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Rural Water Supply & Sanitation Project Kurunegala.

VLOM PUMP
OTC - SYSTEM



*Deutsche Gesellschaft fuer
Technische Zusammenarbeit (GTZ) GmbH*

National Water Supply & Drainage Board

Department of Health , Kurunegala Region

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VLOM PUMP
OTC - SYSTEM

December 1988

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COMMENTS ON MEANWHILE EXPERIENCES

The Project has installed to date 350 Nos. of MK II OTC handpumps with 75mm PVC riser pipes. With 100mm long socketed ends (see 4.3) no joint failures have been reported since. The max. installation depth of this system has been increased to 32m (8 x 4m).

Under a test programme a FINNIDA Project has installed the cylinder at 45m depth and operates the pump since 6 months.

The system has passed a performance and endurance test (1 million strokes) at the National Engineering Research and Development Centre (NERD) of Sri Lanka.

Under an ADB Rural Water Supply and Sanitation Sector Development Planning Project with the National Water Supply & Drainage Board MK II OTC pumps with 75mm PVC riser mains have been recommended recently for production of proto-types and subsequent general application in Sri Lanka.

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VLOM HANDPUMP PERFORMANCE ANALYSIS

1. INTRODUCTION

A Project Evaluation Mission from GTZ in June 1988 suggested the introduction of a VLOM (village level operation & maintenance) handpump with open top cylinder (OTC) under the new ongoing Phase III A of the Rural Water Supply & Sanitation Project, Kurunegala.

Five such pumps were installed early 1987 under a test programme. The maintenance monitoring shows good performance so far.

An inspection was carried out in July 1988 during which the five pumps were examined in order to find out their suitability to claim the VLOM status and the possible installation in larger scale.

During the inspection a detailed photo documentation was carried out to demonstrate the installation procedures and to show components in detail.

2. DESCRIPTION OF PUMP PARTS

2.1 Pump Head Assembly

The pump head assembly of type MARK II was imported from India. The tank was modified to suit the OD 75 mm PVC pipe. An intermediate flange for the flexible suspension of the riser pipe was locally manufactured.

2.2 Cylinder

The basic standard MK II cast iron cylinder with brass liner has the following modifications:

- conical bottom cap to suit extractable check valve
- plunger and check valve can be connected to facilitate extraction through the riser main without lifting of pipes
- top connector larger than ID of cylinder

2.3 Plunger Rods

stainless steel rods \emptyset 12 mm M12 with separate hexagonal connectors and two counter nuts

2.4 Riser Main

Standard PVC pipes size 75, type 1000 of 4 m effective length. One end is factory socketed with 75 mm long sockets.

Pipes are solvent cemented 24 hours before installation. They have sufficient flexibility and allow for installation of full length.

3. INSPECTION

The installation depth of the cylinders ranged from 21 m to 25 m. After removal of the pump head plunger and check valve are engaged with the help of a T-bar fixed to the upper plunger rod. In this process a pin on the check valve opens the plunger valve. After lifting of the check valve / plunger assembly for a few centimeters the water column is released immediately and the plunger rods can be pulled with the check valve / plunger through the riser main.

It has been found that the contact between brass check valve and cast iron seat required comparatively high lifting forces may be due to galvanic reaction of the two different materials. In two cases a jack was needed.

While pulling out the riser main twice breakage of pipe joints occurred. This however can be avoided by providing sufficient helping hands to maintain a max. radius of the bent pipe and by supporting the arc with a long bamboo fork.

However the pulling out of the rising main is not required for normal maintenance and repairs, except for well cleaning or repair of the riser pipe itself.

For more information on the material a tensile strength test has been carried out on glued pipe joints by CISIR. Material failure occurred at loads between 1.12 and 2.15 tons. The max. static load with 24 m water column is approx. 10% of the above lowest result of 1.12 tons.

With an assumed dynamic load of 4 x the static load the system seems to be adequately dimensioned for installation depth of approx. 25 m.

