

# PLUMBER

NSQF LEVEL - 4

Volume II of II

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TRADE PRACTICAL

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SECTOR: PLUMBING



Directorate General of Training

DIRECTORATE GENERAL OF TRAINING  
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP  
GOVERNMENT OF INDIA



**NATIONAL INSTRUCTIONAL  
MEDIA INSTITUTE, CHENNAI**

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Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

**Sector : Plumbing**

**Duration : 1 Year**

**Trades : Plumber - Volume II of II - Trade Practical - NSQF LEVEL - 4**

**Developed & Published by**



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## FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Media Development Committee members of various stakeholders viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Plumber - Volume II of II - Trade Practical NSQF Level - 4 in Plumbing Sector under Yearly Pattern**. The NSQF Level - 4 Trade Practical will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF Level - 4 trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 4 the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these Instructional Media Packages IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

Director General  
Directorate General of Training  
Ministry of Skill Development & Entrepreneurship  
Government of India.

New Delhi - 110 001

## **PREFACE**

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Directorate General of Training, Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of Federal Republic of Germany. The prime objective of this Institute is to develop and provide instructional materials for various trades as per the prescribed syllabus under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

**Chennai - 600 032**

**EXECUTIVE DIRECTOR**

## ACKNOWLEDGEMENT

National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisation to bring out this IMP (**Trade Practical**) for the trade of **Plumber Volume II of II** under the **Plumbing** Sector for ITIs.

### MEDIA DEVELOPMENT COMMITTEE MEMBERS

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### NIMI - COORDINATORS

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Shri. G. Michael Johny	-	Assistant Manager NIMI - Chennai -32.

NIMI records its appreciation of the Data Entry, CAD, DTP Operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks, the invaluable efforts rendered by all other staff who have contributed for the development of this Instructional Material.

NIMI is grateful to all others who have directly or indirectly helped in developing this IMP.

# INTRODUCTION

## TRADE PRACTICAL

The trade practical manual is intended to be used in workshop. It consists of a series of practical exercises to be completed by the trainees during the course of the **Plumber** trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in compliance with NSQF LEVEL - 4.

The manual is divided into Six modules. The distribution of time for the practical in the Four modules are given below.

	Module Name	Hours
Module 1	Piping system	50 Hrs
Module 2	Pumps and PVC joints	125 Hrs
Module 3	Drainage systems	50 Hrs
Module 4	Water supply system	125 Hrs
Module 5	Bending and systems of water supply	125 Hrs
Module 6	Tank installation, test and maintenance	50 Hrs
	<b>Total</b>	<b>525 Hrs</b>

The skill training in the shop floor is planned through a series of practical exercises centred around some practical project. However, there are few instances where the individual exercise does not form a part of project.

While developing the practical manual a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However the development team accept that there is a scope for further improvement. NIMI, looks forward to the suggestions from the experienced training faculty for improving the manual.

## TRADE THEORY

The manual of trade theory consists of theoretical information for the course of the Plumber Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptual capabilities for performing the skills.

The Trade theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indicating about the corresponding practical exercise are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise atleast one class before performing the related skills in the shop floor. The trade theory is to be treated as an integrated part of each exercise.

The material is not the purpose of self learning and should be considered as supplementary to class room instruction.

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## LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

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## SYLLABUS FOR PLUMBER

Duration	Reference Learning Outcome	Professional Skill (Trade Practical) (With indicative hour)	Professional Knowledge (Trade Theory)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Align and lay humid asbestos pipe line of different dia. and fitting & maintenance of drainage pipe line.	93 Interpret drawing of sanitary plumbing.(05 hrs) 94 Lay & align pipe. (08 hrs) 95 Lay & align humid and asbestos pipe. (08 hrs) 96 Demonstrate use of specific dia in different location. (04 hrs)	<ul style="list-style-type: none"> <li>• Use of hummed and asbestos pipes of different sizes.</li> <li>• Method of laying out pipes alignment and joining. (07 hrs)</li> </ul>
		97 Use various sanitary fitting. (06 hrs) 98 Use various fitting of different materials.(06 hrs) 99 Use joining materials of pipe. (07 hrs) 100 Join pipe as per laid down Procedure.(06 hrs)	<ul style="list-style-type: none"> <li>• Description of various pipe joints- straight, Branch, Taft and blow, Expansion joints. Solders and fluxes used in joints. (07 hrs)</li> </ul>
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Install and maintain different Electric pumps.	101 Demonstrate use of different pump. (10 hrs) 102 Demonstrate installation of electric pump (20 hrs) 103 Demonstrate maintenance of electric pump. (10 hrs) 104 Demonstrate working process of centrifugal, reciprocating, submersible pump. (15 hrs) 105 Demonstrate delivery of water to overhead tank through pump, presser head, delivery pipe, suction pipe, etc, (15 hrs) 106 Contamination of water in a well. (05 hrs)	<ul style="list-style-type: none"> <li>• Description of Plumber's materials Lead, tin, Zinc, solder, copper, red lead etc. and their uses.</li> <li>• Water supply system of a small town.</li> <li>• Description and types of pumps viz. suction pump, Centrifugal pump etc. Contamination of water in a well. (21 hrs)</li> </ul>
Professional Skill 50Hrs; Professional Knowledge 14Hrs	Join fittings for different purposes on PVC pipe line.	107 Produce metric & BSP thread on pipe. (10 hrs) 108 Produce Internal and external thread on PVC pipes of different dia. (10 hrs) 109 Join PVC pipe with thread. (06 hrs) 110 Join PVC pipe with solvent cement and heat process (10 hrs) 111 Join PVC pipe as per layout. (14 hrs)	<ul style="list-style-type: none"> <li>• Description of pipe dies, their uses, care and precaution.</li> <li>• Metric specification of various pipes.</li> <li>• Standard pipe threads.</li> <li>• Method employed for bending, Joining and fixing PVC pipe.</li> <li>• Joining material for water and gas pipes.</li> <li>• Use of blow lamp. (14 hrs)</li> </ul>

Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Construct inspection chamber, manhole, gutter, septic tank, socket etc.	112 Demonstrate inspection chamber, manhole, gully trap, septic tank, soak pit. (04 hrs) 113 Construct inspection chambers, cesspool, septic tank, soak pit etc. (21 hrs)	<ul style="list-style-type: none"> <li>• Inspection chamber, septic tank, description of drains, cesspools, soak pits etc.</li> <li>• Types of traps</li> <li>• layout of drainage system (07 hrs)</li> </ul>
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Test pipe line as per site drainage pipe line layout.	114 Demonstrate drawing layout of drainage pipe line. (06 hrs) 115 Perform testing for smoke test, water test, smell test, ball test mirror test. (10 hrs) 116 Join heavy cast iron socket pipe. (03 hrs) 117 Sealing of heavy cast iron pipe joint with lead & caulking tools. (06 hrs)	<ul style="list-style-type: none"> <li>• Method of bending pipes by hot and cold process.</li> <li>• Method of testing drainage lines (07 hrs)</li> </ul>
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Perform removal of leakage pipe line.	118 Identify location of leakage pipe. (06 hrs) 119 Removing out leakages pipe. (10 hrs) 120 Removing of air locks (06 hrs) 121 Demonstrate rain water harvesting system. (03 hrs)	<ul style="list-style-type: none"> <li>• Method of dismantling and renewal of the valves and pipes. Leaks in pipes and noises in plumbing.</li> <li>• Installation of water meters. Air lock in pipes and its removal. (07 hrs)</li> </ul>
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Install, fix & maintain different valve & cock.	122 Demonstrate different cocks & valves including materials.(04 hrs) 123 Employ cocks & valves at different place. (06 hrs) 124 Employ different cock & valve with sensor system. (06 hrs) 125 Demonstrate maintenance of different cocks & valves. (06 hrs) 126 Demonstrate use of packing washer gasket of different cock & valve. (03 hrs)	<ul style="list-style-type: none"> <li>• Description of cocks &amp; valves-their types, materials &amp; advantages for particular work. (07 hrs)</li> </ul>
Professional Skill 75Hrs; Professional Knowledge 21 Hrs	Install & maintain water meter and water supply for fixture.	127 Demonstrate location of meter. Fitting of water meter, bath tub, wash basin. (10 hrs) 128 Install water metre, bath tub, hand wash basin, water closet urinal, sink etc with sensor system. (25 hrs) 129 Demonstrate maintenance of water metre, bath tub, hand wash basin, water closet urinal, sink etc. (15 hrs) 130 Demonstrate testing of water metre, Bath Tub, Hand wash basin. (10 hrs)	<ul style="list-style-type: none"> <li>• Erecting rain water and drainage pipe system,</li> <li>• Installation of sanitary fitting s, inspection and testing of water supply system.</li> <li>• Pipe alignment and slope. Prevention of water hammer.</li> <li>• Storage tanks for general water supply propose.</li> <li>• Test for water supply pipes.</li> <li>• Description of sanitary fittings,</li> <li>• General points to be observed when choosing sanitary (21 hrs)</li> </ul>

		131 Erect rain water and drainage pipe system. (15 hrs)	
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Demonstrate method of bending for different materials & different pipe joint.	132 Demonstrate bending of pipes in bending machine. (08 hrs) 133 Bend GI pipe of different diameter in different angle. (14 hrs) 134 Bend G.I. pipe as per drawing and measurement. (14 hrs) 135 Bend PVC pipe of different diameter in different angle with dry sand by heating. (14 hrs)	Method of bending galvanized mand other heavy pipes. (14 hrs)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Perform fitting and maintenance of Fixture at different place.	136 Demonstrate process of C.I pipe cutting & joining. (12 hrs) 137 Process of C.I. pipe fitting for waste pipe line in different section. (08 hrs) 138 Employ Process of fixing of external soil pipe. (12 hrs) 139 Demonstrate process of fixing of rain water gutter outlet and ground pipe. (10 hrs) 140 Demonstrate process of measurement of waste pipe line. (08 hrs)	<b>Domestic drainage system</b> General layout, one pipe system, specifications of Materials required. Method of testing leakage. Different types of traps, ventilation, antisiphonage and sinks. About Fire hydrants and their fittings. (14 hrs)
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Carry out fitting, fixing & laying installation of hot & cold water pipe line & symbolizing.	141 Demonstrate working of solar water heating system. (02 hrs) 142 Analyse temperature of water (hot and cold). (02 hrs) 143 Layout pipe line for hot and cold water distribution as per drawing. (04 hrs) 144 Install pipe line for distribution of hot & cold water. (08 hrs) 145 Install hot water system & solar water heating system. (08 hrs) 146 Symbolise distribution of hot & cold water pipe line. (01 hr)	Concept of heat and Temperature. Method of transmission of heat. Heating system by different thermal units. Domestic hot and cold water. General layout, specification of materials required and Connection of pipes to mains. Tracing leakage. Repairs to service main. Domestic boilers and Geysers. Method of ventilating pipe. Precaution against air Poisoning. Fixing of solar water system. (07 hrs)
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Perform repairing & reconditioning of waste pipe line.	147 Perform fitting of different trap, valve, cistern etc. (03 hrs) 148 Demonstrate construction of over head tank as per measurement. (08 hrs) 149 Maintenance and recondition pipe line. (10 hrs)	Plumbing and sanitary symbols and plumbing codes for all tools and materials (07 hrs)

		<p>150 Perform pressure test by hydraulic test machine. (04 hrs)</p> <p>151 Demonstrate cleaning of sanitary pipe line. (02 hrs)</p>	
<p>Professional Skill 25Hrs;</p> <p>Professional Knowledge 07 Hrs</p>	<p>Perform repairing &amp; reconditioning, scraping &amp; painting of sanitary fittings pipe line.</p>	<p>152 Perform cleaning of sanitary pipe line. (04 hrs)</p> <p>153 Remove corrosion from pipe line. (03 hrs)</p> <p>154 Demonstrate scraping &amp; painting. (02 hrs)</p> <p>155 Perform scraping &amp; painting of pipe line. (04 hrs)</p> <p>156 Maintenance of broken or cracked sanitary fitting. (05 hrs)</p> <p>157 Estimate and work out abstract cost of plumbing work as per drawing/ layout. (05 hrs)</p>	<p>Sensor system for urinals and was basin, etc.</p> <p>Corrosion - causes and remedies, prevention.</p> <p>Corrosion due to electrolytic action.</p> <p>Effect of water and frost on materials.</p> <p>Layout of pipes as per drawing.</p> <p>Analysis quantity measurement and abstract rate of plumbing and sanitary work.</p> <p><b>Bill of Quantity and Estimation</b></p> <ul style="list-style-type: none"> <li>• Preparation of bill of quantity</li> <li>• Preparation of Estimation (07 hrs)</li> </ul>



## Interpret drawing of sanitary plumbing

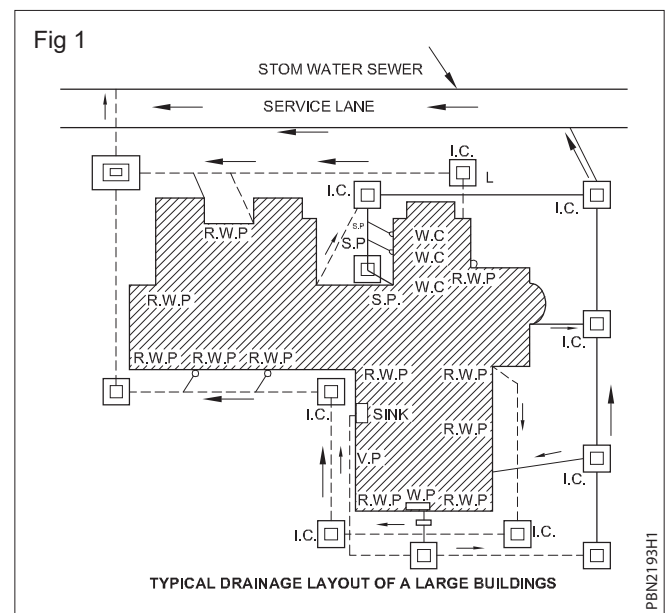
**Objectives:** At the end of the exercise you shall be able to

- demonstrate the layout of drainage system
- identify sanitary plumbing fittings
- prepare the list of materials required
- mark the location of valves.

### PROCEDURE

#### TASK 1: Demonstrate the layout of drainage system (Fig 1)

- 1 Select the list of material required for the drawing of sanitary plumbing fittings.
- 2 check the location of valves, cocks are placed in the correct position.
- 3 Determine the sizes of pipes for sewage, drain, rainwater etc.,.
- 4 Check all the inspection chambers are provided with fresh air inlets.
- 5 Check the drains marked as per drawing.
- 6 Identify the plumbing symbols as per drawing.
- 7 Check all soil pipes should be carried direct to the manholes without gully traps as per drawing.
- 8 Check the drains laid in such a way to ensure their safety in future.
- 9 Inspect the drains laid in such a way so as to remove the sewage quickly from the building.



## Lay and align pipe

**Objectives:** At the end of the exercise you shall be able to

- prepare material for laying of drainage pipes
- specify the layed area
- dig the trench and line the trench
- install the pipe and connect drainage lines
- refilling the trench.

Requirements			
Tools/Instruments		Materials	
• Plumber tool kit	- 1 No.	• Drainage pipe swg (or) PVC (swr)	- as reqd.
• Masonary tool kit	- 1 No.	• Fittings	- as reqd.
• Crow bar	- 1 No.	• Cement solvant	- as reqd.
• Spade	- 1 No.	• Concrete	- as reqd.
• Measuring tape 15 m	- 1 No.	• Pipe	- 6 Nos.
• Mortar pan	- 1 No.	• Rails	- 2 Nos.
• Trowel 25 cm long	- 1 No.	• Boning rod	- 2 Nos.
• Die-set	- as reqd.	• Peg	- 4 Nos.
• Pipe cutter	- as reqd.	• Bracing	- 4 Nos.
• Scriber	- as reqd.	• Bend	- as reqd.
• Hacksaw frame with blade	- as reqd.	• Water	- as reqd.
• Steel rule	- as reqd.	• Vertical pipe	- as reqd.
• Steel tape	- as reqd.	• Gasket	- 2 Nos.
• Hammer	- as reqd.	• Cement	- as reqd.
• Bench vice	- as reqd.	• Sand	- as reqd.
• Pipe wrench	- as reqd.	• Aggregate	- as reqd.
• Try square	- 2 Nos.	• G.I pipe	- as reqd.
Machines/Equipment		• Chalk	- as reqd.
• Trench rail	- 1 No.	• Paper	- as reqd.
• Bonning rod	- 1 No.	• oil	- as reqd.
		• P.V.C pipe	- as reqd.

## PROCEDURE

### 1 Decide the Route

- The route of the pipe should be as direct as possible if draining a particular point or can meander widely if a general area needs to be drained.

### 2 Decide on the Pipe

- For draining a particular point you might need a closed pipe so that water goes in at one end and comes out at the other.
- Closed pipe can come in flexible rolls several yards long with all the fittings required to join as many lengths as necessary. For draining a general area you will need pipes that are open.
- These pipes usually have a row of holes down the length of the pipe and do not usually come except as individual short pipe sections.

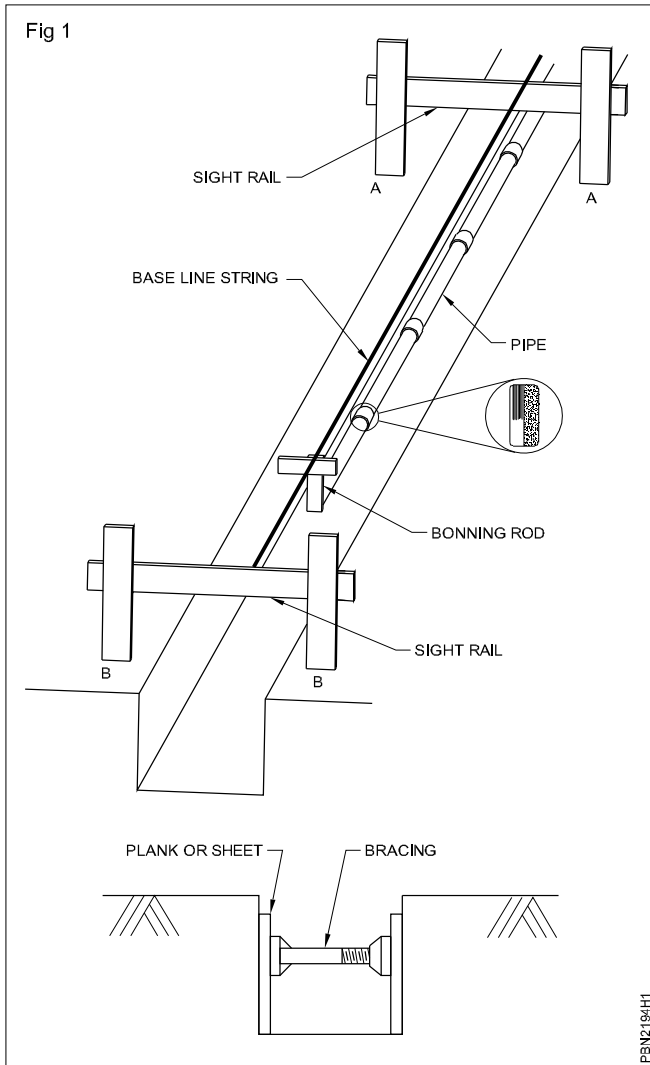
### 3 Dig the Trench

- The drainage pipe needs to be set in a trench. Dig the trench along the route you have already decided upon. The trench needs to be 8 to 10 inches wide and about 18 inches deep.
- When you cut the sod to start the trench, retain it to use to cover the finished job. It is important that the bottom of the trench be firm and always sloping down in the direction of the required drainage.
- The contours of the land might take the trench deeper or shallower at points along its length but the bottom must be evenly down graded.

### 4 Line the Trench

- Line the trench with a couple of inches of gravel and level it off. If you are using open pipes line the trench over the gravel with filter fabric.





## Laying of underground pipes

**Objective:** At the end of this exercise you shall be able to

- lay underground pipes (sewage water pipe).

### TASK 1: Lay under ground pipe (sewage, water pipe)

- 1 Excavate the trench after marking the centre line of pipe layout - The depth and width are to be as per standard.
- 2 Lay the bed concrete.
- 3 Lay the pipe after checking for visible defects.
- 4 Join the pipe - close the end after days work.
- 5 Test the joints.
- 6 Lay the concrete as per standard.
- 7 Refill the trench.

## Skill Sequence

### Excavation of trench for sewer line

**Objective:** This shall help you to

- excavate trench for sewer lines.

Mark the width of the trench on ground with chalk powder.

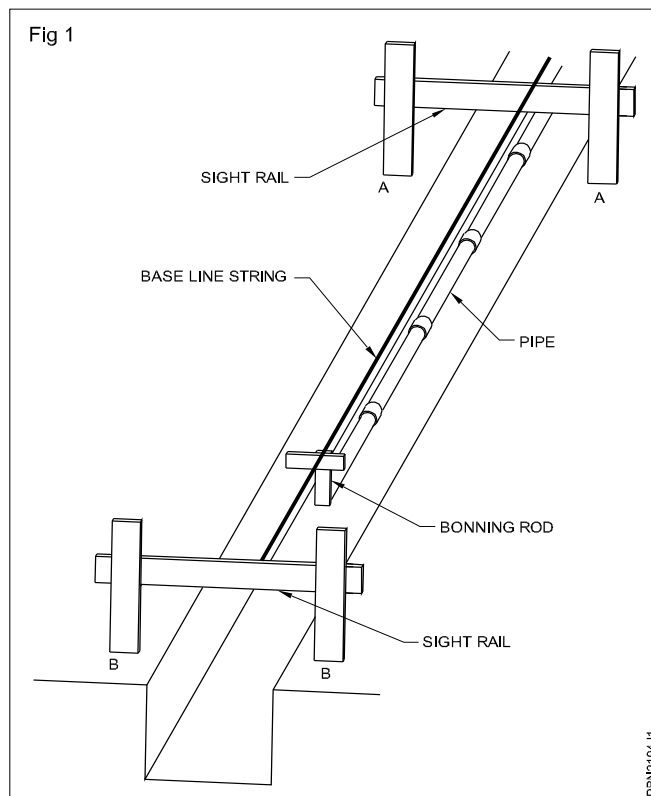
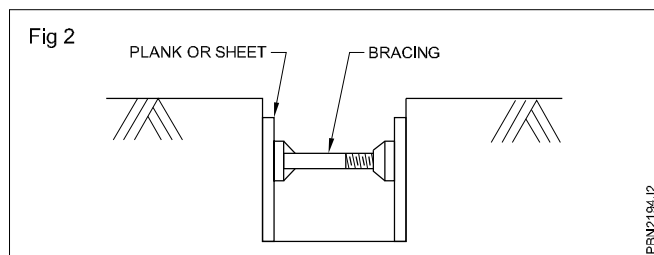
Drive two pegs on the side of trench starting point at a distance of 600mm from trench mark at A.

Mark level on both pegs using water level. Fix a sight rail at mark (Fig 1).

Calculate the required slop up the end of trench.

Fix two more pegs at end as per earlier procedure (at B).  
 Mark the level required considering the slop.  
 Fix a straight rail at mark.  
 Tie a string from sight rail A to B tightly.  
 Check the bottom level of trench using a bonning rod (level of trench to be exactly equal from string)

**Precautions: In case of loose soil trenches are to be shored (Fig 2). Necessary barricades and red light indication to be provided.**



## Joints in stone ware pipe

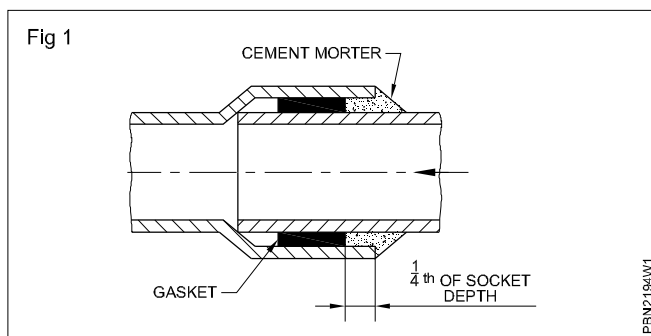
**Objective:** This shall help you to

- joint stone ware pipe.

Clean the out side of spigot end and inside of socket.

Place tarred gasket of hemp yarn soaked in thick cement slurry around the spigot end (Fig 1).

Slip the spigot end well into socket end of pipe previously laid.



### Socket end to face up stream

Adjust the pipe alignment.

Chock the gasket tightly home so as to fill not more than 1/4th of the total depth of the socket.

Fill the remainder of socket with stiff mixture of cement mortar 1:1 (1 cement : 1 fine sand).

Form a fillet round the joint with a trowl at 45° angle.

Remove foreign materials from inside pipe.

Cure the joint for 7 days.

## Test the pipe joints

**Objective:** This shall help you to

- test the joints.

Plug the lower end of the drain and ends of connections if any.

Fill the system with water (Fig 1).

Join a knuckle bend temporary at top end.

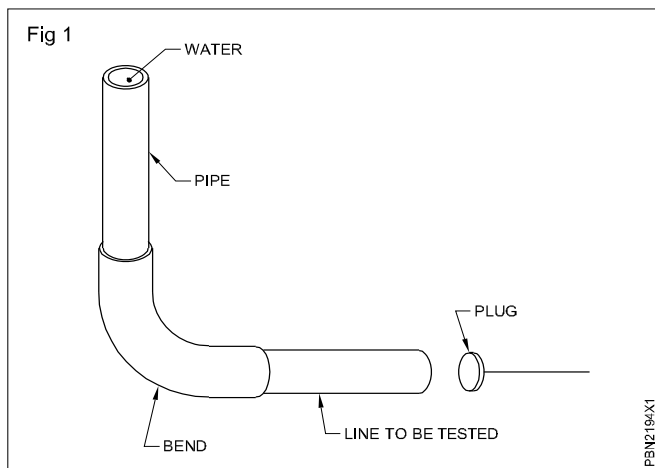
Join a vertical pipe so as to provide required test height i.e 2.5m head at highest point of section undertest.

Fill this pipe also with water.

Check for leakage.

Rectify the leakage or sweating if any.

Re-test.



## Refill the trench

**Objective:** This shall help you to

- **refill the trench if not bedded in concrete.**

Pack refill material by hand under and around the pipe.

Ram with a shovel and light tamper.

Continue upto 600mm above top of pipe. (Dont tamp with in 150mm of top of pipe.)

Refill the balance area.

## Lay the cement concrete

**Objective:** This shall help you to

- **lay concrete to stoneware pipe.**

Ram the bottom of trench.

Water the ramed area.

Mark the height of bedding (Fig 1).

Lay concrete.

Lay the pipe and joint.

Lay the concrete upto the haunch of pipe.

Finish with mortar.

Prepare two template of the required shape as per drawing.

Fix the template at two ends.

Put concrete in line with template shape.

Finish the surface neatly.

Cure it.

$$W = D + X$$

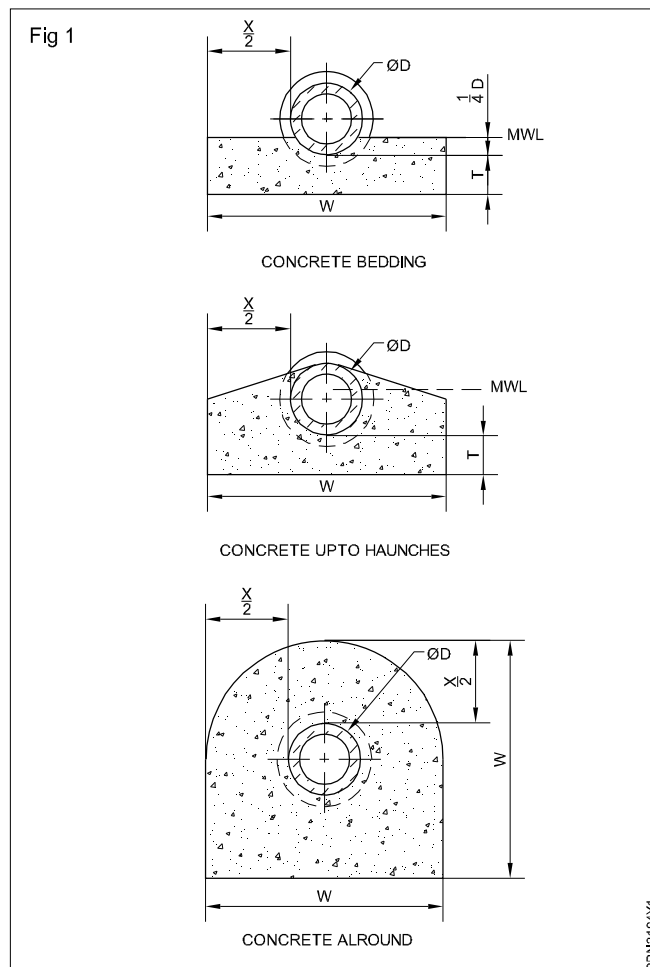
Where

D - is the external diameter of the pipe.

X - 300mm for trench depth of 1200mm, 400mm for trench depth more than 1200mm

T - 100mm for pipes under 150mm, 1/4th internal diameter subject to a minimum of 150mm and maximum of 300mm for pipes more than 150mm

MWL - Maximum water level



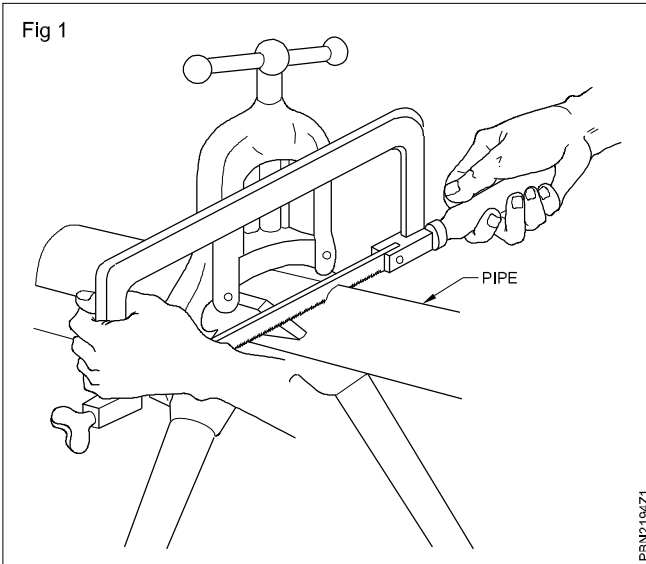
## G.I pipe cutting

---

**Objectives :** This shall help you to

- **measure the G.I pipe**
  - **mark and cut the G.I pipe.**
- 

Measure the required length of G.I pipe with scribe and try square (Fig 1).



Roll the paper on pipe scribed area.

Shade with rolled paper by Marker (or) Chalk.

Hold the pipe in a pipe vice.

Cut the required length of pipe.

Remove the burrs from inside the pipe by file.

Chamber out side.

### **Safety**

- Use proper tools
- Hold the pipe in a pipe vice firmly
- Use water coolant on hacksawing.

**Objective:** At the end of the exercise you shall be able to

- | <b>Requirements</b>          |            |  |                                |            |  |
|------------------------------|------------|--|--------------------------------|------------|--|
| <b>Tools/Instruments</b>     |            |  | <b>Equipments</b>              |            |  |
| • Spade                      | - as reqd. |  | • Hoisting assories            | - as reqd. |  |
| • Pick axe                   | - as reqd. |  | • Hammer drill m/c             | - as reqd. |  |
| • Shovel                     | - as reqd. |  |                                |            |  |
| • Straight rail              | - as reqd. |  | <b>Material</b>                |            |  |
| • Bonning rod                | - as reqd. |  | • Hummed pipe 150~300 mm x 10' | - 2 Nos.   |  |
| • Baseline string            | - as reqd. |  | • Spun yarn rope               | - as reqd. |  |
| • Mortar pan                 | - as reqd. |  | • Portland cement              | - as reqd. |  |
| • Trowel                     | - as reqd. |  | • AC pipe                      | - as reqd. |  |
| • Caulking tool              | - as reqd. |  | • Cement                       | - as reqd. |  |
| • Sprit level                | - as reqd. |  | • Fine river sand              | - as reqd. |  |
| • Plumb bob                  | - as reqd. |  | • 'U' Clamp (or) Special clamp | - as reqd. |  |
| • Marking media (blue)       | - as reqd. |  | • Cotton waste                 | - as reqd. |  |
| • Measuring tape             | - as reqd. |  | • Juttiyam                     | - as reqd. |  |
| • Marking twin drill bit     | - as reqd. |  | • Screws                       | - as reqd. |  |
| • Ball peen hammer           | - as reqd. |  | • Wall type plug wood          | - as reqd. |  |
| • Poker                      | - as reqd. |  | • AC Bend (90°)                | - as reqd. |  |
| • Screw driver               | - as reqd. |  | • AC off join set bend         | - as reqd. |  |
| • Water pump plier           | - as reqd. |  | • AC shoe                      | - as reqd. |  |
| • Double end spanner 10 x 11 | - as reqd. |  | • Gutter                       | - as reqd. |  |
| • Chisel                     | - as reqd. |  | • Swan neck offset             | - as reqd. |  |

- 1 Read the drawing.
- 2 Prepare material as per required.
- 3 Prepare work spot (select, level, mark)
- 4 Excavate the trench after marking the centre line of pipe layout - The depth and width are to be as per standard.
- 5 Layout the bed concrete.
- 6 Lay the pipe after checking for visible defects.
- 7 Joint the pipe - close the end after days work.
- 8 Test the joints.
- 9 Lay the concrete as per standard.
- 10 Refill the trench.

**Objective:** At the end of the exercise you shall be able to

- ### TASK 1: laying asbestos pipe (rain water) (Fig 1 to 4)

- 1 Read the drawing for calculating raw material required.
- 2 Prepare the material as per job sheet.
- 3 Measure and markout the centre line of the pipe by chalkline by using plumb bob.
- 4 Check the AC pipe, bend, shoe, cutter swan neck off set, off set bend, for visible defects.
- 5 Drill the screw holes at required place (pipe collar) in vertical wall.
- 6 Clamping the screw holes.
- 7 Laying the AC pipes start on roof terracing upto ground level.

- 8 Insert the bend from the roof level fix the bend end and pipe collar.
- 9 Tie up Jutti yam or Gasket rope 1/3 portion of collar & spigot and using caulking chisel.
- 10 Remaining portion pack with cement mortar (or) bitmaus compound.
- 11 Above skills (7,8,9,10) continuous upto ground level.

#### Notes

- Rain water pipe line not connect with drain, soil and waste water lines.
- At end of the pipe line must be fix AC pipe shoe only.

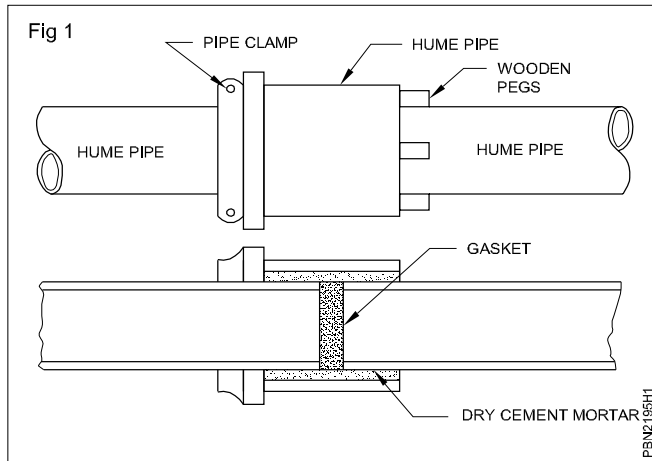


Fig 3

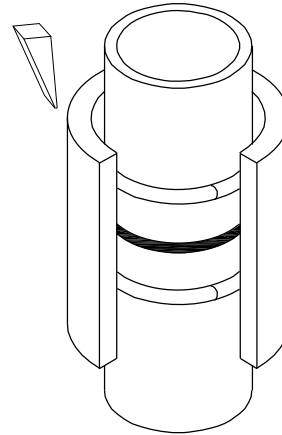


Fig 2

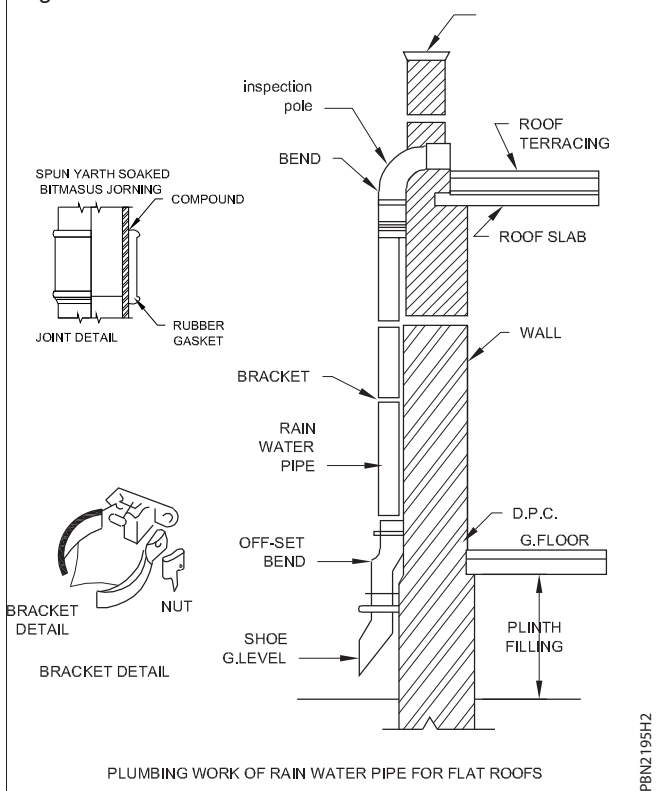
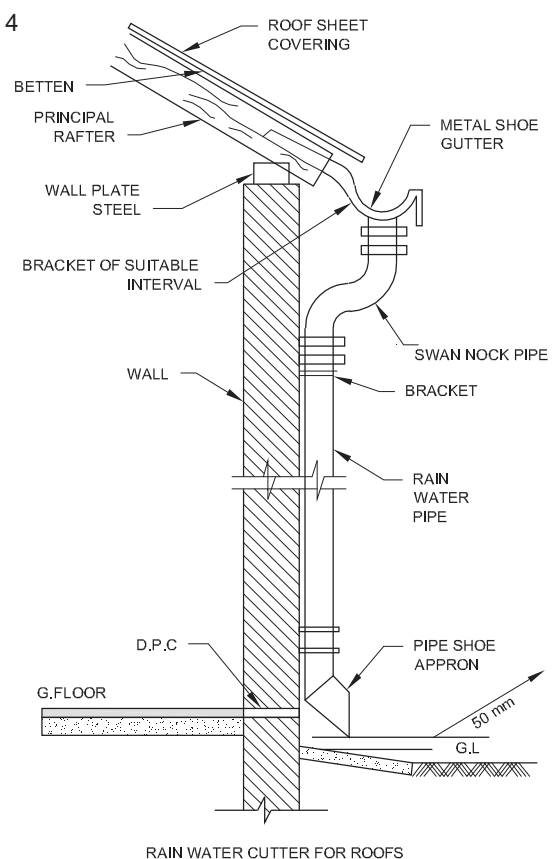


Fig 4



## Skill sequence

### Excavation of trench for sewer line

---

**Objective:** This shall help you to

- **excavate trench for sewer lines.**
- 

Read the drawing to calculate the material.

Prepare the material as per job sheet.

Prepare work spot

- Select the workspot free from water and foreign materials.
- Mark the work spot if trench need area mark with chalk powder.

To form the trench into marked work spot.

Drive two pegs on the side of trench starting point at a distance of 600mm from trench mark (at A).

Mark the level required considering the slop.

Calculate the required slope up the end of trench.

Fix two more pegs at end as per earlier procedure (at B).

Mark the level required considering the slop.

Fix a straight rail at mark.

Tie a string from sight rail A to B tightly.

Insert the spigot to the socket according the straight rail.

Tie up spun yarn rope 1/3 portion of spigot and socket using caulking chisel.

Remaining portion pack with cement mortar.

Check the bottom level of trench using a bonning rod (level of trench to be exactly equal from string).

— — — — —

### Demonstration use of specific dia in different locations

**Objectives:** At the end of the exercise you shall be able to

- identify the different dia pipes
- specify the pipes used in different locations
- lay the pipes as per drawing
- explain the uses of asbestos pipes.

Requirements			
Tools/Instruments		Material	
• Pipe wrench	- as reqd.	• G.I pipe	- as reqd.
• Plumber tool kit	- as reqd.	• Asbestos pipe	- as reqd.
• Asbestos pipe cutter	- as reqd.	• Cotton waste	- as reqd.
Equipments		• Gasket	- as reqd.
• Pipe vice	- as reqd.	• Cement	- as reqd.
• Press test kit	- as reqd.		

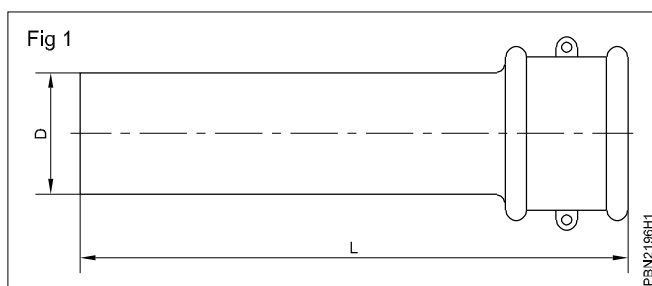
### PROCEDURE

#### TASK 1: Identifying the dia of pipes

- 1 The dia stamped right on the pipe.
- 2 Schedule 40 PVC pipe strong used for drain lines.
- 3 To find out the dia divide the circumference by pi or about 3.14159.

#### Types of pipes used for waste and ventilation (Fig 1)

- 1 Pex, PVC, ABS, copper, galvanised pipes.
- 2 The white pipe recommended by the National Sanitation Foundation (NSF) is safe for potable water.



