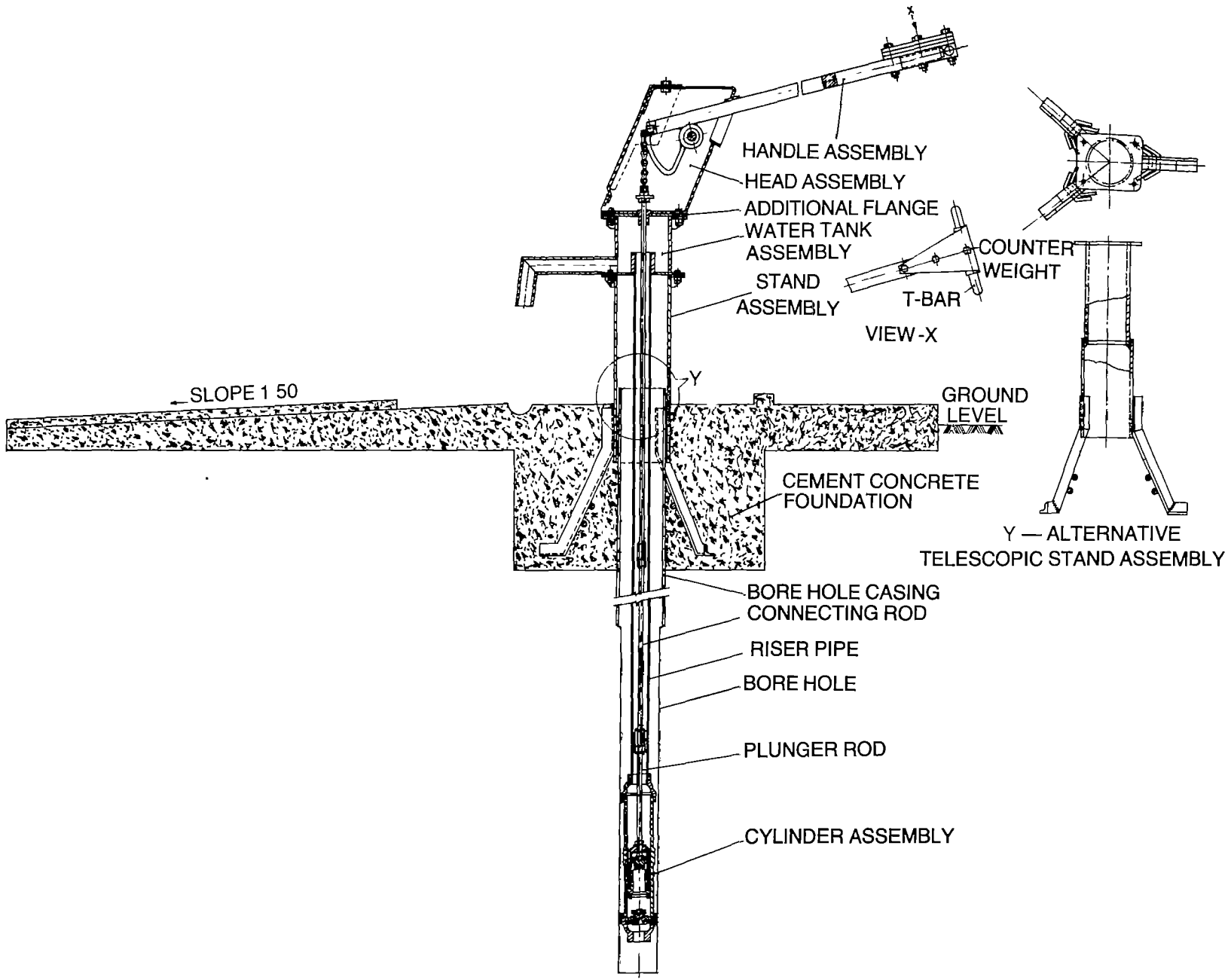
There is no difference in the connecting rod assembly of Extra Deepwell handpump. The connecting rod is three metres in length. The rods are manufactured from bright bars, which are rerolled from the nearest round section. The couplers M12 x 50 and M12 x 20 welded to the rods are then electro-galvanised. The connecting rod is the main link between pump head handle and cylinder for pumping water from the borewell.

The main components of India Mark-II Hand Pump such as head, handle, water tank, and stand assemblies are hot dip galvanised after fabrications are over.

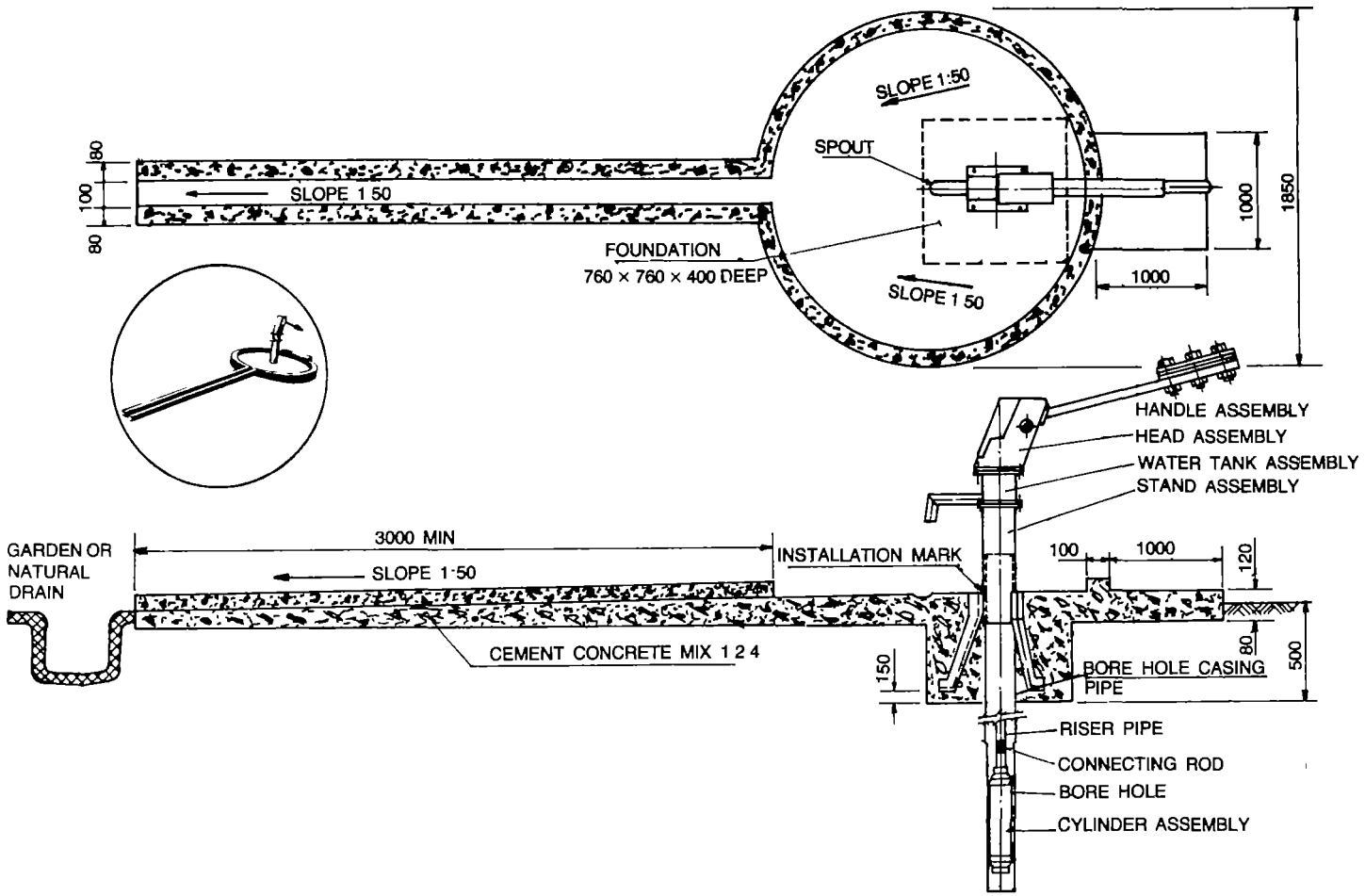
Platform

The platform for Extra Deepwell Handpump can be constructed as with the Mark II handpump. The construction procedure and requirements will be similar to the India Mark II Handpump.

SECTIONAL DETAILS OF INDIA MARK II
EXTRA DEEPWELL HAND PUMP SYSTEM ASSEMBLY



PLAT FORM FOR INDIA MARK II EXTRA DEEPWELL HAND PUMP



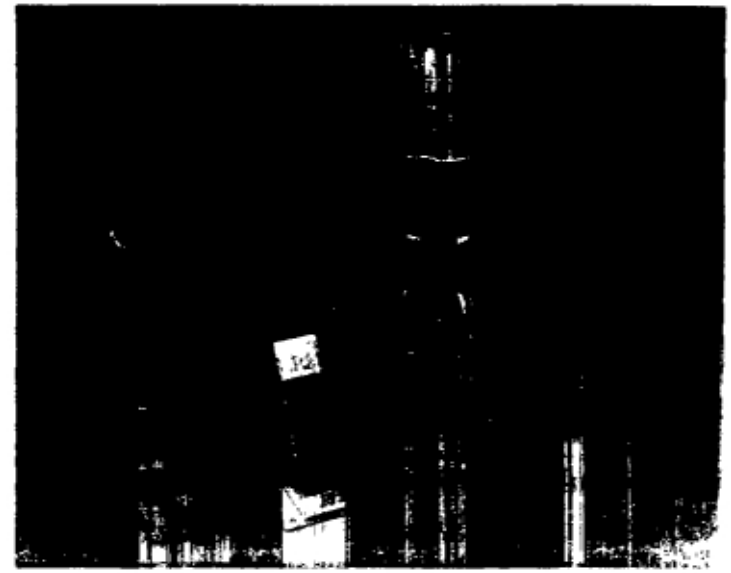
NOTES:

THE FREE END OF THE CASING PIPE SHALL BE MINIMUM 300MM ABOVE THE INSTALLATION MARK
CASING PIPE IS NOT REQUIRED WHEN THE BORE PASSES THROUGH ROCKS.

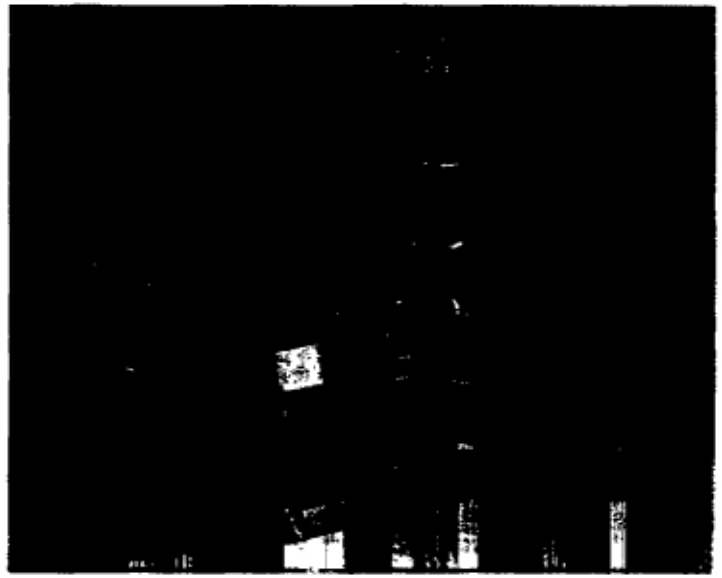
SUITABLE FOR BORE HOLE WITH FINISHED DIA OF 100MM
ALL DIMENSIONS IN MILLIMETRES.

INDIA MARK II HANDPUMP

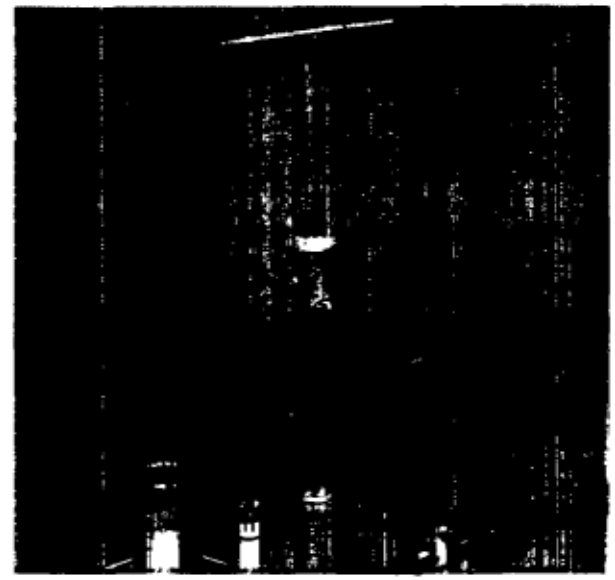
INDIA MARK III HANDPUMP



INDIA MARK II EXTRA DEEPWELL HANDPUMP



DIRECT ACTION HANDPUMP (TARA)



TECHNICAL DETAILS OF DIFFERENT TYPES OF HANDPUMPS

S NO.	SPECIFICATION	SUCTION PUMP	DIRECT ACTION (TARA) HANDPUMP	INDIA MARK II DEEPWELL HANDPUMP	INDIA MARK III VLOM HANDPUMP	INDIA MARK II EXTRA DEEPWELL HANDPUMP
1.	Application–Depth	Static water level depth not exceeding 7 mtrs	Static water level depth not exceeding 15 mtrs	Static water level ranging from 20-50 mtrs	Static water level ranging from 20-50 mtrs	Static water level ranging from 50-90 mtrs
2.	Stroke-length	200± 5 mm	300-400 mm	125 ± 4 mm	125 ± 4 mm	100 ± 3 mm
3.	Discharge	Not less than 40 Ltrs per minute for 40 strokes	Not less than 28 Ltrs per minute for 40 strokes	Not less than 15 ltrs per minute for 40 strokes	Not less than 15 ltrs per minute for 40 strokes	Not less than 12 Ltrs per minute for 40 strokes
4.	Construction/ Materials					
	(A) Pump head	Casting	Fabricated out of 65 mm NB ERW pipe & plate	Fabricated out of MS plates	Fabricated out of MS plates	Fabricated out of MS plates
	(i) Side plate	Nil	Nil	4 mm	4 mm	4 mm
	(ii) Bottom flange	Cast iron	MS round plate Dia 152 mm	250x190x6 mm with 75 mm opening in the centre	250x190x6 mm with 75 mm opening in the centre	250x190x6 mm with 75 mm opening in the centre
	(iii) Additional flange	Nil	Nil	250x190x6 mm with guide bush welded in the centre	250x190x6 mm with guide bush welded in the centre	250x190x6 mm with guide bush welded in the centre
	(iv) Axle bush left/ Right	Fulcrum pin	Nil	Machined out of 45 mm solid bars	Machined out of 45 mm solid bars	Machined out of 45 mm solid bars
	(v) Guide bush	Sliding M.S. plate	Nil	Machined out of 35 mm solid bars	Machined out of 35 mm solid bars	Machined out of 35 mm solid bars
	(B) Handle					
	(i) Length	590 mm	786 ± 2 mm	1170 ± 4 mm	1170 ± 4 mm	1310 ± 4 mm
	(ii) Section	38 mm C.L bar	20 mm NB ERW pipe with 'T' bar	32 mm square bar	32 mm square bar	40 mm square bar
	(iii) Attachments	Nil	Nil	Nil	Nil	'T' bar with 3 counter weight

S NO.	SPECIFICATION	SUCTION PUMP	DIRECT ACTION (TARA) HANDPUMP	INDIA MARK II DEEPWELL HANDPUMP	INDIA MARK III VLOM HANDPUMP	INDIA MARK II EXTRA DEEPWELL HANDPUMP
	(iv) Chain Assembly	Link mechanism	Direct action	25.4 mm pitch 7 link chain welded with chain coupler	25.4 mm pitch 7 link chain welded with chain coupler	25.4 mm pitch 7 link chain welded with chain coupler
	(C) Cover	Nil	Nil	Made from 2 mm CR sheet	Made from 2 mm CR sheet	Made from 2 mm CR sheet
	(D) Water chamber	Integral part of head assembly	Integral part of head assembly	Fabricated out of MS plates and ERW pipes	Fabricated out of MS plates and ERW pipes	Fabricated out of MS plates and ERW pipes
	(i) Top flange	Nil	Nil	250x190x6 mm	250x190x6 mm	250x190x6 mm
	(ii) Bottom flange	Nil	Nil	230x190x6 mm	230x190x6 mm	230x190x6 mm
	(iii) Riser pipe holder	Nil	Nil	To hold 32 mm NB pipe, machined from solid bars	To hold 65 mm NB pipe, machined from solid bars	To hold 32 mm NB pipe, machined from solid bars
	(iv) Spout	Cast iron	50 mm NB ERW pipe	40 mm NB ERW pipe	40 mm NB ERW pipe	40 mm NB ERW pipe
	(v) Tank pipe	Nil	Nil	150 mm NB medium class ERW pipes	150 mm NB medium class ERW pipes	150 mm NB medium class ERW pipes
	(E) Stand	Casting known as pump base	Substituted with a bottom flange	Fabricated out of MS plates and ERW pipes	Fabricated out of MS plates and ERW pipes	Fabricated out of MS plates and ERW pipes
	(i) Flange	Nil	Round plate 14 mm thick Dia 152 mm	230x190x6 mm	230x190x6 mm	230x190x6 mm
	(ii) Stand pipe	Nil	Nil	150 mm NB medium class ERW pipes	150 mm NB medium class ERW pipes	150 mm NB medium class ERW pipes
	(iii) Legs	Nil	100x62x12 mm M.S. rounds	40x40x6 mm angles	40x40x6 mm angles	40x40x6 mm angles
	(iv) Telescopic stand	Nil	Not applicable	150x175 mm NB medium class ERW pipes welded with collar	150x175 mm NB medium class ERW pipes welded with collar	150x175 mm NB medium class ERW pipes welded with collar

S NO.	SPECIFICATION	SUCTION PUMP	DIRECT ACTION (TARA) HANDPUMP	INDIA MARK II DEEPWELL HANDPUMP	INDIA MARK III VLOM HANDPUMP	INDIA MARK II EXTRA DEEPWELL HANDPUMP
	(F) Connecting rod	12 mm dia M.S. round	Known as pump rod 42.3 mm O.D. PVC pipe in length of 3 mtrs $^{+10\ mm}_{-0\ mm}$	12 mm dia MS rod 3 mtrs $^{+10\ mm}_{-0\ mm}$ Length	12 mm dia MS rod 3 mtrs $^{+10\ mm}_{-0\ mm}$ Length	12 mm dia MS rod 3 mtrs $^{+10\ mm}_{-0\ mm}$ Length
	(G) Cylinder body and cap	No separate cylinder forms part of pump body	Cylinder body made out of PVC pipe of 54.3 mm I.D. crimped at the bottom to support foot valve	Cast iron body fitted with brass liner. Caps threaded to hold 32 mm NB pipe	Cast iron body fitted with brass liner. Caps Cap threaded to hold 63.5 mm pipe and bottom cap provided with taper to receive lower valve assembly	Cast iron body fitted with brass liner. Caps threaded to hold 32 mm NB pipe
	(i) Length	N/A	2 mtrs	304 ± 1.5 mm	355 ± 1.0 mm	355 ± 1.5 mm
	(ii) I.D.	75 mm	54.3 mm	63.5 mm	63.5 mm	63.5 mm
	(iii) Pump buckets	1 No. Nitrile rubber/ PVC	1 No. Leather/ Nitrile Rubber	2 Nos. Leather/ Nitrile rubber	2 Nos. Nitrile rubber	3 Nos. Leather/Nitrile rubber
	(iv) Plunger Rod-	MS Rods	PVC	Stainless Steel	Stainless Steel	Stainless Steeel
	Length	554 mm	2 mtrs	450 ± 5 mm	450 ± 5 mm	450 ± 5 mm
	(v) Sealing ring	Nil	Nil	3 Nos. Chrome tanned Nitrile Rubber/Leather	2 Nos. Chrome tanned Nitrile rubber/leather	3 Nos. Crome tanned leather/nitrile rubber
	(vi) Upper valve	Combined plunger and follower plate made of HDPE with a HDPE plunger valve held to piston rod by a nut	PVC and stainless steel component with rubber flap valve	Gun metal component with 2 piece upper valve guide and follower	Gun metal component with 2 piece upper valve guide and threaded follower	Gun metal component with 2 piece upper valve guide and longer follower
	(vii) Lower valve assembly	Leather flapper valve with cast iron weight and M.S. valve screw	PVC and stainless steel component with rubber flap valve	Gun metal components 3 piece lower valve guide	Gun metal compnents 2 piece lower valve guide and threaded cage	Gun metal components with 3 piece lower valve guide
	(H) (i) Riser pipe	40 mm NB G.I. pipe	55 mm NB PVC Pipe	32 mm OD G.I. Pipe medium class	65 mm NB G.I. pipe medium class	32 mm NB G.I. pipe medium class
	(ii) Riser pipe sockets	Commercial couplers	PVC moulded threaded adapters	Manufactured from seamless pipe or machined from solid bar	Manufactured from seamless pipe or machined from solid bar	Manufactured from seamless pipe or machined from solid bar

RISER PIPE AND COUPLER STANDARDS

RISER PIPE AND COUPLER STANDARDS FOR HANDPUMPS

The following standards are available, at present formulated by BIS, for Deepwell hand pumps and riser pipes.

1. IS 9301-1990 - Specification for Deepwell Hand pump (Third revision) with amendment as on September 1991.
2. IS:13056:1992 - Specification for Deepwell Hand Pump (VLOM)
3. IS : 13287 : 1992 - Specification for Extra Deep Well Handpumps.
4. IS 1239 (Part 1) 1979 - Specification for Mild steel tubes, tubulars and other wrought steel fittings.

Riser pipe specification for hand pumps:

The riser pipe used for the India Mark II deepwell hand pump will be of 32 mm NB screwed and socketed of medium grade, hot dip galvanised conforming to IS 1239 (Part 1) - 1979. Each riser pipe shall be of 3 metre length with a tolerance of +0,-25 mm with tapered thread on both ends.

The coupler socket used with the riser pipe shall be manufactured from seamless pipe or machined from Solid bar conforming to grade Fe 410 S of IS 226 - 1975. The minimum diameter will be 50 mm +5,-0mm. having thread RP $1^1/_4$" of IS:554-1974 — Dimension for pipe thread where pressure tight joints are required on the thread and shall be of hot dip galvanised.

One end of the riser pipe shall be fitted with a hot dip galvanised coupler and the other end with a thread protector.

The technical specification of riser pipes is as follows:

1. Nominal Bore: 32 mm
2. Outer diameter minimum 42 mm
   max. 42.9 mm
3. Wall thickness. 3.25 mm
4. Weight: 3.17 Kg/m
5. Tolerances;-

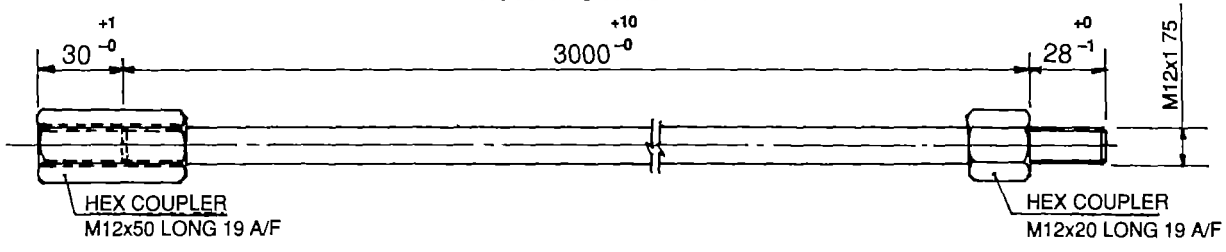
a. On Thickness- + 10 percent
   -8 percent

b. On weight +10 percent
   -8 percent

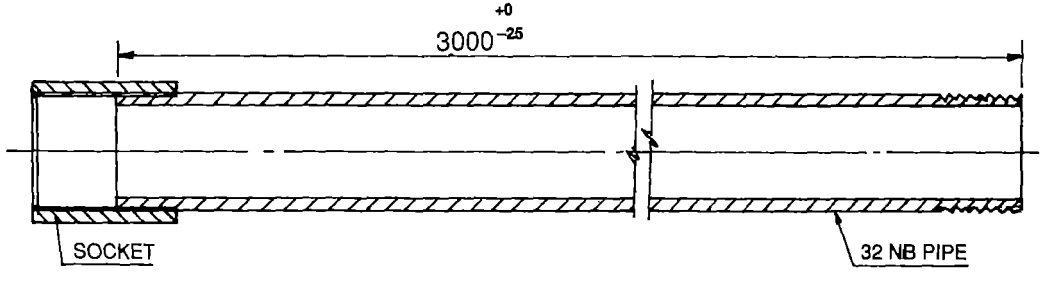
Galvanised coating on the tubes shall be in accordance with IS 4736 - 1968. Minimum value of average mass of coating for 32 mm G.I. pipes shall be 400 gm/sq.m.

For VLOM Mark III hand pumps, the riser pipe shall be 65 mm nominal bore, hot dip galvanised, screwed and socketed in 3 metre length with tolerance of +0,-50 mm conforming to IS 1239 (Part 1); 1979 medium class. One end of the riser pipe shall be fitted with hot dip galvanised socket and the other end with a thread protector. The socket shall be manufactured from seamless pipe or machined from solid bar conforming to Grade Fe 410 S of IS 226:1975 with the dimensions (length and diameter) as specified in IS 1239 (Part 2): 1982 and shall be hot dip galvanised.

CONNECTING ROD



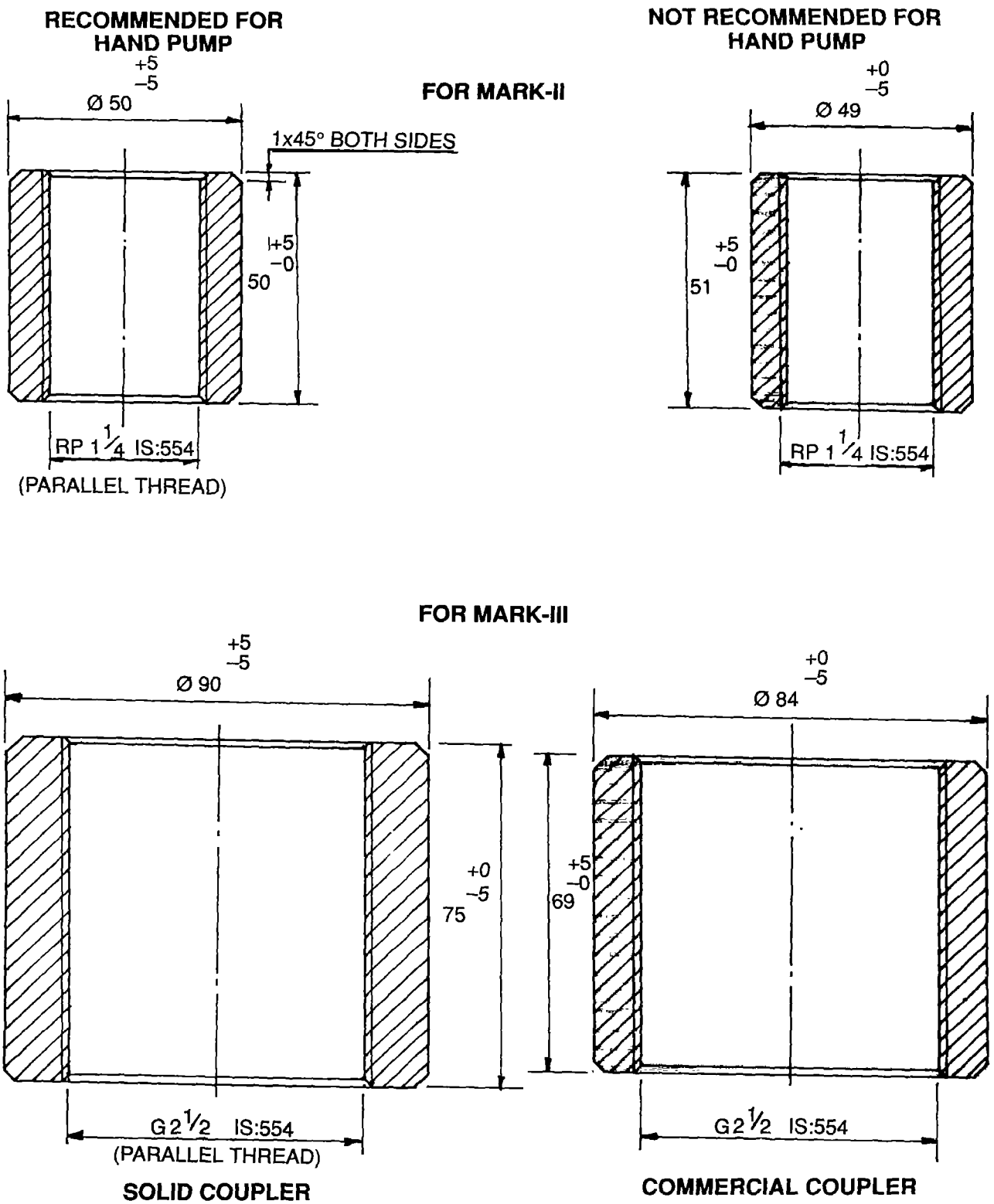
RISER PIPE (32MM)



NOTE:-

1 FOR 65MM NB.G.I. PIPE LENGTH WILL BE 3000 +0 -50

2 ALL DIMENSIONS IN MM


RECOMMENDED FOR HAND PUMP
+5
–5
Ø 50
FOR MARK-II
1x45° BOTH SIDES
+5
–0
50
RP 1 1/4 IS:554
(PARALLEL THREAD)
NOT RECOMMENDED FOR HAND PUMP
+0
–5
Ø 49
+5
–0
51
RP 1 1/4 IS:554
FOR MARK-III
+5
–5
Ø 90
+0
–5
75
G 2 1/2 IS:554
(PARALLEL THREAD)
SOLID COUPLER
+0
–5
Ø 84
+5
–0
69
G 2 1/2 IS:554
COMMERCIAL COUPLER

SPECIFICATION FOR PIPE THREADS

AS PER IS:554-1985 (ISO 7/1-1982)

This Standard which is identical with ISO 7/1-1982 'Pipe threads where pressure-tight joints are made on threads-Part 1: Designation, dimensions and tolerances', issued by the international organization for Standardization (ISO) was adopted by the Indian Standards Institution on recommendation of the Screws Threads Sectional Committee.

ISO 7/2-1982

IS:8999-1979 Gauging practice for pipe threads where pressre tight joints are required on the threads.

ISO 228/1-1982

IS:2643 (Part 1)-1975 Dimensions for pipe threads for fastening purposes: part 1 Basic profile and dimensions (first revision)

IS:2643 (Part 2)-1975 Dimensions for pipes threads for fastening purposes: Part 2 Tolerances (first revision)

IS:2643 (Part 3)-1975 Dimensions for pipe threads for fastening purpose: Part 3 limits of sizes (first revision)

1. Scope and Field of Application

This part of ISO 7 specifies the designation and lays down the dimensions and tolerances of pipe threads where pressure-tight joints are made on the threads.

These threads are intended for tubes suitable for screwing, and for cock valves and any fittings to be connected to the screwed tubes. If considered necessary, an appropriate jointing medium may be used on the thread to ensure pressure-tight joints.

The 1/16 size is given solely for connector threads (see ISO 1179); it is not specified that there should be a size of tube to match this thread.

ISO 7./2 deals with the inspection of these threads, for pipe threads where pressure-tight joints are not made on the threads, see ISO 228/1.

2. References

ISO 7/2, Pipe threads where pressure-tight joints are made on the threads - Part 2: Verification by means of limit gauges.

ISO 228/1, Pipe threads where pressure-tight joints are not made on the threads - Part 1: Designation, dimensions and tolerances.

ISO 1179, Pipe connections, threaded to ISO 228/1, for plain end steel and other metal tubes in industrial applications.

There is no Indian Standard corresponding to ISO 1179-1981 'Pipe connections, threaded to ISO 228/1' to which reference is made in 2.

3. Definitions

The following terms relate to pipe threads.

(a) gauge diameter: The basic major diameter of the thread , whether external or internal.

(b) gauge plane: The plane, perpendicular to the axis, at which the major cone has the gauge diameter.

(c) gauge length: On an external thread the distance from the gauge plane to the small end of the thread.

(d) Complete thread: That part of the thread which is fully formed at both crest and root.

NOTE - When there is a chamfer at the start of the thread not exceeding one pitch in length it is included in the length of complete thread.

(e) incomplete thread: That part of the thread which is fully formed at the root, but truncated at the crest by its intersection with the cylindrical surface of the product.

(f) washout thread: vanish thread: That part of the thread which is not fully formed at the root.

NOTE - The washout thread is produced by the level at the start of the threading tool.

(g) major cone: An imaginary cone which just touches the crest of a taper external thread or the roots of a taper internal thread.

(h) useful thread: The complete thread and the incomplete thread, excluding the washout thread.

(i) fitting allowance: The length of useful thread beyond the gaugeplane of an external thread required to provide for assembly with an internal thread at the upper limit of the tolerance.

(j) wrenching allowance: The length of useful thread which is provided for wrenching beyond the position of hand tight engagement with an internal thread at the upper limit of the tolerance.

4. Symbols and explanation

Rp Parellel internal pipe thread where pressure-tight joints are made on the threads.

Rc Taper internal pipe thread where pressure-tight joints are made on the threads.

R Taper external pipe thread where pressure-tight joints are made on the threads.

H Height of the triangle of the thread profile perpendicular to the thread axis.

h Height of the thread profile between rounded crests and roots perpendicular to the thread axis.

r Radius of rounded crests and roots

P Pitch

d Basic major diameter of the thread

$d_1 = d–1, 280\ 654_p$; basic minor diameter of thread

$d_2 = d–0, 640\ 327_p$; basic pitch diameter of the thread

T_1 Tolerance for the distance of the gauge plane from pipe end

T_2 Tolerance for the position of the gauge plane of a 1 in 16 plug gauge on internal threads.

5. Dimensions

Dimensions in millimeters are given in table 2.

6. Designation

The designation of threads according to this part of ISO 7 shall consist of the following elements in the sequence given:

6.1 The description block shall be pipe thread

6.2 The international Standard number block shall be ISO 7/1

6.3 The individual item block shall be made up-by

(a) a letter symbol

— the letter R followed by the letter p for paralled international threads;

— the letter R followed by the letter c for taper (conical) internal threads;

— the letter R for external threads (always taper)

(b) these letter symbols are followed by the designation of the thread from column 1 of tabe 2.