4. FURTHER DEVELOPMENT

Meanwhile the project in cooperation with a local manufacturer has developed a comprehensive OTC riser pipe / cylinder assembly.

4.1 Cylinder

The Cylinder is made out of a brass pipe of OD 70 mm and 3 mm wall thickness thus having an ID of 64 mm. The upper outer surface is grooved and a 75 mm PVC pipe (ID 66 mm) forced onto. The bottom cap / check valve seat is screwed into the cylinder.

Plunger and check valve hook-in mechanism similar to the TARA system.

4.2 Plunger Rods

The S/S rods have M 12 rolled threads with separate hexagonal connectors and two counter nuts.

New centralizers have been developed by the project and a manufacturer. A bronze bush embedded in rubber with three vanes is pushed down the pipe with the rods. They are held in position by friction and do not move up and down during pump operation. They minimize the lateral rod movement.

4.3 Riser Main

PVC size 75 type 1000

In order to improve the bond the length of the socketed ends has been increased from 75 mm to 100 mm. The pipe length is 4.10 m (effective length 4.0 m). It is advisable not to cut plunger rods but to cut the riser pipes according to the effective rod length. An in situ formed socket on top of the riser main inside the tank is a second line of defence and prevents the pipe from slipping through the flange.

5. CONCLUSION

The described below ground level components have been simplified to achieve the highest degree of local production.

The new design with OTC technique meets the condition for easy village level maintenance and can claim VLOM status.

