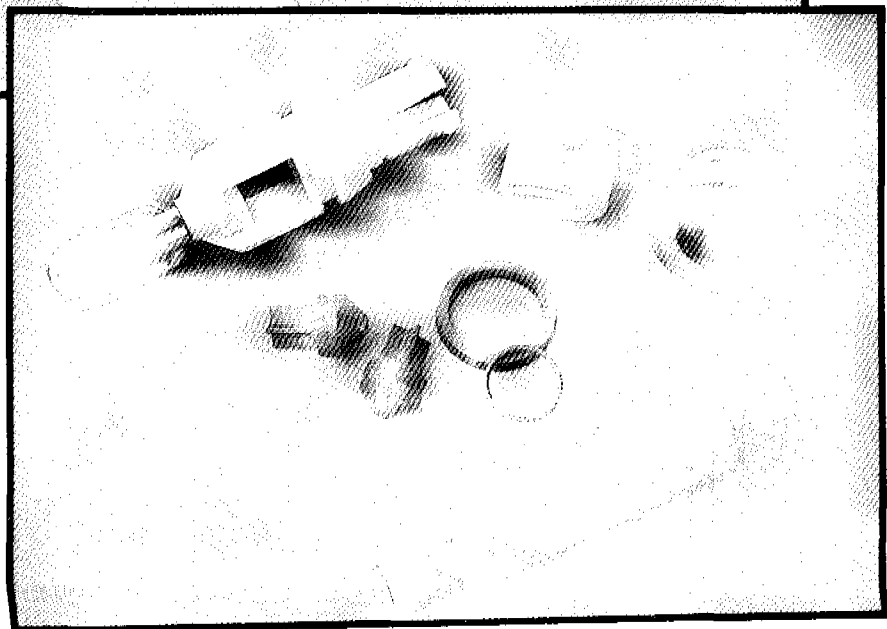
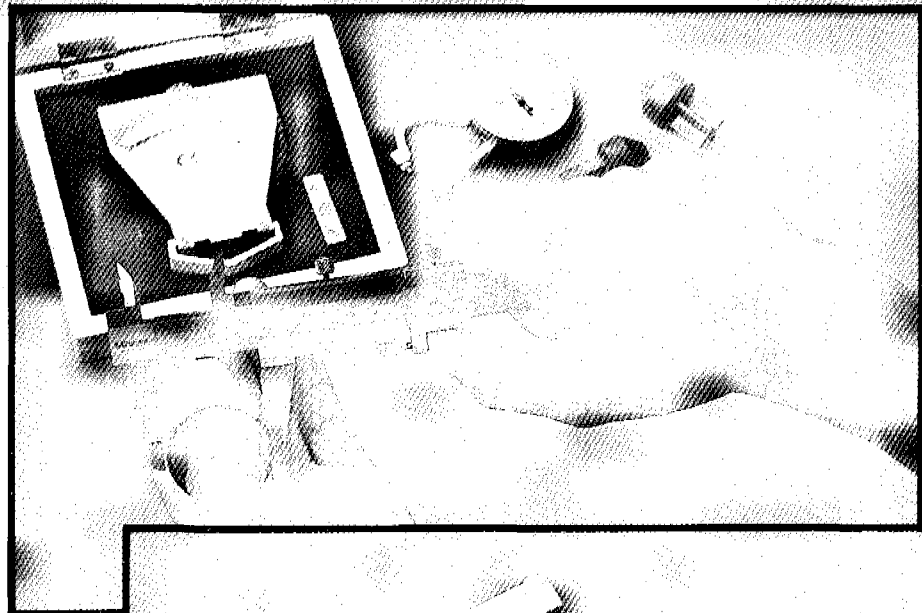

Guidelines For Quality Control And Quality Assurance Of Afridev Handpump



GUIDELINES FOR QUALITY CONTROL AND QUALITY ASSURANCE OF AFRIDEV HANDPUMP

These guidelines cover various aspects of Quality Control and Quality Assurance of the Afridev Handpump.

This document results from work carried out for several years by the UNDP/World Bank Water and Sanitation Program in partnership with SKAT, manufacturers and inspection agencies in several countries. The target group includes manufacturers, quality assurance agencies and purchasers.

Suggestions for improvements and requests for further information are welcome, and should be sent to SKAT at the address given below.

Edition: SKAT/HTN Publication, 1995

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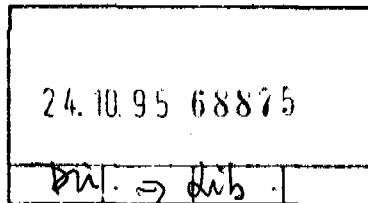
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To all Promoters,
Manufacturers and Purchasers
of Afridev Handpumps

our ref: F9350-AFRIDEV-EB
your ref:



11. October 1995

Subject: Guidelines For Quality Control And Quality Assurance

Dear Colleague,

the Guidelines for Quality Control and Quality Assurance of Afridev Handpumps are now finished. Therefore we are pleased to enclose a copy of the document. The QC/QA Guidelines are based on the Afridev Handpump Specification Revision 2-1994. Please note that the Afridev pump is defined by the specification and the QC/QA guidelines are a supporting document to the specification.

We hope that this latest addition to the range of Afridev documents will help to maintain a high quality level of the pump.

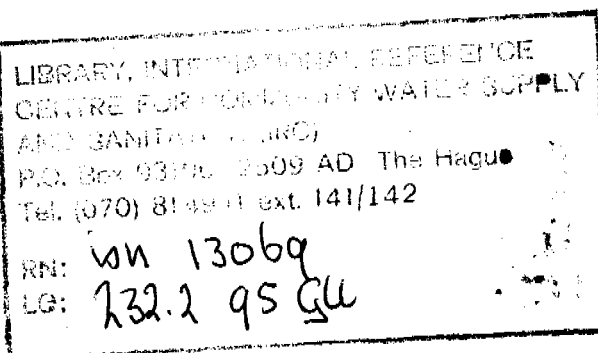
Yours sincerely

Erich Baumann
Handpump Technology Network
Secretariat - SKAT

Enclosure: mentioned

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1. About the Guidelines

The Afridev handpump is produced in several developing countries. The quality, however, varies from manufacturer to manufacturer. While most of the quality related problems can be attributed to lack of internal quality control mechanism at the factory level, others can be attributed either to inadequate procurement procedures or insufficient understanding of the quality assurance requirements by inspection agencies.

These guidelines have been developed with a view to:

- a. help manufacturers in establishing and operationalizing internal quality control mechanism at the factory level.
- b. help in minimizing differences in the interpretation of the product conformity requirements by manufacturers and inspection agencies.
- c. help buyers in formulating procurement procedures while ordering for handpumps and spare parts.

This document covers main physical and chemical properties of raw materials and bought out items, internal quality control procedure from raw materials to finished product, prerequisites for quality assurance, procedure for the pre-delivery inspection and procedure for the consignee end inspection.

This document should be read with the following SKAT/HTN documents: (a) Afridev Handpump Specification Revision 2 - 1994; (b) Afridev Injection Moulding Manual; (c) Afridev Rubber Moulding Guidelines; and (d) Packaging Guidelines for Afridev.

In case of any discrepancy in this document, the details given in the SKAT/HTN - Afridev Specification Revision 2 - 1994 shall prevail.

2. Quality Control and Quality Assurance in Handpump Context

The quality control and quality assurance in the context of the Afridev handpump are described below.

Quality Control: The term 'Quality' literally means "degree of excellence". The term 'Quality' in the handpump context can be defined as "Totality of features and characteristics of a handpump that display its ability to satisfy stated and implied needs". In other words it should perform as per defined performance parameters like discharge, operating effort, reliability and complete interchangeability of parts.

The manufacturing of a handpump involves many interrelated activities. In order to build quality in a product, the manufacturing activities have to be performed in a controlled manner. This system of controlling the activities to produce a quality product is called Quality Control.

Quality Control process comprises a set of well defined operational techniques and procedures that are used to fulfil the requirements for quality. They are aimed both at monitoring a process through stage inspections and eliminating causes of unsatisfactory performance at relevant stages to ensure consistent conformance of a product to specification and also economy in production.

In the context of a handpump, Quality Control is that system of inspection and process control which a pump manufacturer is required to formulate to minimize variation from the required pump specification to achieve consistent quality and interchangeability of pump parts.

Quality Assurance: The quality assurance is a process which assures a buyer that the product being purchased conforms to specification and requirements given in the purchase order. This process comprises a number of stages namely pre-qualification of a supplier, formulation of a technically and commercially clear purchase order, pre-delivery inspection of product at the manufacturer's works and inspection of goods at the consignee's end.

The pre-qualification and pre-delivery inspection are generally carried out by an independent inspection agency (IIA) on behalf of a buyer. There are well defined norms and practices for carrying out pre-qualification survey, selection of manufacturers and pre-delivery inspection. The inspection at the consignee's end is generally carried out by the consignee to ensure that goods received fully conform to the requirements given in a purchase order.

3. About the Afridev Handpump

The Afridev deepwell handpump has been developed with the support from donors, government agencies, research organizations and private companies. Available in public domain, the design has aimed to adopt the Village Level Operation and Management of Maintenance (VLOM) concepts of easy to maintain, low-cost maintenance and suitability for manufacture in developing countries. Several thousand Afridev handpumps are now in operation in many countries in Asia and Africa.

3.1 DESCRIPTION

It is a reciprocating type deepwell handpump (*see Figure 1*) suitable for lifting water from a depth of 10 - 45 meters from boreholes with casing size of nominal bore 100mm, 115mm, 127mm, 150mm and 200mm (4", 4.5", 5", 6" and 8"). The pump can also be installed on a dug well. However, suitable provision must be made for locating the pump stand and supporting the rising main to prevent its swinging.

This handpump has several novel design features like eye and hook pump rod joints which are easy to dismantle and join without the use of a tool, easy to replace plastic bearing bushes, extractable plunger and foot valve made of modern engineering plastics, adjustable handle and non-corrodible below ground components.

The pump assemblies can be broadly divided into 1) Above ground parts, 2) Below ground parts.

i) Above Ground Parts

- a) Stand Assembly;
- b) Pump Head Assembly with Cover;
- c) Handle Assembly with Fulcrum Pin and Bearing Sets; and
- d) Rod Hanger Assembly with Hanger Pin and Bearing Sets.

ii) Below Ground Parts

- a) Cylinder Assembly Including Plunger and Foot Valve;
- b) Pump Rods Assembly with Rod Centralizer;
- c) Rising Main Pipe with Pipe Centralizer.

The SKAT Afridev Handpump Specification was first published by Swiss Center for Development Cooperation in Technology and Management (SKAT), Switzerland, in 1989 followed by the first revision in the year 1991 and the second revision in the year 1994. For more constructional details please refer to the SKAT/HTN - Afridev Handpump Specification Revision 2 - 1994.

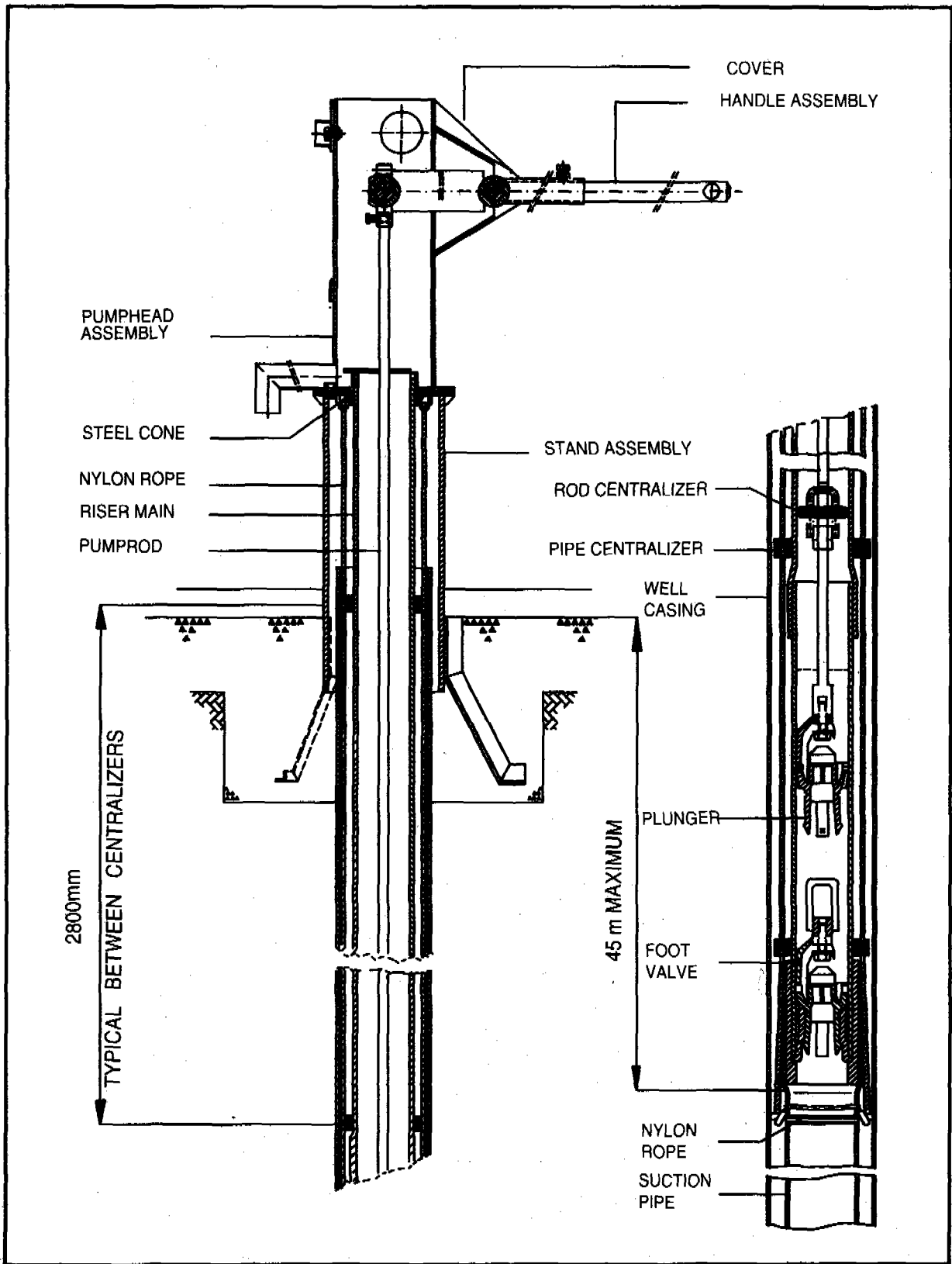


FIGURE NO 1
(NOT TO SCALE)

3.2 ASSEMBLY OPTIONS AND RATIONALE FOR SELECTION

Options are available for certain assemblies. The buyers can select the pump with these options depending on the field requirements. The rationale for selection of options is discussed below.

- i. The pump head assembly is available with spout length of 512mm or 232mm. The pump head assembly with longer spout is recommended for use with concrete pump apron. The shorter spout is recommended for use with stand assembly options G-00a and G-00b.

Pump head is also available with three options of spout direction i.e., (a) Standard (opp. to handle) A-00, (b) Spout pointing to right A-00a, (c) Spout pointing to left A-00b.

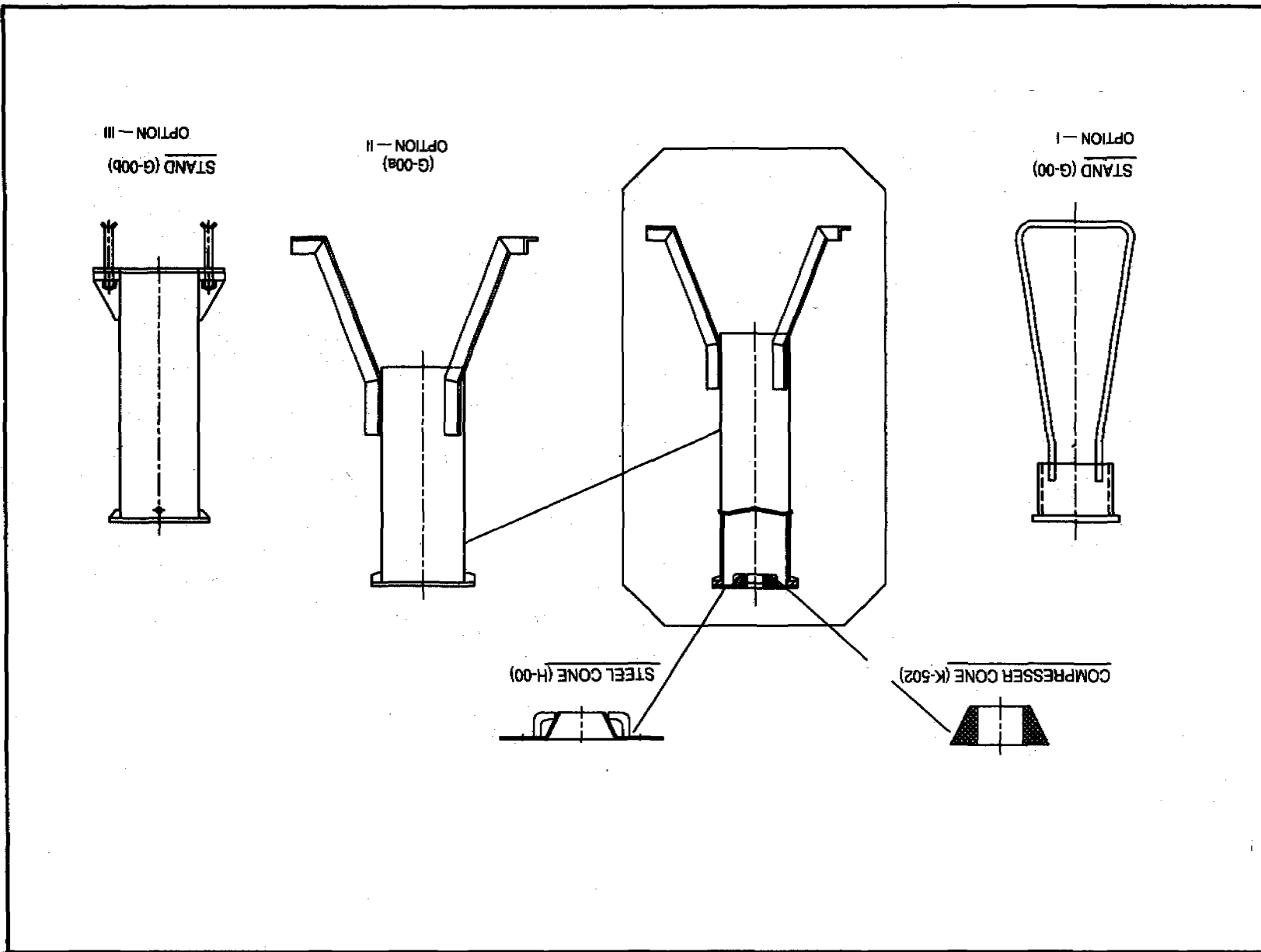
- ii. Stand assembly are available with three options (*see Figure 2*).
 - a. Model G-00: Suitable for pump installation with concrete apron.
 - b. Model G-00a: With three legs welded which are grouted in cement concrete.
 - c. Model G-00b: This is the flange connected version used with foundation bolts grouted in concrete.
- iii. Pump Rods: Pump rods are available in three options (*see Figure 3*).
 - a. Carbon Steel and Galvanized - Fabricated eye and hook versions (J-00).
 - b. Carbon Steel and Galvanized - Forged eye and hook versions (J-00a).
 - c. Stainless Steel (AISI 304/316) - Forged eye and hook versions (J-00a).

Selection is to be made based on the end use. Carbon Steel fabricated/ forged version pump rods are recommended for use in boreholes having non-corrosive water. Stainless steel pump rods are recommended for use in boreholes with corrosive water where pH value is below 6.5. Stainless Steel AISI - 316 is recommended where corrosive conditions are severe.

- iv. Riser main centralizers are available in five options. Selection to be made depending on the casing pipe diameters (100, 115, 127, 150 and 200mm).
- v. Two types of spanners are available.
 - a. Foldable spanner (N-00) with more leverage while loosening.
 - b. Spanner (N-00a) fixed length model.

Either of the above can be used.

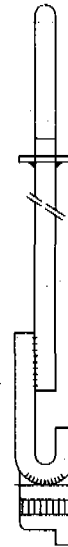
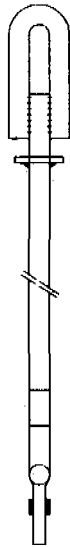
STAND ASSEMBLY OPTIONS
FIGURE NO 2



PUMP ROD

OPTION - I

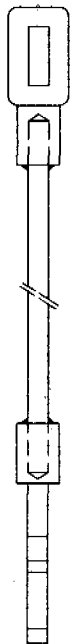
PUMP ROD
(WITH FABRICATED EYE
AND HOOK)
MATERIAL:
CARBON STEEL
GALVANIZED



PUMP ROD (WITH FORGED EYE AND HOOK)

OPTION - II
CARBON STEEL
GALVANIZED

OPTION - III
STAINLESS STEEL



PUMP ROD - OPTIONS

FIGURE NO 3

4. Important Parameters of Raw Materials and Bought Out Items

For ready reference, the physical and chemical properties of raw materials and bought out items are summarized in *Tables 1 and 2*. For more information, the reader is advised to refer to relevant specifications.