Internal thread	Parallel	Pipe thread ISO 7/1-Rp 1 1/2
	taper	Pipe thread ISO 7/1-Rc 1 1/2
External thread	always taper	Pipe thread ISO 7/1-R 1/2

TABLE 2 THREAD DIMENSIONS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Desig-nation of thread	Number of threads in 25.4 mm	pitch	Depth of thread	**Basic diameters at gauge plane**			**Gauge length (distance of gauge plane from pipe end)**					**Position of gaugeplane on internal thread**		**length useful thread on pipe 2) end not less than**			Fitting allowance	
				Major (gauge dia-meter)	Pitch	Minor	Basic	Tolerance + and – $T_1/2$		max.	min.	Tolerance 3) + and - $T_2/2$		For basic gauge length	For maximum gauge length	For mini-mum gauge length		
		p mm	h mm	d mm	d_2 mm	d_1 mm	mm	≈ mm	Turns of thread	mm	mm	≈ mm	Turns of thread	mm	mm	mm	≈ mm	Turns of thread
1/16	28	0,907	0,581	7,723	7,142	6,561	4,0	0,9	1	4,9	3,1	1,1	1 1/4	6,5	7,4	5,6	2,5	2 3/4
1/8	28	0,907	0,581	9,728	9,147	8,566	4,0	0,9	1	4,9	3,1	1,1	1 1/4	6,5	7,4	5,6	2,5	2 3/4
1/4	19	1,337	0,856	13,157	12,301	11,445	6,0	1,3	1	7,3	4,7	1,7	1 1/4	9,7	11,0	8,4	3,7	2 3/4
3/8	19	1,337	0,856	16,662	15,806	14,950	6,4	1,3	1	7,7	5,1	1,7	1 1/4	10,1	11,4	8,8	3,7	2 3/4
1/2	14	1,814	1,162	20,955	19,793	18,631	8,2	1,8	1	10,0	6,4	2,3	1 1/4	13,2	125,0	11,4	5,0	2 3/4
3/4	14	1,814	1,162	26,441	25,279	24,117	9,5	1,8	1	11,3	7,7	2,3	1 1/4	14,5	16,3	12,7	5,0	2 3/4
1	11	2,309	1,479	33,249	31,770	30,291	10,4	2,3	1	12,7	8,1	2,9	1 1/4	16,8	19,1	14,5	6,4	2 3/4
1 1/4	11	2,309	1,479	41,910	40,431	38,952	12,7	2,3	1	15,0	10,4	2,9	1 1/4	19,1	21,4	16,8	6,4	2 3/4
1 1/2	11	2,309	1,479	47,803	46,324	44,845	12,7	2,3	1	15,0	10,4	2,9	1 1/4	19,1	21,4	16,8	6,4	2 3/4
2	11	2,309	1,479	59,614	58,135	56,656	15,9	2,3	1	18,2	13,6	2,9	1 1/4	23,4	25,7	21,1	•7,5	3 1/4
2 1/2	11	2,309	1,479	75,184	73,705	72,226	17,5	3,5	1 1/2	21,0	14,0	3,5	1 1/2	26,7	30,2	23,2	9,2	4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
3	11	2,309	1,479	87,884	86,405	84,926	20,6	3,5	1 1/2	24,1	17,1	3,5	1 1/2	29,8	33,3	26,3	9,2	4
4	11	2,309	1,479	113,030	111,551	110,072	25,4	3,5	1 1/2	28,9	21,9	3,5	1 1/2	35,8	39,3	32,3	10,4	4 1/2
5	11	2,309	1,479	138,430	136,951	135,472	28,6	3,5	1 1/2	32,1	25,1	3,5	1 1/2	40,1	43,6	36,6	11,5	5
6	11	2,309	1,479	163,830	162,351	160,872	28,6	3,5	1 1/2	32,1	25,1	3,5	1 1/2	40,1	43,6	36,6	11,5	5

1. The basic dimensions were converted into millimeters on the basis of 1 in = 25.4 mm, beginning with the number of threads per inch, which determines the pitch P1 the formula h=0,640 327 P (the depth of thread) and the basic major diameter at the gauge plane. Pitch diameter and minor diameter were then compiled by subtracting once or twice respectively the depth of thread h from the basic major diameter.

The basic gauge length, the tolerances and the fitting allowance, were directly computed. The remaining lengths given in the table were obtained by subtracting or adding the tolerances or fitting allowance respectively to the basic gauge length. Tolerances and fitting allowance are expressed in millimeters and in number of turns of thread.

2. The design of internally threaded parts shall make allowance for accommodating external pipe threads up to the maximum lengths of useful thread given in column 16. Internal threads with free run-out may have a reduced length of useful thread, but not less than 80% of the values in column 17.

3. For parallel threaded parts diametral tolerances equivalent to the length tolerances in columns 13 and 14 will apply (1/16 of the length tolerances in column 13).

CAUTION:

DO NOT USE COMMERCIAL MARKET COUPLERS FOR RISER PIPES.

ALWAYS USE SEAMLESS / SOLID COUPLERS FOR HAND PUMP RISER PIPES.

RISER PIPE SHOULD BE 32 mm G.I. MEDIUM GRADE IN 3 METRES $^{+0.8\ mm}_{-25\ mm}$ LENGTH FOR MARK II HANDPUMPS

COUPLER SHOULD BE 50 mm $^{+5\ mm}_{-0\ mm}$ DIA and Length 50 mm $^{+5\ mm}_{-0\ mm}$ FOR MARK II HAND PUMPS.

RISER PIPE SHOULD BE 65 mm G.I. MEDIUM GRADE IN 3 METRES $^{+0.8\ mm}_{-50\ mm}$ LENGTH FOR MARK III HANDPUMPS

COUPLER SHOULD BE 90 mm $^{+5\ mm}_{-5\ mm}$ DIA and Length 75 mm $^{+0\ mm}_{-5\ mm}$ FOR MARK III HAND PUMPS

BASIC THREAD FORMS AND TERMINOLOGY

H = 0,960 491 P
h = 0,640 327 p
r = 0,137 329 p

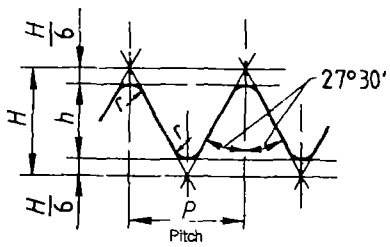


Figure 1 - Parallel thread

H = 0,960 237 p
h = 0,640 327 p
r = 0,137 278 p

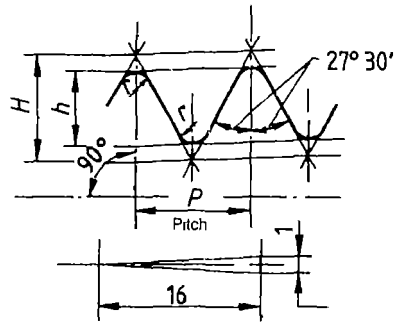


Figure 2 - Taper thread

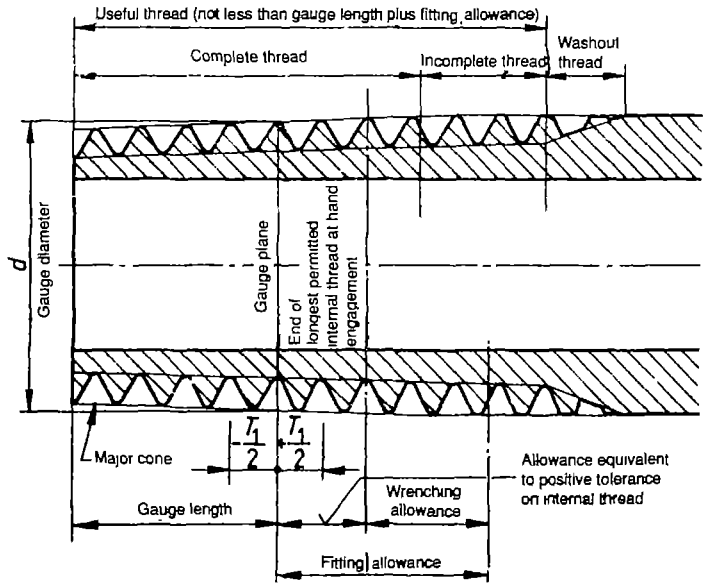


Figure 3 - Terms relating to pipe threads

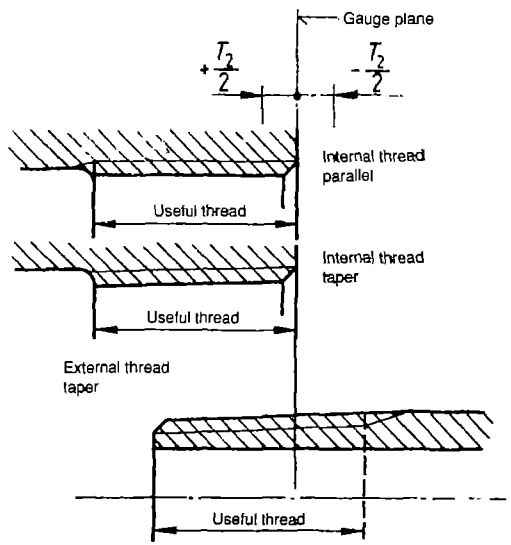


Figure 4 - Position of gauge plane, useful thread

GALVANISING AND ELECTROPLATING

GALVANISING AND ELECTROPLATING FOR DEEPWELL HANDPUMPS

General Considerations:-

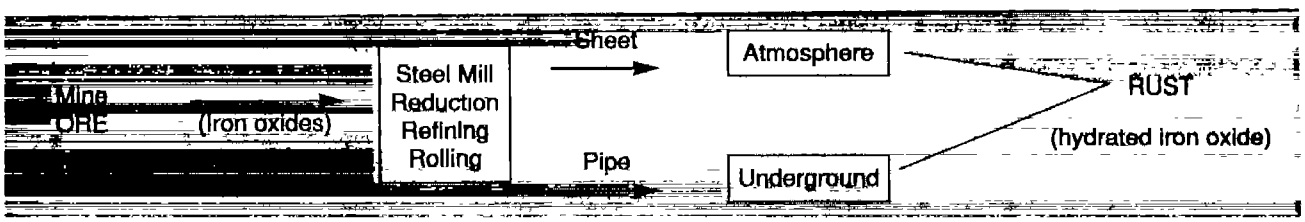
Rust is a term reserved for describing iron and steel corrosion, although, many other metals form their oxides when corrosion occurs.

Corrosion damage can affect appearance, maintenance and repair costs, contamination of product, loss of valuable products, safety and reliability etc.,

Dry corrosion occurs in the absence of a liquid or above the dew point of the environment. Vapours and gases are usually the corrodents.

Corrosion is defined as the destruction of a material because of reaction with its environment. Practically all environments are corrosive to some degree.

Corrosion of metals could also be considered as extractive metallurgy in reverse.



In order to combat corrosion the manufacturer or producer of a product must make sure that it is made of proper material, under good quality control, to a design that is as safe as possible and the inspection must be critical. The designer must be sure that failure will not occur in the actual environment.

Classification and Mechanism of Corrosion:

Corrosion has been classified in many different ways. One method divides corrosion into low-temperature and high-temperature. Another into direct combination (oxidation) and electro chemical corrosion. But the most preferred classification is-

i) Wet corrosion ii) Dry corrosion.

Wet corrosion occurs when a liquid is present. This usually involves an aqueous solution or electrolytes, and accounts for the greatest amount of corrosion. A common example is corrosion of steel by water.

The presence of even a small amount of moisture could change the corrosion activity completely. For example, dry chlorine is practically non corrosive to steel, but moist chlorine or chlorine dissolved in water is extremely corrosive and attacks most of the common metals and alloys.

Electrochemical Aspects:-

The electrochemical nature of corrosion can be illustrated by the effect of hydrochloric acid on zinc When Zn is placed in dil HCl a vigorous reaction occurs, hydrogen gas is evolved and the zinc dissolves forming a solution of zinc chlride.

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$$

$$\text{or } Zn + 2H^* \longrightarrow Zn^{2+} + H_2$$

Hence zinc reacts with hydrogen ions of the acid solution to form Zn ions and hydrogen gas. i.e. Zinc is oxidised to zinc ions and hydrogen ions are reduced to hydrogen.

An oxidation or anodic reaction is indicated by an increase in valence or production of electrons. A decrease in valence or consumption of electrons signifies a reduction or cathodic reaction. These two reactions occur simultaneously and at the same rate on the metal. This leads to the most important principle or corrosion — **"During metallic corrosion, the rate of oxidation equals the rate of reduction."**

Any reaction which can be divided into two or more partial reactions of oxidation and reduction is termed electro-chemical.

When iron is immersed in sea water or water which is exposed to the atmosphere, corrosion occurs.

$$Fe \longrightarrow Fe^{+} + 2e$$

Since the medium is exposed to atmosphere, it contains dissolved oxygen. Thus the cathodic reaction is

$$O2 + 2H_2O + 4e \longrightarrow 4OH^-$$

Combining the two equations

$$2Fe + 2H_2O \longrightarrow 2Fe + 4OH^- \longrightarrow 2Fe(OH)_2$$

$$2Fe(OH)_2 + H_2O + {}^1/_2O_2 \longrightarrow 2Fe(OH)_3 \downarrow \text{RUST.}$$

This is the basic principle of formation of rust. Since the anodic and cathodic reactions occuring during corrosion are mutually dependent, it is possible to reduce corrosion by reducing the rates of either reaction. Oxygen reduction is eliminated by preventing air from coming into contact with the aqueous solution or by removing air that has been dissolved.

If the surface of the metal is coated with paint or other nonconducting film, the rates of both cathodic and anodic reactions will be greatly reduced and corrosion will be retarded.

PREVENTION OF CORROSION

Corrosion can be minimized by

(1) Coating a protecting metal such as zinc, tin, lead, copper etc.

(2) Production of oxide, phosphate or similar coating on iron and steel surfaces.

(3) Application of protective paints.

(4) Rendering the surface of the metal passive.

Let us consider the two important methods namely (i) application of protective paint and (ii) Metallic coatings.

Paints and protective coating:- Paint is a mixture of filmogen (film-forming material with binder) and pigment. The pigment impacts colour. In conventional oil-base paints the filmogen is made from solubilized linseed oil, caseon, emulsified polymer, a cementitious material such as portland cement or a soluble silicate. Different names used in practice for various paints mixture are varnish, enamel, Lacquer etc.,

Galvanising as a means for "Prevention of Corrosion":- The coating of a metal can provide a satisfactory barrier between a metal and its environment.

Metal coatings are applied by electro deposition, flame spraying, cladding, hot dipping or chemical conversion.

Electrodeposition:- more popularly known as Electro plating, involves immersing a part to be coated in a solution of the metal to be plated and passing direct current between the part and another electrode. The character of deposit depends on many factors including temperature, current density, time and composition of the bath. The coating can be produced from 40 microns upto one thousandth of a micron with dull or bright surface. The coating can be ductile or brittle and soft or hard.

It can be a single metal layer or layers of several metals. zinc, nickel, tin and cadmium in that order are plated on the largest tonnage basis. Gold, silver and platinum plating are also common.

The metals more usually plated and their applications are summarised in table. (Annex 1) Electro deposits can be grouped into two (i) those consisting of metals which are anodic to the base metal under condition of service and (ii) those

which are cathodic. When steel is the base metal Zn and cadmium deposits are typical metals of the first group while nickel and tin are representative of cathodic metals. If a porous Zn deposit exists, then Zn will itself corrode preferentially at the discontinuity and will protect the base metal. Zinc is not a corrosive resistant metal but it is utilized as a "sacrificial metal" for protection of steel.

Hot Dip Galvanising: Hot dip galvanising is a process by which iron and steel can be treated to prevent rusting. In essence it involves dipping the article with a chemically clean surface into a bath of molten zinc which reacts with the iron and forms a coating.

How a Zinc coating prevents rust: A hot dipped coating of zinc protects the surface of iron or steel much more effectively than a coating of paint or plastic. When cleaned iron or steel is immersed in molten zinc the reaction is complete and alloyed with the base metal. A galvanised coating is thus much more resistant to physical damage than is a paint. Even if there are some gaps in the coating, it can still protect the actual metal in the gap from rusting and also prevents rust creep underneath the coating. This is because of the electro-chemical difference between zinc and iron which means that the zinc is consumed preferentially to the iron and this protects it. This "sacrificial protection" is one of the main virtues of a hot dip galvanised coating and one of the great advantage of such a coating over the protection afforded by paint or plastic coating.

A hot dipped coating of zinc is able to provide more permanent protection, for although the zinc does react slightly in contact with air or water, the film that forms on the surface is compact and largely protective reducing the corrosion of zinc. In rural areas and other relatively pre atmospheres a galvanised coating lasts very many years and even in a severe industrial atmosphere will prevent iron and steel from rusting for years. Just how long depends on the thickness of the coating.

SOME METALS COMMONLY PLATED

ANNEXURE I

Deposit	Thickness Recommended		Base Metal	Main Application
	Light Service	Severe Service		
Cadmium	0.0002	0.0005	Steel	Bolts, nuts radio parts.
Chromium	0.00001	0.00005	Nickel plate	Bathroom, motor fittings.
Copper	0.0003	0.0010	Steel Zinc	Bronzing, undercoat for nickel.
Lead	0.0003	0.0010	Brass Steel	Resistance to sulphuric acid; fire extinguishers, battery terminals.
Nickel	0.003	0.0020	Steel, Brass Zinc	Undercoat for Chromium.
Silver	0.0013	0.0012	Nickel-Silver Brass	Tableware, electrical contract
Tin	0.0002	0.0005	Steel, Brass	Parts to be soldered terminals, lugs
Zinc	0.0002	0.0005	Steel	Small parts, strip

Note: It is recommended to use chloride solution instead of sodium cyanide solution for electroplating.

Corrosion rate of iron and zinc in outdoor atmosphere is tabulated as under:

Type of Atmp.	Corrosion rate mils/year	Estimated 610g/m² coating
Rural	0.09	34 years
Marine	0.13	23 years
Industrial	0.18	17 years

Following procedure is generally used for a good quality hot dipped galvanised coating

i) Pre-treatment (cleaning) ii) Fluxing
iii) Galvanising iv) Post treatment

The process is explained by the flow diagram (annexure II)

Cleaning: Efficiency of galvanising by Hot dip method depends largely on the pre-treatment of cleaning prior to dipping. In order to obtain a uniform and rapid reaction on the steel surface by the molten zinc, it is essential that all oxides, grease, oil, mill scales etc., should be removed. This will help to permit alloy formation to take place uniformly all over the surface.

In particular, with hand pump components, sub-assemblies like stand assembly, head assembly, handle assembly, etc., pass through several operations including welding, cutting, shearing etc., and gather considerable amount of workshop grease and dirt. These items are acid pickled and degreased. Some manufacturers use grit blasting to remove scaling while others ensure that all mill scales are removed at the raw material stage itself. Degreasing is carried out in an alkali solution which are proprietary solutions. This contains a mixture of caustic soda, detergent and phosphates. Both hot and cold alkali solutions are available in the market. After degreasing and rinsing in hot water (generally), the part is pickled in cold Hydro chloric acid (14% wt) or hot Sulphuric acid. (10 to 14% wt) The aim of acid pickling is to remove scales. Inhibitions are added to stop attack on clean steel without affecting the normal scale removal. Thus a uniform and smooth surface is achieved. When the free acid content reaches 100 gm/lt the solution is discarded.

Fluxing: After acid pickling the articles are rinsed in clean running water and then treated with flux.

There are two methods of galvanising based on the method of fluxing i.e.: Dry galvanising and Wet galvanising.

Dry Galvanizing: After acid pickling the work piece is water rinsed and prefluxed in zinc ammonium chloride, thorough drying and immersion in a clear bath of molten zinc. Water rinsing removes all the iron salts and by pre flux treatment, control of fluxing is obtained. This leads to a better and more consistent finish. The specific gravity, acidity and temperature of fluxing solution is carefully monitored and maintained.

Wet Process:

This involves passing the work through a flux blanket floating on the molten zinc itself. The flux blanket functions are: i) to clean the surface of the work and the molten zinc so that the zinc and steel can react, ii) to lesson danger of splatter when wet work is dipped; iii) to wipe work during withdrawal, so tending to produce thinner coating: iv) to prevent burning or overheating when immersing large objects or during double dipping. Materials such as tallow or sawdust are added to cause frothing which increase the depth of the layer and reduces fuming.

Galvanising:

A galvanising bath is typical oil or coal fired furnace used for storing molten zinc with arrangements for free draining of zinc from the work during withdrawal. The quality of coating formed depends on: i) quality of zinc ii) temperature of galvanising bath iii) time of immersion iv) rate of withdrawal. Zinc used shall be at least 98.5% pure in molten condition with about 1% lead and controlled addition of aluminium. The slab zinc for galvanising should be of recognised grade, should have a consistent analysis and should not contain excessive aluminium and iron. Other factors are: removal of dross regularly. Dross, the zinc-iron alloy which forms, settles at the bottom of the zinc bath and should not be disturbed as far as possible during dipping. It is essential that accumulated dross is removed regularly from the bath. Heat transfer through the part dross is poor and therefore local overheating of bath wall can result if too much dross is piled up. Bath temperature is generally maintained between 445° to 465° C with common working temperature of 450° C.

Increase in temperature leads to thicker Zn coating by weight. Dross formation is also very high. Hence the technique is to galvanise at lowest temperature, with free drainage of Zinc during withdrawal with minimum formation of ash and dross beside safeguarding the furnace and conserving fuel.

Immersion:

The reaction between clean steel and molten zinc proceeds rapidly for one or two minutes producing an alloying layer and then continues at decreasing rate. As soon as the boiling ceases the article should be withdrawn.

Withdrawal:

The rate of withdrawal determines the thickness of unalloyed zinc layer left on the work. The optimum withdrawal rate is about 1.5m/min. Suitable jigs fixtures and carriers are used to maintain reasonable rate of production. After galvanising the articles are water quenched in a continuous water flow.

Post Treatment:

Zinc coating on freshly galvanised surfaces when exposed to humid and poorly ventilated conditions react with moisture, oxygen in the atmosphere and form a mixture of salts resulting in 'white rust'. A post treatment of passivation is carried out by dipping the galvanised article in a chromate solution containing sodium dichromate (0.15%).

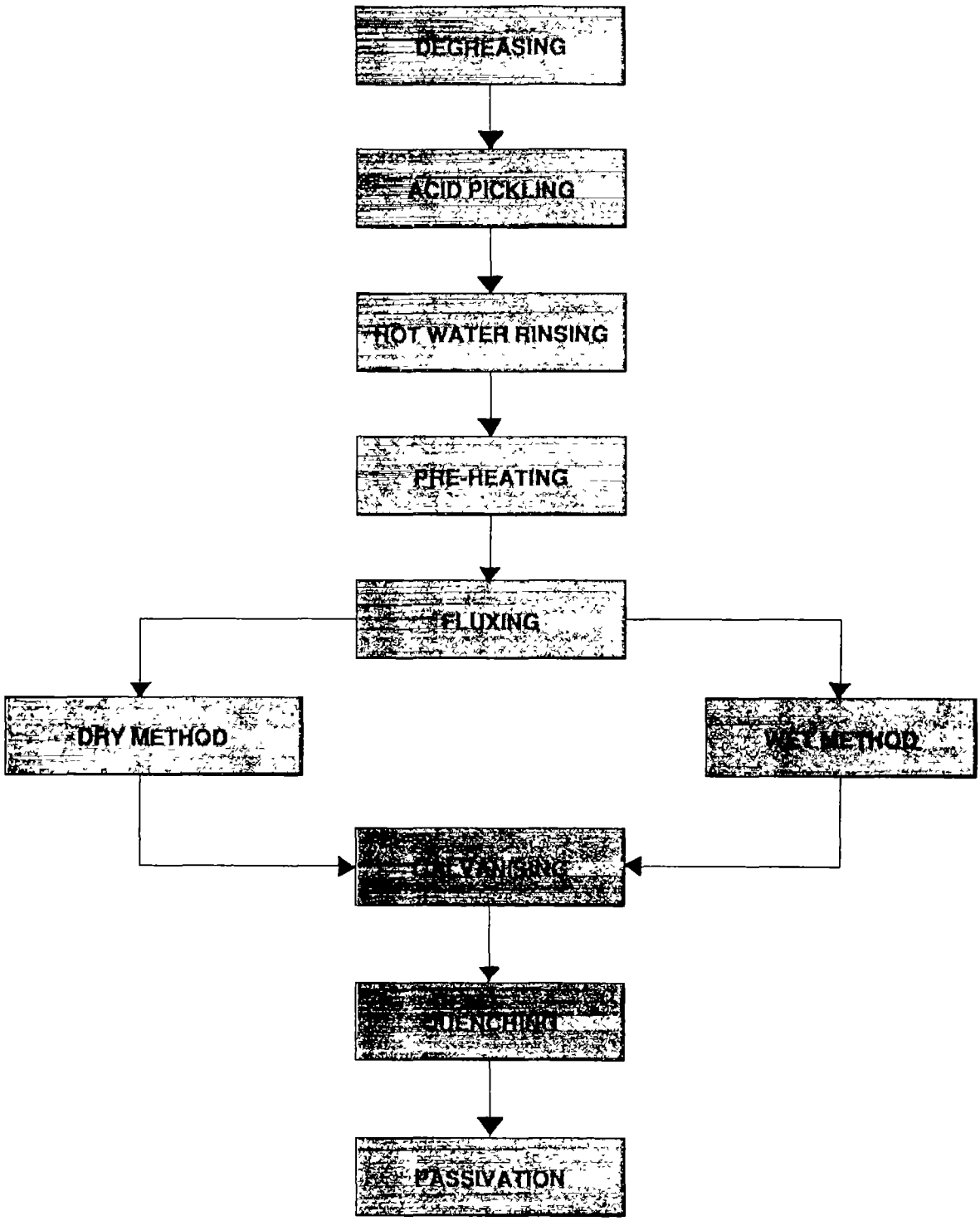
Zinc coatings are measured in gms.per square meter. They are also specified in terms of coating thickness in microns. The relevant specifications are ASTM A 123 and A 153 and IS 4296. Studies have shown that the single factor which is essential to determine the protection against corrosion is the coating thickness. All other factors are minor in determining life compared to this single factor.

Defects:

i) Brittleness of Zn-iron alloy layer
ii) Distortion of articles
iii) Cracks formation on sharply bent articles.
iv) Intercry stalline cracking because of penetration of zinc, reduction in fatigue strength in some cases, due to porosity and pitting.

ANNEXURE II

FLOW CHART FOR HOT DIP GALVANISING



QUALITY CONTROL AND INSPECTION

PRINCIPLES OF QUALITY CONTROL AND INSPECTION

Quality means many things to many people

To a salesman, it is magic word to be used as many times as possible in his sales presentation.

To a company's managing director it is a reputation that must be achieved and once achieved, maintained.

To an engineer it is doing a job that he knows the way it should be done, without compromise.

To a consumer, quality is that property of a product that creates a desire to use or own.

At the outset it is important to differentiate between quality control and inspection. Quality Control is total effort required after a system is put in place to detect deviations from the norm and return the process to that norm.

Inspection is the process of examining the goods to ascertain whether they conform or deviate from the standards of quality that have been specified for them. Inspection is a sort of postmortem performed to give a verdict. Inspection is a one time activity while quality control is a continuous process.

Before going to the topic of detailing the inspection carried out on India Mark II pumps, let us have a look at different kinds of inspections prevalent in the industry today.

The principal reasons for inspection at various stages of manufacturing process are:

1. To prevent accepting shipments of and starting work on raw materials that do not agree with specifications.
2. To prevent doing further work on material that was spoiled in an earlier process or operation.
3. To locate manufacturing processes that are producing or are tending to produce defective work because of mechanical or human failure as a preliminary to correct the cause.
4. To prevent delivery of defective products to customers.

Kinds of Inspection

In order to eliminate defective materials, inspection is required but inspection itself costs money and valuable man hours. So in order to accomplish the objective of locating and eliminating defects in a particular manufacturing situation, different kinds of inspection have been devised to reduce time and costs.

1. Sorting or Acceptance Inspection:

This kind of inspection is for the purpose of classifying the products as good or bad and is used to decide on the disposition of defective units by rework, salvage or scrap. These decisions should be based on the economic advantage of one proposal over the other.

2. Inspection by attributes:

This inspection is to determine if a product does or does not possess a specific characteristic or attribute. Eg. All components to be electrogalvanised.

3. Inspection by variable:

This is inspection with a graduated measuring, instrument to determine the actual size of work within the level of accuracy inherent in the measuring tool. Eg. Stroke length should be 125 ±4 mm.

4. One hundred percent inspection:

When no defective units are permissible one hundred percent inspection of a product is necessary. Every unit must be measured.

5. Sampling Inspection

This kind of inspection is performed on a random sample that is drawn from a lot of the product. The sample is considered to be representative of the entire lot, the lot is accepted, inspected further in some cases or rejected as per the result of the examination. This procedure may be employed in either of two situations.

First when some defective units of the product are permissible and it is desired to reduce the cost of inspection by examining a minimum quantity of the article.

Secondly, when the nature of the test destroys the product.

6. First piece inspection:

This is used when the product evolves from a semi-automatic or automatic machine. After the

semi-automatic or automatic machine is set up on a job, a trial piece is produced and inspected. If inaccuracies are discovered, the machine is adjusted and another trial piece is produced. When a trial piece pass the rigid standards of inspection the machine is released for production. The inspector may be called for a first piece check after a new tool has been installed.

7. Pilot piece Inspection:

When operations on more than one machine are required to complete a component; a trial piece is run through all of them. After a pilot piece has passed inspection, the production line is released for a run.

8. Working Inspection:

This is an extended form of sampling inspection. After a single machine or production line has been released for a run, as in (6) and (7), the work may be inspected periodically by a travelling inspector to disclose any trend towards the production of a defective unit caused by a worn tool or an altered machine adjustments. If such a condition is discovered, the machine or line is shut down until it has been corrected. This prevents the production of defective work.

9. Key operation inspection or stage wise Inspection:

Work is inspected before and/or after critical or expensive operations so that an additional effort on defective units may be avoided.

10. Performance inspection:

Components that can be inspected only on operational conditions are filled into its relevant line of function and inspected.

11. Endurance Inspection:

Useful for automobile and other allied machinery inspections, these are taken from assembly lines and operated for a specified time or until failure occurs. Then they are disassembled and the components are inspected to discover the effects of use.

In a mass production industry, inspection largely depend upon sampling inspection technique. Although the sampling inspection technique can be traced back to time immemorial today, almost every type of enterprise uses statistical techniques for analysis and decision making. Let us take a look at certain fundamentals of statistical methods.

Sample Inspection:

The object of inspection by the purchaser is to ensure the products conformity to the specification requirements, where as the inspection done by the manufacturer during production is to ensure conformity to specification and maintain control over the process. Quality control during production alone can build up quality and reliability and this is indicated by the normal distribution curve obtained by statistical method.

In case adequate and satisfactory system of quality control has been maintained and resulting data and information to that effect is maintained and verifiable, then a random sample can be drawn from the lot and based on the sample's conformity to the requirements, the lot can be accepted.

Hence **no sample inspection is possible unless an adequate and reliable in-plant quality control is implemented in the manufacturing stage.**

Lot size (N): No.of item in a lot which are to be cleared.

Sample: Collection of items selected for inspection from a lot.

Sample size (N): The number of items in the sample.

Defective: The 'item' which does not meet the specified requirements of quality.

Acceptable Quality Level (AQL):

The maximum percent defective for the purpose of sampling inspection which can be considered as a satisfactory process average. In other words it is defined as the worst quality level that is still considered satisfactory.

Characteristics to be checked have been listed and classified in five categories depending on the importance.

The definition of these 5 classes are given below:

Class	Definition
a.	These are very critical characteristics which if not detected may lead to loss of life, equipment and production singly or in combination.

b. These are the critical characteristics which if not detected, may cause loss of equipment or production or both.

c. These are the major characteristics which if not detected, may cause loss of production.

d. These are the minor characteristics which neither have bearing on production nor equipment but if not detected may lead to unsatisfactory performance.

e. These are incidental characteristics it overlooked may not have any bearing on production equipment etc. but are not desirable.

AQL for the aforesaid classes has been chosen as follows:

Class	AQL%
a	0.0(100%)
b.	1.0
c.	2.5
d.	4.0
e.	6.5

Inspection Level:

Five different inspection levels have been provided in Indian standard sampling procedures, Inspection levels, I,II are applicable in the selection of special small sample inspection plans. The relative amount of inspection per lot resulting from inspection levels III, IV & V are approximately 1:2:3

For the majority of production under normal condition of acceptance inspection, inspectional level IV is generally chosen for optimising the inspection effort and quality production.

Acceptance No. (a):

The maximum allowable number of defectives (or count of defects) in the sample(s) for acceptance of the lot.

Rejection No. (r):

The minimum number of defectives in the sample(s) for rejection of the lot.

Sampling Plan:

A statement of the sampling procedure and the rate of making inferences about the lot.

Single Sampling Plan:

A type of sampling plan in which a decision to accept or reject a lot is reached after one sample from that lot has been inspected.

Table II shows (enclosed IS 2500 (I)/75 details of single sampling AQL plans.

The working of single sampling plan is illustrated down below with an example:

Example: Suppose lots containing 200 coupling bolts are submitted for inspection of outside diameter, a decision regarding the class of inspection level and AQL value depending upon the importance of characteristic is to be made. In this particular example AQL of 2.5% and inspection level IV are adopted. Reference to Table-1 then gives the sample size code letter 'G' corresponding to which Table-II shows the sample size and acceptance no. as 32 and 2 respectively. Sampling plan then would work as follows:

From each lot of 200 coupling bolts collect a sample of 32 coupling bolts at random. Collection of sample at random is very important for the successful implementation of sampling inspection. The lot shall be accepted if the number of defective coupling bolts in the same is 2 or less. Otherwise the lot shall be rejected.

Double Sampling plan:

A type of sampling plan in which the 1st sample taken from very lot and evidence is used to accept the lot, to reject the lot or to reserve the decision until further information from a second sample obtained. Thus the decision may be reached either by inspecting the sample or in certain cases by inspecting two samples but never more than two samples from each lot.

The working of double sampling plan is illustrated by following examples.

Suppose lots containing 300 coupling bolts are submitted for inspection for outside dia. First decision regarding the class of inspection level and AQL value depending upon the importance of characteristics is to be made. In this particular example AQL of 2.5% and inspection level IV are

adopted. Reference to Table I then gives the sample size code letter G corresponding to which Table III shows the sampling plan.

From each of 200 coupling bolts collect the first sample of 20 coupling bolts in a random manner and examine them for defects. The lot shall be accepted if the number of defectives coupling bolts in the first samples is nil and rejected if it is 3 or more. If the number of defective bolt is between nil and 3, a second sample of 20 coupling bolts shall be collected and inspected. The lot is accepted if the number of defective ones in the combined sample of 40, coupling bolts is 3 or less and rejected if the number of defective coupling bolts found is 4 or more.

TABLE-III

Sample size Code letter	Sample	Sample size	Cumulative Sample size	Acceptance no.	Rejection no.
G	First	20	20	0	3
	Second	20	40	3	4

QUALITY IS ACHIEVED ONLY THROUGH PLANNED EFFORT

TABLE 1 SAMPLE SIZE CODE LETTERS BY INSPECTION LEVELS AND SIZES OF LOTS

(Clauses 4.3.1 and 4.3.2 and Examples 1,2 and 3)

LOT SIZE			INSPECTION LEVELS				
			*I	*II	III	IV	V
			(Sample Size Code Letters)				
(1)			(2)	(3)	(4)	(5)	(6)
2	to	8	A	A	A	A	B
9	"	15	A	A	A	B	C
16	"	25	B	B	B	C	D
26	"	50	B	C	C	D	E
51	"	100	C	C	C	E	F
101	"	150	C	D	D	F	G
151	"	300	D	E	E	G	H
301	"	500	D	E	F	H	J
501	"	1,000	E	F	G	J	K
1001	"	3,000	E	G	H	K	L
3001	"	10,000	F	G	J	L	M
10001	"	35,000	F	H	K	M	N
35,001	"	150,000	G	J	L	N	P
150,001	"	500,000	G	J	M	P	Q
500,001 and above			H	K	N	Q	R

* These inspections refer to special small sample inspection plans (see 4.1.1.1)

TABLE 2 SINGLE SAMPLING AQL PLANS

(Clauses 4-1-1, 4-1-1-1, 4-2-1, 4-3-1, 4-3-2,, 4-4-1, 4-5-2-2, 4-5-3-2 and Examples 1 and 2)

SAMPLE SIZE CODE LETTER	SAMPLE SIZE (n)	FOR PERCENT DEPICTIVES OR DEFECTS PER 100 ITEMS											FOR DEFECTS PER 100 ITEMS ONLY									
		0-10	0-15	0-25	0-40	0-65	1-0	1-5	2-5	4-0	6-5	10-0	15-0	25-0	40-0	65-0	100-0	150-0	250-0	400-0	650-0	1000-0
		ACCEPTANCE NUMBER (a)											ACCEPTNCE NUMBER (a)									
A	2	⇓	⇓	⇓	⇓	⇓	⇓	⇓	⇓	⇓	0			1	2	3	5	7	10	14	21	30
B	3	⇓	⇓	⇓	⇓	⇓	⇓	⇓	⇓	0			1	2	3	5	7	10	14	21	30	44
C	5	⇓	⇓	⇓	⇓	⇓	⇓	⇓	0	⇑		1	2	3	5	7	10	14	21	30	44	⇑
D	8	⇓	⇓	⇓	⇓	⇓	⇓	0	⇑	⇓	1	2	3	5	7	10	14	21	30	44	⇑	
E	13	⇓	⇓	⇓	⇓	⇓	0	⇑	⇓	1	2	3	5	7	10	14	21	30	44	⇑		
F	20	⇓	⇓	⇓	⇓	0	⇑	⇓	1	2	3	5	7	10	14	21	⇑	⇑	⇑			
G	32	⇓	⇓	⇓	0	⇑	⇓	1	2	3	5	7	10	14	21	⇑						
H	50	⇓	⇓	0	⇑	⇓	1	2	3	5	7	10	14	21	⇑							
J	80	⇓	0	⇑	⇓	1	2	3	5	7	10	14	21	⇑								
K	125	0	⇑	⇓	1	2	3	5	7	10	14	21	⇑									
L	200	⇑	⇓	1	2	3	5	7	10	14	21	⇑										
M	315	⇓	1	2	3	5	7	10	14	21	⇑											
N	500	1	2	3	5	7	10	14	21	⇑												
P	800	2	3	5	7	10	14	21	⇑													
Q	1250	3	5	7	10	14	21	⇑														
R	2000	5	7	10	14	21	⇑															

The rejection number (r) will always be one more than the acceptance number(a).