APPENDIX A



MARK II
OTC Pump



Fixing
T - Bar

4 MK II OTC



Pulling Check
Valve / Plunger
Assembly



Disconnecting
Pump Rods with
MARK II
Installation
Vice



Plunger with
Engaged
Check Valve



Plunger and
Check Valve
Separated



Pulling
Riser Main





Pulling
Riser Main





Tank and
Intermediate
Flange



S/S Rods M 12
with
Rolled Threads



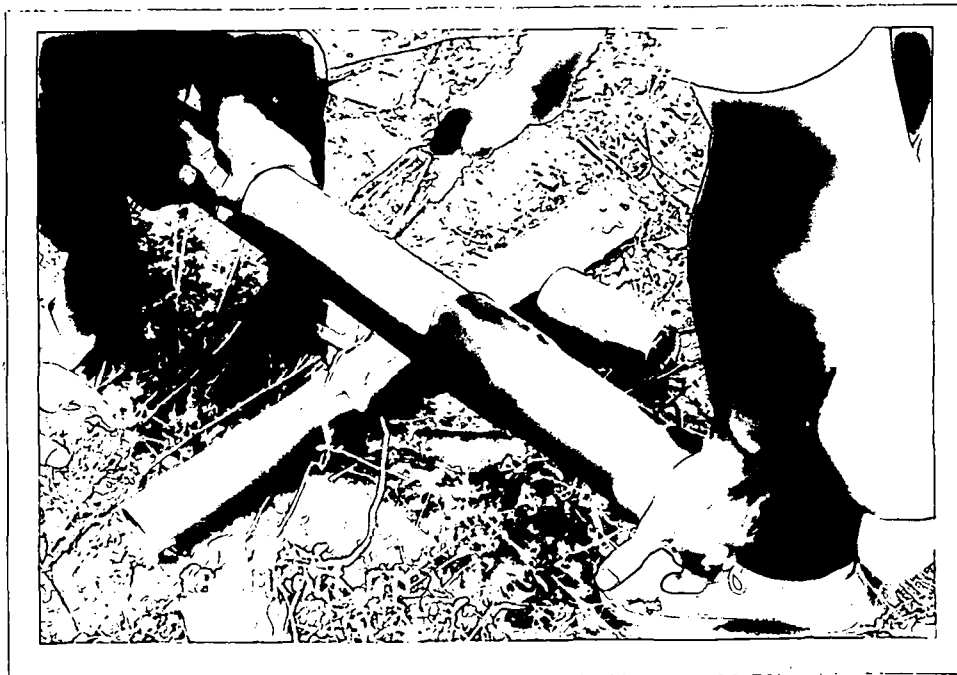
Socketed
PVC - Pipe
Size 75

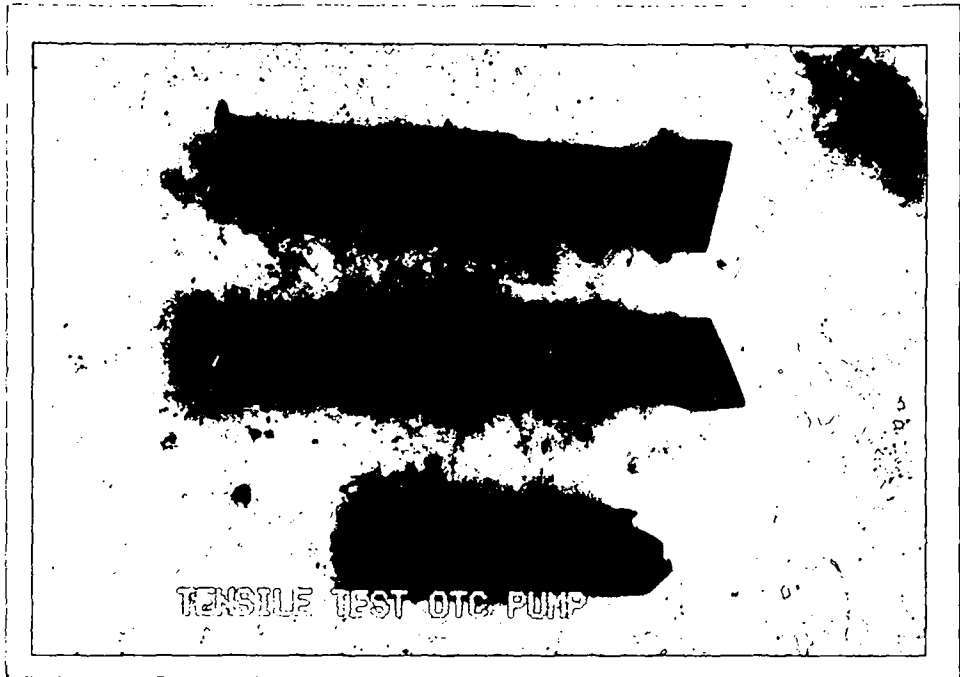


In Situ
Repair of
Riser Main

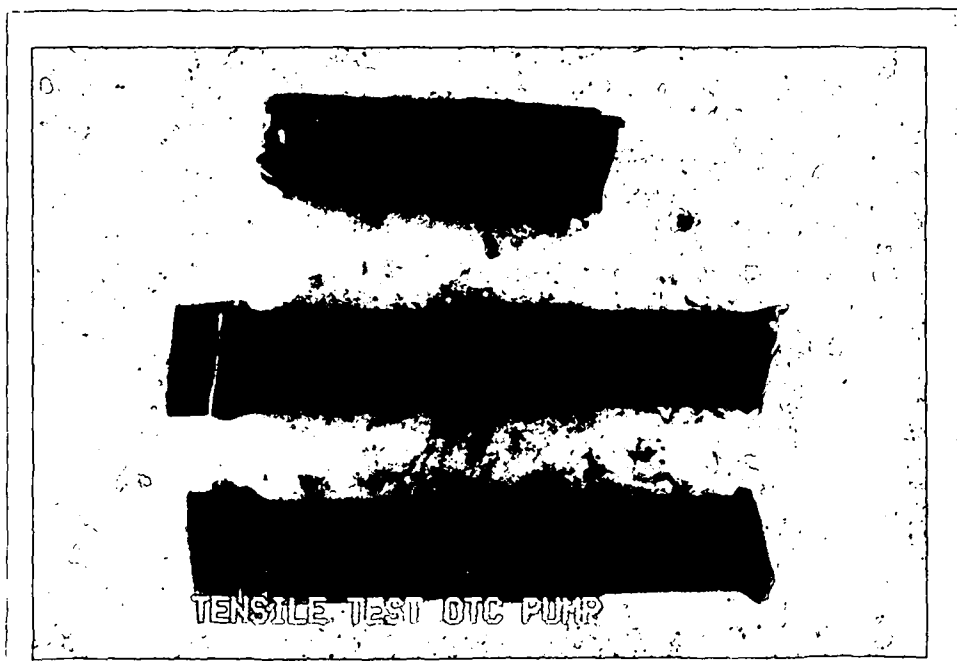


In Situ Repair of Riser Main

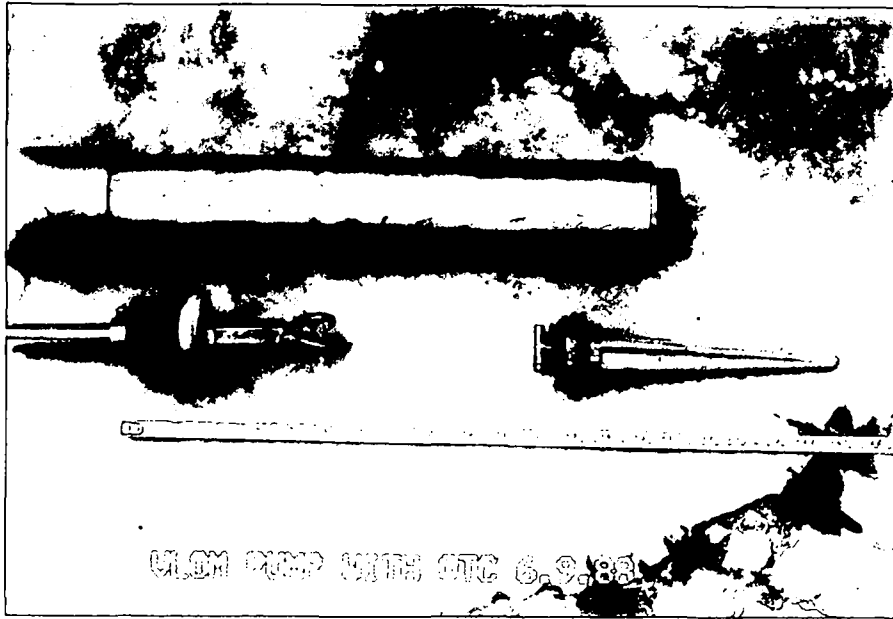




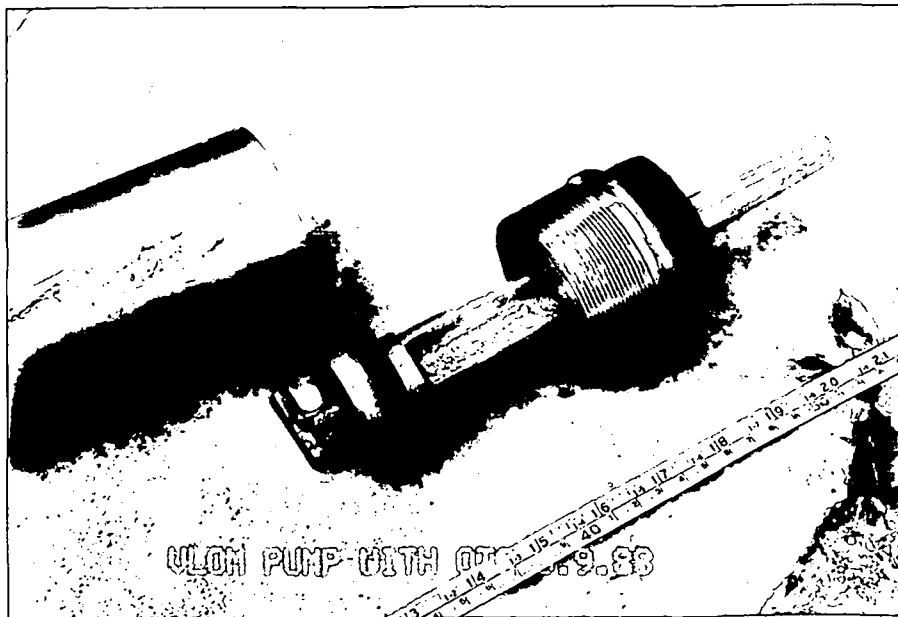
Material Samples Tensile Test PVC - Pipe Size 75