Table 1 - Important Parameters of Raw Materials

S. NO.	MATERIAL	CHEMICAL & PHYSICAL PROPERTIES	EQUIVALENT REFERENCE STANDARDS
1.	Carbon Steel a) Stock items (Plates, Sections, Bars)	Chemical Properties as per ISO 630 Carbon : 0.21% (max) Sulphur : 0.065% (max) Phosphorus : 0.065% (max) Nitrogen : 0.01% (max) Physical Properties Tensile Strength : 340-470N/mm ² Yield Strength : 235N/mm ²	DIN 17100 ST 37-2 IS 2062 SKAT/HTN Afridev Handpump Specification
	b) Cold Rolled Sheets	Chemical Properties as per IS 513 Grade: Deep Drawing (DD) Carbon : 0.10% (max) Manganese : 0.45% (max) Sulphur : 0.035% (max) Phosphorus : 0.035% (max) Physical Properties Tensile Strength : 270-370 MPA Yield Strength : 250 MPA (max) Elongation : 32% (min) Hardness : HRB 65	
	c) Pipes	Chemical Properties as per DIN 17100, ST-37-2 Sulphur : 0.060 (max) Phosphorus : 0.060 (max) Carbon : 0.25 (max) The maximum permissible variation of sulphur and phosphorus shall be 0.005% Physical Properties Tensile Strength : 250-540N/mm ² Yield Strength : 175N/mm ²	SKAT/HTN Afridev Handpump Specification ISO 4200 DIN 2458 DIN 1615 IS 1239
	d) Bright bars	Chemical Properties Same as in 1.a (Carbon steel). Physical Properties as per IS 9550 Grade : 2 Tensile Strength : 470-690 MPA Elongation : 13% (min)	DIN 668 IS 9550

S. NO.	MATERIAL	CHEMICAL & PHYSICAL PROPERTIES	EQUIVALENT REFERENCE STANDARDS
	e) Forgings	<p>Chemical Properties as per IS 2004 Class 3.</p> <p>Carbon : 0.25 - 0.35%; Silica : 0.15 - 0.35%; Manganese : 0.60 - 0.90%; Sulphur : 0.04% (max) Phosphorus : 0.04% (max)</p> <p>Physical Properties</p> <p>Tensile Strength : 490N/mm²(min) Yield Strength : 270N/mm²(min) Elongation : 21% (min) Hardness : 120 BHN (min) Macrostructure : The macrostructure shall meet the following requirements — (a) Macrostructure shall be free from harmful porosity, slag inclusions, rolled in scale, coarse dendrites, harmful segregation and cracks, (b) The flow lines shall follow the contour of the forging. Flow lines shall not cut the contour.</p>	
2.	Stainless Steel a) Bright drawn rods (AISI 304)	<p>Chemical Properties as per DIN 17400-1.4301</p> <p>Carbon : 0.08% (max) Chromium : 18% - 20%; Nickel : 8.00 - 12%; Silicon : 1.00% (max) Manganese : 2.00% (max); Phosphorus : 0.045% (max); Sulphur : 0.03% (max)</p> <p>Physical Properties</p> <p>Tensile Strength : 590 N/mm² (annealed) Yield Strength : 240 N/mm² (annealed)</p>	IS 6603 SKAT/HTN Afridev Handpump Specification
	b) Bright drawn rods/bars (AISI 316)	<p>Chemical Properties as per DIN 17400 - 1.4401</p> <p>Carbon : 0.08% (max) Chromium : 16.00 - 18.50% Nickel : 10.50 - 14.00% Molybdenum : 2.00 - 2.50%</p>	IS 6603 SKAT/HTN Afridev Handpump Specification

S. NO.	MATERIAL	CHEMICAL & PHYSICAL PROPERTIES	EQUIVALENT REFERENCE STANDARDS
		Silicon : 1.00% (max) Manganese : 2.00% (max) Phosphorus : 0.045% (max) Sulphur : 0.03% (max) Physical Properties Tensile Strength : 700 N/mm ² Yield Strength : 450 N/mm ² (0.2%)	
	c) Forgings AISI 304	Chemical Properties Same as 2.a (stainless steel rod) Physical Properties as per DIN 17440 - 1.4301 Tensile Strength : 500-700 N/mm ² Yield Strength : 195 N/mm ² Elongation : 40% (min)	IS 6603
	d) Forgings AISI 316	Chemical Properties Same as 2.b (stainless steel rod) Physical Properties as per DIN 17440 - 1.4401 Tensile Strength : 510-710 N/mm ² Yield Strength : 205 N/mm ² Elongation : 40% (min)	IS 6603

Table 2 - Important Parameters of Bought Out Items

S. NO.	MATERIAL	CHEMICAL & PHYSICAL PROPERTIES	EQUIVALENT REFERENCE STANDARDS
1.	Brass Liner	Chemical Properties as per DIN 17660 - 2.0321:CuZn37 Copper : 62 - 64% Aluminum : 0.03% (max) Nickel : 0.3% (max) Lead : 0.1% (max) Iron : 0.1% (max) Others : 0.1% (max) Tin : 0.1% (max) Zinc : remainder	
		Chemical Properties as per DIN 17660 - 2.0460:CuZn 20 Al2 Copper : 76.0 - 79.0% Aluminum : 1.8-2.3% (max) Nickel : 0.1% (max) Lead : 0.07% (max)	

S. NO.	MATERIAL	CHEMICAL & PHYSICAL PROPERTIES	EQUIVALENT REFERENCE STANDARDS
		Iron : 0.07% (max) Arsenic : 0.02- 0.035% Magnesium : 0.005 Phosphorus : 0.01 Manganese : 0.1 Total impurities : 0.1% (max) Zinc : remainder Physical Properties as per DIN 17671, part I & II Hardness : 80-110 H.B. Tensile Strength : 330 N/mm ²	
1(a)	Brass Liner	Chemical Properties as per DIN 17660 - 2.0470:CuZn 28 Sn1 Copper : 70.0 - 72.5% Zinc : remainder Arsenic : 0.02 - 0.035% Iron : 0.07% (max) Manganese : 0.1% (max) Nickel : 0.1% (max) Tin : 0.9 - 1.3% Phosphorus : 0.01% (max) Lead : 0.07% (max) Others : 0.1% (max)	IS 407
2.	Stainless Steel Sleeve	Chemical & Physical Properties Same as 2.A. Stainless steel (bright drawn)	IS 6603
3.	Components made from Polyamide (PA 6.6 NC) and Polyacetal (POM NC Homopolymer)	Tensile test: Destructive test (9500 Newton) on a few pieces per production batch, and non-destructive test (5000 Newton) on all plunger/ foot valve assemblies Moulding Weight : Compare with reference weights Moulding Colour : Discolouration not desirable Moulding Surface Finish: Wrinkles, pitting not allowed. Surface finish to be Smooth Moulding Sectioning : Pits, voids and discontinuities not acceptable	SKAT/Afridev Injection Moulding Manual
4.	Components made from Nitrile Rubber	Chemical Properties as per BS - 2751 Compound No. BA70 & BA80 Acrilo Nitrile : 28% Mooney viscosity : 45	IS 8683 SKAT/HTN Afridev Rubber guidelines

S. NO.	MATERIAL	CHEMICAL & PHYSICAL PROPERTIES	EQUIVALENT REFERENCE STANDARDS
		Physical Properties Shore Hardness : 70 +5 or -4 (BA 70) (Scale A) : 80 +5 or -4 (BA 80) Tensile Strength : 12.6MPA(min) Compression set for 24 hrs at 70° C : 20% (max) Elongation at break : 150% (min) break Volume change for 24 hours at 40° C : -0%+25% (max) Resistance to low Temp. in °C temp. : 20 for A-70 : 15 for A-80 at which the stiffness shall not exceed 70Mpa	
5.	uPVC pipes	Chemical Properties The material shall contain substantially of polyvinyl chloride. Effect on Water : Lead (1st Extraction) : 1.00mg/lt Lead (3rd Extraction) : 0.30mg/lt Dialkyltin : 0.02mg/lt Cadmium (for all the three extractions) : 0.001mg/lt Mercury (for all the three extractions) : 0.001mg/lt Other toxic substances (3rd extraction) : 0.01mg/lt	DIN 19532 DIN 7748 part 1 DIN 8061 DIN 8062 IS 4985 IS 12235
6.	Solvent Cement	1. Common solvents used: THF, MEK, Cyclohex. 2. Cements containing toluene and polysterene not to be used* 3. Polymer employed should not contain any plasticisers or any reground material* 4. Recommended polymer content in solvent cement is 20-30%* 5. Standard for testing methods: ISO-7381-1, ASTM D2-564, BS 5350-P.B2 6. Packing: Recommended size for use in the field, 250ml in metal tins or tubes. Packing should be sealed air-tight and opaque	ISO 7387-1 (Testing methods)
7. a)	Fasteners Carbon Steel	Chemical and Physical Properties Same as Table 1 - 1a above	ISO 898 DIN 17100 IS 2062
b)	Stainless Steel	Chemical and Physical Properties Same as Table 1 - 2a above	DIN 17400 IS 6603
c)	Brass		DIN 17660 IS 407

* Recommendations based on CRL's report No.A.9047 on "uPVC R/D Solvent Cement", October 1994.

1 Mpa = 1 N/mm² = 1MN/m² = 0.1020 Kgf/mm²

5. Internal Quality Control

Internal Quality Control (IQC) is essential for achieving overall quality of the end product. The quality control activities are performed by the manufacturer as part of the Internal Quality Control System. The quality control activities can be divided into the following three stages:

- (a) Inspection of raw materials and bought out items;
- (b) Stage inspection during production;
- (c) Inspection of main assemblies; and
- (d) Final inspection and marking.

The IQC system should have verifiable records of various activities like inspection of raw materials, bought outs, components and assemblies at various stages of manufacture, periodical checks on gauges, measuring instruments, templates, jigs and fixtures, etc.

If a shop floor inspector observes a deviation/non-conformance during inspection of raw materials, bought out materials, components and assemblies the concerned goods should be immediately segregated and matter referred to the production in-charge. The defect should then be analyzed to ascertain whether a deviation can be allowed, or a corrective action is required or the material is to be rejected totally. The deviations if any granted or corrective action taken is recorded in a Deviation Report as per format given in *Annex I*. In case, the correction is not possible, a rejection note should be issued and concerned material should be withdrawn from factory premises. In a nutshell, to make the IQC system effective transparency in its activities is a must.

A number of dimensional checks and performance tests need to be carried out during the various stages of internal quality control.

To check dimensional conformance of raw materials, components and assemblies at various stages of pump manufacture, measuring instruments and gauges are required. The list of measuring instruments and standard gauges are given in *Annexes II and III*. In some cases it is easy to check the dimensional conformity by using templates. Templates do not give the exact dimension but it indicates whether overall profile of a component is within permissible limits. Templates are very useful for checking parts during production or when inspection is to be carried out on large number of components. For certain dimensions/configurations, it may be necessary to use special gauges. The list of templates and special gauges is given in *Annex IV*.

To carry out some specific tests on certain assemblies like spin welding of plunger/foot valve body, leakage and discharge test on cylinder assembly, special testing equipments are required. These tests are carried out before final assembly and clearance. The list of testing equipment is given in *Annex V*.

5.1 PROCEDURE FOR INSPECTION OF RAW MATERIALS AND BOUGHT OUT ITEMS

The following procedure shall be followed for the inspection of incoming raw materials and bought out items.

5.1.1 General Checks for Raw Materials and Bought Out Items

Following general checks are required to be carried out for all incoming materials.

- i. Verification of the quantity and completeness of material as per purchase order and delivery note.
- ii. Visual inspection is to be carried out for any damages and material defects.
- iii. Verification of test certificates furnished along with the material for conformity with standards. In case, a test certificate is not furnished or there is a discrepancy in a test certificate, sample(s) may be drawn for testing the material in an independent laboratory for conformity to specification(s).
- iv. Check dimensions as per specification drawings and record observations.
- v. If material is found conforming to the purchase order specification both in dimension and physical/chemical parameters the material shall be marked (OK) and taken into stock. In case, material is found not conforming, it is segregated and the supplier is immediately informed of the discrepancy. This segregated (rejected) material shall not be taken into stock.
- vi. The material shall be issued to the factory for further processing only after it has been accepted by the inspection department.
- vii. If the vendor is a regular supplier with consistent good track-record, suitable sampling plan can be developed for incoming material inspection. However, if the vendor is new, one hundred percent inspection should be carried out till such time that the reliability and consistency of a supplier is established.

5.1.2 Specific Checks for Raw Materials and Bought Out Items

The specific inspection checks to be carried out on raw materials and bought out items are given in *Tables 3 and 4*. These checks are based on the nature of materials procured. These tables give details like the type of material, visual and dimensional checks, verification of marking and other specific tests to be carried out.

Table 3 - Specific Inspection Checks for Raw Materials

S. NO.	MATERIAL	VISUAL CHECKS 100%	VERIFICATION OF MARKINGS 100%	DIMENSIONAL CHECKS MIN 10% RANDOM SAMPLE	CHEMICAL, PHYSICAL & OTHER TESTS *
1.	Carbon Steel/ Stainless Steel a) Hot rolled (plates and bars)	Surface flaws, Lamination, Roughness/ imperfect edges, Transit damages	Cast Number, Manufacturer's name/Trade mark, Grade of steel (On material)	Dimensional checks as per purchase order specifications/SKAT drawings	Brinell hardness, impact test, bend test
	b) Cold rolled sheets	Flatness, Squareness of edges, Scales, Rust, Pitting Blisters, Lamination, Porosity, Cracked/torn edges, Transit damages	Manufacturer's name/identification, Quality designation, Product dimensions, Cast No/identification for date of despatch	Thickness $2 \pm 0.12\text{mm}$	Bend Test, Cupping Test
	c) Pipes	Uniform finish on surface; Cracks, Blow holes, Squareness of end-faces, Straightness of the tube, Transit damages	Manufacturer's identification colour code for Grade/Class on each tube, Lot No. on tags	Dimensions for NB 40mm pipe OD 47.9-48.8mm, thickness 3.3mm +0, -10% Dimensions for NB 50mm pipe OD 59.7-60.8mm, Thickness 4mm +0, -10%	
	d) Bright bars	Cracks, Seams, Grooves, Localized pitting, Tool/die scoring marks, Transit damages	Cast No., Heat Treatment batch No./identification No., Manufacturer's identification	Rod Dia 10mm +0, -0.09mm. Out of roundness 0.04mm (max), straightness 1.5 mm/running meter length	
	e) Forgings	Cracks, Profile formation, Scale pits, Burrs	Class of material, Batch No./Identification, Manufacturer's logo	Dimensions and Tolerances as per specifications given in the SKAT drawing	Verify test certificates for Microscopic test, Macroscopic test, Magnoflux test, ultrasonic test

Table 4 - Specific Inspection Checks for Bought Out Items

S. NO.	MATERIAL	VISUAL CHECKS 100%	VERIFICATION OF MARKINGS 100%	DIMENSIONAL CHECKS MIN 10% RANDOM SAMPLE	CHEMICAL, PHYSICAL & OTHER TESTS *
1.	Brass Liner	Cracks, Seams, Scales, Surface smoothness, Surface uniformity, Transit damages	Grade of material, Name of the Manufacturer/logo, Batch No.	I.D: 50mm + 0.3 Length: 700mm ± 2 Thick: 2mm ± 12.5% Chamfer, etc, as per SKAT drawing Smooth surface finish in the bore 0.4 µ Ra	Verify test certificate for Pneumatic, Drifting, flattening Mercurous Nitrate, Double bend tests, Surface smoothness in the bore
2.	Stainless Steel Sleeve	Cracks, Seams, Surface uniformity, Surface smoothness, Transit damages	Grade of material, Manufacturer's name /Logo, Batch No.	OD of Sleeve 38mm - 0.2 Thickness 1.5mm Length: 119mm - 0.2, 68mm + 0.2 ID of sleeve 47mm +0.1 OD 50mm ± 0.2 Length 109mm + 0.2/57.5mm + 0.2	Refer standard check with a magnet to confirm non-magnetic
3.	Plastic Components Bearing Inner (100) Bearing Outer (101)	Mould formation, Surface finish, Discontinuity in surface finish, Darker yellow patches, Surface colour uniformity, Sprues	Manufacturer's identification/logo Batch No., Month & Year of Manufacturing	Dimensions and its accuracy as per SKAT drawing 28.5±0.2 16+0/-0.2 6, 3.5+0.2 O.D.46.7± 0.1mm Bore dia.42.2 + 0.2mm	Tensile test at 5000 N to check spin welding Refer SKAT's guidelines on plastic components
4.	Stainless Steel Rods	Damages, Cracks, Material flaws, Bend etc.	Manufacturer's identification, Batch No., Month & Year of Manufacturing	Dimensions as per SKAT Drawings	Tensile, Elongation and hardness. Check with magnet for non-magnetic

S. NO.	MATERIAL	VISUAL CHECKS 100%	VERIFICATION OF MARKINGS 100%	DIMENSIONAL CHECKS MIN 10% RANDOM SAMPLE	CHEMICAL, PHYSICAL & OTHER TESTS *
5.	Rubber Components	Surface imperfections, Porosity, Voids inclusions flaw marks or faults	Batch No., Cast No. Month/Year of manufacture, Manufacturer's name/Trade mark, size and code	Dimensions as per SKAT drawing	Verify test certificates Refer SKAT's guidelines on rubber components
	Flapper K-500			Dia.80, dia.11 mm Thickness 6mm	
	Compression Cone K-502			Dia. 120. Dia. 61.5 ± 0.3mm Dimension 31 Angle 30° Shore hardness 70	
	Rod Centralizer K-504			Dia.48 ± 0.5mm Radius 24 Dimension 23 ±0.5 Slot 9.5 +0.5 x30 Shore hardness 80	
	Pipe Centralizer K-520			Int. dia.62.5 ±0.3 O.D.92/100/118/ 140/188 Hole dia.8 Dimension 3 Dimension 24 Shore hardness	
	Valve Bobbin 555			Dia.26 ± 0.1/18 ± 0.1 Lengh 40 ± 1/21.5 ± 0.2 Angle 30° Surfacc smooth on 30° Shore hardness 80	
	'O' ring L-557			Dia.44.2, dia.2 Shore hardness 70	
	'O' ring L-558			Dia.28, dia.2.5 Shore hardness 70	

S. NO.	MATERIAL	VISUAL CHECKS 100%	VERIFICATION OF MARKINGS 100%	DIMENSIONAL CHECKS MIN 10% RANDOM SAMPLE	CHEMICAL, PHYSICAL & OTHER TESTS *
	'U' seal L-556			Dia.50.8, dia.38 Dimension 7/6.1 Dia. 39.4/40 Shore hardness 80	
6.	uPVC Pipes	Fins, Surface smoothness, Groovings, Squareness of end faces, Chamfers Transit damages	Manufacturer's Name/ Trade mark, Outside dia., Class of pipe, Pressure rate, Batch No. (on each order)	O.D.; 63mm +0.3 -0 Thickness: 4.7mm + 0.7 or - 0mm other dimensions as per purchase order	Verify test certificates for Reversion Test, Stress relief test, Impact test, Internal Hyd. test
7.	Solvent Cement	Any damages and leakages	Verify Batch No., Brand name and Expiry date	Verify size of bottle/tube as ordered	Certificate for conformance as per P.O.
8.	Fasteners	Malformation of threads, Sharp edges or burrs, Uniformity of coating, Transit damages		Dimensional accuracy as per drawing/purchase order	

* Note: Physical and chemical test certificates to be obtained from the manufacturer.

If the manufacturer's certificate is not available a sample may be drawn and checked for physical, chemical and other properties as per relevant specification (s).

5.2 STAGE INSPECTION DURING PRODUCTION

In order to have effective control on quality, stage inspections are required to be carried out on components and assemblies. Manufacturers are advised to develop flow charts for all components and assemblies and carry out stage inspections covering all the items which are required for manufacturing the Afridev handpump. A typical manufacturing process flow chart for handle assembly indicating stage inspection is given in *Figure 4*.

When components are produced with the help of punch and die, Jigs and Fixtures, etc., the first piece or a small batch shall be checked for all the dimensions as per drawing. If it is found in conformance with the drawing, bulk production can be taken up.

To ensure repetitive accuracy in mass produced components and assemblies, it is economical to use special work holding and tool guiding devices. These devices will help in producing components with consistent dimensional accuracies which will ensure inter-

changeability of components during assembly. An indicative list of fixtures is given in Annex VI. Unless a component or assembly is accepted in the stage inspection it shall not be moved to the next stage for further processing.

5.2.1 Checks on Components and Sub-assemblies

The Tables 5 to 30 below give details of checks to be carried out on components and assemblies at various stages of production. These checks are generally carried out on a sample basis. The sampling plan can vary depending on the condition of tooling and skills of the operators. An indicative sampling plan could be as follows: 1st batch of 10 pieces at the start of the shift or whenever the tooling/operator is changed. If the 1st batch of 10 pieces is satisfactory, continue production and thereafter, 10% of the production batch to be checked at random at each stage of operation.

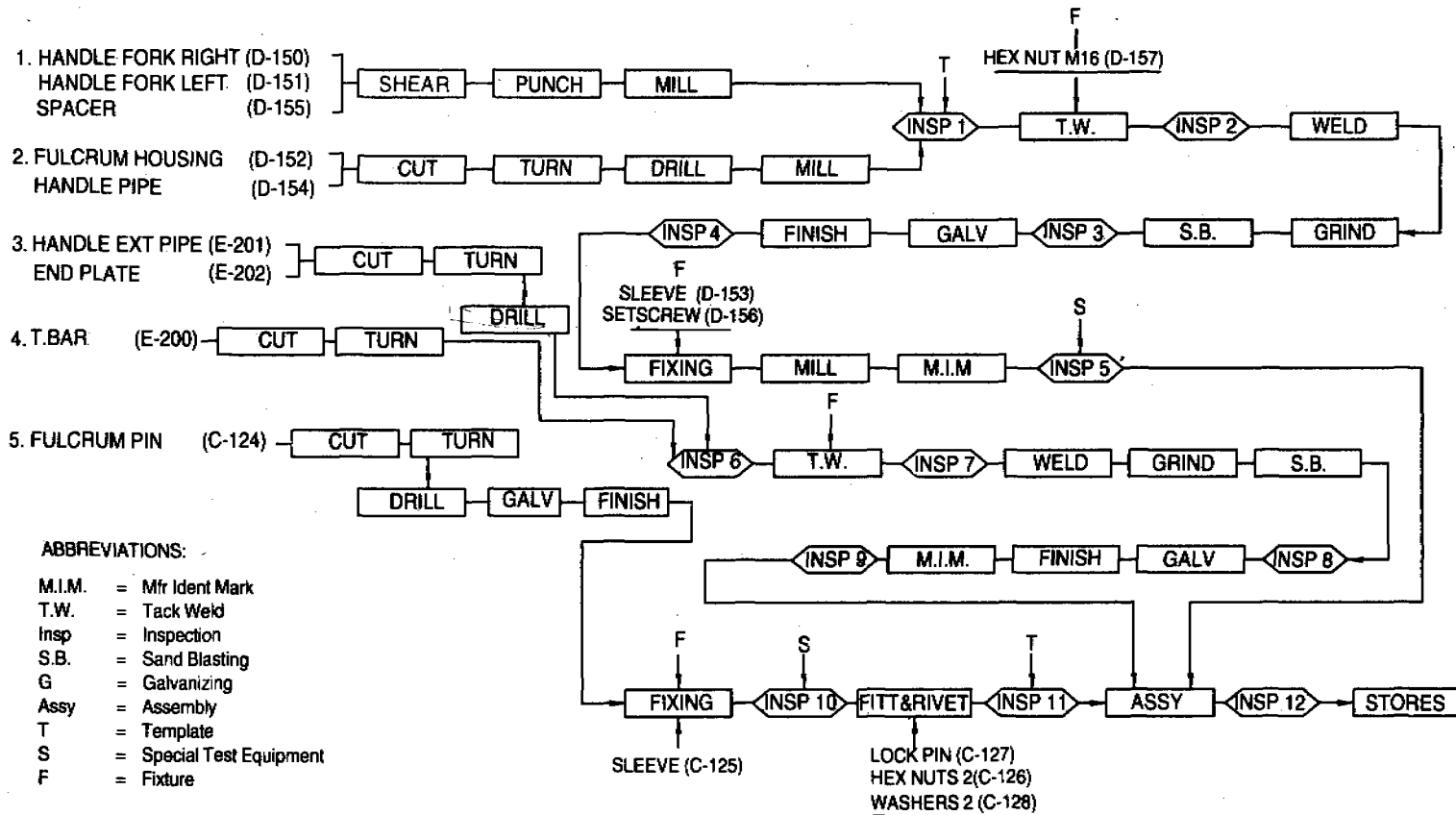
These check lists can be converted into production documents and used for inspection by the manufacturer. Deviations, if any, should be noted in the observation column. The production should be stopped whenever the deviations are beyond acceptable limits. Corrective action should be taken to rectify the process before starting the production again.