Use the first sampling plan below the arrow When the sample size equals or exceeds lot size, do 100 percent inspection.

Use the first sampling plan above the arrow.

TABLE 3 DOUBLE SAMPLING AQL PLANS

(Clauses 4-1-1, 4-1-1-1, 4-2-1, 4-3-1, 4-3-2, 4-4-2, 4-5-2-2, 4-5-3-2 and Examples 3)

SAMPLE SIZE CODE LETTER	SAMPLE	SAMPLE SIZE	CUMULATIVE SAMPLE SIZE	ACCEPTABLE QUALITY LEVEL																					
				FOR PERCENT DEFECTIVES OR DEFECTS PER 100 ITEMS													FOR DEFECTS PER 100 ITEMS ONLY									
				0-10	0-15	0-25	0-40	0-65	1-0	1-5	2-5	4-0	6-5	10-0	15-0	25-0	40-0	65-0	100-0	150-0	250-0	400-0	650-0	1000-0	
				a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	a r	
A				⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	*	*	*	*	*	*	*	*	*	*	
B	FIRST	2	2									*	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	
	SECOND	2	4												1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27	37 38	56 57	
C	FIRST	3	3								⇩	*	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	⇩
	SECOND	3	6												1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27	37 38	56 57	
D	FIRST	5	5							⇩	⇩	⇧	⇩	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	
	SECOND	5	10												1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27	37 38	56 57	
E	FIRST	8	8						⇩	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	⇩			
	SECOND	8	16									1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27	37 38	56 57				
F	FIRST	13	13					⇩	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧				
	SECOND	13	26								1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27							
G	FIRST	20	20				⇩	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧				
	SECOND	20	40							1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27								
H	FIRST	32	32			⇩	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧				
	SECOND	32	64						1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27									
J	FIRST	50	50		⇩	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	50	100					1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27										
K	FIRST	80	80	⇩	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	80	160				1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27											
L	FIRST	125	125	⇧	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	125	200			1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27												
M	FIRST	200	200	⇩	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	200	400		1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27													
N	FIRST	315	315	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	315	630	1 2	3 4	4 1	6 7	8 9	12 13	18 19	26 27														
P	FIRST	500	500	0 3	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	500	1000	3 4	4 1	6 7	8 9	12 13	18 19	26 27															
Q	FIRST	800	800	1 4	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	800	1600	4 5	6 7	8 9	12 13	18 19	26 27																
R	FIRST	1250	1250	2 5	3 7	5 9	7 11	11 16	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧				
	SECOND	1250	2500	6 7	8 9	12 13	18 19	26 27																	

a — Acceptance Number

r — Rejection Number

★ — Use corresponding single sampling plan from Table 2 (for alternatively, use double sampling plan below, where available)

⇩ Use the first sampling plan below the arrow. When the sample size equals or exceeds lot size, do 100 percent inspection.

⇧ Use the first sampling plan above the arrow.

INSPECTION EQUIPMENTS

INSPECTION EQUIPMENTS AND QUALITY CONTROL CHECKS AT MANUFACTURERS END

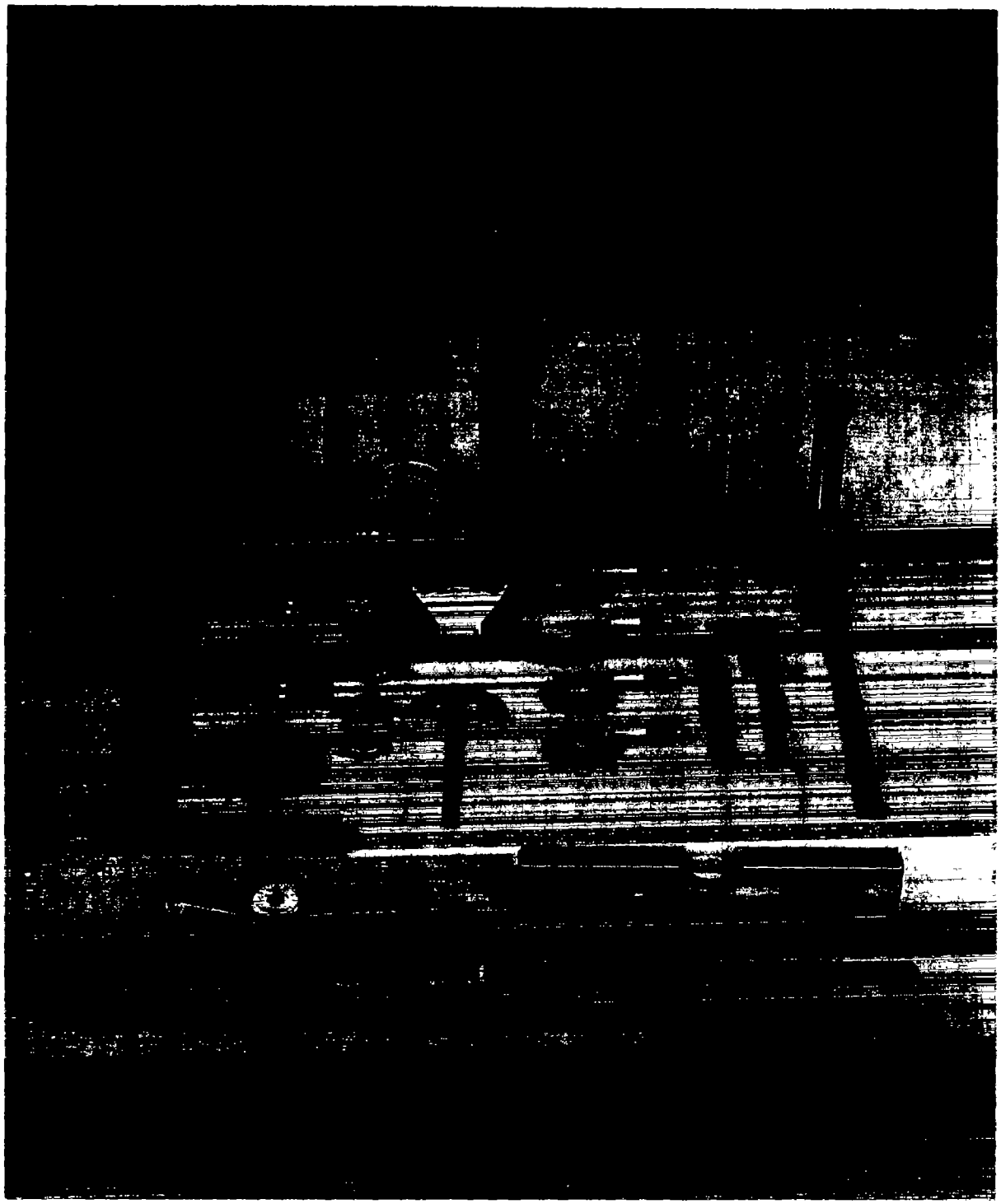
(A) Equipment for Quality Control (Tools & Gauges used for Inspection of Hand Pumps

To bring out a superior product, different types of inspection are to be carried out. For carrying out an inspection systematically, different kinds of tools and gauges are used for making the inspection faster and for getting uniform interchangeable products. We will now discuss in detail the different kinds of tools and gauges used for hand pump inspection at the manufacturer's works.

I. GAUGES (For India Mark II Handpump)

Sl. No.	Gauge (Go & No go)	Size in mm	Gauge used for checking the component
1.	Plain Plug	25Ø + 0.025 −0.00	Axle bush right
2.	Plain Plug	20Ø + 0.025 −0.000	Axle bush left
3.	Plain Plug	13.5Ø + 0.1 −0.0	Guide bush
4.	Snap gauge	20Ø + 0.20 −0.033	Handle axle
5.	Snap gauge	25Ø + 0.00 −0.025	Handle axle
6.	Thread plug	M12 x 1.75	Chain coupler, connecting rod coupler, plunger yoke body.
7.	Thread plug	Rp 1 $^1/_4$" IS:554.	Riser pipe holder, reducer cap.
8.	Thread ring	M12 x 1.75	Connecting rod, handle axle, plunger rod.
9.	Thread Plug	G2$^3/_4$" IS 2643. (Part I)	Reducer cap.
10.	Thread ring	G2$^3/_4$" B-IS:2643 (Part II)	Cylinder body
11.	Plain plug	65.35 + 0.20 −0.000	Cylinder body
12.	Thread plug	M10 x 1.5	Upper valve seat, rubber seat retainer.
13.	Thread plug	1$^1/_8$"	Plunger yoke body.
14.	Thread ring	M10 x 1.5	Check valve guide

INSPECTION GAUGES & MEASURING INSTRUMENTS



Sl. No.	Gauge (Go & No go)	Size in mm	Gauge used for checking the component
15.	Thread ring	$1^1/_8$"	Follower
16.	Plain plug	$47Ø^{-0.042}_{-0.017}$	Bearing housing.
17.	Welding fillet gauge	4 mm/6 mm	Pump head/water chamber/stand welding.
18.	80° leg position fixtures	—	Pumpstand
19.	Plain mandrel	300 mm long	Verticality of riser pipe holder.

Additional Gauges (For – India Mark III (VLOM) Handpump)

Sl. No.	Description	Size	Where used
1.	Thread Plug Gauge	G-$2^1/_2$" (IS-2643 - Part I)	Water tank coupler and top cap.
2.	-do-	G-2" (IS-2643 - Part I)	bottom cap
3.	-do-	RD 36x3.175 (IS-4695)	Cage
4.	Thread Ring Gauge	RD 36x3.175 (IS-4695)	Follower
5.	-do-	M6-6G	Push Rod
6.	Thread plug gauge	M6-6H	Push rod nut
7.	-do-	M52 x 2-6H	Cage
8.	Thread ring gauge	M52 x 2-6G	Check valve seat
9.	Taper plug gauge	5°	Bottom cap
10.	Taper ring gauge	5°	Check valve seat

Additional Gauges (For Extra Deepwell Handpump)

No additional instruments or gauges are required. Gauges used for India Mark-II Handpumps are suitable for this also.

II. Measuring Instruments:

Sl. No.	Description	Size	Minimum required quantity
1.	Micrometer	0 to 25 mm	1
2.	Micrometer	25 to 50 mm	1
3.	Micrometer ball end	0 to 25 mm	1

No.	Description	Size	Minimum required quantity
4.	Vernier calipers	24"	1
5.	Vernier calipers	12"	1
6.	Vernier calipers	6"	1
7.	Electro physic (Microtest)	0 to 100 microns	2
8.	Slip gauges	46 pieces	1
9.	Thickness gauge	0 to 10 mm	4
10.	Thread pitch gauge	60° (Metric)	1
11.	Pitch gauge	55° (BSW)	1
12.	Inside radius gauge	1 to 25 mm	1
13.	Outside radius gauge	1 to 25 mm	1
14.	Feeler gauge	0.01 to 1 mm	1
15.	Measuring tape	15 meter	1
16.	Measuring tape	3 meter	1
17.	Micrometer (for sheet metal reduced anvil)	0 to 25	1
18.	Shore-Hardness tester (for rubber)	'A' scale	1
19.	Steel ruler	150 mm	1
20.	Steel ruler	300 mm	1
21.	Steel ruler	500 mm	1
22.	Steel ruler	1 meter	1
23.	Bevel protractor universal type		1
24.	Try square	12" 6" 3"	one each
25.	Magnet for checking S.S. axle		1
26.	Lens		1

Checking of Performance Test

After a satisfactory inspection of raw materials and components, the pumps are tested for performance. In case a bore-well is available within the manufacturers premises, then the water chamber, pump had and cylinder along with necessary con-rods are fitted in position for the required depth and the pump is tested. The discharge of the pump obtained by pumping 40 continuous strokes in one minute should not be less than 15 litres. In the absence of a bore-well, the cylinder can be tested for discharge, by simulating the required conditions. Care must be taken while testing, to measure the discharge only when there is a continuous flow of water through the water chamber spout.

(B) Quality Control Checks on Hand Pumps

For the India Mark II Deep Well Hand Pump, all the raw materials undergo a chemical and physical analysis. If it conforms to the standard, the material will be released for further processing; otherwise the material has to be rejected. All the components are to be checked for 100% visual check, dimensional check and gauge fitment before releasing. All the threaded components are checked for thread gauge fitment. In case of any rejection at the time of processing, it will have to be discarded and scrapped. The percentage of rejection of the machined components is estimated 4% and the rejection while work is in progress for the sub assembly is estimated to be 1/2%

In general, all the sub assemblies are fabricated with the help of welding fixtures for maintaining the drawing dimension.

Right bush, left bush, guide bush, bearing housing, chain coupler, couplers and all the gun metal components are checked with 'Go' and 'No Go' plain plug gauges. All the threaded portions are checked with the relevant Go and No-Go thread plug gauges.

Quality control checks will have to be done at each stage.

The following are the in line process checks to be carried out:-

Assembly		Process
Head Assembly	(i)	In line reaming of left and right bush before assembly and checked for 20 to 25 plain bore gauge fitment.
	(ii)	Tapping of M12 thread of nuts on cover after galvanising.
	(iii)	Every head assembly checked for alignment, stroke, fouling on bracket and handle shake.
	(iv)	Chain coupler M12 threads are checked for thread gauge fitment and centering of taper hole.
Handle assembly	(i)	Bearing housing bores are reamed properly and ensured for correct fitment of bearings.
	(ii)	10.5 hole reamed after galvanising.
	(iii)	Bearing fits are ensured and the spacer is ensured for locking properly in between bearings.
Water Chamber Assembly	(i)	After galvanising $1\frac{1}{4}$" threaded portion is reamed and tapped and checked with $1\frac{1}{4}$" thread plug gauge.
Stand Assembly	(ii)	Check for leg position 80° and 140° after galvanising
Front cover	(iii)	Check for any cracks after forming

Electrogalvanising:

The connecting rod shall conform to bright bars of type 4, Grade 2 or 3 other than free cutting steel conforming to IS 9550-1980 'Specification for bright bars'. Electrogalvanising shall conform to service condition No. 4 of IS 1573 — 1986 'Specification for electroplated coating of zinc on iron and steel'.

Process of Galvanized Rods:

After threading the connecting rods, the couplers are welded on either ends (one is 50mm long and the other one is 20mm long). After welding, it is checked for cracks and blow holes. The threads are checked with M12 thread plug gauge and M12 thread ring gauges. After the final check, the rod is made to undergo the following process of galvanising.

1. Cleaning in kerosene and saw dust for removing oil and grease, stains, if any.
2. Degreasing for 10 minutes - dipping in degreasing chemical bath, solution for fine cleaning to remove rust and stains completely.
3. Acid picking, HCl, 1:2 mix.
4. Cleaning in running water.
5. Chloride bath dipping for getting good surface on rods for easy coating of zinc.
6. Electroplating - By electrolysis.
7. Water wash - Rods are washed in running water.
8. Passivation - Dipping each rod in passivation solution.
9. Washing and drying - After the passivation is carried out, rod ends are cleaned by retapping for ensuring proper thread gauge fitment.

Hot Dip Galvanising:

The hot dip galvanising is carried out on the head assembly, handle assembly, water chamber assembly, stand assembly and cover. The fabricated items are inspected thoroughly after welding for defects, dimensions etc. before galvanising.

Procedure for Hot Dip Galvanising (Ref. IS 4759-1984 for Galvanising)

(1) Cleaning of material – by sand blasting or by dipping in kerosene.
(2) Dipping in caustic soda solution
(3) Rinsing in running water
(4) Acid pickling – HCl solution 25% concentration
(5) Rinsing in water
(6) Preheating of materials.
(7) Fluxing – Dry or wet method.
(8) Galvanising
(9) Quenching in running water.
(10) Passivation – dipping in Dichromate solution.
(11) Water rinsing.

The mass of zinc coating shall be 610 g/m^2 minimum for 5 mm and above, and for thickness between 5 mm and 2 mm it is 460 g/m^2 .

The galvanising thickness is checked with the help of elcometer (Microtest instrument)

Visual inspection for surface defects is carried out on all the parts. Uniformity of galvanised coating is determined by preece test as prescribed in IS 2633. Adhesion of coating is tested as in IS 2629.

Cylinder Assembly:

All materials are checked for conformance to relevant IS specification (physical and chemical composition). Rubber and leather products are tested for hardness, dimensions, newness (new stock) etc. The cylinder as a whole is tested for water discharge and is only then cleared.

INSPECTION PROCEDURE

INSPECTION PROCEDURE FOR HAND PUMPS

The India Mark II pump is one of the simplest of machines with the most modern technology applied to it. All the latest techniques and tools which are applied in highly sophisticated equipment manufacture are used in hand pump manufacture.

Take for example the design. The pump is designed to IS 9301/90 which is the most detailed standard ever published by BIS. Every aspect of the design right from the selection of raw materials to the methods of testing the end product is standardised.

Due to the relentless and coordinated efforts G.O.I., BIS, manufactures and users of pumps and inspection agencies like SGS/Crown Agents, today India is capable of meeting the national and international demand for pumps and spares with a production capacity of 20,000 pumps per month. Quality control of hand pumps is done at the following stages:

i) Pre-qualification of manufacturer's to ensure that they have the necessary infrastructure, technical expertise, jigs, fixtures, measuring instruments and gauges to produce quality pumps.

ii) Selection of a supplier out of the pre-qualified manufacture and grading them in order of merit and capacity.

iii) Insisting on the supply of "ISI" marked handpumps together with an inspection by an independent agency at the manufacturer's works prior to despatch.

iv) Insisting on pre-delivery inspection of spares at the manufacturer's works by an independent agency prior to despatch.

Independent inspection agencies like SGS are involved in all the above quality control activities and are generating valuable feed back data. They are also associated in suggesting improvements over the present design, manufacturing process and in the evolution of new pumps.

SGS is involved in pre-qualification inspection where, the inspection techniques of a pilot piece inspection is combined with works inspection. Organisational set up, quality control set up, jigs and fixtures, skilled manpower, proper tools and gauges, raw materials flow, identification and maintenance etc., are also inspected.

Once the manufacturer is qualified, it is obligatory to get himself approved by ISI also. Based on tender evaluation an order is placed on the manufacturer.

I. India Mark II Hand Pump

Independent inspection agencies and BIS Officials carry out surprise checks during process inspections of the factory to ensure that the manufacturing process is being carried out as per the standards.

As sufficient care is taken right from the pre-qualification stage itself and ensured that a reliable quality control system is being followed, the actual pumps and spares lot is inspected based on a sampling plan as mentioned in IS 9301/90 with amendments and specific special circulars issued by GOI/UNICEF from time to time.

I. IS 2500, AQL: 1%, Level III, is chosen for the following characteristics.

i) Finish and visual defects.
ii) Dimensional check of assemblies.
iii) Surface contact of handle and bracket
iv) Verticality of riser pipe holder welding.
v) Flatness and matching of flanges.
vi) Alignment of rod with respect to guide bush.
vii) Stroke
viii) Connecting and plunger rod to be examined for straightness and thread formation. Hexagonal coupler to be checked for welding object.

II. Two pumps out of the lots shall be subjected to complete dimensional check.

III. Performance test as in IS9301/90.

The lot inspection carried out on these pumps cover the following broad spectrum.

- Gauge control
- Finished component and Assembly Control.
- Verification of technical documents.
- Jigs and fixtures.
- Performance control.
- Tolerance review.

Gauge Control:

For mass produced items, the check is done by the method of attributes. This is largely accomplished by the use of gauges. Therefore it is imperative that the gauges that are used are checked for their accuracy as often as required.

Jigs and Fixtures:

When you look at the India Mark II hand pump you will clearly observe that fabrication by welding has played a large part in the manufacture. Fillet welding, gusset welding etc. has to be done properly. This is achieved by jigs and fixtures. The process being a manual arc welding process, the control of weld deposit, uniformity of welding and size of welding becomes difficult unless a method is developed to present the job under fabrication in the required position. Various indigenous types of jigs and fixtures, have been evolved for brackets welding, head assembly welding, water tank assembly welding and stand assembly. Many times motorised controls are employed for revolving the water tank assembly. Unless these jigs and fixtures are satisfactory it is not possible to achieve the tolerance specified for the pumps. Regular check is maintained to caution the manufacturer if any of these get worn out.

Finished Component Control:

During the course of lot inspection, as per the sample size prescribed in IS, every component/sub-assembly is checked for various parameter like dimensions, hardness, protective coatings, threading, alignment etc., As a regular record is kept at SGS and the movement of a component or sub-assembly that goes out of the specification is notified by the SGS Inspection Engineer, immediate corrective action is taken up in the form of problem identification and cause, then methods are suggested to improve and avoid recurrence of the problem.

During the process of inspection of a component or sub-assembly at random some of the components are subjected to various chemical and physical testing including the checks prescribed in the specification. The component is drawn out and sent to an independent for analysis.

Verification of technical document:

Various test certificate of the original manufacturer is verified at times and whenever required to establish a certain amount of confidence that the manufacturer uses good quality material only. However, it must be clearly understood that the verification of test certificates is not a fool proof method and it is indicative only.

Performance Control:

Ultimately a consumer derives satisfaction only if the goods he has paid for performs to his satisfaction. Therefore it is imperative that all inspections should culminate only after a performance check. All the manufacturers who are approved by GOI, BIS or UNICEF have made necessary arrangements to check the performance.

No inspection is complete without proper identification. Identification is useful in many ways. The handpump components are identified by punches/stamps. Detailed circulars are available on the method of stamping (Steel and ink stamps), location of the stamps, nature and methods of packing to be used for various components, methods of rust prevention and preservation, use of weather proofing materials etc...

Tolerance review:

Reviewing tolerance on the specified quality characteristics of materials, parts, assemblies and finished products determine whether they genuinely represent the limit of acceptability. This review has brought about quite a few changes furthering the standardisation and performance of the pumps as a whole and components independently, SGS inspection has contributed considerably for this.

Reviewing of Test Reports for Chemical and Mechanical Properties.

Test certificates shall be insisted on from

manufacturers for each lot of inspection carried out for raw materials well as components which have been analysed by an independent laboratory. The test reports from a reputed lab or the original manufacturer is a must for verifying the quality of materials as the pump manufacturer purchases raw materials from different parties. Wherever the review record is found varying, or a difference is noticed in the visual check a test piece could be collected and analysed by another independent lab. A check list for the chemical and physical properties of hand pump components is attached.

II. India Mark - III (VLOM) Handpump

The India Mark-III VLOM handpumps are generally inspected as in IS:13056-1991

A. General:

1) Verify order conditions:- to confirm that the goods are offered as in order specification. Check any variants in the order e.g. leather buckets Chrome tanned/vegetable tanned/nitrile rubber buckets, number of connecting rods with each pump, normal/stepped spacer, stainless steel connecting rods.

2) Verify offer sheets:- to verify the materials offered, serial number of pumps, cylinders and connecting rod batch number.

3) Verify raw material test certificates:- to confirm that the raw materials used and the relevant test certificates conform to specifications.

B. For detailed inspection, sampling is done as specified by IS:2500; AQL 1% level III to check the following characteristics:

i) Finish and visual checks

ii) Check for welding defects like blow holes, under cuts, fillet etc.,

iii) Dimensional check of parts and assembly as per drawings.

iv) Special emphasis to be given for inspection of the following:

a) Stepped spacer for nitrile rubber buckets

b) Check valve seat and bottom cap 5° taper matching and dimensions

c) Cage and follower knuckle thread suiting to each other

d) 2 1/2 inch BSP thread check and verticality in water tank.

e) All the rubber items: sealing ring, rubber seating in the upper valve and lower valve, O-ring, pump buckets - properties to conform to Nitrile rubber.

f) Check stainless steel parts - Axle, plunger rod, push rod and M 6 nut for non-magnetic.

g) Check for galvanising and electroplating coating thickness.

h) Check for cylinder assembly leakage.

Inspection at Assembly Stage

i) Alignment of rod with respect to guide bush on third plate

ii) Stroke length 125±4mm.

iii) Surface contact of handle and bracket

iv) Handle shift after assembly not more than 2mm

v) Performance test: discharge of 15 litres minimum in 40 continuous strokes in one minute.

Special Note:-

1) Head assembly shall be supplied with third plate

2) In case of doubt in raw material quality samples can be taken for independent analysis.

III. Extra Deepwell Handpump (Refer IS:13287/92)

A. General

1) Verify order conditions:- to confirm that the goods are offered as in order specification. Check any variants in the order e.g. leather buckets Chrome tanned/vegetable tanned/nitrile rubber buckets, number of connecting rods with each pump, normal/stepped spacer, stainless steel connecting rods.

2) Verify offer sheets:- to verify the materials offered, serial number of pumps, cylinders and connecting rod batch number.

3) Verify raw material test certificates:- to confirm that the raw materials used and the relevant test certificates conform to specifications.

B. For detailed inspection, sampling is done as specified by IS:2500; AQL 1% level III to check the following characteristics:

(a) All the pumps shall be examined for finish and visual defects.

(b) All dimensions of the assemblies shall be checked for conformance with the figures.
(c) The handle shall have reasonably good surface contact with the top and bottom portions of the bracket.
(d) Riser pipe holder welding shall be checked for verticality. Plain round mandrel of 300 mm length shall be screwed to the water tank coupling and the verticality shall be checked with the help of try square. For the entire length of the mandrel a maximum of 1 mm tilt may be allowed.
(e) The flanges shall be reasonably flat to provide proper matching of the holes to ensure unrestricted insertion of the bolts.
(f) After putting pump on perfect level over the platform, alignment of the rod with respect to the guide bush shall be checked as given below.
(g) A rod of length 100 mm and diameter 12 mm shall be fitted to the chain coupling. The handle shall be raised and lowered gently. The rod shall pass through the guide bush freely.
(h) The handle shall be checked for lateral play at the end of square section of handle which shall not exceed 2 mm on either side.
(i) The clearance between the handle and the bracket side shall not be less than 1.5 mm.
(j) The stroke of the pump shall be 100 ± 3 mm.
(k) The connecting rods and plunger rod shall be examined for straightness and the formation of the threads The hexagonal coupler shall also be subjected to similar checks. The hexagonal coupler shall be stress relieved before welding to avoid cracks since these are manufactured from cold drawn bars.
(l) When pump head is assembled with handle assembly, it shall be possible to insert handle axle by using a soft hammer. The fitment of the bearing shall be checked to ensure that outer races of the bearing do not move when mild force is applied on the inner racing of the bearing and the inner race of bearing shall rotate freely.
(m) The cylinder assembly shall be checked for leakage of water. The cylinder be fitted with water and water level is checked after 5 minutes. There shall be no leakage of water.
(n) The check valve and the plunger valve shall move freely after assembly.

Routine Tests

Two complete pumps including cylinders out of the batch selected shall be subjected to the following tests in addition to the tests given above.
(1) The pump assembly and cylinders assembly shall be dismantled and all the components shall be checked in detail for critical dimensions as per the figures. The connecting rods shall also be checked for dimensions.
(2) The cylinder assembly (other than those selected for dimensional checks) of pumps shall be placed fully submerged in a barrel of 200 litre water capacity. The pump shall be primed and test shall start only after getting continuous flow of water through the spout. The water shall then be collected in container for 40 continuous strokes to be completed in one minute and the discharge thus measured shall not be less than 12.0 litres.

IV. Shallow Well Hand Pump

The Shallow well handpumps are generally inspected, in keeping with IS 8035 - 1976. The pump consists of the following sub-assembles.
i) Pump body ii) Plunger assembly with plunger rod iii) Handle and cover iv) Flapper valve v) Base vi) Riser pipe.

A. General:

(1) Verify order conditions, offer sheets and raw material test certificates.
(2) Check for raw material conformance.
i) Body, cover, handle and base - cast iron - IS:210 - 1978 Grade FG-150
ii) Plunger rod - bright bar as in IS:9550-1980 or mild steel as in IS: 226-1975
iii) Plunger assembly parts - bronze - IS:318-1981
iv) Flapper valve and pump bucket - leather - IS: 1015 - 1987.

B. For detailed inspection, sampling is done as per IS:2500; AQL 1% level III to check the following characteristics.
i) Finish and visual checks
ii) Check for painting, galvanising and electroplating.
iii) Dimensional check for parts as per drawings

iv) Check for flanges matching.

v) Special emphasis on:

a) Smooth finish in bore of the body where plunger actuates and the bore diameter.

b) Check for casting defects on body like blow holes, cracks etc.,

c) Check all threaded components to suit gauges.

d) Check all fasteners as per IS:1367-1984

e) Check riser pipes as per IS:1239-1979

Inspection at assembly stage

i) Check for proper movement

ii) Check for overall size

iii) Pump body - test for a hydraulic pressure of 2 kg/sq. cm.

iv) Performance test: discharge not less than 20 litres per minute for 20 strokes.

V. Direct Action Hand Pump (TARA)

The Direct Action (TARA) handpumps are generally inspected as in IS DOC:HMD 20 (0003) P1 - Aug '91

The Direct Action (TARA) handpump consists of the following sub assemblies: i) Pump head assembly - Nominal Bore pipes as in IS:1239 and flange as in IS:226 ii) Pump Rod assembly - uPVC iii) Handle Assembly - nominal bore pipe as specified IS:1239 iv) Cylinder assembly - HDPE and stainless steel v) Rising Main - uPVC vi) tube well assembly - uPVC vii) Retrieving rod assembly - as in IS:226.

A. General

(1) Verify order conditions.

(2) Verify offer sheets and raw material certificates

(3) Check for raw material conformance.

i) Pump head assembly and handle assembly to IS: 1239

ii) Nitrile rubber items to the specification given in IS: 3400

iii) Stainless steel parts to IS: 6603-1972

iv) uPVC items to IS:4985-1988 and 12035

v) HDPE items to IS:7328-1974

B. For detailed inspection, sampling is done as per IS:2500; AQL 1% level III to check the following characteristics.

i) Finish and visual checks.

ii) Check for galvanizing and electroplating

iii) Interchangeability of components

iv) Dimensional check as per drawings

v) Belling ID of upper and lower casing to be checked. Quality of belling, freedom from any burning marks, concentricity, change of colour due to overheating.

vi) Straightness of uPVC pipes, pump rods etc.

vii) Concentricity of threaded adapters in pump rods and riser main

viii) Testing of uPVC fitting as per IS:7834 and gauging to check quality of threading.

ix) Bouyancy of Pump rods

x) Flushing of body pipe with flange in the groove

xi) Level of bottom flange, position and vericality of legs.

xii) Special emphasis on:

a) Cementing/glueing of uPVC parts

b) The dimensions of uPVC pipes to conform to the dimensions given in the draft standard.

Inspection at Assembly Stage

i) Alignment of holes of guide bush with respect to pump body

ii) Alignment of handle nut with rod for concentricity

iii) Leakage test: pump rods are to be subjected to 9 bars internal pressure for 30 minutes to observe leakage.

iv) Foot valve assembly to be subjected to leakage test when 1 bar pressure is developed and the cylinder is in a vertical position

v) Discharge test: discharge shall not be less than 21 litres in 30 strokes of 300 mm stroke length after cylinder is installed with 15 mtr riser pipe.

CERTIFICATE FORMAT

MADRAS LABORATORY
304-305, 1st Floor, Anna Salai,
Teynampet, MADRAS 600 018.
Phone: 451427, 453083, 453084
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SGS

S G S India Limited

Regd. & Head Office: SGS House, Nagroji Furdoonji Road,
Bombay-39

CERT. No. SMM/LAB/2001/TECH/MS/HP/SPARES/92

ANALYSIS CERTIFICATE

Date 15/09/1992

We hereby certify that a sample described as LEATHER PUMP BUCKET — SAMPLE SUBMITTED BY PARTY

sealed with monogram seals — — — — received by us on 12-09-1992

from M/s **TANSI PUMP UNIT, MADRAS**

with the following marks:

SD - TANSI

has been analysed with the following results:

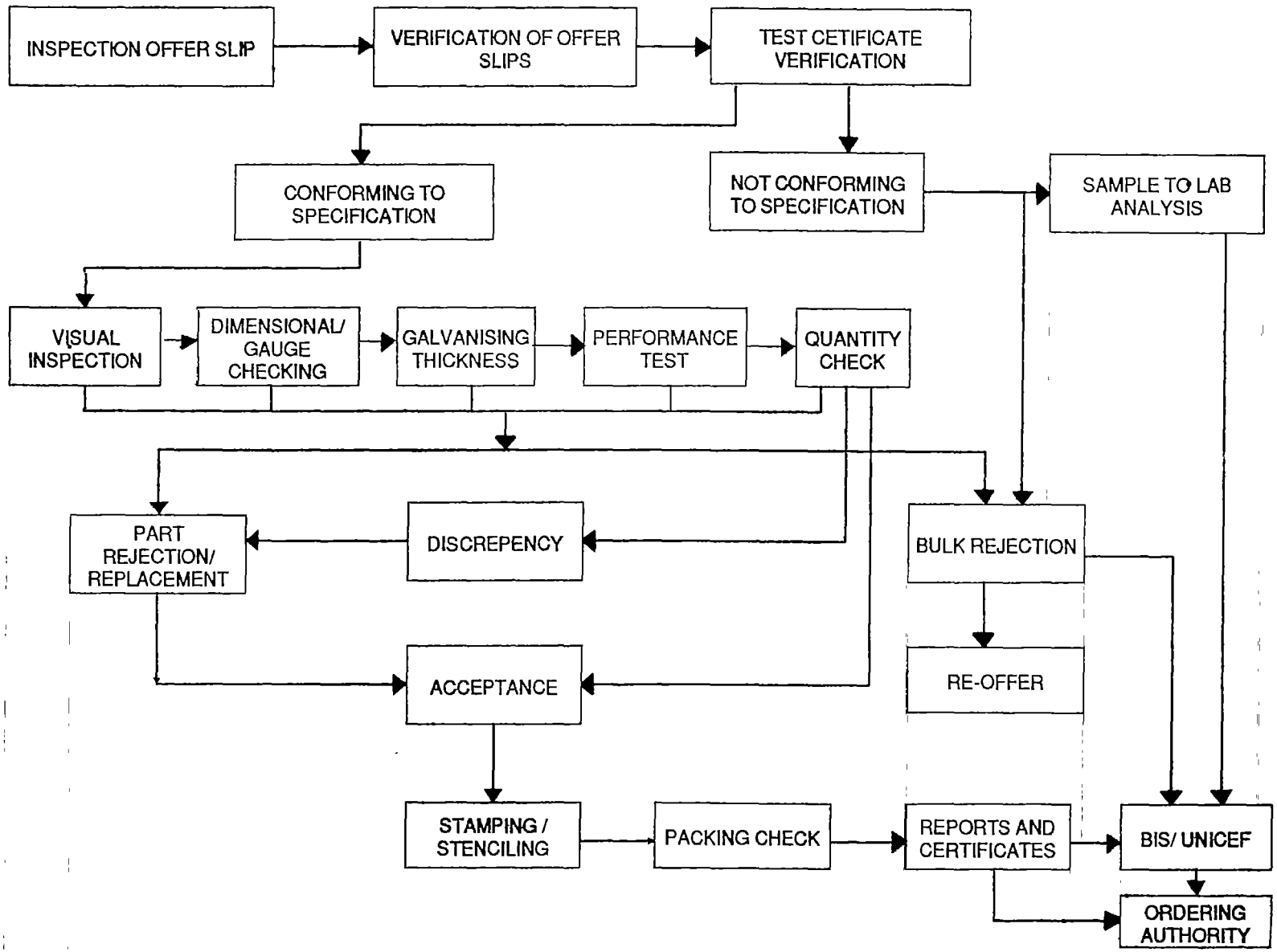
	RESULTS OBTAINED	LIMITS AS PER IS 1015/1987
PH of water solubles	4.9	3.3
Differential Number	0.40	0.60
Acid value of extracted fat	3.13	4.0 max
Solvent Extractable Substance	12.63%	10% min
Performance Test	Passes the test	To pass test

Remark: The sample conforms to IS 1015/1987 in the above respects.