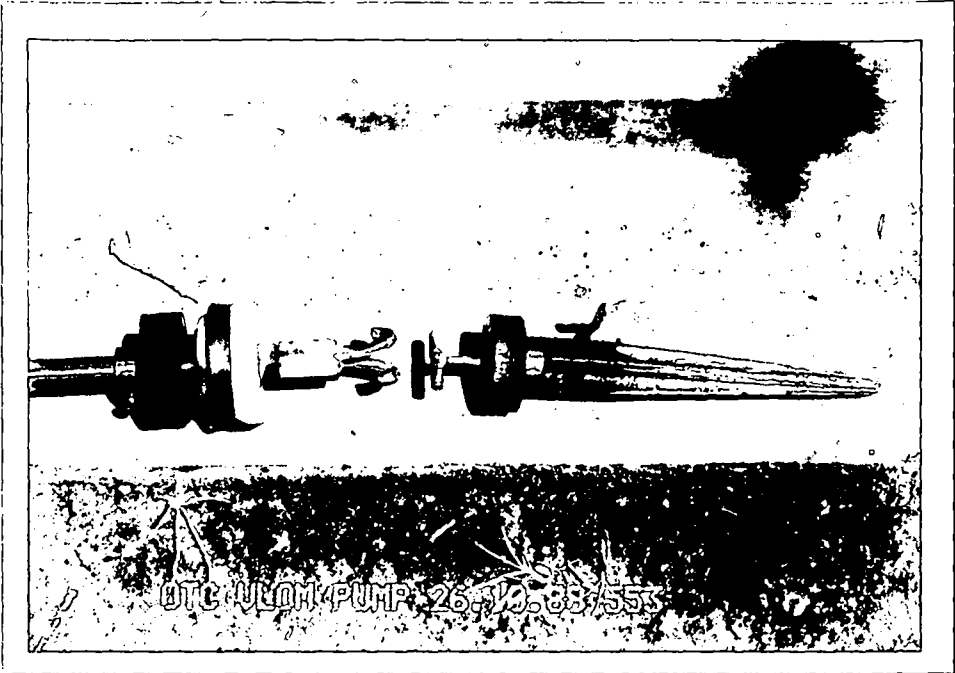
APPENDIX B



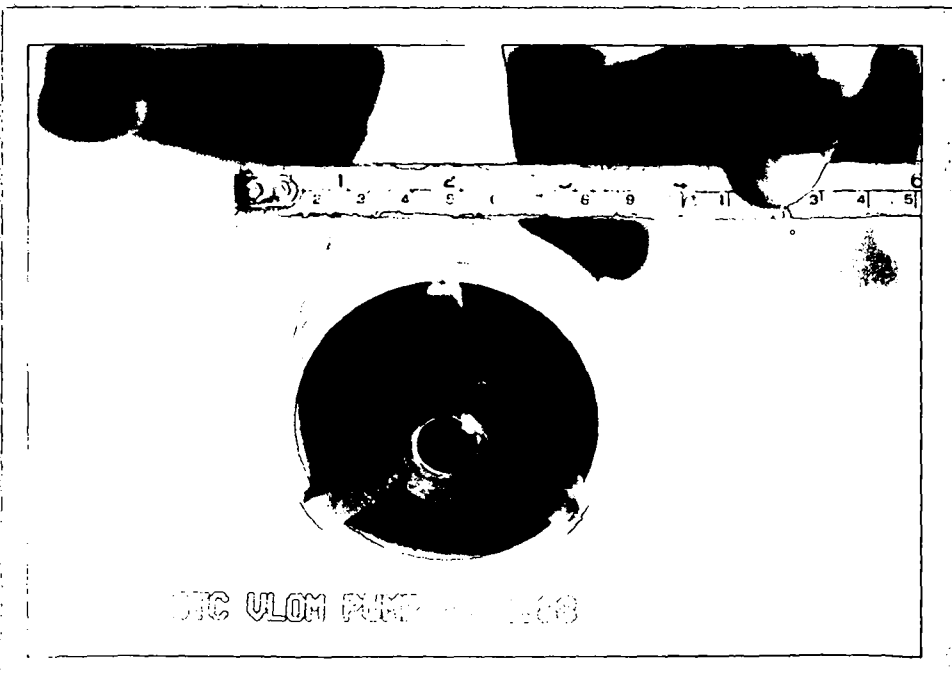
OTC Cylinder
Check Valve
and Plunger