Table 5 - Pump Head Assembly A-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Spout A-16	Length 100 Angle 45° Length 580/300mm Dimension 44 + 1mm Dimension 5.5 +0.5mm Orientation of cutout	
Stage 2		Welding at 45° to form 90° joint Check Weld quality	
Stage 3	Base Flange A-10 Body A-12 Body 12b Right A-03a	Squareness of sides; Center distance of 70 & 90 for holes dia.13.5 w.r.t. to dia.87 Body Sizes and Position of holes dia.100, dia.18, dia.25, dia.50 and slot 10 R Body Sizes and Position of holes dia.100, dia.18, dia.25, dia.50 and slot 10 R Check position of hole Dia.50 and dia.18	

MANUFACTURING PROCESS FLOW CHART (E-00)

HANDLE ASSEMBLY FRONT (D-01) AND REAR (E-01) AND FULCRUM PIN (C-01)



A TYPICAL MANUFACTURING FLOW CHART

FIGURE NO 4

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	Body 12 Left A-03b	Body Sizes and Position of holes dia.100, dia.18, dia.25, dia.50 and slot 10 R Check position of hole dia.50 and dia.18	
	Stopper Plate A-15	Squareness of sides Dimension 160 Dimension 120.2 -0.3mm	
	Fulcrum Bracket side Plate A-14	Angle 30° Slot 16.5 ± 0.2mm Dimension 135 - 1mm Dimension 258 x 170mm Position of slot 16.5 w.r.t. angle 30° & dimension 2 + 0.5mm	
	Over Flow Cover A-17	Dimension 155 x 57.5 ± 1mm Dimension 140 + 2mm Bend profile radius 2	
	Locate Items in Fixture	Check for orientation of all items as per drawing in Fixture Base flange butting to spout Squareness of body w.r.t. base flange	
Stage 4	Tack Weld	Dimensions 288 ± 1, 465 ± 4, 135 - 1, 140 ± 1	
Stage 5	After Welding	Check for assembly Dimensions as per drawing A-00 Check weld quality after full weld 1. Check galvanizing thickness 2. Check adherence 3. Check surface finish and surface defects like black spots 4. Check passivation is effective 5. Check dimension 120.2 + 0.5/-0mm with special gauge	
Stage 6			

Table 6 - Pump Head Cover B-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Cover Plate B-50	Size 575 x 162 Slot 18 x 31	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
		Opening 65 x 90 Thickness - 2mm	
	Side Plates B-51	Size 219 x 337 Angle 40° & 22° Opening 32 & dia.40 Bend R6. Thickness 2	
	Shroud B-52	Dia.60.3 Dimension 35mm Thickness 2mm/2.3mm	
	Deflector B-53 Locate Items in Fixture	Length 273. Dia.6. Bent shape Check for proper orientation of all items in fixture Butting of cover plate with side plates Concentricity of shroud with slot and dia.40mm. Tack weld all items	
Stage 2	Tack Weld	Dimension 80, 177, 154	
Stage 3	Weld	Check weld quality after full welding	
Stage 4	Galvanize	Check assembly as per SKAT drawing B-00 Check for Galvanization and passivation	

Table 7 - Fulcrum Pin - C01

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Fulcrum pin C-124	Dia.34.7 - 0.2mm Length 119.5 - 0.2 Length 37 on both sides Threads M16 Hole dia.6 H7 x 12 depth on both sides	
	Sleeve C-125	Dia.38 - 0.2 Length 119 - 0.2 Wall thickness 1.5mm	
	Hex Nut Special C-126	Threads M16 Length 20 Chamfer 60° dia.18, dia.16.5 and dimension 5mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 2	Electro Galvanize	Check Electro Galvanizing	
Stage 3	Assemble All Items and Rivet	Sleeve shall not protrude from pin. Check tightness of sleeve on pin by rotating with hand, 100% Pin dia.6 projection 4 + 0.5mm on both sides Dimension 12 min. between pin face and nuts with special gauge. Check riveting is proper by rotating nuts upto the end. Nuts shall not come out	

Table 8 - Rod Hanger Pin C-01

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Rod Hanger pin C-129	Dia.34.7 - 0.2 Length 68.5 + 0.2 Length 30mm on either side Threads M16 both sides Dia.6 H7 x 12 on both sides Overall length 128.5 Check thickness of Electro-galvanizing	
	Sleeve C-130	Dia.38 - 0.2mm Length 68 + 0.2mm Thickness 1.5mm	
Stage 2		Check tightness of sleeve on pin Pin dia.6 projection 4 + 0.5mm on both sides Dimension 12 min gap between pin face and M16 nuts with special gauge Check riveting is proper by rotating the nuts upto the end Nuts shall not come out	

Table 9 - Handle Assembly Front D-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Handle Fork Left D-150	Dimension 232 x 75mm Thickness 8mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	Handle Fork Right D-151	Slot dimension $16.5 \pm 0.2\text{mm}$ Radius $38 + 1\text{mm}$. Step 69 Orientation of step. Entry Chamfer 15°	
	Spacer D-155	Dimension $68.8 + 1\text{mm}$ Dimension $50 \pm 1\text{mm}$ Thickness 6mm	
	Housing D-152	I.D. $50.4 + 0.2 / - 0.1\text{mm}$ Slot $6.3 \pm 0.1 \times 7.5 + 0.5$ width	
Stage 2	Handle Pipe D-154	Dia. 60.3 , length $600 \pm 3\text{mm}$, length 615 Pipe Thickness 4mm , Hole dia. 18mm Radius $38 + 1\text{mm}$ Orientation of Hole dia. 18mm w.r.t. radius 38mm Straightness of pipe within 1mm Check for proper orientation of all items as per drawing	
Stage 3	After Tack Weld and Welding	Check dimensions as per Drawing E-00. Squareness of T-bar with Handle extension pipe Squareness of handle forks on fulcrum housing Check weld quality after full welding	
Stage 4	After Galvanization	Check dimensions as per Drawing D-00 Dimension $68.8 + 1$ and 12.7mm Dimension $109.5 + 0.5$ Check for galvanization and passivation	
Stage 5	After Fitment of Sleeve and Milling	Check tightness of sleeve in fulcrum housing. Sleeve should not protrude outside fulcrum housing Slot 6.3 ± 0.1 width $\times 7.5 + 0.5\text{mm}$ Check orientation of slots	

Table 10 - Handle Assembly E-01

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	T-Bar E-200	Length 400mm , dia. 32mm	
	Handle Extension pipe E-201	Dia 48.3 , length $615 \pm 5\text{mm}$ Thickness 4mm Dimension 25mm Hole dia. 33mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	End Plate E-202	Straightness of pipe with in 1mm Dia.45 x dia.13.5mm Thickness 4mm Check for proper orientation of items as per drawing	
Stage 2	After Tack Weld	Squareness of T-bar with handle extension pipe Check weld quality after full welding	
Stage 3	After Galvanization	Check as per Drawing E-01 Dimension 200mm Check for galvanization and passivation	

Table 11 - Rodhanger Assembly F-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Hanger Bush F-250	Dia.63, length 58 + 0.2mm Slots 6.3 ± 0.1, width 7.5 + 0.5mm	
	Sleeve F-251	Length 57.5 +0.2mm Dia.50 ± 0.2mm, dia.47 ± 0.1mm	
	Rod Hanger Connector F-252	Square 32mm, length 44mm Thread M16, 10.5 + 0.2mm Radius 31.5mm	
	Retainer Bush F-253	Dia.26.9mm, length 30 ± 1mm Thickness 2.65mm	
	Tack Weld	Check for proper orientation of items as per drawing	
Stage 2	After Galvanizing	Dia.47 ± 0.1mm Check weld quality after full welding Check for galvanization and passivation Check Dimension 58 + 0.5mm	
Stage 3	After Fitment of Sleeve	Check tightness of sleeve in Rod Hanger Bush by hand on all the sleeves Check sleeve does not to protrude from Rod Hanger Bush Slot 6.3 ± 0.1 width x 7.5 + 0.5 Check orientation of slots	

Table 12 - Stand Assembly G-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Stand Flange G-300	Size 230 x 200mm, Hole dia.166.5mm ± 0.5 mm Holes dia.13.5 + 0.5 Center distance of holes 140 \pm 0.5mm, 180 \pm 0.5mm Dimension 90 \pm 0.5mm, 70 \pm 0.5mm with template. Thickness 6mm	
	Stand Pipe G-301	Dia.185mm, Thickness 4mm Height 120mm, Hole dia. 13.5mm	
	Leg G-302	Dia.12mm. Dimension 600 x 110mm	
	Gusset G-303	Dimension 22 x 22mm. Thickness 6mm	
Stage 2	Tack Welding	Check for proper orientation of items as per drawing	
Stage 3	After Welding	Check weld quality after full welding Check dimensions as per Drawing G-00	
Stage 4	Galvanizing	Check for galvanization and passivation	

Table13 - Steel Cone Assembly H-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Steel Cone H-350	Dimension 36 - 0.5mm Dia.76mm, Angle 30°. Thickness 3mm	
	Eye H-351	Dia.8mm Dimension 23 \pm 1mm & 32.5 \pm 1mm Radius 6mm	
	Flange Plate H-352	Size 230 x 200mm. Dia.122 x 125mm Holes dia.13.5 + 0.5mm Center Dist. of holes 180 & 140mm Dimension 90mm and 70mm with template Thickness 3mm	
Stage 2	Tack Welding	Check for proper orientation of items in fixture Check dimensions as per Drawing H-00	
Stage 3	Welding and Galvanizing	Check weld quality after full welding Check for galvanization and passivation	

Table 14 - Stand Assembly Option - A - G-00a

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Stand Flange G-300	Size 230 x 200mm, Hole dia.166 ± 0.5mm Holes dia.13.5 + 0.5 Center distance of holes 140 ± 0.5mm, 180 ± 0.5mm Dimension 90 ± 0.5mm, 70 ± 0.5mm with template Thickness 6mm	
	Stand Pipe G-321	Dia.185mm, height 690mm Thickness 4mm. Hole dia.13.5mm	
	Leg G-322	Height 425mm. Dimension 215 & 75mm Angle size 40x40x6mm	
Stage 2	Welding	Check for proper orientation of items as per drawing G-00a Check weld quality after full welding	
Stage 3	Galvanizing	Check for galvanization and passivation	

Table 15 - Stand Assembly Option - B - G-00b

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Stand Flange G-300	Size 230 x 200mm Hole dia.166.5 ± 0.5mm Holes dia.13.5 + 0.5 Center distance of holes 140 ± 0.5mm, 180 ± 0.5mm Dimension 90 ± 0.5mm, 70 ± 0.5mm with template Thickness 6mm	
	Gusset G-303	Dimension 22 x 22mm Thickness 6mm	
	Stand Pipe G-330	Length 574mm, Dia. 185mm Thickness 4mm. Hole dia.13.5mm Dimension 25mm	
	Gusset G-331	Dimension 100 x 50mm Dimension 5mm. Thickness 12mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	Bottom Flange G-342	Thickness 12mm Dimension A,B,C, D,E & F (Drawing G-00b) as per purchase order Check for proper orientation of items	
Stage 2	Tack weld	Check dimensions as per Drawing G-00b	
Stage 3	Welding	Check weld quality after full welding	
Stage 4	Galvanizing	Check for galvanization and passivation	

PUMP RODS J-00

Table 16 - Plunger Fitting Bottom - Option A - J-00 (Fabricated Version)

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Plunger Connector J-402	Dia.20mm, length 35mm Thread M10	
	Plunger Rod J-403	Dia.10mm Length 750 ± 5mm	
	Washer J-404 Eye Hook J-405	Dia.23, dia.10mm Thickness 3mm Dia.10mm Dimension 70 ± 2 and 10.8 ± 0.3mm	
Stage 2	Tack weld	Check for proper orientation of items as per drawing	
Stage 3	Welding	Check weld quality after full welding Dimension 36 ± 0.15 Dimension 31.5mm	

Table 17 - Pump Rod Fitting Top - J-00 (Fabricated Version)

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Spacer J-406	Dimension 25mm Thickness over welds 10 ± 0.3 Dimension 7 & 7.1 Dimension 10 ± 0.3 mm	
Stage 2	Hook J-407	Check dia.10mm Dimension 75 ± 2 mm Dimension 10.8 ± 0.3 mm Dimension 30 ± 2 mm Radius 5.4 ± 0.15	
	Rod J-408	Dia.10mm Length 2780 ± 5 mm	
Stage 3	Tack Weld	Check for proper orientation of items as per drawing	
Stage 4	After Welding	Dimension 17mm Dimension 35.6 ± 0.15 mm Check weld quality after full welding	
Stage 5	Galvanizing	Check for galvanization and passivation Check for interchangeability	

Table 18 - Pump Rod - J-00 (Fabricated Version)

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Eye Hook J-405	Rod dia.10mm Length 70 ± 2 mm Radius 5.4 ± 0.15 mm	
	Hook J-407	Rod dia.10mm Length 75 ± 2 mm Length 30 ± 2 mm Radius 5.4 ± 0.15 mm	
	Spacer J-406	Width 25mm Thickness over welds 10 ± 0.3 Radius 41mm Projection 7.1 and 7mm	
	Pump Rod J-408	Dimension 2780 ± 5 mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 2	Weld	Check for proper orientation of items as per drawing Check for weld quality on both sides separately for eye end and hook end Dimension $36 \pm 0.15\text{mm}$ Dimension 31.5mm Dimension $2780 \pm 5\text{mm}$	
Stage 3	Galvanizing	Check for galvanization and passivation Check for interchangeability	

Table 19 - Pump Rod Bottom - Option B - J-00a (Forged Version)

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Plunger Connector J-420	Dia.20mm, length 35mm Threads M10	
	Plunger Rod J-421.	Dia.10mm Length $735 \pm 5\text{mm}$	
	Eye Connector J-422	Dia. $10 + 0.2\text{mm}$, 25mm depth Check Eye $10 + 0.3 / + 0.1\text{mm} \times 30 + 0.3$ with special gauge Thickness $10 + 0 / - 0.3\text{mm}$	
Stage 2	Tack Weld	Check for proper orientation of items as per drawing	
Stage 3	Weld	Check for proper orientation of items as per drawing Check weld quality after full welding	

Table 20 - Pump Rod - Option A - J-00a (Forged Version)

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Rod J-424	Dia.10mm Length $2780 \pm 5\text{mm}$	
	Hook Connector J-423	Dimension $10 + 0.4, + 0.1 \times 20 - 0.5\text{mm}$ with special gauge Dimension $10 + 0 / - 0.3\text{mm}$ Dia.22mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	Eye Connector J-422	Dia.22mm, length 30mm Dimension 80 ± 1 mm Dimension $10 - 0.3$ mm Dimension $10 + 0.3/+0.1$ and $30+0.3$ with special gauge	
Stage 2	Welding	Check for proper orientation of items as per drawing Check weld quality after full welding Check for any bend Note: Bend not more than 2mm over full length	
Stage 3	Galvanizing	Check for galvanization and passivation.	

Table 21 - Pump Rod Fitting Top - J-00a (Forged Version)

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Plunger Rod J-424	Dia.10mm Length 2780 ± 5 mm	
	Hook Connector J-423	Dimension $10 + 0.1, + 0.4 \times 30 - 0.5$ mm Connector with special gauge	
Stage 2	Tack Weld	Check for proper orientation of items as per drawing	
Stage 3	Welding	Check weld quality after full welding	
Stage 4	Galvanizing	Check for galvanization and passivation Check for interchangeability	

Table 22 - Cylinder Assembly - L-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Cylinder Pipe L-552	Length 850 ± 5 mm Dia. $63 + 0.2$ mm Chamfer 15° on both sides Wall thickness $4.7 + 0.7$ mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	Brass Liner L-553	Length 700 ± 2 mm. Bore dia. $50 - 0.3$ mm. Wall thickness 2mm Chamfer 30° Check for dents and bulges Check surface finish inside bore. Shall be smooth, no scratches or damages	
Stage 2	Shrink Fit Brass Liner in Cylinder Pipe	Check for tightness of fitment on all the cylinders (to be tested at load 400 Newton)	
Stage 3	Suction Pipe L-550	Check dimension $75.3 - 0.2$ mm, dia 75, thickness 3.6, length 75 ± 2 , length 1000 ± 10 and hole dia. 10 Check any damages or shrinkages of pipe	
Stage 4	Sleeve L-581	Dia. 10mm, Length 75mm, thickness 1mm	

Table 23 - Foot Valve Fitting - J-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Foot Valve Connector J-400	Threads M10 Dia. 20mm, length 20mm	
	U-Hook J-401	Dia. 6mm, Dimension 34mm with special gauge Bend radius 6mm	
Stage 2	Weld	Check weld quality after full welding Dimension 62 & 5mm	

Table 24 - Foot Valve L-575

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Foot Valve L-575	Check 'O' ring groove Dia. 29.2 and width 3.2mm with special gauge	
Stage 2		Check for proper assembly of 'O' ring. Check for proper fitment of U-hook (400 & 401), Bobbin (555) and M10 bolt (559) with washer (576)	

Table 25 - Foot Valve Receiver L-04

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Foot Valve Receiver L-554	Check 'O' ring groove Dia.44.8 + 0.1 and width 3.9mm with special gauge	
Stage 2		Check for assembly of 'O' ring (557) Check for fitment of Plunger Foot Valve lower in Receiver (L554)	

Table 26 - Plunger L-575

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Plunger Rod L-403	Check for assembly of Plunger Rod (403) with M10 bolt (559) and washer (576) and Bobbin (555) in position	

Table 27 - Riser Main K-503

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Riser Main L-503	Length 2900 ± 25mm Dia.63.3 + 0.2mm Dia.63.3 - 0.2mm Length 115mm Check for bends Concentricity of diameters within 0.5mm with a stepped dia. plug gauge Check for straightness of pipe	

Table 28 - Fishing Tool M-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Rod M-600	Dia.10, Length 1495 ± 5mm	
	Cover Plate M-601	Thickness 2, Width 20 - 0.5mm, Length 134.5, Angle 45°, Dimension 16, Hole dia.6.5	
	Side Plate M-602	Thickness 2, Width 36 + 0.5, Length 95 (One plate), Slot 6.5 + 0.5, Length 68 ± 1mm, Dimension 9 ± 0.5mm	
	Pin M-603	Dia.6, Length 45mm	

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
	Eye Hook 405	Dia.10mm Dimension 70 ± 2 and 10.8 ± 0.3mm	
	Eye Connector 422	Dia.10 + 0.2mm and 25mm depth Check Eye 10 + 0.3 + 0.1mm x 30 + 0.3 with special gauge Thickness 10 + 0/ - 0.3mm	
Stage 2	Weld	Check welding quality Dimension 40 x 20mm	
Stage 3	Galvanizing	Check galvanizing and passivation	
	Fishing Hook M-604	Thickness 6mm Hole dia.6.5mm Dimension 65mm Dimension 43 - 0.5mm Profile with template	
Stage 4	Assemble	Check for hooking by inserting into cylinder and pull out Foot valve should come out along with fishing tool	

Table 29 - Foldable Spanner N-00

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Spanner Socket N-650	Across flats 24.2 + 0.3mm Dia.33, Length 35 Dia.23, Length 70	
	Handle N-651	Thickness 3 'U' dimension 25, Length 280 Hole Dia.8.5 at 20 and 18 + 0.5mm, Angle 20° and R 11.5 Dimension 30 and 23 R 15 and R 5	
	Handle Extension N-652	Dia.16, Length 260 Radius R8, R17 ± 0.5, R4 ± 0.5mm Dimension 17 ± 0.5 and 1.5mm	
	Pin N-653	Dia.8 + 0.3, Length 30	
Stage 2	Weld	Check weld quality	
Stage 3	Electro-galvanizing	Check electro-galvanization	

Table 30 - Spanner N-00a

INSPECTION STAGE	PART/DRG.NO./ PROCESS STAGE	CHECKS TO BE CARRIED OUT	REMARKS
Stage 1	Spanner Socket N-660	Across Flats $24.2 + 0.3$ Dia. 35 ± 0.2 , Length 69 Dia. 21.5 ± 0.2 Hole dia. 16.5 at dimension 19mm	
	Handle N-661	Dia. 16, Length 300 ± 5 mm	
Stage 2	Weld	Check weld quality	
Stage 3	Electro-galvanizing	Check electro-galvanizing	

5.2.2 Inspection Check List for Main Assemblies

After various stages of manufacture, components get converted into sub-assemblies. The sub-assemblies of Afridev handpump are then assembled together to form main assemblies. The list of general checks and specific checks to be carried out on assemblies are given below.

General Checks: The general check shall include the following:

- a) **Identification Mark:** Check for manufacturer's identification marks on components/assemblies/main assemblies as per *Table No.31*.
- b) **Welding:** Check for blow holes, pin holes, cracks, undercuts, distortion, discontinuity, lumps, fillet size, uniformity, finish and positional accuracy.
- c) **Galvanizing:** Check for defects like flux, ash, bare patches, black spots, pimples, lumpiness, runs, rust stains, bulky white deposits, blisters etc. which are not permitted. Check coating thickness, uniformity of coating and adhesion strength.
- d) **Electroplating:** Check for defects like blisters, pits, roughness, nodules, cracks, burning or unplated areas. Check coating thickness and adhesion strength of coating.

Specific checks: Group assembly-wise specific checks are detailed below.