Chemist-in-charge

for and on behalf of
SGS India Limited

INSPECTION PROCEDURE



CHECK LIST FOR THE CHEMICAL AND PHYSICAL PROPERTIES OF MARK II, MARK III AND EXTRA DEEP WELL HANDPUMP COMPONENTS

A) Gunmetal Components used in Cylinder Assembly

i) Material Specification: LTB-2 of IS 318 — 1981

Requirement of chemical composition when tested in accordance with IS 4027 - 1967

Constituents	Acceptable %
Tin	4.0 to 6.0
Zn	4.0 to 6.0
Pb	4.0 to 6.0
Ni Max.	2.0
Al Max.	0.01
Si Max.	0.02
Sb Max.	0.4
Total Impurities	0.8 (Excluding Ni)
Cu	Remainder

Requirement of mechanical properties when tested in accordance with IS 2654 - 1964

Mode of Casting	Tensile strength (Min.)	% Elongation
Sand Cast	190	13.0
Chill Cast	190	6.0

ii) Naval Brass Components used in Cylinder Assembly (IS : 6912 – 1985)

Requirements of chemical composition when tested in accordance with IS:6912 – 1985.

Constituents	Acceptable %
Cu	61 to 64 (plus incidental Ni)
Tin	1 to 1.5
Pb	0.20
Fe	0.10
Zn	Remainder
Total impurities	0.20

Requirements of mechanical properties:- When tested in accordance with IS:2654 – 1977.

Size	Tensile Strength (MPa)	% Elongation
6 mm and over	340 (Min)	15 (Min)

B) Iron Castings – Cylinder Body and Caps

Material Specification: GRADE FG 200 of IS 210 : 1978

Requirement for chemical composition

Chemical composition should conform to IS 4843 - 1968

Requirement of Mechanical Properties

(1)	Tensile Strength (Testing as per IS 2078-1962) :	200 N/sq. MM
(2)	Hardness test (Testing as per IS 1978-1961) :	160 - 220 HB

C) Stainless Steel Bars – Plunger Rod and Handle Axle

Material Specification: GRADE 04C.18 Ni 10 Mn2 of IS 6603 - 1972

Requirement for chemical composition

Constituents	Acceptable %
C Max.	0.08
Si	1.0
Mn	2.0
Ni	8.0 - 12.0
Cr	17.0 - 20.0
S	0.03
p	0.045

Mechanical Properties

(1)	Tensile Strength (Testing as per IS 1608 - 1960)	:	1030 N/Sq. MM – for Handle Axle 1270 N/Sq. MM-for Plunger Rod
(2)	% Elongation	:	15% Min - for Handle Axle 12% Min - for Plunger Rod

Other Tests to be carried out

(1) Bend test as per IS 1599 – 1960

(2) Brinell Hardness test as in IS 1500 – 1968

(3) Charphy Impact test as in IS 1499 – 1959

D) M.S. Bright Bars – Connecting Rod

Material Specification: TYPE 4 GRADE 2 OR 3 OF IS 9550 – 1980

I. Dimensional tolerance

(i)	Diameter	:	12 mm $^{-0.11}_{+00}$
(ii)	Out of Roundness	:	Difference between largest and smallest diameter should not exceed $1^1/_2$ of the permissible total variation in diameter.
(iii)	Out of Straightness	:	1.5 mm / meter

II. Chemical Composition should conform to IS 1570 - 1961

Mechanical Properties for Grade 2

(i)	Tensile strength	:	540 to 790 MPa
(ii)	Yield strength	:	65-80% of TS
(iii)	Elongation on GL of 65 So	:	13% min

Mechanical Properties for Grade 3

(i)	Tensile strength	:	610 to 790 MPa
(ii)	Elongation on GL of 65 So	:	12% min

E) M.S. Materials

Plate	:	6 mm – For flanges
HR Sheet 4 mm	:	4 mm – For pump head
12 mm Sq. bar	:	For handle sector
32 mm Sq. bar	:	For handle rod
Rounds 70Ø, 55Ø, 45Ø & 35Ø	:	Bearing housing, riser pipe holder, axle bush & guide bush
Angle 40 x 40 x 6	:	For legs

Material Specification: IS 226 ST 42-S

Requirement for chemical composition:- When tested in accordance with IS 228 - 1959

Constituents	Acceptable %
C Max.	0.23 – for thickness diameter 20 mm and below 0.25 – for thickness diameter over 20 mm
S Max.	0.055
P Max	0.055

Mechanical properties:- When tested in accordance with IS 1608 – 1972

(i)	Plates and Sections	– Bend test, Tensile Elongation Test
(ii)	Bars, Rounds and Squares	– Tensile strength 410 to 530 N/Sq. mm
		– Yield strength 240 N/Sq. mm
		– % Elongation (23%)

F) M.S. PIPES (ERW)

For Pump stand, water chamber, spout pipe and riser pipe.

Material Specification: IS : 1239 (Part I)-1979 ERW. Medium Series

I. Dimensional Tolerance

(i)	Spout pipe	NB 40 mm	Thickness	$3.25^{-0.33}$
(ii)	Stand pipe & water chamber pipe	NB 150 mm	Thickness	$4.85^{-0.49}$
(iii)	Telescopic Stand pipe (As per IS:1161)	NB 175 mm	Thickness	$5.4^{-0.54}$

II. Chemical Composition

C Max.	0.250
S Max	0.055
P Max	0.055

III. Mechanical Properties

(i)	Tensile Strength	:	320 N/Sq. mm
(ii)	% Elongation	:	20% Min.
(iii)	Bend Test for tubes upto including 50mm NB 90° – galvanised tubes 180° – on un-galvanised tubes.	:	There should not be any cracks
(iv)	Flattening test for tubes above 50 NB	:	There should not be any fracture or crack.

Riser Pipe: a) 32mm NB medium class – thickness $3.25^{-0.33}$

Weight tolerance : +10% –8%

b) 65mm NB medium class – thickness $3.65^{-0.37}$

Weight tolerance : +10% –8%

Chemical and Mechanical properties same as other pipes given above. In addition to that –

(i) Expansion test on sockets:

Drift expanding test	–	Minimum Expansion 1.5% for 32 mm NB
or		Minimum Expansion 1% for 65 mm NB
Taper screw plug test	–	No fracture

(ii) Hydro test – 5 N/sq.mm.

Sampling for tubes as per IS 4711 – 1974

(G) Rubber Components (Rubber Seating / Pump Bucket)

Material Specification: Raw Acrylonitrile Butodiene Rubber conforming to IS 8683 – 1977

RAW MATERIAL TESTS

1. Determination of volatile matter.
2. Determination of solvent extract.
3. Determination of organic acid content.
4. Determination of soap content.
5. Determination of total ash content.
6. Determination of combined acrylo nitrile content
7. Determination of solubility
8. Determination of money viscosity.

Physical Properties:

The physical properties of nitrile rubber shall be:

Shore hardness on A scale	80^{+5}_{-4}
Tensile strength	12.6 MPa, *Min.*
Elongations at break	150%, *Min.*
Compression set, 24 h at 70°C	20%, *Max.*
Volume change, 22 h at 40°C	–0% +25%
Resistance to low temperature at which rigidity modulus does not exceed 70 MPa	–10°C
Adhesion to corrosion of metals 168 h at 70°C	There shall be no corrosion or pitting of the metals and the vulcanizates shall not adhere to the metal surfaces or show any sign of liquid exudation. Discoloration of the metal surfaces shall not be considered cause for rejection.

(H) Brass Liners

Material Specification: Cu Zn As of IS 407 – 1981

Chemical Composition

Cu + incidental Ni	–	68.5 to 71.5
Pb Max.	–	0.07
Fe Max.	–	0.06
Ar Max.	–	0.02–0.06
Total impurities Max	–	0.3
Zn	–	Remainder

Physical Properties

(i)	Tensile strength (Annealed condition)	–	285 N/sq. mm
(ii)	Hardness	–	75 HV Max.
(iii)	Drifting test	–	Should withstand (without showing) any crack or flaw
(iv)	Flattening test	–	There should not be any cracks.
(v)	Double bend test	–	There should not be any cracks on the outside of either bend.
(vi)	Mercurous nitrate test	–	There should not be any cracks.

Note: The Brass liner shall be free from Pitting and Scar marks and shall have a smooth finish. No cracks in Brass tube during operation are permissible.

(I) Leather Components

Sealing Ring– Chrome tanned

Ref. : IS 3020 – 1976

(i)	Shrinkage in boiling water	–	Reduction in area 3% minimum
(ii)	Resistance to hot oil	–	Shall not shrink more than 5% and remain soft and flexible at 100°C.
(iii)	Cracking of the grain	–	Shall not crack
(iv)	Resistance to hot air	–	Shall remain soft and flexible at 100° C.

Pump Buckets – Vegetable tanned

Ref. – IS 1015 – 1987

(i)	Shrinkage in 70° C. water (testing as per IS 5914 – 1970)	–	Not more than 5% of original area
(ii)	Cupping test	–	Shall not lose shape or show any damage
(iii)	Cracking test	–	No cracks permitted

(J) Handle Chain – Simplex Type

Ref. STD : IS 2403 – 1975

Pitch	–	25.4 mm
Measuring load	–	51 Kgs.
Breaking load	–	4310 Kgs.

(K) Bearing – 6204 Z Single shielded packed with lithium based grease.

Ref. STD : 20 Bc 02p – IS 6455 – 1972

INSPECTION PROCEDURE FOR SPARE PARTS

The list of major components in the form of sub assemblies for India Mark II Handpump can be classified as given in Annexure 'A'.

Although there is no standard list of spare parts, by our experience it is observed that almost al the components are being purchased by the State Government in India. As such, we give below the methodology for the Inspection of spare parts.

1. The spares depending upon the item are, offered either in packed or unpacked condition.

Connecting rods, pedestal, water tank and head assembly (including handle assembly) are offered unpacked and the rest of the items are offered packed. The details of the packing and marking are given as per Annexure 'B'.

2. All welded assemblies are checked 100% visually for quality of workmanship and apparent manufacturing defects. Peeling of zinc coating, burrs, welding cracks, porosity etc. are also checked. Physical inspection for dimension etc are carried out on the basis of a sampling plan given in IS 2500. AQL 1% Level III.

The dimensions are governed by IS 9301/1984 with the latest revisions and amendments. The connecting rods and other threaded assemblies are also checked for interchangeability and also for conformity by the method of attributes.

Material test certificates as per relevant BIS standards are verified for each batch of components.

In general the procedure followed is similar to the inspection carried out on handpumps as per IS 9301-1990 with the latest amendments.

The packing checks are conducted as per guidelines of BIS/UNICEF which is given In Annexure 'B'.

ANNEXURE 'A' :-

INSTRUMENTS AND GAUGES USED FOR INSPECTION OF SPARE PARTS

Item No.	Description	Type of Instruments	Remarks
1.	Pump Bucket (Leather/Nitrile rubber)	Vernier generally used.	
2.	Follower (GM)	Vernier and fitment used.	
3.	Checkvalve seat (GM)	Vernier generally used	
4.	Spacer (GM)	Vernier generally used	
5.	Rubber seat retainer (GM)	Vernier Go, and No go gauge used	
6.	Check valve guide (GM)	Vernier, thread and ring gauge used	
7.	Upper valve guide (GM)	Vernier, used	
8.	Plunger yoke body (GM)	Vernier, Go and No go gauge	fitment with follower
9.	Rubber seating (Big)	Vernier, Hardness tester	
10.	Rubber seating (Small)	Vernier, Hardness tester	-do-
11.	Sealing ring (Chrome tanned leather)	Vernier used	-do-
12.	Plunger rod (Stainless steel)	Steel tape, ring gauge, Go and No go gauge used.	
13.	Reducer cap (Cast Iron)	Vernier, go and No go gauge used	Painting-visual checking.
14.	Cylinder body (Cast Iron)	Steel tape, pitch gauge and vernier	-do-

Item No.	Description	Type of Instruments	Remarks
15.	Brass liner	Vernier, Micrometer Steel tape/rule used.	
16.	Connecting rods	Go and No go gauge, ring gauge steel tape, vernier, elecometer	
17.	Pedestal	Steel tape/Micrometer ball type, micrometer flat type, vernier, elecometer, fillet gauge angle gauge.	
18.	Water tank	Micrometer ball type vernier, micrometer flat type, Go and No go gauge, mandrel for verticality check, elcometer and fillet gauge.	
19.	Head assembly	Vernier, micrometer gauge, filler gauge used. Go and No go plug gauge for right & left bush/elcometer	Bearing-visual check. Elecometer-Coating thickness fillet gauge-for fillet weld.
20.	Cover	Vernier, Micrometer, Elcometer.	
21.	Handle axle	Snap gauge, vernier/ring gauge	Magnet check on S.S. Material
22.	Full cylinder	Suitable discharge system and measuring vessel.	

Additional Guages for India Mark III (VLOM) Handpump:

1.	Follower with extended thread portion	–	Thread Ring Gauge
2.	Cage	–	Thread Plug Gauge
3.	Conical valve	–	Thread Ring Gauge
4.	Two piece conical valve guide	–	Thread Ring Gauge
5.	'O' Ring for conical valve	–	Vernier 'Go' and 'No Go' gauge
6.	Cylinder Body	–	Plain plug gauge
7.	Cylinder Top Cap	–	Thread Plug Gauge
8.	Cylinder lower cap	–	Thread Plug Gauge
9.	Push Rod 6mm	–	Thread Ring Gauge
10.	Push rod nut M6	–	Thread Plug Gauge
11.	Water chamber with $2^1/_2$" cylinder	–	Thread Plug Gauge

ANNEXURE 'B' :-

DETAILS OF SPARE PARTS MARKING

I. India Mark II Handpump

Serial No.	Description	Type of Instruments
1.	Pump head with cover, bolt	**HPMM** on head flange & name plate.
2.	Cover	**HPMM**
3.	Cover bolt	**PMM**
4.	Additional Flange (Third Plate)	**HPMM**
5.	Handle bar welded to bearing housing housing holder, and roller chain guide	**HPMM**
6.	Bearing	**PMM**
7.	Handle axle	**HPMM** on milled portion
8.	Chain with coupling	**HPMM & PMM**
9.	Hexagonal bolt M 10x1.5x40	**PMM**
10.	Hexagonal Nyloc Nut M 10x1.5	**PMM**
11.	Spacer	–
12.	Washer (4 mm thick)	–
13.	Hexagonal Nuts M12	
14.	Water Tank Assembly	**HPMM** mark on flanges
15.	Stand Assembly	**HPMM** on the flange
16.	Stand Assembly (Telescopic)	**HPMM** on the flange
17.a.	Hexagonal bolt M12x40	**PMM**
17.b.	Hexagonal Nut	–
18.	Connecting rod	**HPMM** with month and batch number of manufacturer on hexagonal coupler
19.	Hexagonal couplers M12x50 long 19 A/F	**HPMM**
20.	Cylinder assembly (complete)	**HPMM** and Year of manufacturer on cylinder body in raised letters and serial number punched.
21.	Upper valve assembly complete with plunger yoke body, upper valve guide rubber seating, pump buckets, spacer and follower.	**HPMM/PMM** on components
22.	Upper valve only comprising, upper valve guide and rubber seating	**HPMM/PMM**
23.	Lower valve assembly complete with check valve set, check valve guide, rubber seating and rubber seat retainer	**HPMM/PMM**
24.	Lower valve only comprising rubber seat retainer, rubber seating and check valve guide.	**HPMM/PMM**
25.	Reducer cap	**HPMM**
26.	Cylinder body with brass liner	**HPMM** and year on C.I. body and serial number **PMM**
27.	Plunger rod	**HPMM**

Serial No.	Description	Type of Instruments
28.	Sealing ring	**HPMM (ink)/PMM**
29.	Rubber seating (for upper valve assembly)	**HPMM**
30.	Rubber seating (for lower valve assembly)	**HPMM**
31.	Plunger yoke body	**HPMM/PMM**
32.	Upper valve guide	**HPMM/PMM**
33.	Check valve guide	**HPMM/PMM**
34.	Spacer (gun metal)	**HPMM/PMM**
35.	Rubber seat retainer	**HPMM/PMM**
36.	Check valve seat	**HPMM/PMM**
37.	Follower	**HPMM/PMM**
38.	Pump Bucket	**HPMM(ink)/PMM**
39.	Riser Pipes in 3 m lengths with both ends threaded and one end fitted with solid machined socket.	**PMM with ISI marking**
40.	Socket (solid machined coupler)	**PMM**

II. India Mark III Handpump

Serial No.	Description	Type of Instruments
1.	Pump head with cover, bolt	**HPMM** on head flange & name plate.
2.	Cover	**HPMM**
3.	Cover bolt	**PMM**
4.	Additional Flange (Third Plate)	**HPMM**
5.	Handle bar welded to bearing housing housing holder, and roller chain guide	**HPMM**
6.	Bearing	**PMM**
7.	Handle axle	**HPMM** on milled portion
8.	Chain with coupling	**HPMM & PMM**
9.	Hexagonal bolt M 10x1.5x40	**PMM**
10.	Hexagonal Nyloc Nut M 10x1.5	**PMM**
11.	Spacer	–
12.	Washer (4 mm thick)	–
13.	Hexagonal Nuts M12	
14.	Water Tank Assembly	**HPMM** mark on flanges
15.	Stand Assembly	**HPMM** on the flange
16.	Stand Assembly (Telescopic)	**HPMM** on the flange
17.a.	Hexagonal bolt M12x40	**PMM**
17.b.	Hexagonal Nut	–
18.	Connecting rod	**HPMM** with month and batch number of manufacturer on hexagonal coupler
19.	Hexagonal couplers M12x50 long 19 A/F	**HPMM**
20.	Cylinder body with brass liner	**HMM and Year on C.I. Body and serial no / PMM**
21.	Upper Cap (Open Top)	**HPMM**

Serial No.	Description	Type of Instruments
22.	Bottom Cap (Machined Conical Surface)	**HPMM**
23.	Plunger Rod – 500 MM	**HPMM**
24.	Upper valve assembly complete with plunger yoke body, upper valve guide with rubber seating, spacer follower, nitrile rubber buckets.	**HPMM / PMM on Parts**
25.	Plunger yoke body	**HPMM/PMM**
26.	Upper Valve Guide	**HPMM/PMM**
27.	Rubber seating (U.V. Assembly)	**HPMM/PMM**
28.	Spacer	**HPMM**
29.	Follower	**HPMM/PMM**
30.	Pump Buckets	**HPMM/PMM**
31.	Lower valve assy complete with cage, check valve with rubber seating check valve seat with O-ring, push rod with nut	**HPMM/PMM**
32.	Cage	**HPMM/PMM**
33.	Check valve with rubber seat	**HPMM/PMM**
34.	Rubber seating (L.V. Assy)	**HPMM/PMM**
35.	Check valve seat	**HPMM/PMM**
36.	O-ring	**HPMM/PMM**
37.	Sealing rings	**HPMM/PMM**
38.	Riser pipes 65 mm NB in 3 Mts length with both ends threaded and one end fitted with solid machined and other end PVC protector	**HPMM/PMM**
39.	Socket (Solid machined coupler) for 65 mm NBpipe.	**PMM**

III. Extra Deepwell Handpump:

The following spare parts are additional requirements for this Pump.

1.	T-Bar	**HPMM**
2.	Counter Weight	**HPMM**
3.	M12 x 120 Bolt	**PMM**
4.	Nuts M12	**PMM**
5.	Washer for M12 Bolt	**PMM**

Note 1:-

HPMM : Handpump Manufacturer Marking
PMM : Primary Manufacturer Marking.

Note 2:-

i) The same marking procedure is adopted for Shallow well handpump, and Direct Action (TARA) handpump.

ii) For Direct Action (TARA) handpump, manufacturer's name shall be screen printed on all the uPVC pipes.

STAMPING PROCEDURES

A. For Spare Parts other than Welded Sub Assemblies and Connecting Rods:

a. The spare parts shall be offered duly packed in wooden cases or crates. Each case/crate shall have a packing slip containing details of the contents.

b. After inspection and acceptance the stamping shall be under:-

i) Ink impression on each wooden case/crate (preferably with white background)

(OR)

A name plate bearing name of manufacturer, case/crate number and date of inspection shall be affixed on the wooden case/crate. The name plate shall bear the steel stamps impression.

ii) Ink impression on packing slips of those cases/crates that have undergone detailed examination.

iii) The steel clamps used for strapping the cases/crates shall bear the steel stamps impression.

B. Welded Sub Assemblies

Welded assemblies shall be offered for inspection in unpacked condition. After inspection and acceptance these shall be stamped as under:

a. Handle Assembly.
Steel stamp impression on the flat surface where the square section meets the round section.

b. Head Assembly.
Steel stamp impression on the front bottom end plate.

c. Water tank assembly and stand assembly.
Ink impression of inspection stamp on inside of 150 mm N.B. pipe.

d. Cylinder Assembly
Steel stamp impression on flat raised surface of cylinder body.

e. Connecting rod.

i. The connecting rods shall be offered in bundles as in IS 9301-1990. Each bundle shall contain not more than 10 connecting rods unless the purchase order stipulates otherwise.

ii. Inspectors shall pick out at random the required number of bundles as considered necessary for a detailed examination of the contents.

iii. If the inspector is satisfied with the components of the bundles chosen, then the consignment shall be accepted.

iv. All the bundles will be strapped by sealing wire with a lead seal and the same will be punched with inspection agent's monogram. The bundle from which the actual inspection was carried out will be double sealed and the rest single sealed.

Note: i) The same stamping procedure is adopted for Shallow well handpump, India Mark - III (VLOM) handpump, India Mark - II Extra Deepwell handpump and Direct Action (TARA) handpump.

PACKING STANDARDS

PACKING STANDARDS FOR HANDPUMPS AND SPARE PARTS

General Packing procedures adopted for complete Hand Pump set in accordance with BIS Standard is as follows:

(1)	Pumphead fitted with cover, bolt, water chamber and handle assembly	Wrapped in open end polythene bag or waterproof material covered with straw ropes and hessian cloth.
(2)	Water tank assembly	-do-
(3)	Stand assembly	Wooden plank of flange and packed with polythene paper or waterproof materials covered with straw ropes and hessian cloth.
(4)	Cylinder assembly	Covered with polythene bag individually and six such cylinders packed in small wooden cases.
(5)	Connecting rod assembly	10 rods covered with polythene paper protecting thread end with PVC cap and hexagonal end with PVC plug. Such rods packed in gunny bundles.

Ensure that the pump and part reach consignee stores as per packing mentioned above. In case any difference is noted they will have to be immediately reported to the higher authorities for taking proper action. The incoming material receipts chart can be prepared by the store keeper for this purpose.

In the case of spare parts the following mode of packings are adapted as per BIS Standard, which may be verified at the consignee end.

DOMESTIC PACKING (For Mark II Handpump) (Refer IS : 12732/90 for details)

Sl. No.	Description	Individual Packing	Bulk Packing
1.	Pump head with cover and bolt	Wrapped in paper or open polythylene bag covered with straw ropes.	One
2.	Cover	Crates (32 maximum in one crate)	32 maximum in a wooden crate.
3.	Cover bolt	Polythylene bag	Wooden box
4.	Handle bar welded to bearing housing, housing holder and roller chain guide	hessian	One
5.	Bearings	Each bearing in original manufacturers carton	Wooden box
6.	Handle axle	Polythylene sleeve with thread protector	Wooden box
7.	Chain with coupling	Polythylene bag duly lubricated with graphite grease	Wooden box

Sl. No.	Description	Individual Packing	Bulk Packing
8.	Hexagonal bolt M10x1.5x40	Polythylene bag	Wooden box
9.	Hexagonal Nyloc Nut 10x1.5	Polythylene bag	Wooden box
10.	Spacer	Polythylene bag	Wooden box
11.	Washer (4 mm thick)	Polythylene bag	Wooden box
12.	Hexagonal Nuts M12	Polythylene bag	Wooden box
13.	Water Tank Assembly	Straw rope with Hessian cover	Four in wooden crate
14.	Stand Assembly	Wooden plank on flange and packed with straw rope with Hessian cover	One
15.	Stand Assembly (Telescopic)	-do-	One
16(a)	Hexagonal Nut	Attached to chain coupling for locking last connecting rod to chain assembly	
(b)	Hexagonal bolt M12x40	Polythylene bag	Wooden box
17.	Connecting rod	Polythylene with hessian cover with plastic thread protector and end plug for coupler	Ten maximum wrapped in hessian cloth
18.	Hexagonal coupler M12x50 long 19 A/F	Polythylene bag	Wooden box
19.	Cylinder Assembly (complete)	Polythylene bag	Maximum six in wooden box
20.	Upper valve assembly complete with plunger yoke body, upper valve guide rubber seating, pump buckets, spacer and follower.	Individually packed cardboard carton	Wooden box
21.	Upper valve only comprising, upper valve guide, and rubber seating.	Cardboard carton individually wrapped in paper or polythylene bag.	Wooden box
22.	Lower valve assembly complete with check valve seat, check valve guide, rubber seating and rubber seat Retainer	Cardboard carton	Wooden box
23.	Lower valve only comprising rubber seat retainer, rubber seating and check valve guide.	Cardboard individually wrapped in paper	Wooden box
24.	Reducer cap	Individually in polythylene bag	Wooden box
25.	Cylinder body with brass liner	Individually in Polythylene bag with thread protector	Wooden box
26.	Plunger rod	Polythylene bag with thread protectors	Wooden box
27.	Sealing Ring	Plastic or cardboard container	Wooden box
28.	Rubber seating (for upper valve assembly)	Polythylene bag	Wooden box

Sl. No.	Description	Individual Packing	Bulk Packing
29.	Rubber seating (for lower valve assembly)	Polythylene bag	Wooden box
30.	Plunger yoke body	Cardboard carton individually wrapped in paper	Wooden box
31.	Upper valve guide	Cardboard carton individually wrapped in paper with plastic/rubber thread protector	Wooden box
32.	Check valve guide	Cardboard carton individually wrapped in paper with plastic/rubber thread protector	Wooden box
33.	Spacer (gun metal)	Cardboard carton individually wrapped in paper	Wooden box
34.	Rubber seat retainer	Cardboard carton individually wrapped in paper	Wooden box
35.	Check valve seat	Cardboard carton individually wrapped in paper	Wooden box
36.	Follower	Cardboard carton individually wrapped in paper with thread protector (plastic/rubber)	Wooden box
37.	Pump bucket	Polythylene/cardboard container	Wooden box
38.	Riser Pipes in 3 m lengths both ends threaded and one end fitted with solid machined socket and other end with PVC thread protector.	As per IS:4740-1979 Code of practice for packing of steel tubes.	Maximum 10 in one bundle
39.	Socket (solid machined couplers)	Polythylene conver (10 in one)	Wooden box

Note: i) The same procedure is adopted for Shallow well handpump, India Mark III (VLOM) handpump, India Mark II Extra Deepwell handpump.

ii) For Direct Action (TARA) handpump

a) All plastic components including uPVC pipes should be packed in wooden crates to avoid any damage during transit/transhipment. One crate should be used for components/pipes of one pump set.

b) All the threaded portions should be properly protected with plastic thread protectors.

c) Pump body and handle are to be packed in hessain cloth.

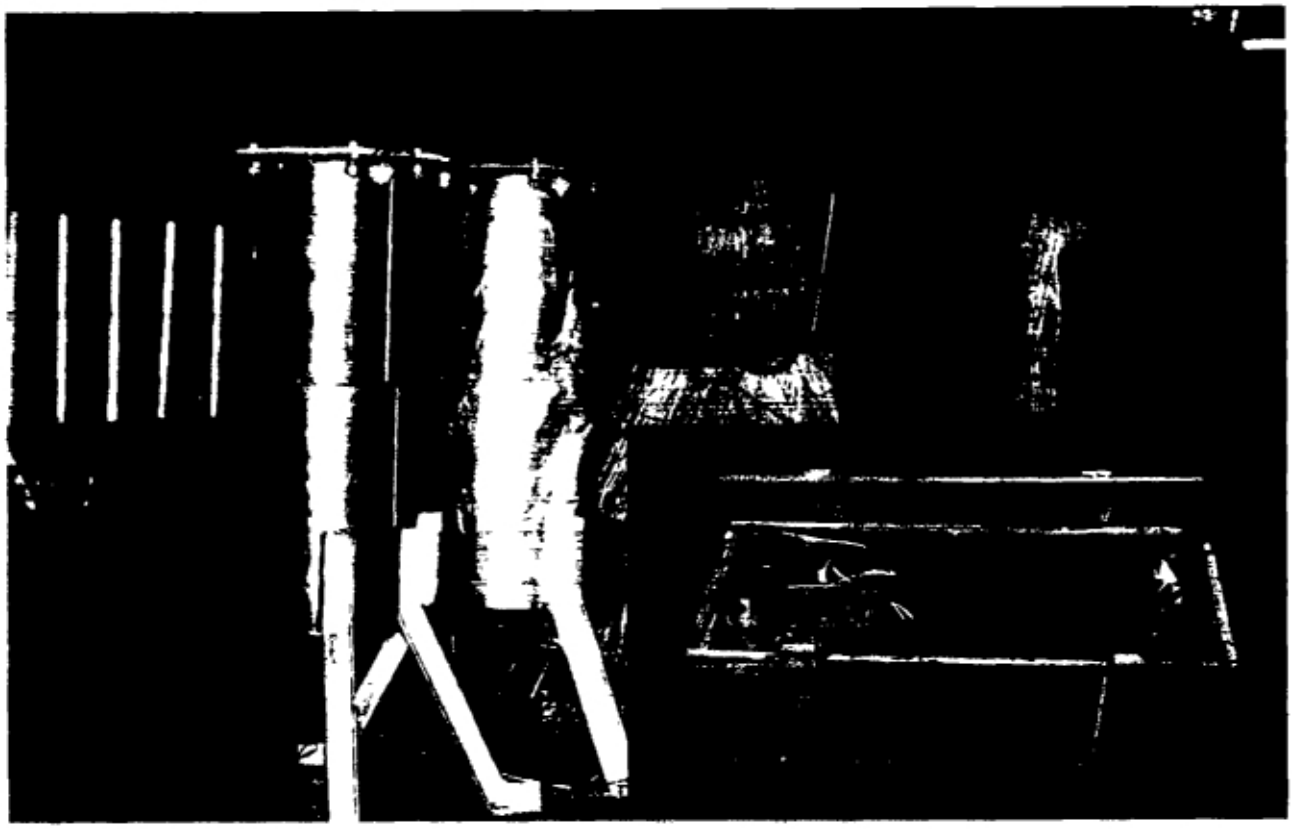
EXPORT PACKING (For Mark II Handpump)

a. Full container load: (20 ft long)

Sl. No.	Description	Net Wt. (approximate) kg.	Gross Wt. (approximate) kg.
i)	175 complete pumps with 10 connecting rods per pump but exclusive of riser pipes	14,875	16,000
	OR		
ii)	60 complete pumps with 10 connecting rods and 10 riser pipes per pump	17,600	18,000

b. Break-bulk (Sea-worthy packing)

Sl. No.	Description	Volume (Approximate) cu. mtr.	Net Wt. (Approximate) kg.	Gross Wt. (Approximate) kg.
i)	One head assembly one water tank assembly one stand assembly, and one cylinder assembly in one wooden case	0.60	60	122
ii)	a) 5 head assemblies and 5 cylinder assemblies in one wooden case and b) 5 water tank assemblies and 5 stand assemblies in one wooden case	2.05	285	530
iii)	10 connecting rods in one bundle	0.05	28	30
iv)	2 rising main of 3m length in one bundle	0.04	42	43



CONSIGNEE END INSPECTION

CONSIGNEE END INSPECTION PROCEDURE

OBJECTIVE:

(a) To ensure that only inspected and accepted goods are received at the consignee stores.

(b) To ensure that correct materials are received as per order.

(c) To collect full data regarding discrepancies, damages etc, and give feedback to the head office.

The consignee end inspection procedures adopted by the Junior Engineer/Stores Officer can be detailed as follows:

A) GENERAL:-

1) Check whether all materials are received in packed condition as per standards specified.
2) Check whether proper packing materials are used.
3) Check whether copy of 'Offer slip' presented to the inspection agency by pump manufacturer is received at stores for verification of materials.
4) Check whether copy of inspection certificate is received at your stores.
5) Check for Inspection stamps on pump head, water chamber, stand, handle, cylinder and connecting rod bundles as per certificate of inspection agency.
6) Check whether packing slip of manufacturer and quantity of goods received in stores are in order.

B) FABRICATED PARTS:

Head assembly, handle assembly, water chamber, stand assembly.

1) Check whether flanges are proper without any bend.
2) Check the welding of flanges
3) Check that the handle bar is without defects (twist or bend).
4) Check for any rusting or corrosion.
5) Check for bearing marks and condition freely moving, (without any rust and properly greased)
6) Check for graphite grease on chain assembly.
7) Check for water chamber coupler welding (crack/broken etc.) and proper greasing on the threaded portion.
8) Check for any damages to spout pipe (bend or cut)
9) Check for stand pipe damages (cut/bend/dent)
10) Check for stand leg damages (bend/cut, etc.)
11) Check for welding of legs (cracks)
12) Check for proper galvanising and good surface finish.
13) Check whether correct quantity of bolts and nuts required for installation are fitted on the pump or packed separately.
14) Check for manufacturers identification mark on pump flanges.
15) Magnetic check for Handle axle and plunger rod.

C) CYLINDER PARTS:

1) Check for proper painting and visual appearance of cylinder.
2) Check for availability of all cylinder parts.
3) Check for any broken packing cases and damage caused to cylinder assembly inside.
4) Check for cylinder body and cap surface defects, (casting defects, cracks and thread damage)
5) Check for serial number of cylinder and manufacturer's logo, month and date of manufacture.
6) Check for proper fitment of brass liner into the cylinder body (Brass liner should not be loose in fitment).

D) CONNECTING ROD:

1) Check whether connecting rods are bundled in proper gunny bags and polythylene sheets.
2) Check for thread protection on either side of the rod.
3) Check for connecting rod identification mark, month, batch number, etc. punched on coupler.
4) Check whether all connecting rods received are electroplated properly and visual appearance is good.

E) G.I. RISER PIPES AND COUPLERS:

1) Check whether the pipes are of medium grade. (thickness of pipe within tolerance as per IS 1239)
2) Check for proper pipe threading as per IS : 554
3) Check for proper galvanising thickness as per IS : 4736
4) Check for solid machined couplers as per IS 9301 and its threading as per IS 554 and galvanising thickness as per IS 4759.
5) Check for length of pipe as per specification having one end fitted with solid coupler and other end with thread protector.

NOTE

It is advisable to have a report made on the discrepancies noticed after the verification of goods that arrived at your stores. This report can be forwarded to the pump manufacturer/inspection agency through your head office for necessary action.