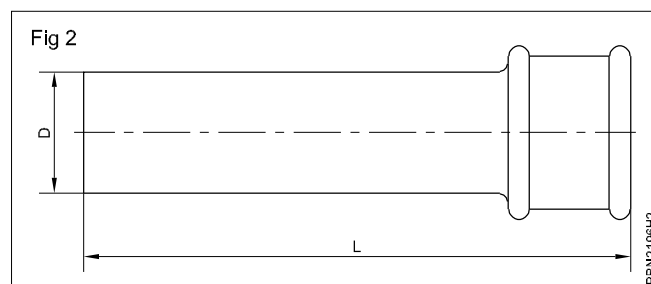
- 3 Copper pipe with lead free joint material is best for water pipes. They won't leach chemical HDPE (High Density Polyethylene pipes suitable for under ground supply.)
- 4 The department of environment recommended pipes to be buried at least 600mm (2 feet) under ground.
- 5 PVC pipes should not be buried under concrete due to UV radiation.

#### French drain

- 1 Trench filled with perforated pipe and grand that allow drain naturally to the yard.

#### Asbestos pipes (Fig 2)

- 1 Asbestos pipes manufactured with a dia of 80mm to 600mm.
- 2 Working pressure not more than 50% of test pressure for pumping mains and 67% for gravity mains.



#### Pressure testing procedure of asbestos cement pipes

- 1 At a time one section of the pipe line between two sluice valves up for testing. The section usually taken is about 500 meters long.
- 2 One of the valves is closed and the water is admitted into the pipe through the other, manipulating air valves suitably. (If there are no sluice valves in between the section, the end of the serve as an air relief vent or filling the line as may be required. The pipe line after it is filled, should be allowed to stand for 24 hours before pressure testing.)



- 3 After filling this sluice valve is closed and the pipe section is isolated.
- 4 Pressure gauges are fitted at suitable intervals on the crown into the holes meant for the purpose.
- 5 The pipe section is then connected to the delivery side of the pump through a small valve.
- 6 The pump is then worked till the pressure inside reaches the designed value which can be read from the pressure gauges fixed.
- 7 After the required pressure has been attained, the valves is closed and the pump disconnected.
- 8 The pipe is then kept under the desired pressure during inspection for any defect i.e leakages at the joints etc,. The test pressures will be generally as specified in 6.7.1 and Appendix 6.4. The water will then be emptied through scour valves and defects observed in the test will be rectified.

#### The sizes of plumbing pipes (Fig 3)

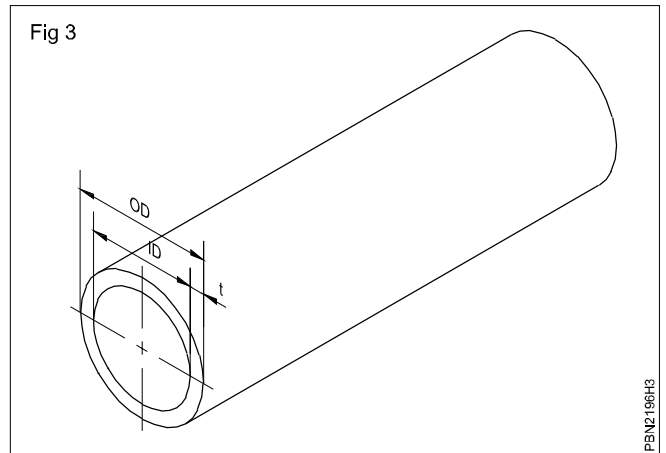
- 1  $\frac{3}{4}$  or 1 inch in dia used from houst to street.
- 2  $\frac{1}{2}$  inch dia pipe used for individual components.
- 3  $1\frac{1}{2}$  in dia pipe used for drain outlet.

- 4 50-150mm dia pipe used for rain water.
- 5 Waste water pipe shall not be less than  $1\frac{1}{4}$  inch dia.

#### Safety tips

- Ensure proper pipe line excuation procedures.
- Use appropriate PPE while working.
- There should not be any abrupt changes in the pipe line which may affect natural flow.
- Inspect all tools used on site.

Fig 3



PBN2196H3

## Use various sanitary fitting

**Objectives:** At the end of the exercise you shall be able to

- troubleshooting of hummed and AC pipes
- repairing of hummed pipe and AC pipe.

Requirements			
<b>Tools/Instruments</b>			
• Spade	- as reqd.	• Forge	- as reqd.
• Pick axe	- as reqd.	• Blow lamp	- as reqd.
• Shovel	- as reqd.	• Wooden wedge	- as reqd.
• Crow bar	- as reqd.	• Hand pump	- as reqd.
• Mortar pan travel	- as reqd.	• Motor 0.5 HP, Self primming	- as reqd.
• Caulking tool	- as reqd.	• Foot valve 25mm	- as reqd.
• Chisel	- as reqd.	• N.R.Valves	- as reqd.
• Ball peen hammer	- as reqd.	• Gate valve	- as reqd.
• Screw driver	- as reqd.	• Pipe fittings PVC (or) G.I.	- as reqd.
• Water pump plier	- as reqd.	• Pipes PVC (or) G.I.	- as reqd.
• Double end spanner 10x11	- as reqd.	• Thread seal materials	- as reqd.
• Hacksaw frame with blade	- as reqd.	• Solvant cement	- as reqd.
• Wire brush	- as reqd.	• Stop cock	- as reqd.
• Hammer	- as reqd.	• Water meter	- as reqd.
• Melting pot	- as reqd.	<b>Material</b>	
• Straight wedge	- as reqd.	• G.I pipe	- as reqd.
• Sprit level	- as reqd.	• Lead	- as reqd.
• Tongs	- as reqd.	• Spun yarn	- as reqd.
• Try square	- as reqd.	• Clay	- as reqd.
• Wedge	- as reqd.	• Kerosene	- as reqd.
• Trowl	- as reqd.	• Coal	- as reqd.
• Water level	- as reqd.	• Cotton waste	- as reqd.
• Marking thread	- as reqd.	• Flange	- as reqd.
• Twin and pin	- as reqd.	• Gasket	- as reqd.
• Plumb bob	- as reqd.	• Nut	- as reqd.
• Tube level	- as reqd.	• Bolt	- as reqd.
• Wood raps file	- as reqd.	• S.W pipe	- as reqd.
• Mallet	- as reqd.	• Cement	- as reqd.
• Measuring tape	- as reqd.	• Sieved river sand	- as reqd.
• Pipe wrench	- as reqd.	• Gasket (hemp yarn)	- as reqd.
• Measuring tape	- as reqd.	• A.C pipe	- as reqd.
• Cup die set	- as reqd.	• Cement	- as reqd.
• Spanner set	- as reqd.	• Fine riversand	- as reqd.
<b>Equipments</b>		• Hemp yarn	- as reqd.
• Hammer drill m/c	- as reqd.	• Rubber rings	- as reqd.
• Chain block with 'A' channel	- as reqd.	• A.C collars coupling	- as reqd.

## PROCEDURE

### Burst (or) Leaking supply pipe

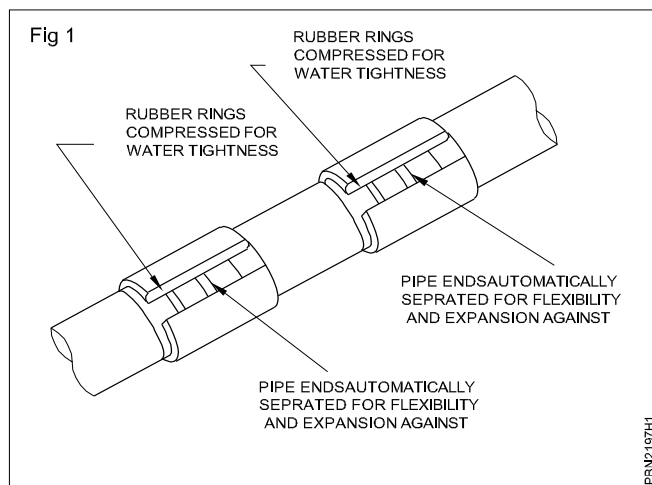
- 1 Leak may be gained by tracing through to walls, floor on ground.
- 2 After leak found the water turn off.

- 3 Repair can be carried out whether replace the fittings or pipe.

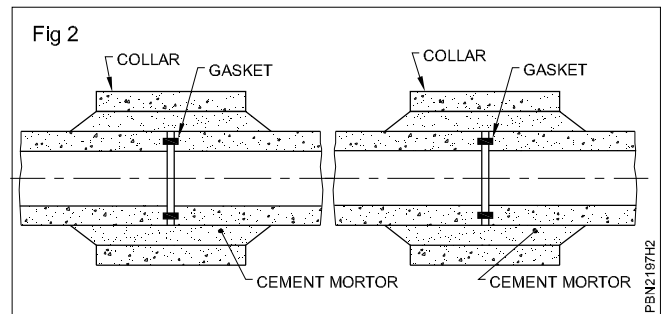
**Prepare material as per fault.**

## Replace the pipes

- 1 Close the inlet.
- 2 Cut and remove defective portion of pipes.
- 3 Measure the required pipes.
- 4 Prepare the required size of pipes & collars.



- 5 Insert the collars on both end of the existing line.
- 6 Fix the pipe on existing line.
- 7 Position the collar's to connect on existing line and newly insert the pipes.
- 8 Tie up spun yarn both side of the collars.
- 9 Pack with cement mortars.
- 10 Allow to curing.
- 11 Fill the packing materials.



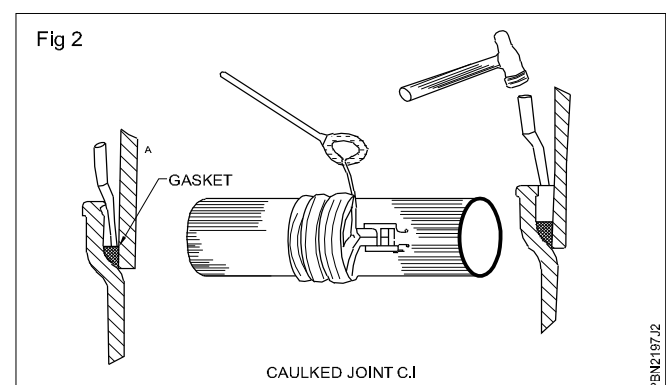
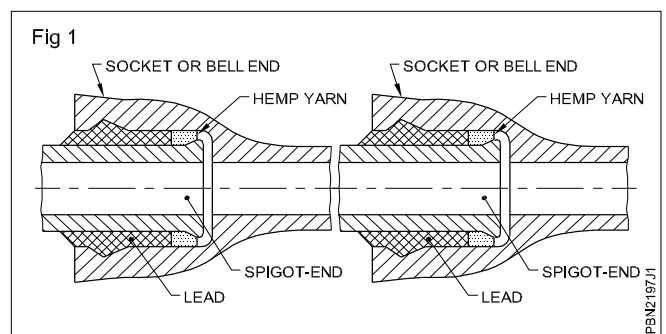
## Cast Iron pipe (socket and spigot joint)

**Objectives:** At the end of the exercise you shall be able to

- clean the cast iron socket and spigot end by wire brush
- insert the cast iron socket and spigot ends
- tie-yarn and compack the socket and spigot joint area by using clay
- melt and pour the moulten lead in socket and spigot jointed area
- caulk the socket and spigot joint area by using set of caulking tool
- check the jointed area.

- 1 Clean the pipe socket and spigot ends.
- 2 Insert spigot end in to socket end.
- 3 Tie-yarn the joint tightly to a depth of 1/3 the socket lengths.
- 4 Compact yarning material solidly, rigidly right around the joint with right yarning iron.
- 5 Burn off any loose stand of material sticking up from the join.
- 6 Place the flexible abstract rope approximately Ø25mm around the pipe.
- 7 Push the cord firmly up in the socket.
- 8 Wrap stiff clay around the rope shape the mould by wet thumb.
- 9 Remove the rope carefully leaving the pour hole on top of pipe.
- 10 Pour molten lead slowly through pouring hole.
- 11 Remove the clay mould.
- 12 Caulking by hammer around joint by using caulking tool.
- 13 Check the joint.

- Handle molten lead carefully by using Pot and Tongs.
- Fill the molten lead continuously.
- Caulk the lead after pouring.



## Safety

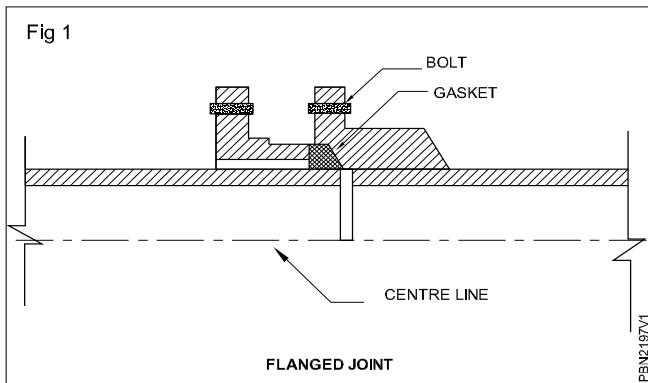
- Handle proper tool use proper handle in a hammer.

## C.I pipe joint (flanged joint)

**Objectives:** At the end of the exercise you shall be able to

- set the flange in C.I. pipe
- locate the gasket in the C.I. pipe
- fix the bolt and nut in C.I. pipe flange
- check the jointed area.

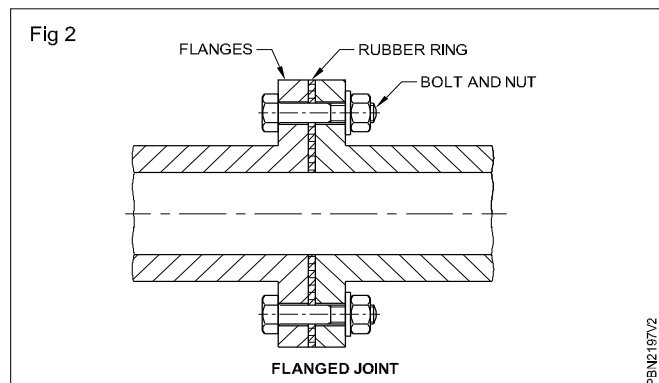
- 1 Place the flange end of the C.I pipe.
- 2 Place flange face to face.
- 3 Place Gasket middle of the two flange
- 4 Tight the nut & bolt flange by using spanner.
- 5 Check the joint by using spirit level.



- 6 Check the alignment of pipe line.

### Safety

- Use proper hand tools.
- Dont over tight the flange
- Dont fix flange without Gasket.

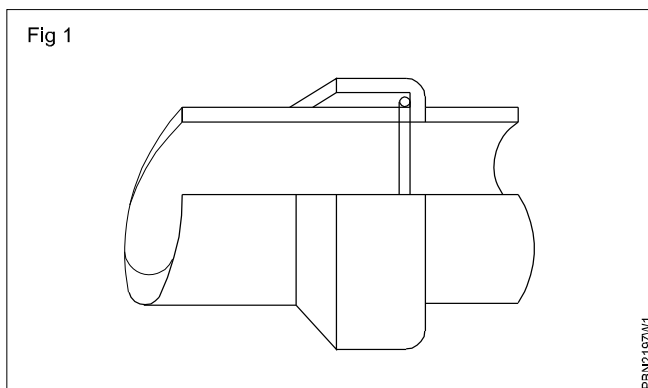


## S.W Pipe (socket and spigot) Joint

**Objectives:** At the end of the exercise you shall be able to

- clean and insert the S.W pipes
- pack span yarn at socket and spigot in S.W. pipe
- fill the cement mortar in S.W. pipe joint area
- check the slope in S.W. pipes.

- 1 Clean the External area of spigot end and internal area socket.
- 2 Place spigot end into socket end.



- 3 Adjust the pipe in correct positions giving uniform gap around.
- 4 Insert hemp yarn socks in cement mortar a round spigot end.
- 5 Fill the cement mortar in proportion 1:1 ratio.
- 6 Form a filler around the joint use a trowel barrel of the pipe.
- 7 Clean the inside of pipe.
- 8 Check the joint.

### Safety

- Use proper hand tools
- Dont allow cement mortar inside the pipe
- Mortar preparation should be proper ratio.

## A.C pipe joint (simplex joint)

**Objectives:** At the end of the exercise you shall be able to

- clean and insert the A.C pipes socket and spigot
- Pack hemp yarn at A.C pipe socket and spigot
- fill the sand mortar in A.C pipe socket and spigot
- check the joint.

- 1 Clean the External area of spigot and internal socket area of the A.C pipe.
- 2 Place spigot end into socket end.

- 3 Insert hemp yarn socket in cement mortar around spigot end.
- 4 Adjust the pipe in correct positions giving uniform gap around the barrel of the pipe.

**Tight pack of hamp yarn may be crack (or) damage the socket**

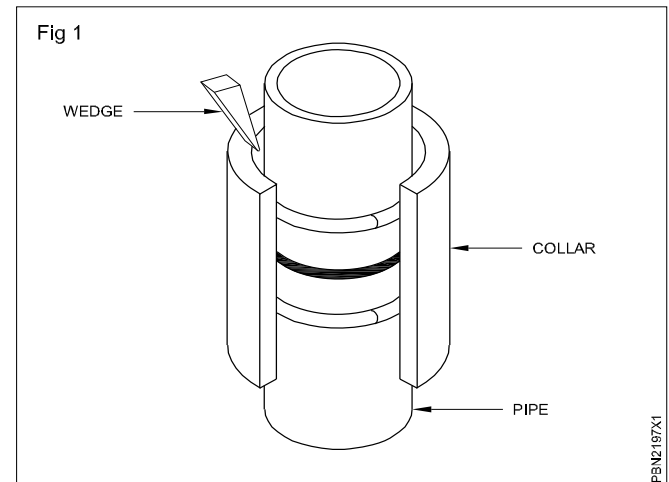
- 5 Add Fill the cement mortar in to the socket end.
- 6 Clean the inside of A.C pipe.
- 7 Check the joint.

#### Safety

- Use proper hand tools
  - Dont allow cement mortar inside the pipe
  - Mortar preparation should be proper ratio.
  - Avoid tight pack of hemp yarn.
- 5 Check the slope if horizontal laying.

#### Joint of AC pipes

For joining small diameter AC pipe the two ends of pipes are butted against each other then two rubber ring will be slipped over pipes and the coupling will be pushed over the rings as shown in Fig 1.



### A.C Pipe Joint (Coupling Joint/Collar Joint)

**Objectives:** At the end of the exercise you shall be able to

- prepare A.C pipe for joints
- insert the spunn yarn/rubber ring gasket in the pipe lines
- pack the cement sand mortar in the collar
- check the joints.

#### TASK 1 : Preparation of A.C pipe for joints

- 1 Clean the pipe end and rubber ring.
- 2 Lubricant the end of the pipe and coupling with soft soap solution.
- 3 Seat the rubber ring in the grooves of coupling.
- 4 Push the assembly (Coupling with rubber ring) with the help of wooden block and crow bar.
- 5 Check the joint.

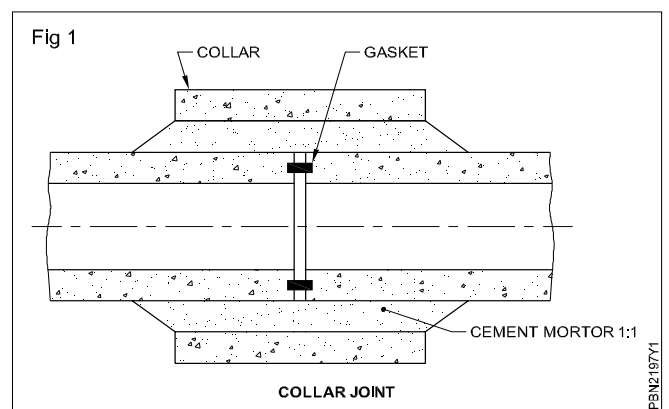
#### Safety

- Place the correct size rubber ring
- Use wooden wedge for fixing rubber ring
- Use lubricant if necessary.

#### Collar joint

This type of joints are mostly used for joining big diameter concrete and asbestos cement pipes. The end of the pipes

are brought in one level before each other. Then rubber gasket between steel rings and jute-rope soaked in cement is kept on the groove and the collar is placed at the joint so that it should have the same lap on both the pipes. Now 1:1 cement mortar is filled in the space between the pipes and the collar as shown in Fig 1.



#### TASK 2 : Cement sand mortar in the collar

- 1 Clean the pipe and collar.
- 2 Insert the pipe and both end of the collar.
- 3 Pack spunn yarn rd of the collar.
- 4 Remaining portion pack with cement sand mortar.
- 5 Allow the quering.
- 6 Check the joints.

---

**Plumbing**  
**Plumber - Piping System**

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**Exercise 2.1.98**

**Use of various fitting of different material**

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Refer the Exercise : 2.1.97

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**Plumbing**  
**Plumber - Piping System**

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**Exercise 2.1.99**

**Use joining material of pipe**

---

Refer the Exercise : 2.1.97

---

**Plumbing**  
**Plumber - Piping System**

---

**Exercise 2.1.100**

**Join pipe as per laid down procedure**

---

Refer the Exercise : 2.1.97

**Demonstrate use of different pumps**

**Objectives:** At the end of the exercise you shall be able to

- prepare installation material for bed forming
- comession the pump and motor's onto the bed
- connect the suction line and delivery line
- testing the suction line and delivery line.

**Requirements**

**Tools/Instruments**

- |                                 |         |
|---------------------------------|---------|
| • Pipe wrench                   | - 1 No. |
| • Spanner set                   | - 1 No. |
| • Screw driver                  | - 1 No. |
| • Sprit level                   | - 1 No. |
| • Trowel                        | - 1 No. |
| • Hammer                        | - 1 No. |
| • Chisel                        | - 1 No. |
| • Measuring tape                | - 1 No. |
| • Feeler gauge                  | - 1 No. |
| • Bond                          | - 1 No. |
| • India mark special tool kit   | - 1 No. |
| • Hacksaw frame                 | - 1 No. |
| • Masonery hand tools           | - 1 No. |
| • Pipe vice                     | - 1 No. |
| • Hoist/Tripod with chain hoist | - 1 No. |
| • Miscellaneous wrenches        | - 1 No. |
| • Bore clamp                    | - 1 No. |
| • Cutting pliers                | - 1 No. |
| • Alien key                     | - 1 No. |
| • Knife (or) Wire cutter        | - 1 No. |
| • Water pump plier              | - 1 No. |
| • Plumb bob                     | - 1 No. |
| • Leveling instruments          | - 1 No. |

**Machines/ Equipments**

- |                                     |         |
|-------------------------------------|---------|
| • Centrifugal pump                  | - 1 No. |
| • Motor                             | - 1 No. |
| • Foundation template, Bolt & Nuts  | - 1 No. |
| • Gland rope                        | - 1 No. |
| • Reciprocating hand pump           | - 1 No. |
| • Reciprocating power operated pump | - 1 No. |
| • Special tools                     | - 1 No. |
| • India mark hand pump              | - 1 No. |
| • Mono block                        | - 1 No. |
| • Foundation template, Bolt & Nuts  | - 1 No. |
| • Submersible pump                  | - 1 No. |
| • Teflon tape                       | - 1 No. |
| • Insulation tape                   | - 1 No. |
| • Polythylene pipes 32mm            | - 1 No. |
| • Thread seal                       | - 1 No. |

- |                    |            |
|--------------------|------------|
| • Gate valve       | - as reqd. |
| • NR-valve         | - as reqd. |
| • Poly safety rope | - 1 No.    |
| • Cable tag        | - 1 No.    |

**Materials/Components**

- |                                    |            |
|------------------------------------|------------|
| • G.I pipe                         | - as reqd. |
| • Foot valve                       | - as reqd. |
| • Non-return valve vertical type   | - as reqd. |
| • Non-return valve horizontal type | - as reqd. |
| • Gate Valve                       | - as reqd. |
| • Bend,flange,socket,elbow,union   | - as reqd. |
| • Couplings                        | - as reqd. |
| • Cement sand concrete             | - as reqd. |
| • Blue metals                      | - as reqd. |
| • Centrifugal pump                 | - as reqd. |
| • Strainer, Gasket washer          | - as reqd. |
| • Existing borewell                | - as reqd. |
| • Cement concrete motor            | - as reqd. |
| • Rigid couplings                  | - as reqd. |
| • Thread seal material             | - as reqd. |
| • Hacksaw blade                    | - as reqd. |
| • Lubricating oil                  | - as reqd. |
| • Grease                           | - as reqd. |
| • Flange washer                    | - as reqd. |
| • Union                            | - as reqd. |
| • Nipple                           | - as reqd. |
| • Foundation nut                   | - as reqd. |
| • Washer & bolt                    | - as reqd. |
| • Sims                             | - as reqd. |
| • Jet pump - 80' 1 - HP            | - as reqd. |
| • Jet pump - 80' 150 - 1.5 HP      | - as reqd. |
| • Pipe fittings                    | - as reqd. |
| • Ball valve                       | - as reqd. |
| • Pipe nipple                      | - as reqd. |
| • Tee                              | - as reqd. |
| • Flow control valve               | - as reqd. |
| • Angle & Angle bolt nuts          | - as reqd. |
| • Poly safety rope                 | - as reqd. |
| • Bore clamp                       | - as reqd. |

## PROCEDURE

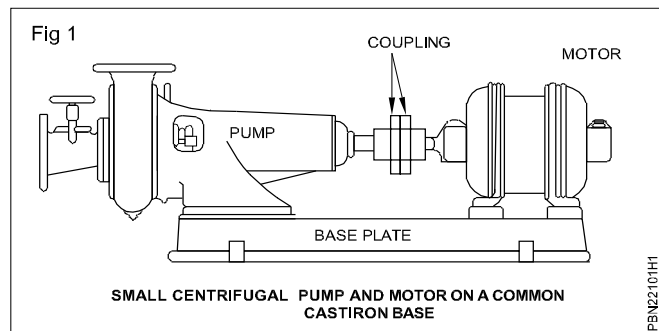
### TASK 1 : Make foundation bed

- 1 Prepare installation material for bed.
- 2 a Make a cement mortar as per ratio (1:2:4).

#### Cement sand mortar ratio

**Cement : Sand : Blue metal 1 : 2 : 4**

- b Grounding the foundation bolt & nut with help templates.
- c Fill the cement motor in the grounded area.



- d Allow to curing.
- e Remove the template and levelling the bed.
- f Erecting the bed.
- g Commissioning the pump and motor on the bed with help of spirit level and feeler gauge.
- h Alignment the pump pulley & motor pulley.

#### Alignment pulley

**To assemble pump pulley & motor pulley properly.**

**If not properly alignment following defects are developed.**

- Loose joint coupling assemble failure.
- Gland rope & bush wornout.
- Wornout of pump bearing.

### TASK 2 : Connect the suction line and delivery line

- 1 Measure the require length of suction pipe.
- 2 Select the require pipe fitting, valve's gasket.
- 3 Connect the foot valve-gasket, flange, bend to the pump.

#### Foot valve assemble

- 1 To maintain water level in suction pipe line.

- 4 Measure the require length of delivery pipe.
- 5 Select the require pipe fittings, and valves-Gaskets.
- 6 Connect the delivery line for required place Non-Return-Valve and with help of fittings.

#### Purpose of Non-Return valve

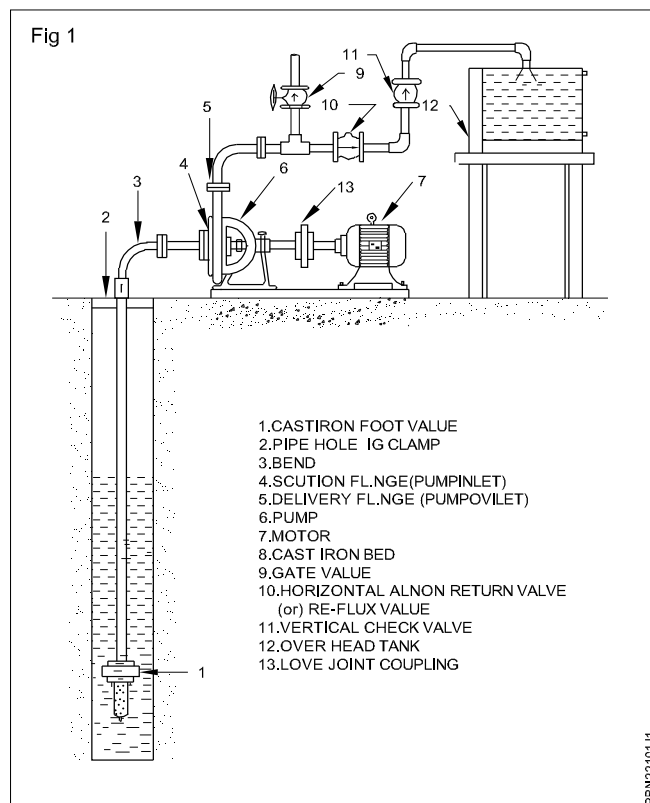
- 1 To avoid back pressure.
- 2 Place the Non-Return valve if required horizontal (or) vertical delivery line.

- 7 To provide electrical connection.
- 8 Priming the suction pipe.

#### Priming

- 1 To release air from the suction pipe

- 9 Switch on the pump.
- 10 Check the suction pipe & delivery pipe.

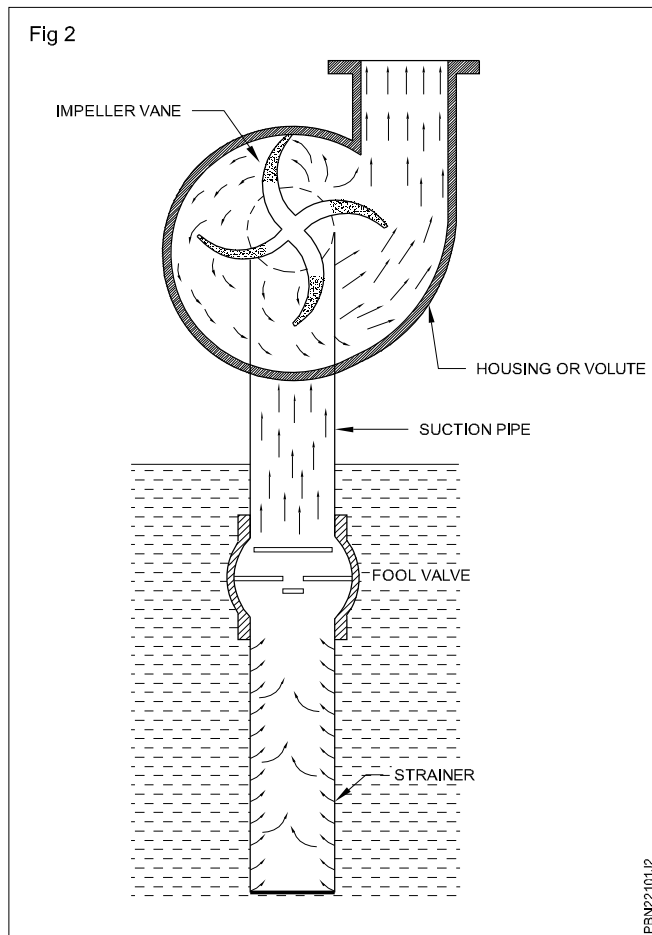


#### Safety

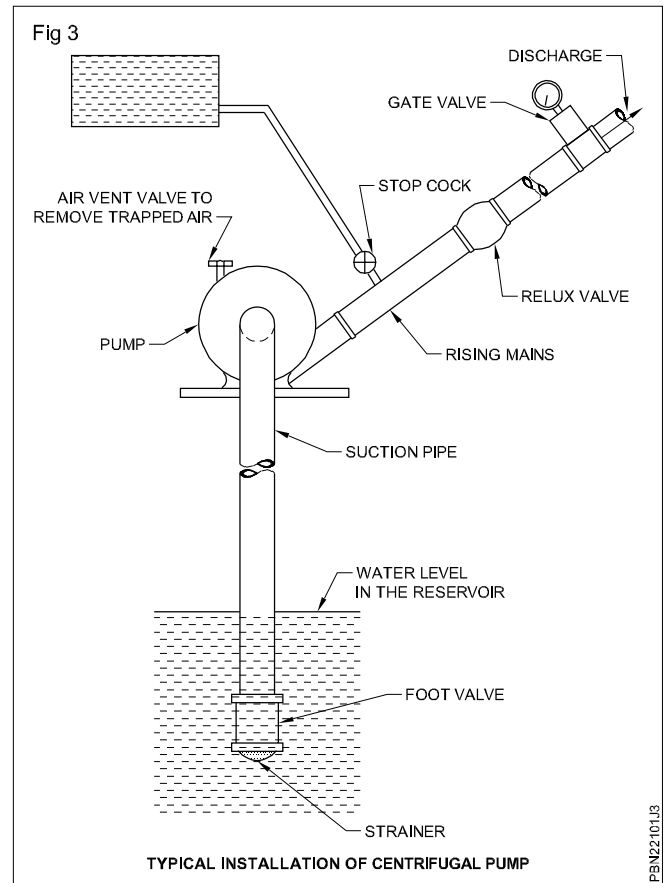
- Use proper hand tool.
- In the foot valve position to maintain bottom of the ground water level.
- To avoid dry run.



- Don't over tight the gland rope because rope shall burn.



- To avoid vibration on this systems.
- Check the lubricants as and when required at bearings.



## Installation of reciprocating pump

**Objectives:** At the end of the exercise you shall be able to

- prepare installation material for reciprocating pump(hand & power operated)
- compression the pump in the wall brackets/bed
- connect the suction and delivery line
- testing the suction and delivery line.

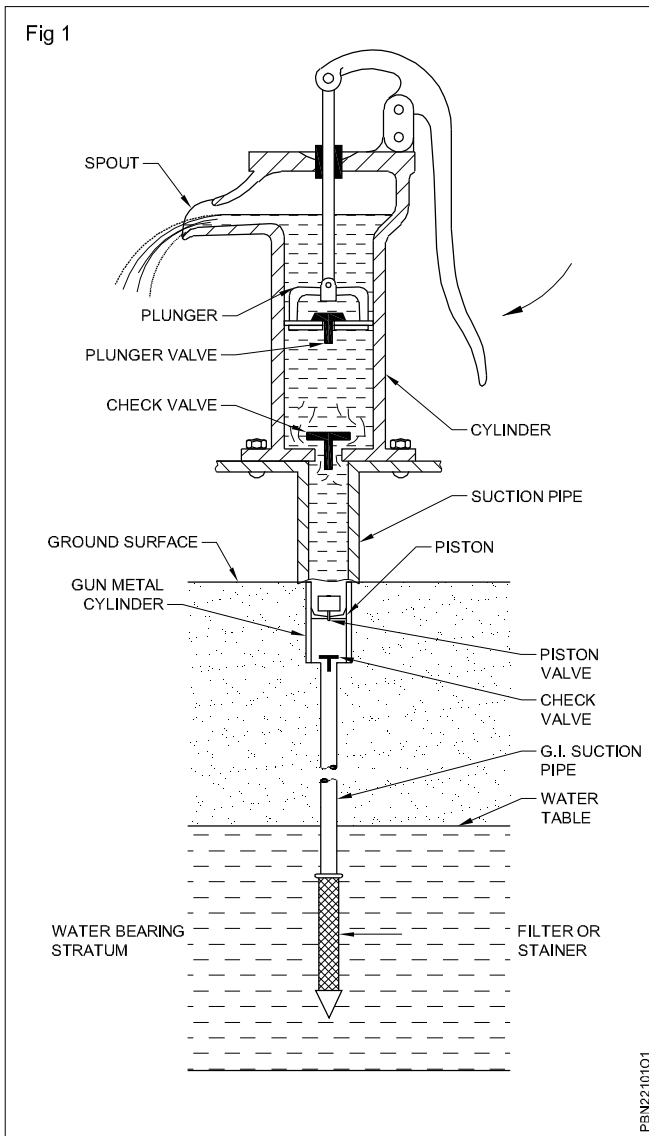
### TASK 1 : Installation of hand operated pump

- 1 Prepare installing materials (Fig 1).
- 2 Locating the area and marking.
- 3 Marking the holes and providing angle, for fixing. Hand pump base.
- 4 Allow to curing.
- 5 Fixing the suction pipe with check valve.
- 6 To provide pump base with weight washer (or) air washer
- 7 Connect the cylinder fix on the base with bolt & nuts.
- 8 To assemble cup washer with plunger rod.
- 9 To fix the plunger rod with hand lever.
- 10 To connect plunger rod assembly with cylinder head.
- 11 To operate the hand lever to up and down motion.

**Plunger valve must be fix proper position.**

**Weight washer placed at cylinder base.**

Fig 1



## TASK 2 : Power operated reciprocating pump

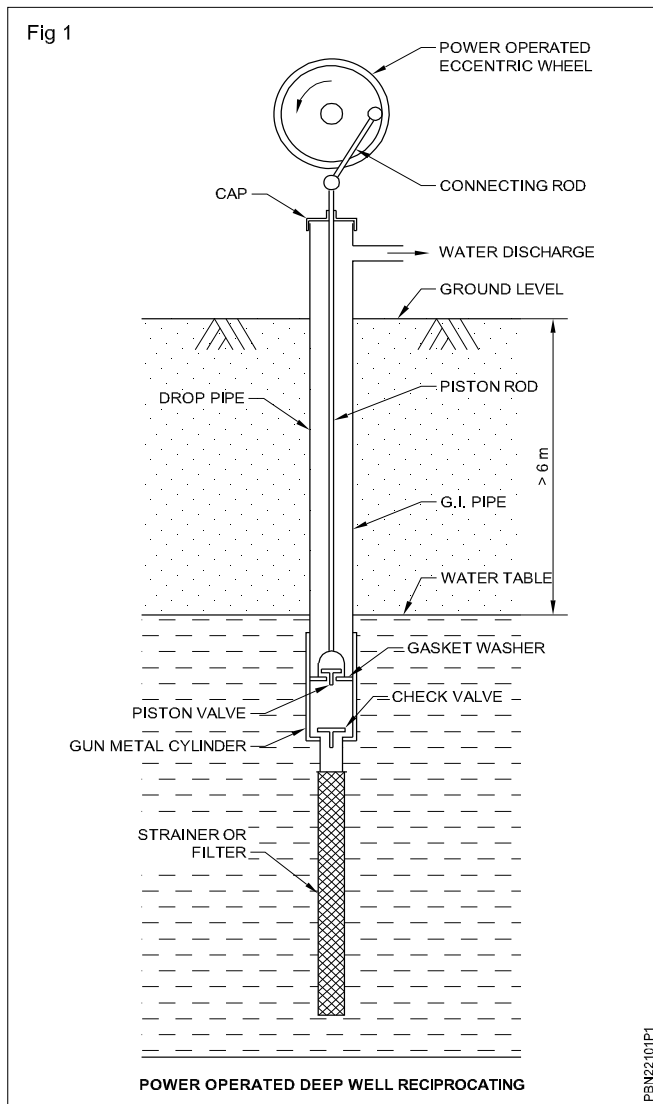
### Make foundation bed (Fig 1)

- 1 Prepare installation material for bed.
  - Make a cement mortar as per ratio (1:2:4).
  - Grounding the foundation bolt & nut with help templates.
  - Fill the cement motor in the grounded area.
  - Allow to curing.
  - Remove the template and levelling the bed.
  - Erecting the bed.

- Commissioning the pump and motor on the bed with help of spirit level and feeler gauge.
- Alignment the pump pulley & motor pulley.

#### Alignment pulley

- To assemble pump pulley & motor pulley properly.
- If not properly Alignment following defects are developed.



### TASK 3 : Connect the suction line

- 1 Measure the required length of suction pipe.
- 2 Select the required pipe fitting, valve's gasket.
- 3 Connect the check valve-gasket, flange, bend piston rod connections rod.
  - Piston rod properly hold connect the plunger set.
  - Piston rod and connecting rod must be properly hold and connect.

#### Check valve assemble

- 1 To maintain water level is suction pipe line.
- 2 To provide electrical connection.
- 3 Switch on the pump.

- 4 Check the suction pipe.

#### Safety

- Use proper hand tool.
- In the foot valve position to maintain bottom of the ground water level.
- To avoid dry run.
- Don't over tight the gland rope because rope shall burn.
- To avoid vibration on this systems.
- Check the lubricants as and when required at bearings.

## Installation of India mark III pump

**Objectives:** At the end of the exercise you shall be able to

- Installation of india mark pump with existing bore.

### TASK 1 : Foundation of India Mark III pump

- 1 Mounting the pump body.
- 2 Clean and grounded 1 meter  $\varnothing$  150mm deep around the borewell.

3 Place the pump body assemble with help of masonry hand tools.

4 Place and fix self locking clamp above the pump body.

## TASK 2 : To connect cylinder head with section pipe and connecting rod

- 1 To connect cylinder head top end and connecting rod with suction pipe.
- 2 Above said assembly insert the borewell with help of self locking clamp.
- 3 Further link if required to assemble connecting rod and suction pipe.