- a) **Pump Head Assembly:** Check the following.
 - i. Alignment of 16.5mm slots To be in line

- | | | |
|------|--|---|
| ii. | Distance between fulcrum bracket plates | 120.2 + 0.5/0mm |
| iii. | Squareness of body with respect to flange | 90° ± 1° |
| iv. | Spout length
Check position of spout
a. Normal
b. Right
c. Left
(Check as per purchase order) | 232mm/512mm |
| v. | Flatness of the Flange | Unevenness not more than 1mm |
| vi. | Welding of (cover lock) (M-16) | Check position |
| vii. | Free movement of the cover bolt (M-16) | It should not get detached without the use of spanner |
- b) **Cover Assembly:** Check the following.
- | | | |
|------|-------------------------------------|--|
| i. | Check position of shroud | To be concentric to dia.18/ at rear and to dia.40 on sides |
| ii. | Dimension of slot | 32mm |
| iii. | Dimension for opening in the shroud | 35mm |
| iv. | Easy fixing and removal of cover | Must fit without the use of force |
- c) **Handle Assembly:** Check the following:
- | | | |
|-----|---|-----------------|
| i. | Proper glue of the Stainless Steel sleeve in fulcrum housing and on the fulcrum pin | Should be tight |
| ii. | The stainless steel sleeves should not protrude beyond the faces of fulcrum housing and fulcrum pin | Visual check |

- | | | |
|---|--|--|
| iii. | Free entry and proper locking of outer bearing bush in fulcrum housing slot to prevent rotation | Check location |
| iv. | Free entry of fulcrum pin in inner bearing bushes | Should rotate freely |
| v. | Check inner bearing projection is located in 16.5mm slot in fulcrum in the bracket | Visual check |
| vi. | Alignment of the slot 16.5mm with respect to gap between the handle forks right and left (68.8 + 1mm) proper seating of Rod Hanger housing | Check with gauge and also for easy and proper seating of the rod hanger housing |
| vii. | Free movement of handle rear (T-bar) and in handle front | Insert T-Bar and check free movement in handle |
| Viii. | The effectiveness of locking with Hexagonal head Screw M-16 (156) | Tighten M16 bolt on T-bar and check for tightness. Shall not get loosened when rotated by hand |
| d) Rod Hanger Assembly: Check the following. | | |
| i. | Proper gluing of Stainless steel sleeves in Rod Hanger housing and on Rod Hanger pin | Should be tight |
| ii. | Stainless sleeves should not protrude out from end face of Rod Hanger housing and Rod Hanger pin | Check with gauge |
| iii. | Outer bearing bush should enter freely and get locked in the hanger housing slots | Visual check |
| iv. | Rod Hanger pin should enter freely in the inner bearing | Insert and check for free movement |

- | | | |
|-------|---|--|
| v. | Check, if inner bearing projection is located in 16.5mm slot | Visual check |
| e) | Stand Assembly: Check the following. | |
| i. | Overall Height | 700mm for G-00
965 +10/-0mm for G-00a
580mm for G-00b |
| ii. | Flatness of the flanges | To be within 1mm. Check with try-square |
| iii. | Fit steel cone with rubber compression cone on the flange of the stand. The compression cone should protrude 2 to 3mm above the steel cone flange plate | Visual check |
| f) | Pump Rods: Check for the following. | |
| i. | Check Eye and Hook mating dimensions | Use special gauges |
| ii. | Interchangeability of hook/eye with one another | Select at random, eye/hook connectors
Fit and check for entry and locking
(at least 25%) |
| iii. | Free engagement of hook in eye at 90° | Check by inserting rod hook in rod eye at 90° |
| iv. | Check for its locking in Assembled condition | Check assembly |
| v. | Length of Pump Rod | 2780mm ± 5mm |
| vi. | Length of the pump rod fitting top | 2780mm ± 5mm |
| vii. | Length of pump rod fitting bottom/Plunger rod | 735mm ± 5mm |
| viii. | Centraliser fitment | Insert on rod and check |

Note: The above dimensions are for the Forged version.

- g) **Cylinder Assembly:** Check the following.
- | | |
|---|---|
| i. Cylinder Bore diameter | 50 + 0 / - 0.3mm |
| ii. Check slippage of Brass sleeve in cylinder pipe (testing load of at 400 N) | Check on test rig. (Type test at random at least 1% min 400 N) |
| iii. Holding of foot valve within foot valve receiver with 'O' ring in position | Visual check |
| iv. Movement of Plunger with 'U' seal for full stroke | Pull and push to full stroke and observe the movement is proper
Movement should not be tight |
| v. Check rod centralizer is fitted on pump rod fitting bottom | Visual check |
| vi. Tightness of pipe centralizer on cylinder pipe | Should not be loose |
| vii. Check for moulding flashes on bobbin valve | Flashes not allowed |
- h) **Riser Main:** Check the following.
- | | |
|---|---|
| i. Pipe centralizer fitness on pipe dia. 63 + 0.2mm | Should not be loose |
| ii. Bell mouth internal dia. on the ends | 63.3 + 0 / - 0.2mm |
| iii. Out side diameters of pipe centralizers 92/100/118/140/188 as applicable) depending on the casing pipe | Check as per purchase order |
| iv. Length of the pipe | 2900 ± 25mm |
| v. Any offset of bell mouth with respect to pipe | No offset permissible, should be concentric |

5.3 FINAL INSPECTION AND MARKING PROCEDURE

5.3.1 Checks during Final Inspection

The final inspection of all pumps is to be carried out by the manufacturer. The checks to be carried out are as follows:

- | | |
|--|--|
| i. Verify internal Quality control reports which were made during stage-wise inspection for components and assemblies including manufacturer's identification as given in Table 31 | Verify and record the observations |
| ii. Completeness of the all assemblies: All the assembly parts, fasteners to be fully assembled | Visual check |
| iii. Check stroke length on all assemblies | $225 \pm 3\text{mm}$ |
| iv. Check alignment | A 10mm measuring rod shall pass freely through a 12mm slot in a measuring gauge placed in the dia.87 hole of pump head assembly. The slot must be oriented parallel to the axis of the pump handle |
| v. The flatness of the Flanges to provide proper matching, when they are assembled one to the other | Gap not more than 1mm. Check with Feeler gauge |
| vi. The leakage of the cylinder at one bar and 10 bar pressure on a hydraulic equipment for cylinder assemblies | Check on test rig at minimum of 5%
No leakage allowed |
| vii. Proper engagement of foot valve to foot valve receiver | Visual check |
| viii. Movement of plunger within cylinder bore | By push and pull 'U' seal to full stroke. No excessive force needed to move plunger |

- | | | |
|------|--|--|
| ix. | Easy and proper engagement of fishing tool with foot valve in Cylinder Assembly | Engage and pull plunger foot valve to come out |
| x. | Damages and other defects | Visual check |
| xi. | Check for discharge on a test rig cylinders drawn as per sampling criteria specified in the Afridev specification. At random at least 5% min | Discharge not less than 16.5. liters of water in 40 on continuous full strokes in one minute |
| xii. | Identification marks | Check identification marks on parts |

It is absolutely necessary to keep a record of final inspection findings.

5.3.2 Marking Procedure

The following are suggested for marking by the manufacturer on various pump parts

Table 31 - Identification Marks for Components/Assemblies

S. NO.	DESCRIPTION	TYPE OF MARKING
1	PUMP HEAD	PMI, YEAR, SL. NO. ON NAME PLATE
2	BOLTS M12 x 35	SDI
3	BOLT M16 x 20	SDI
4	COVER	PMI
5	BEARING SET	PMI/SDI
6	FULCRUM PIN	PMI
7	ROD HANGER PIN	PMI
8	HANDLE ASSEMBLY FRONT	PMI MARK ON BEARING HOUSING
9	BOLT M16 x 30	SDI
10	HANDLE ASSEMBLY REAR	PMI
11	ROD HANGER ASSEMBLY	PMI MARK ON CONNECTOR
12	M16 x 30 BOLT	SDI
13	STAND ASSEMBLY	PMI ON TOP FLANGE
14	CONE ASSEMBLY	PMI
15	PUMP ROD FITTING TOP	PMI
16	PLUNGER FITTING BOTTOM	PMI

S. NO.	DESCRIPTION	TYPE OF MARKING
17	PUMP ROD	PMI
18	FOOT VALVE FITTING	SDI/PMI
19	COMPRESSION CONE	SDI/PMI
20	RISER MAIN PIPE	SDI YEAR, MONTH AND BATCH NO.
21	FLAPPER	SDI
22	ROD CENTRALIZER	SDI/PMI
23	PIPE CENTRALIZER	SDI/PMI
24	ROPE	
25	BOBBIN VALVE	SDI/PMI
26	PLUNGER FOOT VALVE	PMI/SDI
27	CYLINDER ASSEMBLY	PMI, MONTH, YEAR, SL. NO.
28	U-SEAL (PLUNGER)	PMI/SDI
29	M10 x 35SS BOLT	SDI
20	WASHER	SDI

Abbreviations :

PMI - Pump Manufacturer's Identification Marks

SDI - Standard Part/Component Manufacturer's Identification Marks

Note: Steel punch marks to be used on Steel Parts. Ink impression/embossing to be used on plastic/rubber parts.

6. Quality Assurance

6.1 PRE-REQUISITE FOR QUALITY ASSURANCE

There are four pre-requisites to ensure supply of correct quality and quantity of handpumps in the stipulated period. They are: prequalification of suppliers; placement of a well defined purchase order; pre-delivery inspection at the manufacturer's works; and inspection at the consignee's end.

Pre-qualification of Pump Suppliers: Pre-qualification of bidders before inviting bids is desirable. The pre-qualification of a handpump manufacturer will include evaluation of the production facilities, organizational set-up, quality control set-up, inspection techniques, skilled manpower, manufacturing tooling, jigs, fixtures, inspection gauges, instruments and test equipments. The procedure for calibration and maintenance of gauges and instruments is also evaluated. In a nutshell, it is the overall assessment of a manufacturer's capability and capacity to deliver goods conforming to specifications. The pre-qualification inspection should be done by an experienced Independent Inspection Agency (IIA). A format for evaluation of manufacturers with check-list and recommended points weightage system is given in *Annex VII*.

Only pre-qualified suppliers/manufacturers should be invited to bid. This procedure will keep the 'GHOST SUPPLIERS' away and ensure supply of quality handpumps within the stipulated time.

Clearly Defined Purchase Order: The purchase order plays an important role in getting the correct materials. The purchase order should contain full details like specification of product, quantity, pre-delivery inspection, supply conditions and commercial terms and conditions. Options should be specified clearly like stand assembly option, length and position of spout, carbon steel forged/welded pump rods or stainless steel pump rods, etc. An incomplete purchase order can result in delays and incorrect supplies. A format for the purchase order with explanatory notes is suggested in *Annex VIII*.

Pre-delivery Inspection: This is perhaps the most important part of the quality assurance system. Experience shows that insistence on inspection of handpumps by an IIA creates a psychological pressure and thereby forcing a manufacturer to take extra care during production. Continued exposure to external inspection helps in improving overall quality of product. Although, pre-delivery inspection at the manufacturer's works costs extra money, such expenditure is more than justified keeping in view the advantages it offers. **It is, therefore, recommended that all handpumps and spare parts are subjected to pre-delivery inspection at manufacturer's works.**

6.2 PROCEDURE FOR PRE-DELIVERY INSPECTION

On receipt of the copy of a purchase order, the inspection agency will work out an inspection schedule in consultation with the manufacturer.

The manufacturer shall lay out the completed pumps systematically, assembly-wise for inspection and provide IIA the completed "Manufacturer's Declaration Sheet". The format, for the Manufacturers' Declaration Sheet is suggested in *Annex IX*.

The information in the declaration form shall be verified with respect to the purchase order and other relevant data pertaining to raw material, production and testing. The test certificates provided by the manufacturer shall be verified against relevant specifications. Checks will also be made to verify the effectiveness of the internal quality control system.

If the declaration and internal quality control is found satisfactory, IIA shall proceed with hundred percent visual check of assemblies for workmanship and visual defects. If visual defects are found at this stage, the manufacturer is allowed to replace the same defective assemblies.

Then random samples are selected as per the sampling plan for detailed check of attributes and variables. The sampled assemblies are checked for the following.

(1) Dimensional check, (2) Checks by gauges, tools and instruments, (3) Welding checks, (4) Galvanizing checks, (5) Interchangeability, (6) Performance check.

If the above checks are satisfactory, quantity check and inspector stamping and stenciling will follow. If the above checks indicate defects beyond acceptable limit as per sampling plan, then, total quantity is rejected.

6.2.1 Verification for the Effectiveness of the Internal Quality Control System

Verify Internal Quality Control (QC) System followed in the handpump manufacture for its effectiveness with the following checks.

- a) Incoming inspection records for quality of materials received including raw materials and finished parts/components.
- b) Verify the record of discrepancies noticed and measures taken to avoid recurrence.
- c) When the manufacturing process is in progress, observe at random how the stage inspection is carried out and findings are recorded.
- d) Check if jigs, fixtures, testing apparatus, measuring instruments and gauges/templates used during manufacture and inspection are calibrated periodically.
- e) Verify whether the complete set of instruments and equipment are available with the pump manufacturer to carry out internal quality control checks.
- f) Whether knowledge on quality control is imparted to the production/inspection staff, through periodical orientation/training.

- g) Pick up some components and assemblies during stage inspection and audit them for quality standards (with respect to QC Reports of the internal QC Department).
- h) Verify whether Internal Quality Control (IQC) personnel have adequate skills to carry out QC checks.

6.2.2 Sampling of Afridev Handpump and Spare Parts (excluding uPVC pipes) for Pre-delivery Inspection

The objectives of sampling are twofold: (1) To make external inspection economical; and (2) To induce in the supplier psychological pressure of non-acceptance of the lot based on the non-conformity of the sample. This psychological pressure makes it imperative for the manufacturer to take all steps to keep the internal quality control system effective.

When a specific value of Acceptable Quality Level (AQL) is designated for certain non-conformities it indicates that the sampling scheme will accept a lot of handpumps provided the quality level, percent of non-conformities do not exceed the acceptance number. Example: For a batch of 500 pumps to be inspected with general level 1 and AQL 1%, 20 Nos. of handpumps are selected on random basis. The batch will be considered acceptable if all pumps in the sample lot are found without any non-conformity. Even if one pump out of the sampled pumps is found non-conforming, the whole lot of 500 handpumps shall be rejected. Higher the level of inspection, more will be the number of samples to be drawn. Example: For general level 3 and AQL 1% the number of samples to be drawn from a lot of 500 handpumps will be 80.

Sampling plan for pump (Table 32) are based on ISO 2859-1/IS 2500 and for pump spares (Table 33) on IS 2500. Sampling plan can be tightened or loosened depending on the past performance and reliability of a manufacturer. The switching rules for normal, tightened and reduced inspections are given in ISO 2859-1.

Table 32 - Sampling Plan for Afridev Complete Handpump

LOT/BATCH SIZE			SAMPLE SIZE	ACCEPTANCE* NO.
2	-	8	2	0
9	-	15	2	0
16	-	25	3	0
26	-	50	5	0
51	-	90	5	0
91	-	150	8	0
151	-	280	13	0
281	-	500	20	0
501	-	1200	32	0
1201	-	3200	50	1
3201	-	10000	80	2

* Defective Allowed

Table 33 - Sampling Plan for Afridev Handpump Spares

LOT/BATCH SIZE			SAMPLE SIZE	ACCEPTANCE* NO.
2	-	8	2	0
9	-	15	2	0
16	-	25	3	0
26	-	50	3	0
51	-	90	5	0
91	-	150	5	0
151	-	280	8	0
281	-	500	8	0
501	-	1200	13	0
1201	-	3200	13	0
3201	-	10000	20	0

Note: In case the manufacturer has not been consistent in producing quality pumps, sampling can be done based on a tighter AQL level. The decision for this shall rest solely with the IIA inspector.

6.2.3 Checks for Important Attributes

- a. One hundred percent interchangeability of sub-assemblies and components.
- b. Check for: Finish of cylinder bore (brass liner) - scratches and damages not allowed; and Chamfer on the top edge of cylinder liner.
- c. Movement of plunger in cylinder (no excessive force shall be needed to move the plunger assembly). Also check for the engagement of foot valve in foot valve receiver.
- d. Engagement of fishing tool to 'U' hook of the foot valve.
- e. Outside diameter of the unlined cylinder portion. Tensile test on one plunger/foot valve body.
- f. Foot valve leakage test at 1.0 bar and 10.0 bar hydraulic pressure. No leakage allowed.
- g. The pump rods and plunger rod shall be examined for diameter, fitment of hook and rod centralizer. The quick coupling device shall be checked for in-line attachment of eye and hook to rods. Rods shall also be checked for easy engagement of eye and hook.
- h. Check for: welding defects like cracks, blow holes, pin holes and discontinuity; and weld fillet size and uniformity, positional accuracy of components and workmanship.
- i. Check for: galvanizing defects like poor adherence of coating, black spots, pimples, lumps, white deposits, rust stains and blisters; and surface uniformity and coating thickness.
- j. The flanges shall be reasonably flat to provide proper matching. Use of force for insertion of flange bolts is not permissible.
- k. Alignment check: A 10mm diameter measuring rod fitted in the rod hanger shall

pass freely through a 12mm slot in a measuring gauge placed in the 87.0mm diameter hole of the pump head assembly. The slot must be oriented parallel to the axis of the pump handle.

- l. Check stroke length: 225 ± 3
- m. Check for: Free movement of handle in pumphead after assembly; Easy movement of handle extension (T-bar) in handle pipe before tightening M16 set screw; and Handle to have good surface contact with stopper plates at upper and lower stroke position.
- n. Bearings assembly fit: The bush shall be easy sliding fit in the housing. The pin shall be easy sliding fit when bushes are in position. Locating lugs shall engage fully without excessive clearance. The bearings should seat properly in housing and it should be possible to take them out without the use of force or a tool. Inner bearing should rotate freely.
- o. Stainless steel sleeve shall not protrude beyond the end faces of fulcrum and rod hanger housings and pins.
- p. The rod hanger shall fit in between the forks easily and retainer bush shall be in line with the two slots provided at the top of the pumphead body. The fulcrum pin shall fit easily into $16.5 \pm 0.2\text{mm}$ slots in fulcrum bracket.

6.2.4 Dimensional Check List for Afridev Handpump/Spares

The inspector shall carry out the following dimensional checks on at least two sample pumps and all the sampled spare parts. If the performance of the manufacturer is not consistent, the inspector can carry out detailed dimensional checks on all sampled pumps. The details of dimensional checks that need to be carried out on pumps/spare parts are given below.

i. Pump Head (A-00)

- a. Overall height $465 \pm 4\text{mm}$
- b. Height of over flow cover $140 \pm 1\text{mm}$
- c. Distance between bracket $120.2 + 0.5 / -0\text{mm}$
with gauge
- d. Base flange hole dia. $87 +2 / -0\text{mm}$
- e. Spout length as per P.O. $580/300\text{mm}$
- f. Spout position as per P.O.
 - a. Normal
 - b. Right
 - c. Left
- g. Dimension $120.2 + 0.5$ with gauge.
- h. Galvanizing thickness - Ref. DIN 50976/IS 4759 - 70 microns

ii. Pump Head Cover (B-00)

- a. Internal dimension $154 \pm 1\text{mm}$
- b. Opening for handle $65 \pm 1\text{mm}$

- c. Opening for nut in cover $32 \pm 1\text{mm}$
- d. Opening in shroud $35 \pm 1\text{mm}$
- e. Shroud dia. 60.3 mm
- f. Galvanizing thickness - ref DIN 50976/IS 4759 - 55 microns

iii. Bearing Set (C-00)

Bearing Inner (100)

- a. Outside diameter $41.9 + 0 / -0.2\text{mm}$
- b. Bore diameter $38 + 0.2 / - 0\text{mm}$

Bearing Outer (101)

- a. Outside diameter $46.7 \pm 0.1\text{mm}$
- b. Bore diameter $42.2 + 0.2\text{mm}$

iv. Fulcrum Pin (C-01)

- a. Length of the pin $119.5 + 0 / -0.2\text{mm}$
- b. Outside diameter $38 + 0 / -0.2\text{mm}$
- c. Pin length from face on both sides $4 + 0.5\text{mm}$

v. Rod Hanger Pin (C-01)

- a. Length of the pin $68.5 + 0.2 / -0\text{mm}$
- b. Outside diameter $38 + 0 / -0.2\text{mm}$
- c. Pin length from face on both sides $4 + 0.5\text{mm}$

ITEM iv and v to be checked for sleeve fitness test: Sleeve shall not slip

vi. Handle Assembly (D-00 & E-00)

- a. Bore diameter (fulcrum housing) $47 + 0.1 / -0\text{mm}$
- b. Length of the fulcrum housing $109.5 + 0.5 / -0\text{mm}$
- c. Distance between Handle Fork $68.8 + 1\text{mm} / - 0\text{mm}$
- d. Dimension for hole dia. 13.5 5mm
- e. Location of M-16 Nut 50mm
- f. Slot dimension $16.5 \pm 0.2\text{mm}$
- g. Distance for slot $225.5 \pm 1\text{mm}$
- h. T-Bar dimension $400 \pm 3\text{mm}$
- i. Rod diameter $32 \pm 1\text{mm}$
- j. Pipe diameter $48.3 \times 615 \pm 5\text{mm}$

k.	Galvanizing thickness Ref DIN 50967/IS 4759	85 microns
l.	Check for slippage of the sleeve	Shall not slip
vii. Rod Hanger (F-00)		
a.	Bore diameter (Rod Hanger housing)	$47 + 0.1/-0\text{mm}$
b.	Length of the Rod Hanger housing	$58 + 0.2/-0\text{mm}$
c.	Slot width	$6.3 \pm 0.1\text{mm}$
d.	Hole diameter	$10.5 + 0.2 /-0\text{mm}$
e.	Threads	M-16
viii. Stand Assembly (G-00)		
i) Standard Assembly (G-00)		
a)	Overall height	700mm
b)	Base dimension (Leg)	300mm
c)	Flange thickness	6mm
d)	Rod diameter (Leg)	12mm
ii) Option A (G-00a)		
a)	Overall height	$965 + 10\text{mm}$
b)	Dimension from ground level to stand pipe	275mm
c)	Flange thickness	6mm
d)	Position of legs with respect to flange	$80^\circ \pm 1^\circ$
e)	Angle (Leg)	40 x 40 x 6mm
iii) Option B (G-00b)		
a)	Overall height	580mm
b)	Position of the gussets as per drawing	
c)	Top flange thickness	6mm
d)	Bottom flange thickness	12mm
e)	Centre distance of holes	as specified
ix. Steel Cone (H-00)		
a.	Steel cone angle	30°
b.	Minor end diameter	76mm
c.	Dimension	$36 + 0/-0.5\text{mm}$

x. Pump Rod Assembly (J-00) - Fabricated Version

i. Pump Rod Fitting Top

- a. Length 2780 ± 5mm
- b. Dimension 17mm
- c. Dimension 35.6 ± 0.15mm
- d. Dimension 10 ± 0.3mm

ii. Pump Rod

- a. Length 2780 ± 5mm
- b. Dimension 17mm
- c. Dimension 35.6 ± 0.15mm
- d. Dimension 36 ± 0.15mm
- e. Dimension 10 ± 0.3mm

iii. Plunger Fitting Bottom

- a. Length 750 ± 5mm
- b. Thread M-10
- c. Dimension 36 ± 0.15mm

Pump Rod Assembly J-00a - Forged Version

i. Pump Rod Top

- a. Length 2780 ± 5mm
- b. Check hook with special gauges

ii. Pump Rod

- a. Length 2780 ± 5mm
- b. Check Eye and Hook with special gauge

iii. Pump Rod Bottom

- a. Length 735 ± 5mm
- b. Thread M-10
- c. Check eye with special gauge

xi. Flapper (K-500)