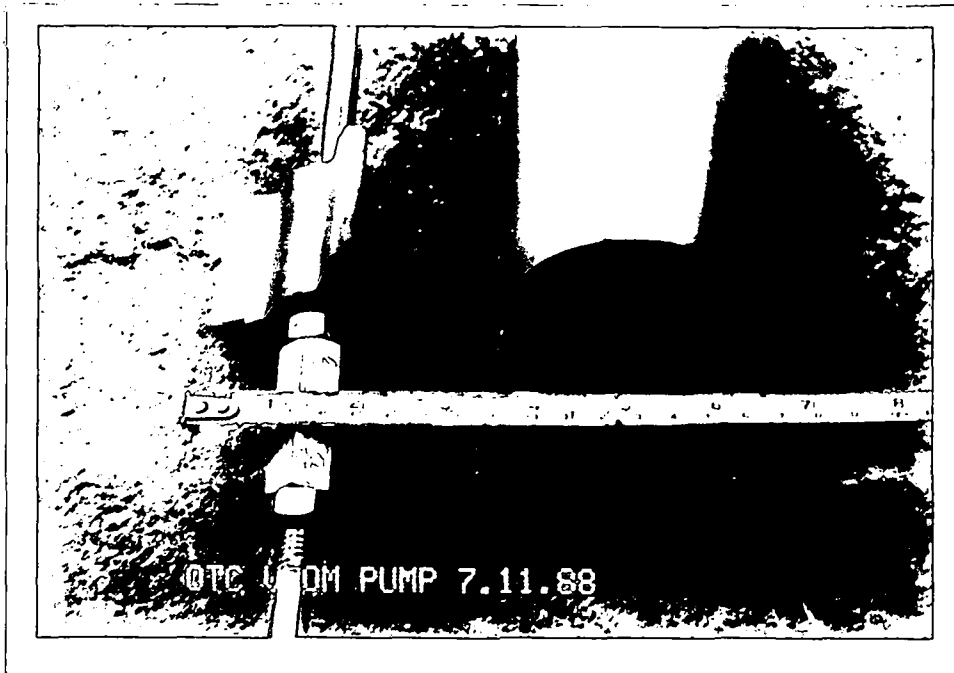
Check Valve
and Seat



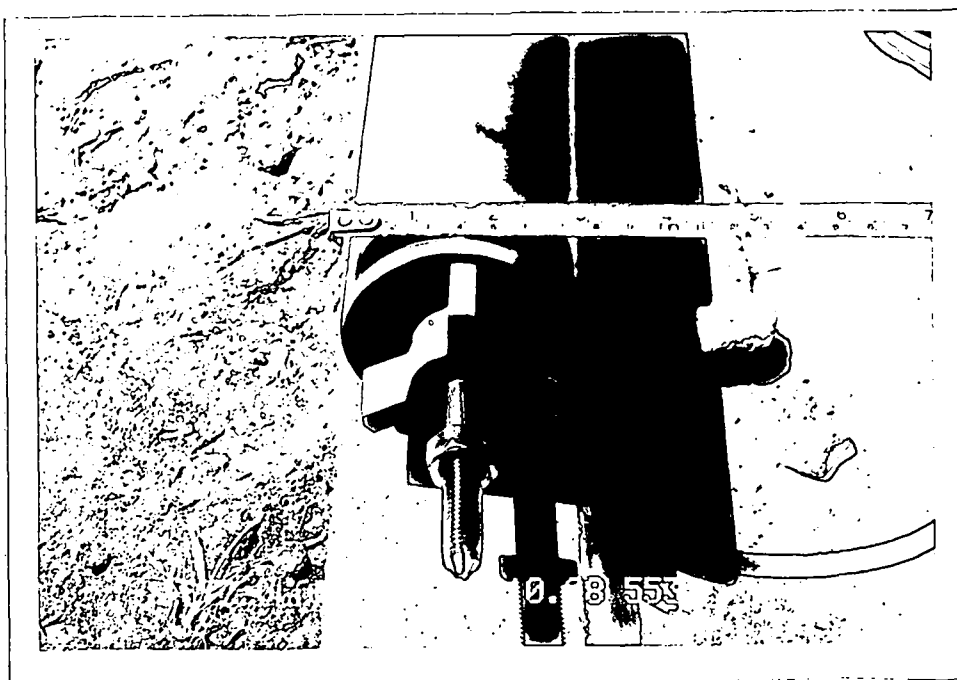
Check Valve
and Plunger