**Connecting rod have one end stud other end coupling.**

**Suction pipe connect with rigid couplings.**

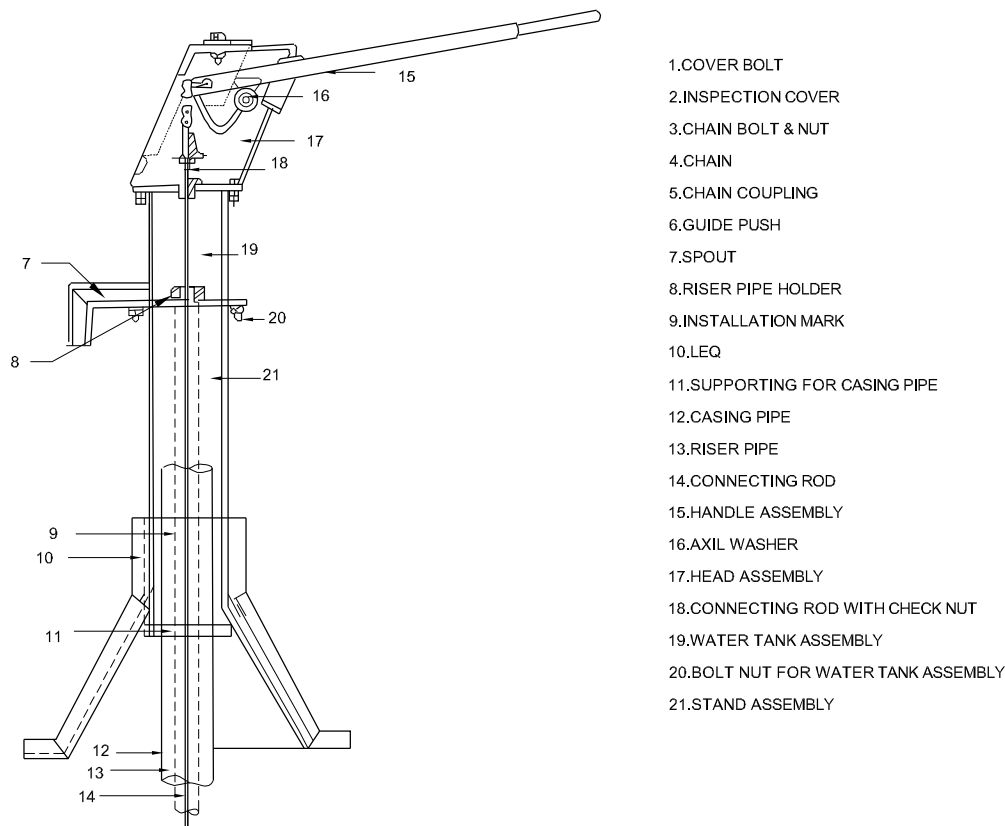
- 4 To connect water tank(bottom) assembly in the suction pipe and connection rod.
- 5 Connecting rod routed out with guide bush.
- 6 To assemble hand level chain (assembly) in the connecting rod.
- 7 Close the inspection chamber body cover.
- 8 To operate the hand lever up and down motion.
- 9 Check the water flow through water tank spout.

## TASK 3 : Assemble the pump (Fig 1&2)

- 1 Mounting on pump body 900 vertical position the ground with help of spirit level.
- 2 Must use proper self locking clamp for assemble suction pipe and connection rod.
- 3 Properly assembled cylinder body and suction pipe.

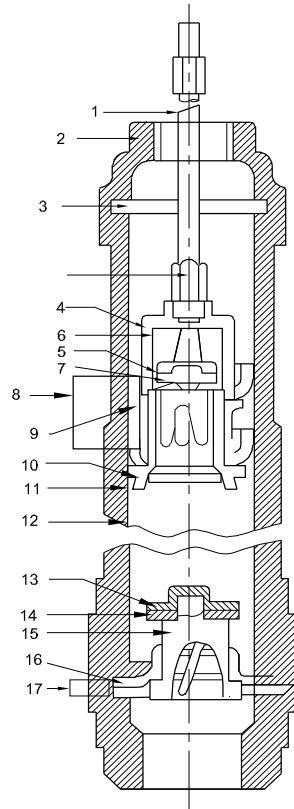
- 4 Use lifting tool to insert the suction pipe & connecting rod.
- 5 Head assembly proper chain link used.
- 6 Periodically apply solid lubrication in the chain link.

Fig 1



PBN22101S1

Fig 2



1. PLUNSER ROD
2. REDUCER CAP
3. SEALING RING
4. PLUNGER YOKE BODY
5. UPPER VALVE SEAT
6. RUBBER SEATING (UPPER VALVE)
7. UPPER VALVE GUIDE
8. PUMP BUCKET
9. SPACER
10. FOLLOWER
11. CYLINDER ROD
12. BRASS LINER
13. RUBBER SEAT RETAINER
14. RUBBER SEAT LOWER VALVE
15. CHECK VALVE GUIDE
16. CHECK VALVE SEAT
17. HEX COVER

PBN22101S2

## Installation of mono block pump

**Objectives:** At the end of the exercise you shall be able to

- prepare installation material for bed
- connect suction and delivery pipe lines
- testing the suction line and delivery line
- commission the pump over the bed.

### TASK 1 : Installation material for bed

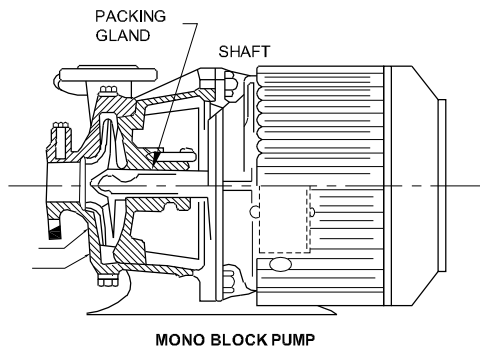
- 1 Make foundation bed.
- 2 Make a cement mortar as per ratio (1:2:4).

#### Cement sand mortar ratio

**Cement : Sand : Blue metal 1 : 2 : 4**

- 3 Grounding the foundation bolt & nut with help templates.
- 4 Fill the cement mortar in the grounded area.

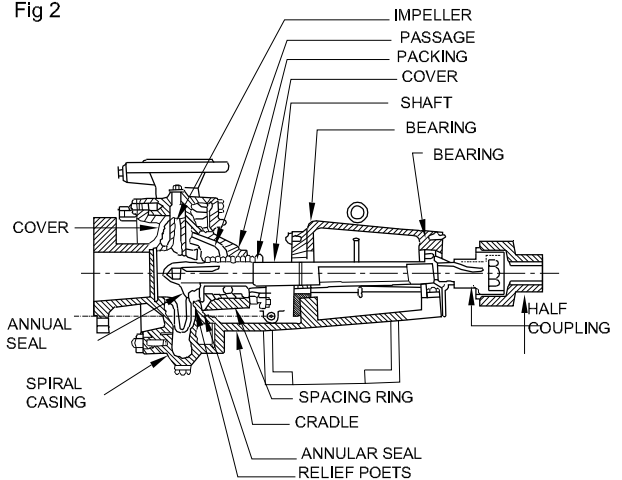
Fig 1



PBN22101U1

- 5 Allow to curing.
- 6 Remove the template and levelling the bed.
- 7 Erecting the bed.
- 8 Commissioning the pump and motor on the bed with help of spirit level and feeler gauge.

Fig 2



PBN22101U2

## TASK 2 : Connect the suction line and delivery line

- 1 Measure the require length of suction pipe.
- 2 Select the require pipe fitting, valve's gasket.
- 3 Connect the foot valve-gasket, flange, bend to the pump.

### Foot valve assemble

#### 1 To maintain water level in suction pipe line.

- 4 Measure the require length of delivery pipe.
- 5 Select the require pipe fittings, and valves-Gaskets.
- 6 Connect the delivery line for required place Non-Return Valve and with help of fittings.

### Purpose of Non-Return valve

- 1 To avoid back pressure.
- 2 Place the Non-Return value if required horizontal (or) vertical delivery line.

- 7 To provide electrical connection.
- 8 Priming the suction pipe.

### Priming

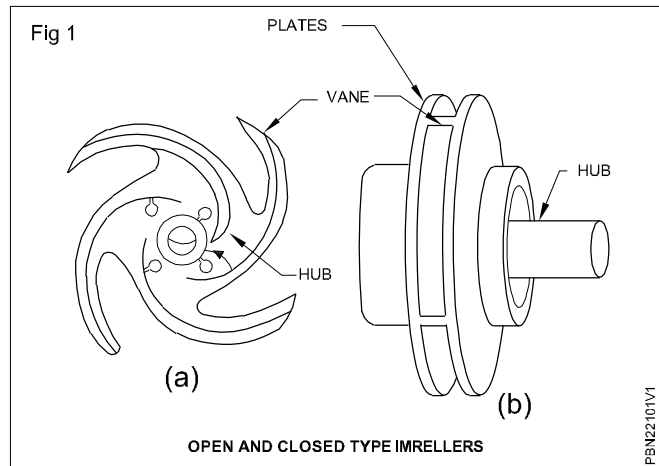
#### 1 To release air from the suction pipe

- 9 Switch on the pump.

- 10 Check the suction pipe & delivery pipe.

### Safety

- Use proper hand tool.
- In the foot valve position to maintain bottom of the ground water level.
- To avoid dry run.
- Don't over tight the gland rope because rope shall burn.
- To avoid vibration on this systems
- Check the lubricants as and whne required at bearings.



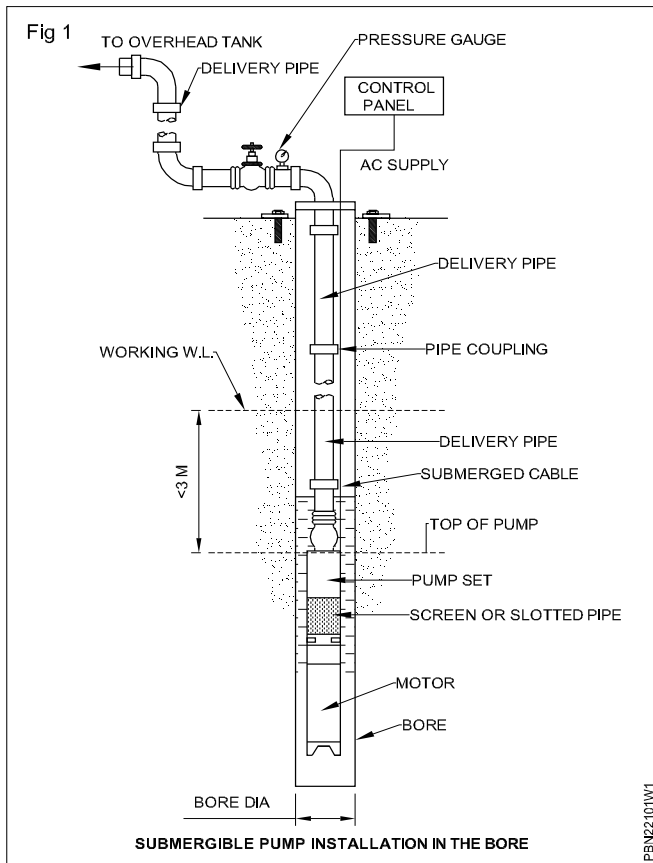
## Installation of submersible pump

**Objectives:** At the end of the exercise you shall be able to

- assemble the pump and motor
- install the pump and motor in the well.

## TASK 1 : Assemble the pump and motor

- 1 Check submersible pump and accessories.
- 2 Check physical condition.
- 3 Check working condition, electrical condition.
- 4 Choose the location for installation of pump, if should be installed not less than 1.5 m from the bottom of the well.
- 5 Check the pump, accessories, electric supply for proper voltage, fusing, wire size, grounding and capacity of transformer, casing.
- 6 Select the pipe.



## TASK 2 : Installing the pump with polythylene pipe

- 1 Fix the adaptor into the pump discharge end.

**While holding the discharge head with pipe wrench to prevent the head from loosening from the pump housing.**

- 2 Fix required hose clamps over one end of the pipe and tighten.
- 3 Apply heat to the polythylene pipe to soften the pipe.
- 4 Press the polythene pipe over the adaptor.
- 5 Tighten the clamp securely around the pipe over the adaptor end.
- 6 Pump and pipe lowered into the well.
- 7 Submersible wire cable must be secured to the discharge pipe 5 feet from the top of the pump using electrical tap (or) snap wire ties.
- 8 Repeat this procedure at 3m intervals along the discharge piping.

**Pipe vice or collar clamp should always be firmly affixed to the upper end of the pipe as its being lowered.**

- 9 Pump has reached the required depth.

**Send the pipe and cable through the opening in the well seal. Well seal must be vented.**

- 10 Continue pipe connection to the tank location in the house. Additional clamps and fitting use.
- 11 A fix union gate valve and non return valve at end of the delivery line at near by bore.

**Verify the yield to adjust gate valve.**

## Installation of Jet pump

**Objectives:** At the end of the exercise you shall be able to

- prepare jet pump for installation
- commission the jet pump
- connect the suction and delivery to the jet pump.

### TASK 1 : Shallow-well jet pump

If build-in-set assemblies for minimum lift of 25'.

- 1 Choose the place for locate the pump near by bore.

- 2 Mounting the pump.
- 3 Connect the jet & tie with rope and delivery pipe, continue if required length of delivery pipe to deep well.

**It should be installed not less than 1.5m from the bottom of the bore well.**

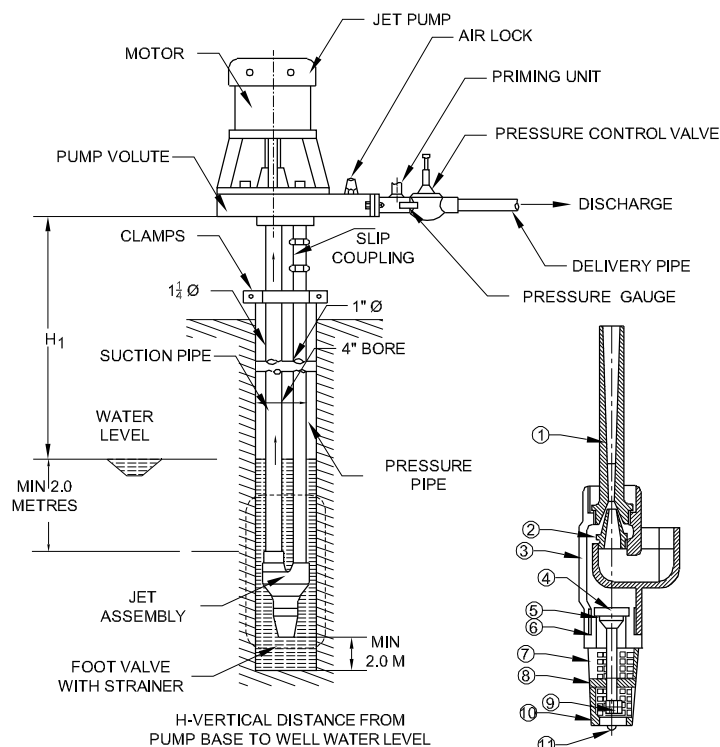
- 4 Fix flange in the suction end.
- 5 Assemble the suction and bottom of the pump.
- 6 Fixing the pressure control valve after the priming pipe.

- 7 Connect the delivery line after the control valve.

**To fix priming, control valve and delivery pipe above the pump parts.**

- 8 Priming the pump.
- 9 Start the pump.
- 10 Water flow out, check any leakage or not.

Fig 1



S.NO	NAME OF THE PART	MATERIAL
1	VENTURI TUBE	G.M/SPL.POLYMER
2	JET NOZZLE	GUNMETAL
3	JET ASSEMBLY BODY	GUNMETAL
4	FOOT VALVE PLUNGER	GUNMETAL
5	PLUNGER 'O' RING	RUBBER
6	FOOT VALVE JOINTING WASHER	RUBBER
7	FOOT VALVE BODY	GUNMETAL
8	PLUNGER SPRING	S.S.SPRING
9	PLUNGER LOCK NUT	GUNMETAL
10	STRAINER	STAINLESS STEEL
11	CAP SCREW	BRASS

JET PUMP INSTALLATION

PSN22101X1

## Installation of air lift pump

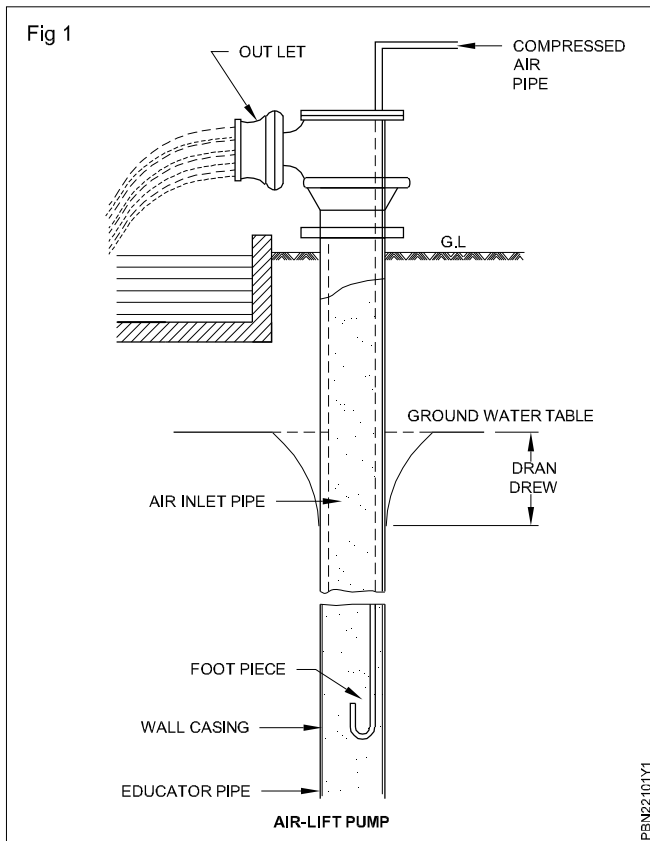
**Objectives:** At the end of the exercise you shall be able to

- prepare air lift pump for installation
- commission the air lift pump
- connect the suction air pipe and delivery pipe.

### TASK 1 : Preparation of air lift pump

- 1 Mounting air compressors motors.
- 2 Connect the jet nozzle with educator. (PVC)
- 3 Deep well required length.
- 4 To preserve the nozzle level 1.5m above the ground water level in the bore.
- 5 Clamp it to provide bore clamp at above the ground level.
- 6 To connect suction air pipe to pump minimum 6m length of G.I.pipe should be used.
- 7 Connect the delivery pipes, if required length.
- 8 Run the air lift pump.
- 9 Check water flow off.





## Installation of booster pump

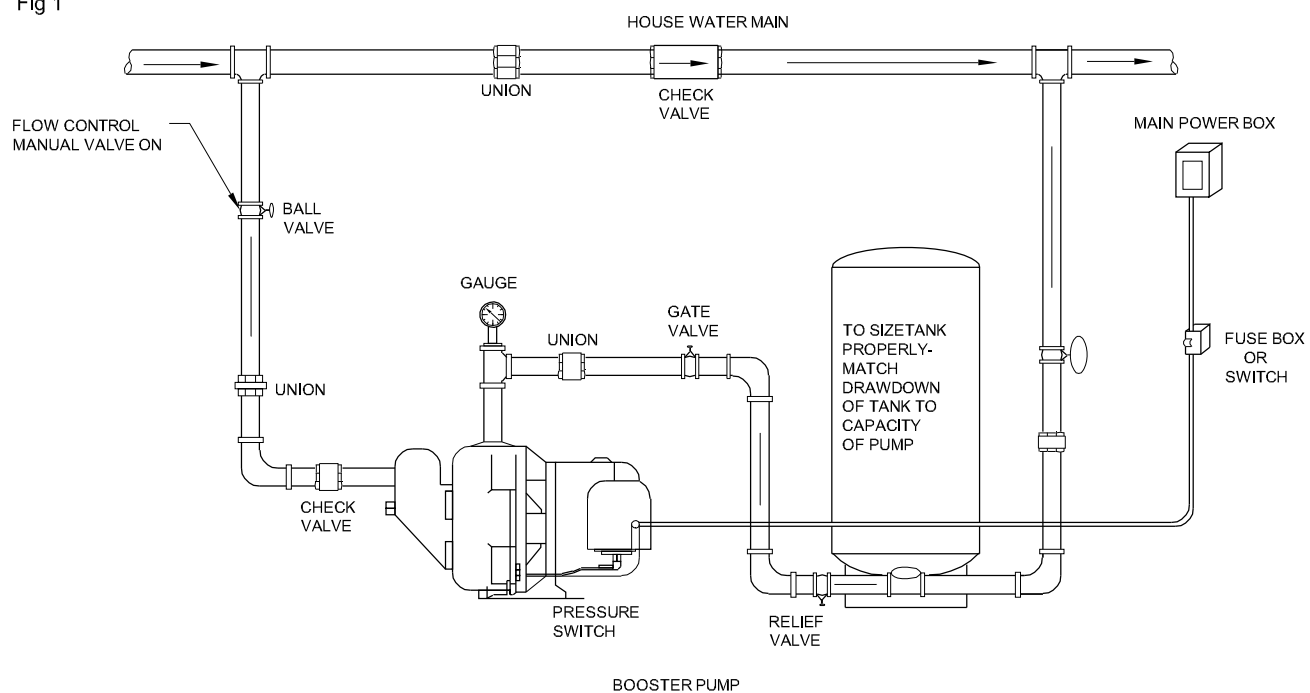
**Objectives:** At the end of the exercise you shall be able to

- prepare booster pump for installation
- commission of booster pump.

### TASK 1 : Mounding the booster pump assembly

- 1 Erecting the pump in bed with foundation bolt.
- 2 Fix pressure tank assembly.
- 3 Connect the check valve in the pump suction line.
- 4 After the check valve fix the pressure reduce valve in the suction line.
- 5 Fix the pressure reduce valve after the check valve with union in suction line.
- 6 Fix bolt valve after the pressure reduce valve with union in the suction line.
- 7 To connect tee in the suction line for one end connect overhead tank and other end is universal valve change.
- 8 Outlet of universal valve change to connect with hexagon barrel nipple.
- 9 End of nipple to connect Tee.
- 10 One end to Tee to connect ball valve and other end is delivery line.
- 11 Fix union and hexagon barrel nipple in the pressure tank outlet.
- 12 To connect hexagon barrel nipple in the pressure tank and union.
- 13 To fix the check valve/Non-return valve choose the direction of the valve.
- 14 Before the ball valve in the line fix union is must.
- 15 Properly installed.
- 16 Use recommended pressure in the pump.

Fig 1



PBN22101Z1

<b>Plumbing</b> <b>Plumber - Pumps and PVC Joints</b>	<b>Exercise 2.2.102</b>
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**Demonstrate installation of electric pump**

Refer the Exercise : 2.2.101

<b>Plumbing</b> <b>Plumber - Pumps and PVC Joints</b>	<b>Exercise 2.2.103</b>
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**Demonstrate maintenance of electrical pump**

Refer the Exercise : 2.2.101

<b>Plumbing</b> <b>Plumber - Pumps and PVC Joints</b>	<b>Exercise 2.2.104</b>
--	-------------------------

**Demonstrate working process of centrifugal pump reciprocating submersible pump**

Refer the Exercise : 2.2.101

<b>Plumbing</b> <b>Plumber - Pumps and PVC Joints</b>	<b>Exercise 2.2.105</b>
--	-------------------------

**Demonstrate delivering of water to over head tank through pump, presser head, delivering pipe and suction pipe**

Refer the Exercise : 2.2.101

## Contamination of water in a well

**Objectives:** At the end of the exercise you shall be able to

- explain source of contamination
- identify the symptoms of water contamination
- explain well water testing
- explain method of purifying well water.

### Requirements

#### Tools/Instruments

- |  |            |   |            |
|--|------------|---|------------|
| • Water testing equipment  | - as reqd. | • Jar test equipment/ Flocculation test equipment | - as reqd. |
| • Bench top pH meter   | - as reqd. | • Portable conductivity meter (EC meters)         | - as reqd. |
| • Conductivity meter/ Bench top conductivity meter/ Dissolved oxygen analyzer / Dissolved oxygen monitor | - as reqd. |   |            |

## PROCEDURE

### TASK 1 : Remove toxin from well water

- |  |   |
|--|---|
| 1 The best type of filter is a granular activated carbon block filter (as recommended by the EPA) which remove most harmful chemicals and metals. Another method of removing toxic chemicals from water is activated carbon (GAC). | 2 This material sometimes just referred to as carbon or charcoal is the recommended treatment for most of the water containments listed by EPA. We should test well water once in year for total coliform bacteria, nitrates, total dissolved solids and PH levels. |
|--|---|

### TASK 2 : Treatment of bacterial infected in the water well

- 1 Shock chlorination is the process which disinfected using house hold liquid bleach recommended for treating well water.

#### Major well water containments

- Microbiological
- Heavy metal
- Organic chemical
- Fluorides
- Nitrates

#### How well water containments?

Water run off from rain fall or snow melt can contaminate private wells by washing micro organisms in to the well systems or seeping under ground (Fig 1).

#### Maintenance

- In addition to periodic water testing regular physical inspections can help you sort potential problems that might lead to contamination. To make sure your well is performing best tips to maintain the water well.
- The well cap should be checked regularly to ensure that it is securely in place and water tight.
- Joints, cracks and connections in the well casing should be sealed.
- Pumps and pipes should also be checked on a regular basis.
- Any changes in water quality should be investigated.

## Produce metric and BSP thread on pipe

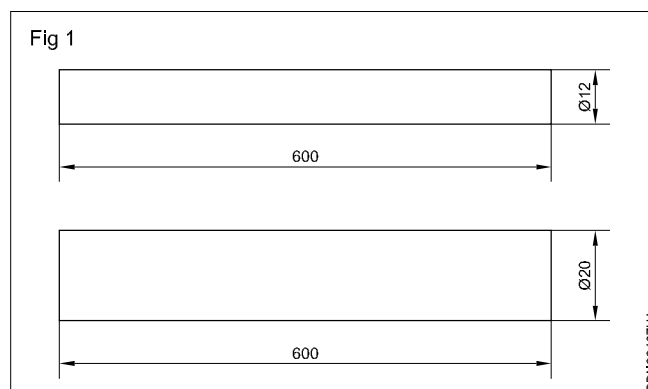
**Objectives:** At the end of the exercise you shall be able to

- select the correct hand die for a given thread
- hold the pipe on pipe vice
- cut external thread using a hand dies
- file chamfer on the ends of studs on a bench grinder
- check the external thread fit (in the hole drilled in previous exercise
- job by matching with internal threads.

Requirements			
Tools/Instruments		Materials/Components	
• Hand hacksaw frame	- as reqd.	• Blade	- as reqd.
• File	- as reqd.	• PVC pipe	- as reqd.
• Try square	- as reqd.	• G.I pipe	- as reqd.
• Die & Die stock	- as reqd.	• Coolant oil	- as reqd.
• Spanners (Square headed)	- as reqd.	• Cotton waste	- as reqd.
• Taps and tap wrench	- as reqd.		
Machines/Equipments			
• Pipevice	- as reqd.		

## PROCEDURE

- 1 Check the diameter of the pipe.
- 2 Cut the pipe of 20 mm and 25 mm to the length of 60cm each as per drawing.
- 3 Chamfer the ends by using files.
- 4 File and furnish both portions to size.
- 5 Hold the job in the pipe vice.
- 6 Cut the thread with a die set a on one side of each pipe.
- 7 Check the thread with the pipe made in previous Exercise job.



## Skill sequence

### Cut external threads using dies

**Objective :** This shall help you to

- cut external threads using dies.

Select a correct size and circular pipe and chamfer the ends.

Grip the pipe in the pipe vice using a jaw, projecting the pipe, side of the pipe vice jaws, 100 mm more than the required length of thread.

Fix the die in the diestock. The leading side of the die must be opposite to the stock of the die stock.

Open the die fully by tightening the centre screw of the die stock.

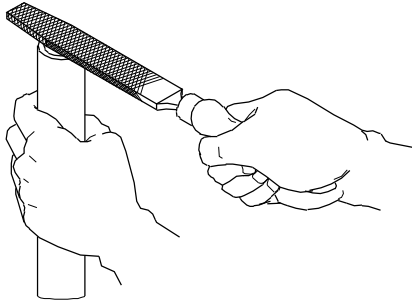
Place the leading side of the die on the chamfer of the job.

Start the die, square to the bolt centre line.

Turn in the clockwise direction to advance the die on the pipe with even pressure on both ends of the die stock.

Cut thread slowly the die for a short distance in order to break the chips.

Fig 1



PSN22107.J1

### Use a cutting lubricant

**Clean the die frequently with a brush to prevent the chips from clogging and also from spoiling the thread.**

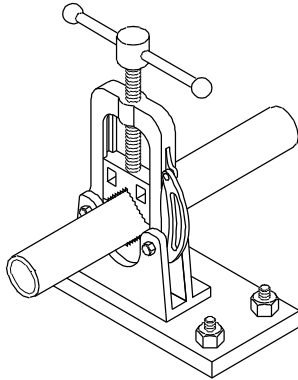
Reverse and remove the die after the full required length is reached.

Increase the depth of the cut gradually by loosening the centre screw and tightening the side screws.

**Too much depth of cut at one time will spoil the thread. It can also spoil the die.**

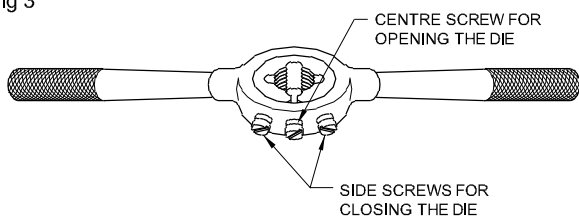
Check the fit of threads with a matching fittings.

Fig 2



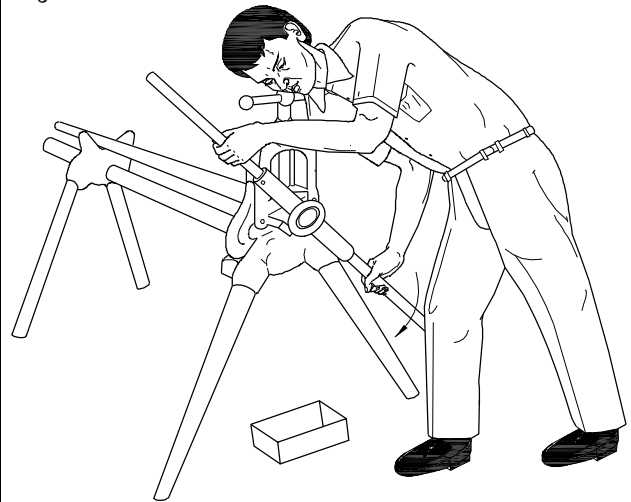
PSN22107.J2

Fig 3



PSN22107.J3

Fig 4



PSN22107.J4

**Produce internal and external thread on PVC pipes of different dia**

**Objectives:** At the end of the exercise you shall be able to

- determine the tap drill sizes for internal threading
- cut internal threads using hand taps
- check the threads by screw gauges.

**Requirements**

**Tools/Instruments**

- Drill bit - as reqd.
- Counter sink - as reqd.
- Tape and tap wrenches - as reqd.
- Centre punch - as reqd.
- Hammer - as reqd.
- Wire brush - as reqd.
- File - as reqd.
- Scriber - as reqd.

**Machines/Equipments**

- Benchvice - as reqd.
- Drilling machine with M/C vice - as reqd.

**Materials/Components**

- Cast iron block 50x50x50 - as reqd.
- Marking media - as reqd.

**PROCEDURE**

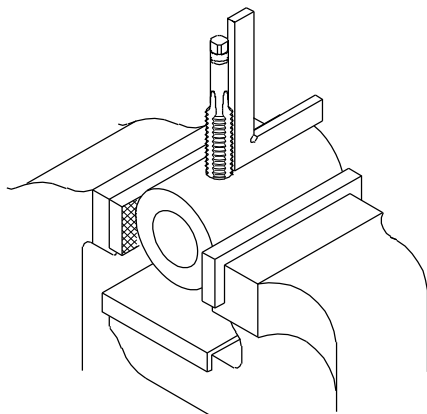
**TASK 1: Internal dia**

- 1 Measure and mark the job by scribe and marking media.
- 2 Punching the marked area by centre punch.
- 3 Hold the job on machine vice.
- 4 Mark the drill holes.
- 5 Chambering the drilled holes (Fig 1).

**Base the drill mark and punch portion on machine vice.**

- 6 Fix the first tap (taper tap) in the wrench.
  - Hold the job firm and horizontal in the vice. The top source should be slightly above the level of the vice jaw. This will help in using a try-square without any obstruction while holding the finished surface on the vice (Fig 2).

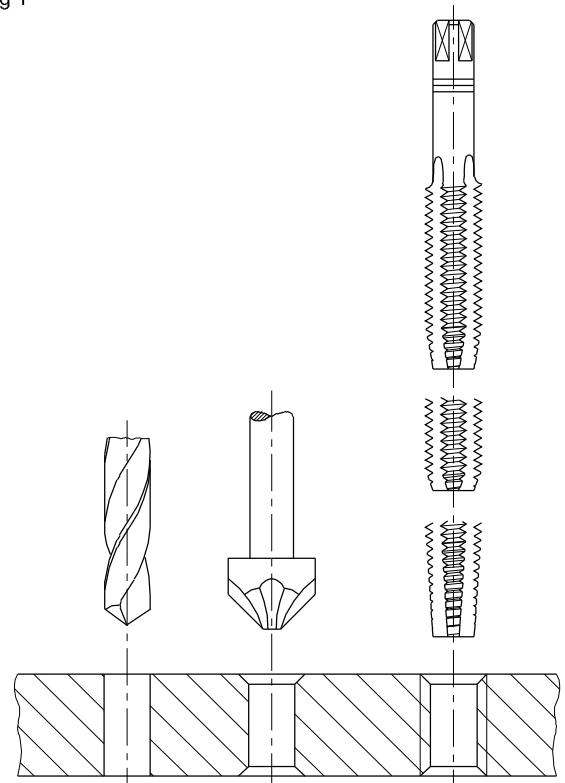
Fig 2



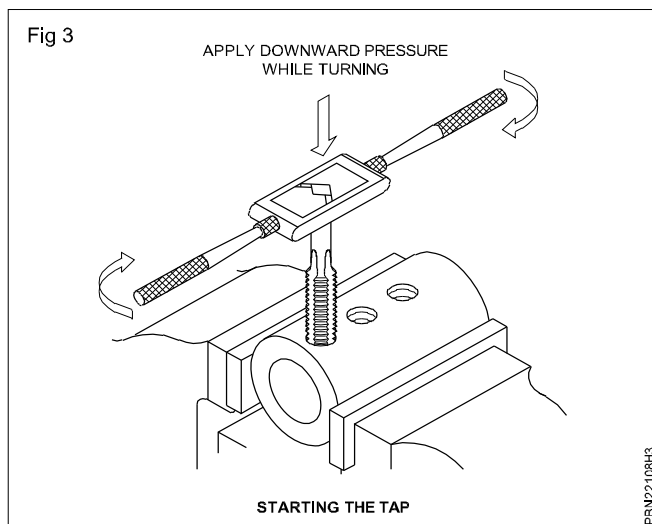
PBN22108H2

- Too small a wrench will need a greater force to turn the tap. Very large and heavy tap wrench will not give the force required to turn the tap slowly as it is cuts.
- 7 Exact steady downward pressure and turn tap wrench slowly in the clockwise direction to form the thread hold the tap wrench close to the centre (Fig 3).

Fig 1



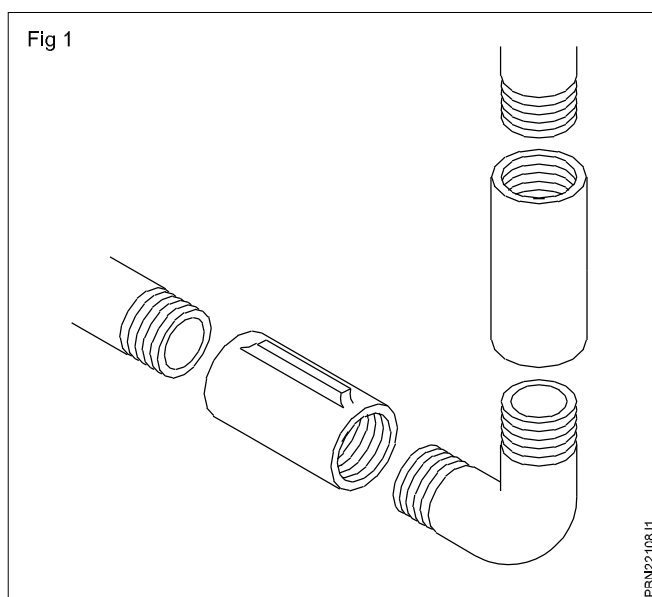
PBN22108H1



- Ensure of starting of the thread, remove tap wrench without disturbing the tap alignment.
  - Check and make sure the tap is vertically use a small square for help.
- 8 fix the second tap in the wrench. Exact steady downward pressure and turn tap wrench slowly in the clockwise direction to form the thread hold the tap wrench close to the centre.

## TASK 2: External thread (Fig 1)

- 1 Select a correct size and circular pipe and chamfer the ends.
- 2 Grip the pipe in the pipe vice using a jaw, projecting the pipe, side of the pipe vice jaws, 100 mm more than the required length of thread.
- 3 Fix the die in the diestock. The leading side of the die must be opposite to the stock of the die stock.
- 4 Open the die fully by tightening the centre screw of the die stock.



- 5 Place the leading side of the die on the chamfer of the job.
- 6 Start the die, square to the bolt centre line.
- 7 Turn in the clockwise direction to advance the die on the pipe with even pressure on both ends of the die stock.
- 8 Cut thread slowly the die for a short distance in order to break the chips.

### Use a cutting lubricant

**Clean the die frequently with a brush to prevent the chips from clogging and also from spoiling the thread.**

- 10 Reverse and remove the die after the full required length is reached.
- 11 Increase the depth of the cut gradually by loosening the centre screw and tightening the side screws.

**Too much depth of cut at one time will spoil the thread. It can also spoil the die.**

- 12 Check the fit of threads with a matching fittings.
- 13 Check the internal and external thread.



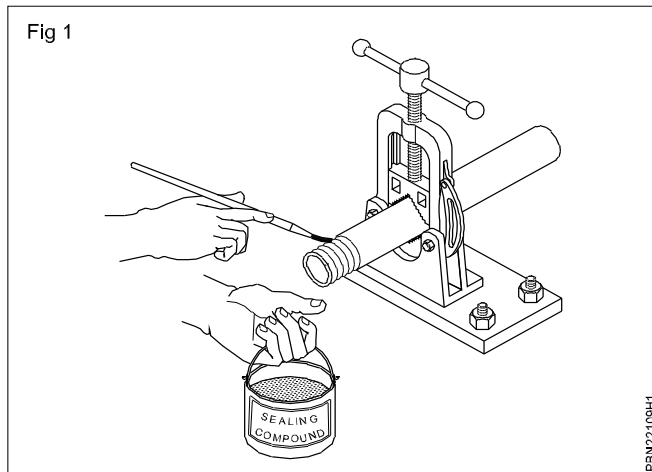
## P.V.C Pipe Joint (Screwed Joint)

- Objectives:** At the end of the exercise you shall be able to
- prepare material for PVC screwed joint as per drawing
  - cut the thread on PVC pipe
  - check the thread as PVC pipe and fittings
  - joint the PVC fittings and pipes.

Requirements			
<b>Tools/Instruments</b>		<b>Materials/Components</b>	
• Die stock	- as reqd.	• P.V.C Pipe	- as reqd.
• Hacksaw frame	- as reqd.	• Screwed socket	- as reqd.
• Steel rule	- as reqd.	• Thread Seal (Hamp/Thread ball/ Teflon tape)	- as reqd.
• Steel tape	- as reqd.	• Hacksaw blade	- as reqd.
• Pipe wrench	- as reqd.		
<b>Machines/Equipments</b>			
• Pipe vice	- as reqd.		

### PROCEDURE

- 1 Study the drawing.
- 2 Select the fittings & required materials.
- 3 Hold the pipe in a pipe vice (Fig 1).



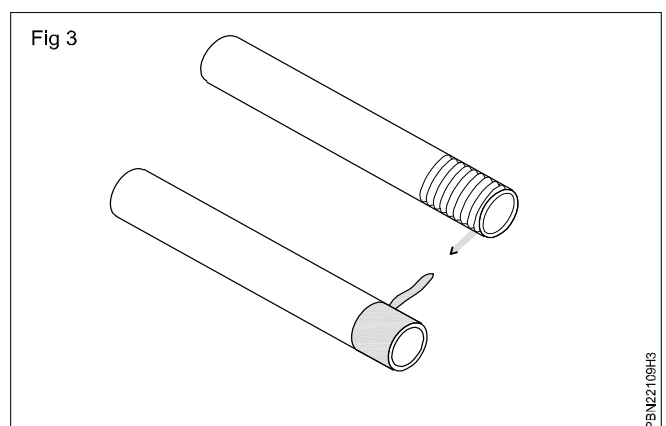
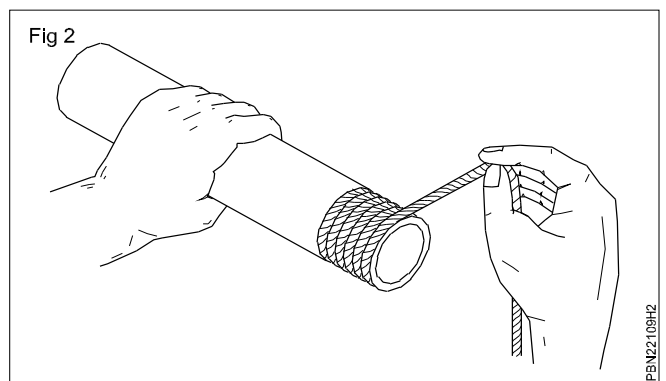
- 4 Marking the pipe as given length.
- 5 Cut the pipe as given length.
- 6 Chambering the PVC pipe use with rough file.
- 7 Cut the thread on PVC pipe by using of Die-stock.
- 8 Check the thread with standard fittings.
- 9 Apply thread seal if suitable material (Fig 2&3).
- 10 Assemble the PVC pipes and fittings.

### Safety

- Use thread seal properly
- Handle proper tools

- Don't over tight the fittings.
- Thread perpendicular to the pipe.

**Wind the hemp packing to external threads of all the pipes and standard fittings and apply sealing compound over the threads before joining with the other one (Fig 3).**



## P.V.C Pipe (adhesive Joint)

**Objectives:** At the end of the exercise you shall be able to

- hold PVC pipe with pipe vice
- cut the PVC pipe to given length
- the spigot and socket are cleaned and dry condition
- apply solvent to the chamfered end of the pipe
- push the pipe firmly into the socket.

Requirements			
Tools/Instruments		Materials/Components	
• Hacksaw	- 1 No.	• P.V.C Pipe	
• Steel rule	- 1 No.	• P.V.C fittings	- as reqd.
• Steel tape	- 1 No.	• Solvent cement	- as reqd.