THERE IS ALWAYS TIME TO DO THINGS WHICH YOU REALLY WANT TO DO LEADING TO BETTER QUALITY

EQUIPMENT AND ACCESSORIES FOR INSPECTION AT CONSIGNEE END

As and when the need arises to cross check the goods received at the consignee's stores from the manufacturer, it is necessary to have the minimum inspection tools and gauges available. This will help the consignee stores officer to verify the condition of the goods and the nature of defects, if any

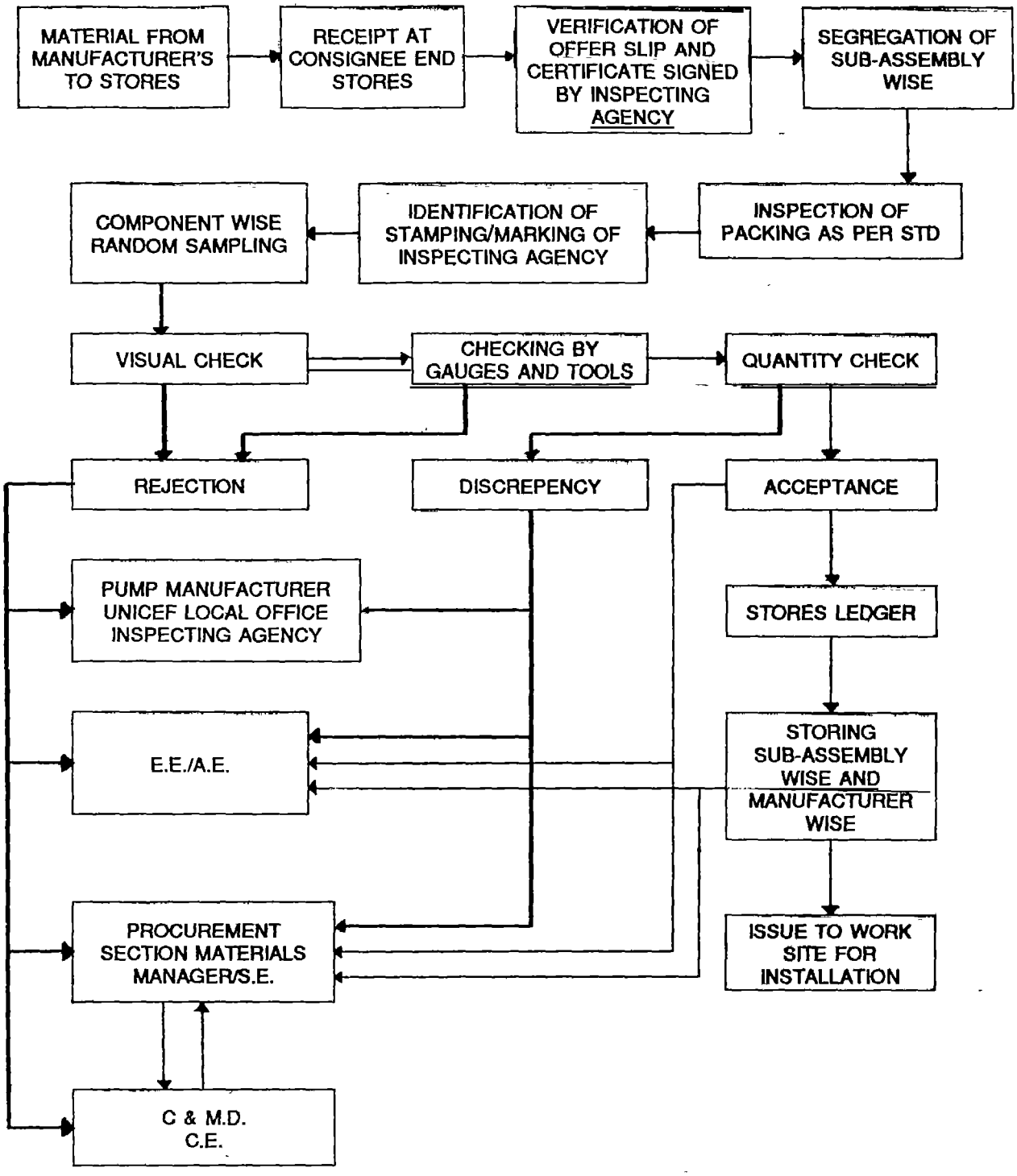
A list of recommended inspection tools is given below:

(1) Measuring tape 3 m and Steel ruler 12"	–	for measuring length, height etc.
(2) Vernier calipers 12"	–	for measurement of thickness, width, length etc.
(3) $1^1/_4$" Thread plug gauge	–	to check water chamber coupler and reducer cap threads
(4) M12 x 1.75 thread ring gauge	–	to check threads on connecting rod
(5) Spirit level	–	for checking the level surfaces of flanges etc.
(6) Elcometer-Microtest	–	for checking coating thickness on connecting rod and pump body
(7) Magnet	–	to identify stainless steel components

Besides checking with tools & gauges, it is also important to have a thorough visual check, which is stated elaborately in the subject 'CONSIGNEE END INSPECTION PROCEDURES'. It is also essential to ensure that the measuring equipments are handled carefully by trained persons and readings properly noted. Care should be taken to ensure that the instruments are calibrated periodically and stored properly after use. Detailed feedback on discrepancies and defects noticed at consignee end will help in taking timely corrective action and improving quality of pumps.

QUALITY IS EVERYBODY'S BUSINESS

METHODOLOGY FOR CONSIGNEE END INSPECTION AND FEED BACK EVALUATION SYSTEM



STORAGE METHODS

STORAGE METHODS FOR HANDPUMPS AT CONSIGNEE STORES

Functions and Responsibilities of Stores:

1. Receive all incoming materials and see that the quantities are correct in accordance with challan invoice.
2. See that the daily goods receipt register is properly maintained.
3. Arrange for inspection and verification of material received whenever necessary.
4. Ensure that inward notes are raised and distributed without delay.
5. See that materials are properly stored against deterioration, theft etc. and they are readily available for issue.
6. Issue materials against authorised requisition to other departments or whenever necessary.
7. Maintain accurate record (bin card) of materials received, issued and in storage and see that the postings are updated.
8. Ensure that all documents relating to receipts and issues are sent to stock control, acounts, and other departments without any delay.
9. Carry out stock verification in accordance with the procedures laid down by the department to find out any shortage.

After receipt of materials at your consignee stores care should be taken to store the pump and its parts properly before installation or replacement of parts. The following points should be noted while storing materials:

1) Care should be taken while unloading the material from the truck in your stores. Sufficient manpower should be used to avoid breakage due to mishandling or falling goods.
2) Proper stacking of materials by component and by manufacturers for easy identification.
3) Proper storing of material for easy removal.Materials must not be kept in the open exposed to rain and flood water.
4) Proper racks or storage bins should be available for keeping materials.
5) Separate area should be earmarked and for keeping rejected goods.
6) Maintaining proper bin cards for easy verification and quantity of goods available.

Enough care has to be taken for keeping material separately by manufacturer. This will help in easy identification in case any problem arises at a later date. Care should be taken while issuing goods for installation. The components like pump head, cylinder, and connecting rod of one manufacturer should be issued for erection, rather than mixing up with an other manufacturer's material. This will help in reviewing the performance of the pump manufactured and supplied by individual manufacturers for future verification.

Proper bin card and storage rack of individual items are essential for easy identification of material. The bin card and storage rack can be made as per details/sketches given along with the format. These will help easy withdrawal of goods without damage.

Another important point to be observed is to keep the broken material and other defective material separately on the area earmarked for rejected goods.

As an executing authority of handpump installation and maintenance and as an important link between the pump manufacturers and villagers. Right care taken in issuing good material will go a long way to ensure trouble free working of each hand pump in the remote corners of villages.

Layout of Racks:

A uniform rule cannot be applied to the layout of racks and bins. It will vary from store to store and should take into account the following.

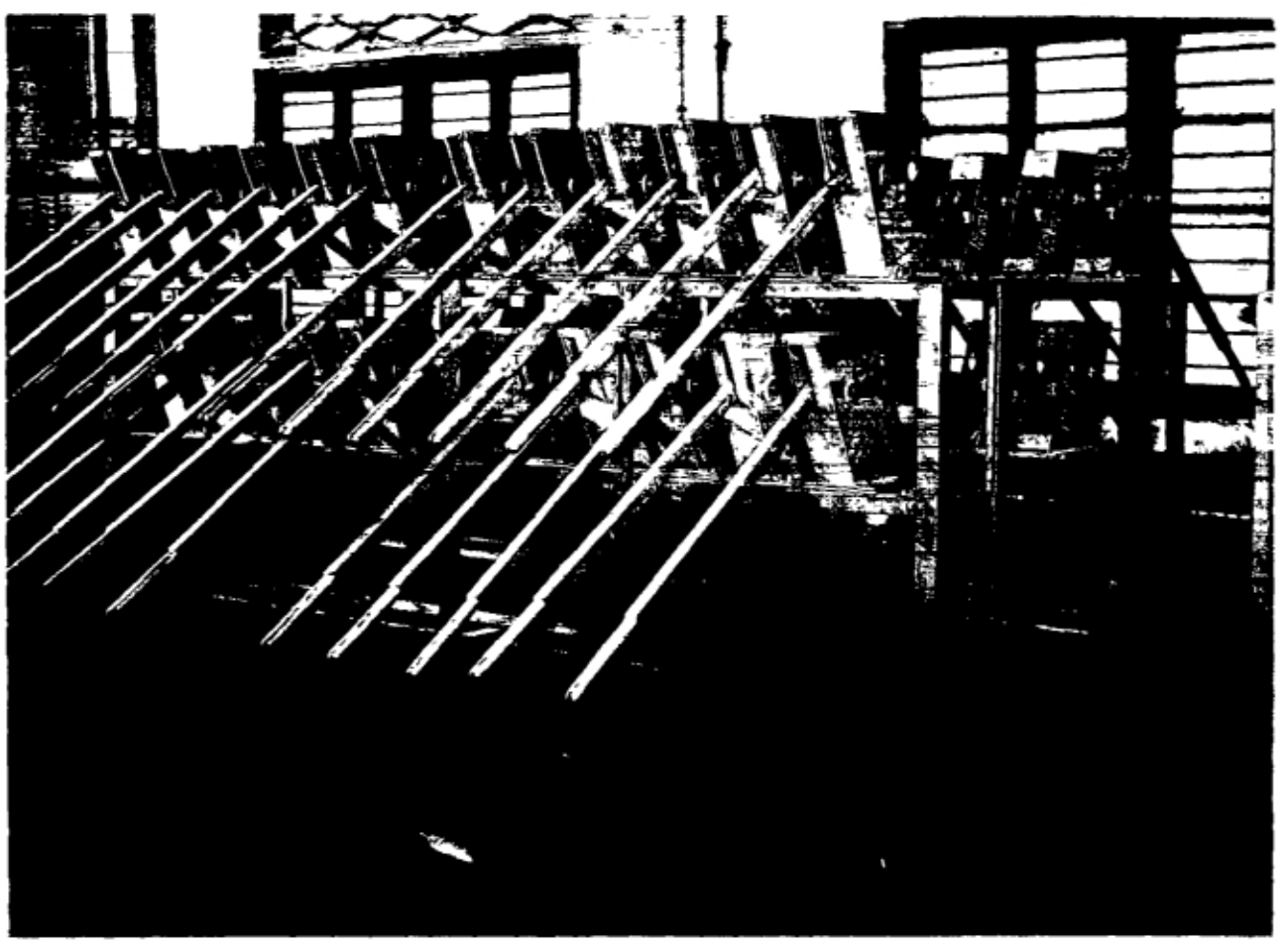
a) The size and shape of the stores and position of the main entrance door.

b) The kind of materials to be stored.

c) The type of bins and racks proposed to be used.
d) The type of material handling equipment to be used.
e) Convenience for taking material in and out of the bins.
f) Maximum utilisation of floor and overhead spaces.

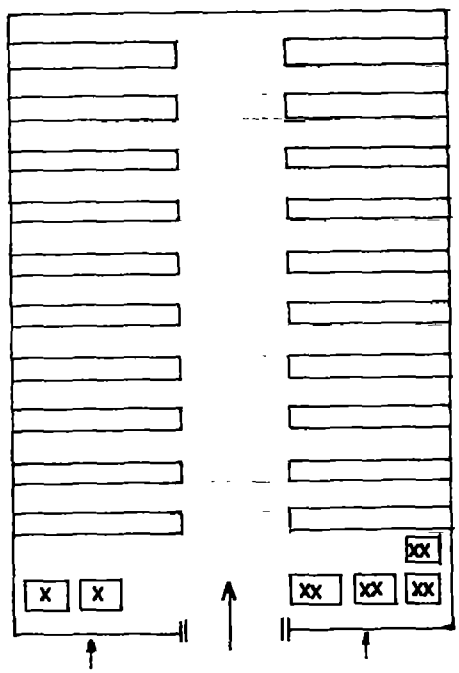
Note:

1. For storing of hand pump and subassemblies and spare parts, any one of the general layouts shown in the enclosed sketch can be used depending upon area available in your stores.
2. For storage of above materials any size of the racks, bins and pallet boxes (for cylinders etc.), shown in the enclosed sketch may be used depending upon space available in your stores.
3. For material handling any type of equipment may be used in your stores as per enclosed sketch.
4. Copies of various kind of formats to be used for verification are enclosed for your reference, which will be very useful for managing the stores effectively.



LAYOUT OF RACKS

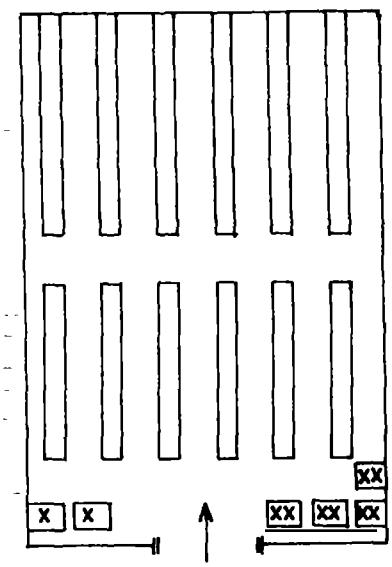
TYPE-A



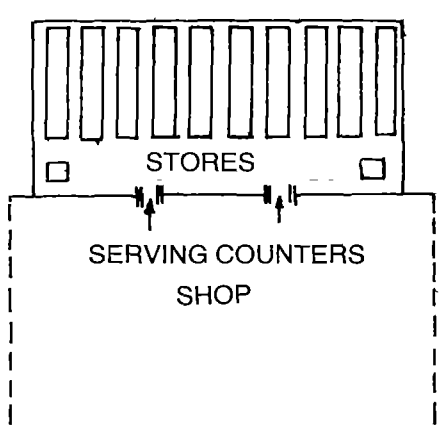
SEATS OF
STORES STAFF

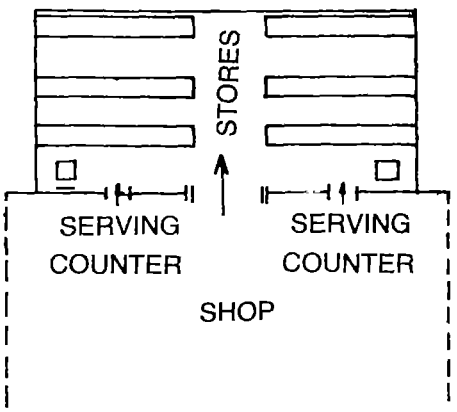
TROLLEYS OR TABLES
FOR KEEPING MATERIALS
FROM RECEIVING SECTION
BEFORE BINNING

TYPE-B

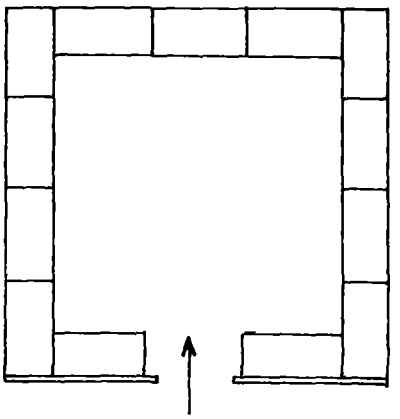


TYPE-C

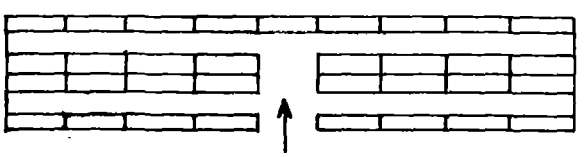




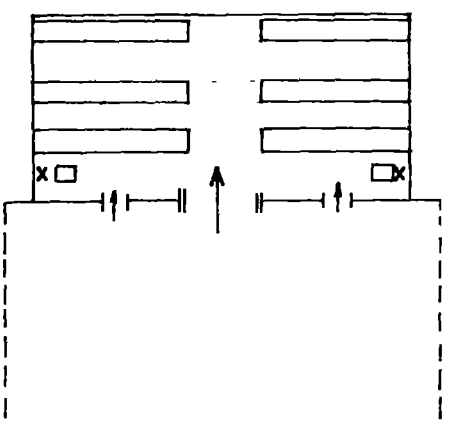
TYPE-D



TYPE-E



TYPE-F



TYPE G

STORAGE EQUIPMENT

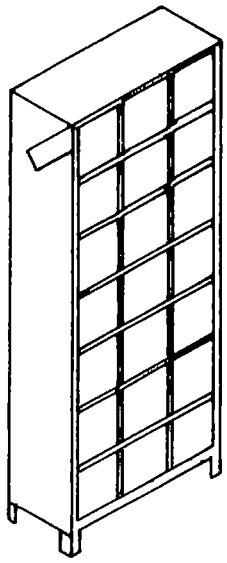


FIG - A
BIN

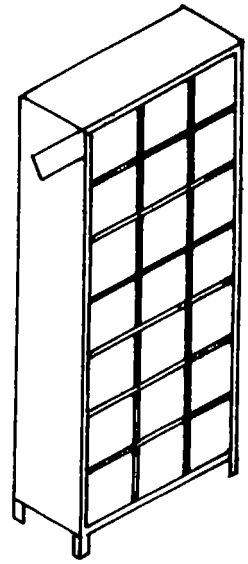


FIG - B
BIN

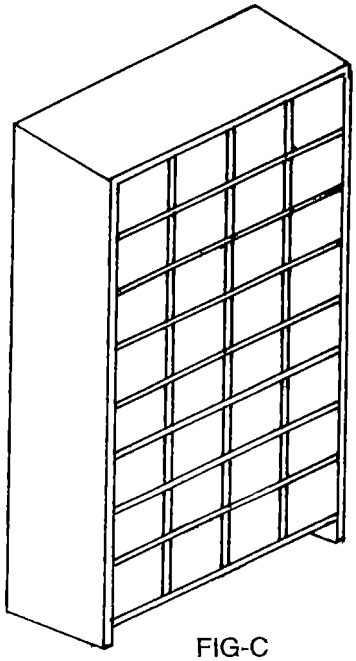


FIG-C
BIN

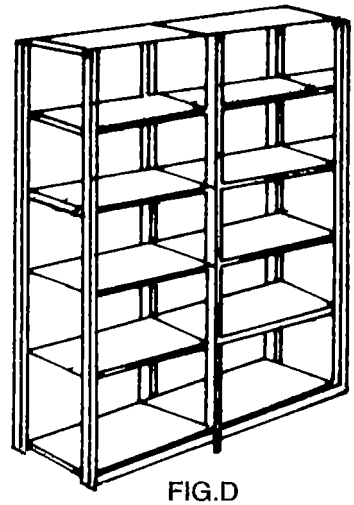


FIG.D
OPEN TYPE RACKS
FOR GENERAL USE

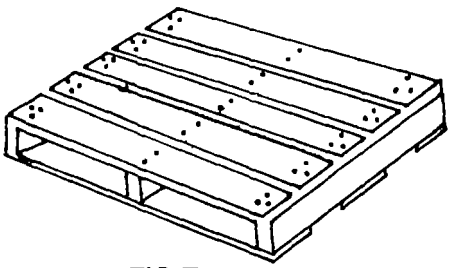


FIG.E
FLAT PALLET

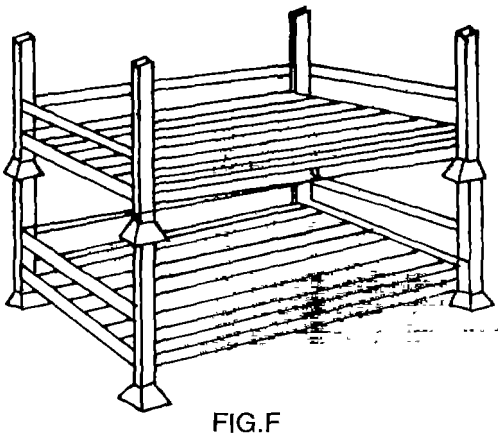


FIG.F
POST PALLET

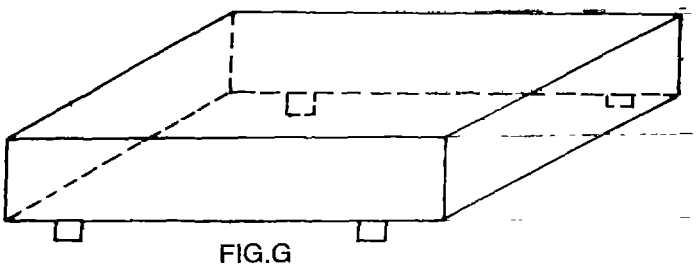


FIG.G
TRAY PALLET

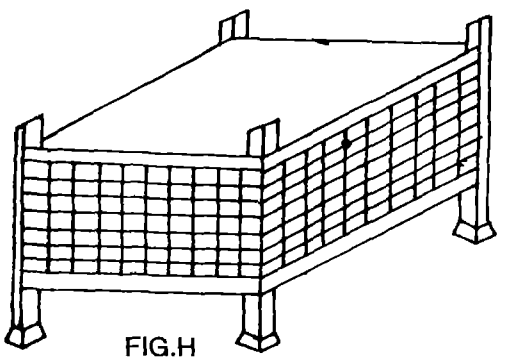


FIG.H
BOX PALLET

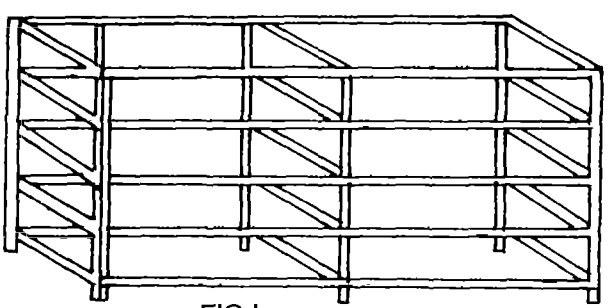


FIG.I
PALLET RACK

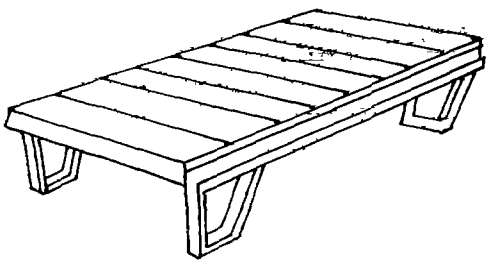


FIG.J
SKID PLAT FORM

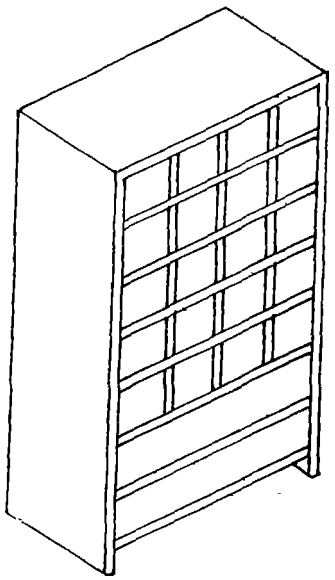


FIG.K
BIN FOR GENERAL STORES

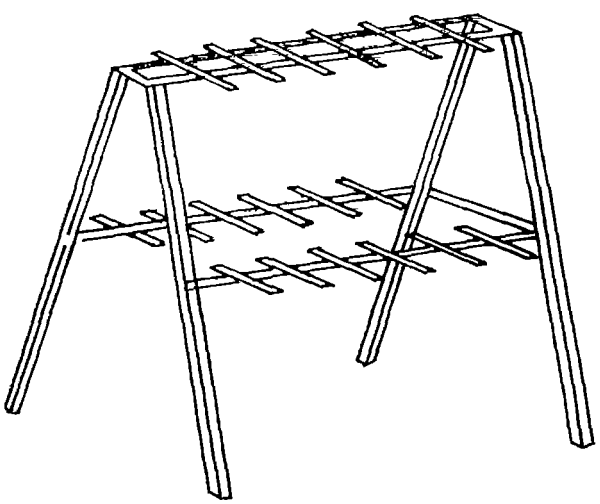


FIG.L
LEAN ON RACK FOR BARS AND TUBES

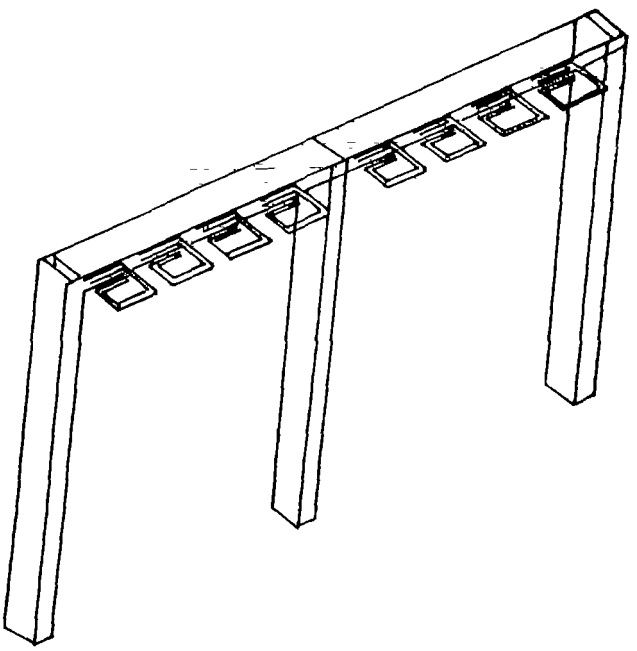


FIG.M
RACK FOR VERTICAL STORAGE
OF BARS AND TUBES

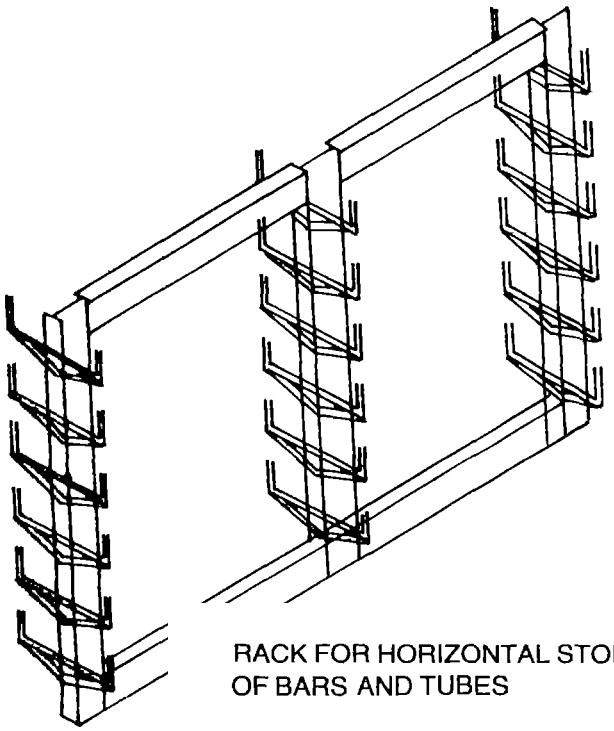


FIG.0

RACK FOR HORIZONTAL STORAGE OF BARS AND TUBES

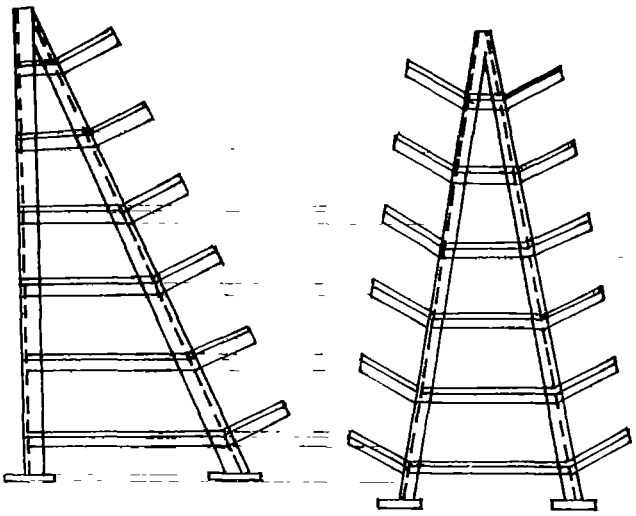


FIG. P

END-VIEW OF SINGLE FACED HORN TYPE RACK FOR HORIZONTAL STORAGE OF BARS AND TUBES

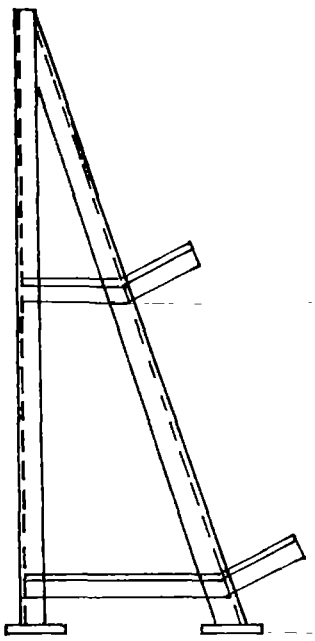


FIG.Q

END VIEW OF SINGLE FACED RACK FOR STORAGE OF SHEETS IN SLANTING POSITION

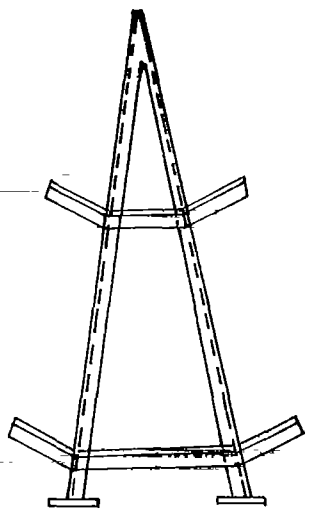


FIG-R

END VIEW OF DOUBLE FACED RACK FOR STORAGE OF SHEETS IN SLANTING POSITION

MATERIAL HANDLING EQUIPMENTS

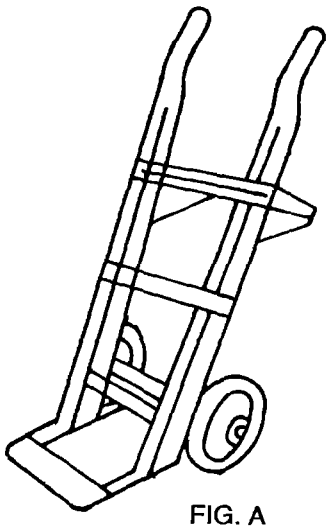


FIG. A
TWO WHEEL HAND TRUCK OR SACK TRUCK

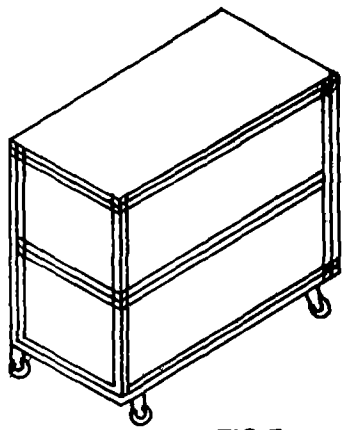


FIG.B
SHELF TROLLEY

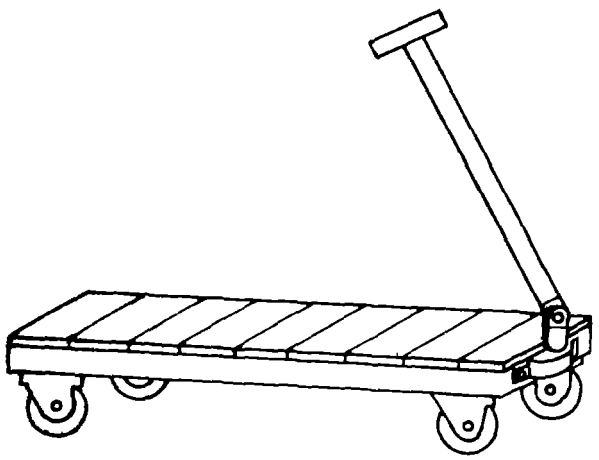


FIG. C
THREE OR FOUR WHEEL HAND TROLLEY

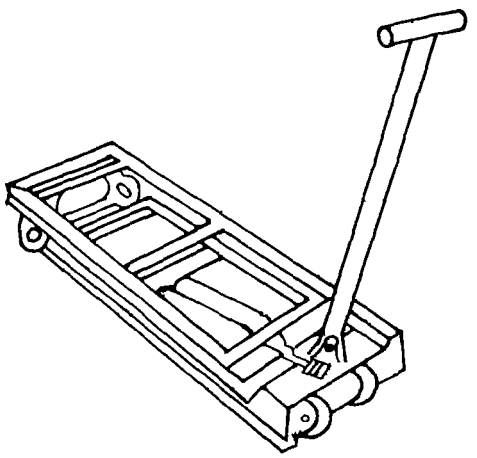
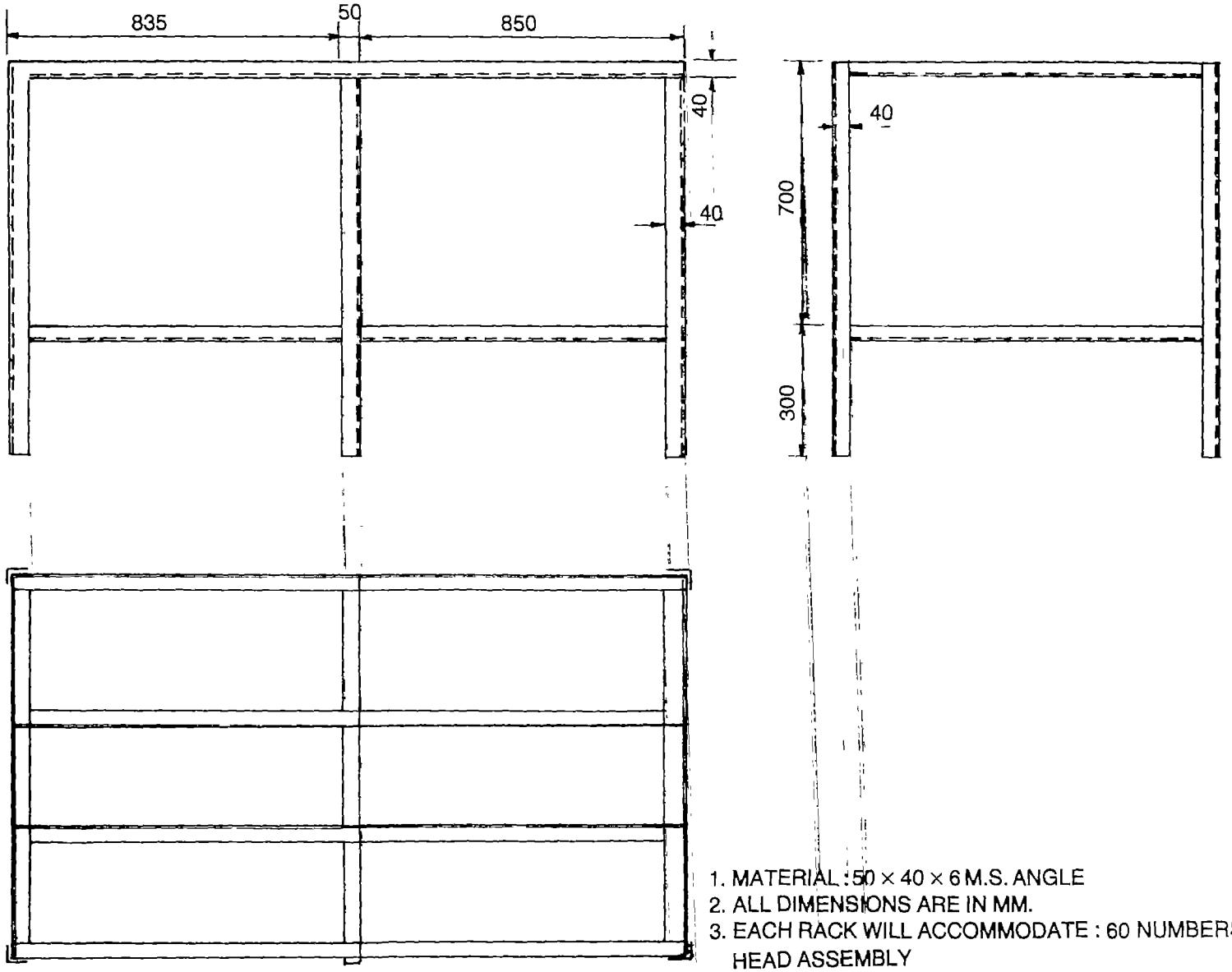