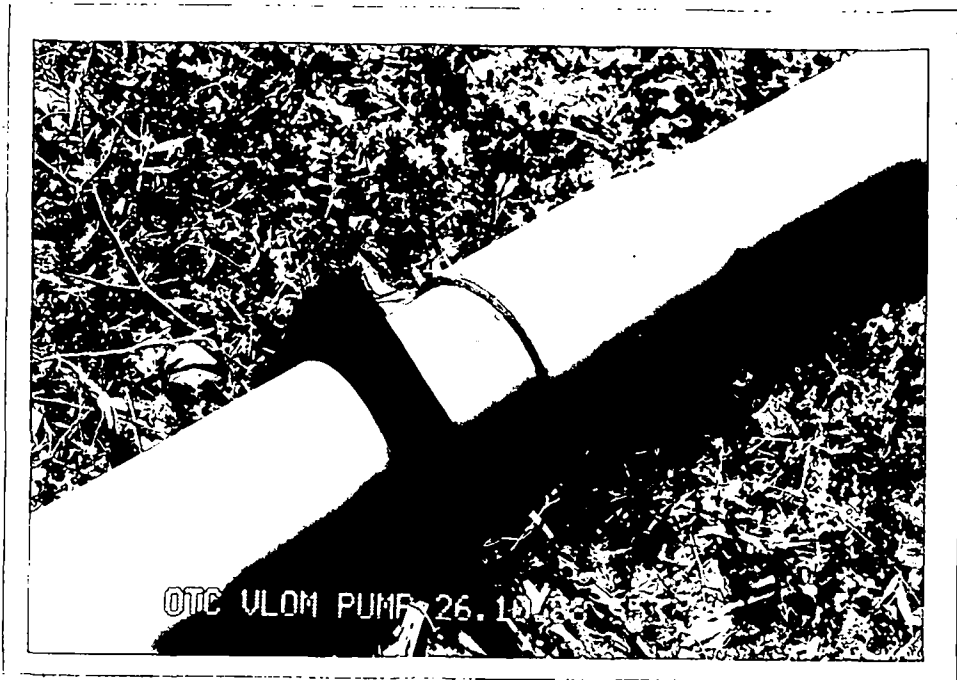


Rod Centralizer
Size 75



Rod Centralizer Size 75





Riser Main Joint PVC Size 75
with Pipe Rubber Centralizer