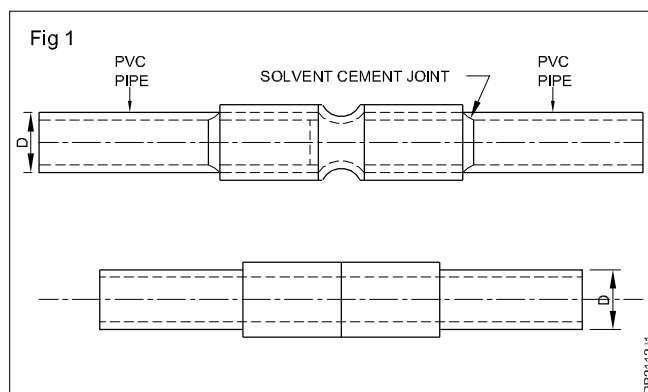
## PROCEDURE

- 1 Study the drawing.
- 2 Select the fittings & required materials.
- 3 Hold the pipe in a pipe vice.
- 4 Marking the pipe as given length.
- 5 Cut the pipe as given length.
- 6 Chamber the edge of the pipe to be inserted at an angle of about 15° to 1/3 rd the wall thickness using a coarse file.
- 7 Make sure that the spigot and socket are thoroughly cleaned and are completely dry.
- 8 Insert the pipe into the socket without seal ring and mark along the pipe, after it is fully inserted.
- 9 Apply solvent cement to the chamfered end of the pipe, right upto the marking made on spigot or to the socket end of the fitting.
- 10 Push the pipe firmly into the socket unit the gap between the mark on the spigot and socket is about 10mm to allow for thermal expansion, if any.
- 11 Check the joints.

**Solvent cement is flameable material so protect care is needed.**

### Safety

- Use proper tool.
- Turn only 45° after the apply solvent cement.
- Uniformly apply solvent cement.
- Doesn't sprit solvent cement on our eye and head.



## Join PVC pipe as per layout

**Objectives:** At the end of this exercise you shall be able to

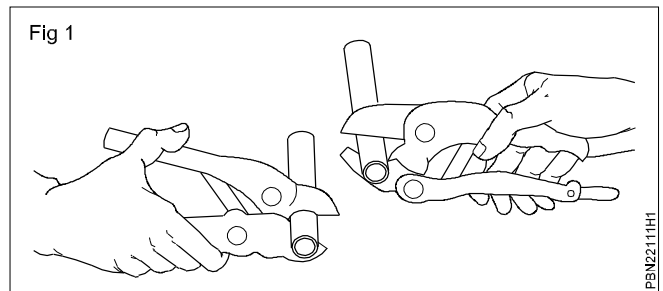
- lay composite pipes for internal work.

### PROCEDURE

#### Details of end preparation for jointing.

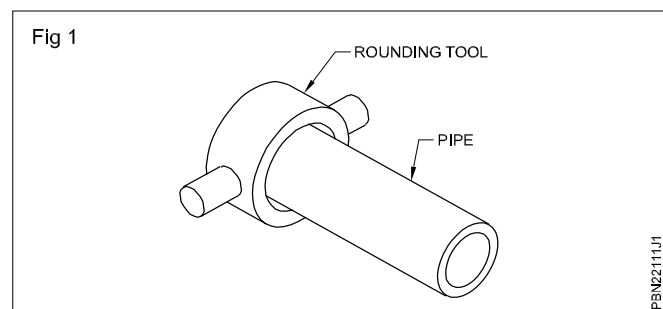
#### TASK 1: Cutting of pipe

- 1 For joining of composite pipes, the end preparation of pipe is very important. Use special tools only for perfect end preparation. the details are as follows.
- 2 Always use special pipe cutter to ensure burr free cutting. It is necessary that the cut be always at the right angle. Hold the pipe as shown in the (Fig 1) to ensure right angle cut.



#### TASK 2: Rounding of pipe

- 1 Insert the pipe for rounding the end (Fig 2).
- 2 Push the pipe over the rounding tool. Rounding of the pipe end is essential. By using rounding tool, the end of the pipe is properly rounded.
- 3 The dimensions of the end are properly formed so that perfect sealing takes place in case of external as well as internal sealing fittings.



#### TASK 3: Chamfering of pipe

- 1 It is always essential to chamfer the end of the pipe when pipe is used with brass as well as composite internal sealing fittings.
- 2 The chamfering of the pipe protects the “O” rings against any damage while pushing the pipe over the fitting.

**Note: Use external/internal bending spring while bending.**

#### TASK 4: Joining the pipe

- 1 Insert the pipe into the socket without seal ring and mark it.
- 2 Apply solvent cement to the chamfered end of pipe.
- 3 Push the pipe firmly into the socket.
- 4 Allow 10mm gap for thermal expansion.
- 5 Check the joints.

Demonstrate inspection chamber, manhole, gulley trap, septic tank soak pit

- Objectives: At the end of the exercise you shall be able to
- demonstrate inspection chamber, manhole and gulley trap
  - demonstrate septic tank and soak pit.

PROCEDURE

Instructor shall display and demonstrate to the students regarding inspection chamber, manhole, gulley trap, septic tank and soak pit.

- 1 Trainees will note down all the displayed different drainage fittings (Fig 1 to 6).
- 2 Record in the Table 1.
- 3 Get it checked by the instructor Table 1.

Fig 1

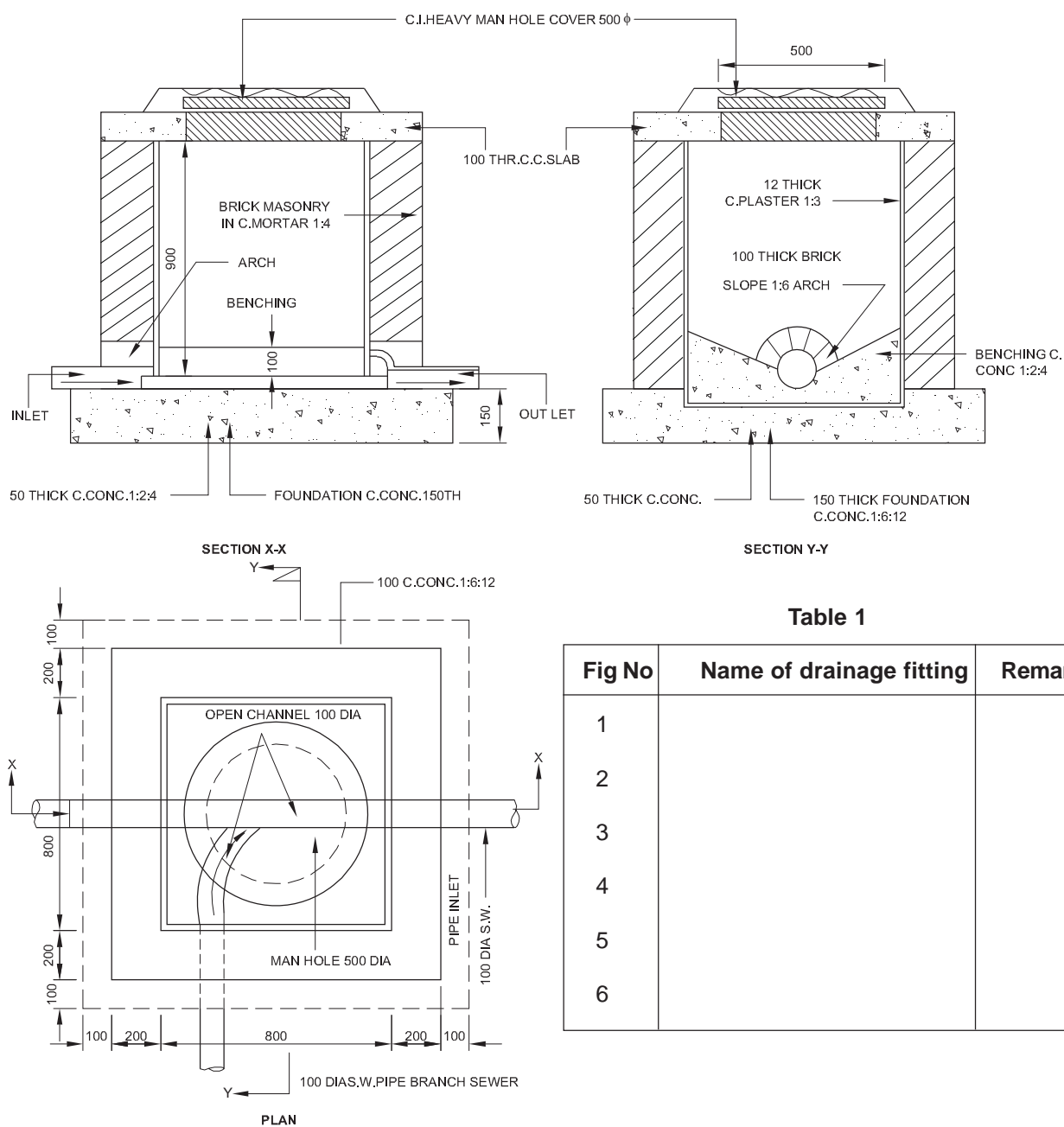
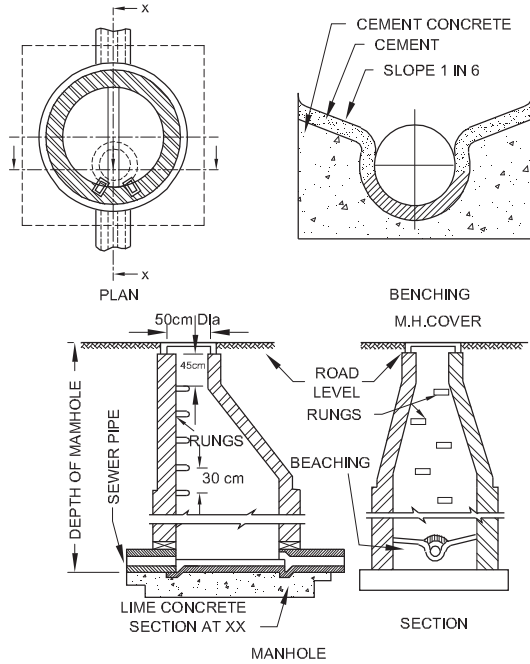


Table 1

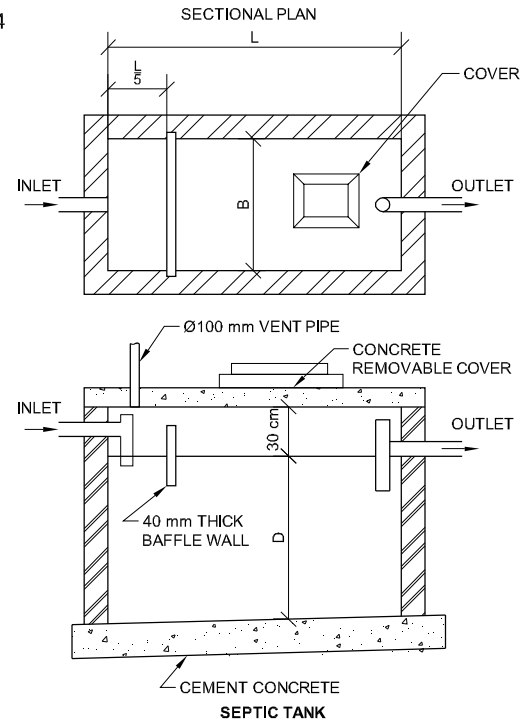
Fig No	Name of drainage fitting	Remarks
1		
2		
3		
4		
5		
6		

Fig 2



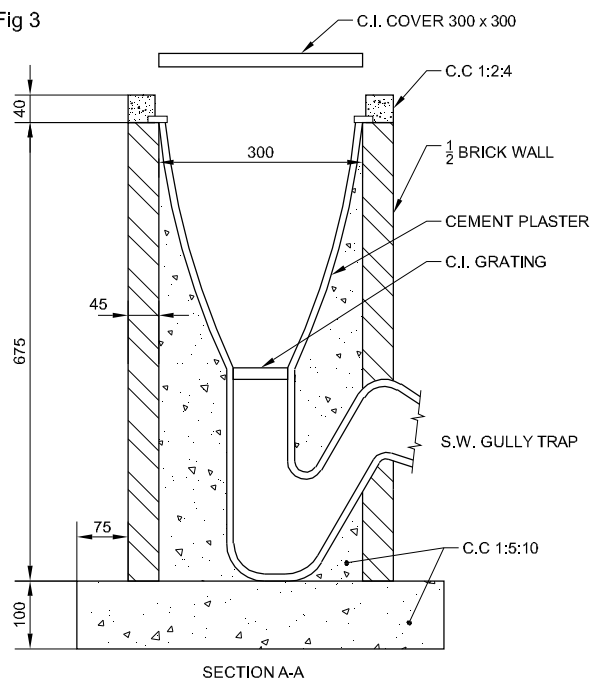
PBN23112H2

Fig 4

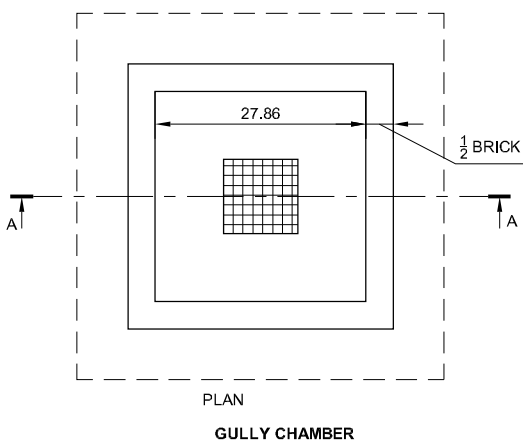


PBN23112H4

Fig 3



SECTION A-A

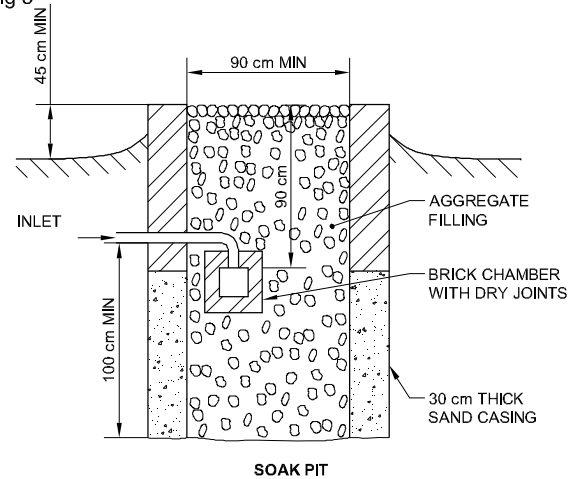


PLAN

GULLY CHAMBER

PBN23112H3

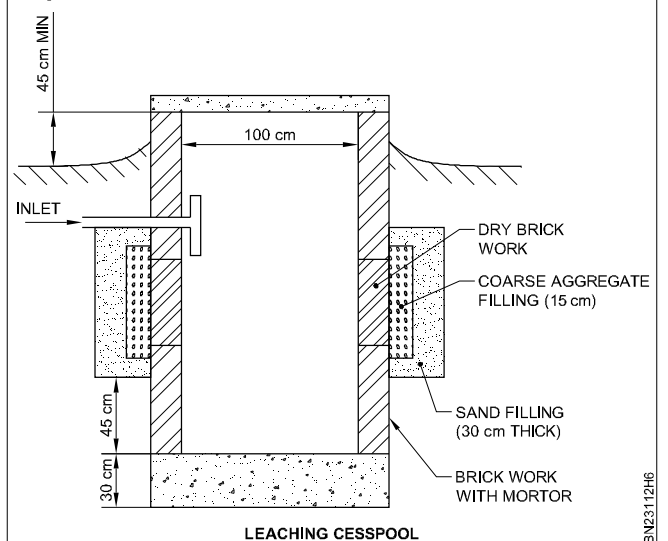
Fig 5



SOAK PIT

PBN23112H5

Fig 6



LEACHING CESSPOOL

PBN23112H6

## Construction of inspection chamber

**Objectives:** At the end of the exercise you shall be able to

- read the reading of the drawing according to the work spot
- excavate laying of cement concrete
- laying of wall laying of benching and channel
- plastering the wall.

### Requirements

#### Tools/Instruments

- |                               |            |
|-------------------------------|------------|
| • Measuring tape              | - 1 No.    |
| • Spade                       | - 1 No.    |
| • pick axe                    | - 1 No.    |
| • Mortar pan                  | - 1 No.    |
| • Trowel                      | - 1 No.    |
| • Sprit level                 | - 1 No.    |
| • Mason axe                   | - 1 No.    |
| • Plumb bob                   | - 1 No.    |
| • Thread with nails           | - 1 No.    |
| • Straight edge               | - 1 No.    |
| • Water level tube            | - 1 No.    |
| • Water tube level            | - 1 No.    |
| • Wooden smoother             | - 1 No.    |
| • Caulking tool               | - 1 No.    |
| • Wooden planner              | - 1 No.    |
| • Iron planner                | - 1 No.    |
| • Mixing tools                | - 1 No.    |
| • Steel square (75 cm X 50cm) | - 1 No.    |
| • Steel tape 3m               | - 1 No.    |
| • Line and pins               | - as reqd. |
| • Brick hammer 1½ lbs         | - 1 No.    |
| • Man hole $\phi$ 50cm        | - 1 No.    |
| • Ball of nylon thread        | - as reqd. |

- |            |        |
|------------|--------|
| • Crow bar | - 1 No |
|------------|--------|

#### Equipment/Materials/Components

- |                            |                      |
|----------------------------|----------------------|
| • Chalk powder             | - as reqd.           |
| • Cement                   | - as reqd.           |
| • Brick                    | - as reqd.           |
| • Brick gravels            | - as reqd.           |
| • Aggregate                | - as reqd.           |
| • River fine grain sand    | - as reqd.           |
| • C.I.Frame with cover     | - as reqd.           |
| • Gully trap               | - as reqd.           |
| • Grating                  | - as reqd.           |
| • Hemp yarn                | - as reqd.           |
| • Cement mortar            | - as reqd.           |
| • RCC Slab 1.2 x 1.2 x 0.1 | - 0.14m <sup>3</sup> |
| • Cement                   | - as reqd.           |
| • 8 mm bar                 | - 10 m               |
| • Water                    | - as reqd.           |
| • Wooden board 200x40mm    | - 2 to 4             |
| • Strut 100x100mm          | - as reqd.           |
| • Poling boards 200x40mm   | - as reqd.           |

## PROCEDURE

### TASK 1 : Reading of the drawing according to the work spot

- 1 Excavate for the inspection chamber as per drawing true to dimension and level.

**Read drawing carefully to prepare required size of materials.**

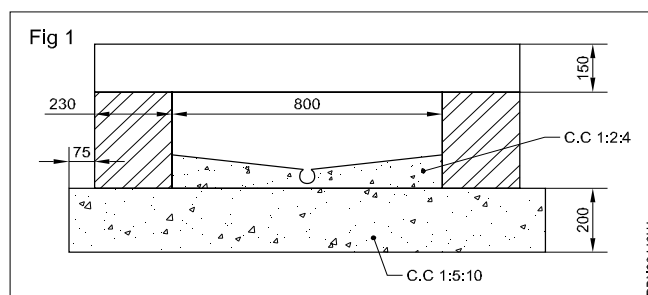
- 2 Lay the concrete as per drawing Fig 1 & 2.

**Prepare cement concrete for base of free chamber proper ratio.(1:5:10)**

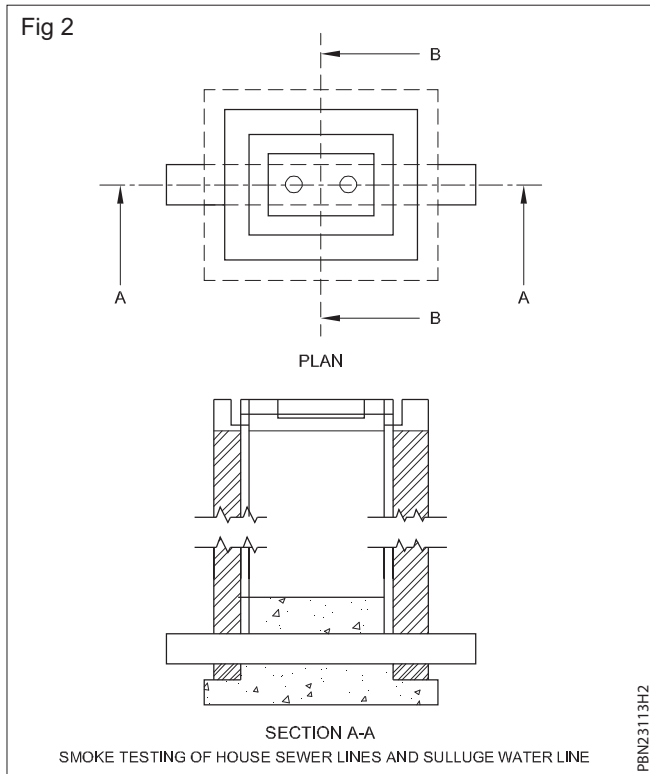
- 3 Construct brick work with first class 75 brick in cement mortar 1:4.

**Internal wall it must fine smoothness is need.**

- 4 Finish the internal wall smooth.



- 5 Make the joint of pipe and brick work for leak proof.
- 6 Block the pipe to prevent entry to foreign material.
- 7 Plaster the inside walls with 12mm thick cement plaster (Cement 1 : Coarse sand 3).
- 8 Provide channel and benching with cement concrete 1:2:4 aggregate 20 mm normal size.



- The inspection chamber and man hole construction of use the mortar accurate ratio.
- Dont use more quanty water in the mortar.
- The inspection chamber depth/height according to the thickness of wall.
- The inspection chamber and manhole construction of used in the deep in bricks of water.
- Dont make brick joint more width the 25 mm.
- Check the slope channel.
- Use the plum bob for vertical straightness
- The inspection chamber and manhole complete of the dry wall in the plaster.

9 Render smooth with neat coment (the depth of channel as benching is hall be as per drawing).

**The chamber must provide proper benching.**

- 10 Provide centering for top cover.
- 11 Fabricate and fix the reinforcement for cover.
- 12 Fix the cast Iron over frame.
- 13 Fix the top cover.
- 14 Cure the work.
- 15 Remove centering and render remove block.

#### Safety

- Dont use damaged tools
- The inspection chamber and construction for use the good bricks.

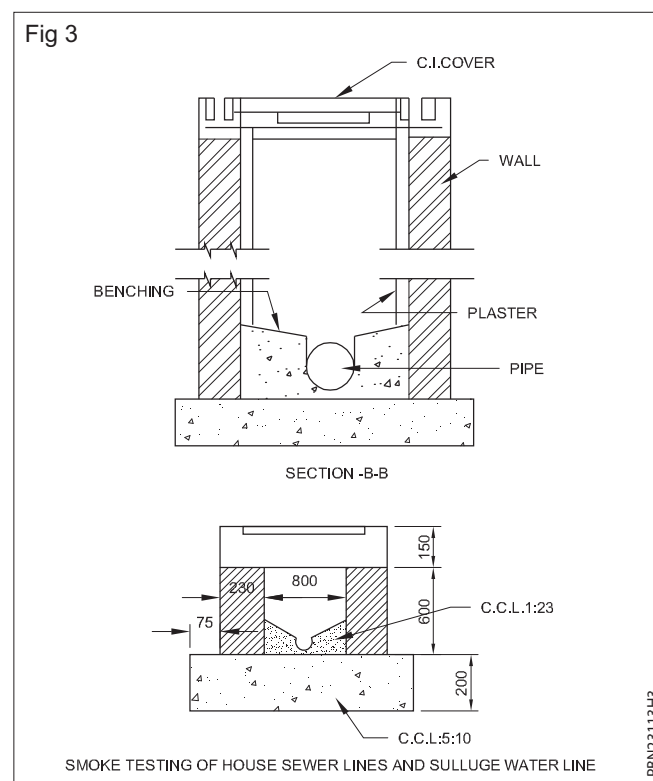
## Construction of gully trap

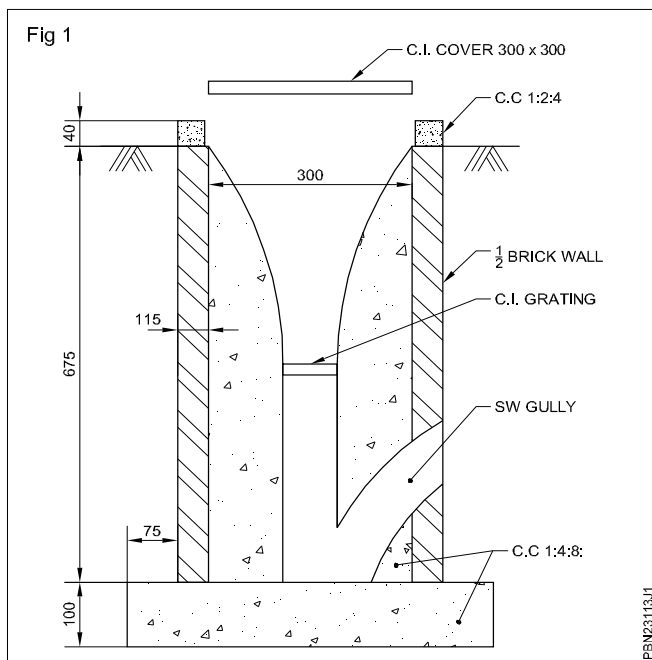
**Objectives:** At the end of the exercise you shall be able to

- drawing reading according to the marking in the area
- excavate and fix the gully trap
- laying of CC and wall
- plaster and neat cement
- CI cover fixing.

- 1 Excavate for gully trap as per (Fig 1) to dimensions and levels.
- 2 Lay the concrete as per drawing.
- 3 Check the quality of gully trap.

**Place the gully trap on the surface level fill the water inside the gully trap. Inspect water at water seal level. If not maintain water seal level don't use gully trap.**





- 4 Place gully trap in level.
- 5 Connect gully outlet to the branch drain (Refer S.W. Pipe joint).
- 6 Test the gully and branch drain.

**Check gully and branch grain for pass through outlet to entrap the silt from the gully trap periodically gully trap may cleaned.**

- 7 Construct 1.15 mm thick brick masonry chamber 300 x 300 mm inside a round gully trap from top of the bed concrete upto the ground level.
- 8 Fill the gap between the chambers walls and trap with cement concrete.
- 9 Plaster the upper portion of the chamber. i.e above the top level of the trap with cement mortar 1:3.
- 10 Finish the plaster area with a floating coat of neat cement. Round off the corners and bottom of the chamber so as to slope towards the grating.
- 11 Fix C.I. grading 300 x 300 on top of the brick masonry with cement concrete 1:2:4.
- 12 Render the concrete smooth finished top level of cover shall be about 4cm below the adjacent ground level).

### Safety

- Check the required materials.
- Dont use the damaged tools.
- The gully trap chamber construction, non baking bricks.
- The gully trap chamber construction of the good quality of bricks. (Class - I)
- Quired brick only use for construction.

## Construction of manhole

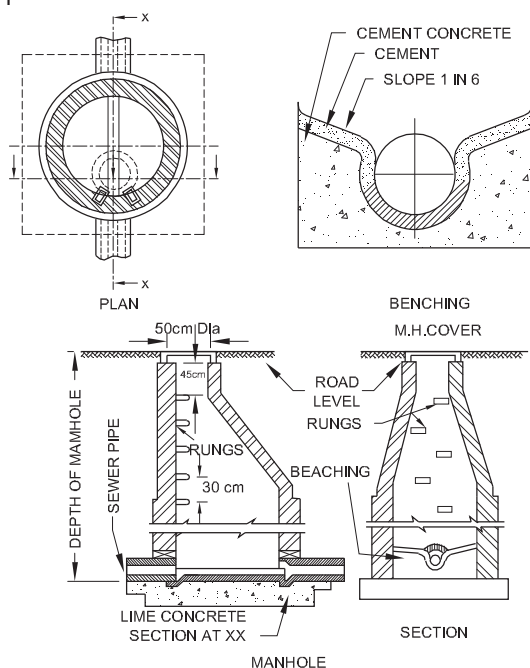
**Objectives:** At the end of the exercise you shall be able to

- read drawing according to work spot
- excavate laying of cement concrete
- laying of wall, laying of benching and concrete
- fix of foot rest
- plastering of wall.

- 1 Excavate for the inspection chamber as per drawing true to dimension and level. Read drawing carefully to prepare required size of materials.
- 2 Lay the concrete as per drawing (Fig 1). Prepare cement concrete for base of free chamber proper ratio. (1:5:10)
- 3 Construct brick work with first class 75 brick in cement mortar 1:4. Internal wall it must fine smoothness is need.
- 4 Finish the external joints smooth.
- 5 Make the joint of pipe and brick work for leak proof.
- 6 Block the pipe to prevent entry to foregin material.
- 7 Plaster the inside walls with 12mm thick cement plaster (Cement 1:Coarse sand 3).
- 8 Provide channel and benching with cement concrete 1:2:4 (1 cement : 2 course sand : 4 stone)aggregate 20 mm normal size.
- 9 Render smooth with neat cement (the depth of channel as benching is hall be as per drawing). In the chamber must be provide proper benching.
- 10 Embed the M.S.foot rests in cement concrete block of 20 x 20 x 10cm of cement concrete 1:3:6.
- 11 Fix the foot rest 40cm appart projecting 10cm beyond the surface of wall. (only for deep chamber)
- 12 Paint the foot rest with coal tar.
- 13 Provide centering for top cover.
- 14 Fabricate and fix the reinforcement for cover.
- 15 Fix the cast Iron over frame.
- 16 Concrete the top cover.
- 17 Cure the work.
- 18 Remove centering and render remove block.



Fig 1



19 Fix man hole cover.

20 Seal the man hole cover with grease.

### Safety

- Don't use damaged tools
- The inspection chamber and construction for use the good bricks.
- The inspection chamber and manhole construction of use the mortar accurate ratio.
- Don't use more quantity water in the mortar.
- The inspection chamber depth/ height according to the thickness of wall.
- The inspection chamber and manhole construction of used in the deep in bricks of water.
- Don't make brick joint more width the 25 mm.
- Check the slope channel.
- Use the plumbbob for vertical straightness
- The inspection chamber and manhole complete of the with dry wall in the plaster.

## Laying out foundation concrete and construction of man hole

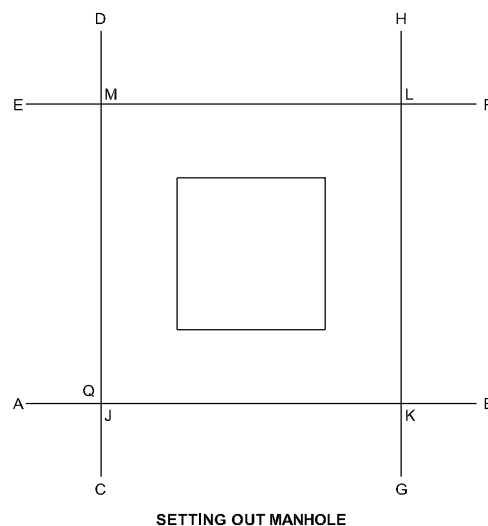
**Objectives:** At the end of this exercise you shall be able to

- set out the man hole
- lay brick courses with bonding.

### TASK 1: Set out the man hole

- 1 Draw AB straight line and mark point Q on the line AB
- 2 From the point Q Draw a line CD as shown in Fig 1.
- 3 Mark 4 bricks length on the line CD and draw line EF perpendicular to the line CD and parallel to AB
- 4 Draw perpendicular line GH and parallel to the CD
- 5 Join "jklm" i s the required man hole square
- 6 Excavate the square man hole as shown in Fig 1 at a depth of 1 metre.
- 7 Place the base concrete 1:5:10 for the thickness of 15cm and rammed well.
- 8 Level top surface of the concrete bed with the aid of straight edge.

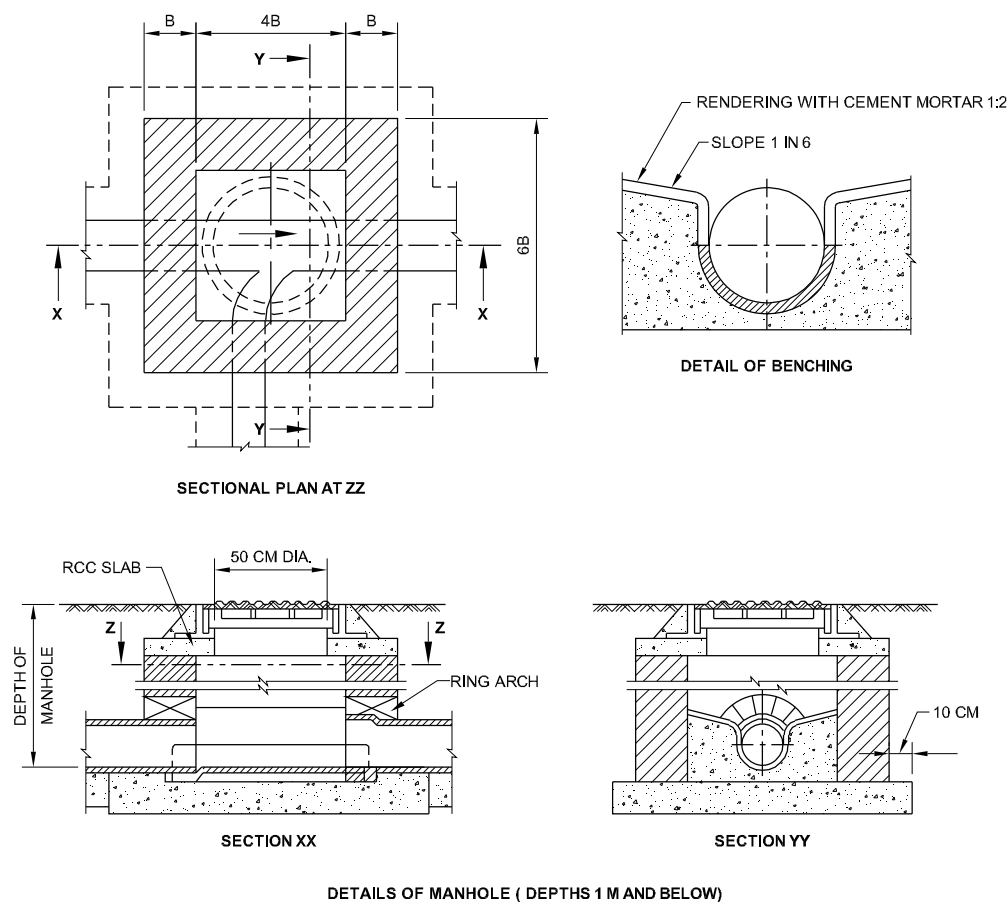
Fig 1



### TASK 2: Lay brick courses with bonding

- 1 Lay dry bricks to suit the benching and dimensions square man hole.
  - 2 Place pipes in the centre of man hole as shown in Fig 1.
  - 3 Flush the pipe inside the face of the man hole.
  - 4 Continue brick work with cement mortar until required as shown in (Fig 1)
  - 5 Fill up all the joints inside as well as outside wall.
- Take care no load shall be provided on the pipes placed in the manhole.**

Fig 1

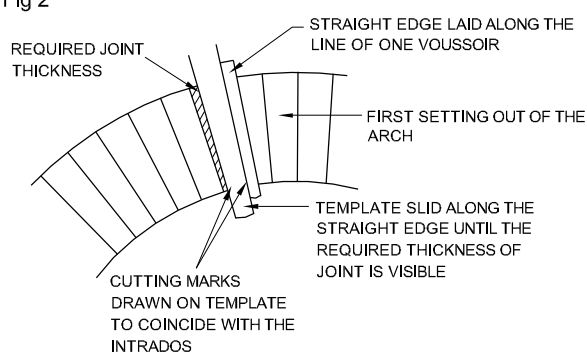


PSN23113W1

**All brick work in manhole chambers and shafts shall be carefully laid with bricks in English bond**

- 6 Cut the bricks according to the template (Fig 2)
- 7 Check all the voussoirs joints.

Fig 2



PSN23113W2

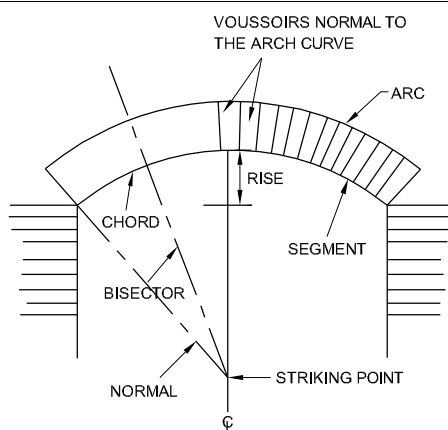
**The method of construction procedure are similar to the semi circular arch**

**The skewback should be constructed in bricks by forming an angle of  $60^\circ$  as shown in (Fig 3)**

- 8 Lay the jointing faces of each brick being well buttered with cement mortar.

**The walls of manholes shall be plastered both inside and outside with cement mortar 1:3**

Fig 3



PSN23113W3

# Method of providing foot rest and forming of drain and benching

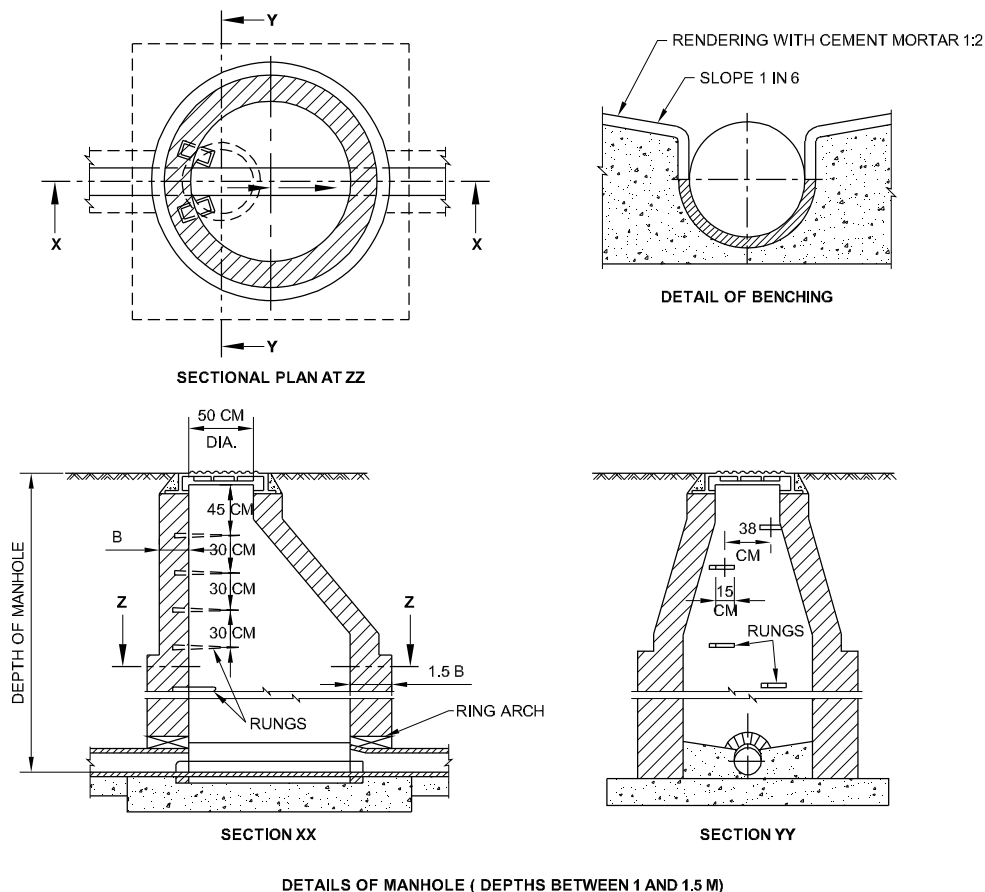
**Objectives:** At the end of the exercise you shall be able to

- read drawing according to work spot
- excavate laying of cement concrete
- laying of wall, laying of benching and concrete
- fix of foot rest
- plastering of wall.

## TASK 1: Providing foot rest and benching in drain

- 1 Excavate for the inspection chamber as per drawing true to dimension and level. Read drawing carefully to prepare required size of materials.
- 2 Lay the concrete as per drawing (Fig 1). Prepare cement concrete for base of free chamber proper ratio. (1:5:10)
- 3 Construct brick work with first class 30cm brick in cement mortar 1:4. Internal wall it must need fine smoothness.
- 4 Finish the external joints smooth.
- 5 Make the leak proof joint of pipe and brick work.
- 6 Block the pipe to prevent entry to foreing material.
- 7 Plaster the inside walls with 12mm thick cement plaster (Cement 1:Coarse sand 3).
- 8 Provide channel and benching with cement concrete 1:2:4 (1 cement : 2 course sand : 4 stone aggregate 20 mm normal size).
- 9 Render smooth with neat cement (the depth of channel as benching is shall be as per drawing). In the chamber must be provided proper benching.
- 10 Embed the M.S foot rests in cement concrete block of 20 x 20 x 10cm of cement concrete 1:3:6.
- 11 Fix the foot rest 40cm apart projecting 10cm beyond the surface of wall. (only for deep chamber)
- 12 Paint the foot rest with coal tar.
- 13 Provide centering for top cover.
- 14 Fabricate and fix the reinforcement for cover.
- 15 Fix the cast Iron cover frame.
- 16 Concrete the top cover.
- 17 Cure the work.
- 18 Remove centering and render remove block.
- 19 Fix man hole cover.
- 20 Seal the man hole cover with grease.

Fig 1



## Safety

- Don't use damaged tools
- The inspection chamber and construction use the good bricks.
- The inspection chamber and manhole construction use the mortar accurate ratio.
- Don't use more quantity water in the mortar.

- The inspection chamber depth/height according to the thickness of wall.
- Check the slope channel.
- Use the plumb-bob for vertical straightness
- The inspection chamber and manhole complete the dry wall with the plaster.