- a. Outside diameter 80mm

b. Inside diameter	11mm
c. Thickness	6mm
xii. Top Sleeve (K-501)	
a. Bore diameter	63.3 +0/ -0.2mm
b. Outside diameter	72 +2/ -0mm
c. Length	30 mm
xiii. Compressor Cone (K-502)	
a. Inner diameter	61.5 +/- 0.3mm
b. Outer diameter	120 mm
c. Thickness	31mm
d. Angle 30°	
e. Shore Hardness (Scale A)	70 + 5/ - 4
xiv. Rod Centralizer (K-504)	
a. Outside diameter	48 ± 0.5mm
b. Slot width	9.5 + 0.5 x 30mm
c. Shore Hardness (Scale A)	80 + 5 / - 4
xv. Pipe Centralizer (K-520 to K-524)	
a. Outside diameter	92/100/118/140/188mm
b. Inside diameter	62.5 ± 0.30mm
c. Hole diameter	8mm
d. Shore Hardness (Scale A)	80 + 5 / - 4
xvi. 'U' Seal (L-556)	
a. Outside diameter	50.80mm
b. Inside diameter	40mm
c. Width 7mm	
d. Shore hardness (Scale A)	80 + 5 / - 4
xvii. 'O' Ring (L-557)	
a. Inside diameter	44.2mm
b. Cross section diameter	3mm
c. Shore hardness (Scale A)	70 + 5 / - 4

xviii. 'O' Ring (L-558)

- | | |
|-----------------------------|--------------|
| a. Inside diameter | 28mm |
| b. Cross section diameter | 2.5mm |
| c. Shore hardness (Scale A) | 70 + 5 / - 4 |

xix. Suction Pipe (L-550)

- | | |
|-----------------------------------|-------------------|
| a. Overall length | 1000 ± 10mm |
| b. Dimension for hole dia 10mm is | 250 ± 10mm |
| c. Belling length | 75 ± 2mm |
| d. Bell mouth diameter | 75.3 +0 / - 0.2mm |

xx. Cylinder (L-552, 553)

- | | |
|-----------------------------------|--------------------|
| a. Overall length | 850 ± 5mm |
| b. Outside diameter | 63 + 0.2 / - 0.0mm |
| c. Dimension from bottom end | 120 + 5mm |
| d. Bore diameter | 50 + 0 / - 0.3mm |
| e. Sleeve Fitness at testing load | 400N |

xxi. Reducer (L-551)

- | | |
|-----------------------|-----------------|
| a. Overall Length | 135 + 0 / - 3mm |
| b. Bore diameter | 63.5 + 0.1mm |
| c. Step Bore diameter | 55 ± 1mm |

xxii. Foot Valve Receiver (L-554)

- | | |
|--------------------------------|------------------|
| a. Bore diameter | 33 + 0.1 / - 0mm |
| b. Dimensions for bore dia. 33 | 35.6 - 0.1mm |
| c. Outside diameter | 62 - 0.2mm |
| d. 'O' Ring Groove diameter | 44.8 + 0.1mm |
| e. Groove width | 3.9mm with gauge |

xxiii. Valve Bobbin (L-555)

- | | |
|--|----------------|
| a. Total Length | 40 ± 1.0mm |
| b. Outer diameter of the leg | 18 ± 0.10mm |
| c. Outer diameter of the step | 26 ± 0.10mm |
| d. Step dimension | 21.5 ± 0.2mm |
| e. Shore hardness (Scale A) | 80 + 5 / - 4mm |
| f. Check for flashes on valve seating area | |
| g. Angle 30° | |

xxiv. Plunger/Foot Valve (L-575)

- | | |
|----------------------------------|---------------------------|
| a. 'U' Seal Groove diameter | 40.2 + 0 to - 0.2mm |
| b. Groove Width
special gauge | 7.2 + 0.2mm |
| c. 'O' Ring Groove diameter | 29.2mm with special gauge |
| d. Groove Width | 3.2mm |

xv. Fishing Tool (M-00)

- | | |
|---|------------|
| a. Length | 1495 ± 5mm |
| b. Dimension (Box) | 20 x 40mm |
| c. Galvanizing thickness | 85 microns |
| d. Check for engagement with foot
valve fitting hole | |

xvi. Folding Spanner (N-00)

- | | |
|---------------------------|--------------------|
| a. Length extended handle | 260mm |
| b. Dia. 16mm | |
| c. Channel length | 280mm |
| d. Hex. socket | 24.2 + 0.3 / - 0mm |

xvii. Spanner (N-00a)

- | | |
|------------------------|-------------|
| a. Handle Rod diameter | 16mm |
| b. Socket dimension | 24.2 +0.3mm |
| c. Socket depth | 33mm |
| d. Length of the rod | 300 ± 5mm |

Check for interchangeability of all sampled assemblies.

6.2.5 Performance Test

After satisfactory inspection of attributes and variables a minimum of two cylinders irrespective of lot size shall be selected at random from the sample lot for performance test for water discharge. Performance test shall be conducted on a test rig. Discharge of water shall not be less than 16.5 liters in forty complete and continuous strokes in one minute.

6.2.6 Inspection of uPVC Riser Pipes

Inspection of uPVC riser pipes is also carried out if it is included as a part of the handpump order. The procedure for inspection checks shall be as given in DIN 4422/IS 12235 and DIN 8061/IS 4985. In addition to verification of manufacturer's test certificates and general visual checks on all riser pipes, specific checks shall be carried out on samples drawn. The sampling plans for specific tests together with a brief description of each test is given in *Annex X*. Identification and markings shall be done as per the uPVC pipe specification. Inspection of riser main should be carried out at the pipe manufacturer's premises, if test facilities are not available at the pump manufacturer's premises.

6.2.7 Inspection Stamping Procedure

The inspection stamping for complete handpumps and uPVC riser pipes shall be as given in *Table 34*.

Table 34 - Inspection Stamping of Pumphead, Stand, Cylinder, Riser Main and Handle

S. NO.	DESCRIPTION	TYPE OF STAMP	PLACE OF STAMPING
1.	On all the Stands	Ink stamp	Inside the pipe
2.	On all the Cylinders	Ink Stamp	On outer dia. of the tube at bottom end
3.	Riser Main (On sampled pipe bundles)	Ink Stamp	On outside of the pipe at one end
4.	All the handles	Steel punch	One left fork near Fulcrum housing
5.	On all pumpheads	Steel punch	On Flange
6.	On Pump Rod Bundles	Seal punch	On lead seals attached to all pump rod bundles Double Lead seal on inspected bundles

For Spare Parts the following stamping procedure will be adopted.

- a. For spare parts the packing cases and bin cards shall be stamped with Inspectors Ink Stamp.
- b. The Packing list verified by inspector shall be marked with inspector's Ink Stamp.

6.2.8 Important Points to Remember

The following shall be kept in view before clearing the materials for packaging.

- i. If the rejected quantity is more than the acceptable number of the sampling plan the whole lot shall be treated as rejected.
- ii. If the sampled components/assemblies satisfy all the above checks and performance

test, the assemblies and components will be stamped as per Inspection stamping procedure given in *Table 34*.

- iii. The clearance will be issued for packaging of pumps and spares after acceptance and stamping of the material.
- iv. Unless otherwise specified, the pumps and spares shall be packed as per SKAT's Packaging Guidelines for Afridev. The inspector, when required by the buyer, shall verify: the quality of packing; the quantity of parts as per packaging list prepared by the manufacturer; and identification marks on packages/packing cases. The packing list shall be attested by the IIA inspector for its correctness.
- v. The packing shall be closed and sealed with lead seals attached to the straps/tags/packing cases. All the packing cases will be stuffed into a container in the presence of the IIA inspector for certification. The container shall be finally sealed by the inspector.
- vi. The IIA inspectors normally do not carry out packing, stuffing and loading unless specifically asked by the buyer. Buyers are advised to include these aspects in the scope of IIA inspection wherever necessary.

6.2.9 Issue of Acceptance/Rejection Note

Acceptance Note: The inspection agency, after satisfactory inspection of the handpumps/spare parts, shall issue an acceptance note (*suggested format given in Annex XI*) if the materials offered conform to the quality requirements specified in the purchase order.

The acceptance note will be specially designed and printed in sets of copies by inspection agency and shall be signed by the authorized inspection personnel. The details of pre-delivery inspection stamping details as marked on assemblies and inspected bundles/packages shall be indicated in the acceptance note.

The acceptance notes shall be numbered and a register for all acceptance notes shall be maintained by the inspection agency. Distribution of acceptance note shall be as follows:

- (a) Original plus one copy to the manufacturer;
- (b) One copy will be sent to the purchaser; and
- (c) One copy will be retained by the inspection agency's office.

Rejection Note: A rejection note will be issued by the inspector if the material is considered unacceptable due to non-conformance to purchase order requirements. It will give specific details of non-conformity, reasons for rejection and quantity rejected. The original copy shall be given to the manufacturer and a copy forwarded to the buyer for information. A typical format for rejection note is given in *Annex XII*. Based on the non-

conformance mentioned in the rejection report, the manufacturer shall investigate and take corrective/preventive action to eliminate defects. The manufacturer after taking required corrective action shall approach the IIA for a reinspection of the material. The details of steps to repair/replace the defective materials and avoid repetition of such non-conformities shall also be informed to IIA.

6.3 PROCEDURE FOR CONSIGNEE END INSPECTION

The main objective of the consignee level inspection is to ensure that only inspected and accepted materials are received by buyers.

The consignee end inspection is normally carried out by an authorized representative of the consignee. A list of measuring instruments and equipment required for carrying out inspection is given in *Annex XIII*. The procedure for consignee end inspection is given below.

6.3.1 General Checks

The general checks recommended are given below.

- a. Check whether copy of acceptance note is furnished along with despatch documents.
- b. Check whether all materials are received in packed condition (without damage to seal or tampering of packages) as per packaging standards specified.
- c. Check whether all the assemblies and bundles/packages are stamped as specified in the acceptance note.
- d. Check whether packing slip of manufacturer, quantities mentioned in the supplier's invoice and quantity of goods received are in order.

6.3.2 Specific Checks

The specific checks required to be carried out at random to confirm that the materials confirm to specifications.

i. Fabricated Parts

Check the fabricated items like Head assembly, Handle assembly, Stand assembly and Steel Cone assembly as follows.

- a. Check for flatness of the flanges with a steel ruler in case of transit damage.
- b. Check for proper welding, fillet size and uniformity of weld surface defects like blow holes, cracks, etc.
- c. Check for damages on spout pipe, stand pipe, handle bar and steel legs, etc.

- d. Check for free movement of the handle bar in handle pipe and free handle movement in pump head.
- e. Check for any corrosion or pitting.
- f. Check if all fasteners (bolts and nuts) required for installation have been supplied.

ii. Cylinder Assembly

- a. Check for any breakage of packing cases and damage caused if any to cylinder assemblies.

iii. Pump Rod Bundles

- a. Check for proper packaging with quantity as per packing slip and inspection stamp.
- b. Check for manufacturer's identification marks
- c. Check for Inspection stamp on connecting rod bundles
- d. Interchangeability in eye and hook joints.

6.3.3 Reporting and Follow-Up

In case of any deficiencies, a consolidated report of discrepancies/findings is prepared by the consignee. The report shall be forwarded to the pump manufacturer and the inspection agency for necessary action. This provides feedback to both manufacturer and inspection agency for further follow-up action. In case of a major discrepancy a joint inspection involving inspection agency, purchaser and manufacturer is recommended.

Annex I - Typical Format for Manufacturer's Deviation Report

ABC Company Limited

Report No.

Date:

S. NO.	PART/ASSY. NO.	DESCRIPTION	DETAILS OF DEVIATION

Signature of the Inspector:

Corrective Actions suggested:

Corrective Action taken:

Signature of Production In-charge:

Signature of Quality Control Chief :

Annex II - List of Measuring Instruments

S. NO.	DESCRIPTION	SIZE & ACCURACY	QTY.
1	STEEL TAPE	3M/1mm	1 + 1
2	MICROMETER	0 - 25/0.01mm	1 + 1
3	-DO-	25 - 50/0.01mm	1 + 1
4	STEEL RULER	150/1mm	1 + 1
5	-DO-	300	1 + 1
6	-DO-	500	1 + 1
7	-DO	1000	1
8	VERNIER CALIPER	150/200mm/0.02mm	1 + 1
9	-DO-	350/0.02mm	1 + 1
10	BEVEL PROTRACTOR (MECHANICAL)	180°/10"	1
11	INSIDE RADIUS GAUGES	1 - 15	1 SET
12	OUTSIDE RADIUS GAUGES	1 - 15	1 SET
13	THICKNESS GAUGE DIAL TYPE	0 - 10mm / 0.1mm	1 + 1
14	FEELER GAUGE	0.02 to 1mm	1 SET
15	SHORE HARDNESS TESTER SCALE A	0 - 100	1
16	ELCOMETER	0 - 100 micron	1
17	TRY SQUARE	150mm	1 + 1
18	TRY SQUARE	300mm	1 + 1
19	MAGNET FOR CHECKING STAINLESS STEEL PARTS		1
20	MAGNIFYING LENS	3 X	
21	SPIRIT LEVEL	300mm/ 0.1/M	1
22	SLIP GAUGES (GAUGE BLOCKS SET) (49 PIECES)	0 - 100 grade 1	1 + 1 1 SET
23	V-BLOCK	100 x 100 x 90°	
24	SURFACE PLATE (GR.1)	630 x 630	2
25	DIAL GAUGE	0 - 10mm / 0.01mm	1
26	MAGNETIC STAND	250 mm	1 1

Annex III - List of Standard Gauges

S. NO.	GAUGE GO & NO GO	GAUGE SIZE / DIMENSIONS	GAUGE USED FOR
1	PLUG GAUGE	DIA 47 + 0.1	HANDLE BAR
2	THREAD PLUG GAUGE	M 16 - 6H	HEX. NUTS
3	THREAD RING GAUGE	M 16 - 6g	SET SCREW, FULCRUM PIN AND ROD HANGER PIN
4	THREAD PLUG GAUGE	M 10 - 6H	PLUNGER CONNECTOR
5	THREAD RING GAUGE	M 10 - 6g	PLUNGER ROD
6	PLUG GAUGE	DIA 6 H7	FULCRUM PIN AND ROD HANGER PIN
7	THREAD RING GAUGE	M 12 - 6g	FOR M 12 BOLTS
8	THREAD PLUG GAUGE	M 12 - 6H	FOR M 12 NUTS

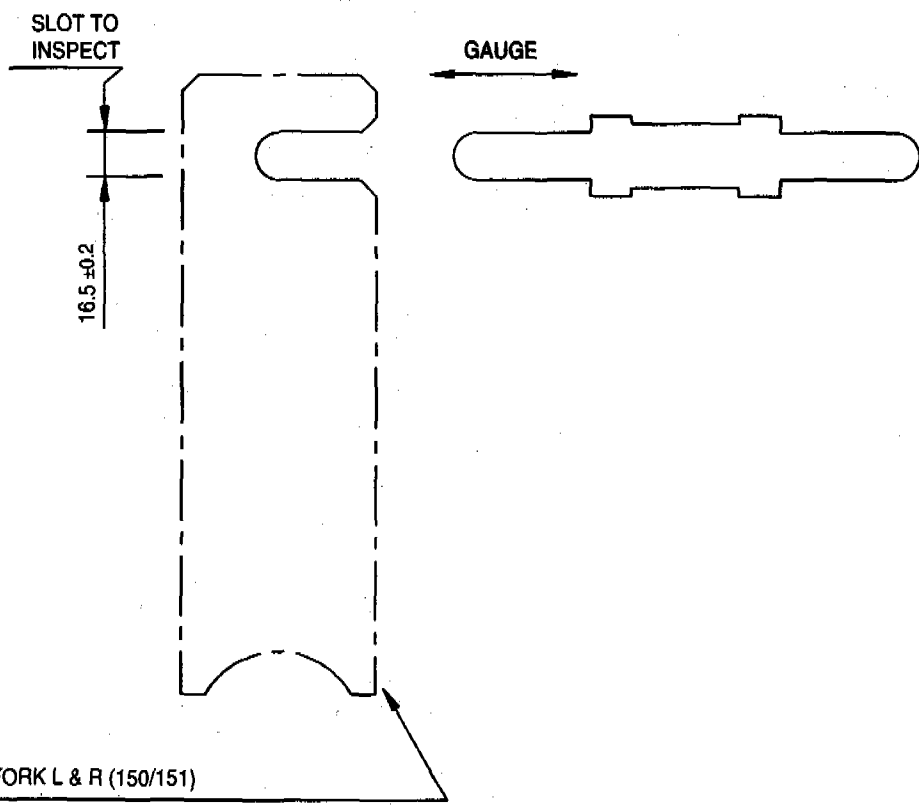
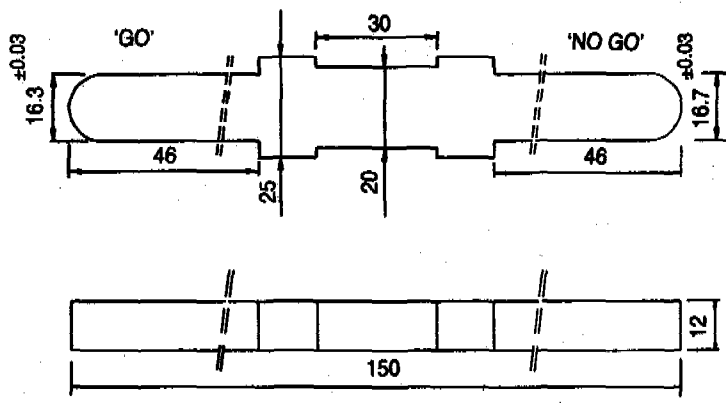
Annex IV - List of Special Gauges and Templates

NO.	DESCRIPTION	GAUGE SIZE		WHERE USED/ SKAT NO.
		GO	NO GO	
1	GAUGE FOR SLOT OF HANDLE FOR (LEFT AND RIGHT) (FIGURE NO. 5)	16.4	16.7	HANDLE FORKS (150, 151)
2	GAUGE FOR SLOT OF EYE (FIGURE NO. 6)	30 x 10.1	30.3 x 10.3	EYE (422)
3	GAUGE FOR SLOT (FIGURE NO. 7)	10.1 x 29.5	10.4 x 30	HOOK CONNECTORS (423)
4	GAUGE FOR SLOT INCLUDING RADIUS OF FOOT VALVE CONNECTOR (FIGURE NO. 8)	35.7 x 19.7	36.3 x 20.3	FOOT VALVE FITTING (401)
5	GAUGE FOR U SEAL GROOVE DIA GAUGE FOR 'O' (FIGURE NO. 9)	40.0 x 7.2	40.2 x 7.4	PLUNGER/FOOT VALVE (575)
6	'O' RING GROOVE DIA (FIGURE NO. 10)	29.2 x 3.1	29.4 x 3.4	PLUNGER/FOOT VALVE (575)
7	SNAP GAUGE FOR 'O' RING GROOVE (FIGURE NO. 11)	44.8 x 3.9	44.9 x 4	FOOT VALVE RECEIVER (554)
8	GAUGE FOR DIMENSION 12 BETWEEN PIN AND NUTS (FIGURE NO. 12)	12MM		FULCRUM PIN (124 AND 126) HANGER PIN (129 AND 131)
9	GAUGE FOR ORIENTATION OF HOLES (FIGURE NO. 13)			BASE FLANGES (10)
10	GAUGE FOR LENGTH 119.5 -0.2 (FIGURE NO. 14)	119.3	119.5	FULCRUM PIN (124)
11	GAUGE FOR LENGTH 68.5 + 0.2 (FIGURE NO. 15)	68.5	68.7	ROD HANGER PIN (129)

NO.	DESCRIPTION	GAUGE SIZE		WHERE USED/ SKAT NO.
		GO	NO GO	
12	RING GAUGE FOR DIA. 38 - 0.2 (FIGURE NO. 16)	37.8	38	FULCRUM PIN ROD HANGER PIN (C-01)
13	GAUGE DIMENSION 120.2 +0.5 BETWEEN BRACKET PLATES (FIGURE NO. 17)	120.2	120.7	BRACKET (14) (A-01)

TEMPLATES:

NO.	DESCRIPTION	TEMPLATE DIMENSIONS	WHERE USED/ SKAT NO.
1	PROFILE OF FULCRUM BRACKET	DIMENSION 70 AND ANGLE 30°	FULCRUM BRACKET (14)
2	SIDE PLATE PROFILE	DIMENSION 337, 154, R-51	SIDE PLATE (51)
3	PROFILE OF STEEL CONE	DIA. 76 AND ANGLE 30°	STEEL CONE (350)
4	PROFILE OF SPACER	DIMENSION 25.7, 7.1, RADIUS 41.	SPACER (406)
5	PROFILE OF VALVE BOBBIN	ANGLE 30°, DIMENSION 21.5±0.2 AND 9 ± 0.2	VALVE BOBBIN (555)
6	PROFILE OF FISHING HOOK	DIMENSION 43.5 - 0.5 RADIUS 3, RADIUS 5, RADIUS 8 AND ANGLE 50°	FISHING HOOK (604)
7	PROFILE GAUGE OF HOOK CONNECTOR	DIMENSION 29.5 + 0.5, 9.5, RADIUS 15	HOOK CONNECTOR (423)

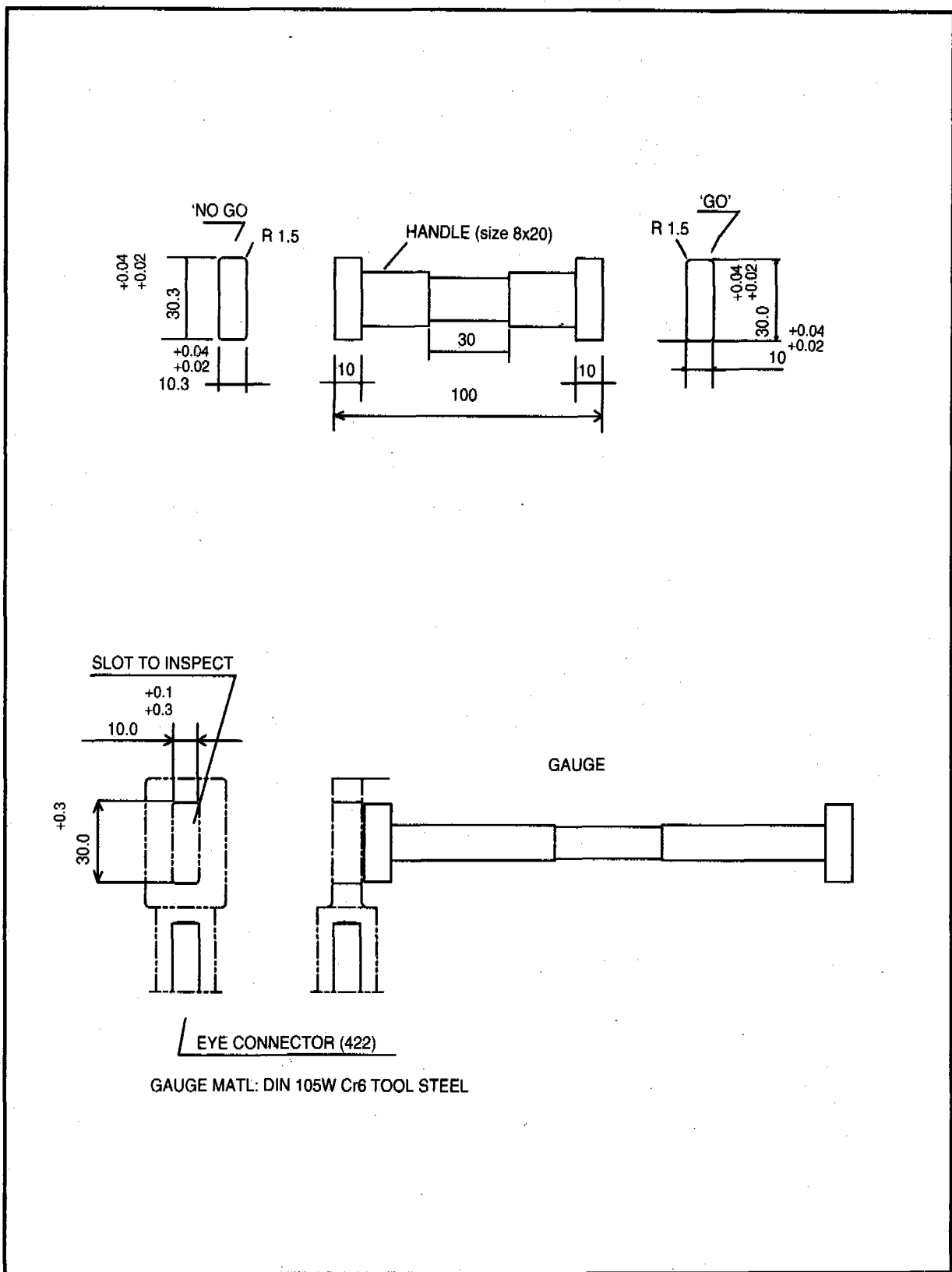


HANDLE FORK L & R (150/151)