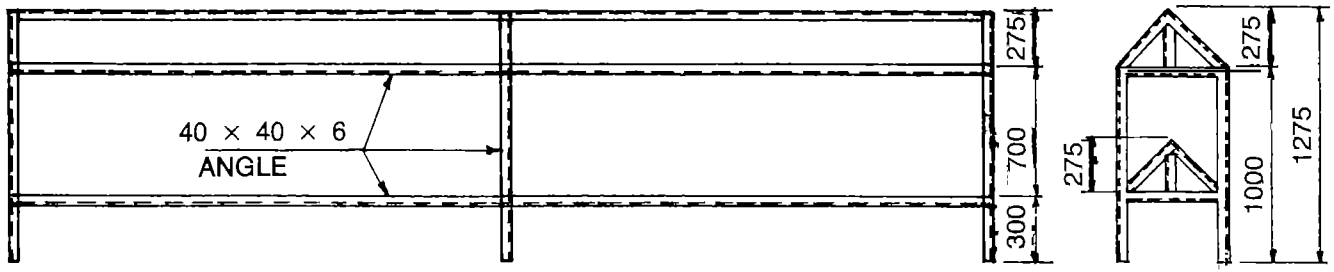
FIG.D
LIFT TRUCK

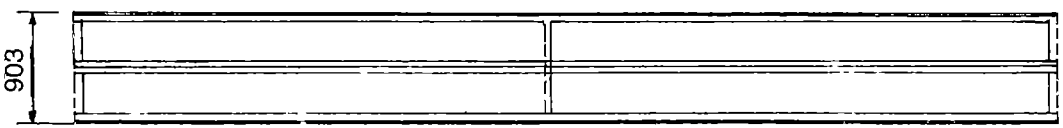
RACK FOR HEAD ASSEMBLY



1. MATERIAL : 50 × 40 × 6 M.S. ANGLE
2. ALL DIMENSIONS ARE IN MM.
3. EACH RACK WILL ACCOMMODATE : 60 NUMBERS HEAD ASSEMBLY

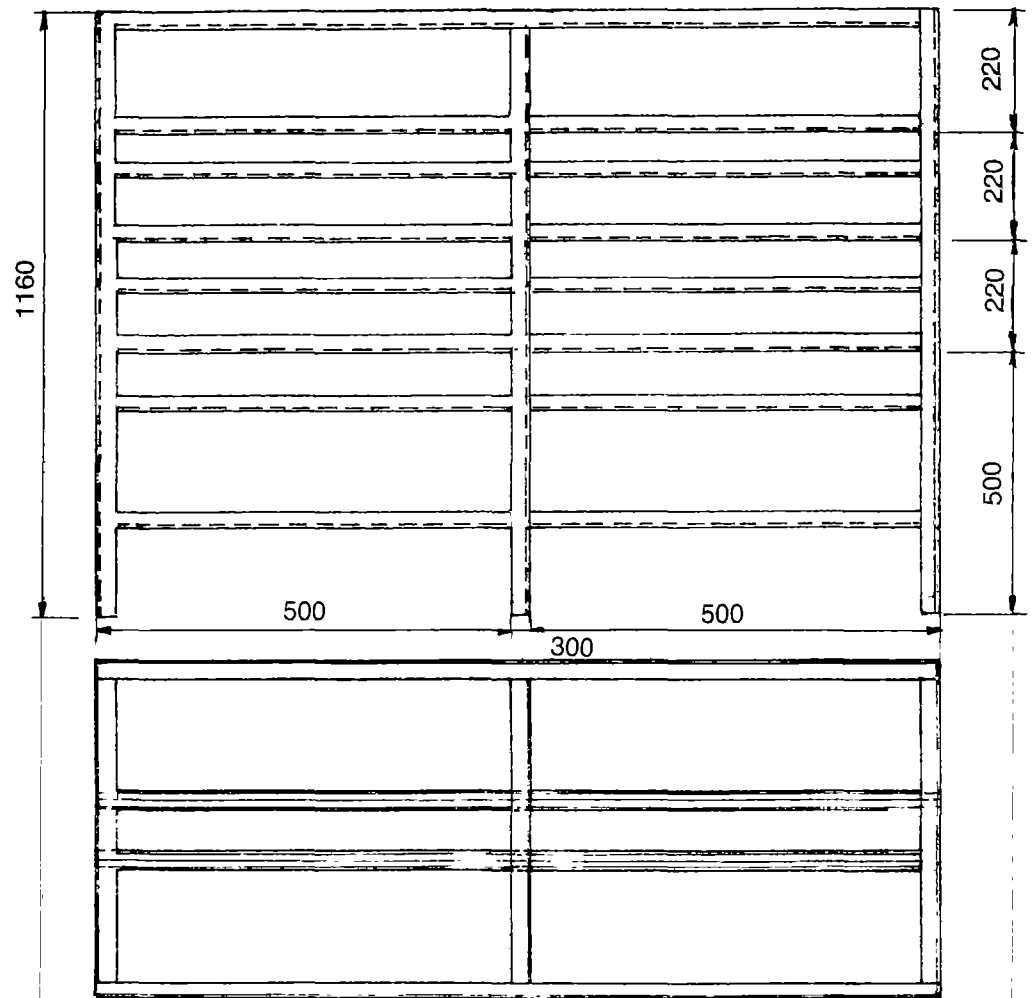
RACK FOR WATER TANK ASSEMBLY

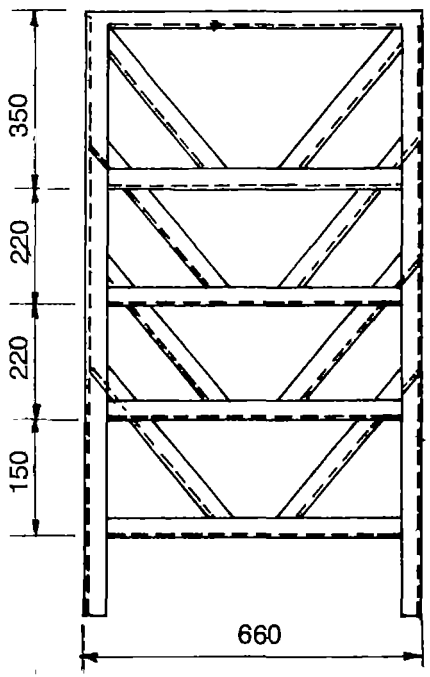




1. MATERIAL : M.S ANGLE
2. ALL DIMENSIONS ARE IN MM
3. EACH RACK WILL ACCOMMODATE : 200 NUMBERS WATER TANK ASSEMBLY

RACK FOR CYLINDER ASSEMBLY





1. MATERIAL : 30 × 30 × 5 M.S. ANGLE
2. ALL DIMENSIONS ARE IN MM.
3. EACH RACK WILL ACCOMMODATE : 280 NUMBERS CYLINDER ASSEMBLY

Supplier's Name	Challan No.	Date of Challan	No. of Items	Description of Material	Purchase Order No. & Date	GRN No.

FORM 2. DISCREPANCY REPORT

To

Ref. PS/

Date

Dear Sirs,

We have to report the following discrepancy in regard to materials supplied under your Challan No.....
dated..... against our order No..... dated.....

Code No.	Description	Qty. shown on challan	Qty.Recd.	Remarks

Would you kindly look into the matter and let us have your remarks by return. In the meantime please note that payment will be made only on the basis of the materials received/accepted by us.

Yours

No. .....
Date.....

FORM 3. REJECTION NOTE

SUPPLIERS Address	Challan..... Date.....	Order No.	G.I.N.No.

Class	Code No.	Description	Qty. Supplied	Qty. Rejected	Defect

Authorised by	Inspector	Posted on Bin Card	Posted on S.C. Card	Accounts

Copy to

(1) Advance copy
(2) Purchase
(3) Stock Control
(4) Inspection Dept.
(5) Accounts
(6) Supplier to sign and return
(7) Supplier to retain
(8) Gate Pass

FORM 4. MATERIAL RECEIPT ADVICE

Date .....

To

.....

Please note that the undermentioned materials have arrived against your Purchase Requisition No..... dated.....

Code No.	Description	Quantity

FORM 5. IDENTIFICATION TAG

Class ..... Stock No .....

Description .....

..... Qty .....

G.I.N ..... Date of receipt .....

Supplier .....

Challan No ..... Date .....

FORM 6. BIN CARD

Class & Code .....

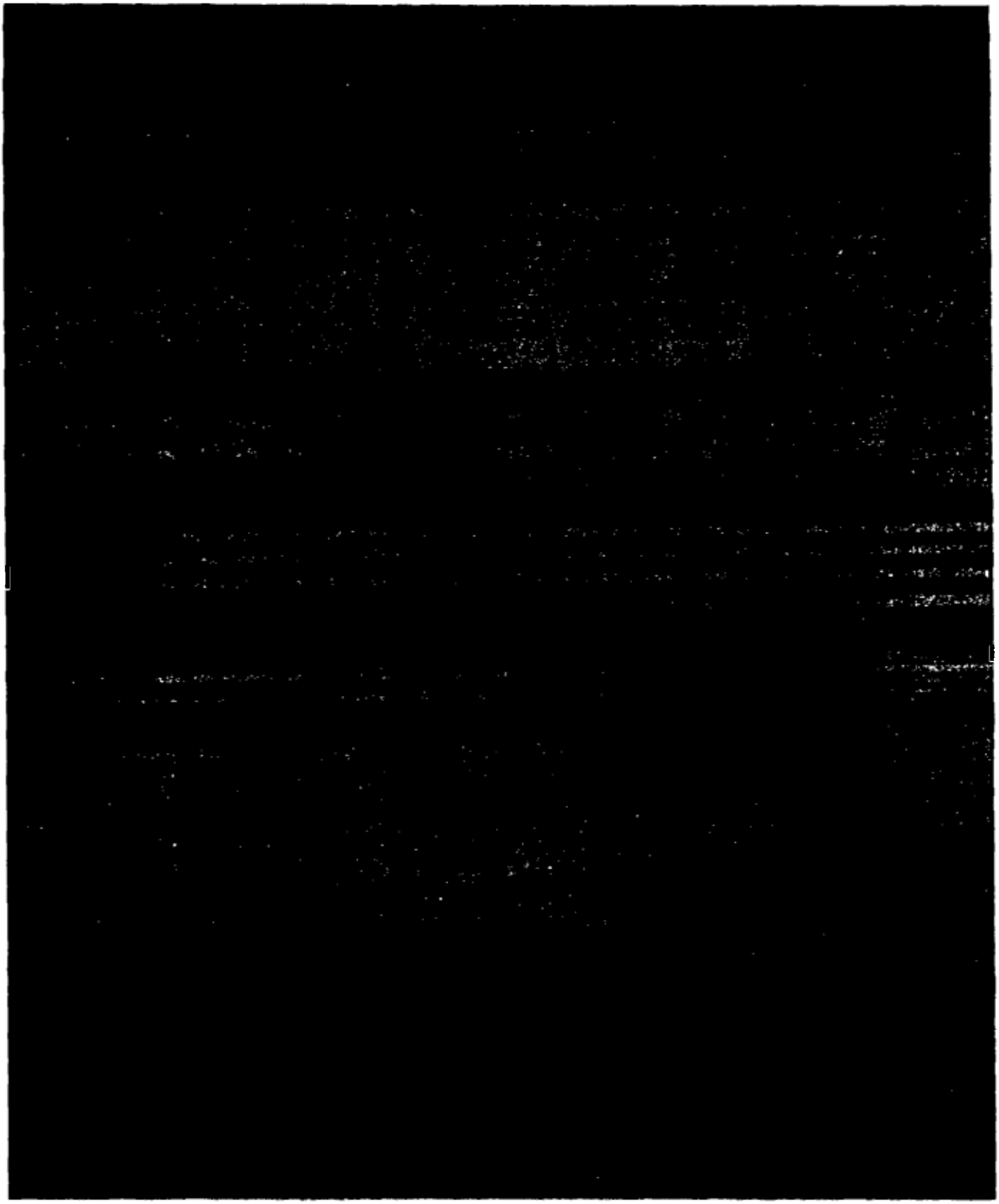
Description .....

Card No. .....

Qty per Invc. .....

Location .....

Date	Document No.	W.O.No.	Qty. received	Qty. Issued	Balance	Loan



COMMON DEFECTS

COMMON DEFECTS IN HANDPUMPS

(A) Primary Defects:

Defects occured on raw material procurement.

These defects are noticed during the procurement of materials by the pump manufacturer's such as non-conformance to the specification laid down by BIS. Example: Procurement of connecting rods, gun metal components, pipes, stainless steel rods, castings, etc. which do not conform to the exact requirement as per specification.The defects are also noticed due to the procurement of second quality materials (materials already rejected by the main suppliers) by the pump manufacturer such as materials with cracks and other surface defects. Example: 32 mm square bar and cylinder castings. If these primary defects are not checked this will lead to more complications at the final production stage.

(B) Manufacturing Defects:

These defects are commonly noticed at the production stage in the pump manufacturer's workshop. The defects can be further classified as under:

1. Defects due to wear out of jigs and fixtures:

   A minimum life period is given for the jigs and fixtures which are used for production of hand pumps and sub-assemblies. While every care should be taken to check the manufacturing wear and tear of the fixtures, the pump manufacturers normally do not carry out an end line check on them which will result in various defects over a period of time.
2. Defects due to use of sub-standard consumables: e.g., welding rods. This will result in producing a defective sub-assembly.
3. Defects due to human handling errors such as under cut in welding, excessive grinding, improper machining and threading, under filling, etc.

These errors are quite common and defects could occur on the end product if proper checks are not carried out at regular intervals.

(C) Defects during Transit of Materials:

The defects commonly observed while transporting materials are:

1) Improper packing:- Often packing is found not conforming to standard on receipt at stores.
2) Defects on pump sub-assemblies. Examples are bent flanges, broken couplers, and flanges welding etc.
3) Wooden cases in broken conditions - For cylinders, quite often cases are found broken due to low thickness of wooden planks.
4) Any other defects unnoticed before despatch of goods can happen.
5) Sabotage/change of parts (good to bad).

(D) Defects due to improper storage:

The defects which are noticed due to improper storage of materials are as follows:

Non-availability of required space and racks for keeping the materials in a proper condition till issued to work site - Often this is noticed in many of the stores due to problems faced by the department from time to time, thereby materials stored in an improper way, get rust or are corroded and are badly damaged due to stacking one over another which will lead to a permanent defects when fitted in the inspection site.

Connecting rods, water chambers which are glavanised can be corroded by keeping in the open for extended periods of time.

(E) Defects due to improper installation:

1) Weak flow or no flow.
2) Delayed flow (you have to pump many times before water comes).

3) Reduced discharge.
4) Handle shaky.
5) Pumping difficult.
6) Hand pump loose in its foundation.

The possible causes for these defects are given below:

(i) Water level going below the cylinder:-

The water level can go below the cylinder due to serious drought conditions. Before deciding the depth at which the cylinder is to be placed, the static water level, the yield of the well, etc. are taken into consideration. This reason is not very common unless the static water level in the entire area has gone too deep. Measure the static water level as well as bore depth. Add extra length pipes required to place the cylinder inside the water so the cylinder is at least 6 m (20 ft.) from the bottom of the bore well.

(ii) Rod disconnected:

The main operating link between the handle and the plunger mechanism is the connecting rod. Disconnection of this rod will therefore not provide any movement to the plunger assembly inside the cylinder. You know the result of this (i.e.) no water. It is advisable to remove all the rods along with the pipes and cylinder for carrying out a detailed examination. Examine the threading in the connecting rod as well as inside the coupler in all the rods. If the rod is broken or the thread is worn out, arrange for replacement.

(iii) Rising main disengaged:

The rising main or riser is the water main, bringing the water up from the bore well. The operation of the handle results in movement of the plunger up and down thereby displacing the water upwards in the rising main which ends in the water tank. Water then comes through the spout. If the rising main is disengaged, it will become very heavy, as you have to lift the pipes also while working the handle. The dismantling operation has to be done with utmost care and with proper tools otherwise the broken pipes may drop inside the well, and could result in the abandoning of the bore well. Remove all the pipes. Examine the threads and replace the pipe or coupler which is broken or where the threading is damaged.

(iv) Cup seal completely worn out

Improper erection, sand particles in the water, poor quality of water, ovalty in the cylinder bore etc. could be the reasons.

(v) Check valve not opening at all

In the design of the valve used in Mark II pumps, the chances are very rare. This could happen due to bad workmanship and improper dimensions of the guide and the bore of the seat. You can only change with a new assembly.

(vi) Upper valve rubber seating worn out

Replace the rubber seating if the other components are in a fit condition or the entire assembly.

(vii) Pump cylinder cracked

Replace the cylinder body or the entire assembly. Examine the reasons for the breakage which could be because of the cylinder rubbing the bore when the pump is in operation, due to improper erection.

If the flow of water is low, delayed, or intermittent, these are the possible defects: (and possible remedies)

a. Leaky or partially worn out cup seals - overhaul the entire cylinder assembly.

b. Improper seating of rubber seats leading to inadequate sealing. This leads to leakage in the upper valve or check valve or both.
– overhaul the entire cylinder assembly

c. Leakage in pipe joints
– replace defective riser pipe.

d. Inadequate yield of bore well
– Measure the depth of the bore. If the cylinder can be taken down still further, the pump may be operable for more time because of greater storage.

e. Complete stroke of the pump not possible due to folding of the chain.

– The folding of the chain happens due to improper erection. During erection, the connecting rod is marked to the top of the flange, then cut and threaded. If the rod is cut too low then the plunger will hit the top and a full downward motion will not be possible, and the handle will not touch the bottom stopper.

However if the rod is cut at a level higher than the flange, the plunger will hit the bottom of the cylinder and the handle bar will not touch the stopper. The leather cup seal could also get jammed resulting in the folding of the chain. In this case the cylinder will have to be overhauled.

f. Sometimes there is excessive noise and vibration when the pump is operating.

This could be due to the following reasons -

1. Connecting rods rubbing the inside of riser pipe

   – replace the connecting rod.

2. Hexagonal coupler of the connecting rod may be rubbing the inside of the pipe due to the coupler welded offset.

   – replace the connecting rod

3. Stand assembly flange bent and not levelled properly. This results in the head assembly not being level, Consequently the connecting rod will be rubbing the guide bush.

   – level the flange

4. Loose bolts and nuts connecting the mounting flanges

   – tighten all bolts and nuts

5. Handle alone may shake side-ways due to loose axle nuts or worn out bearings.

   – tighten the axle nuts and in case the shake persists, remove the handle Inspect the bearings, spacer, axle and remove worn out parts. Shakey handle will damage the head faster, and the entire head will need replacement.

6. The pedestal assembly may be loose in the foundation. This may be due to breakage of legs or improper curing when the platform was cast initially

   – replace pedestal only or re-construct the platform

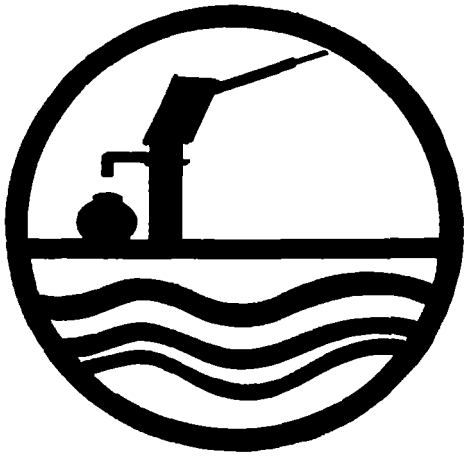
7. Broken flanges of sub-assemblies.

   – replace sub-assembly.

TROUBLE SHOOTING CHART

Sl. No.	Defect	Operation of the pump	Cause	Remedy
1.	No water	a) Handle easy to operate	(a) Rod is disconnected	a) Join the connecting-rod which is disengaged.
		b) Handle difficult and heavy to move	(b) Pipe disengaged	b) Join the pipes together. If broken or cracked replace the pipe.
		c) Movement of the handle normal	(c) i) Water level gone down below the cylinder assembly	c) i) Add more pipes and rods
			ii) Cup seal completely worn out	ii) Replace the cup seal

Sl. No.	Defect	Operation of the pump	Cause	Remedy
			iii) Valve seats worn out	iii) Replace the respective part of valve assembly
			iv) Pump cylinder cracked	iv) Fit a new cylinder body.
2.	Delayed flow of water	a) Normal	a) i) Leaky valves	a) i) Overhaul the cylinder and replace valves.
			ii) Complete stroke not available due to improper erection	ii) Correct the stroke by adjusting the length of the rod.
			iii) Leakage in pipe couplers/pipes	iii) Replace pipe couplers/pipes
		b) Tight	b) Cup seal-tight and hence folding of chain	b) Overhaul the cylinder and replace cup seals.
3.	Reduced discharge	a) Easy	a) Partial worn out cup washers	a) Replace cup washers
		b) Normal	b) i) Complete stroke not available due to improper erection	b) i) Correct the stroke
			ii) Reversal of plunger rod	ii) Refix the plunger rod in the proper position
4.	Abnormal noise while operating the pump	a) Normal	a) Rod rubbing the guide bush/pipes as pedestal flange not in level	Level the pedestal flange
		b) Inconvenient	b) i) Connecting rod bent ii) Hexagonal couplers welded offset	b) i) Replace the connecting rod ii) Change the defective rod
5.	Pump-handle shaky		a) Broken flanges	a) Replace the respective assembly
			b) Loose axle nuts	b) Tighten the axle nuts
			c) Worn out or broken bearings	c) Overhaul the complete handle assembly
			d) Worn out axle	d) Replace the axle
			e) Spacer damaged	e) Replace the spacer
6.	Folding of chain during return stroke		a) Improper erection	a) Adjust the length of last connecting rod suitably.
			b) Leather cup washers getting jammed inside the cylinder	b) Overhaul the cylinder and replace leather buckets.



LOOK OUT

FOR THE

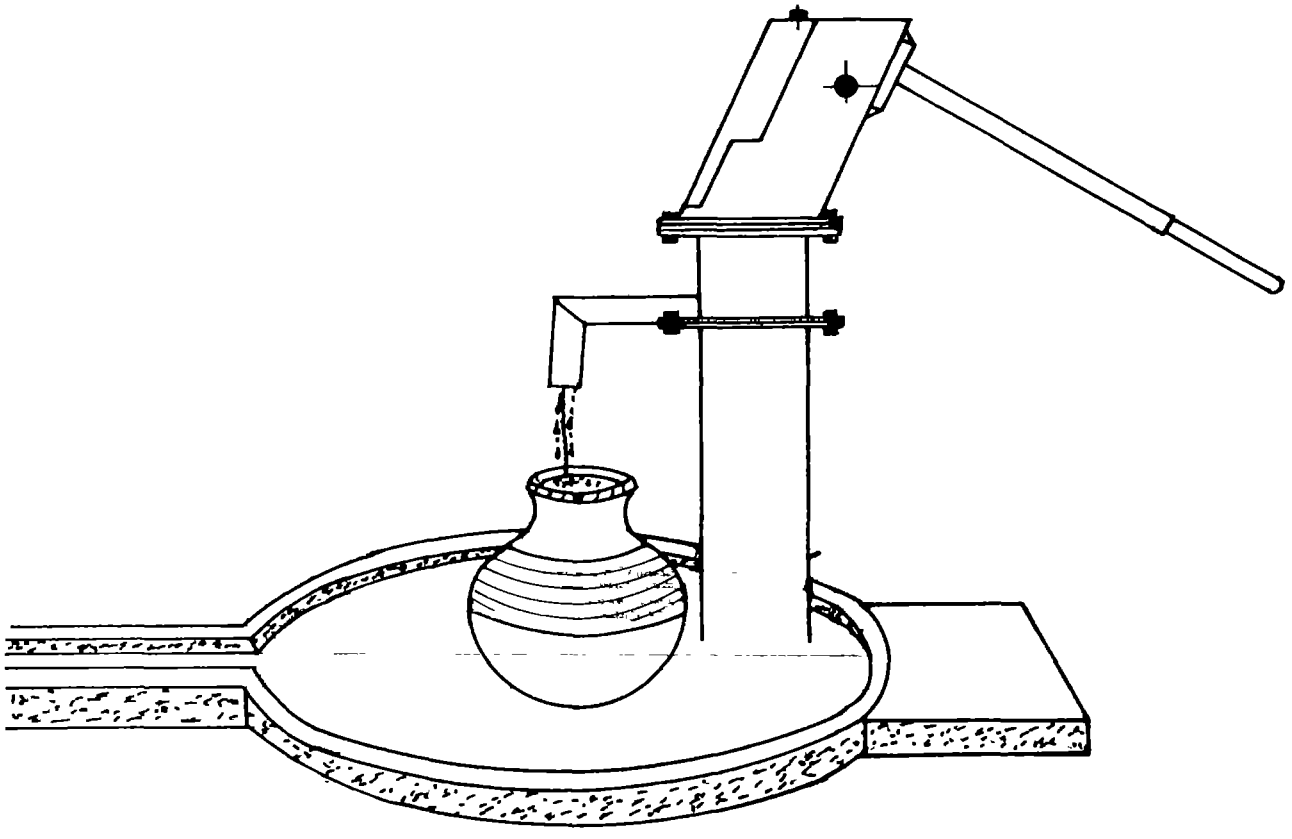
FOLLOWING

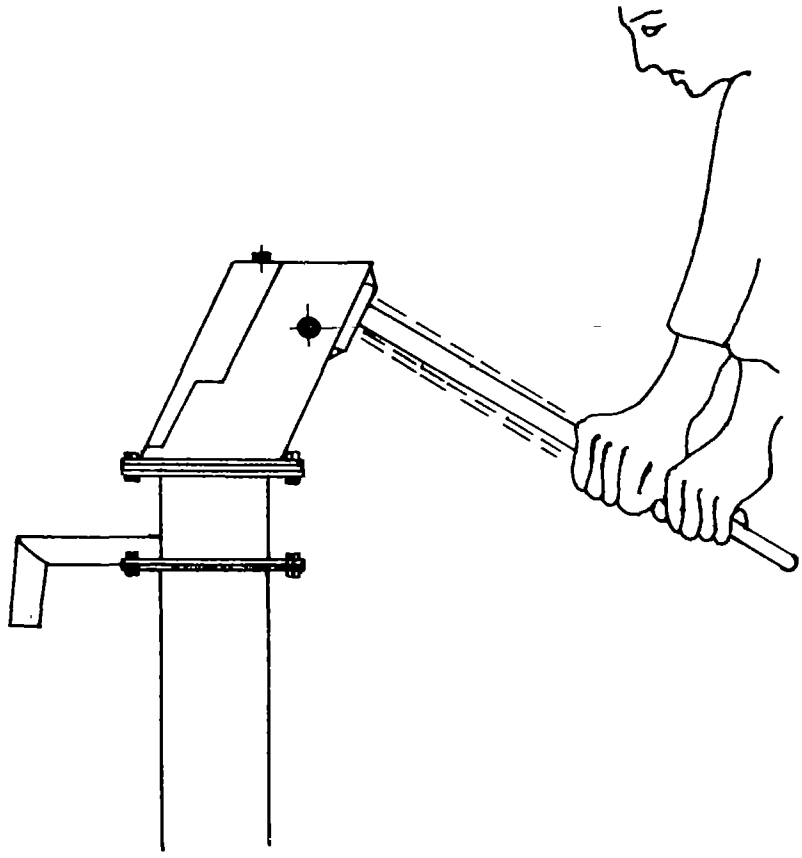
DEFECTS

WEAK FLOW OR NO FLOW

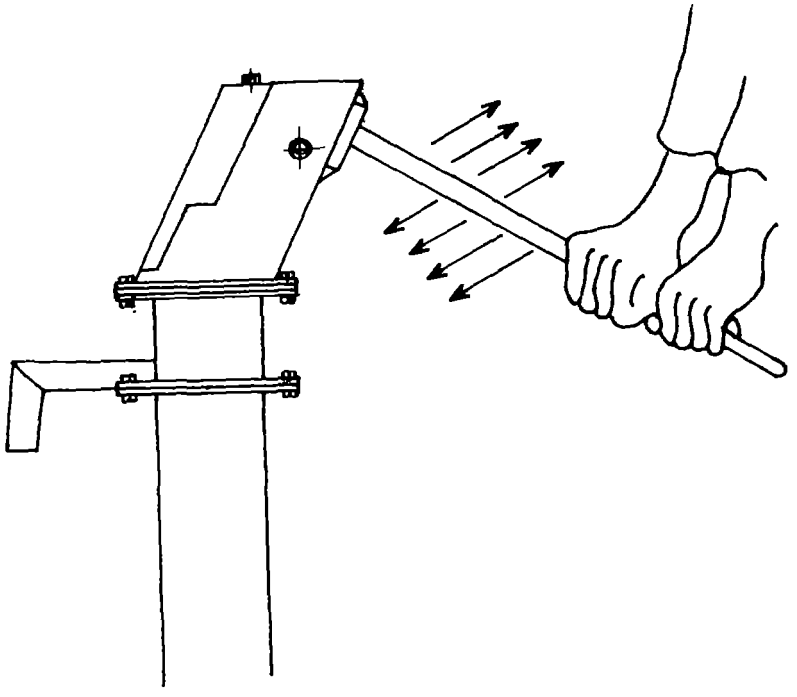
DELAYED FLOW

(you have to pump many times before water comes)

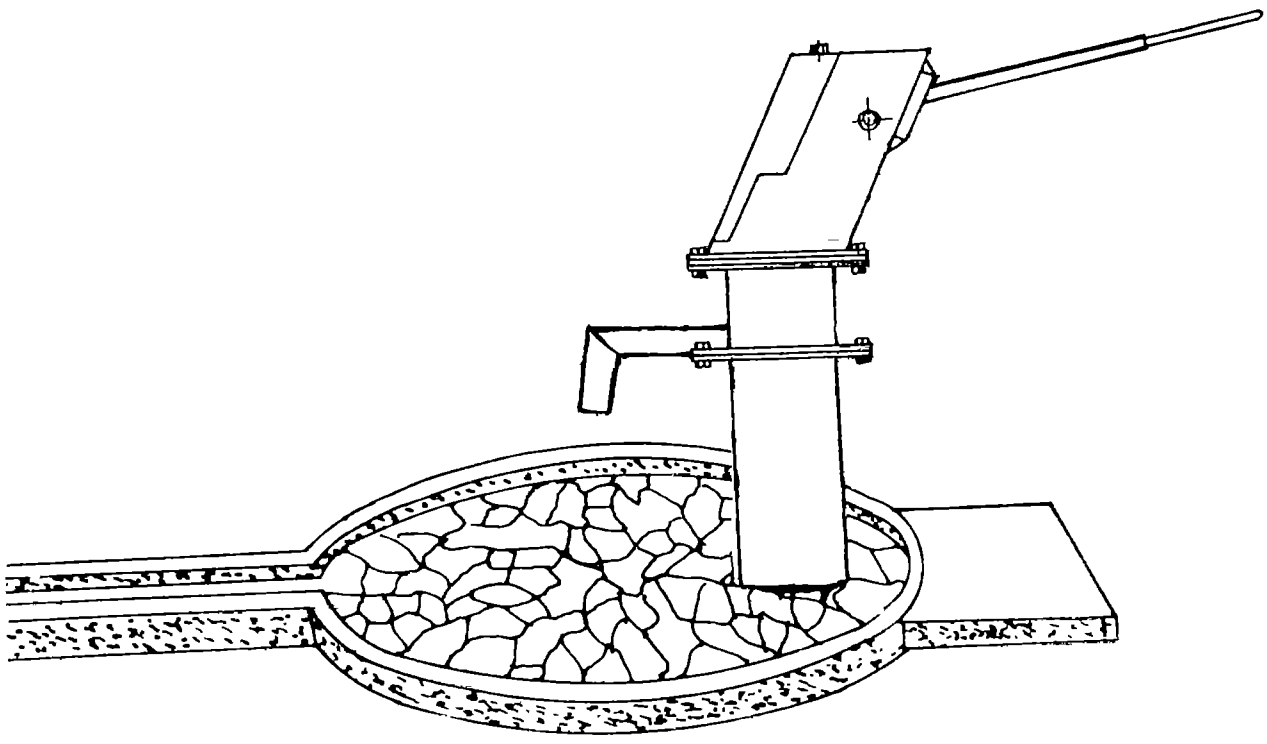




PUMPING DIFFICULT



HANDLE SHAKY



HANDPUMP LOOSE IN ITS FOUNDATION...

DEEPWELL HANDPUMP INSTALLATION REQUIREMENTS

DEEPWELL HANDPUMP INSTALLATION REQUIREMENTS

Erection of India Mark II/Mark III and Extra Deep Well Hand Pump can be done with the help of standard tools available in the hardware shops, but it is cumbersome and at times dangerous and unsafe.

Keeping in view the above, special tools have been designed which makes the installation and maintenance of these pumps simpler, faster and safer. By using special tools one hand pump can be installed with the help of 3 to 4 workmen in 45 minutes. For the erection of the India Mark II and Extra Deep Well hand pumps, the following tools are required.

A. SPECIAL TOOLS

(a)	Tank pipe lifter	... 1 No.
(b)	Self Locking clamp	... 1 No.
(c)	Coupling spanner	... 1 No.
(d)	Connecting rod lifter	... 1 No.
(e)	Handle axle removal tool	... 1 No.
(f)	Lifting spanners	... 3 Nos.
(g)	Chain coupler supporting rod	... 1 No.
(h)	Connecting rod vice	... 1 No.
(i)	Crank spanners	... 2 Nos.
(j)	Bearing pressing tool	... 1 No.
(k)	Tool Box (for all items except (b&f)	... 1 No.

B. STANDARD TOOLS

(a)	Button die to suit M12 x 1.75 threads	... 1 No.
(b)	Die set for 32/40 mm N.B. pipe	... 1 No.
(c)	600 mm pipe wrench (stilson type)	... 2 Nos.
(d)	450 mm pipe wrench (stilson type)	... 1 No.
(e)	M17 x M19 double ended spanners (10mm x 12 mm)	... 2 Nos.
(f)	Screw driver 300 mm long	.., 1 No.
(g)	1 Kg. ball pein hammer with handle	... 1 No.
(h)	Hacksaw frame with spare blade 300 mm	... 1 No.
(i)	Pressure type oil can (1/2 pint with oil)	... 1 No.
(j)	Wire brush	... 1 No.
(k)	250 mm half round file with handle	... 1 No.
(l)	Graphite grease & LITHON 3 grease	... 1 kg each
(m)	0-9 number punch (6 mm)	... 1 set
(n)	Nylon rope (3 mm thick)	... 75m
(o)	Adjustable spanner	... 1 No.

C. MASONARY TOOLS:

(a)	Scoop	... 3 Nos.
(b)	Pan	... 4 Nos.
(c)	Spade	... 3 Nos.
(d)	Crow bar	... 2 Nos.
(e)	Spirit level 250 mm	... 1 No.
(f)	Levelling plank wooden (small and large)	... 2 Nos.
(g)	20 litre bucket	... 1 No.
(h)	2 litre mug	... 1 No.
(i)	measuring tape 3 m	... 1 No.
(j)	Quick settling compound	... 250 gms
(k)	Tube setting compound	... 1 No.
(l)	Pedestal cover plate	... 1 No.
(m)	India Mark II Platform shuttering unit	... 1 Set

The special tools for India Mark II Deep well handpumps should be used by the mobile installation and maintenance team while installing or repairing India Mark II deep well handpumps.

I. TOOL NO. 1 - TANK PIPE LIFTER

Use this tool to lower or lift the water tank with riser pipér.

i) Screw it on to water tank coupling.

ii) Use 2 or 3 lifting spanners equally spaced on the tank pipe lifter to raise or lower water tank assembly.