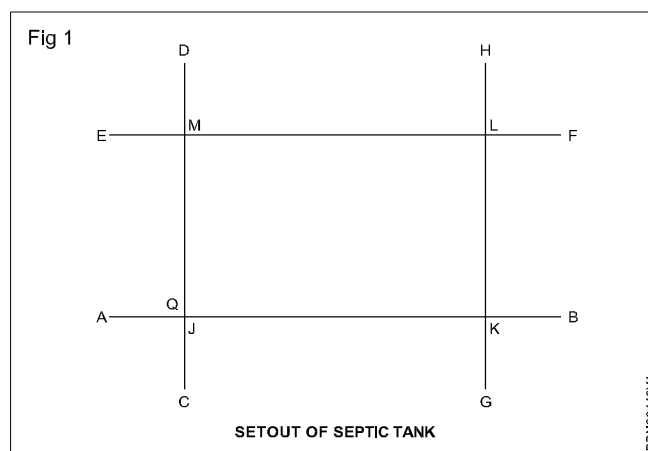
## Construction of septic tank

**Objectives:** At the end of this exercise you shall be able to

- set out the septic tank
- lay the cement concrete
- lay brick courses with bonding.

### TASK 1: Set out the septic tank

- 1 Mark AB straight line and mark point Q on the line AB. From the point Q set a line CD as shown in Fig 1.
- 2 Mark Qm equal to 2.10m.
- 3 Mark JK equal to 5.10m.
- 4 Mark perpendicular line GH and parallel to CD.
- 5 Join JKLM is the required septic tank.
- 6 Excavate the rectangular septic tank as shown in Fig 1 at a depth of 2.75m.



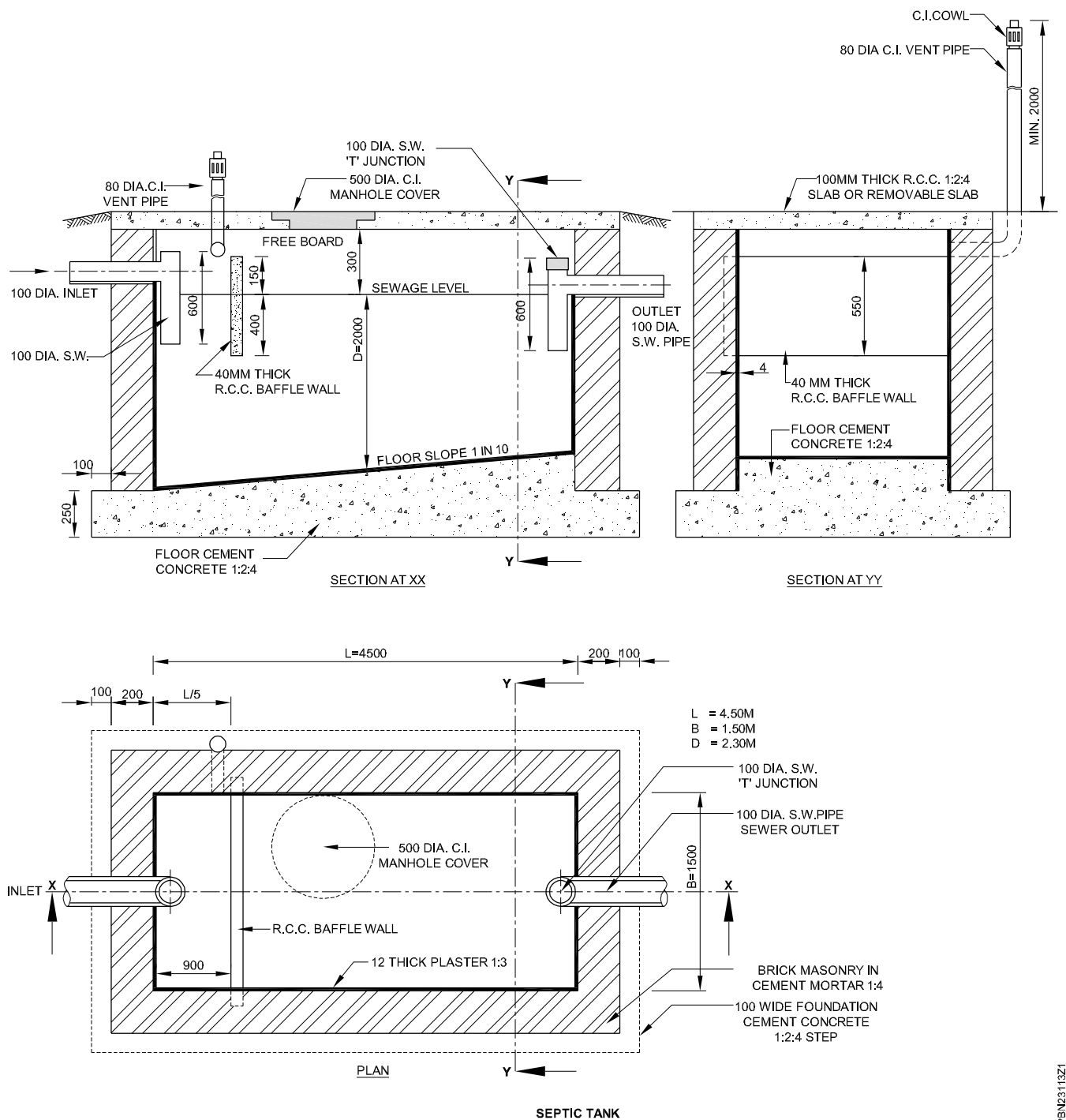
### TASK 2: Lay the cement concrete

- 1 Place the base concrete 1:2:4 for the thickness of 25cm and rammed well (Fig 2).
- 2 Level top surface of the concrete bed with slope of 1 in 10.

### TASK 3: Lay the brick courses with bonding

- 1 Lay the bricks around wall in english bond in one brick thick with cement mortar 1:4
- 2 Lay 40mm thick R.C.C Baffle wall, 90cm from inlet end.
- 3 Keep the inlet stone ware pipe 100mm  $\varnothing$ , above water level
- 4 Keep the outlet pipe 100mm  $\varnothing$  bottom level of sewage level.
- 5 Fill 210 all the joints inside of septic tank.
- 6 Fix 80mm  $\varnothing$  C.I. vent pipe.
- 7 Keep the vent pipe 200cm above the ground level.
- 8 Fix the C.I cowl at the top of vent pipe.
- 9 Lay 10 cm thick R.C.C 1:2:4 slab or removable slab over the septic tank.

Fig 1



PBN23113Z1

## Laying of drainage pipes

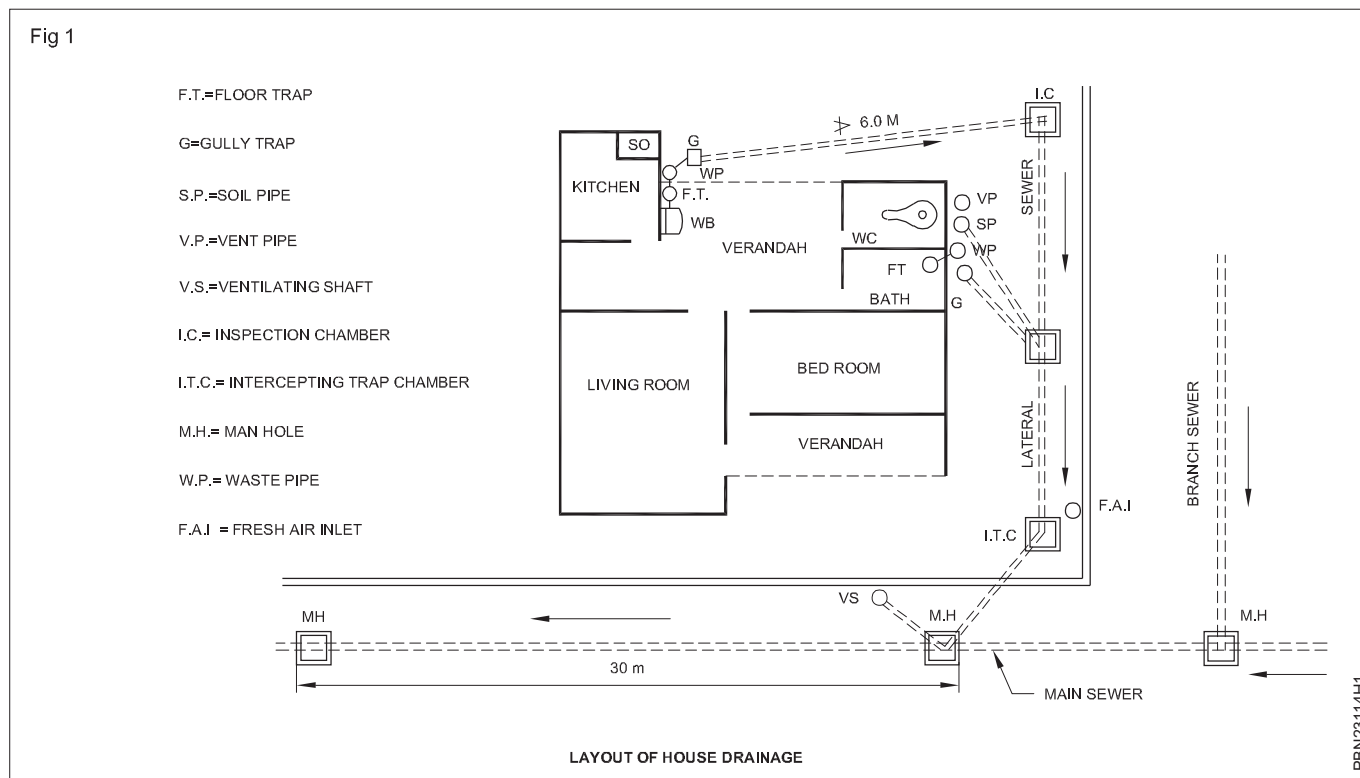
**Objectives:** At the end of the exercise you shall be able to

- prepare material for laying of drainage pipes
- specify the layed area
- dig the trench and line the trench
- install the pipe and connect drainage lines
- refilling the trench.

### TASK 1: Demonstrate layout of drainage pipe line

Refer the Exercise : 2.1.94 for the Layout of drainage pipes

### TASK 2: Demonstrate layout of house drainage



**Testing of drainage lines test (Smoke, Water, Odor, Ball, Mirror)**

**Objective:** At the end of the exercise you shall be able to  
• **layout the smoke test, water test, ball test and mirror test.**

Requirements			
<b>Tools/Instruments</b>			
• Funnel	- 1 No.	• Fitting	- as reqd.
• Drain plug	- 1 No.	• Mirror	- as reqd.
• Pipe wrench	- 1 No.	• Smoke filling machine	- as reqd.
• Spanner set	- 1 No.	• Drain plug	- as reqd.
<b>Materials/Components</b>		• Newly committed pipelines	- as reqd.
		• Tar paper	- as reqd.
• Brass ball	- 1 No.	• Oil checked cotton waste	- as reqd.
• C.I.pipe	- as reqd.	• Oil of paper mint	- as reqd.

**PROCEDURE**

**1 Smoke test**

- Plug one ends of pipe other end for testing smoke.
- After entering the smoke rocket in pipe the touch paper it lift producing dense clouds of smoke which travel through out.
- This pipe work or smoke generator can be used to force the smoke under pressure to pipe.
- Check the installation for ring of smoke leaking from the joints plugged.
- Check for leakage.

**2 Water test or hydrostatic test**

- The equipment required to can duct this test is drain plug air bag slopper extrusion tubes funnel and sight gauge.
- Fined out from below the minimum heat of water required and duration of test which must be applied the pipe work.
- Vertical pipe are temporarily installed on the top and to provide pressure or heat on horizontal pipe run.
- A funnel is fitted to the pipe to all to fitting of the pipe and to record level of water.
- Coloured water test is similier this except that soluable dye such as fluorescence is mixed with water to easily locate the leak.
- Check for leakage.

**3 Ball test**

- Use a mirror test such as bend in the pipe.
- A bass ball 13mm smaller than the inside of pipe is inserted.

- The top end should roll freely along the bottom or invert of the pipe.
- If there is on obstruction.
- Pipe is out of alignment the ball will stop.
- The point where it slope is marked on a rod so that the exact position can be measured of along the pipe.
- The problem can be reamed by there.
- Realinging the pipe to the correct fall.
- Removing the obstruction.

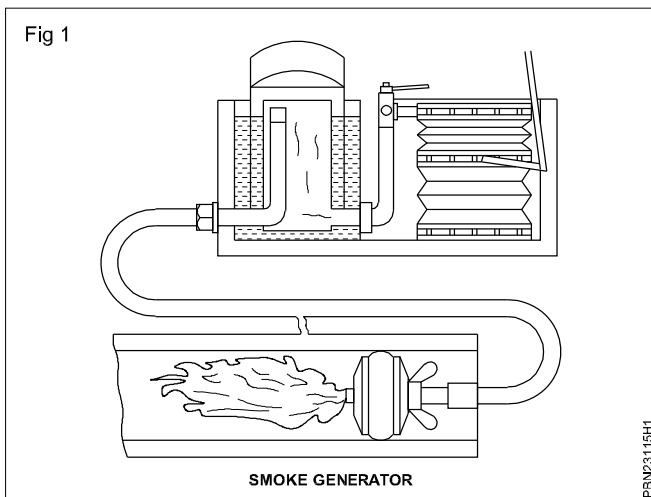
**4 Mirror test**

- Check the alignment and condition of the in side the pipes.
- Two mirror are used for the test.
- They are placed in position through across point and by looking at one of the mirror.
- The condition of the bore of the pipe can be seen as the light is reflicated along the pipe.

**5 Joining cast iron**

- Clean the socket in side (spigot end) to be jointed.
- Place the spigot and inside the socket.
- Yarn the joint tightly to a depth of 1/3 the socket length.
- Compact the yarning material slightly right around the joint with right yarning.
- Quired brick only use for construction.
- Burn off any loose strand of material sticking up from the joint.

- Apply powered resin or a small amount of grease to the joint. (In case of vertical joints melted can be poured now)
- Place flexible asbestos cord/rope approximately 25mm. Ø around the pipe.
- Push the cord firmly up in the socket.
- Wrap stiff clay around the shape the mould by wed thumb.



- Remove the clay mould cut away lump of lead that formed in the pouring hole.
- Chisel away the lead plug.
- Hammer the caulking around the joint caulking tool and hammer, check the joint has been correctly caulked all round.

### Safety

- Uses the wooden block carefully.
- The complete open joint of plug.
- Use the funnel.
- Don't loose the drain plug.
- The uses of in the pipe fixed ball.
- Don't loose ball.
- Check the materials before using.
- Don't cut the pipe with out fitting inside sand because can be broken.

### After II

- The join check the leakage.

## Testing of drainage lines by smoke test

**Objective:** At the end of the exercise you shall be able to

- to install the drain plug on new piping line (sewer line and sulluge line).

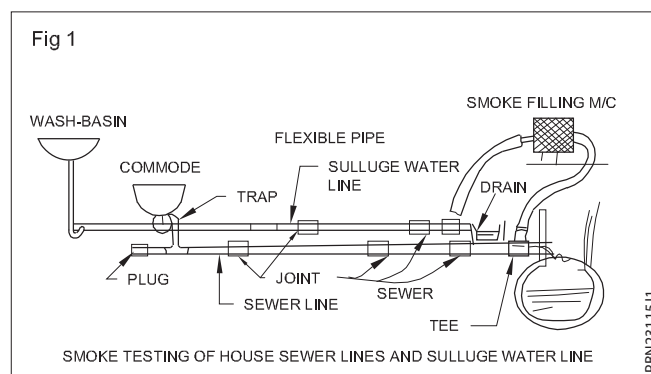
### TASK 1: Smoke test of the house sewer lines (Fig 1)

- 1 Plug in pipe line sewer line and sulluge water line.
- 2 Prepare smoke test m/c.
- 3 Inlet probe connect the pipe line.
- 4 Outlet probe connect the pipe line.
- 5 To feed the smoke material in the combustion chamber.
- 6 Switch on the machine.
- 7 Open the valve to allow the smoke in inside the pipe line.

**Inlet probe may connect at lower end of the drainage system.**

- 8 Allow the smoke in the pipe line system in 15 to 20 mins.
- 9 Defect any leak available or not in the pipe line.

**If smoke are leak at pipe line rectify the particular spot in the pipe line.**



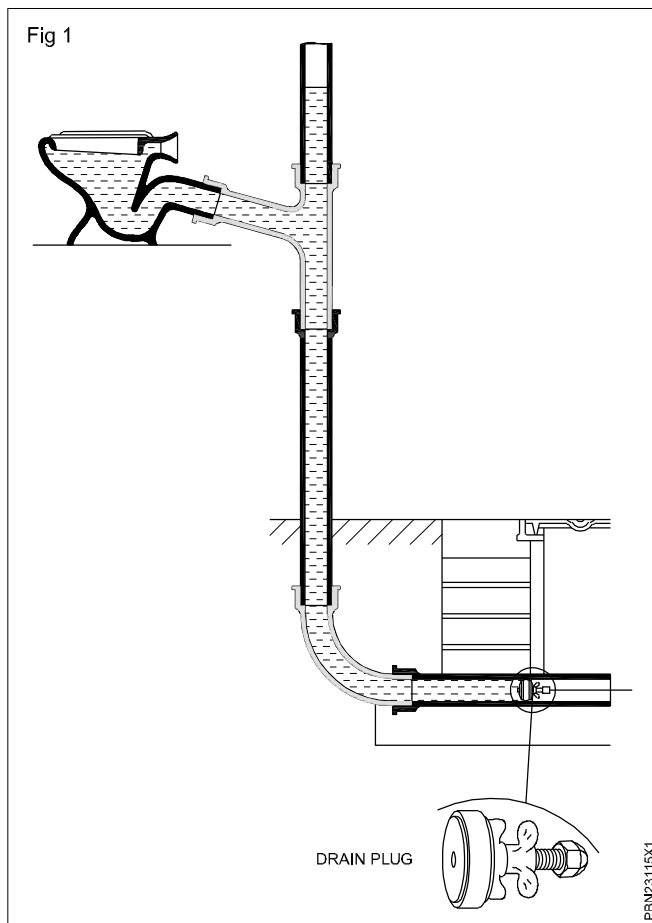
- 10 Dismantling the smoke testing m/c from the pipe line.

**Before dismantling close the valve. Removal the inlet and outlet probe querying the combustion chamber.**

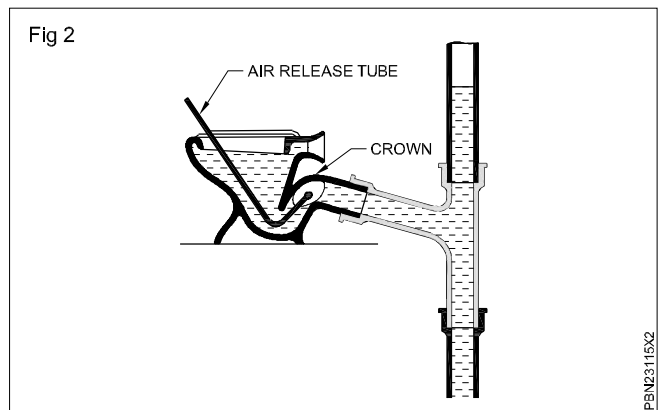


## TASK 2 : Water test

- 1 Plug the soil pipe outlet (Fig 1) with an expanding drain plug.
- 2 Fill the stack with water through an appliance.



- 3 Continue filling unit to appliance is on the point of overflowing.
- 4 Check the level of water in appliance.
- 5 Remove the trapped air by inserting a rubber tube through water seal of the trap until it reaches crown. (Fig 2)
- 6 Closely observe the water level.
- 7 Locate the leakage and repair if any.
- 8 After repair, repeat the test.



**Precaution: Water test should not exceed height of 6m or less than 1.5m. In case test is carried out in pipe in water logged area a small quantity of dye such as fluorescent to the test water and check along pipe for green colour stain.**

## TASK 3 : Odor test

- 1 Close the outlet end all vent pipes.

**Except top most one vent pipes must be open.**

- 2 Pour 50 gms to 60 gms of paper mint oil at top most opened vent pipe.

**6m length of pipe line must be used.**

- 1 50gms to 60gms → Paper mint (or) Odor ferrous substance → used
- 2 5 litres of boiled water.

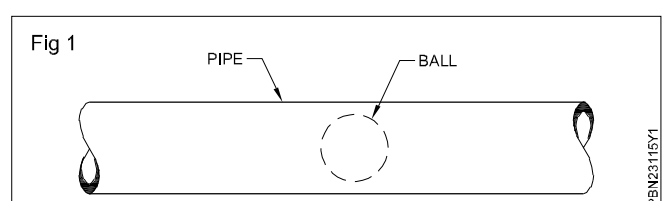
- 3 Pour 5 litres of boiling water in the top most opened vent pipe.
- 4 Close the top vent pipe.
- 5 Find the leakage by smelling.

**If pour the cold water smell not developed we must use boiled water only.**

- 6 Any odor comes out made a repair, if required area.
- 7 Remove all the cap's.

## TASK 4 : Testing of drainage lines by ball test (Fig 1)

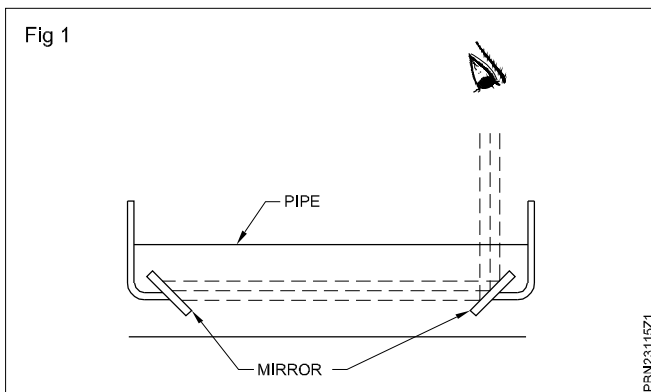
- 1 Use a mirror test such as bend in the pipe.
- 2 A bass ball 13mm smaller than the inside of pipe is inserted.
- 3 The top end should roll freely along the bottom or invert of the pipe.



- 4 If there is an obstruction.
- 5 Pipe is out alignment the ball will slope.
- 6 The point where it slop is marked on a rod so that the exact position can be measured of along the pipe.
- 7 The problem can be reamed by there.
- 8 Realigning the pipe to the correct fall.
- 9 Removing the obstruction.
- 10 If  $\varnothing 100\text{mm}$ , 12mm -> 300 mm slope is required.

#### TASK 5 : Testing of drainage lines by mirror test (Fig 1)

- 1 Check the alignment and condition of the in side of the pipes.
- 2 Two mirror are used for the test.
- 3 They are placed in position through across point and by looking at one of the mirror.
- 4 The condition of the bore of the pipe can be seen as the light is reflcted along the pipe.



#### Joining cast iron

- 1 Clean the socket in side (spigot end) to be jointed.
- 2 Place the spigot and inside the socket.
- 3 Yarn the joint tightly to a depth of 1/3 the socket length.
- 4 Compect the yarning material solidly right around the joint with right yarning.
- 5 Quiired brick only use for construction.
- 5 Burn off any loose strand of material sticking up from the joint.

- 6 Apply powered risin or a small amount of grease to the joint. (In care of vertical joints meltened can be poured now)
- 7 Place flexible asbestos cord/rope approximately 25mm.  $\varnothing$  around the pipe.
- 8 Push the cord firmly up in the socket.
- 9 Wrap stiff clay around the shape the mould by with thumb.
- 10 Remove the clay mould cut away lump of lead that formed in the pooring hole.
- 11 Chisel away the lead plug.
- 12 Hammer the caulking around the joint caulking tool and hammer, check the joint has been correctly caulked all round.

#### Safety

- Uses the wooden block carefully.
- The complete open joint of plug.
- Use the funnel.
- Don't loose the drain plug.
- The uses of in the pipe fixed ball.
- Don't loose ball.
- Check the materials before using.
- Don't cut the pipe with out fitting inside sand because can be broken.

#### After II

- The join check the leakage.

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**Plumbing**  
**Plumber - Drainage Systems**

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**Exercise 2.3.116**

**Join heavy cast iron socket pipe**

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Refer the Exercise : 2.1.97

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**Plumbing**  
**Plumber - Drainage Systems**

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**Exercise 2.3.117**

**Sealing of heavy cast iron pipe joint with lead and caulking tools**

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Refer the Exercise : 2.1.97

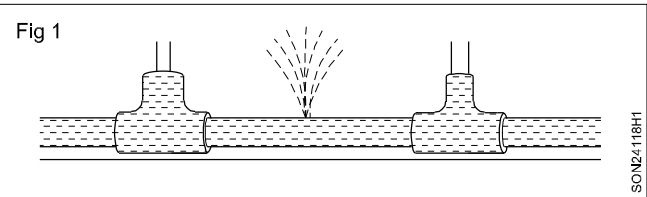
Identify location of leakage pipe

- Objectives:** At the end of the exercise you shall be able to
- select the location of floor water pump
  - check the water tap
  - check the gate valve.

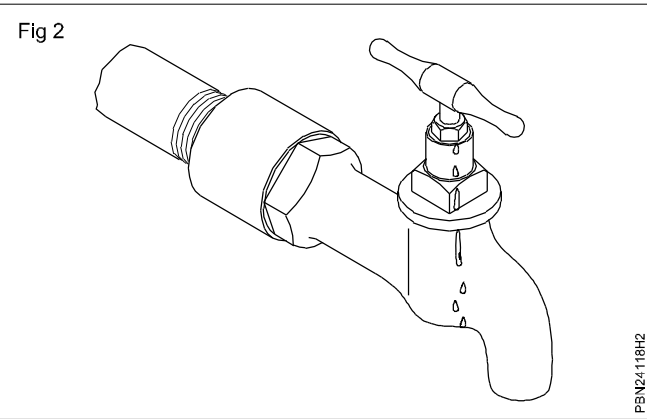
Requirements			
Tools/Instruments		Equipment/Materials/Components	
• Spade	- as reqd.	• Sounding rod	- as reqd.
• Pick axe	- as reqd.	• Chalk powder	- as reqd.
• Crow bar	- as reqd.	• Water tap assemble	- as reqd.
		• Gate - valve assemble	- as reqd.

PROCEDURE

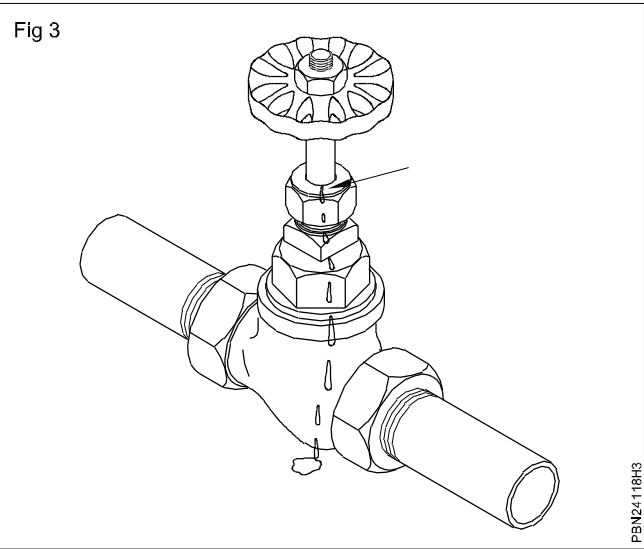
- 1 Clear distribution line.
- 2 Hearing the sound in pipe line.
- 3 Listen the sound of bursting water.
- 4 Identify the leak in water pump locate on the floor (Fig 1).



- 5 Close the inlet valve.
- 6 Identify the leak in water tap (Fig 2).



- 7 Close the stop cock by turning the handle clockwise.
- 8 Identify the leak in gate valve (Fig 3).
- 9 Close the gate valve by turning the hand wheel clockwise.



Safety

- Don't make damage to the pipe line while cleaning.
- Only merely lowest the pipe with sounding rod.

## Removing out leakages pipe

**Objectives:** At the end of the exercise you shall be able to

- detect leakage in water supply system
- decide the joint in water supply pipe lines
- repair the joints in water supply system.

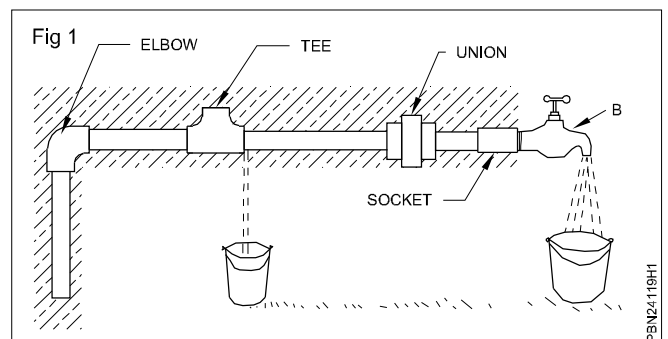
Requirements			
Tools/Instruments		Equipment/Materials/Components	
• Hacksaw	- as reqd.	• Wooden cone	- as reqd.
• Chisel and hammer	- as reqd.	• Pipe	- as reqd.
• Spade	- as reqd.	• Pipe and pipe fittings	- as reqd.
• Pick axe	- as reqd.	• Thread seal materials	- as reqd.
• Spanner set	- as reqd.		

## PROCEDURE

- 1 Clear the pipe by removing the soil on the pipe line.
- 2 Detect the reason of leak.
- 3 If any loose joint, tight it perfectly.
- 4 Close the main line.
- 5 If it is a break of pipe clear from soil to the both sides of the pipes up to 2m length.
- 6 Cut of the broken piece.
- 7 Measure the length of the cut piece.
- 8 Cut a piece of pipe less than 2cm of the cut piece.
- 9 Arrange and fix on both ends and connect them to the pipe line.
- 10 Check if any further leakage.
- 11 Finish the job.

## Safety

- Clear the pipe slowly without making more damage.
- Close the pipe line before cutting.
- Cut straightly.
- Put the rings correctly.
- Tight slowly the nuts.



Removal of air locks

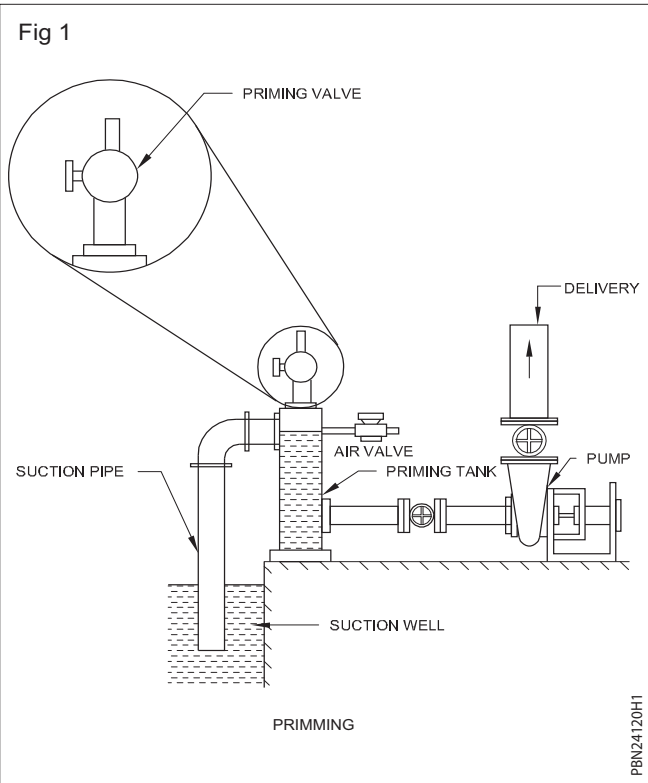
- Objectives:** At the end of the exercise you shall be able to
- removal of air locks in a pump
  - removal of air locks in a main line
  - removal of air locks in a domestic water line.

Requirements	
<b>Tools/Instruments</b> <ul style="list-style-type: none"><li>• Hand drill</li><li>• Chisel</li><li>• Hammer</li><li>• Spanner set</li><li>• Pipe wrench</li></ul>	<b>Equipment/Materials/Components</b> <ul style="list-style-type: none"><li>• Air valves</li><li>• Saddle</li><li>• Pipes</li></ul>

PROCEDURE

TASK 1 : Removal of air locks in a pump (Fig 1)

- 1 Remove the air in the suction line.



- 2 Open the cap/valve at priming line.  
3 Fill the water in the priming line.  
4 Open the air lock.  
5 Allow the air bubbles fully come out.  
6 Close the air lock.  
7 Close the cap at priming line.

TASK 2 : Removal of air locks in a main line

- 1 Open the valve for flow the water in the pipe line.  
2 Found the quantity of air flow out in the pipe line.  
3 Disconnect the fitting nearest point. (highest pipeline portion)  
4 Modify inspection chamber.  
5 Fix the air relief valve at inspection chamber.  
6 Air relief valve to release the air lock in the pipe line, air goes at the top of pipes.

7 Air relief valve chamber.

**Ball may worn out.**

**Rubber flange may worn out above said care the valve properly not functioning, If needed replace it.**

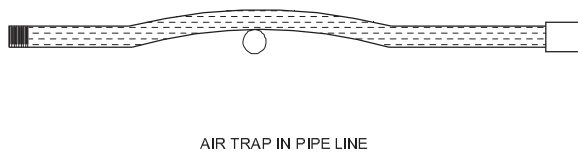
### TASK 3 : Removal of air locks in a domestic pipe line

- 1 Close the inlets.
- 2 Open the all inlets. (Valve lock)
- 3 Open the inlets.
- 4 Check the flow off in the pipe's & outlet appliances.
- 5 If any outlet not flow off.
- 6 Check the any swell on the pipe and point out.
- 7 Close the inlet valve.
- 8 Cut and replace swelled area.

**Does not connect number off direction changes. (use bends)**

- 9 The length of pipe and inlet finish of the pipe.
- 10 Head of water.
- 11 Types of bends and number of bends are required in the line.

Fig 1



PBN24120/J1

Fig 2

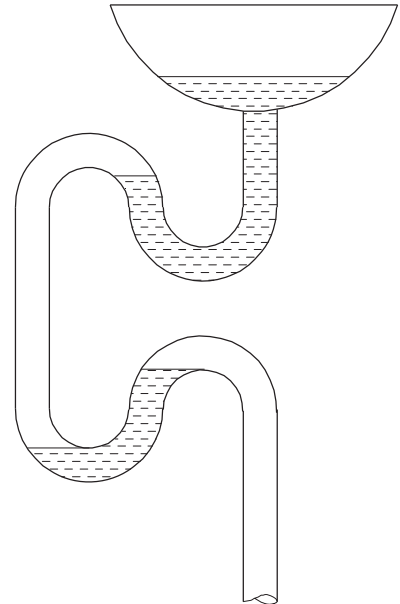


DIAGRAM OF AIR BLINDING

PBN24120/J2

#### Safety

- Open the end of the pipe line before pumping in to it.
- Fix the air valve in vertical position at inspection chamber.
- Fix the air valve on the top of the pipe line.

## Demonstrate rain water harvesting (percolation pit) system

**Objectives:** At the end of the exercise you shall be able to

- making pit and fill the pit with gravels
- fixing rain water pipes
- connect the pipes to pit
- cover the pit.

### Requirements

#### Tools/Instruments

- Trowel - 1 No.
- Spade - 1 No.
- Pick axe - 1 No.
- Mortar pan - 1 No.
- Hacksaw - 1 No.
- Hammer - 1 No.
- Steel tape - 1 No.
- Straight edge - 1 No.

#### Equipment/Materials/Components

- Bricks - as reqd.
- Sand - as reqd.
- Stone aggregate - as reqd.
- Cement - as reqd.
- Pipes - as reqd.
- Fittings - as reqd.
- RCC cover/grating - as reqd.

### PROCEDURE

- 1 Locate the place of the pit
- 2 Make the pit up to 3 meter depth and 300mm dia.
- 3 Construct chamber 1x1x $\frac{1}{2}$ m on the top of the pit up to ground level.
- 4 Fix a rain water pipe from the roof.
- 5 Connect the pipe to the pit
- 6 Fill the pit with gravel or rubble
- 7 Cover the pit with C' or RCC grating.
- 8 Check and finish the job.

#### Safety

- Don't allow debris enter into the pit
- Top of the pit should be below ground level
- Fine sand should be keep above the filtering media.
- Fix side support while digging loose soil.

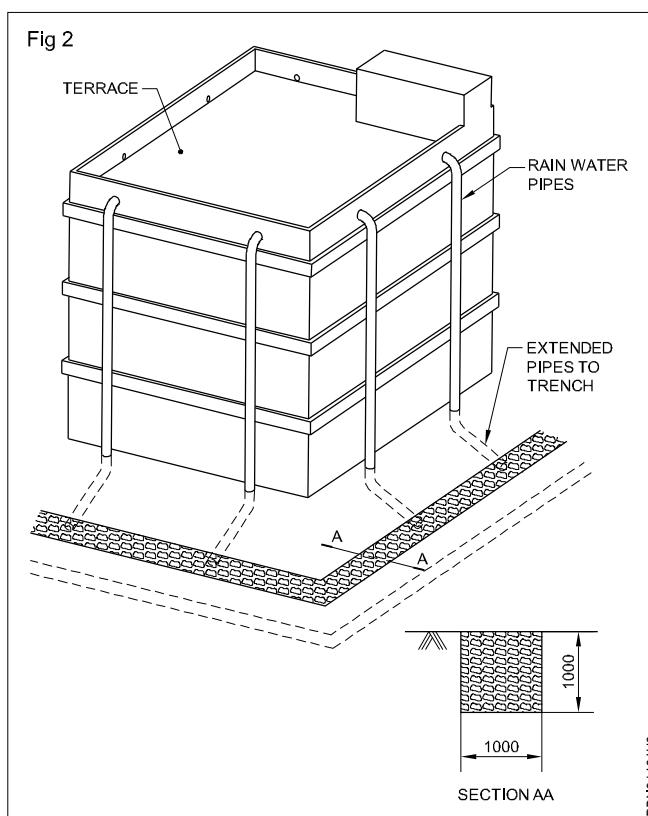
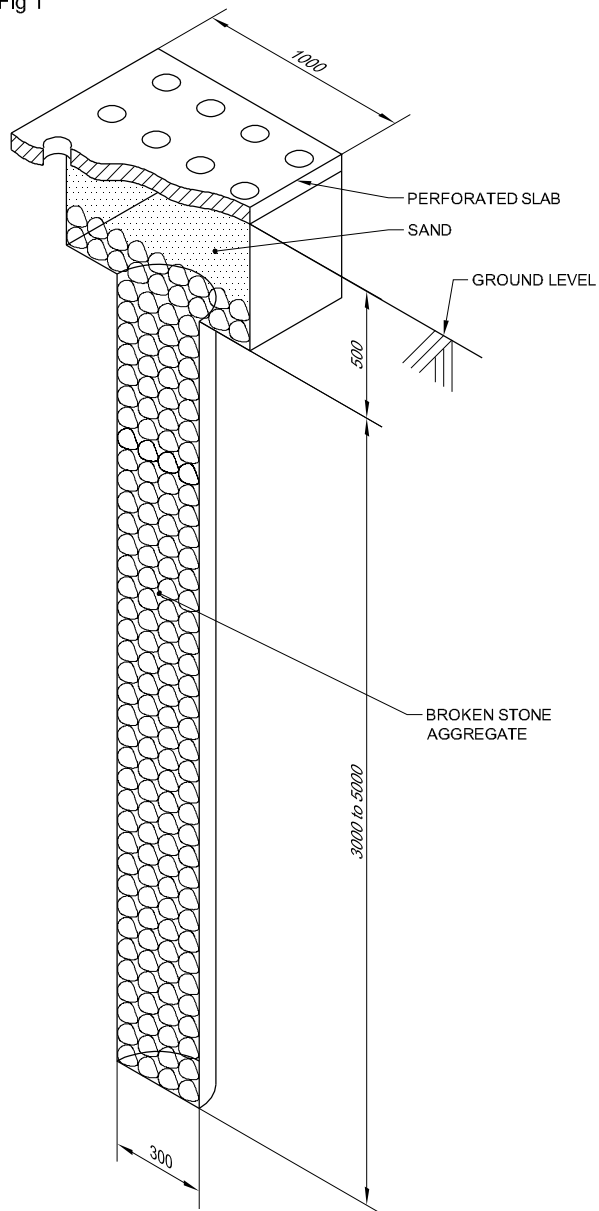




Fig 1



## Demonstrate different cocks and valves including materials

**Objectives:** At the end of the exercise you shall be able to

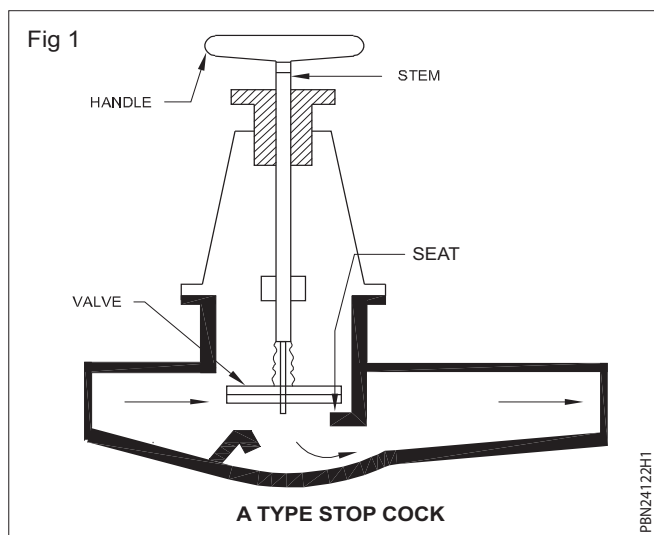
- identify different cocks and valves
- explain the uses of cocks and valves
- describe the function
- explain different and removal of cocks and valves.

### PROCEDURE

#### TASK 1 : Identify different cocks

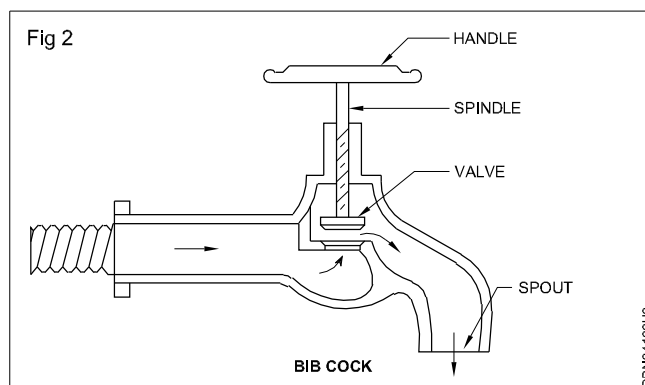
##### 1 Stop cocks (Fig 1)

- Check the functioning of stop cock.
- Check it is provided prior to water meter.
- Ensure it is enclosed in proper cast iron box having hinged cover.