GAUGE MATL: DIN 105W Cr6 TOOL STEEL

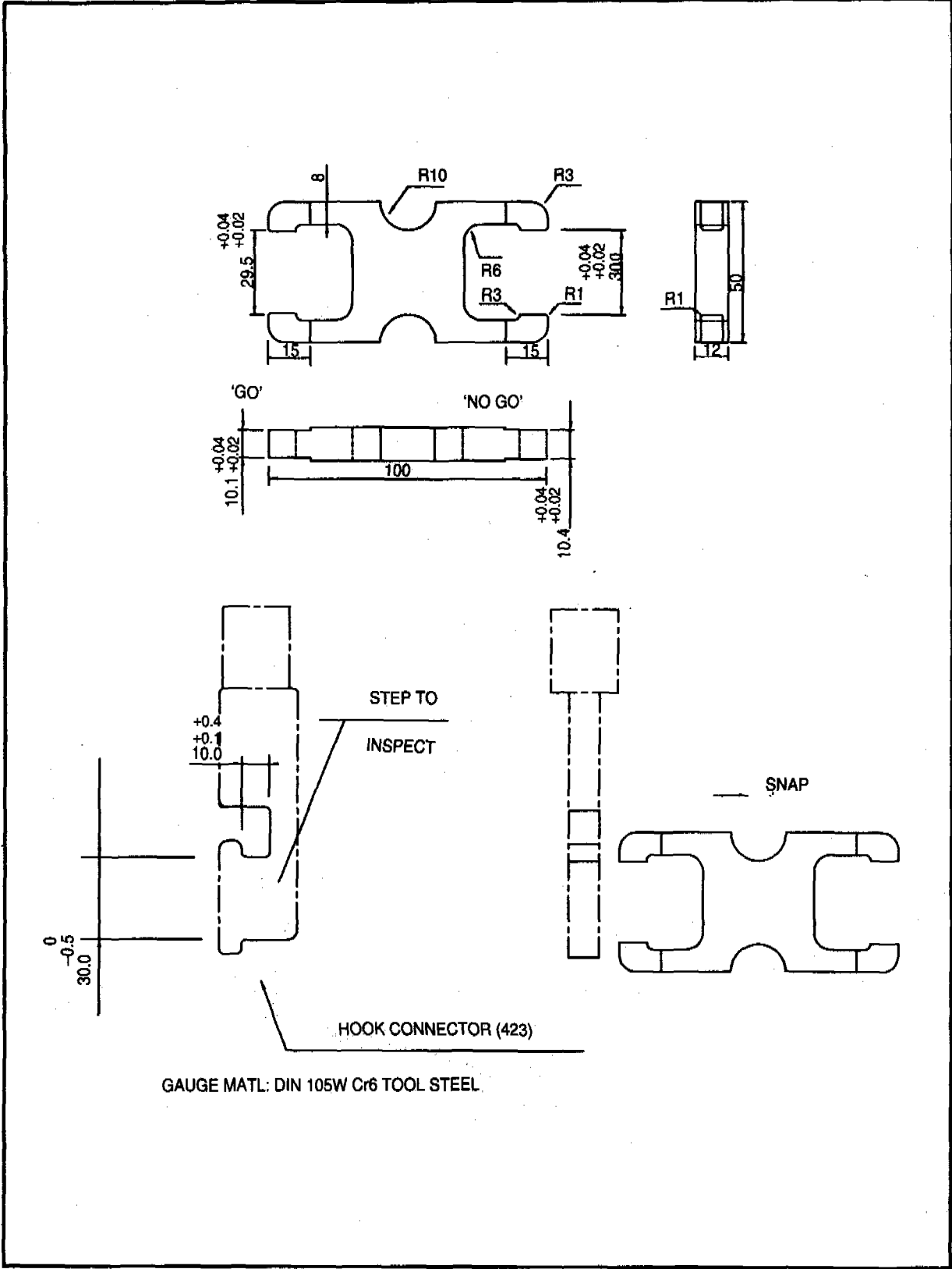
GAUGE FOR 16.5MM SLOT

FIGURE NO 5



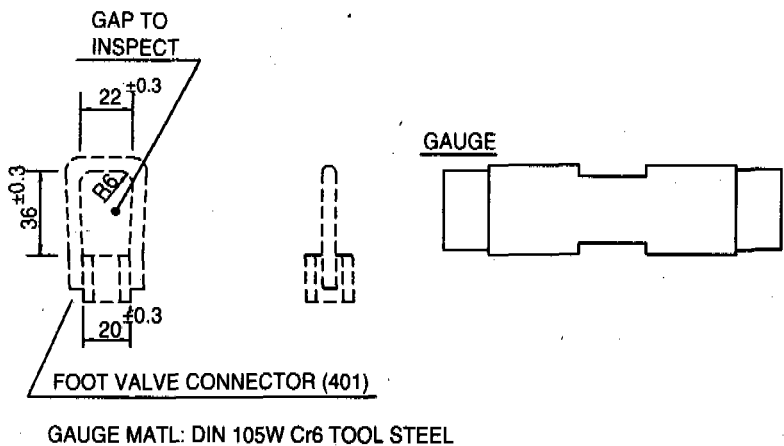
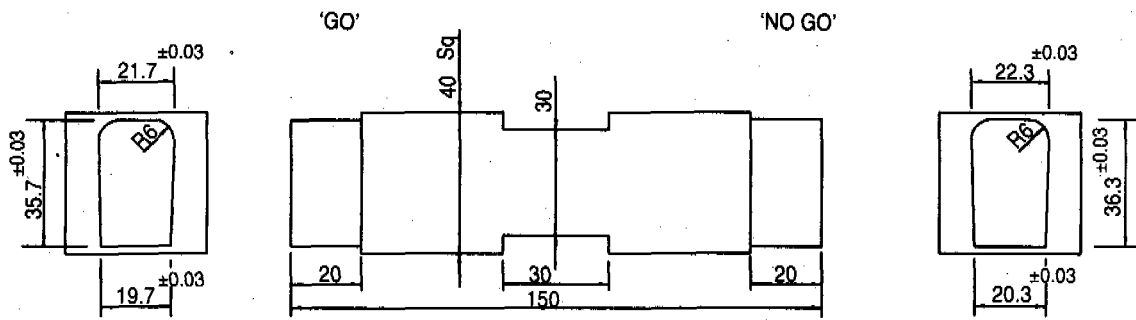
PLUG GAUGE FOR EYE CONNECTOR

FIGURE NO 6



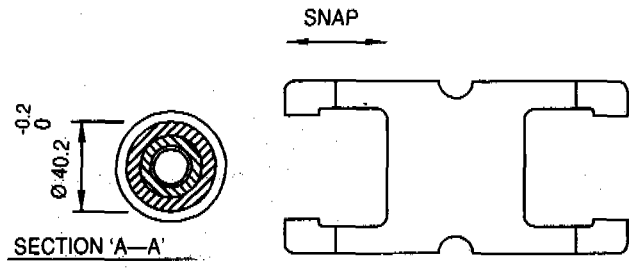
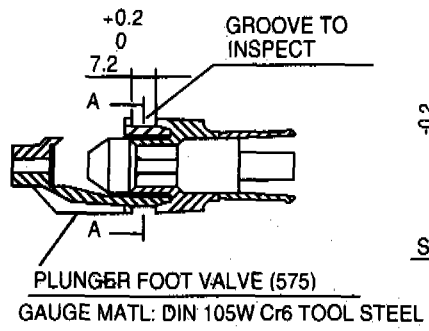
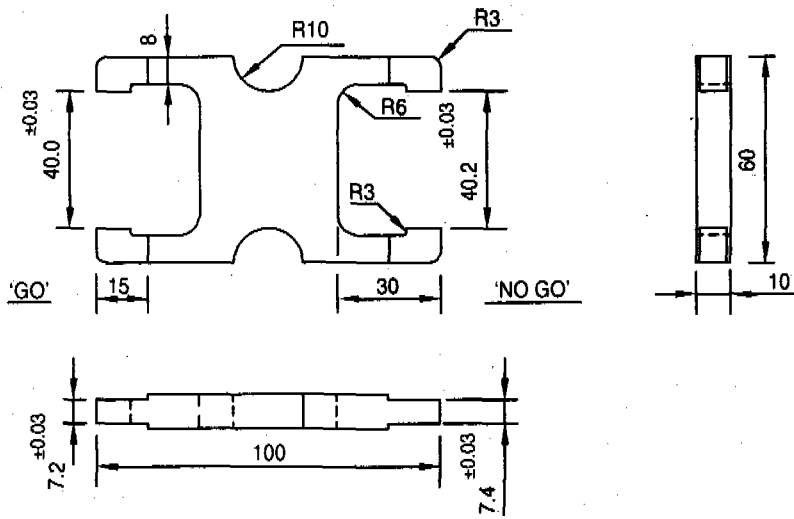
SNAP GAUGE FOR HOOK CONNECTOR

FIGURE NO 7



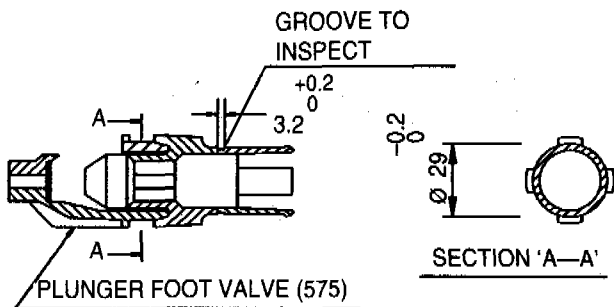
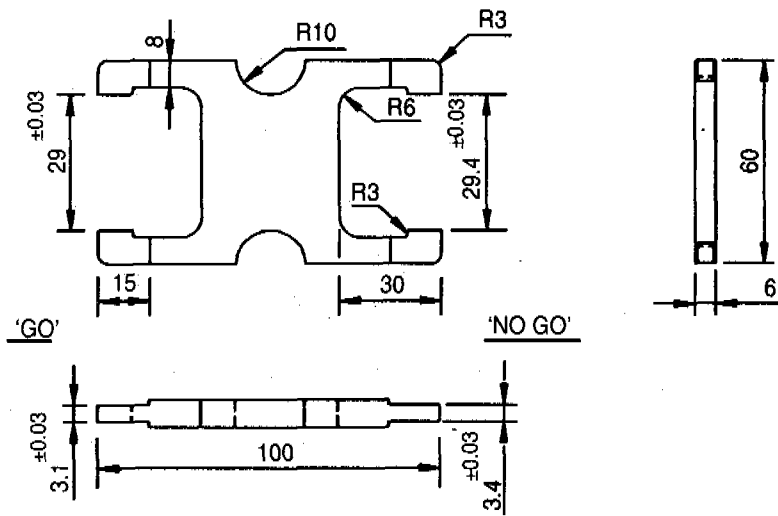
GAUGE FOR FOOT VALVE CONNECTOR

FIGURE NO 8



SNAP GAUGE FOR 'U' SEAL GROOVE

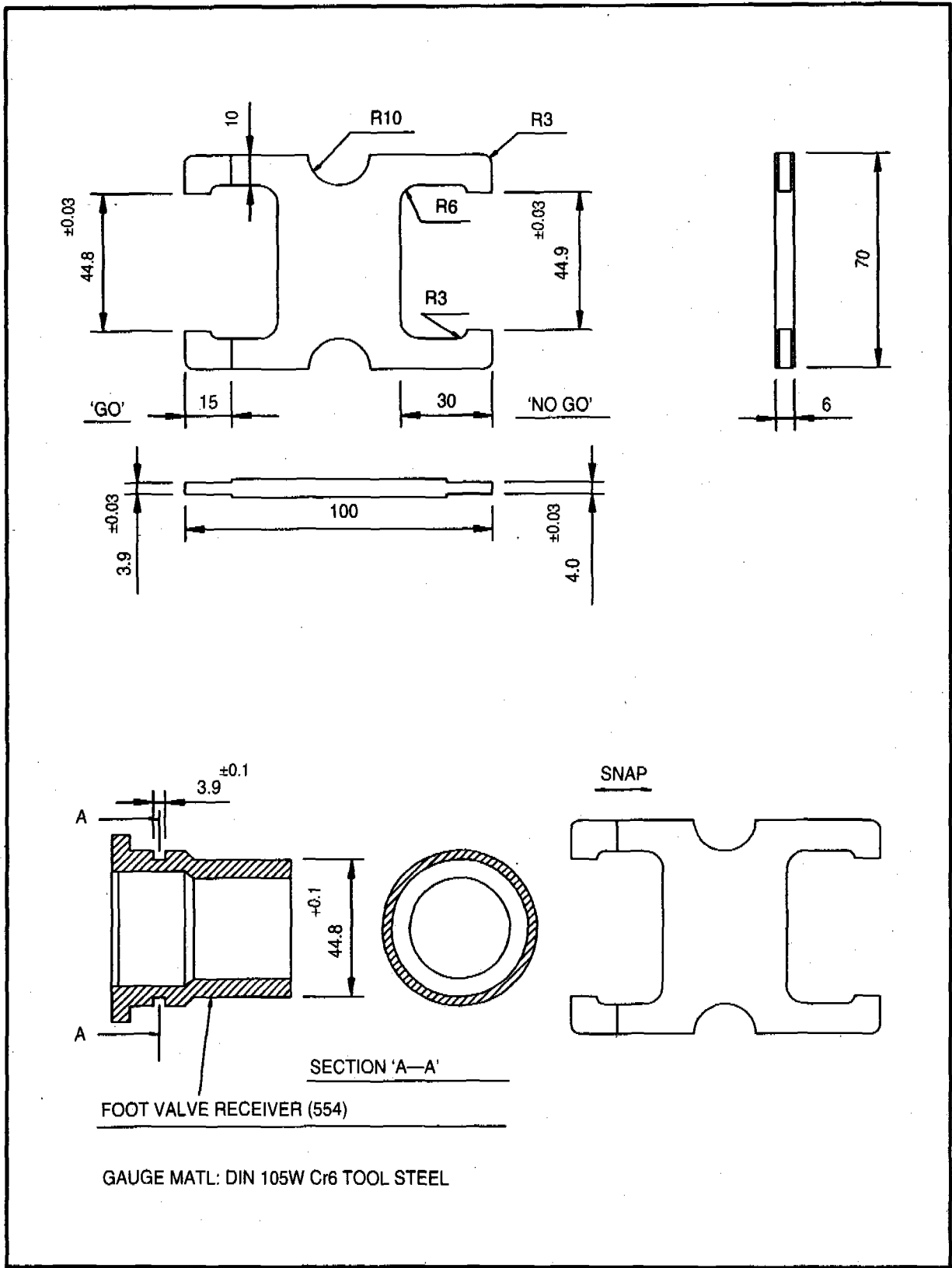
FIGURE NO 9



GAUGE MATL: DIN 105W Cr 6 TOOL STEEL.

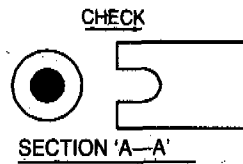
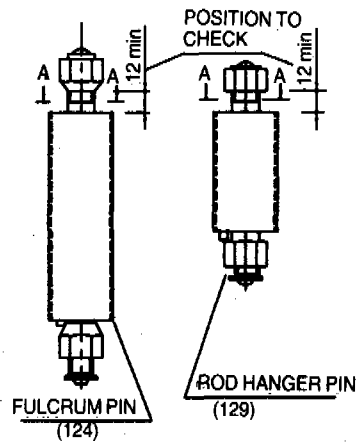
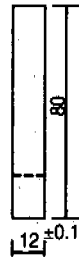
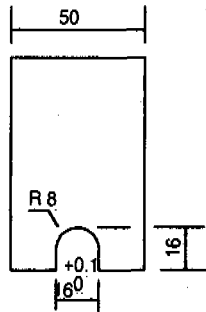
SNAP GAUGE FOR 'O' RING GROOVE OF FOOT VALVE

FIGURE NO 10



SNAP GAUGE FOR 'O' RING GROOVE
OF FOOT VALVE RECEIVER

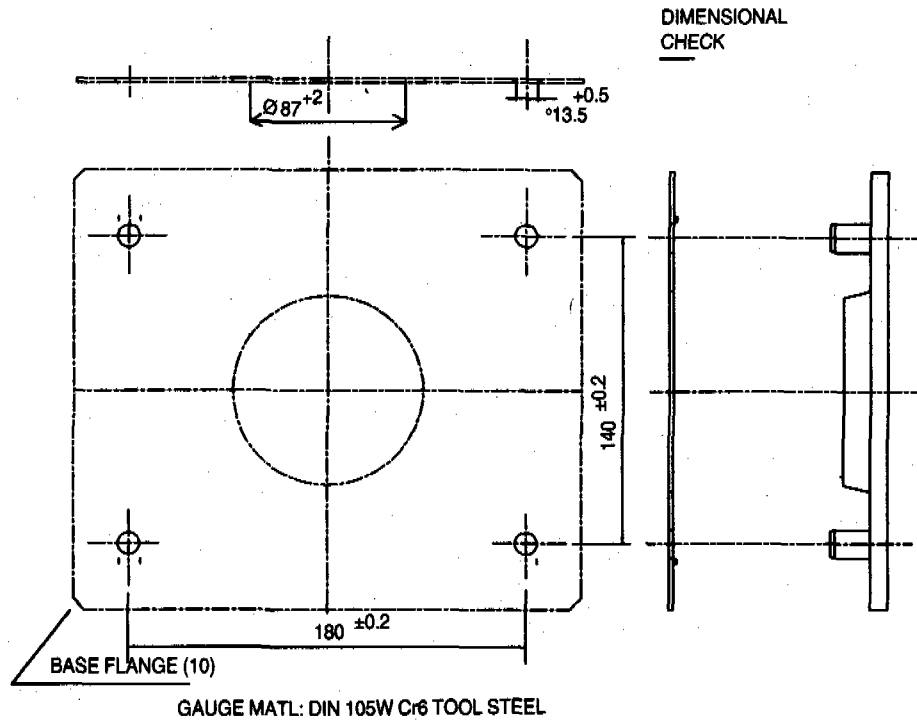
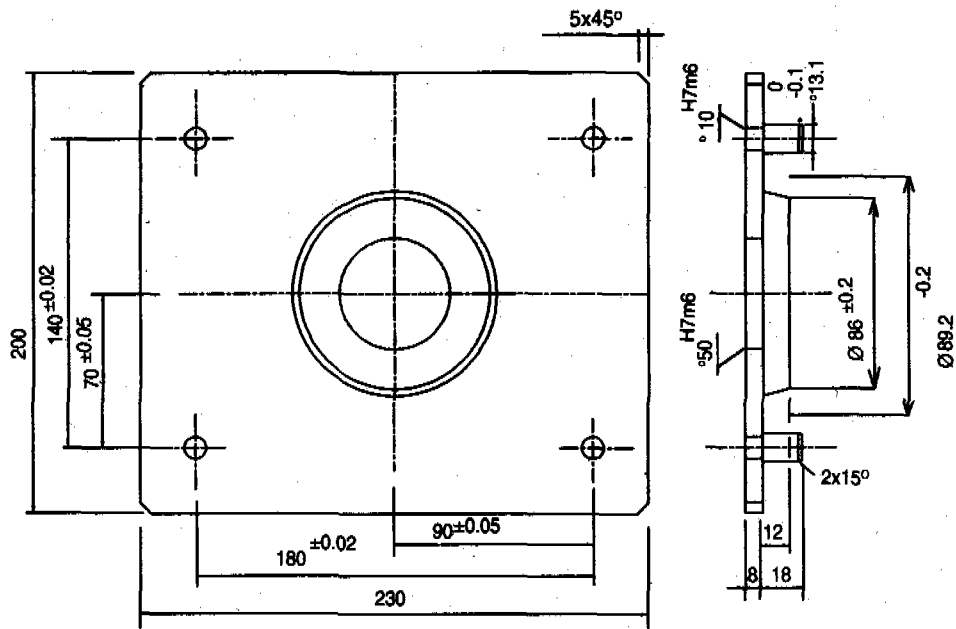
FIGURE NO 11