II. TOOL NO.2-SELF LOCKING CLAMP

Use this tool for holding the riser pipe while lifting or lowering.

While raising the pipe you need not operate the handle to open out the jaws, as the tool has been devised to facilitate pulling out the rising main couplers without the jaws by hand.

While lowering the pipes, the jaws should be opened and pipes should be lowered with the help of lifting spanners. Never try to open the jaws unless the lifting spanners are on the pipe and load is being taken by them. Insert the lifting spanner handle in the socket and lock one pipe wrench. This will reduce one person who is otherwise required.

III. TOOL NO.3-COUPLING SPANNER

Use this tool for tightening the connecting rod coupler faster and with ease.

IV. TOOL NO.4-CONNECTING ROD LIFTER

Use this tool for raising or lowering the connecting rod.

(a) Thread on the tool to connecting rod

(b) Insert lifting spanner

(c) Lift or lower as required.

V. TOOL NO.5-HANDLE AXLE PUNCH

This tool is used for driving out the handle axle without damage to axle threads.

i) Remove axle nuts and washers.

ii) Put handle axle punch on taper portion of axle.

iii) Hammer gently, handle axle punch until you are able to pull out axle by hand.

b) While driving in the handle axle, the sequence shall be as follows:

i) Insert the handle axle through left bush and bearing.

ii) Insert the handle axle thought right bush, so that the threaded portion goes into the handle axle punch.

iii) Hold the handle axle punch by one hand and hammer the handle axle gently.

iv) Hammer the handle axle till the threaded portion comes out through left bush. The handle axle punch should have come out by then.

VI. TOOL NO.6-LIFTING SPANNER

Use the tool to raise or lower the rising main. These lifting spanners are suitable for 32 mm ($1^1/_4$".) N.B. and also 40 mm ($1^1/_2$") N.B. pipes.

i) Lifting spanners should be spaced equally around the rising main.

ii) Use 2 lifting spanners to lower or lift upto 30 of rising main.

iii) Use 3 lifting spanners if the rising main is longer than 30 m. DO NOT use pipe wrenches for lifting or lowering the rising main.

iv) The handle of the self locking clamp need not be operated, when the lifting spanner is used for removing the pipe. The clamp will allow the pipes to move up.

v) The handle of the clamp is to be used only when the pipes are to be lowered., Lift the pipes a little which will release the pressure on the handle of the clamp. Press the handle of the clamp still further so that the jaws open and start lowering the pipes with the help of the spanners.

VII. TOOL NO.7-CHAIN COUPLER SUPPORTING TOOL

Place this tool between the chain coupler and the flange of the conversion head assembly. This facilitates easy fixing of the chain on the handle assembly, as the entire rod weight is supported by this tool.

VIII. TOOL NO.8-CONNECTION ROD VICE

Use this tool for holding the connecting rod while it is out and threaded.

IX. TOOL NO.9-CRANK SPANNERS

Use crank spanners for tightening or loosening flange bolts, check bolts, check nuts, nyloc nuts and anchor bolts.

X. TOOL NO.10-BEARING PRESSING TOOL

With the help of this tool bearing can be fitted very easily in the bearing housing of handle assembly.

SPECIFICATION OF MATERIAL FOR TOOLS

(a) Self Locking Clamp

Main items like pipe lifter holder, hand jaw lifting block, support piller, base plate etc. are as in IS 226 of ST 42 and springs will be from spring steel. Anchor Bolt will be HT bolt of 8.8 grade with axle pin of EN 8 material. Axle pin will be hardened to 25 to 30 RC. The lifting block pipe used will be 40 mm NB medium series steel pipe conforming to IS 1239/79 Part-1. The left hand jaw will be case hardened to 30 to 35 RC. Spring steel wire will conform to IS 4454 (Part 1) - 1981 of grade II.

(b) Tank Pipe Lifter

The pipe coupler will conform to IS 9301/84. The pipe used will be 32 mm NB medium ERW black tube conforming to IS 1239/79. and electro galvanized to 30 microns minimum.

(c) Coupling Spanner

Made out from 20 mm NB pipe medium series conforming to IS 1239/79 Part I, electrogavanized to 30 microns minimum.

(d) Handle Axle Punch

Made out of En 31 material, case hardened to 30 - 35 RC and electro galvanized to 30 microns minimum

(e) Connecting Rod Lifter

Made out from 32 mm NB ERW black pipe conforming to IS 1239/79 and welded with 19 mm A/F, 50 mm long hexagonal coupler M12 x 1.75P thread material IS 9550/80 grade II or III steel other than free from cutting steel. Will be electro galvanized to 30 microns minimum.

(g) Lifting Spanner

Made out of material IS 226 ST 42 hardened to 40 - 45 RC welded with 25 mm NB Class C pipes as in IS 1239/79. Gusset will be solid triangular 25 to 30 mm long as specified by IS 226, electro galvanized to 30 microns minimum.

(h) Connecting Rod Vice.

Material used in keeping with IS 226 ST 42 and supporting block will be made from bright drawn bars electro-galvanized to 30 microns minimum.

(I) Chain Coupler Supporting Tool

Material used IS 226 St 42 with surface electro galvanized to 30 microns minimum.

(J) Bearing Pressing Tool

Made from either solid or welded bar conforming to IS 226 St 42 and nut used will be M20 x 2.5p (hexagonal) fully electro plated for 30 microns minimum.

TOOLS FOR INDIA MARK III VLOM HAND PUMP

A. SPECIAL TOOL KIT

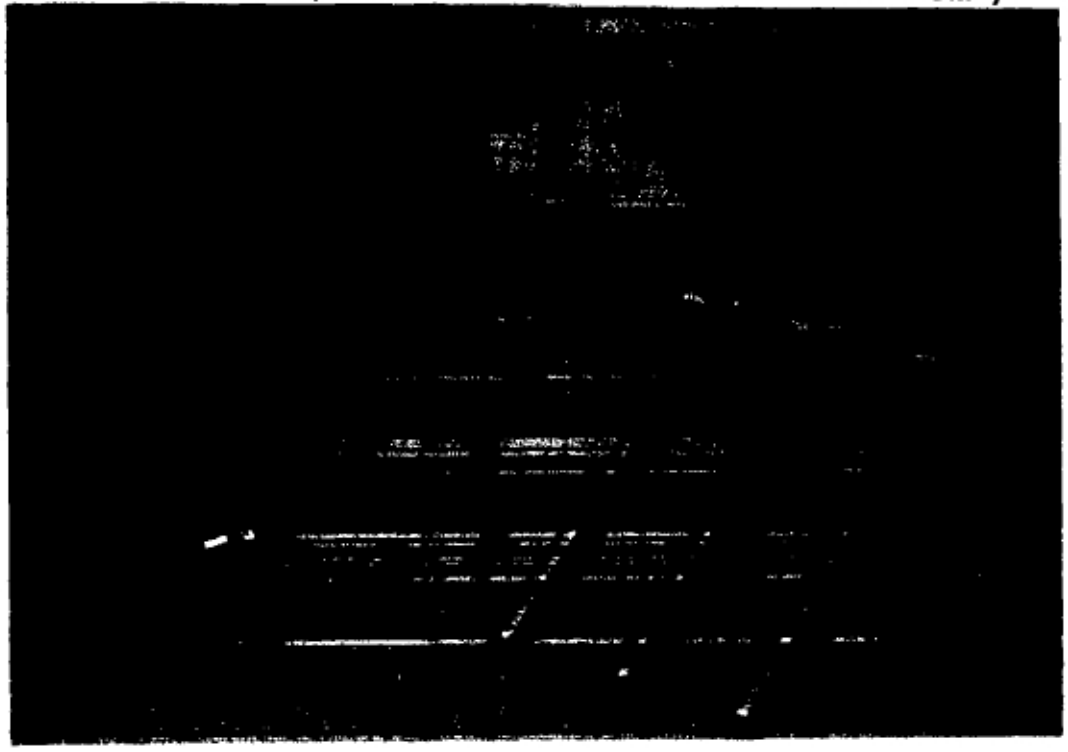
S. NO.	ITEM	QUANTITY Nos.
1.	2 1/2" Self-locking or Heavy duty clamp	1
2.	2 1/2" vice type clamp	1
3.	2 1/2" water tank pipe lifter	1
4.	2 1/2" pipe lifting spanners	3
5.	Rod Coupling spanner (300m long)	1
6.	Crank spanner (M17 x M19)	2
7.	Handle axle punch	1
8.	Connecting rod lifter	1
9.	Connecting rod lifter 'T' type	1
10.	Connecting rod vice (with receiver for hexagonal coupler)	1
11.	Chain coupler supporting tool	1
12.	Bearing pressing tool	1 set
13.	Check valve lifting adapter (Connecting rod)	1
14.	Check valve lifting adapter (Fork type)	1
15.	Mild steel tool box (to keep all the above except items 1 & 4)	1

B. VLOM MECHANIC TOOL KIT

1.	Connecting rod vice (with receiver for hexagonal coupler)	1
2.	Connecting rod lifter (T-Bar type)	1
3.	Crank spanner (M17 x M 19)	2
4.	Double ended spanner (M17 x M19)	2
5.	Check valve lifting adapter (fork type)	1
6.	Axle punch	1
7.	Chain coupler supporting tool	1
8.	Rod coupling spanner (300m long)	1
9.	Bearing pressing tool	1 set
10.	M12 x 1.75p Button die with holder for 12 mmthreads	1 set.
11.	1 Kg ball pein hammer with handle	1
12.	250 mm flat file with handle	1
13.	M6 ring spanner	1
14.	250 mm screw driver	1
15.	300 mm pipe wrench	1
16.	Hacksaw 300 mm with 6 blades	1 set.
17.	Tool box (to keep all the above items)	1

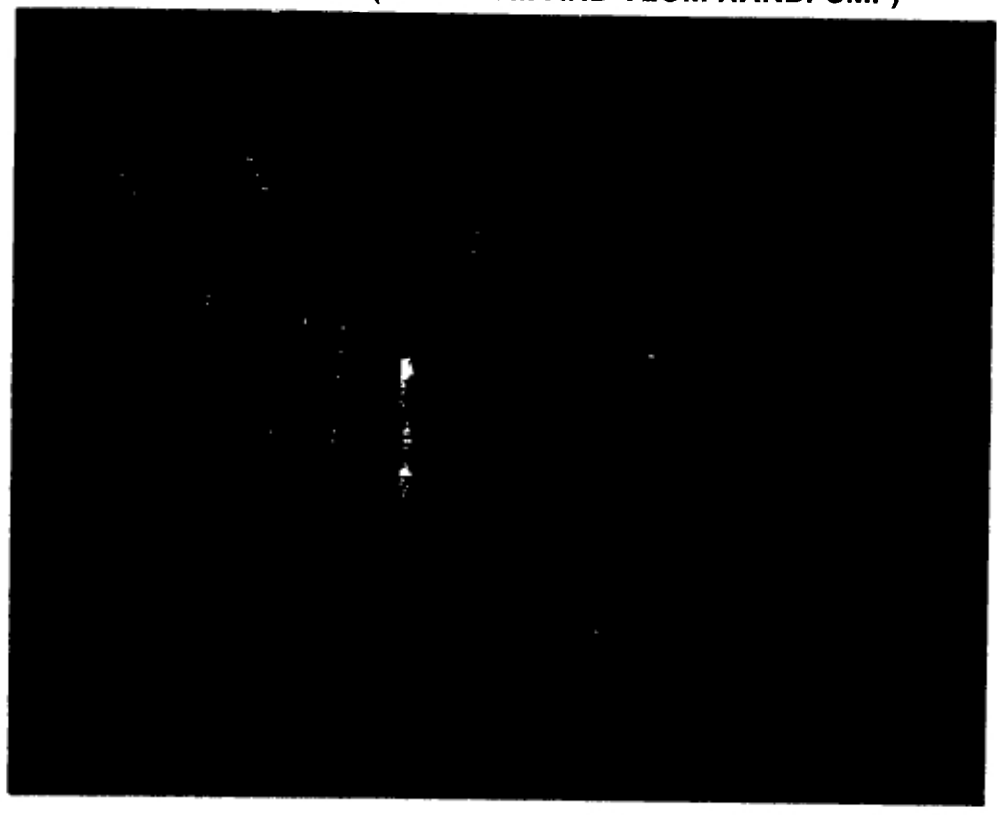
STANDARD TOOLS

SPECIAL TOOLS (FOR MK II AND EXTRA DEEPWELL HANDPUMP)



VLOM MECHANIC TOOL KIT

SPECIAL TOOLS (FOR MK III AND VLOM HANDPUMP)



LIST OF RECOMMENDED SPARES FOR 2 YEARS

(Normal Operation and Maintenance)

(A) INDIA MARK II HAND PUMP:-

SPARES FOR PUMP-HEAD

		QTY
1.	HEXAGONAL BOLT M 12 x 1.75 x 40 MM LONG	8 Nos
2.	HEXAGONAL NUT M 12 x 1.75 MM	18 Nos
3.	HIGH TENSILE BOLT M10 x 1.5 x 40 MM LONG	1 No
4.	NYLOC NUT M 10 x 1.5 MM	1 No
5.	HANDLE AXLE (STAINLESS STEEL)	1 No
6.	WASHER (4MM THICK) FOR HANDLE AXLE	1 No
7.	BEARING	2 Nos
8.	SPACER (BEARING)	1 No
9.	CHAIN WITH COUPLING	1 No
10.	BOLT FOR FRONT COVER M 12 x 1.75 x 20MM LONG	2 Nos

SPARES FOR CYLINDER:

1.	CUP WASHERS (VEGETABLE TANNED) OR NITRILE RUBBER	6
2.	SEALING RING (LEATHER OR NITRILE RUBBER)	6
3.	RUBBER SEATING (BIG)	2
4.	RUBBER SEATING (SMALL)	2

NB: ALL ITEMS TO BE PACKED IN CARDBOARD BOX AND LABELLED "SPARE PARTS KIT FOR INDIA MARK II HANDPUMP"

SPARES FOR CONNECTING ROD AND G.I. RISER PIPE

1.	CONNECTING ROD - 3 mts LONG	3 Nos
2.	PIPE SOCKET (SEAMLESS PIPE OR MACHINED FROM SOLID BAR) FOR 32 MM NB -G I RISER PIPE	4 Nos

(B) INDIA MARK II EXTRA DEEPWELL HANDPUMP:-

SPARES FOR PUMP HEAD

1.	HEXAGONAL BOLT M 12 x 1.75 x 40 MM LONG	8 Nos
2.	HEXAGONAL NUT M 12 x 1.75 MM	25 Nos
3.	HIGH TENSILE BOLT M 10 x 1.5 x 40 MM LONG	1 No
4.	NYLOC NUT M 10 x1.5 MM	1 No
5.	HANDLE AXLE (STAINLESS STEEL)	1 No
6.	WASHER (4MM THICK) FOR HANDLE AXLE	1 No

7.	BEARING	2 Nos
8.	SPACER (BEARING)	1 No
9.	CHAIN WITH COUPLING	1 No
10.	BOLT FOR FRONT COVER M 12 x 1.75 x 20 MM LONG	2 Nos
11.	LONG BOLT FOR 'T' BAR ON HANDLE M 12 x 120 MM	3 Nos

SPARES FOR CYLINDER:

1.	CUP WASHERS (NITRILE RUBBER)	6 Nos
2.	SEALING RING (LEATHER OR NITRILE RUBBER)	6 Nos
3.	RUBBER SEATING (BIG)	2 Nos
4.	RUBBER SEATING (SMALL)	2 Nos

N.B. ALL ITEMS TO BE PACKED IN CARDBOARD BOX AND LABELLED "SPARE PARTS KIT FOR INDIA MARK II EXTRA DEEPWELL HANDPUMP"

SPARES FOR CONNECTING ROD AND RISER PIPE

1.	CONNECTING ROD - 3 mts LONG	3 Nos
2.	PIPE SOCKETS (MACHINED FROM SOLID BAR) FOR 32 MM NB GI RISER PIPES	6 Nos

(C) INDIA MARK III (VLOM) HAND PUMP:-

SPARES FOR PUMP HEAD

1.	HEXAGONAL BOLT M 12 x 1.75 x 40 MM LONG	8 Nos
2.	HEXAGONAL NUT M 12 x 1.75	18 Nos
3.	HIGH TENSILE BOLT M 10 x 1.5 x 40 MM LONG	1 No
4.	NYLOC NUT M 10 x 1.5	1 No
5.	HANDLE AXLE (STAINLESS STEEL)	1 No
6.	WASHER (4 MM THICK) (FOR HANDLE AXLE)	1 No
7.	BEARING	2 Nos
8.	SPACER (BEARING)	1 No
9.	CHAIN WITH COUPLING	1 No
10.	BOLT FOR FRONT COVER M 12 x 1.75 x 20 MM LONG	2 Nos

SPARES FOR CYLINDER

1.	NITRILE RUBBER BUCKET WASHER	4 Nos
2.	O-RING (NITRILE RUBBER)	4 Nos
3.	UPPER VALVE GUIDE WITH RUBBER SEATING	1 No
4.	CHECK VALVE WITH RUBBER SEATING	1 No
5.	M 6 NUT	1 No
6.	UPPER VALVE RUBBER SEATING	4 Nos
7.	CHECK VALVE RUBBER SEATING	2 Nos
8.	RUBBER SEALING RING	4 Nos

N.B.ALL ITEMS TO BE PACKED IN CARDBOARD BOX & LABELLED "VILLAGE LEVEL SPARE PARTS KIT FOR INDIA MARK III (VLOM) HANDPUMP"

SPARES FOR CONNECTING ROD AND GI RISER PIPE

1.	CONNECTING ROD - 3 Mtrs LONG	3 Nos
2.	PIPE SOCKET (MACHINED FROM SOLID BAR/SEAMLESS TUBE) FOR 55 MM NB-GI RISER PIPE	6 Nos

(D) DIRECT ACTION HAND PUMP (TARA):-

1.	PUMP ROD	2 Nos
2.	CUP SEAL-VEG. TANNED	4 Nos
3.	FLAP VALVE	2 Nos
4.	'O' RING	2 Nos
5.	GUIDE BUSH	1 No
6.	RUBBER GROMMET	1 No
7.	SPLIT PIN	1 No
8.	CENTRALISER	2 Nos

NB: ALL ITEMS TO BE PACKED IN CARDBOARD BOX & LABELLED "SPARE PARTS KIT FOR DIRECT ACTION HAND PUMP (TARA)"

TIME SPENT ON PLANNING SAVES THREE TIMES ON EXECUTION

PLATFORM SHUTTERING & CONSTRUCTION OF PLATFORM

Before starting the installation of the handpump proper fixing of the pedestal is a must. For fixing the pump pedestal properly , a platform is required. Construction of the platform is perhaps the most important part of the installation. Any defect in the platform will affect the pump performance. It is also not easy to correct the defects afterwards. A good platform around the pump is absolutely essential for the following reasons:

a) It provides a strong foundation around the pump pedestal.
b) It does not allow the dirty water to enter the borewell and contaminate it.
c) It forms a perfect sanitary seal.
d) It gives a good operational area.

The platform is to be constructed to the required size and dimensions. For construction of the platform neatly, shuttering design is now available and can be universally adopted.

The shutterings are made from MS sheet of size 3.16 mm (CR Sheet) by forming it into the shapes required to be provided while concreting. The main parts of shutterings are:

a) Inner ring
b) Outer rings into two halves.
c) Foot stand
d) Drain and lock pins

There are no bolts or nuts in the assembly and thus no skilled manpower is required for assembling the shuttering.

The handpump site is the next item to be looked into. Arrange for cleaning and proper levelling of the site around the casing pipe upto 3 square metres and on to the drainside upto a length of 4 metres and a width of 1 metre.

The next step is to measure the total depth of the bores and static water level. Keep a record of the same for further reference. Do not forget to cover the casing pipe.

Construction

Mark a square of 76 cm (30") with the casing pipe in the centre. Start digging a pit around the casing pipe upto a depth of 40 cm (16"). When the digging operation is in progress arrange to collect the sand, 20 mm gravel metal and cement. Strong concrete is made if the ingredients (viz) sand, cement and metal are used according to the recommended proportion. The correct mixture is one part cement, 2 parts sand and 4 parts of 20 mm metal. The total quantity of concrete required for the entire platform is 0.9 cubic metre. The approximate materials needed for the construction of one platform is:

a)	Cement	...	6 Bags of 50 Kg. each
b)	Sand	...	0.4 M3
c)	Metal (20mm size)	...	0.80 M3

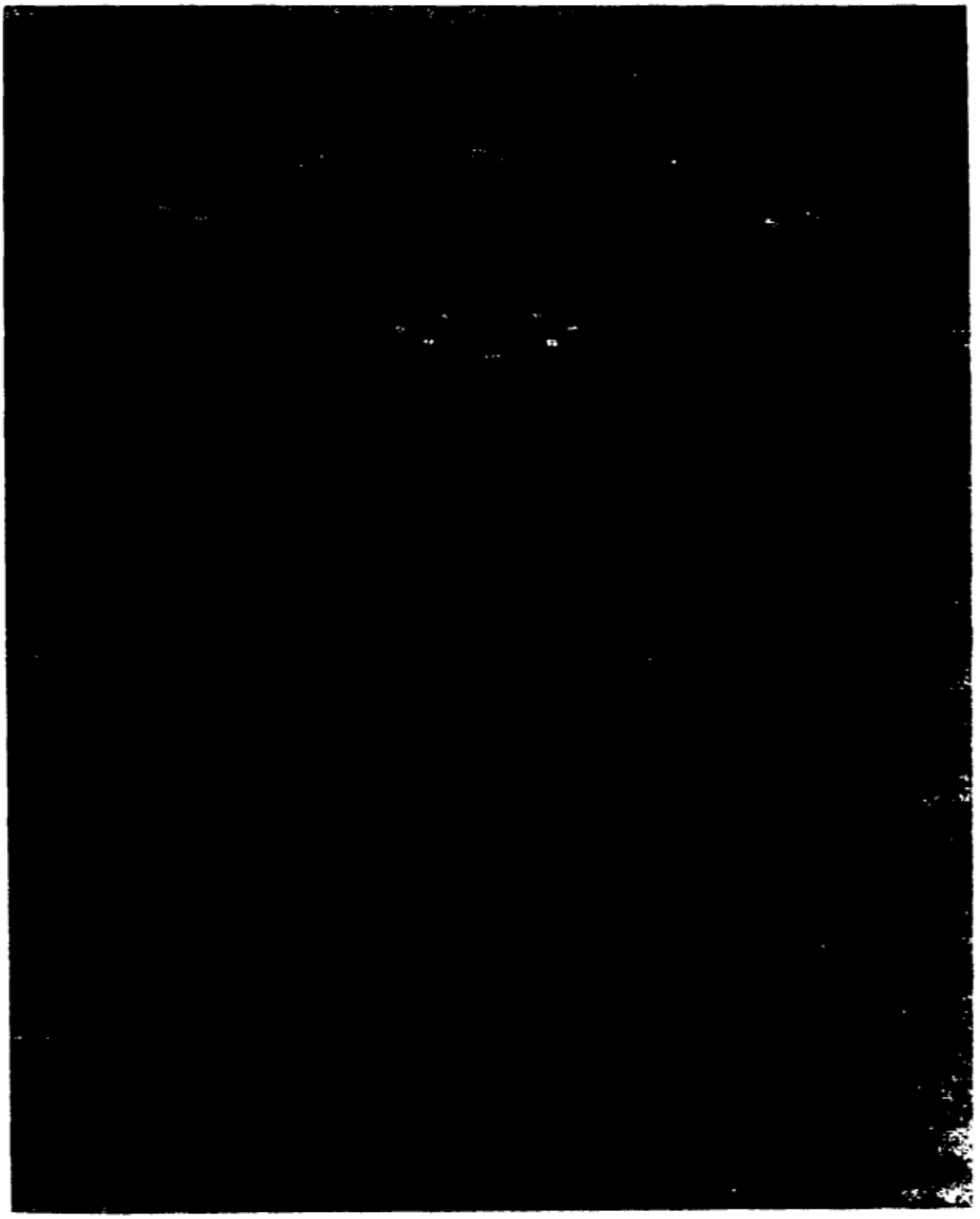
When the pit is completely dug, bring the outer ring, foot stand and drain nearer to the pit. Apply used/waste oil or soap water inside the shuttering so that the concrete does not stick on to the sides of the shuttering while removal. Place the outer ring taking care to check that the water tank spout pipe centre is in the centre of platform. Place the drain on the side decided and after keeping the foot stand in position, assemble the shuttering completely, with the inner ring in its position.

The next job is to mark out the concrete portion inside the foot stand, the inner and outer ring, as well as the drain. Scoop out earth from inside the marked line upto a depth of 8 cm (3") to prepare the place for concreting.

Mix the concrete thoroughly, i.e. the cement and sand may have to be first mixed and then after levelling the metal, spread the sand-cement mixture over the metal. Sprinkling sufficient quantity of water, mix the metal and the mixture (sand and cement).

Pour the cement concrete inside the pit over the layer of the sand so that the total height of the concrete thus poured comes to 8 cm (3" from the bottom). Level the concrete mixture properly. Place the pedestal taking care to see that the leg at

PLATFORM SHUTTERING UNIT FOR DEEPWELL HANDPUMP



the apex of the triangle is towards the drain to ensure that the spout pipe faces the drain when water tank is fitted and that the pedestal is exactly in the centre of the casing pipe. The top of the leg should be in level with the bottom of the ring. Counter check the same with the help of the rope. Level the pedestal with an accurate spirit level kept over the flange in both the directions. Remember that this is an important step as explained earlier.

Dump the concrete inside the pit till ground level taking care not to disturb either the position of the pedestal or the level. Then continue to place the well mixed concrete around the pedestal so that the concrete after levelling is upto the top of the pedestal leg. Complete the concreting over the foot stand, then platform and then over the drain, taking care to press the mixture while pouring, to ensure complete removal of air bubbles as well as adequate consolidation, the essential requirements for the construction of a good platform. Ensure that a slope of 1:50 is given in the platform towards the drain so that water collected in the platform drains quickly when the pump is commissioned. In our country, a majority of the villagers use pots with a round bottom, keeping this in mind a small hemispherical dished depression is to be made exactly at the bottom of the spout pipe through which the water comes out.

Allow the concrete mix with the shutterings in position to set for a reasonable time of three to four hours. Then the dismantling at the shuttering is to start. Remove the foot stand after enuring the removal of the jointing pin or bolt. The next item to be dismantled is the drain. Remove the inner ring and then finally the outer ring. Patch up work if any may be attended to. It will be better to seal the concrete and the ground with sand or earth available all around.

Protect the entire concrete with thorny bushes immediately on completion of concreting and after touching up and finishing.

After 24 hours, arrange for curing the concrete. If the concrete is cured well, the platform will have a long life. Arrange for constructing temporary banks or a bund on the top of the foot stand, block the drain at the ends as well as middle. The main platform around the pedestal may be divided into two or three compartments with water right upto the brim of bank. Sprinkle water over the outer periphery of the drain. The concrete is to be allowed to set for seven days. During this time, arrangements are to be made to keep the water level full by pouring water daily.

The Platform is now ready for the further work of fixing other handpump components on the eighth day.

NOTE: 1. For 6" bore pumps telescopic stands are used and for borewells less than 6" size standard pumps are used for easy fixing on to the borewell.

2. This shuttering is suitable for India Mark II, Mark III and Extra Deepwell Handpumps.

QUALITY IS DOING THINGS RIGHT FIRST TIME AND EVERY TIME

KARDEX SYSYEM

KARDEX SYSTEM

INTRODUCTION TO KARDEX SYSTEM OF HP MAINTENANCE RECORD

Today in India there are more than 1.8 million handpumps installed catering to reliable and clean drinking water needs of the village population.

Rural water supply schemes based on handpump is predominently a government operated scheme where the maintenance of pumps is also the responsibility of the departments.

The prevailing traditional methods of recording details of repair maintenance, use of spare etc. in books/registers have proved to be inadequate. This inadequacy was also responsible for improper maintenance/repair of pumps thereby affecting the water supply programme.

UNICEF has now developed a more efficient, simple and easy to operate system of record keeping for installation and repair of hand pumps on a very large scale. Kardex is a brand name given by the suppliers. It is an efficient data capture mechanism which is adaptable to computerised Management Information System. The details of the system are as follows:

What Is Kardex?

Kardex is a Visible Record System. A quarter inch of every record maintained on Kardex is "VISIBLE." In the "VISIBLE" portion of the record, the title of the record can be seen. Therefore, it is extremely simple to 'find' the record of a particular title.

Kardex operates on four basic principles. They are:

VISIBILITY
DUAL CONTROL
FLEXIBILITY
SIGNAL CONTROL

We enumerate below the above four principles.

VISIBILITY:

As mentioned above, every record in Kardex is laid out in such a manner that $^1/_4$" is visible. The record which is in the form of a card is held in Pockets. These Pockets are laid out in such a manner that $^1/_4$" at the bottom of the pocket is a plastic protector. It is through this plastic protector that a title of the card is visible. Therefore, it is possible to trace a particular record from a large number of records.

However, it is necessary that the cards be arranged in a particular order. The most common arrangement is alphabetical. Other methods of indexing are necessary for specific types of records.

DUAL CONTROL:

It is possible to maintain different types of records for the same subject. Permanent/semi-permanent record can be kept separately and the running record can be kept separately.

When the record of a particular subject is traced through the visible portion, the pocket is opened. Now we see two different cards. The TOP CARD contains all permanent/semi-permanent information and the BOTTOM CARD has all the current running information. Both the cards are tucked into the pockets so that they remain in position always. The segregation of the permanent and running information is done so that when the bottom card is completely filled up, it can be changed without disturbing the Permanent Record. Cards are also designed in such a manner that a periodic transfer of running information is recorded on the top card so that a summary of running record is available, even though the previous running record card (Bottom Card) has been changed.

FLEXIBILITY:

In case a record becomes obsolete, the cards of the obsolete record can be removed. This leaves a blank space in the Pocket. The blank pocket can be removed and placed at the end of the tray. This ensures that the order in which the records are laid out is not disturbed. Similarly, if a new record is to be added, the record can be introduced precisely in

the order in which the records are laid out. This is done by removing a blank pocket from the end of the tray and placing it at the location where the new record is to be introduced. This ensures that the sequence of the record is undisturbed.

SIGNAL CONTROL:

We had mentioned earlier that every record on Kardex is 'VISIBLE.' In this visible portion of the card, we can also highlight important information by means of signals. These signals are of two types:

(a) **Graphamatic Signals and**

(b) **Crimped Signals.**

Both signals can be used simultaneously, highlighting different information.

The **Graphamatic Signal** slides out from the centre of the pocket to the right side of the pocket. The longer the length of the signal, the greater the number and the shorter the length of the signal, the less the number. There is a central position which is the 'Normal Level.' Therefore, when a review is made of the Graphamatic Signals, most of the records will have their signals at the normal position. Those signals deviating from the normal level are records which require 'attention.' Therefore, corrective action can be taken against those records only.

The **Crimped Signal** is the second type of signal used on Kardex. These are1/4" width and they highlight a different set of information by virtue of their location. For this, the cards for Kardex are so designed that certain positions in the 'Visible portion' of the card indicate different parameters.

By placing the Crimped Signals on one of the parameters on the card, the parameter is highlighted when the pocket is closed.

The signal system is the most important feature of Kardex. It draws attention to only those records which need attention and action.

The Signals are available in various colours. Each colour indicate a different control.

Difference between other Record keeping methods and kardex:

The other common record keeping methods are:

a. Ledgers and

b. Card Index Cabinets.

The Ledger and the Card Index systems are 'Blind' systems of record keeping. To search for a record is therefore time-consuming. The systems offer no dual control, limited flexibility and no signal control.

OPERATING INSTRUCTIONS OF KARDEX FOR HANDPUMP MAINTENANCE RECORD

To commence operating, the following steps must be taken:

The Hand Pump Maintenance Record System is designed on 11 x 9" card system. The cabinets supplied by UNICEF have 12 trays and 8 trays. The information on handpumps are segregated on three cards viz.

a. Handpump Installation Card (11 x 9")

b. Analysis (11 x 9")

c. Maintenance Card (11 x 17")

The Handpump Installation Card is the TOP CARD, while the Analysis Card and the Maintenance Card are BOTTOM CARDS.

Instruction on Posting Kardex Cards

The first operation to begin the system is to arrange the Handpump Record. The arrangement should be done in such a manner that all the information pertaining to the handpumps located in a village is prepared in sequence. The index for the Kardex system is based on Block/Mandal/ Village/Pump code. Therefore, begin posting the information on the Hand Pump Installation Card. The information should be posted in the appropriate columns/space provided. Since the handpumps have already been installed, the complete information on the handpump should be available with you to fill up this card.

Next we take Handpump Maintenance card. For the present, posting has to be done only at the bottom in the columns showing Block/Mandal/ Village and pump Code. The rest of the information on the same lines is also important, which is on the same lines is also important, which is to be highlighted by means of CRIMPED SIGNALS. The main body of the card will be posted only after the maintenance team has visited and serviced the handpump. The use of the CRIMPED SIGNALS is explained later. Remember that after the visit and servicing of the handpump is completed, all the information shown in the column must be posted. After the year end, this information will be consolidated and transferred on to the Analysis Card.

On the Analysis Card there will initially be only the index to be posted i.e. Mandal/Village/Pin code. The information will be transferred on to this card from the Maintenance Card on a yearly basis.

As the three cards are simultaneously posted, they must be arranged in the same order so that their sequence is not disturbed.

General Instructions for Posting Entries on Cards

1. The data should be entered carefully, preferably by a person having good handwriting, so that the format gives an impression of a printed card.
2. Where data is incomplete, or of doubtful nature, it should be entered by using a lead pencil so that when correct data is available, the entries can be erased and replaced by the authentic information.
3. The installation data is of a permanent nature and should preferably be entered in field position. However, in special cases where data has to be entered by a different agency, the installation card may be taken out and passed on to the concerned agency. However, the cards should be carefully handled so that they do not get soiled or dog cared.
4. SCP stands for Special Component Plan
   TSP stands for Tribal Sub Plan
   mm stands for millimetres
   m stands for metres
   l/m stands for litres per minute
   C stands for cracked
   W stands for water-logged
   D stands for dirty
   L stands for length
5. Borewell depth norm is 50 metre.
6. Numbering system for spare parts is as follows:

1. Axle
2. Handle bar
3. Bearing
4. Head assembly
5. Nuts and bolts
6. Chain with coupling
7. Spacer
8. Connecting rod
9. Cylinder body
10. G.I. Pipe
11. Washer
12. Upper Valve
13. Lower Valve
14. Socket
15. Front cover
16. Leather/Nitrile Rubber buckets
17. Rubber seating (small & Big)
18. Handle axle
19. Check Valve guide
20. Check Valve Seat
21. Plunger Yoke body
22. Upper Valve seat
23. Upper Valve guide

24. Follower
25. Sealing ring
26. Plunger rod
27. Nyloc nuts
28. Hexagonal coupling

Installation of Posted Cards in Kardex

1. After approximately 600 cards have been posted with the titles, pull out the top-most tray of the Kardex cabinet to its maximum extent. Rest the tray on the 6th or 7th tray which is pulled out approximately half its length.
2. Open the top plate of the top tray. The top pocket is now exposed. At the top edge of the pocket, there is a perforated die-cut running along the width of the pocket. Fold the the pocket along the perforation and crease the pocket.
3. Now pick up the first Bottom Card (Maintenance Card) on which the title has already been typed /written. Fold the card along the perforation for the typing stub. You will also note that there is a cut provided on both sides of the card approx. 9" from the bottom. Fold the card here again along the die-cuts.
4. Now slip the bottom portion of the card the plastic protector of the second pocket. Ensure that the card is completely seated in the Plastic protector. The title of the card will now be seen through the protector. Slip the top edge of the card in the tope die-cut of the pockets. The Bottom Card is now in position. This pocket is now reserved for the records of a particular handpump located in a particular village within a particular mandal.
5. The installation card (Top Card) is now inserted into the plastic protector of the previous pocket. The information on this card has to be posted before the card is inserted.
6. The Analysis Card is to be placed behind the Maintenance Card. The Analysis Card is slipped in between the typed strip of the main body of the Maintenance Card We have now completed the installation of a set of cards for a particular Handpump.
7. Fold the next pocket and repeat the procedure mentioned in Points 4, 5, and 6. When the cards of a group of handpump if a particular village has been placed in the pockets and a new group begins, leave a few pockets blank and begin placing the cards again as described above. The reason for leaving these pockets blank is to provide for new pumps which will be installed.
8. Leave a few pockets at the bottom edge of the tray for the same reasons stated above. Start on the 2nd tray just as done in the first tray. Each tray is provided with a tray index. Here we can indicate the range of records in the tray.