##### 2 Bib cocks (Fig 2)

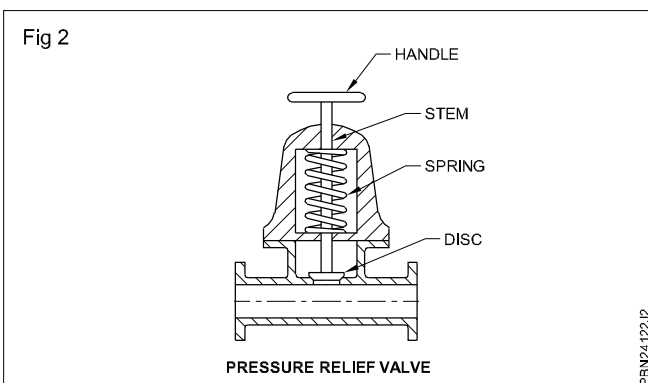
- Check the functioning of stop cock.
- Explain the parts of bib cocks.
- Put the bib cock in correct position.
- Check the rubber washer between the joint.



#### TASK 2 : Identify different types of valves

##### 1 Sluice valve (Fig 1)

- Check the function of sluice valve.
- Ensure that it is made of grey cast iron.
- Explain the parts of sluice valve, pressure relief valve (Fig 2).

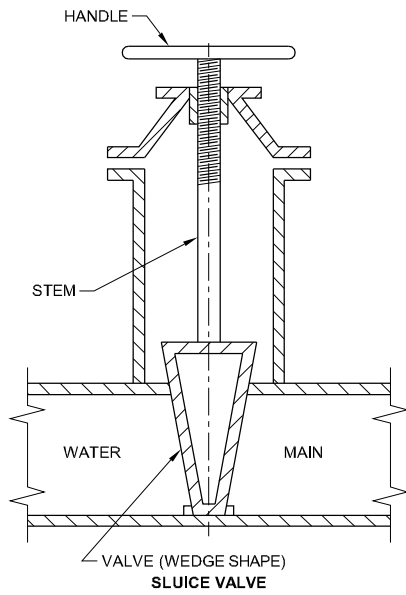


- Check the working of pressure relief valve.
- Explain how the excessive pressure relieved.
- Explain the parts of relief valve.

##### 2 Types of different valves

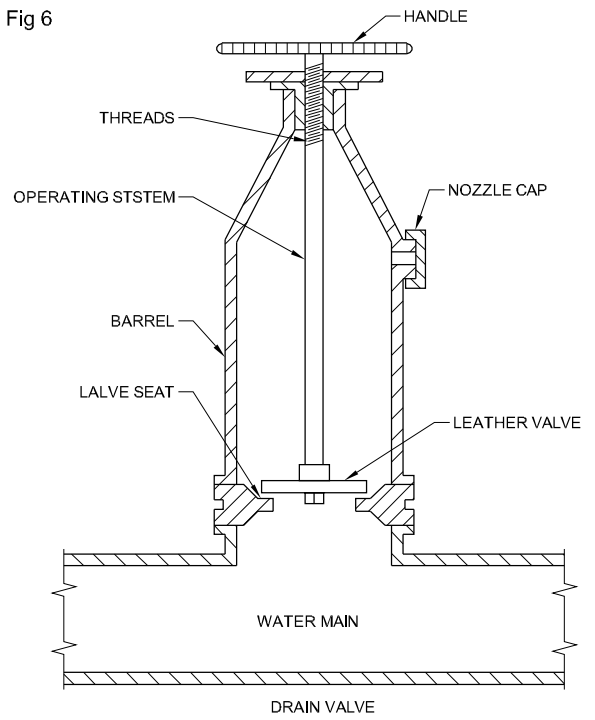
- Air relief valve (Fig 3).
- Double float air relief valve (Fig 4).
- Single float air relief valve (Fig 5).
- Drain valve (Fig 6).
- Gate valve (Fig 7).
- Globe valve (Fig 8).
- Mud valve (Fig 9).
- Non-return valve/check valve (10a, 10b, 10c)

Fig 1



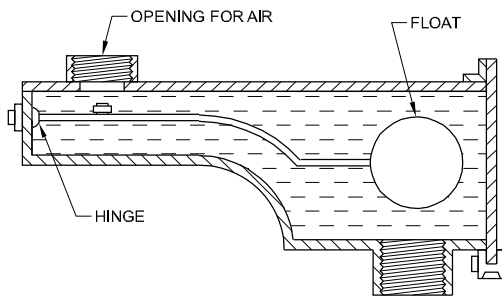
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Fig 6



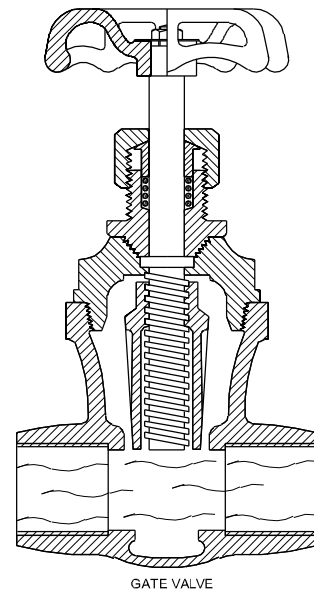
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Fig 3



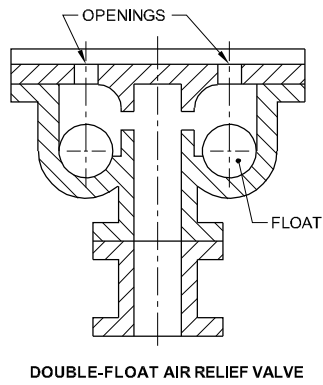
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Fig 7



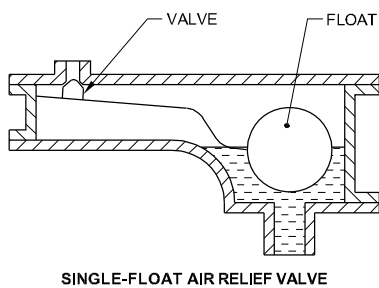
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Fig 4



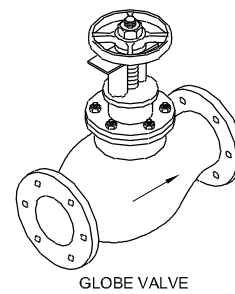
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Fig 5



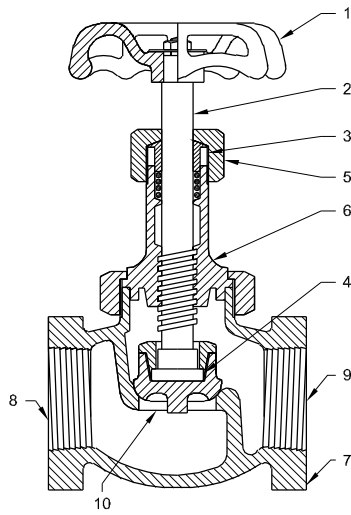
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Fig 8



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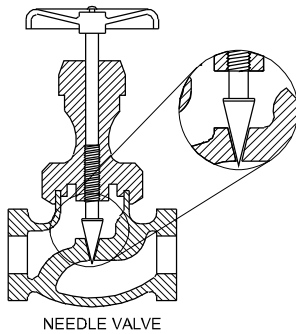
Fig 9



PBN24122JB

- Needle valve (Fig 11)

Fig 11

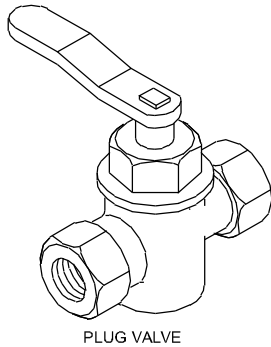


NEEDLE VALVE

PBN24122JB

- Plug valve (Fig 12)

Fig 12



PLUG VALVE

PBN24122JC

### Safety

- Do not over tight.
- Use only correct size spanner.
- Do not use other tools except spanner to open and close the valves.
- Filling the gasket should not be too enough.

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Fig 10

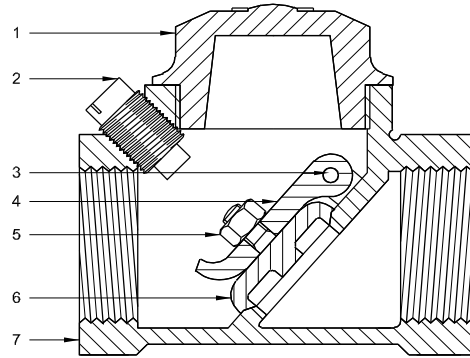


Fig A

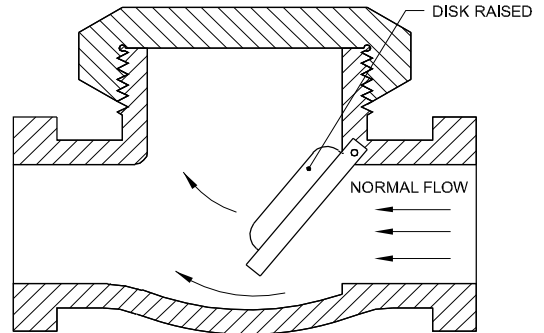


Fig B

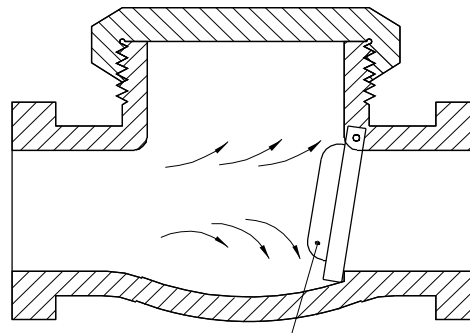


Fig C

PBN24122JA

## Employ cocks and valves at different place

**Objectives:** At the end of the exercise you shall be able to

- select the place the bib cock, sluice valve and stop cock
- fix bib cock
- fix sluice valve
- fix stop cock
- test the valve and cocks function.

### Requirements

#### Tools/Instruments

- |                 |         |
|-----------------|---------|
| • Spanner set   | - 1 No. |
| • Screw driver  | - 1 No. |
| • Pipe wrench   | - 1 No. |
| • Hacksaw       | - 1 No. |
| • Die set       | - 1 No. |
| • Pliers        | - 1 No. |
| • File          | - 1 No. |
| • Hammer        | - 1 No. |
| • Screws panner | - 1 No. |

#### Equipment/Machines

- |              |            |
|--------------|------------|
| • Pipe vice  | - as reqd. |
| • Bench vice | - as reqd. |

#### Materials/Components

- |                                     |            |
|-------------------------------------|------------|
| • Bib cock, sluice valve, stop cock | - as reqd. |
|-------------------------------------|------------|

- |                         |            |
|-------------------------|------------|
| • Hacksaw blade         | - as reqd. |
| • Cotton waste          | - as reqd. |
| • Teflon tape           | - as reqd. |
| • Thread seal           | - as reqd. |
| • Lubricant oil         | - as reqd. |
| • G.I Reducer, coupling | - as reqd. |
| • Barrel nipple         | - as reqd. |
| • Tee                   | - as reqd. |
| • Bend                  | - as reqd. |
| • Coupling              | - as reqd. |
| • Pipe                  | - as reqd. |
| • Nipple                | - as reqd. |
| • Union                 | - as reqd. |
| • Washer, Nut, Brush    | - as reqd. |
| • Grang rope            | - as reqd. |

## PROCEDURE

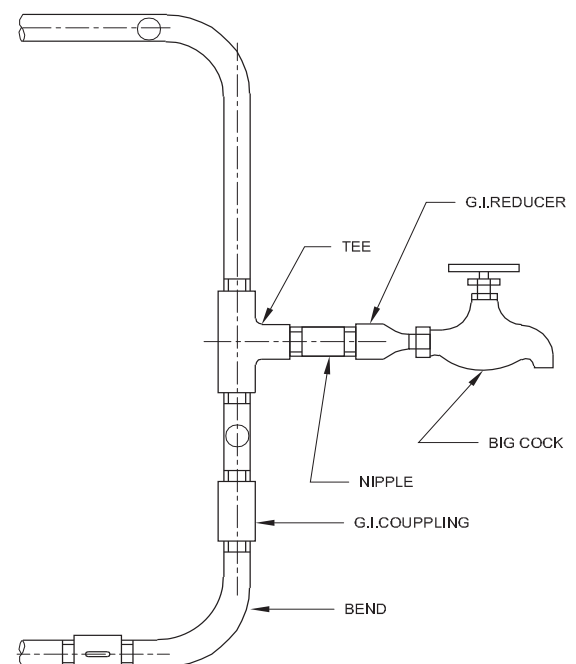
### TASK 1: Fixing bib cock

- 1 Decide the place for fixing bib cock.
- 2 Fix bibcock to socket using pipe wrench after adopting the procedure.
- 3 Fix a rubber washer between the joint.
- 4 Remove any excess hemp string or sealing tape after completing the joints using hacksaw blade or a blow lamp.

#### Safety

- Put the Bibcock in the correct possition.
- Don't over tight.
- Use only spanner.
- While fixing water tap.
- Use correct spanner size only.

Fig 1



PBN24123H1

## TASK 2: Fixing Stop cock

- 1 Decide to the place for fixing stop cock.
- 2 Fix long pipe of same dia stop cock.
- 3 Fix the stop cock.

**The arrow embossed on stop cock to be in the direction of flow of water.**

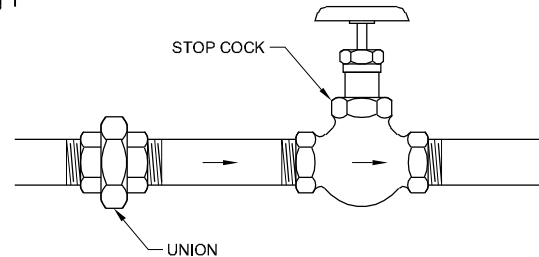
- 4 Clean the joints.
- 5 Test the pipe line through the stop cock.

**To assemble wrong direction of stop cock reduce the water flow quantity in the pipe lines.**

### Safety

- Check the direction before fixing.
- Dont over tight.
- Use correct spanner size only.

Fig 1



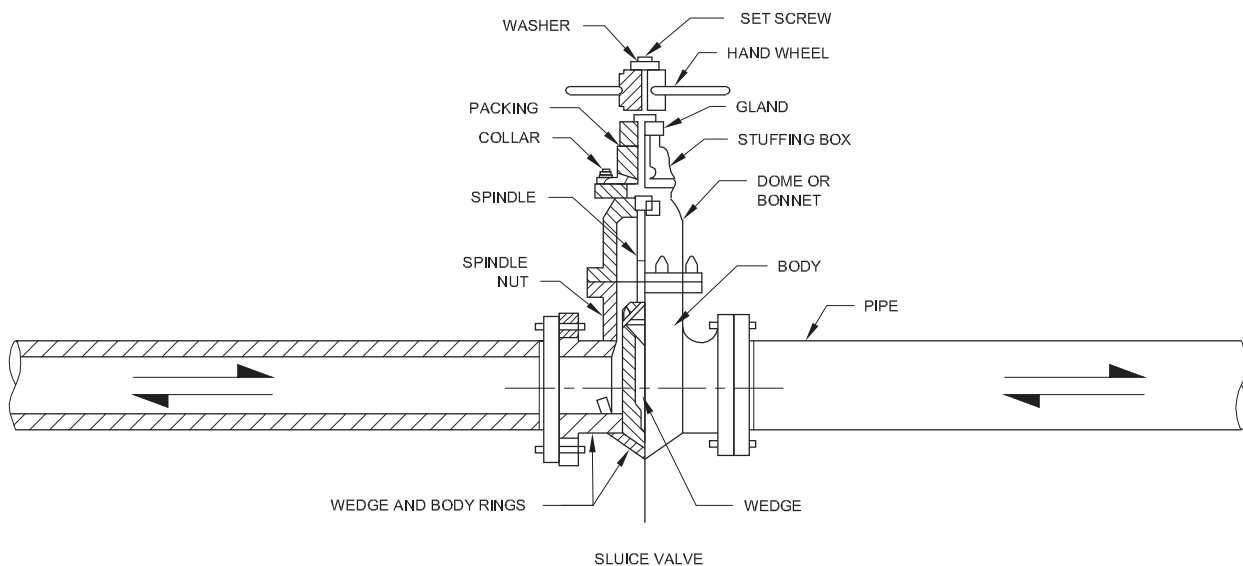
## TASK 3: Fixing sluice valve

- 1 Decide to place for fixing sluice valve.
- 2 Fix big dia cast iron or G.I pipe.
- 3 Tight the nut subsequently.
- 4 Fix a rubber or leather gasket between the joint.
- 5 For flanges may be fitted by screwing, welding.

### Safety

- Put the valve in the correct position.
- Dont over tight.
- Tight the nut alternately.

Fig 1



## Skill Sequence

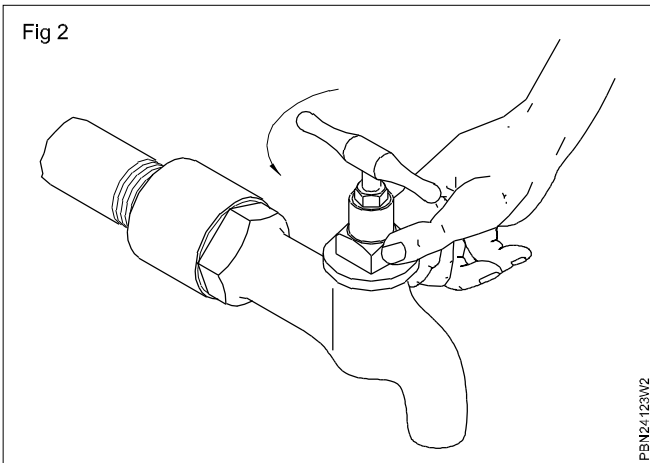
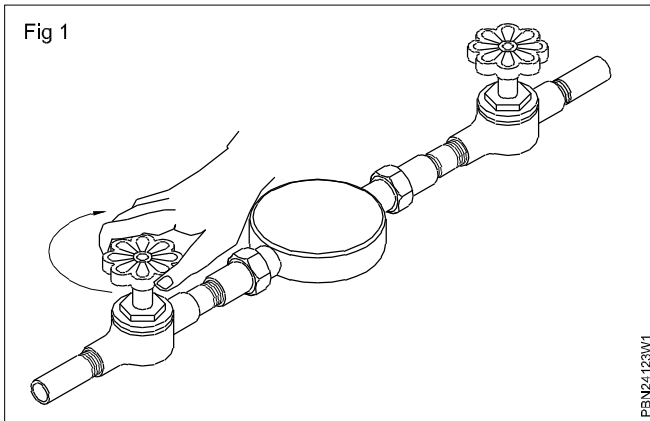
### Repairing of water tap replacing of washer

**Objectives:** This shall help you to

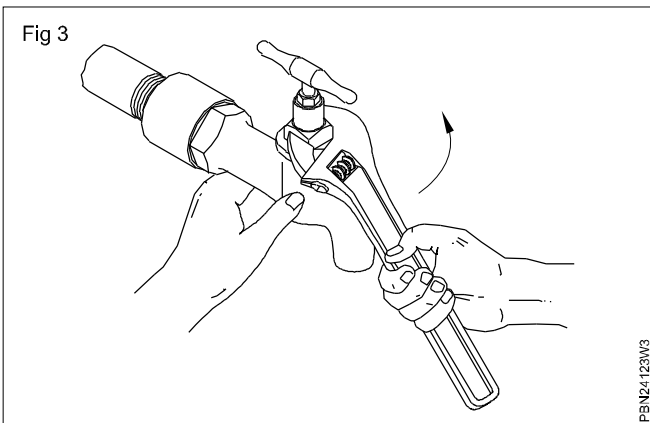
- repair a water tap by replacing washer on the metal disk-holder.

Shut off the water supply by closing the main stopcock or the main gate valve. (Fig 1)

Keep the water tap to be repaired in the "open" position. (Fig2)



Remove the bonnet from the water tap with a spanner (Fig 3).



Inspect the washer for damage (Fig 4).

Hold the metal disk plate with a pliers and unscrew washer nut with a spanner (Fig 5).

Remove the washer from its seating.

Press the new washer into position.

**Use fiber washer for hot water tap.**

Refit the washer nut and tighten it firmly (Fig 6).

Replace the repaired bonnet into the water tap (Fig 7 & 8). Tighten the bonnet with a wrench. Do not overtighten it as this would change the thread of the water tap body.

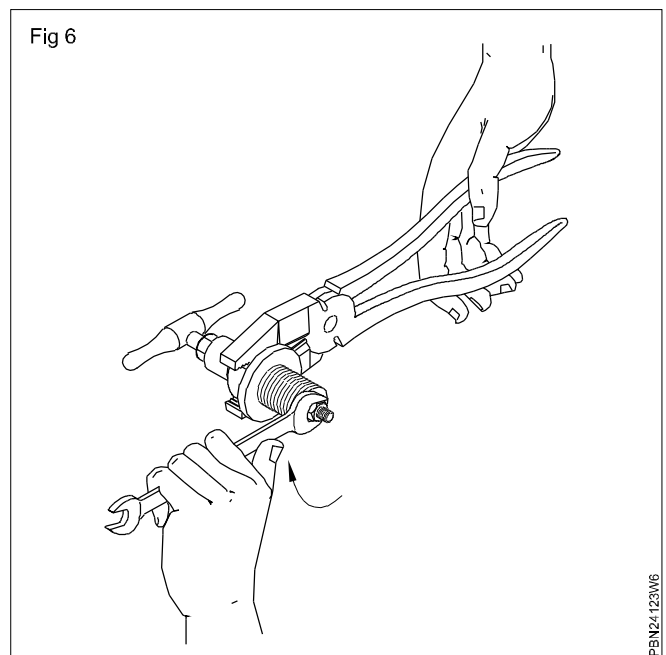
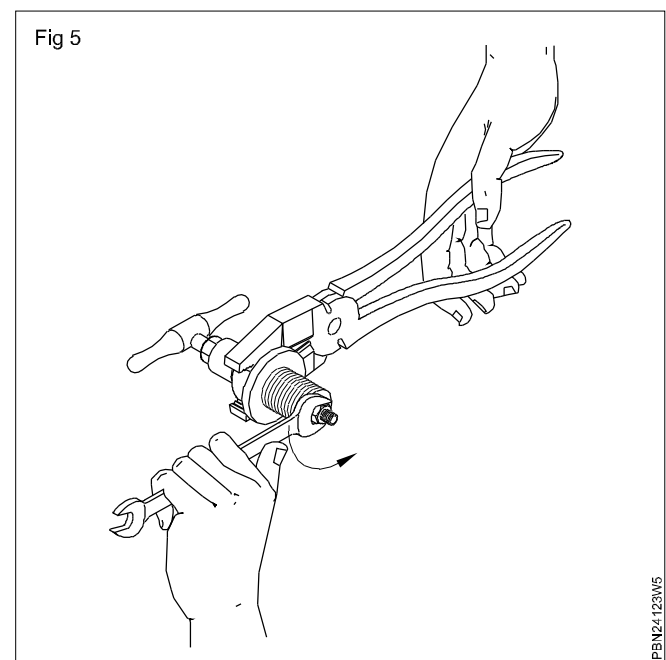
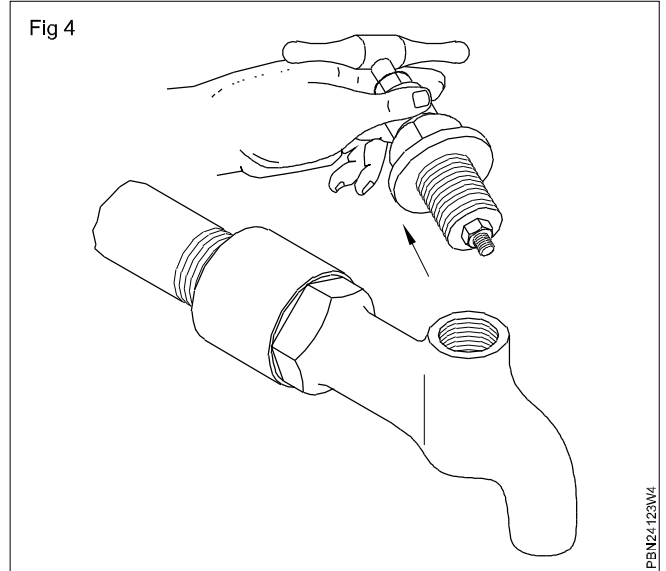
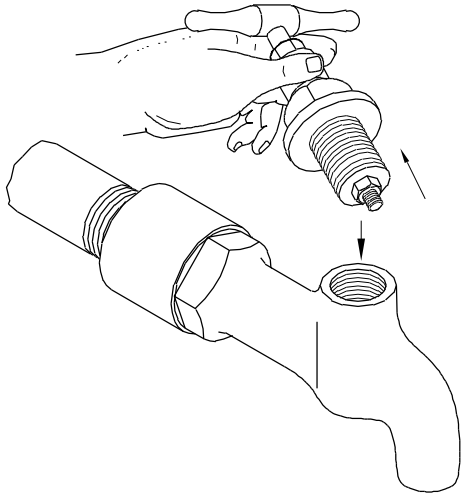
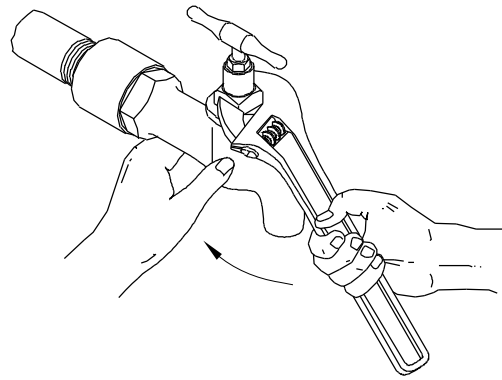


Fig 7



PBN24123W7

Fig 8



PBN24123W8

## Repair water tap replacing of packing material

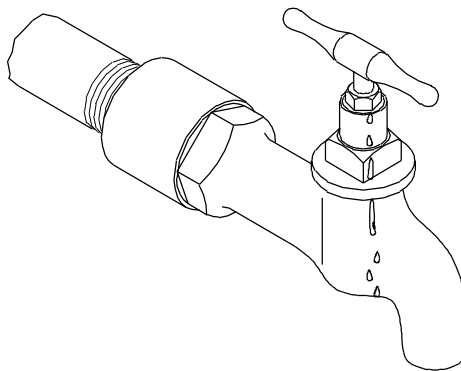
**Objectives:** This shall help you to

- repair a water tap by replacing the packing material in the stuffing box.

Another repair job which a plumber may need to perform is to change the packing in the stuffing box.

If water escapes from the water tap's gland nut, close the stopcock by turning the handle clockwise as this will stop the water in the tap to be repaired (Fig 1).

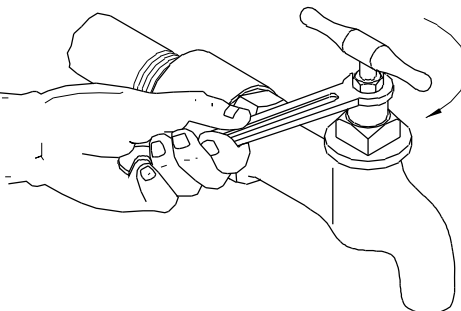
Fig 1



PBN24123X1

Tighten the gland nut to compress the packing around the shaft (Fig 2).

Fig 2

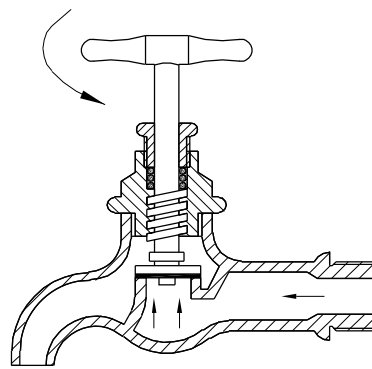


PBN24123X2

Now open the water tap to check if the leak has stopped. If the water tap still leaks, the packing in the stuffing box should be replaced (Fig 3).

Shut off the water supply by closing the main gate valve.

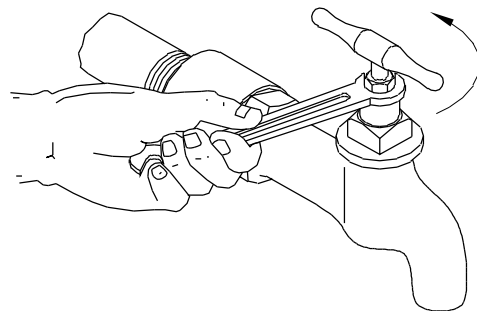
Fig 3



PBN24123X3

Loosen the gland nut from the bonnet by turning it anticlockwise with a spanner (Fig 4).

Fig 4



PBN24123X4

Lift up the gland nut and clean out the old packing from the stuffing box (Fig 5).

**Do not damage the bore of the stuffing box.**

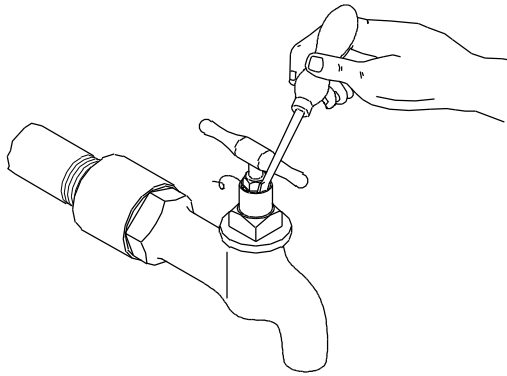
Make a new packing out of asbestos rope (Fig 6).

Coil the new packing around the shaft and push it down with a small screw driver (Fig 7).

Re-assemble the gland nut and tight (Fig 8).



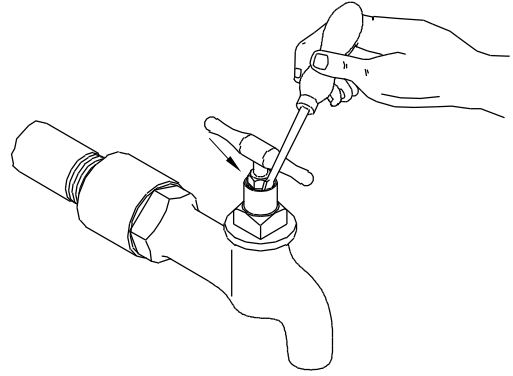
Fig 5



PBN24123X5

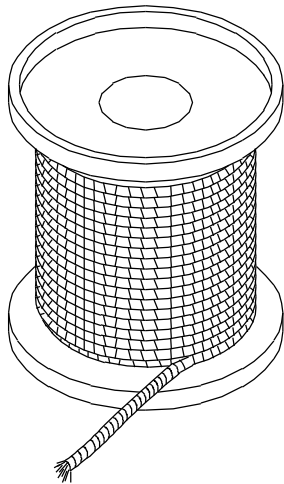
Open the main gate valve and test the water tap for leakage.

Fig 7



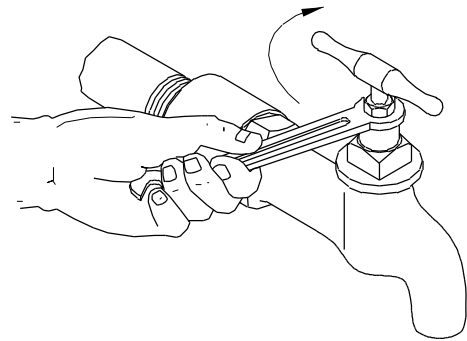
PBN24123X7

Fig 6



PBN24123X6

Fig 8



PBN24123X8

## Dismantle and service of gate valve

**Objectives:** This shall help you to

- **dismantle, service and reassemble a gate-valve in domestic water supply.**

Shut off the water by closing the main valve.

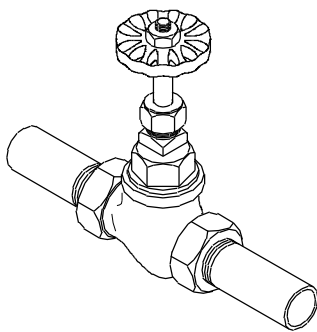
Close the gate-valve and remove the wheel nut with a spanner.

Remove the gland nut from the bonnet.

Clean out the old packing in the stuffing box.

Remove the bonnet with the spindle from the body and clean all the parts (Fig 1).

Fig 1



PBN24123Y1

Coil the asbestos rope, smear it with water pump grease and push it down with a screwdriver.

Assemble the spindle gate to the bonnet.

Assemble the gland nut, hand wheel and tighten the hand wheel nut.

Open the gate-valve and tighten the gland nut until the packing is compressed sufficiently to stop the water escaping from the gland nut.

**Do not use the gate-valve to regulate the flow.  
It should be either in fully opened or fully closed condition.**

## Repair a gate valve

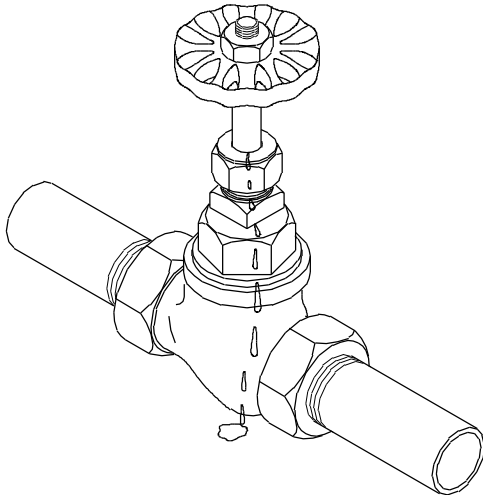
**Objectives:** This shall help you to

- repair a gate-valve.

Close the gate-valve by turning the hand wheel clockwise (Fig 1).

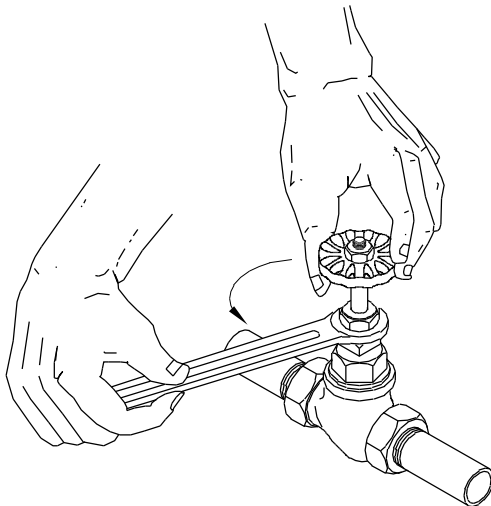
**This will stop the water in the valve to be repaired.**

Fig 1



Remove the nut with a spanner and lift off the wheel (Fig 2).

Fig 2



Remove the gland nut from the bonnet by turning it in the anticlockwise direction (Fig 3).

Remove the stuffing gland (Fig 4).

Clean out the old packing in the stuffing box (Fig 5)

Cut a strand of asbestos rope to make a new packing. (Smear it with water pump grease or graphite paste)(Fig 6)

Coil the new packing round the shaft and push it down with a screwdriver (Fig 7).

Push in the stuffing gland and check that it fits tightly in the stuffing box (Fig 8).

Re-assemble and leave the gland nut hand tight (Fig 9).

Assemble the hand wheel and tighten the hand wheel nut (Fig 10).

Fig 3

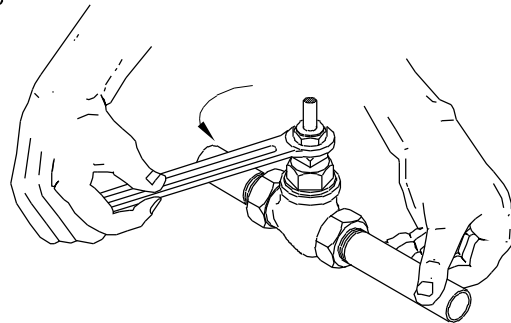


Fig 4

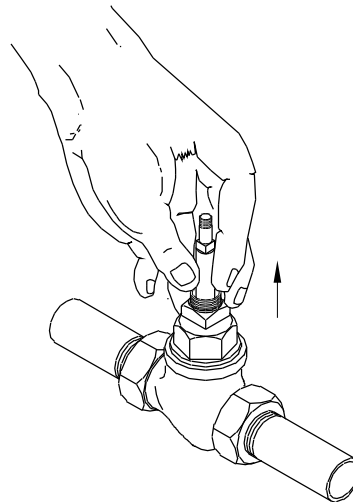


Fig 5

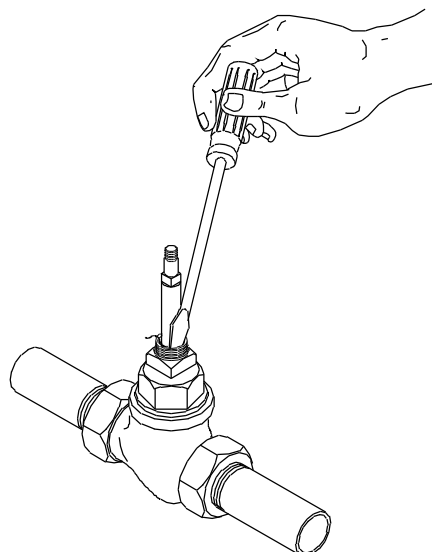
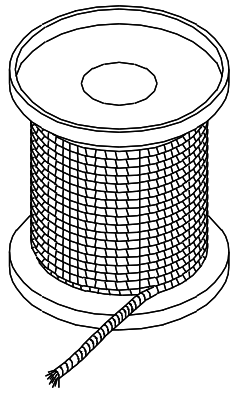
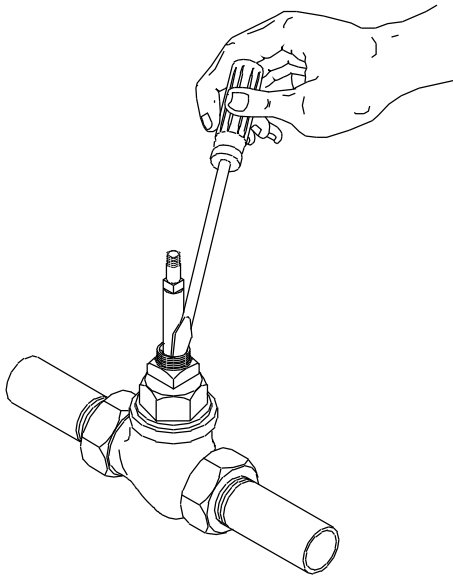


Fig 6



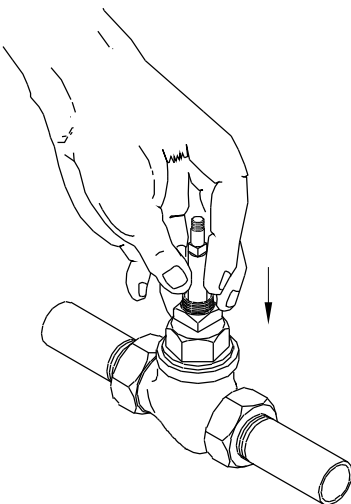
PBN24123Z6

Fig 7



PBN24123Z7

Fig 8



PBN24123Z8

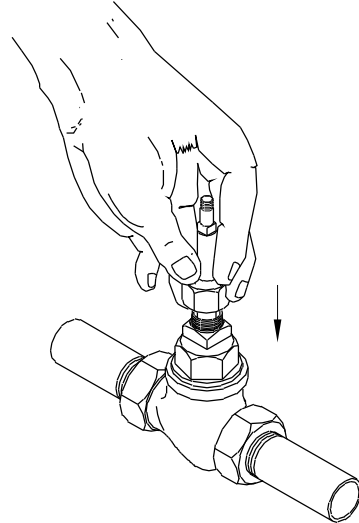
Open the gate-valve and tighten the gland nut until the packing is compressed sufficiently to stop the water escaping from the gland nut.

Removal of spindle set and gate part.

Hold the spanner at bonnet neck.

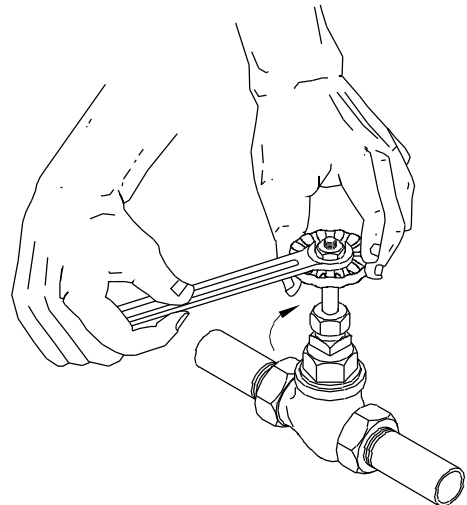
Loosen the bonnet two or three turn again close the bonnet 2 or 3 turn.

Fig 9



PBN24123Z9

Fig 10



PBN24123ZA

**Employ different cock and valves with sensor system**

**Objectives:** At the end of the exercise you shall be able to

- **identify different cock and valves**
- **explain the function of cock and valves**
- **explain the sensor system**
- **describe function of urinal and wash basin sensor system.**

**Requirements**

**Tools/Instruments**

• Trowel	- as reqd.	• Cistern automatic	- as reqd.
• Pocker	- as reqd.	• PVC and pipe	- as reqd.
• Sprit level	- as reqd.	• Wall clamp	- as reqd.
• Pipe wrench	- as reqd.	• White cement	- as reqd.
• Water tube level	- as reqd.	• Solvent cement	- as reqd.
• Measuring tape	- as reqd.	• Angle cock	- as reqd.
• Hammer	- 1 No.	• Push cock	- as reqd.
• Screw driver	- 1 No.	• Urinal spreader	- as reqd.
• Hacksaw	- 1 No.	• Wash basin	- as reqd.
• Plum bob	- 1 No.	• Pillar tap	- as reqd.
• Water pump plier	- 1 No.	• PVC connector	- as reqd.
• Chisel	- 1 No.	• Rag bolt	- as reqd.
• Mason square	- 1 No.	• Rubber plug	- as reqd.
		• Plaster of parrige	- as reqd.