GAUGE MATL: DIN 105W Cr6 TOOL STEEL

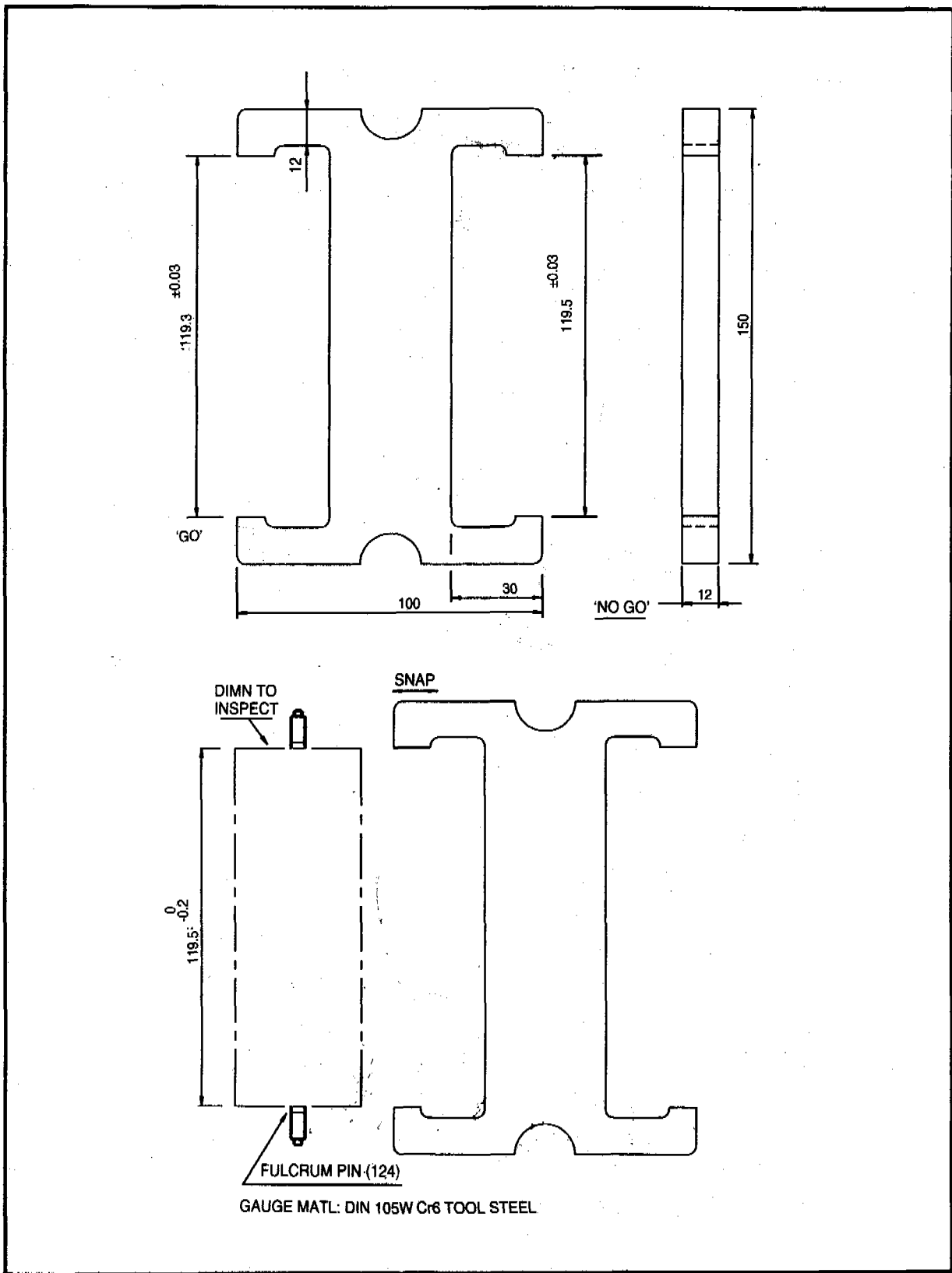
GAP GAUGE FOR FULCRUM/ROD HANGER PIN

FIGURE NO 12



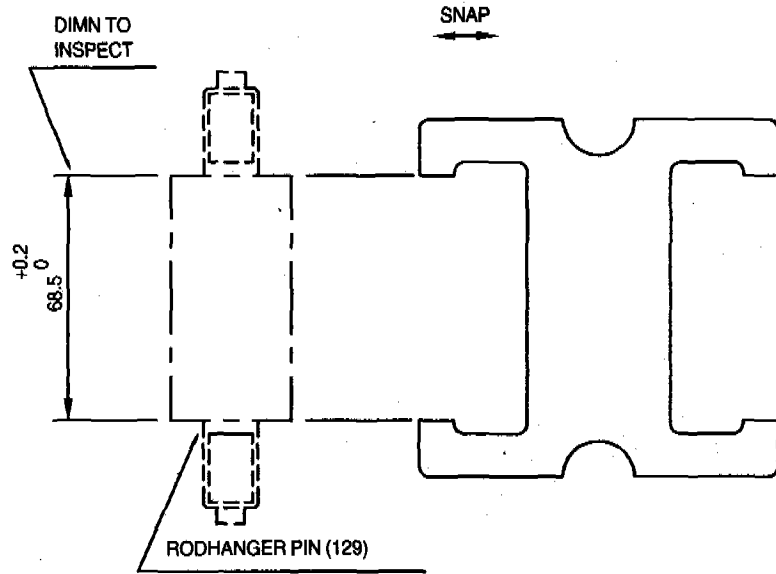
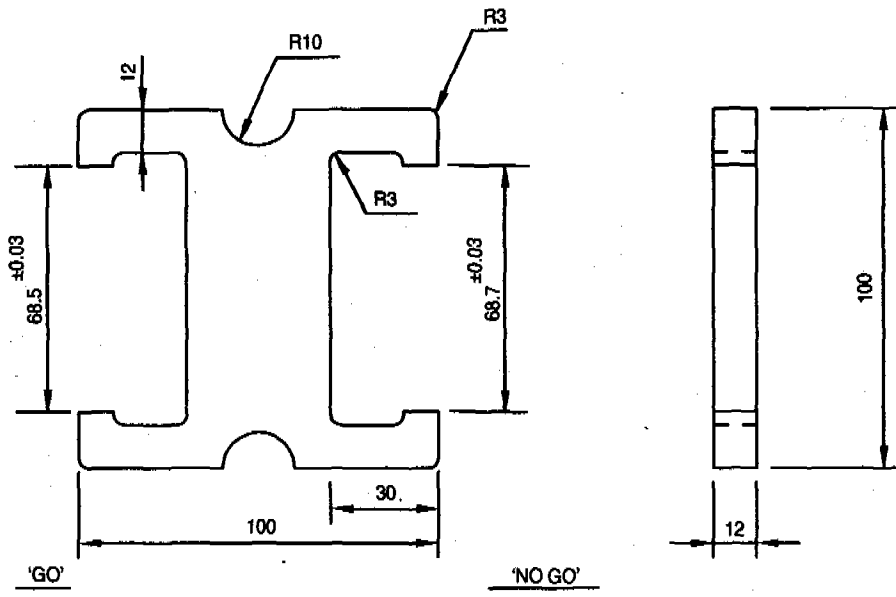
TEMPLATE FOR FLANGE HOLES

FIGURE NO 13



SNAP GAUGE FOR FULCRUM PIN

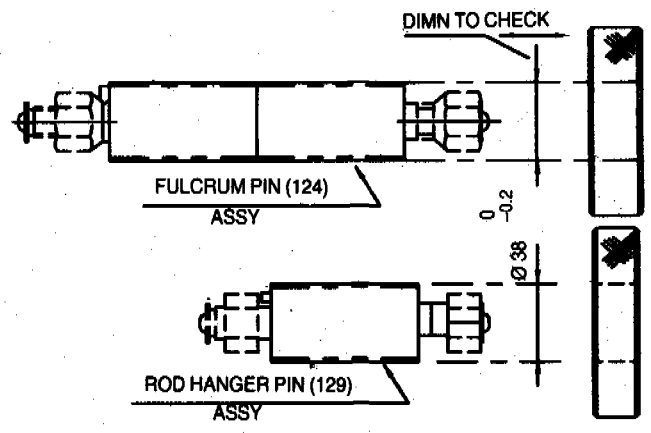
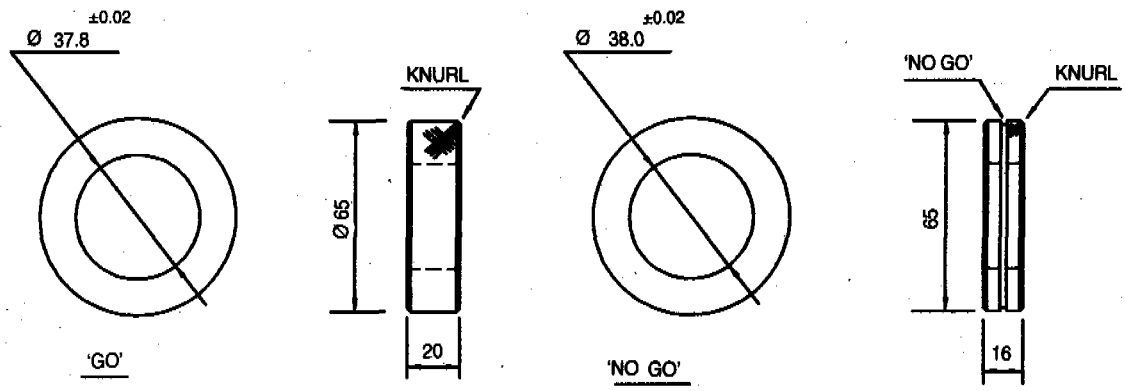
FIGURE NO 14



GAUGE MATL: DIN 105W Cr6 TOOL STEEL

SNAP GAUGE FOR ROD HANGER PIN

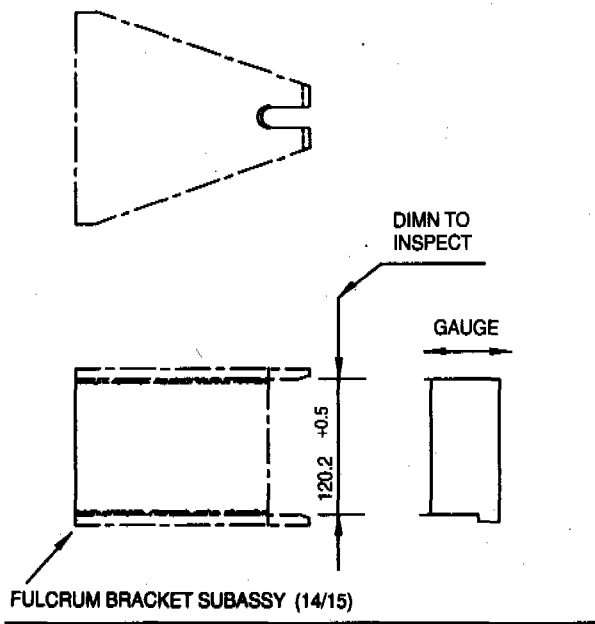
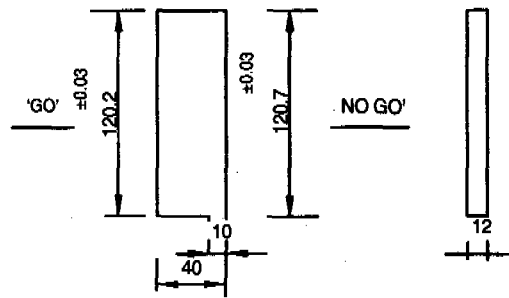
FIGURE NO 15



GAUGE MATL: DIN 105W Cr6 TOOL STEEL

PLAIN RING GAUGES FOR FULCRUM AND ROD HANGER PINS

FIGURE NQ 16



FULCRUM BRACKET SUBASSY (14/15)

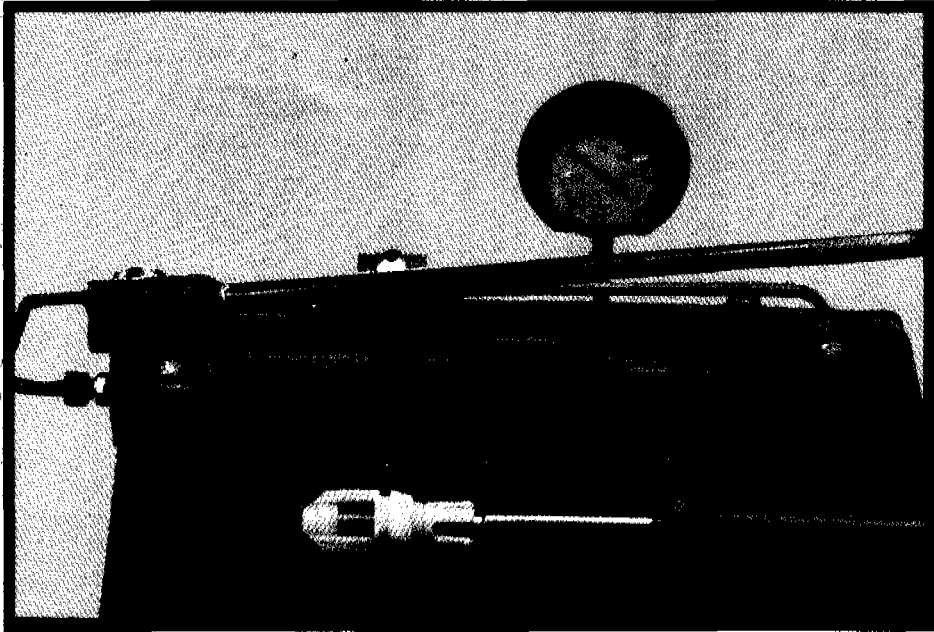
GAUGE MATL: DIN 105W Cr8 TOOL STEEL

GAUGE FOR FULCRUM BRACKET DISTANCE

FIGURE NO 17

Annex V - List of Special Apparatus (Testing Equipment)

EQUIPMENT NO.	DESCRIPTION	QTY.
1	TESTING EQUIPMENT FOR LOAD TEST FOR SPIN WELDING OF PLUNGER/FOOT VALVE BODY (575)	1
2	TESTING EQUIPMENT FOR LEAKAGE TEST 1 BAR AND 10 BAR FOR CYLINDER ASSEMBLY	1
3	TESTING EQUIPMENT (RIG) FOR DISCHARGE TEST OF PUMPS	1

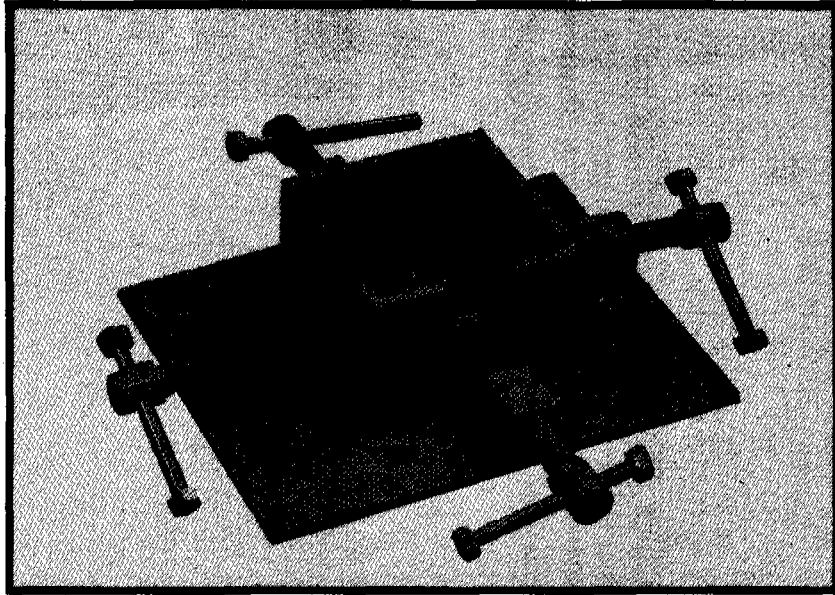


*Test Equipment for Spin Weld Strength
(for Plunger/Foot Valve)*

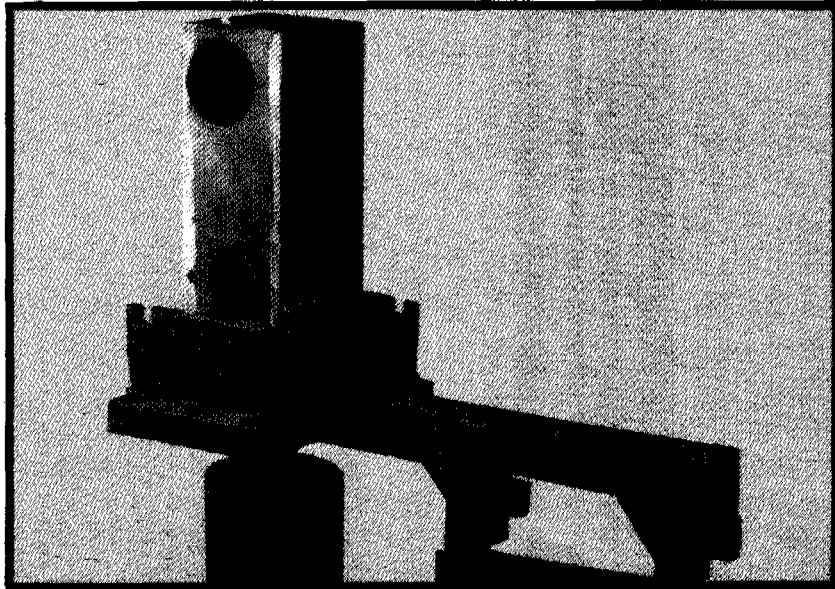
Annex VI - Indicative List of Fixtures

SL. NO.	NAME OF JIG & FIXTURE*	DESCRIPTION
1.	Pump head	For welding of square body, flange, Fulcrum bracket, spout and overflow cover
2.	Cover	For welding of cover plate, side plates, shrouds and deflector
3.	Handle Front	Forks left and right, Fulcrum housing and handle pipe welding
4.	Handle Rear	For welding T-Bar and Handle extension pipe
5.	Rod Hanger Assy.	For locating of welding of Hanger bush, rod hanger connector, Retainer bush and hex. nuts
6.	Stand Assy.	Welding of Steel flange, Stand pipe legs and gussets
7.	Steel Cone Assembly	For welding flange, Steel cone and eyes
8.	Foot valve connector	Welding U hook and Plunger connector
9.	Plunger rod	Welding of Plunger rod, Plunger connector and eye hook
10.	Pump Rod Top and Pump Rod Cylinder	For welding of pump rod, eye, hook connectors
11.	Cylinder	Fixing of Brass liner to the Cylinder pipe
12.	Fishing Tool	Welding of rod, cover plate, side plate and hook connector
13.	Foldable Spanner	Welding Hexagonal socket, U channel
14.	Welding of Stand Assembly	Option A and B for welding of stand pipe, legs, flanges
15.	Leg	Bending fixture
16.	Fishing Tool	Fixture for bending side plates 601
17.	Fulcrum Housing and Rod Hanger	Sleeve fixing fixture
18.	Fulcrum Pin and Rod Hanger pin	Sleeve fixing fixture

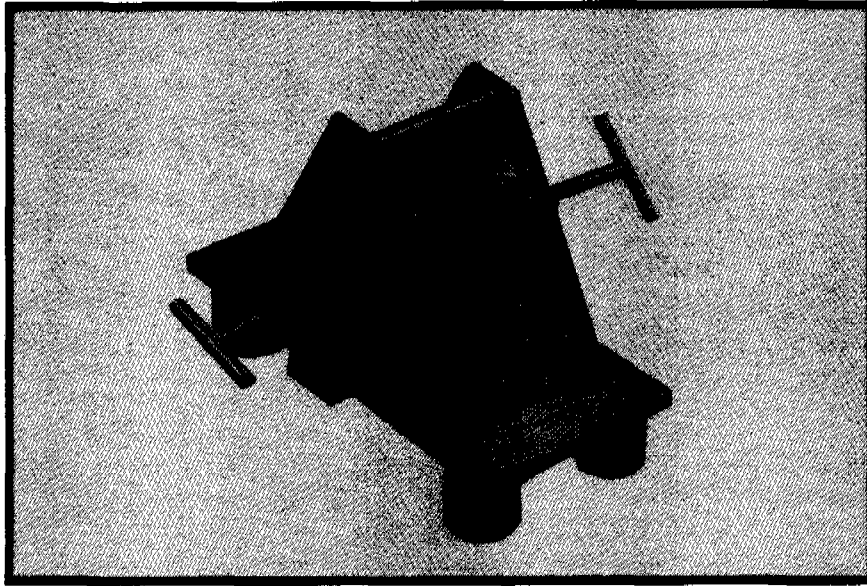
* Photographs for Jigs and Fixtures — Courtesy: Meera & Ceiko (P) Ltd., Hyderabad, India.



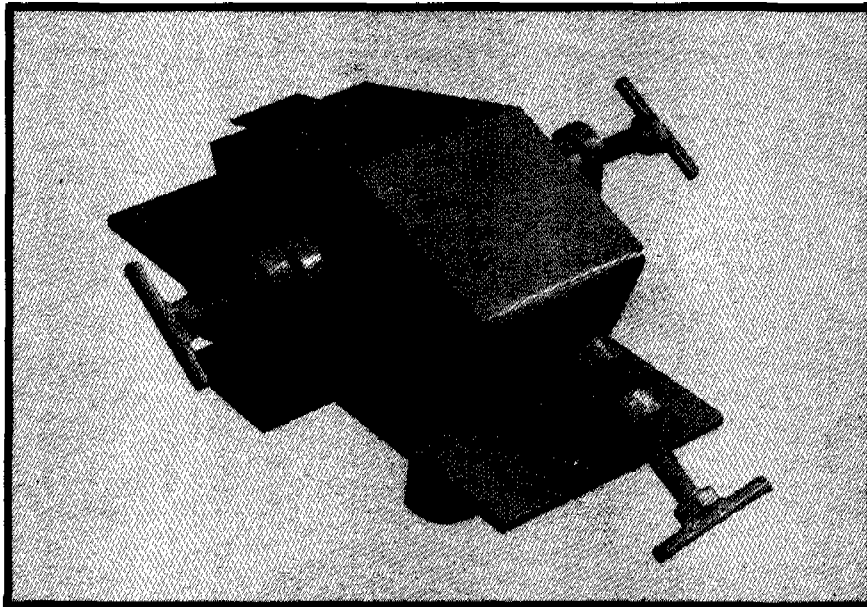
Welding Fixture for Pump Head



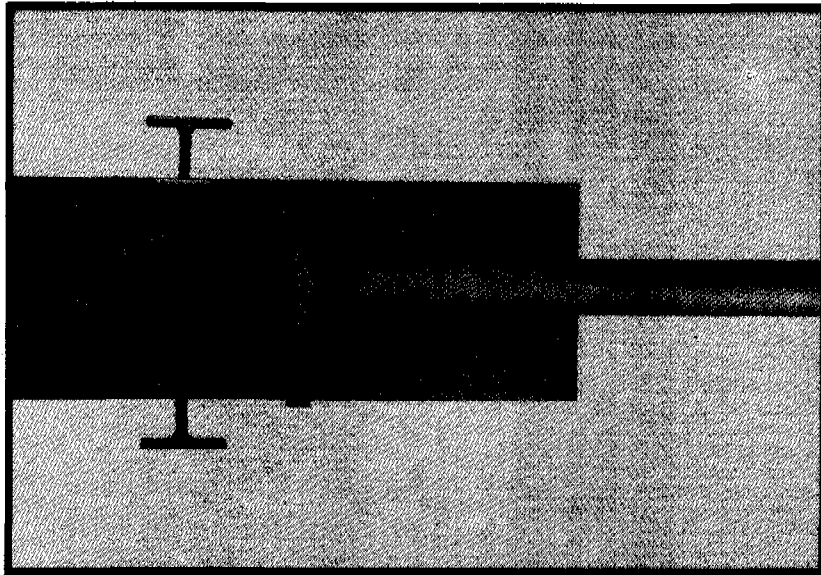
Welding Fixture for Pump Head-Spout Pipe