Use of 1/4" crimped signals

You will note that at the bottom of the Maintenance Card columns are provided the Block/Mandals/Village Pump codes. Next it on the same line, there are other notings such as 'Chain not greased', 'Nuts missing', etc. The 1/4" Crimped Signals are placed on the appropriate position to highlight such important information i.e., if a Crimped Signals is placed on 'Chain not greased', the signals is visible through the plastic edge of the pockets. Thus when the tray is pulled out of the cabinet, several signals are visible which highlight the particular problem with the handpump.

Thus, before a maintenance team leaves for a particular village to service handpumps, the team can quickly find out from the kardex system the specific type of defect for each handpump. They can thus decide on the corrective action to be taken.

We have supplied Crimped Signals in five different colours namely Yellow, Blue, Red, Green, Navy Blue.

Yellow signal may be used to highlight internal conditions of the handpump i.e. Chain not greased, Nuts missing. etc.

Blue signal is used to highlight the condition of the platform i.e. Water-logged, Dirty, not constructed properly etc.

Red signal is used to highlight whether functioning awaiting spares, awaiting service, etc.

Green signal is used to highlight whether the Caretaker has been active or inactive.

Navy Blue signal is used to highlight the condition of the drain.

By allocating specific colours for various parametres of the handpumps, the operator knows at a glance the nature of defect and the specific problem with the handpump.

DO'S

1. Always pull out of the trays gently from the shelf.
2. To refer to a record, first find the pocket where the record is kept through the visible portion.
3. If the record is in the 40th pocket of the tray, open the tope plate first, then lay-back the pockets approx. 7 to 10 at a time and not more.
4. Post/update the record without removing the tray from the shelf.
5. Organise postings is such a manner that all information to be posted in a particular tray is done at one time. This reduces operator fatigue and also extends the life of the cabinet.
6. Do replace damaged pockets. This prevents other pockets getting damaged Pockets are expensive.

DONT'S

1. Do not mishandle the cabinet and trays. Mishandling will cause damage and they are expensive to repair.
2. Do not open the pockets without opening the top plate of the tray. If this is done, the top pocket will get damaged. Remember pockets are expensive. They cost approximately 50% of the cost of the cabinet.
3. Do not remove the trays from the shell frequently. You may get confused while replacing the trays back if more than one tray is removed at a time.
4. Avoid opening more than 10 pockets at a time. This places an extra strain on the pockets and consequently, the life of the pockets may be reduced.

HANDPUMP MAINTENANCE CARD

VISIT DATE	PLANNED/ REQUES-TED VISIT	WORKING	REPAIRED		STATIC WATER LEVEL (m)	CYLINDER DEPTH (m)	BOREWELL DEPTH (m)	BREAK DOWN DATE	BREAK DOWN REPORTED ON	PLATFORM CONDITION			CARETAKER EXISTS/ACTIVE		CHAIN GREASED YES/NO	NUTS BOLTS MISSING YES/NO	LENGTH OF DRAIN (m)	SPARES USED	REPAIR COST
		YES/NO	YES/NO	MAJOR/ MINOR						C	W	D	YES/NO	YES/NO					

BLOCK/MANDAL	VILLAGE	PUMP CODE	CHAIN NOT GREASED	NUTS MISSING	PLATFORM				PUMP NOT FUNCTIONING	AWAITING SPARES	AWAITING SERVICE	NO LOCAL CARE	CARE TAKER		DRAIN (L) BELOW NORMAL
					C	W	D	NOT CONST					ACTIVE	NOT ACTIVE	

ANALYSIS- YEAR ENDING 31ST MARCH

BLOCK/MANDAL **VILLAGE:** **PUMP CODE:**

	19	19	19	19	19	19	19	19	19	19
NO OF VISITS-PLANNED										
REQUESTED										
SPARE PARTS USED										
TOTAL COST OF SPARE PARTS										
MAINTENANCE EFFECTIVE										
INEFFECTIVE										
AVERAGE WATER LEVEL STATIC										
AVERAGE PERIOD BETWEEN PUMP BREAKDOWN AND REPORTING										
AVERAGE PERIOD BETWEEN PUMP BREAKDOWN REPORTING AND REPAIR										
NO OF TIMES PUMP REPAIRED										
MAJOR										
MINOR										
PLATFORM EXISTS YES/NO										
DRAIN EXISTS YES/NO										
CONDITION OF PLATFORM CRACKED/WATER LOGGED/DIRTY										
LENGTH OF DRAIN(m)										
SURROUNDINGS-CLEAN/DIRTY										
CARETAKER EXISTS-YES/NO										
CARETAKER ACTIVE/INACTIVE										
LOCAL CARE-EXISTS/ABSENT										
CHAIN GREASED-YES/NO										
NUTS,BOLTS MISSING-YES/NO										
BORE DEPTH FROM NORM (m)										
CYLINDER DEPTH (m)										
DIFFERENCE BETWEEN STATIC W LAND CYLINDER DEPTH (m)										
REMARKS.										
BLOCK/MANDAL		VILLAGE					PUMP CODE:			

STATE LEVEL PROCUREMENT

GUIDELINES FOR STATE LEVEL PROCUREMENT OF HAND PUMPS, TOOLS AND SPARES

Quite often it is noticed that the procurement of hand pumps is always not in a systematic way. It is observed that the planning in procurement of hand pumps and spare parts is not as per the delivery period required by the Divisional Water Board Offices. To have a uniform procurement policy and to have enough materials available at any time in each division the following general guidelines can be taken into account by the Department.

1. The purchases order and specification should be made very carefully in relation with the BIS Standard and the details of order issued on any manufacturer should clearly indicate the parts and the delivery schedule of the item required by the department.

2. The material procurement policy by the department should be done on a planned basis after getting the actual requirements in time from the various divisions and float tenders accordingly for procurement giving a reasonable delivery period. In the absence of such reasonable delivery periods the manufacturer often takes advantage of asking for an extension of the delivery period and thereby affecting the water supply programme of the department.

3. The purchase order issued by the department should clearly indicate the name of inspection agency so that the material can be inspected in time as per requirements.

4. A pre-evaluation and proper selection of manufacturer could be done in consultation with the inspection agency or BIS before issue of tender documents or purchase order to any pump manufacturer so that the department is assured of getting quality products in time.

5. The purchase order and the specification should also be made available to the consignee stores for better coordination. Guidelines/procedures for acceptance of materials at the consignee stores should be circulated by the department to stores and executive engineers for carrying out checks on materials received prior to release of payments to supplier/manufacturer so that the department is assured of getting the right product.

6. Proper verification of offer slips, certificates and other documents should be done from time to time by the executive engineer in coordination with the Divisional Stores personnel. The stores incharge should be given proper instructions for reporting any material defects or other defects noticed while on receipt of materials in relation with the purchase order issued by the department.

7. Skilled personnel should be available for proper installation of materials and atleast one trained Assistant Engineer or Junior Engineer should be available per division for coordinating the consignee end inspection programme. The proper documentation, periodic audit of stores should be carried out by the department at the stores level to get a better performance in each stores.

8. The department should develop a monitoring system for procurement, storage and handling by consignee stores to enable management to coordinate the programmes which can be continued without any disruption, thereby helping the Government in implementation.

9. A proper storage facility should be made available at each consignee store so that the procured material can be stored safely and issued whenever required by the department. This will hep the department to save a lot of money.

ACTION PLAN FOR IMPLEMENTING PROCUREMENT GUIDELINES

(1) Purchase order and specification should be made very carefully. (Refer BIS specification, UNICEF circulars on packing and marking)

(2) Planned material procurement policy based on actual requirements and reasonable delivery time.

(3) Purchase order should specify the inspection agency and procedure of inspection and method of identification.

(4) Pre-evaluation and proper selection of supplier/manufactures (ISI approved, UNICEF approved, Proper Gradation, etc.)

(5) Purchase order and specification copy to be made available to the consignee.

(6) Proper procedure for acceptance of material and release of payment.

(7) Verification of offer sheet, inspection certificate, markings and other identification, etc to confirm that only inspected goods are received.

(8) Proper Q.A. procedure, i.e., documented procedure to be circulated to all concerned for ready reference (Can be printed and presented in a book form).

(9) Formats for feedback evaluation system to be updated incorporating complete details.

(10) Periodic auditing should be arranged in stores to have better control.

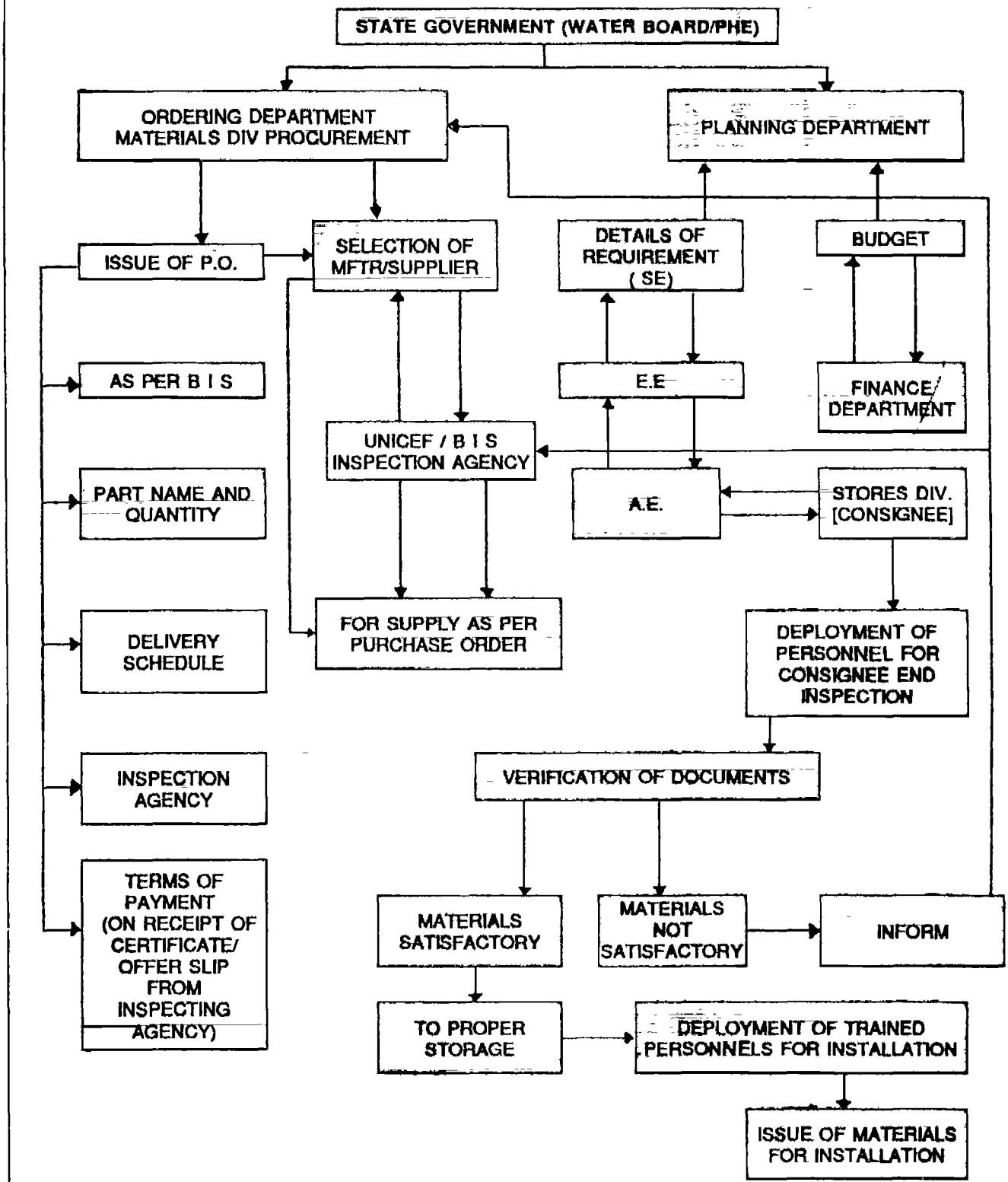
(11) Proper storage facilities should be made available in departmental stores.

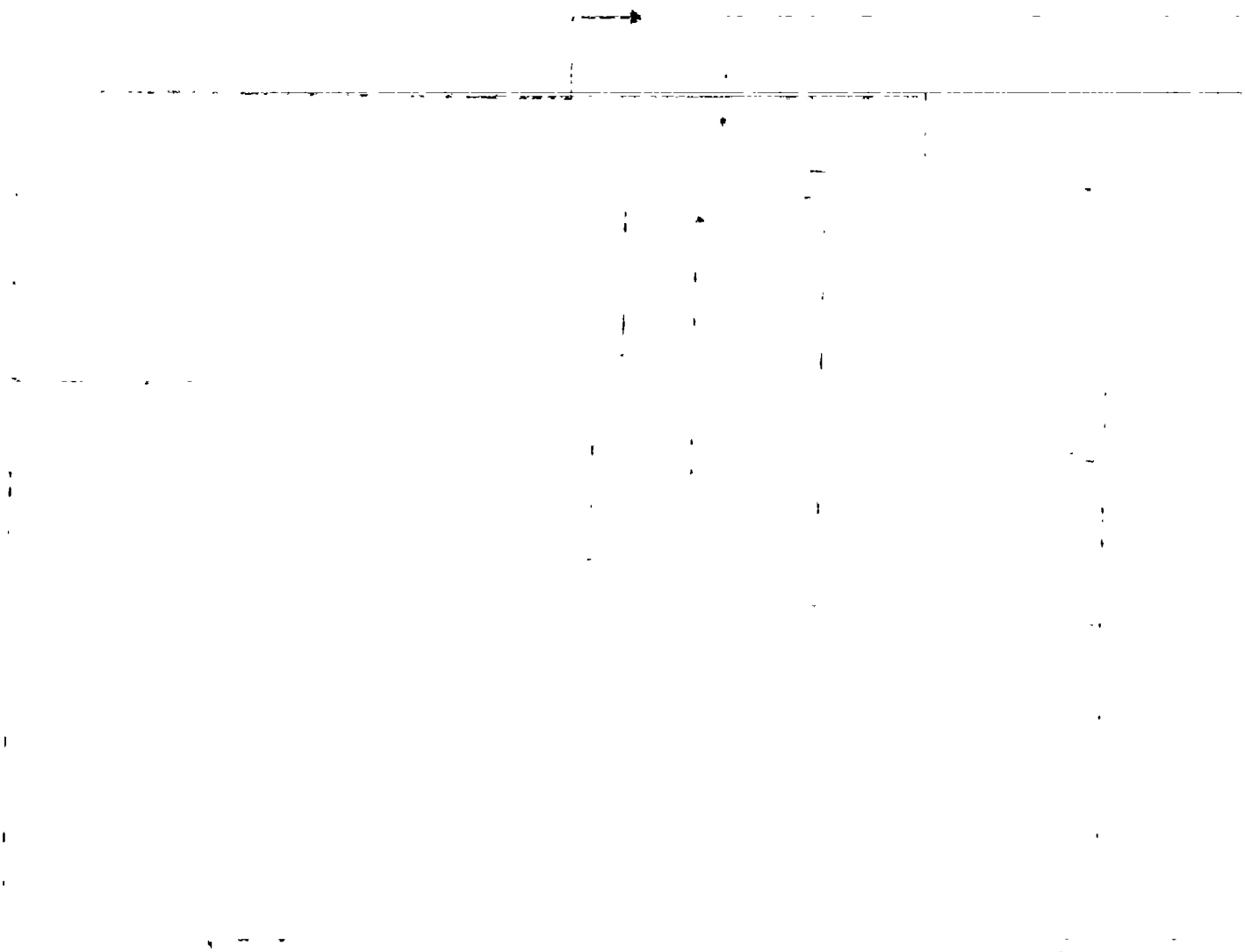
(12) Deployment of engineers to carry out consignee end Inspection at stores.

(13) Deployment of skilled personnel for installation

TIME PASSES BUT
QUALITY ENDURES

PROCUREMENT & QUALITY CONTROL SYSTEM FOR HAND PUMPS AND SPARES





LIST OF QUALIFIED MANUFACTURERS

LOCATION OF QUALIFIED MANUFACTURERS OF HANDPUMPS IN INDIA

LOCATION OF FACTORY		●
ANDHRA PRADESH		14
BIHAR		5
DELHI	-	3
GUJARAT	-	1
KARNATAKA		5
MADHYA PRADESH	-	2
MAHARASHTRA		1
ORISSA	-	4
RAJASTHAN	-	3
TAMIL NADU	-	3
UTTAR PRADESH	-	3
WEST BENGAL	-	1
TOTAL	-	45

LIST OF QUALIFIED MANUFACTURERS OF INDIA MARK II HANDPUMP AND SPARES LOCATED IN THE VARIOUS STATES OF INDIA

ANDHRA PRADESH

	OFFICE	FACTORY
1.	Balaji Industrial & Agricultural Castings, 4-3-140, Hill Street, Secunderabad-500 003 Andhra Pradesh Tel: 70883/73210 Grams: Bore Pumps	Plot No. 16, I.D.A. Balanagar, Hyderabad 500 037 Tel: 264008, 263614 Telex: 0425-6866 Biac in Fax: 91-842-844553
2.	Balaji Industries & Engg. Corpn. 4-3-74, Hill Street, Ghasmandi, Secunderabad 500 003 Andhra pradesh Tel : 77698, 821127 Grams: Water Pumps	Road No.3, Satelite Indtl. Estate, Balanagar, Hyderabad 500 037 Tel : 262790 Telex:0425-2008 Bpvl In
3.	Bhavani Domestic Appliances Private Limited Office & Factory:	F-23 A & B IDA Jeedimetla, Hyderabad 500 855 Andhra Pradesh Tel: 843729, 66472
4.	Central India Engg. Co., 4-3 -161 (2153/5), Hill Street, Ranigunj, Secunderabad 500 003. Andhra Pradesh Tel: 76831	1-7-1056/A Azamabad Indtl. Area., Hyderabad 500 020 Andhra Pradesh Tel: 867098
5.	Gurudev Engineering Company 4-3-129 Hill Street, Raniganj, Secunderabad 500 033 Tel : 76831	1-7-1054/3, Azambad Industrial Area Hyderabad 500 020 Andhra Pradesh Tel : 867098, 865131
6.	Janatha Industrial Corpn (India) 5-2-357, Hyderbasti, Secunderabad 500 003 Andhra Pradesh Tel : 75626	8-3-224, Yousufguda Road, Hyderabad 500 038 Andhra Pradesh Tel : 33435, 33380 Telex:0425-6027 Arki In

7.	Meera and Ceiko Pumps P.Ltd, 4-3-161 (2153/5), Hill Street, Ranigunj, Secunderbad 500 003 Andhra Pradesh Tel : 76831 Grams: Ceico	1-7-1054/1, Azamabad Indtl. Area, Hyderabad 500 020 Andhra Pradesh Tel: 865131, 867098 Telex: 0425-6460 Pump In
8.	M.A. Tool Room 4-3-54/80 Old Bhoiguda, Ghasmandi Road, Secuderabad 500 003	Plot No.4, Behind Praga Toola Ltd., Opp Mekala Mandi, Bholakpur, Secunderabad, Tel : 822398
9.	Meera Industries 7846 Hill Street, Ranigunj, Secunderabad 500 003 Andhra Pradesh	1-7-1054/1 Industrial Area Azamabad, Hyderabad 500 020 Andhra Pradesh Tel : 807098, 865131
10.	P.S.R. Engg. Co. 4-3-1141, Hill Street Secunderbad 500 003	16, Indtl Development Area Balanagar, Hyderabad 500 037 Andhra Pradesh Tel : 264007
11.	Premier Deepwell Hand Pumps Pvt. Ltd. Office & Factory:	41 & 42, Sri Venkateswara Coopertaive Indtl. Estate, Balanagar, Hyderabad 500 037 Tel : 263515, 263525 Telex: 0425-6272 Ssi In
12.	Surya Bharat Industries 23,Shantinagar, Hyderabad 500 002 Andhra Pradesh Tel : 220198, Grams : Handpump	51, 58 Craftmen Guild, E 22, Katteden Hyderabad 500 457 Andhra Pradesh
13.	Uma Engineering Works, Office & Factory:	B-11, TIE Phase II, Balanagar, Hyderabad 500 037 Andhra Pradesh Tel : 261864, 262919

14. Varalaskhmi Engineering works,
5-1-568/1, Hill Street,
Ghasmandi,
Secunderabad 500 003
Andhra Pradesh
Tel : 821127

Road No.3,
Satelite Indtl. Estate,
Balanagar,
Hyderabad 500 037

Tel : 262790

BIHAR

1. Ashoka Foundry
National Highway
Begusarai, Bihar 851 101

8A Industrial Area
P O Tilrath, Begusarai,
Bihar 851 101
Tel : 217

2. Indistrial House
Kankarbagh Road
Patna 800 020, Bihar
Tel : 53001

Opp Milan Motors
Patna - 800 020
Bihar

3. Rastrive Agricultural Products
Mahabir Industries
P.O. Box No.12
Begusarai - 851 101
BIHAR
Tel: 2446, 2864

Mahabir Industries,
No.1, Barauni Industrial Area
P.O. Tilarth - 851 122
Dist. Begusari
BIHAR
Tel: 06342 - 3051, 4243

4. Steelman Industries
Office & Factory:

Kanakarbagh Road,
Patna 800 020
Bihar
Tel : 52428, 50399

5. Shree S.K.Industries,
Office & Factory:

Gola Road,
Danapur 801 503
Bihar
Tel : 7402, 7671
222128

DELHI

1. Greysham Company Pvt. Ltd.
1-B Vandhna,
11 Tolstoy Marg
New Delhi 110 001
Tel : 3313518, 3312969, 3310952
Telex : 031-3872

D-30 SMA Industiral Estate
GT Karnal Road
Delhi 110 033
Tel : 2523989, 2523854

2.	Inalsa Private Ltd Surya Kiran, 19 Kasturba Gandhi Marg New Delhi 110 001 Tel : 3314214 Telex : 3165063 INAL	9/51 Kirti Nagar Industrial Area New Delhi 110 015 Tel : 533132, 533327
3.	Murti Enterprises Office & Factory	A-125 Group Industrial Area Wazirpur Delhi 110 052

GUJARAT

1.	K. Rasiklal & Co., Aji Industrial Estate, Rajkot 360 003 Tel : 87360/361 Telex : 0169-274 Grams : Kerasikco	Aji Industrial Estate, 80 Feet Road, Rajkot 360 003

KARNATAKA

1.	Balaji Industries & Agricultural Castings 1186/14, 35 'C' Cross 4, T. Block Jayanagar, Bangalore 560 011 Karnataka Tel : 40433	27/2 Raghuvanahalli, Kanakapuram Main Road, Bangalore 560 062 Karnataka Tel : 42180
2.	Karnataka Water Pumps Pvt Ltd 20/1 1st Floor Silver Jubilee Park Road, Bangalore 560 002 Karnataka Tel : 23 8882 Fax. 91 – 812 – 225774	No. 13 B & C, Attibele Indtl Area, Neralur Post Anekal Talluk, Bangalore Karnataka Tel : ATTIBELE 48
3.	Prakash Engg. Enterprises Office & Factory.	No.A-193, 4th Cross, Peenya Indtl. Area (Estate), Ist Stage, Bangalore 560 058 Tel : 395645

4.	Prem Enterprises 180/1, Hosur Road, Wilson Garden, Bangalore 560 027 Tel : 222931, 239559, 235457	28 C, 2nd Stage, Peenya Indtl. area, Bangalore 560 058 Tel : 395206/395723
5.	Radha Engg. Corpn. No. 40 Indu Town, Rajaji Nagar, Bangalore 560 044 Tel : 355758	Radha Indtl. Works A-154 2nd State, Peenya Indtl Estate Bangalore 560 058 Tel : 395821

MADHYAPRADESH

1.	Adroit Multitech Pvt. Ltd. Office & Factory:	19 Industrial Area, Richhai, Jebalpur 452 009 Tel : 330839/310681
2.	Varun Enterprises Office & Factory:	27 MPLUM Shed, Industrial Area, Govindpura, Bhopal 462 023 Madhya Pradesh Tel : 546432

MAHARASHTRA

1.	Span pumps pvt. Ltd., 410 Bizzy Land, 776 A, Sadashiv Peth, Near Vishramabaugwada, Pune 411 030 Tel : 423347	965/2 Sanaswadi, Shirur (Taluka) Pune. Tel : 021175-412

ORISSA

1	Bhagirathi Jute & Holdings Pvt. Ltd. Office & Factory:	S-1/116 & 101, IDCO's New Industrial Estate Bhubaneswar 751 010 Tel : 53167 (Works) 53326, 55836 Cable: STOTRAMALA

2.	Koshala Udyog, Office & Factory:	B-23, Industrial Estate, Rourkela 769 004 Tel : 3114/3937 Grams: Drinko
3.	M.M. and Co., Office & Factory:	B-30, Industrial Estate, Cuttack 753 010 Orissa Tel : 24494 (office) 22274 (resi) Cable : Ememco Telex : 0676-238 ALFA In
4.	Orissa Pump & Engg Co. Ltd. Orissa Small Industries Corporation Ltd., Barbati Stadium, Cuttack 753 005 Tel : 20818 Telex : 0676-226 OSIC IN	B-9 New Industrial Estate Jagatpur 754 021 Cuttack, Orissa

RAJASTHAN

1.	Dees Pistons Pvt. Ltd. Office & Factory:	A-407/A road No. 14, Vishwakarma Industrial Area, Jaipur 302 013. Tel : 832583
2.	Rajasthan State Agro Industries Corpn. Ltd., Office & Factory:	Agricultural Implements Factory Jhotwara, Jaipur 302 006 Tel : 68361
3.	Varun Enterprises Office & Factory	17-18-19 Parvati Nagar Tank Fatak Jaipur 302015 Rajasthan Tel : 75627

TAMIL NADU

1.	Indira Engineering Corporation 5/18, Veerakeralam, Coimbatore 641 007 Tamilnadu Tel : 40572 Grams : INDECOR	C-25 Private Industrial Estate, Coimbatore 641 021 Tel : 86572

2. Richardson & Cruddas (1972) Ltd,
(A Govt. of India undertaking)
No.5, Cenotaph Road,
Teynampet,
Madras 600 018
Tel : 456805/469685/458851
Cable: Iron Works
Telex : 041-7128 INSI

68 E/69D,
SIDCO Industiral Estate,
Ambattur,
Madras 600 058
Tamil Nadu.
Tel : 654111, 654114

2. Tamil Nadu Small Industries
Corpn. Ltd. (TANSI)
No.1 Whites Road,
Madras 600 014
Tel : 82161
Grams : Tansi
Telex : 041-7496 INSI

Tansi Pump Unit,
C-14, Industrial Estate,
Ambattur, Madras 600 058.
Tamil Nadu
Tel : 652351

Tansi Tool & Engg. Works
Industrial estate,
Ariyamangalam,
Trichy 620 010
Tamil Nadu
Tel : 25479

UTTAR PRADESH

1. Ajay Indl. Corpn
4561 Deputy Ganj
Gadar Bzar
Delhi 110 006
Tel : 512204/524366/533633

Site no. IV
20/11 Sahibabad Indtl. Area,
Uttar Pradesh

Tel : 736206

2. Bharat Enterprises,
A 123, Inderpuri,
New Delhi 110 012
Tel : 5719154

B-10, Sector VI,
Noida 201 301,
Uttar Pradesh
Tel : 89 - 27928

3. Inalsa Pvt. Ltd.
Surya Kiran
19, Kasturba Gandhi Marg,
New Delhi 110 001
Tel : 3314214

42-B2 Rajinder Nagar
Near Mohan Nagar,
Ghaziabad,
Uttar Pradesh.
Tel : 866427

WEST BENGAL

1. Bhagirathi Jute and Holdings
Pvt. Ltd.
Office & Factory:

Haryana House,
57 E, Ballygunge Circular Road,
Calcutta 700 019
Tel : 75-4335, 75-6159

LIST OF MANUFACTURERS FOR INDIA MARK III (VLOM) HANDPUMPS AND SPARE PARTS (SUPPLIED TO UNICEF)

ANDHRA PRADESH

	OFFICE	FACTORY
1.	Balaji Industrial & Agricultural Castings, 4.3-140, Hill Street, Secunderabad 500 003 (Andhra Pradesh) Tel : 70883 Grams : BOREPUMPS	Plot No. 16, Indl. area Balanagar, Hyderabad 500 037 (Andhra Pradesh) Tel : 262284 Tlx : 0425-6866 BIAC
2.	Balaji Industries & Engg. Corpn, 4-3-74 Hill Street, Gchasmandi, Secunderabad 500 003 Andhra Pradesh Tel : 77698 Grams : WATER PUMPS	Road No.3, Satellite Industrial Estate, Balanagar, Hyderabad 500 037 (Andhra Pradesh) Tel : 262790
3.	Meera & Ceiko Pumps (P) Ltd., 4-3-161, Hill Street, Ranigunj, Secunderabad 500 003 Andhra Pradesh Tel : 76831 Grams : CEICO	1-7-1054, 1054/1 Indl. Area. Azamabad Hyderabad - 500 020 Tel: 865131, 867098

DELHI

1.	Inalsa (P) Ltd, Surya Kiran, 19, Kasturba Gandhi Marg, New Delhi 110 015 Tel : 3314214 Telex : 3165063 INA	9/51, Kirti Nagar, Industrial area, New Delhi 110 001 Tel : 533132, 533327
2.	Murti Enterprise Office and Factory:	A-125 Group Industiral Area, Wazirpur Delhi 110 052

KARNATAKA

1. Karnataka Water Pumps (P) Ltd.
   20/1 First Floor
   Silver Jubilee Park Road,
   Bangalore 560 002
   Karnataka
   Tel : 228882

   No. 13 B&C
   Attibele Industrial Area
   Neralur Post, Anekal Taluk,
   Bangalore Dist. Karnataka

ORISSA

1. M.M. & Company
   Office and Factory:

   B-30 Industrial Estate,
   Cuttack 753 010
   Orissa
   Tel : 24494

TAMIL NADU

1. Richardson & Cruddas Ltd.
   (A Govt of India Undertaking)
   No.5 Cenotaph Road,
   Teynampet,
   Madras 600 018
   Tel : 456805/459685
   Telex : 041-7128
   Grams : IRONWORKS

   68E/69D SIDCO Indl. Estate,
   Ambattur, Madras 600 058
   Tel : 654111, 654114

2. Tamilnadu Small Industries
   Corporation Ltd (TANSI)
   1, Whites Road, Madras 600 014
   Tel : 82161
   Grams : TANSI
   Telex : 7496 INSI

   TANSI Pump Unit,
   C-14 Industrial Estate,
   Ambattur,
   Madras 600 058
   Tel : 652351

UTTAR PRADESH

1. Ajay Indl. Corporation
   4561 Deputy Ganj Gardar Bazaar,
   Delhi 110 012
   Tel: 524366, 533663

   Site No. IV
   20/11 Sahibabad Indtl Area,
   Uttar Pradesh
   Tel: 736206

2. Inalsa (P) Ltd.
   Surya Krian
   19, Kasturba Gandhi Marg,
   Naw Delhi 110 001
   Tel : 3314214
   Telex : 3165063 INAL

   42-B2 Rajinder Nagar
   Near Mohan Nagar
   Ghaziabad, Uttar Pradesh
   Tel : 866427

LIST OF MANUFACTURES FOR DIRECT ACTION HANDPUMP (TARA) AND SPARE PARTS (SUPPLIED TO UNICEF)

	OFFICE	FACTORY
1.	Ajay Indl. Corporation 4561 Deputy Ganj, Gadar Bazaar, Delhi 110 012 Tel : 524366, 533663	Site No. IV 20/11 Sahibabad Indtl Ave. Uttarpradesh Tel: 736206
2.	Inalsa (P) Ltd. Surya Kiran 19, Kasturba Gandhi Marg, New Delhi - 110 001. Tel : 3314214 Telex : 3165063 INAL	9/51 Kirti Nagar, Industrial Area, New Delhi 110 015 Tel : 533132, 533327

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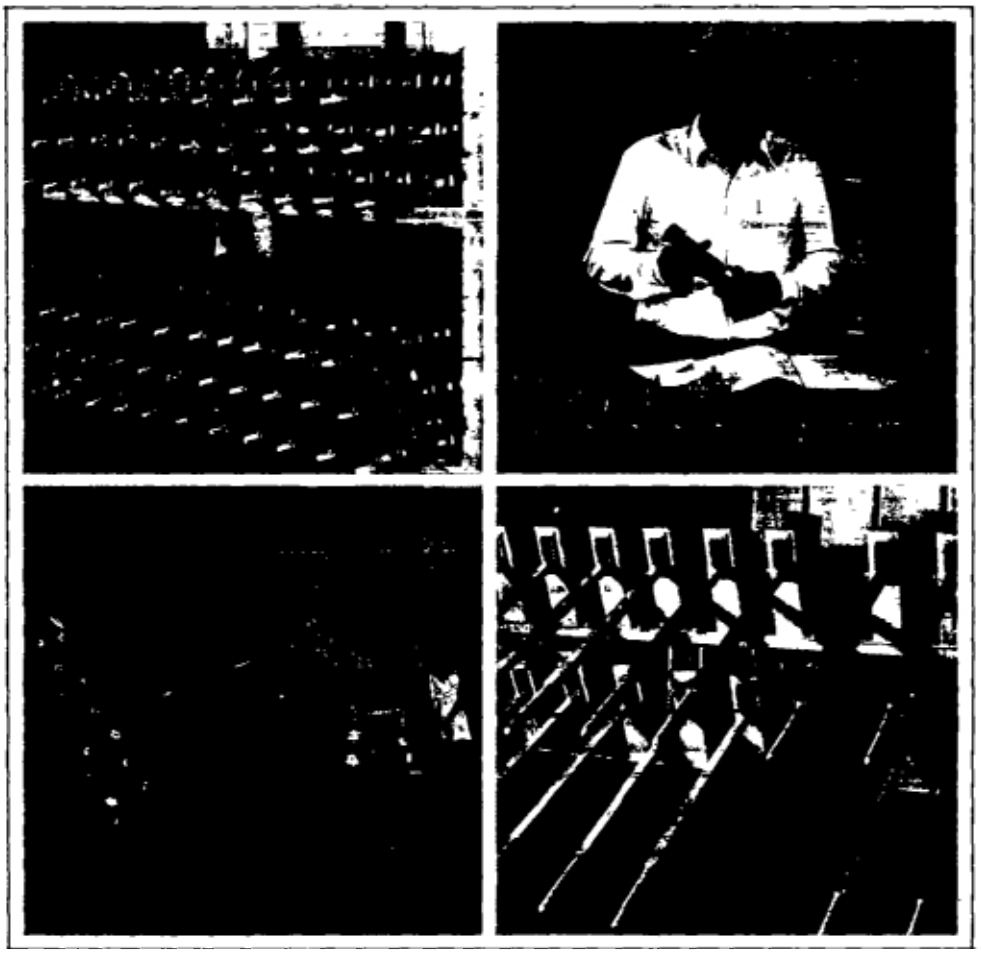
304/305 ANNA SALAI, TEYNAMPET, MADRAS - 600 018
TAMIL NADU
INDIA

This manual is produced on behalf of WES section, UNICEF India country office by S G S INDIA LTD., MADRAS, for the purpose of conducting training programmes on Quality Control Procedures of Hand Pumps. The Views expressed in this manual do not necessarily reflect those of either organisation.



unicef

United Nations Children's Fund