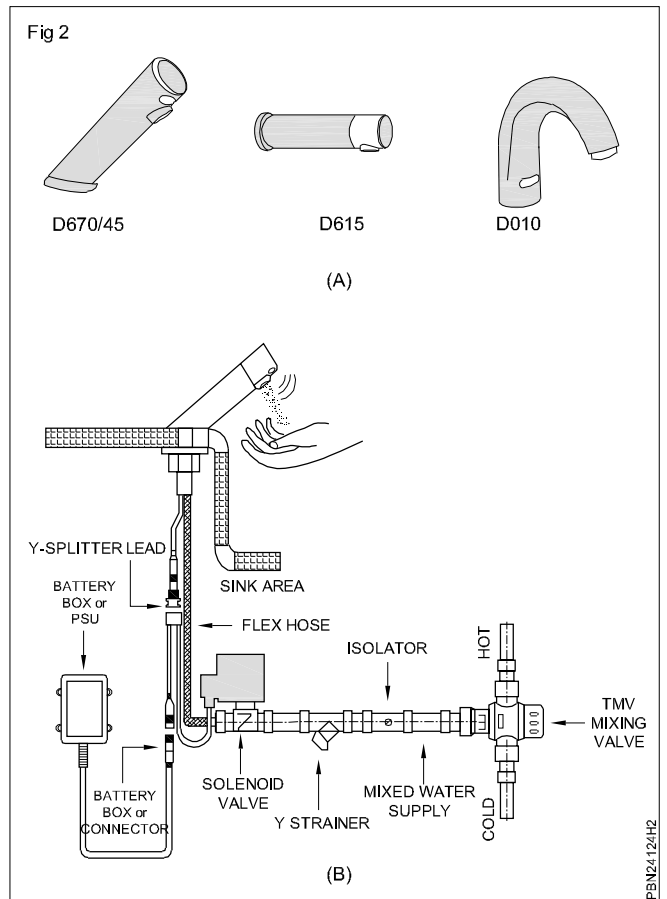
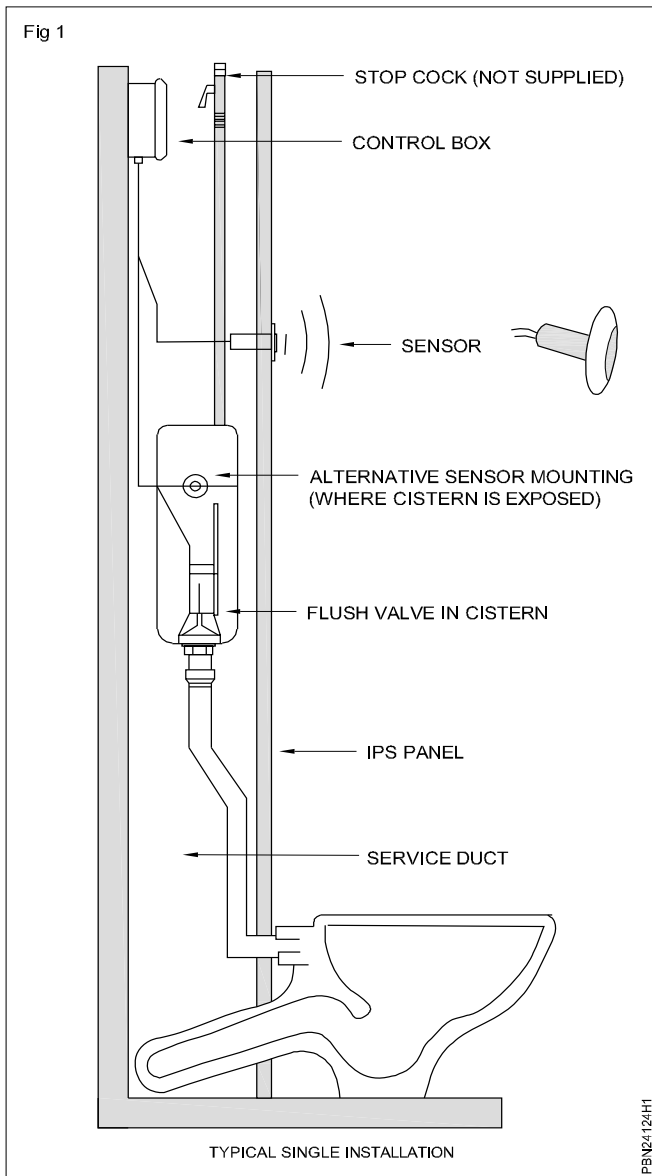
**Machines / Materials/Components**

- Urinal - as reqd.

**PROCEDURE**

**TASK 1: Fixing cock with sensor system (Fig 1 & 2)**

- 1 Mark the position of rag bolt so that 800mm from floor.
- 2 Drill the mark position for rag bolt.
- 3 Fix the rag bolt.
- 4 Check the wash basin any deffect.
- 5 Assemble the wash basin.
- 6 Keep the wash basin on the rag bolt.
- 7 Pass the inlet pipe and sensor cable through mounting of bath room basin.
- 8 Attach the inlet pipe to the inlet point on your sensor tap controller box.
- 9 Repeat the same process for your outlet pipe.
- 10 Connect bottle trap.
- 11 Leave the bottle trap to floor trap semi-circular open drain etc.,
- 12 Test the functioning.



## TASK 2: Installation of sensor urinal (Fig 3&4)

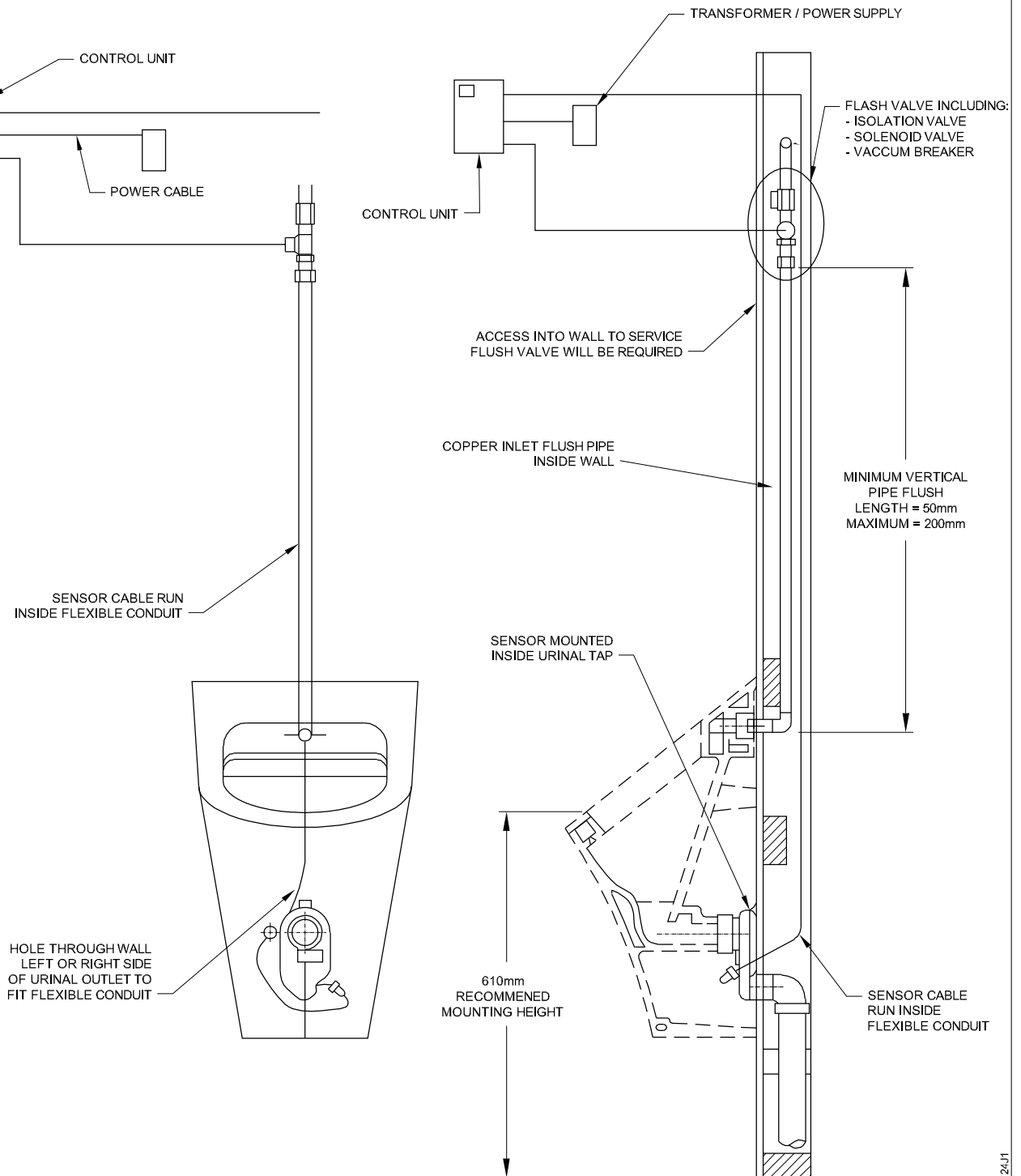
- 1 Fix installation clamp.
- 2 Before fixing urinal install sensor set.
- 3 Insert the sensor in the slot.
- 4 Tighten the bolt with back nut.
- 5 Place the urinal on the installation.
- 6 Connect the inlet.
- 7 Connect the green wire to batter box.
- 8 Set the coramic lid on the top.
- 9 Turn the screw clock and anti clock wise.

- 10 Check the function.

### Safety precautions

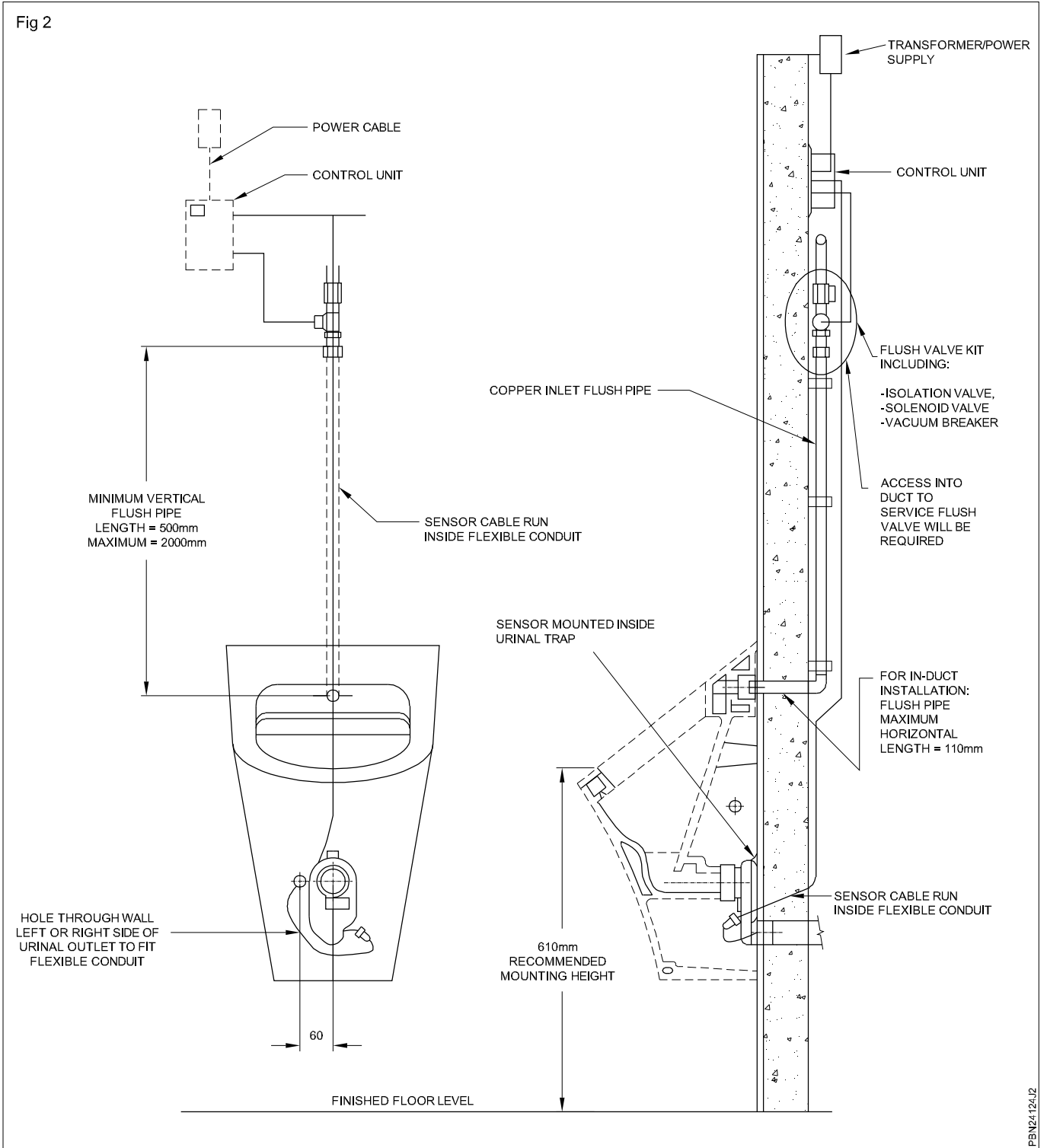
- Do not use a voltage that exceeds the operating voltage.
- Do not short circuit the load it will result explosion.
- Ensure power supply connected to correct polarity.
- Do not tap it with hammer while mounting sensor.
- Do not use sensor where there are chemical vapours

Fig 1



PSW24124J1

Fig 2



PSN24-124/J2

**Demonstrate maintenance of different cocks and valves**

**Objective:** At the end of this exercise you shall be able to  
• **demonstrate maintenance of different cocks and valves.**

**PROCEDURE**

**Instructor shall displays and demonstrate to the students regarding the name and maintenance of different cocks and valves. The figure shown in Exercise 2.4.122**

- 1 Trainees will note down all the displayed different cocks and valves name and maintenance.
- 2 Record it in Table 1 and 2.
- 3 Get it checked by the instructor.

**Table 1**

Fig No	Name of Cocks	Maintenance
1		
2		

**Table 2**

Fig No	Name of Valves	Maintenance
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		



**Demonstrate use of packing washer gasket of different cock and valve**

**Objective:** At the end of this exercise you shall be able to

- **demonstrate use of packing washer and gasket in cock and valve.**

**PROCEDURE**

Instructor shall displays and demonstrate to the students regarding use of washer gasket different cocks and valves.

Refer the Exercise 2.4.123

— — — — —

### Demonstrate location of fitting water meter and bath tub

**Objectives:** At the end of the exercise you shall be able to

- tap formation on C.I water main line
- fix ferrule on C.I water communication pipe
- fix the water meter
- laying the consumer pipe line's.

#### Requirements

##### Tools/Instruments

- |                      |            |
|----------------------|------------|
| • Pipe wrench        | - as reqd. |
| • Ratchet brace      | - as reqd. |
| • Taper tap          | - as reqd. |
| • Die set            | - as reqd. |
| • Ball peen - hammer | - as reqd. |
| • Cold chisel        | - as reqd. |
| • Spanner set        | - 1 No.    |
| • Screw driver       | - 1 No.    |
| • Hacksaw            | - 1 No.    |
| • Measuring tape     | - 1 No.    |
| • Shovel             | - 1 No.    |
| • Spade              | - 1 No.    |
| • Crow bar           | - 1 No.    |
| • Trowel             | - 1 No.    |

- |        |            |
|--------|------------|
| • Bond | - as reqd. |
|--------|------------|

##### Machines / Materials/Components

- |                        |            |
|------------------------|------------|
| • Saddle piece         | - as reqd. |
| • Gun metal ferrule    | - as reqd. |
| • Union                | - as reqd. |
| • Elbow-PVC            | - as reqd. |
| • Gate valve           | - as reqd. |
| • PVC pipe             | - as reqd. |
| • Water meter          | - as reqd. |
| • Rubber washer        | - as reqd. |
| • Thread seal material | - as reqd. |
| • Solvent cement       | - as reqd. |

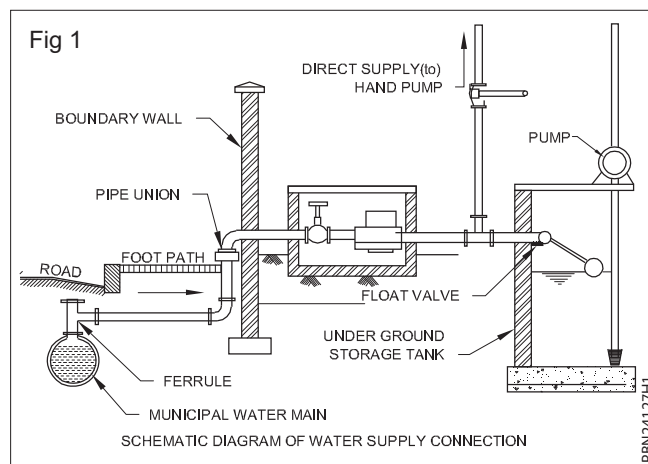
### PROCEDURE

#### TASK 1: Service and fixing the meter

- 1 Arrange the proper tools and materials.
- 2 Close the main line.
- 3 Mark the position for drilling and tapping on the main line.
- 4 Drill the main line with ratchet brace.
- 5 Cut the internal threads with taper pipe tap.

**Pipe tap is formed with BSP thread.**

- 6 Connect the saddle piece on main line.
- 7 Fit up ferrule to form the necessary connection.
- 8 Open the valve inside ferrule and close the cap.
- 9 Take service pipe on from the saddle piece.
- 10 Fix a stop cock or gate valve on inlet and out let of water meter location.
- 11 Close the stop cock.
- 12 Measure the length of water meter and distance between the two unions.
- 13 Tighten the union to the pipes.



- 14 Fix the water meter between two union, as per the direction to coincide with the arrow mark on the meter.
- 15 Open the valve.
- 16 Check the pipe lines.

**Must fix the gate valve before the water meter.**

#### Safety

- Be careful while drilling the main line

- Fix the ferrule in the saddle.
- Fix a goose neck if the line is crossing a road.

- To connect stop cock before the water meter.

## TASK 2: External (Outdoor)

- 1 Dig the trench as per alignment marked upto the required depth.
- 2 Water and ramp the bed.
- 3 Fill the depression if any with earth and ramp.
- 4 Lower the pipe into trench carefully after anti corrosive painting.
- 5 Joint the pipes using pipe wrench.
- 6 Plug the open ends temporary.
- 7 Pressure test the line section by section.
- 8 Fill the trench in layer of 100mm thick. (Generally 7.5cm sand below the pipe and 15cm sand above the pipe are given.)
- 9 Consolidate each layer by ramming.

### Precaution

- Trenches in loose soil must be shored.
- Excavations to be barricaded and marked with safety lights.

## Skill Sequence

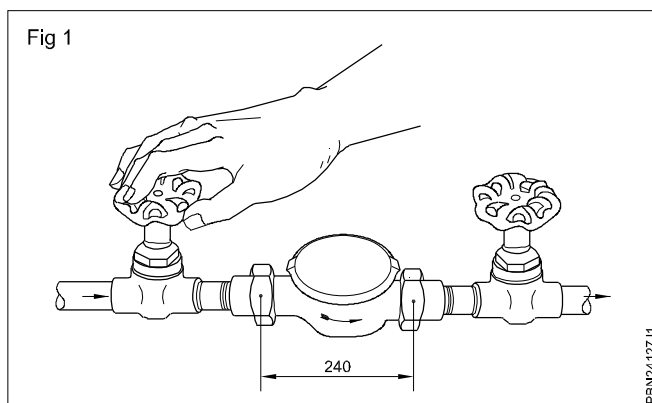
### Installation of water meter in domestic water supply

**Objective:** This shall help you to

- install a water meter in domestic water supply.

Fix a stop cock or gate valve on inlet and outlet of water meter location.

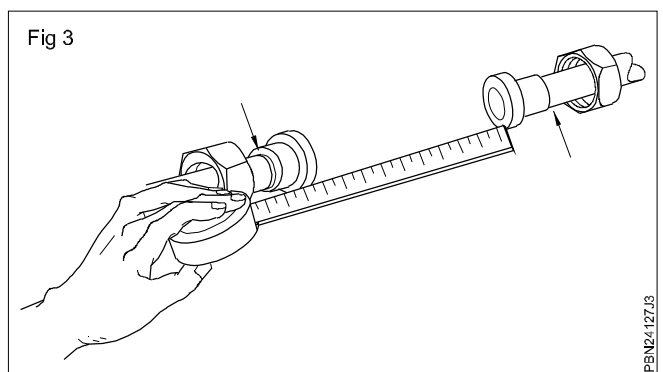
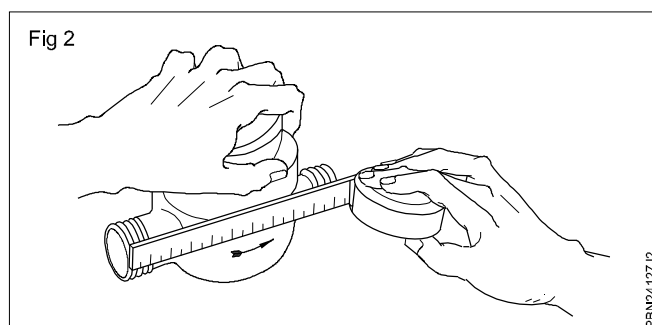
Close the stop cocks (Fig 1).



Measure the length of water meter and distance between the two unions (Fig 2 & 3).

Tighten the union to the pipes.

Hold the water meter in position between the two union. The direction of flow to coincide with the arrow mark on the water meter.



Place a soft leather or rubber washer on one side of the meter (Fig 4)

Screw the nut on the coupling.

Repeat the same procedure for otherside.

Tighten the coupling nut firmly with a spanner or an adjustable wrench (Fig 5).

Open the outlet and inlet valve (Fig 6)

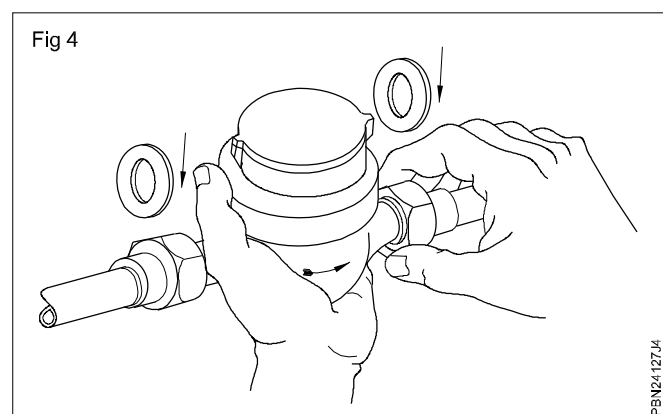
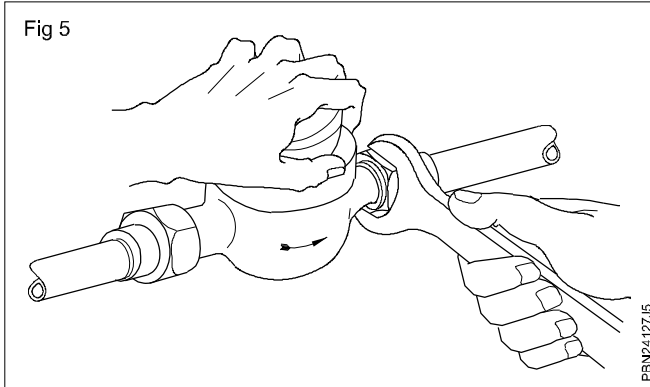
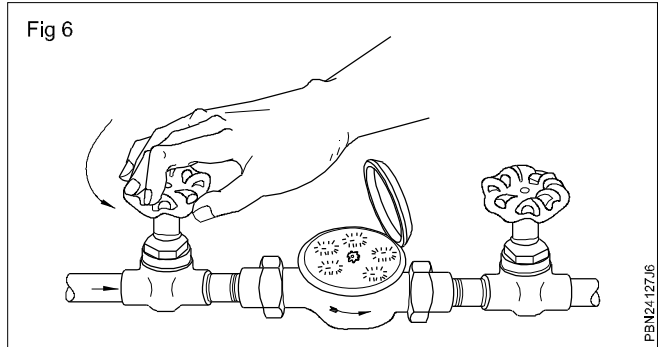


Fig 5



Check the joints are not leaking and water meter is working (Fig 6).

Fig 6



## Installation of stop cock-gate valves in domestic water supply

**Objective:** This shall help you to

- install stop cock-gate valves.

Decide the place for fixing stop cock.

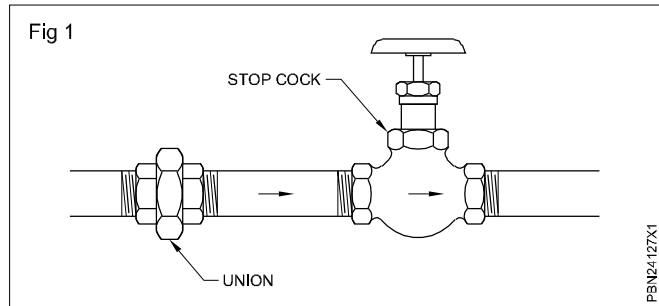
Fix a union.

Fix 150mm long pipe of same dia of stop cock to union.

Fix stop cock to the pipe. The arrow embossed on stop cock to be in the direction of flow of water (Fig 1).

Clean the joints and test.

Fig 1



## Installation of bath tub, hand wash basin, urinal and sink

**Objective:** At the end of the exercise you shall be able to

- level, measure, marke, bond, fix, connect and test for bath tube installation.

Requirements			
<b>Tools/Instruments</b>			
• Ball peen hammer	- 1 No.	• Lubricant-oil	- as reqd.
• Drilling Machine	- 1 No.	• Wash basin	- as reqd.
• Chisel	- 1 No.	• Pillar tap	- as reqd.
• Spanner	- 1 No.	• PVC Connector	- as reqd.
• pipe wrench	- 1 No.	• Waste-coupling	- as reqd.
• screw driver	- 1 No.	• Rag bolt	- as reqd.
• D.End spanner	- 1 No.	• Rubber plug	- as reqd.
• Hammer	- 1 No.	• Chain	- as reqd.
• Hacksaw	- 1 No.	• Plaster or parrise	- as reqd.
• Trowel	- 1 No.	• Drilling machine	- as reqd.
• Pocker	- 1 No.	• Urinal	- as reqd.
• Sprit level	- 1 No.	• Cistern(Automatic)	- as reqd.
• Water tube level	- 1 No.	• PVC pipes	- as reqd.
• Measuring tape	- 1 No.	• Wall clamp	- as reqd.
• Plum bob	- 1 No.	• White cement	- as reqd.
• Water pump plier	- 1 No.	• Solvent cement	- as reqd.
• Mason square	- 1 No.	• Angle cock	- as reqd.
• Steel tape	- 1 No.	• Push cock	- as reqd.
• Marking media	- 1 No.	• Urinal spreaders	- as reqd.
• Masonary tools	- 1 No.	• Required fittings	- as reqd.
• Water pump plain	- 1 No.	• Hammer drilling m/c	- as reqd.
• Plier	- 1 No.	• Sink	- as reqd.
• Pick axe	- 1 No.	• Bracket	- as reqd.
• Spade	- 1 No.	• Waste pipe	- as reqd.
• Straight edge	- 1 No.	• Cement	- as reqd.
• Mortar pan	- 1 No.	• Fine sand	- as reqd.
<b>Machines/Equipment</b>		• IWC	- as reqd.
• Pipe vice	- as reqd.	• Flush tank assembly	- as reqd.
<b>Materials/Components</b>		• Trap 'P' or 'S'	- as reqd.
• GI Pipe	- as reqd.	• Bricks	- as reqd.
• Elbow	- as reqd.	• SW pipe or PVC pipe	- as reqd.
• Union	- as reqd.	• PVC pipe	- as reqd.
• Valve	- as reqd.	• Fine grain silica sand	- as reqd.
• Shellac	- as reqd.	• Water	- as reqd.
• White lead	- as reqd.	• Solvent cement	- as reqd.
• Cotton waste	- as reqd.	• Tee	- as reqd.
		• Bend	- as reqd.
		• Elbow	- as reqd.

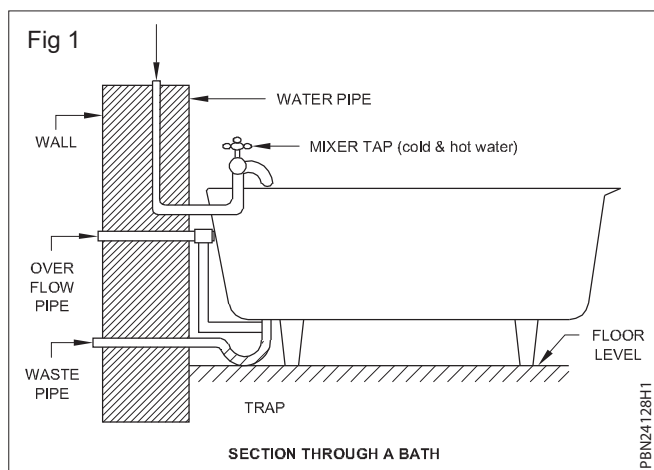
## PROCEDURE

### TASK 1: Installation of bath tub

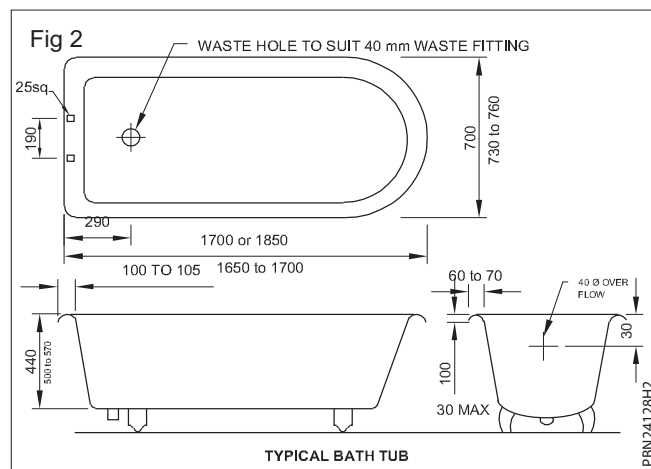
- 1 Check the bath tub for any visible defects (Fig 1).
- 2 Place the bath tub at the location specified. Keeping top in level over sand custion (Fig 2).
- 3 Study the manufactures instruction.
- 4 Connect the waste pipe to the waste hole.
- 5 Connect hot and cold water supply line to the tub.
- 6 Check the functioning after opening the taps.
- 7 Check the flush system and EWC for any leak.

## Safety

- Fix the bath tub level to the top level.
- Fix the trap in the outlet.
- Connect the hot water line in the left side of the mixture unit.
- Their should be handles on the top of the tubs.



- If any welded surface shall be cleaned off inside and outside of the bath tub.
- Inside the bath tub to provide enamel coating.
- Overflow pipe must be connect before the trap.
- Always to connect left side of the mixer on hot water. Right side on cold water.

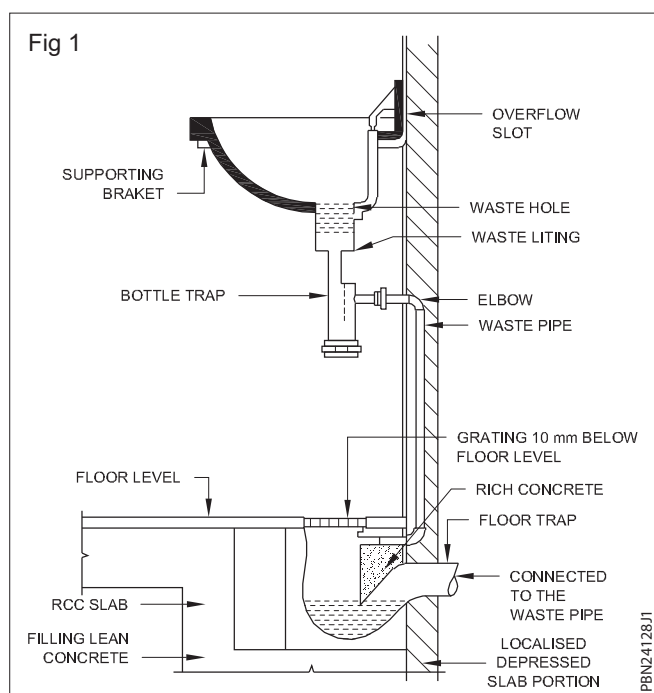


## Wash basin fixing practice

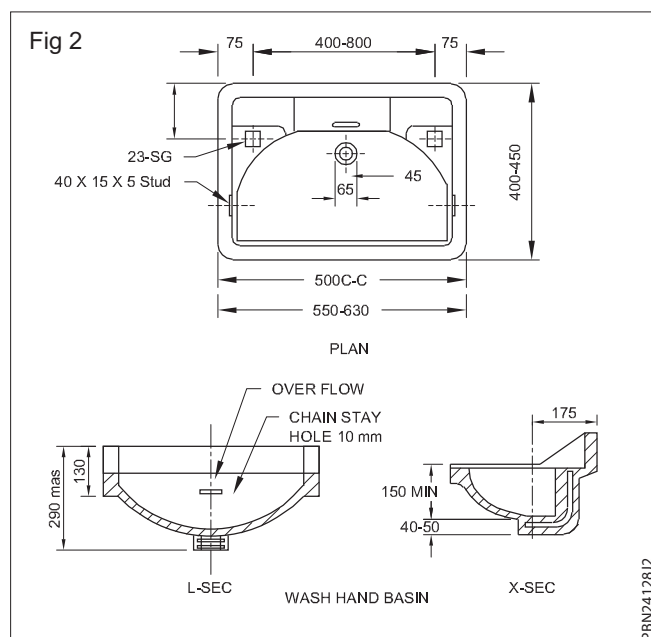
**Objectives:** At the end of the exercise you shall be able to

- mark the height for wash basin
- fix wash basin in the wall
- connect pillar tap in the wash basin.

- 1 Mark the position of rag bolt so that of 800mm from floor.
- 2 Drill the mark position for rag bolt fixing.
- 3 Fix the rag bolt suitable distance.
- 4 Check the wash basin any visible defects.



- 5 Assemble the wash basin with pillar tap, waste coupling, rubber plug & chain.
- 6 Keep the wash basin on the rag bolt.
- 7 Connect the supply line to pillar tap with flexible connector.
- 8 Connect bottle trap.
- 9 Leave the bottle trap to floor trap, semi circular open drain etc.



10 Test the functioning and leakages in joints.

11 Check the job.

#### Safety

- Handle the wash basin carefully.

## Urinal fixing practice

**Objectives:** At the end of the exercise you shall be able to

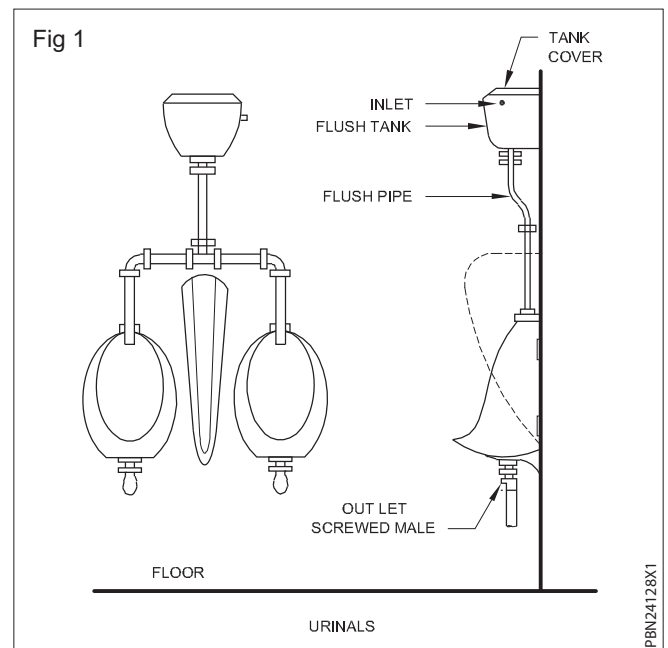
- measuring & marking as per layout
- fixing urinal
- connect flushing cistern & waste line
- check the fitting.

- 1 Select the place for providing urinal.
- 2 Draw the centre line and layout the dimensions on the wall correctly.
- 3 Bore the wall and fix the wooden plugs with cement mortar where required.
- 4 Fix the urinal and the tank on the plug provided with suitable screws.
- 5 Connect water supply to flushing cistern and check if for any leak.

#### Safety

- Handle the urinal carefully.
- Fix the trap in protect level.
- Give minimum gradient to the floor.

- Drill straight & level for rag bolt.
- Use trap in the out let.
- Connect hot water in the left side.



## Installation of sink

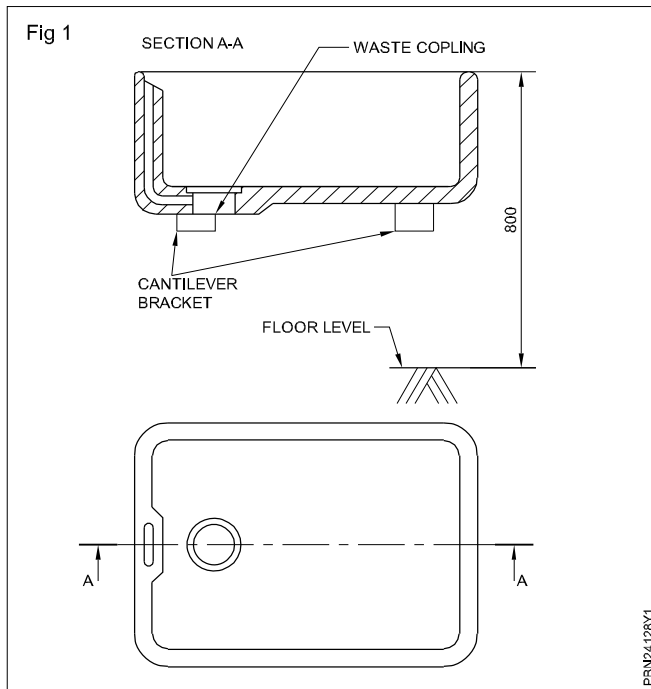
**Objectives:** At the end of the exercise you shall be able to

- prepare sink for installation
- fixing of sink
- provide outlet connection to the sink.

- 1 Hold sink in position in level. (The height of front edge of sink from the floor level shall be 80cm)
- 2 Mark the position of bracket.
- 3 Make a chasing of 100 x 75 x 150cm using chisel etc.
- 4 Fix C.I cantilever bracket in the chasing using cement concrete 1:2:4.
- 5 Cure the concrete.
- 6 Check the sink for any visible defects.
- 7 Place the sink on the bracket.
- 8 Connect chromium plated waste coupling to the sink.
- 9 Connect G.I. or PVC pipe to union and leave to floor trap.
- 10 Check the functioning and leakage in joints.

#### Safety

- Chromium plated coupling does not heavy loaded.
- Don't handle acid material in the sink.
- Don't hidden (or) striking on sink (or) brackets.

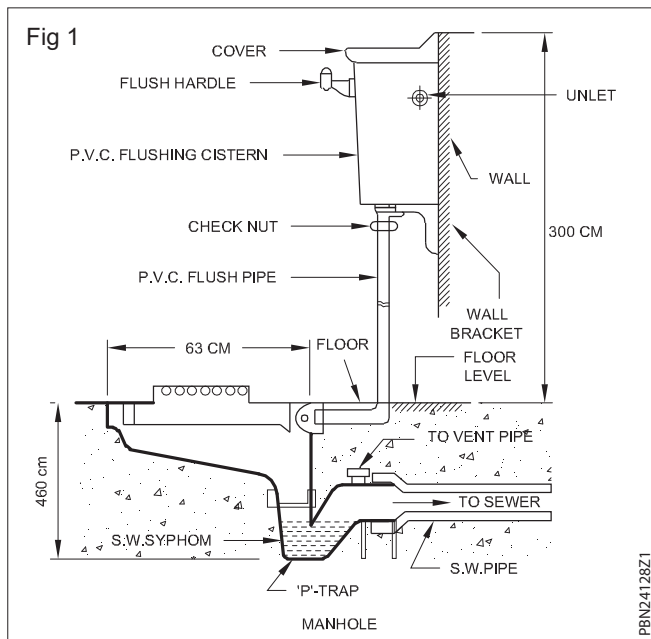


## Installation of IWC

**Objectives:** At the end of the exercise you shall be able to

- laying of particular spot
- fix the 'S' (or) 'P' trap with existing pipe line
- fix the wsc over the trap
- fix the flush cistern with flush pipe.

1 Select the place for IWC.



- 2 Mark the position for fixing closet keep the centre line of closet at 90° to rear wall.
- 3 Place the P or strap in level at required height .
- 4 Check any visible defects in IWC.
- 5 Joint the closet and trap flush pipe using spun yarn soaked in cement paste and cement mortar 1:1.
- 6 Flush pipe is connected in between high level flush cistern and the in let of the water closet yoke.
- 7 Fix foot rest on the shorter arm of the pan on right and left sides.
- 8 Connect water supply line to the flush tank.
- 9 Check any leak with water pressure.

### Safety

- Handle the closet carefully.
- Fix the trap in perfect level.
- Give minimum gradient to the floor.



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**Demonstrate maintenance of water meter, bath tub, hand wash basin, water closet, urinal and sink**

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**Objective:** At the end of the exercise you shall be able to  
• **demonstrate maintenance of sanitary fitting.**

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**PROCEDURE**

**Instructor shall displays and demonstrate to the students regarding the maintenance of water meter, bath tub, hand wash basin, water closet, urinal and sink. Refer the Exercise:2.4.127 and 2.4.128.**

- 1 Trainees will not down all the displayed sanitary fitting name and maintenance.
- 2 Get it checked by the instructor.