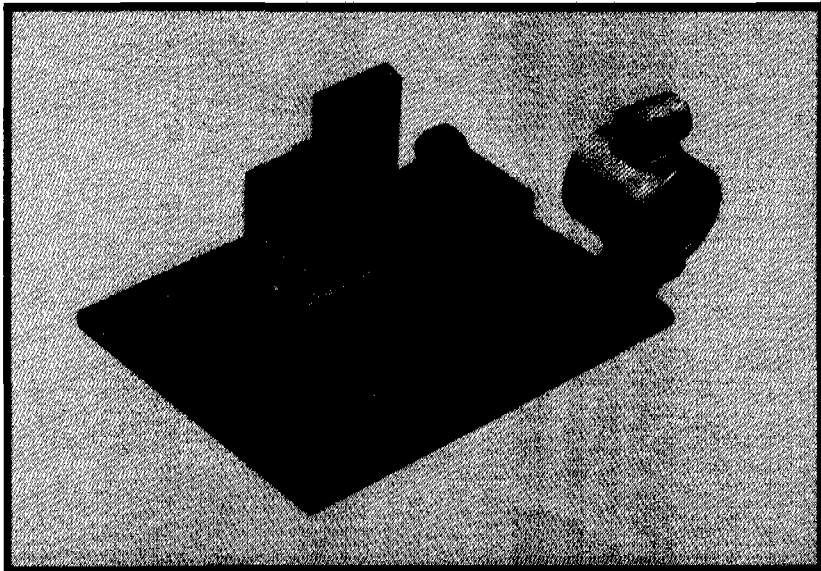
Welding Fixture for Pump Head Fulcrum Bracket



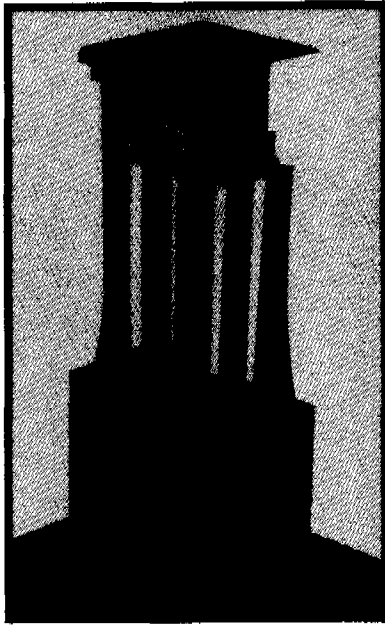
Welding Fixture for Pump Head Cover



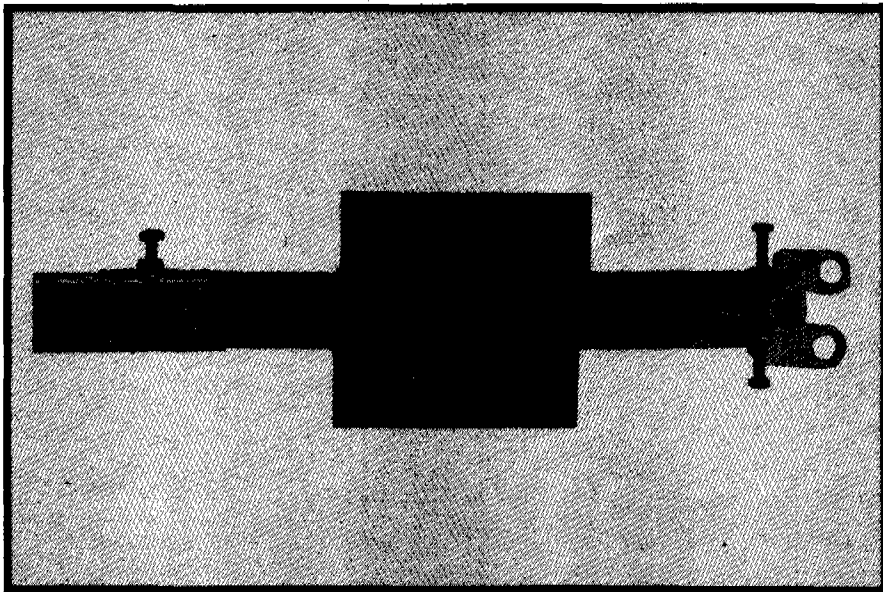
Welding Fixture for Handle



Welding Fixture for Rod Hanger



Welding Fixture for Stand



Drill Jig for Handle Bar

Annex VII - Format for Evaluation of Afridev Handpump Manufacturers

Particulars:

1. Name of the pump manufacturer
 2. Address
 3. State/Country
 4. Telephone/Telex/Fax nos
 5. License No
 6. No. of years in business
-
- 2.1. Assessment:
 - a. Premises/Factory
 - b. Inspection area
 - c. Production area
 - d. Stores area

Condition
Satisfactory Unsatisfactory
 - e. General appearance
 - f. General maintenance
 - g. Space distribution and utilization for
 - Production/Fabrication
 - Galvanizing plant
 - Welding units
 - Feting and sand/shot blasting
 - Inspection floor
 - Internal Quality Control
 - Stores/Inventory control
 - 2.2. List of skilled/semi-skilled manpower
 - Production
 - Quality Control

Available	Condition
Yes No	Satisfactory Unsatisfactory
 - 2.3. Jigs and Fixtures
 - 2.4. Tools and Gauges
 - 2.5. Master Gauges set
 - 2.6. Inspection Gauge set
 - 2.7. Test Facilities
 - 2.8. Production Equipment
 - 2.9. Internal Quality Control for raw materials and finished products
 - Quality Control Structure
 - Procedural system including documentation and verification
 - 2.10. Material flow (Handling facilities)
 - 2.11. Packing and shipping facilities
 - 2.12. Manufacturing capacity

Units/Month and Year

- 2.13. Normal Rejection level
 - Due to manufacturing process
 - Due to Quality control
 - Due to Tools and Accessories

'Percentage'

- 2.14. Compliance
 - Supplied before delivery date
 - Supplied after delivery date
 - Orders cancelled due to non-compliance with delivery date

No. of Items Qty

- 2.15. Other information

Attachment to Annex VII

Analysis of Production Capacity and Facilities on Points Weightage Basis.

Name of the Supplier

1. Structure of the Company
2. Location
3. Covered Area (Square Meters)
4. Electrical Power (KW)
5. Manpower
6. Production previous 4 years
7. Total No. of rejections
8. Pumps produced/rejected (previous 4 years)
9. Factors for evaluation

	Weightage for Evaluation	Actual Score
Type of Organization	5	
Infrastructure facility	10	
Manpower	5	
Financial ability	5	
Welding Jigs and Fixtures	10	
Gauges and Measuring instruments	5	
Internal Quality Control	20	
Past Quality control record	20	
Design and development	5	
Earlier performance	5	
Responding to complaints	5	
Reliability	5	
Total	100	

Signature of Inspector

Grade: A: Excellent - Above 80% B: Good - Above 70% C: Satisfactory - Above 60 %
 D: Below 60% needs improvement.

Annex VIII - A Typical Purchase Order Format

ABC COMPANY LIMITED

XXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXX

Phone No.:
Fax No.:
Telex No.:

Purchase Order No.....(All shipments, invoices, correspondence must indicate this No.)

Date.....

Amendment No..... Forwarding instructions.....

Date.....

Supplier's Ref: BID No.
Opened on

Remarks:

Please supply the following material as per terms and conditions given below.

1. Price:

	Qty.	Unit Price	Total Price
(a) Supply of Afridev Handpump complete as per SKAT/HTN Afridev Specification, Revision 2 -1994, and described below:			
(b) Supply of spare parts as per attached list'			

2. Description: Each set consists of the following.

ITEM NO.	DESCRIPTION	QTY.
i.	*Pump Head with cover (Spout length, Spout position to be specified)	1
ii.	Handle assembly E-00 with Fulcrum and rod hanger pins, bearing bushes, rod hanger assembly etc. complete.	1
iii.	* Stand Assembly drawing No.....	1
iv.	Steel cone with rubber compression cone	1
v.	* Riser main (503)	
vi.	* Riser pipe centralizer size... Drawing No.	
vii.	* a. Pump rod fitting top drawing No....., material..... * b. Pump rod fitting bottom drawing No....., * c. Pump rod drawing No....., material:.....	1
viii.	Rod Centralizers	
ix.	Cylinder assembly L-00 (without suction pipe)	1

ITEM NO.	DESCRIPTION	QTY.
x	Suction pipe	1
xi.	Fishing tool	1
xii.	* Spanner drawing No.....	1
xiii.	Open end spanner 17/19	2
xiv.	* Ropemts

* Indicate appropriate option and/or quantity.

* Use the attached format while ordering spare parts.

Other terms and conditions of purchase order:

1. Prices: Indicate whether prices are (i) On FOB or CIF or Ex-factory basis, (ii) inclusive or exclusive of taxes, and (iii) inclusive or exclusive of packing charges.
2. Despatch Details: Mode of Transport; and Destination address (Consignee's address).
3. Earnest Money Deposit and forfeiture clauses.
4. Delivery Schedule (indicate if part delivery acceptable or not).
5. Pre-delivery inspection by independent inspection agency (give name and address of inspection agency).
6. Packaging instructions (indicate the type of packing i.e. as per SKAT guidelines or any specific requirements).
7. Marking (indicate if any particular marking is required).
8. Guarantee Clause (indicate whether as per SKAT specification or any other specific clause).
9. Terms for payment.
10. Documents to be forwarded for payment of invoices (give clear instructions regarding documents to be submitted with the invoice, number of copies of each document to be forwarded).
11. Paying authority (Name of person who needs to be contacted by manufacturer for settlement of invoices and documents to be submitted with the invoice).
12. Penalty clause (% of total value of order will be charged for every week of delay in despatch).
13. Mode of resolving receipt of defectives/damages.
14. Circumstances leading to purchase order cancellation.
15. Issue of amendments (who is authorized to issue amendments).
16. Arbitration: Suitable clause to be included.

Enclosures:

Signature:

(Name and designation of ordering Authority)

Return one copy attesting acceptance of the order.

Order Acceptance

Signature:

(Name and Designation of supplier)

Format for Ordering Afridev Handpump Spares

(Part of Annex VIII)

S. NO	DESCRIPTION	SKAT NO.	QTY.	UNIT PRICE	TOTAL AMOUNT
1.	* Pump head - Spout length 512/232 * Spout position-Normal -Right -Left	A-00			
2.	Bolts M12 x 35	19			
3.	Bolt M16 x 20	18			
4.	Cover	B-00			
5.	Bearing set - Inner Outer	100 101			
6.	Fulcrum pin	C-01			
7.	Rod Hanger pin	C-01			
8.	Handle assembly front	D-00			
9.	Bolt M16 x 30	156			
10.	Handle Assembly Rear	E-01			
11.	Rod Hanger assembly	F-00			
12.	M16 x 30 bolt	255			
13.	* Stand assembly	G-00, G-00a, G-00b			
14.	Cone assembly	H-00			
15.	* Pump Rod - Bottom Fabricated Forged	J-00 J-00a			
16.	* Pump Rod - Fabricated Forged (Material: Carbon Steel, Stainless Steel)	J-00 J-00a			
17.	* Pump Rod - Top Fabricated Forged (Material: Carbon Steel, Stainless Steel)	J-00 J-00a			

S. NO	DESCRIPTION	SKAT NO.	QTY.	UNIT PRICE	TOTAL AMOUNT
18.	Compression cone	H-00			
19.	Riser main	503			
20.	Flapper	500			
21.	Rod Centralizer	504			
22.	* Pipe Centralizer	520 521 522 523 524			
23.	Rope	580			
24.	Bobbin Valve	555			
25.	Plunger Foot Valve	575			
26.	Cylinder Assembly	L-00			
27.	U-Seal (Plunger)	556			
28.	M10 x 35 SS bolt	559			
29.	Washer	576			

* Indicate appropriate option

Annex IX - Manufacturer's Declaration Sheet for Third Party Inspection

- 01. Date of request for inspection :
- 02. Date of inspection :
- 03. Order No. and Date :
- 04. Reference No :
- 05. Client's Name :
- 06. Total quantity of order :
- 07. Delivery date as per order :
- 08. Quantity offered for inspection :
- 09. Quantity already supplied :
- 10. Balance quantity to be offered :
- 11. Value of the order :

S. NO.	MATERIALS	MANUFACTURER'S DETAILS	TEST CERTIFICATE NO. & DATE
1	2mm Plate		
2	3mm Plate		
3	4mm Plate		
4	6mm Plate		
5	8mm Plate		
6	12mm Plate		
7	40x40x6 Angle		
8	Dia. 10mm Rod (Bright bar)		
9	Dia. 16mm - do -		
10	Dia. 32mm Rod		
11	Dia. 40mm Rod		
12	Dia. 75mm Rod		
13	Dia. 40mm Mild Steel Pipe		
14	Dia. 52mm - do -		
15	Dia. 185mm - do -		
16	S.S. Sleeve Dia. 38mm		
17	- do - Dia. 50mm		

S. NO.	MATERIALS DETAILS	MANUFACTURER'S NO. AND DATE	TEST CERTIFICATE
18	Brass liner Dia. 50mm		
19	-do- Dia. 54mm		
20	Cyl. Pin Dia. 6mm x 16mm		
21	Cyl. Pin Dia. 6mm x 45mm		
22	Cyl. Pin Dia. 10mm x 30mm		
23	Cylinder pipe (uPVC)		
24	Riser pipe (uPVC)		
25	Suction pipe (uPVC)		
26	Reducer (uPVC)		
27	Top sleeve (uPVC)		
28	Plunger/Foot valve (POM NC)		
29	Foot valve receiver (POM NC)		
30	Brg.bush outer (POM NC)		
31	Brg. bush inner (PA 6.6NC)		
32	Sleeve Dia. 10mm. (Nylon)		
33	Rope. (Polypropylene)		
34	Compressor cone (Rubber)		
35	'O' Ring 28x2.5mm. (Rubber)		
36	- do - 'O' Ring 44x3mm. (Rubber)		
37	- do - 'U' Seal 50x40x7mm. (Rubber)		
38	- do - Rod centralizers (Rubber)		
39	- do - Pipe centralizers (Rubber)		
40	- do - Fasteners		
41	Eye and Hook Connector		

01. Serial No. of pumps :
02. Sl. No. of cylinders :
03. Consignee Address :
04. Packing details as per SKAT-Guidelines/As per Contract :

05. Manufacturer's Identification marks. :

This is to certify that the material offered for inspection has undergone complete internal quality control check as per company procedures and fully conforms to SKAT and Purchase Order specifications.

Date: Proprietor/Works Incharge

NOTES:

1. Manufacturer shall furnish the following backup documents for verification.
 - a) Order copy
 - b) Packing list
 - c) Material test certificates
 - d) Internal Q.C. Reports

Preparations before inspection by Inspection Agency.

2. The materials are to be offered in sub-assembly/parts condition only.
3. The items must be arranged in rows, each assembly-wise in a place where there exists sufficient light and space for free movement for visual check.
4. Instruments, Gauges, Templates to be kept ready.
5. Tools for assembly and dismantling are to be kept ready.
6. Test rigs to be arranged for discharge test.

Annex X - Scale of Sampling for uPVC Pipes (Double Sampling Method)

Scale of Sampling for Visual Appearance and Dimensional Requirements

No of PVC pipes in Lot	Sample No.	Sample Size	Cumulative Sample Size	Acceptance No.	Rejection No.
Up to 1000	First	13	13	0	2
	Second	13	26	1	2
1001 to 3000	First	20	20	0	2
	Second	20	40	1	2
3001 to 10000	First	32	32	0	3
	Second	32	64	3	4
10001 and above	First	50	50	1	4
	Second	50	100	4	5

Scale of Sampling for Reversion Test

SAMPLE NO	SAMPLE SIZE	CUMULATIVE SAMPLE SIZE	ACCEPTANCE NO.	REJECTION NO.
First	3	3	0	2
Second	3	6	1	2

Reversion Test: A sample piece of 300mm long pipe is immersed in both of Ethylene Glycol or Mineral Oil at 150°C and the length shall not alter more than 5% when tested according to IS 1 Part 5. The test can be carried out by oven method.

Scale of Sampling for Stress Relief Test (Double Sampling Method)

SAMPLE NO. SIZE	SAMPLE SAMPLE	CUMULATIVE SIZE	ACCEPTANCE NO.	REJECTION NO.
First	5	5	0	2
Second	5	10	1	2

Stress Relief Test: A sample piece of 100 mm long is kept in an oven at 150°C for one hour as per IS-4985 and IS-12235 and shall not show blisters, excessive delamination, cracking or signs of weld line splitting.

Scale of Sampling for Internal Hydrostatic Test

NO. OF PVC PIPES IN LOT	SAMPLE SIZE	ACCEPTANCE NO
Up to 3000	2	0
3001 to 10000	3	0
10001 and above	5	0

Internal Hydraulic Test: As per IS-4985 and IS 12235, a test piece of 250 to 750mm length is connected to hydraulic pressure line at ambient controlled temperature. The sample shall not rupture during the test.

Scale of Sampling for Impact Test

NO. OF PVC PIPES IN LOT	SAMPLE SIZE	ACCEPTANCE NO
Up to 1000	26	0
1001 to 3000	49	0
3001 to 10000	64	0
10001 and above	100	0

Impact Test: The test is to be carried out at least 100mm away from the end of the pipe. All pipes can be tested for one strike as per the table below. One sample for every extrusion run is then selected and the sample is subjected to 14 strikes. No sample shall fail or show signs of fracture.

The mass of striker and the height of free fall is based on the table given below:

NOMINAL SIZE, DN	TOTAL MASS OF STRIKER KG	HEIGHT OF FREE FALL MM
40	0.25	1000 ± 10
50	0.25	2000 ± 10
80 and 100	0.50	2000 ± 10
125 and above	1.00	2000 ± 10

Note: For detailed information on tests for uPVC pipe specifications please refer to IS 12235 or other relevant specification(s).

Annex XI - Typical Format of Acceptance Note by Independent Inspection Agency

Inspection Agency's Monogram and Address

Acceptance Note

(Valid for 60 days)

To,

Inspection Request

Received on

Inspection attended on.....

Place of Inspection.....

Total No. of Visits.....

Order completed/not completed

P.O. No./Date.....

Amendment No./Date.....

Consignee.....

ITEM NO.	DESCRIPTION	ORDERED QTY.	OFFERED QTY.	ACCEPTED QTY	TOTAL QTY. ACCEPTED AS ON DATE

Inspection Stamping Details:

Remarks:

Total No. of Items Cleared (in words).....

Date:

for INSPECTION AGENCY

Place:

(Signature)

Annex XII - Format for Rejection Note by Independent Inspection Agency

To,
M/s.
(Manufacturer's address)

Dear Sir,

Sub: Inspection of Afridev Handpumps/Spares
Ref: 1. P.O. No..... dt.
2.

Kindly refer to the visit of our representative for inspection at your works
..... on wherein the following materials were not found satisfactory as
detailed below.

S. NO.	DESCRIPTION	QTY. OFFERED	REASONS FOR REJECTION	REMARKS

Due to the above deviations, the material is rejected and you are requested to replace/
rectify and re-offer for inspection.

Yours faithfully,

Signature and Date

CC to: Buyer

Annex XIII - Recommended List of Measuring Instruments and Accessories Required for Inspection at Consignee End

S. NO	NAME OF THE EQUIPMENT	REQUIREMENT
1.	Measuring tape 3M	For measurement of length and height
2.	Steel rule 250/300mm	”
3.	Vernier Caliper 250/300mm	For measurement of thickness/width, length, dia. etc.
4.	Spirit Level 0.1/m	For checking level flanges at the time of installation
5.	Elcometer 0-100 micron	For checking coating thickness
6.	Magnet	For checking of stainless steel component material

Annex XIV - References Standards used in Afridev Handpump Specification

S. NO.	DESCRIPTION	DIN	ISO	IS	BS
1.	Parallel pins,	7	-	2393	-
2.	Bright round steel dimensions permissible deviations according to ISO tolerance zone h11.	668	-	9550	-
3.	Welded circular unalloyed steel tubes not subject to special requirements.	1615 Part 1	-	1239	-
4.	Wrought copper and copper alloy tubes for condensers and heat exchangers.	1785	-	5493	-
5.	Welded austenitic stainless steel pipes and tubes. Conventional masses per unit length.	2463 Part 1		-	
6.	Plastic molding materials, unplasticized polyvinyl chloride (uPVC) moulding materials, classification and designation.	7748 Part 1	-	-	-
7.	Unplasticized polyvinyl chloride pipes, General Qualification requirements and testing .	8061	6992	4985 12235	-
8.	Unplasticized polyvinyl chloride (uPVC, PVC-HI) pipes, Dimensions.	8062	-	4985	-
9.	Edge preparation for welding: Edge forms on steel, Gas welding, Manual arc welding and Gas shielded arc welding.	8555 Part 1 & Part 2		-	
10.	Stainless Steels: Technical delivery conditions for plate and sheet, hot rolled sheet wire rod, drawn wire, steel bars forgings and semi-finished products.	17440 17400	- -	6603	- -
11.	Copper-Zinc alloys (Brass) (Special brass): composition.	17660	-	407	-

S. NO.	DESCRIPTION	DIN	ISO	IS	BS
12.	Wrought copper and copper alloy tubes: properties.	17671 Part 1 and Part 2	-	-	-
13.	Wrought copper and copper alloy tubes with rolled fins for use in heat exchanger.	17679	-	-	-
14	Pipelines of unplasticized polyvinyl chloride (Rigid PVC, uPVC) for drinking water supply pipes, pipe joints, pipeline parts, DVGW technical rules.	19532 4422			
15.	Protection against corrosion: chromating of electroplate zinc and cadmium coatings, general directions, symbols and methods of test.	50941	-	1573	-
16.	Electroplated coatings: zinc and cadmium coatings on iron and steel. Chromate treatment of zinc and cadmium coatings.	50961	-	1573	-
17.	Corrosion protection, Hot-dip batch galvanizing requirements and testing.	50976	-	4759	-
18.	Structural steels.	17100	630	2062	-
19.	Hexagon head screws. grade A and B.	933	4017	1364 Part 1	
20.	Cold finished steel structural hollow sections, dimensions and sectional properties.	59411	4019	-	-
21.	Hexagon nuts, style 1 - product grades A and B.	934	4032	1364 Part 3	-
22.	Hexagon Nuts (Brass)	-	4033	-	-
23.	Plain end steel tubes, general tables of dimensions and masses per unit length	2458	4200	1239 Part 1	-

S. NO.	DESCRIPTION	DIN	ISO	IS	BS
24.	Plain washers, Normal series - product grade A.	125	7089	2016	-
25.	Adhesive with solvents for assembly of uPVC pipe elements, characterization, Part 1, Basic test methods	-	7387 Part 1	-	-
26.	Specification for general purpose acrylonitrile, butadiene rubber compounds	-	-	8663	2751
27.	Specification for low compression set acrylonitrile, butadiene rubbers	-	-	-	3222
28	Sampling inspection tables: part 1 inspection by attributes and by count of defects	-	2859	2500 Part 1	-

Other References:

S. NO.	TITLE	PUBLISHER	YEAR OF PUBLICATION
1.	SKAT/HTN - Afridev Handpump Specification, Revision 2 - 1994	SKAT	1994
2.	Packing Guidelines for Afridev	SKAT	1992
3.	Afridev Injection Moulding Manual	SKAT	1991
4.	Afridev Rubber Moulding Guidelines	SKAT	1994

BIBLIOGRAPHY :

1. *Report on Solvent Cement* by Consumer Research Laboratory (CRL), 1994.