**Testing of existing connection to bath tub, washbasin and sink**

**Objectives:** At the end of the exercise you shall be able to

- tracing of existing pipe line in the fittings
- mark the founded area
- repair the leak founded points.

Requirements			
<b>Tools/Instruments</b>		<b>Materials</b>	
• Plumber tool kit	- 1 No.	• Soap oil	- as reqd.
<b>Machines/Equipment</b>		• Thread seal material	- as reqd.
• Compressor	- 1 No.		

**PROCEDURE**

- 1 To find any disconnection in the system. If so make proper connection.
- 2 Close the outlet point in the system.
- 3 Feed pipe compressor air in to the inlet

**Feed 5 P.S.I. exerted in the pipe for 15 to 20 minutes.**

- 4 While pass the gas observe the sound. If abnormal sound may occur, found the point
- 5 Mark and find the leaking point

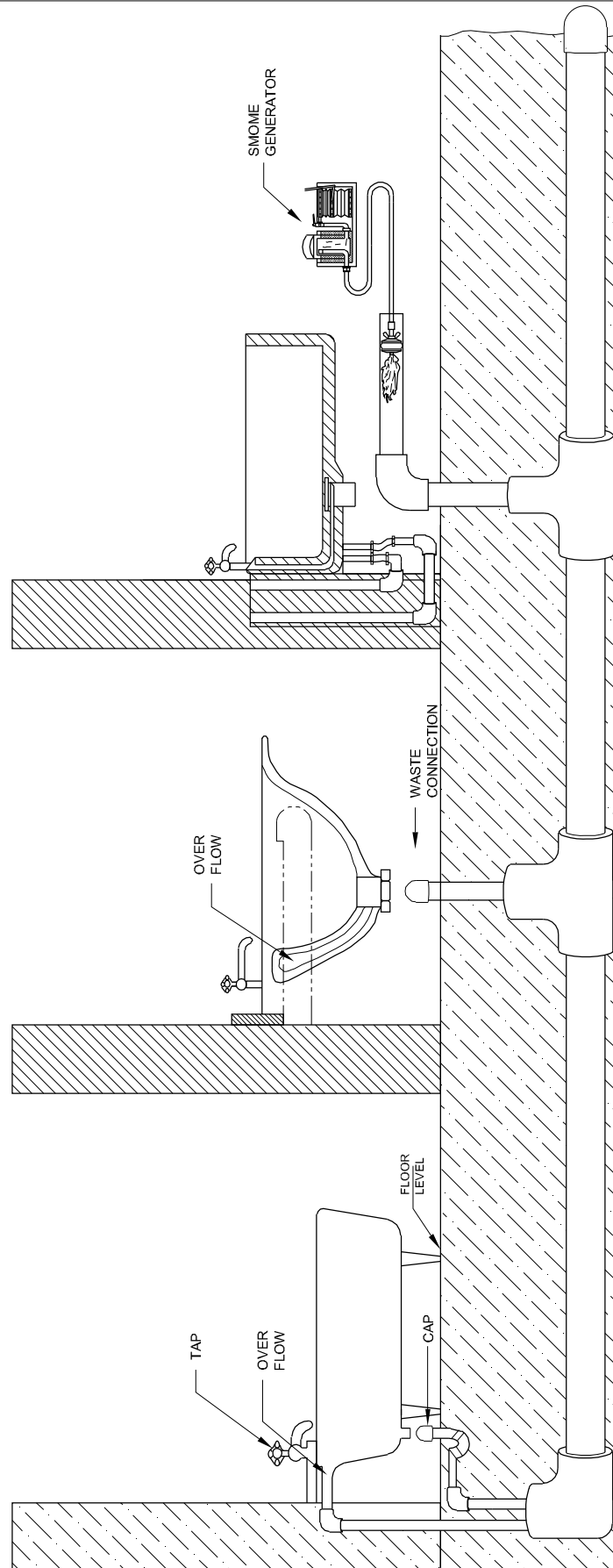
**In the leaking point may be on pipe**

- 1 Before, after the point fitting may dismantle and replace it.

**If the leaking point may be on fitting**

- 1 Particular fitting may dismantle and replace of.
- 2 If any loose fitting
- 3 Make proper tightening of fitting with suitable thread seal materials.

Fig 1



**Exact rain water and drainage pipe system**

**Objectives:** At the end of the exercise you shall be able to

- fix the rain water cutter on the metal shoe end
- connect the PVC pipe to the cutter
- assemble the pipe shoe on end of the pipe.

**Requirements**

**Tools/Instruments**

• Measuring tape	- 1 No.	• Clamp	- as reqd.
• Hammer	- 1 No.	• Cement	- as reqd.
• Chisel	- 1 No.	• Sand	- as reqd.
• Trowel	- 1 No.	• Aggregate	- as reqd.
• Mortar pan	- 1 No.	• Solvent cement	- as reqd.
• Plumb bob	- 1 No.	• Pipe shoe	- as reqd.
• Spade	- 1 No.	• Metal pot	- as reqd.
• Roval jumper	- 1 No.	• Leadle	- as reqd.
• Hammer, chisel	- 1 No.	• Brand C.I.pipe	- as reqd.
• Diamond point chisel	- 1 No.	• Vent cowl	- as reqd.
• Caulking tool	- 1 No.	• Door etc.,	- as reqd.
• Sprit level	- 1 No.	• Door cross 'Y' etc.,	- as reqd.
• Blow lamp	- 1 No.	• Corrosion oil	- as reqd.
• Straight edge	- 1 No.	• Russian blue	- as reqd.
• Water tube level	- 1 No.	• Thread seal	- as reqd.

**Equipment/Materials/Components**

• Drilling machine	- as reqd.	• Clay spun yarn	- as reqd.
• Mason pits	- as reqd.	• Spun yarn	- as reqd.
• Pipe PVC 6"	- as reqd.	• Hemp Yarn	- as reqd.
• Pipe shoe PVC	- as reqd.	• Lead	- as reqd.
• Swan	- as reqd.	• Door band	- as reqd.
• Neck pipe off set pipe	- as reqd.	• Door "Tee"	- as reqd.
• Metal sheet	- as reqd.	• Plain band	- as reqd.
• Gutter	- as reqd.	• Plain "Tee"	- as reqd.
		• Collar	- as reqd.

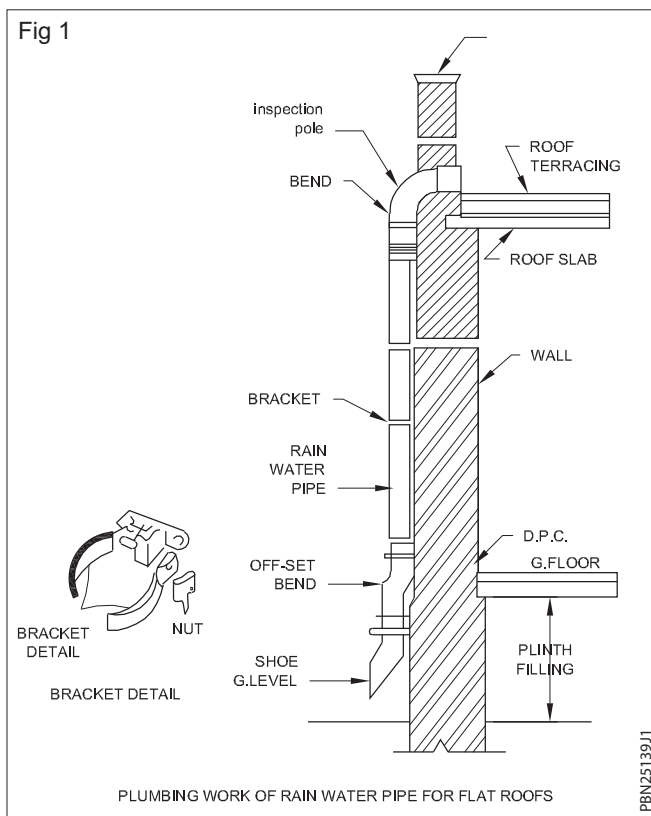
**PROCEDURE**

**TASK 1 : Measure and marking of rain water pipe**

- 1 Measure and mark out the centre line of the pipe by chalk line & plumb bob.
- 2 Check the pipe, bend, shoe for visible defects.
- 3 Fix the bracket
- 4 Take the measurements of pipe line considering the bend will be inserted in pipe & shoe will be atleast 50mm above the grand level.
- 5 Make hole in parapet wall larger than bend's out side dia.
- 6 Fix the bend in concrete 1:2:4 at the hole.
- 7 Cure the concrete
- 8 Joint the pipes from bottom of bend.
- 9 Fix bracket loosely
- 10 Fix shoe to pipe & bracket.
- 11 Test vertically of pipe with plumb bob.
- 12 Connect the rain-water pipe to drainage pipe
- 13 Test it for leakages.

**Safety**

- Fix the pipe rigidly and vertically.
- Inlet shoule be same or below the level of the roof.
- Don't allow debris enter in the pipe.

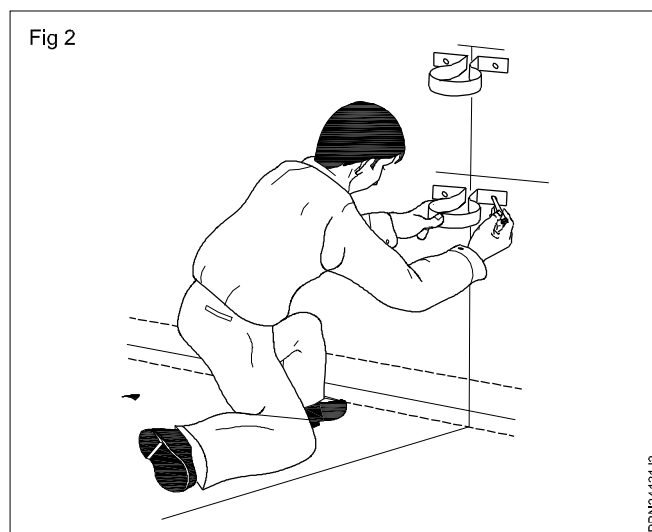
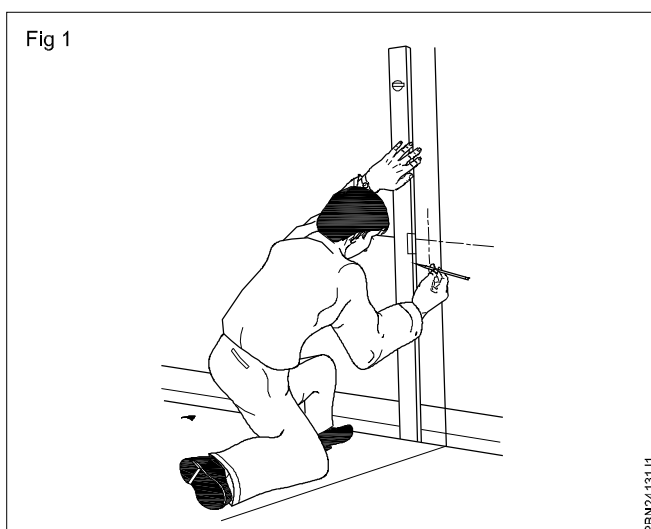


## Fixing of C.I external waste water pipe from bath tub, wash basin and sink

**Objectives:** At the end of the exercise you shall be able to

- measuring and marking of fixing the pipe as per drawing
- connecting the pipe and fittings
- check the joints.

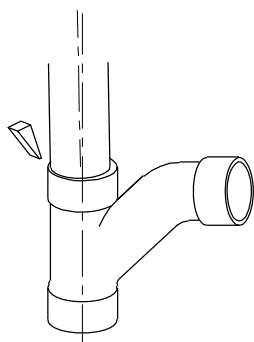
- 1 Measure and mark out the centre line of the pipe work installation on wall.
- 2 Mark the position of all fittings like 'Y' bend etc.
- 3 Check pipe and fitting for visible defects
- 4 Take measurement of the pipe work connecting the fitting including length entering the socket.
- 5 Fix brackets at standard intervals in structure.
- 6 Keep temporarily the pipe and fittings in position with aid to brackets fixed to structure along the centre line of the pipe work.
- 7 Ensure that each pipe is centered fully in to socket.
- 8 Centralise the joint using small wedge or packing.
- 9 Joint the pipe and fittings using lead/cement mortar starting from bottom.



## Safety

- Don't use the damaged tools.
- Fill the complete fitting check the before work.
- All marking accurately.
- Don't loosen the clamp.
- Don't break in the joint of lead.
- Vertical pipe right to angle in the fix.
- The horizontal line in the accurate slope.
- Complete the joint neatly.

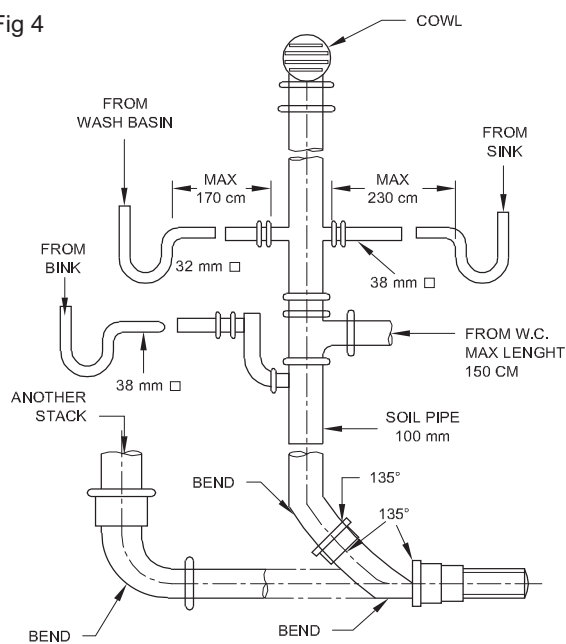
Fig 3



PBN24131J3

- Four way, three way, Y bend, and bend before door fitting may use.
- To check the joints completely.

Fig 4



PBN24131J4

## Fixing of soil pipe, external waste water pipe from W.C and urinal

**Objectives:** At the end of the exercise you shall be able to

- read the drawing
- measure and marking as per drawing in work spot
- connect trap and existing line
- check and test in pipe lines.

- 1 Find the lines.
- 2 Measure and mark the existing line to trap.
- 3 Prepare the material required.
- 4 Connect the trap out let to required chamber.

**If need fittings to connect the pipe lines as per the drawing.**

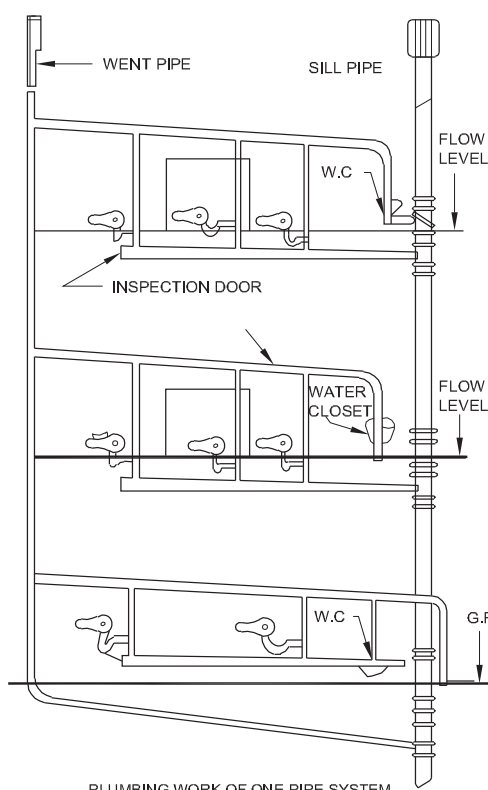
- 5 Check the piping system.

**If available test smell, smoke, odour, water.**

## Safety

- Don't use the damaged tools.
- Check the complete fitting before work.
- All marking accurate.
- The horizontal line in the accurate slope.
- Complete joint with good finishing.
- W.C fixing the level check.
- Check the joint completely.

Fig 1



PBN24131X1

## Bending of G.I pipe portable bending machine

**Objectives:** At the end of the exercise you shall be able to

- prepare G.I pipe for pipe bending
- prepare pipe bender for pipe bending (portable hand operated pipe bender) and hydraulic
- bend the G.I pipe by pipe bender
- check the bended pipe in the angle.

### Requirements

#### Tools/Instruments

- |                    |         |  |            |
|--------------------|---------|--|------------|
| • Ball peen hammer | - 1 No. | • Hydraulic bending machine with all accessories | - as reqd. |
| • Steel tape/rule  | - 1 No. | • Template                                       | - as reqd. |
| • Try square       | - 1 No. | • G.I pipe (12mm - 75mm)                         | - as reqd. |
| • Soft hammer      | - 1 No. | • Wooden plug                                    | - as reqd. |
| • Marking tool     | - 1 No. | • Dry fine silica sand                           | - as reqd. |

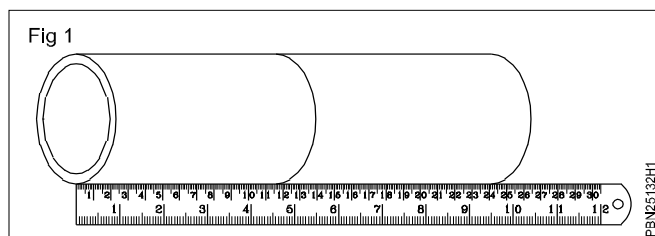
#### Equipment/Materials/Components

- |                            |            |                 |            |
|----------------------------|------------|-----------------|------------|
| • Portable bending machine | - as reqd. | • Marking media | - as reqd. |
|----------------------------|------------|-----------------|------------|

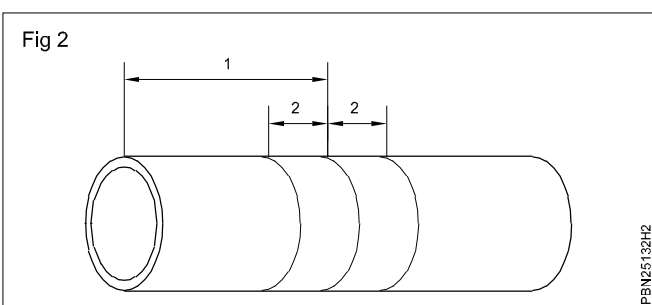
## PROCEDURE

### TASK 1: Portable hand operated pipe bender

- 1 Check the pipe for squareness and ensure it is free from burrs. Measure and mark off the centre of the bend (Fig 1).



- 2 Mark off the beginning and the end of the bend from the centre line (Fig 2).



- 3 Prepare pipe bender for pipe bending.
- 4 Grouting the machine properly.

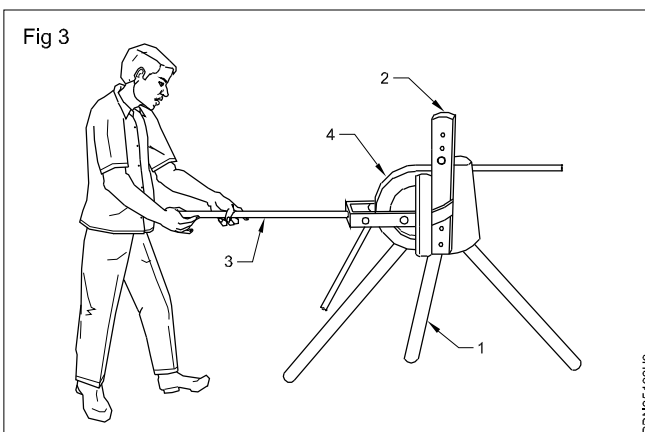
**Ensure that the stance is properly balanced while bending.**

- 5 Bending the pipe by pipe bender.

- 6 Check the bender with all components (Fig 3).
- 7 Insert the pipe with suitable former.
- 8 Push off the leverage handle.

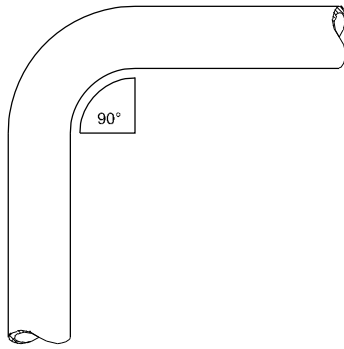
**Give gradual load to the machine.**

- 9 Bend required angle of the pipe.
- 10 Check the bended pipe.
- 11 Check the angle and radius of bend using templates. (Fig 4 & 5)



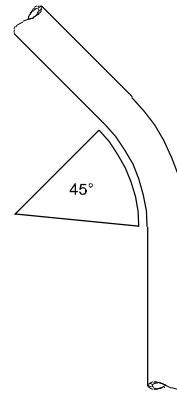
- |                       |                    |
|-----------------------|--------------------|
| i Tripod stand        | ii Pipe stop lever |
| iii Handle (or) lever | iv Inside former   |

Fig 4



PSN25132H4

Fig 5



PSN25132H5

## TASK 2: Prepare bending machine for hydraulic

1 Select and locate the machine.

**If arrange require size of former (inner and back) and pipe.**

2 Set the former.

3 Open the pressure release valve.

4 Insert the inner former.

5 Set the pipe in proper location.

6 Close the base plate on proper hole.

7 Close the pressure release valve.

8 Pull and push the operating lever.

**Provide pressure to the pipe, it may occur to bend.**

9 Inner formers are interchangeable and are able to bend pipes upto 75mm diameters. (Fig 1A,1B,1C,1D,1E&1F)

- Inner former
- Back former
- Hydraulic ram
- Pressure release valve
- Operating lever
- Bleed screw
- Base plate

10 Stop the pull and push by the operating lever.

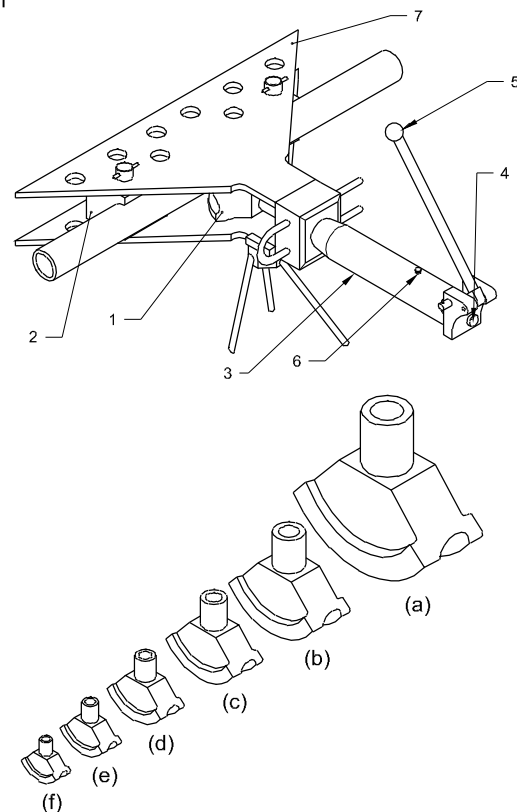
**If achieved required angle to bend stop the process of pull and push.**

11 Open the pressure release valve.

12 Open the base plate and remove the pipe from the machine.

13 Check the angle of bending the pipe by using of templet.

Fig 1



PSN25132J1



## Bending G.I pipe of different diameter in different angle

**Objectives:** At the end of the exercise you shall be able to

- prepare G.I pipe for pipe bending
- prepare pipe bender for bending
- bench type hand operated pipe bender
- bend the G.I pipe by pipe bender
- check the bended angle in the pipe.

### Requirements

#### Tools/Instruments

- Try square - 1 No.
- Scriber - 1 No.
- File - 1 No.
- Ball peen hammer - 1 No.
- Hacksaw with blade - 1 No.
- Bench vice (or) pipe vice - 1 No.
- Lever - 1 No.

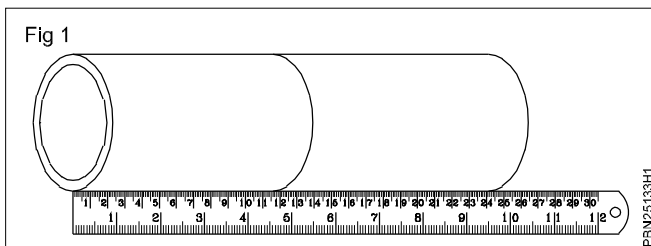
#### Equipment/Materials/Components

- Bench type hand operated - as reqd.
- pipe bender - as reqd.
- Template - as reqd.
- G.I. pipe - as reqd.

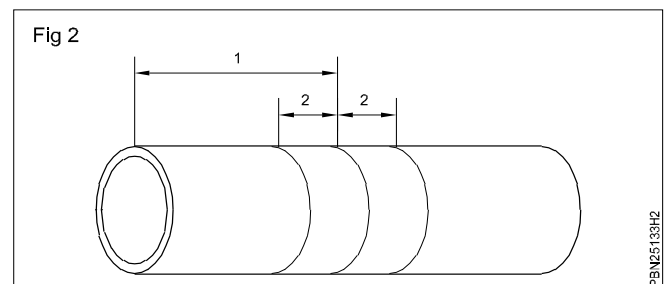
### PROCEDURE

#### TASK 1 : Prepare G.I. pipe for pipe bending

- 1 Check the pipe for squareness and ensure it is free from burrs. Measure and mark off the centre of the bend. (Fig 1)

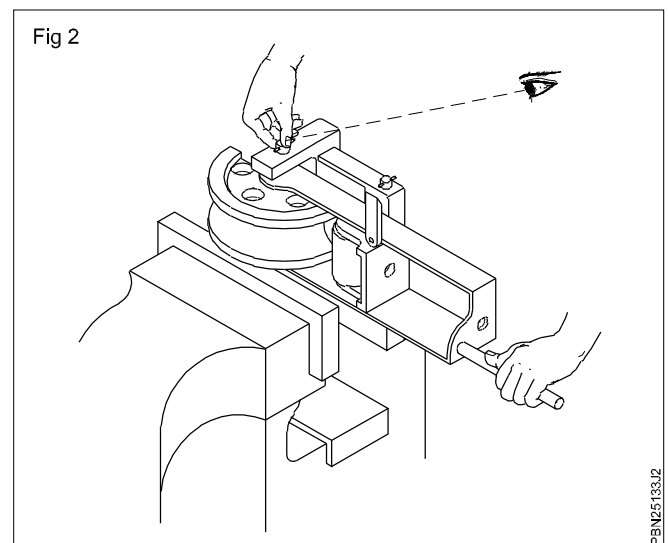
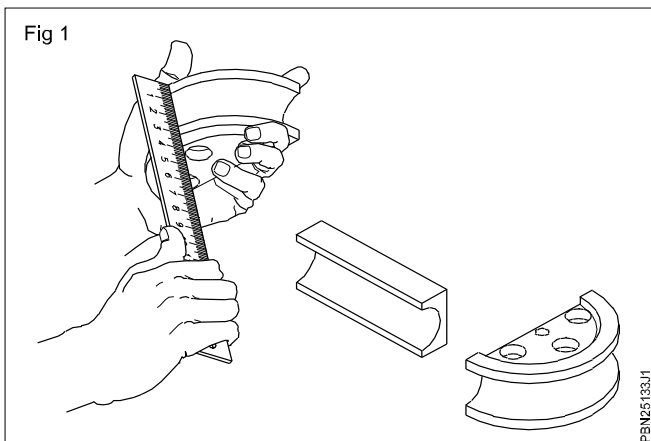


- 2 Mark off the beginning and the end of the bend from the centre line. (Fig 2)



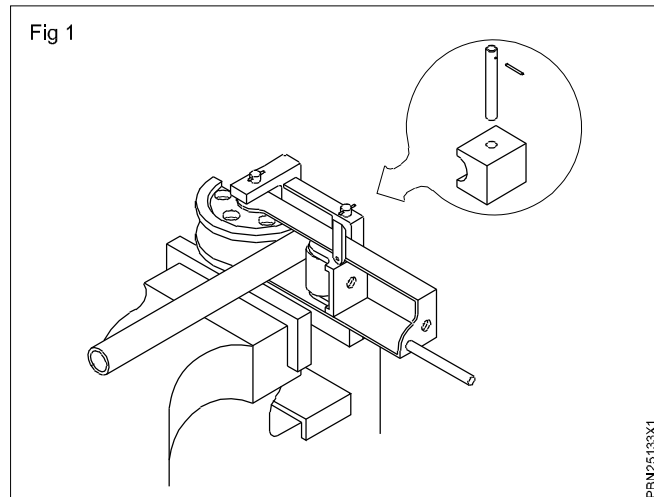
#### TASK 2 : Prepare pipe bender for pipe bending

- 1 Select the former to suit the size of the pipe (Fig 3).
- 2 Clamp the bending machine in a bench vice.
- 3 Keep the former in position and lock with a pin (Fig 4).

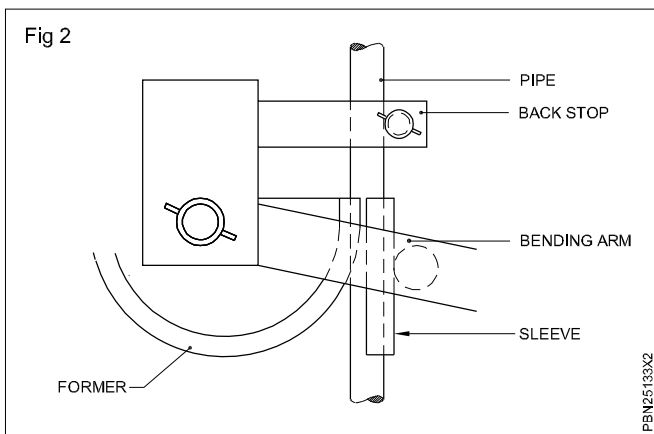


### TASK 3 : Bend the G.I pipe by pipe bender

- 1 Fix the back-stop with a pin (Fig 1).

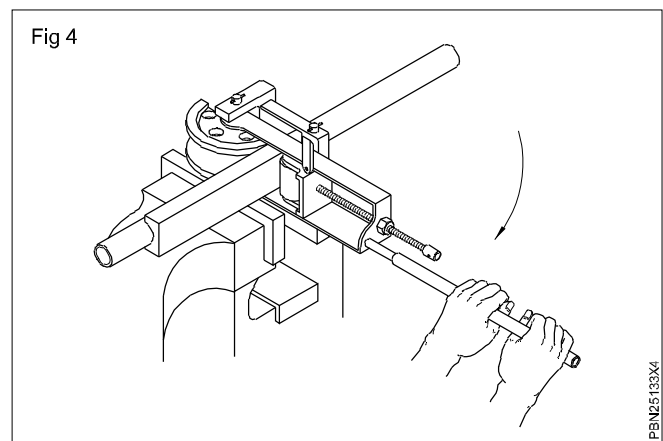
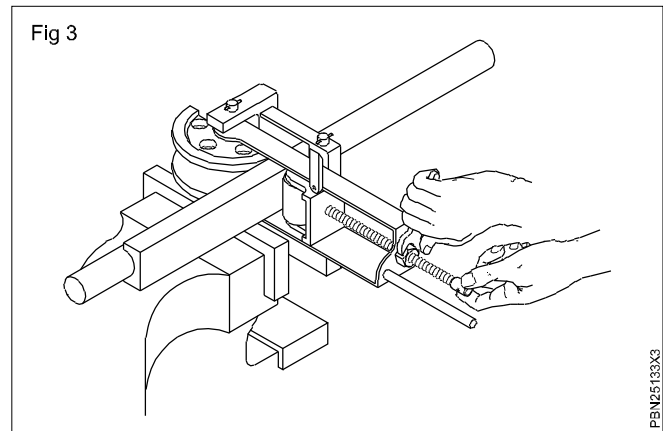


- 2 Place the pipe in the bending machine, passing it through the bending arm and ensuring that it is seated with the groove of the former and against the back-stop, (Fig 2) and set the roller on the bending arm by adjusting the screw and lock nut (Fig 3).



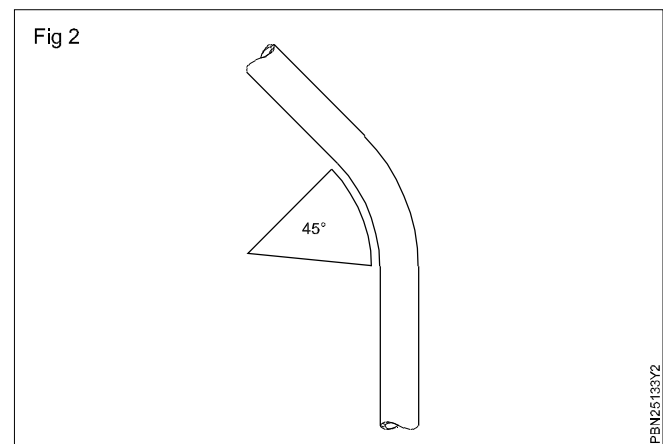
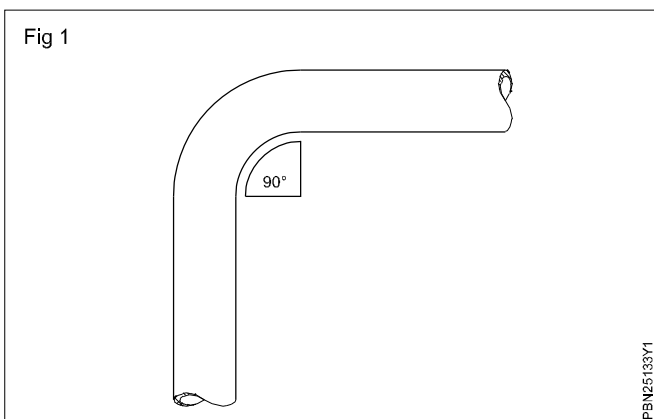
- 3 Bend the pipe by pulling the bending arm towards your body (Fig 4).

**Ensure that the stance is properly balanced while bending.**



### TASK 4 : Check the bended angle in the pipe

- 1 Check the angle and radius of bend using templates. (Fig 1 & 2)



## Bending of G.I pipe as per drawing and measurement

**Objectives:** At the end of the exercise you shall be able to

- measure and mark the bending of G.I pipe or PVC pipe by hot method
- prepare the bending machine for bending the pipe
- pre-heat the bending the pipe
- hold and bend the pipe on bending machine
- bend the pipe
- check the bending of pipe.

### Requirements

#### Tools/Instruments

- File - 1 No.
- Hammer - 1 No.
- Steel rule - 1 No.
- Measuring tape - 1 No.
- Try square - 1 No.
- Hand hacksaw with blade - 1 No.

#### Equipment/Materials/Components

- Pipe bending M/C with accessories - as reqd.
- Blow lamp - as reqd.

- Oxy-acetylene torch - as reqd.
- Bench vice - as reqd.
- Portable forging machine - as reqd.
- G.I pipe - as reqd.
- Sand - as reqd.
- Wooden plug - as reqd.
- Template - as reqd.
- Funnel - as reqd.
- Marking media - as reqd.

## PROCEDURE

### TASK 1 : Bend G.I pipe by hot method

- 1 File the pipe ends square.
- 2 Remove burrs.
- 3 Calculate the length of pipe.
 

If  $D$  = diameter of bend  
 $\phi$  = angle of bend  
 $l$  = length of curved portion

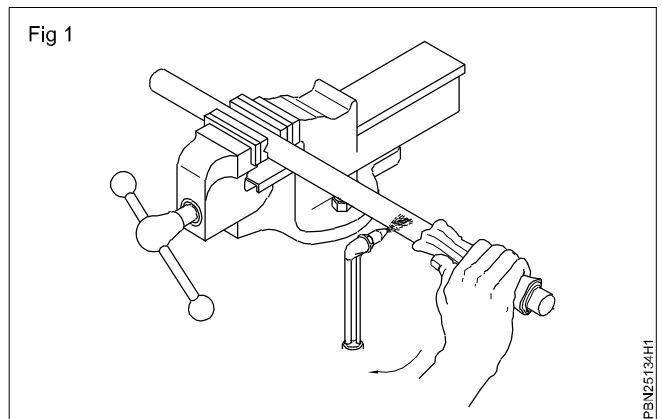
then,  $l = \frac{\pi \times D \times \phi}{360}$

If  $OA$  = inner radius of bend (R)  
 $AB$  = radius of pipe (r)  
 $OB$  = radius of bend (R+r)

then,  $l = (R+r) \times 0.01745 \times \phi$ .
- 4 Measure and mark off the:
  - centre of the bend
  - beginning and end of the bend from the centre line.
- 5 Measure the inside diameter of the pipe and select two suitable wooden pegs for the pipe.
- 6 Plug one end of the pipe with a wooden peg.
- 7 Fill the pipe with clean, dry and fine sand (Compress the sand by tapping the pipe up and down with a soft hammer.) and plug the other end.

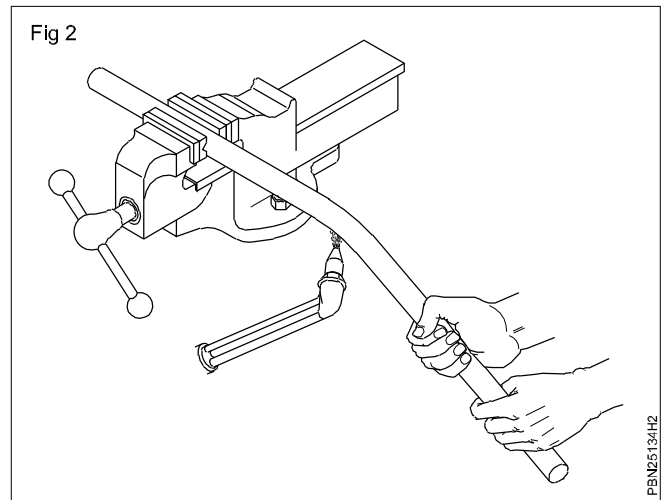
- 8 Clamp one end of the pipe in a vice and protect the clamped portion of the pipe with lead or copper shims.
- 9 Heat the area to be bent with oxy-acetylene torch evenly until it glows dull red (Fig 1).

Fig 1



- 10 Pull down the pipe gently in the direction of the bend.
- 11 Take short pulls until the correct bend angle is reached.
- 12 Check the bend radius with a template.
- 13 Apply heat throughout the whole operation and overbend slightly and straighten out the final bend.
- 14 Remove one end of the plug.

15 Remove the sand by tapping the pipe gently with a hammer (Fig 2).



-----

## Bend PVC pipe of different diameter in different angle with dry sand by heating

**Objectives:** At the end of the exercise you shall be able to

- prepare PVC pipe for bending
- prepare PVC pipe bending machine
- explain the bending procedure.

Requirements			
Tools/Instruments			
• Safety glasses	- 1 No.	• Rotary tool	- 1 No.
• Respirator	- 1 No.	• Drill	- 1 No.
• Solvent proof gloves	- 1 No.	• Dead blow hammer	- 1 No.
• Heat resistant gloves	- 1 No.	<b>Equipment/Materials/Components</b>	
• Steel wool	- 1 No.	• Heat gun	- as reqd.
• Sand paper	- 1 No.	• PVC pipe cutting machine	- as reqd.
• Measuring tape	- 1 No.	• PVC pipe bending heaters	- as reqd.
• Calipers	- 1 No.	• Frp control panel	- as reqd.
• 4" bar clamps	- 1 No.	• PVC pipe bend heater control panel	- as reqd.
• Hacksaw	- 1 No.	• PVC pipe bend socket heater	- as reqd.
• Deburring tool	- 1 No.	• Bend spring 25mm	- as reqd.

### PROCEDURE

#### TASK 1 : Using an oven

- 1 Use hot sand to fill the pipe and bend it without collapsing.
- 2 Heat your oven to 425°F (281.3°C)
- 3 Fill the pipe with sand so that it is a few inches past the bend block off one end.
- 4 Pour the sand into an oven-safe dish and put it in the oven.
- 5 Carefully pour the hot sand back into the PVC pipe.
- 6 Slowly bend the pipe into your desired shape.
- 7 Empty the sand out and let the pipe cool.

Fig 1



PBN25135H1

#### TASK 2 : Using a hair dryer or heat gun

- 1 Fill the pipe with enough sand to cover two to three inches above the planned bend.
- 2 Apply the heat evenly around your planned bend.
- 3 Slowly bend the pipe applying more heat as necessary.
- 4 Remove the sand and let the pipe cool.

#### Safety

- Bending procedures must be conducted in well ventilated area.
- Always use protective clothing.
- Use safety glasses.
- Do not expose pipe to open flames or excessive temperature.

Fig 2



PBN25135H2

## Process of C.I pipe cutting and joining

**Objectives:** At the end of this exercise you shall be able to

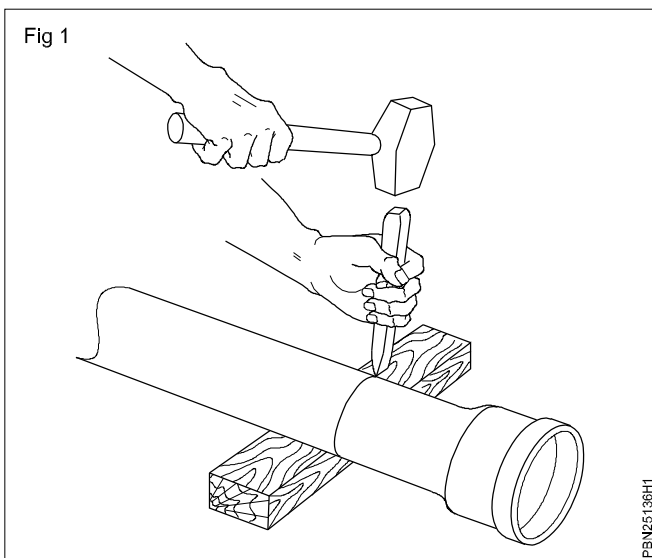
- identify the tools for C.I pipe cutting
- mark the lines as per drawing
- cutting C.I pipes
- join the C.I pipes.

Requirements			
Tools/Instruments		Equipment/Materials/Components	
• Powered miter saw	- as reqd.	• Cotton waste	- as reqd.
• Tube cutter	- as reqd.	• Adhesive	- as reqd.
• Solder and proper torch	- as reqd.	• Putty knife	- as reqd.

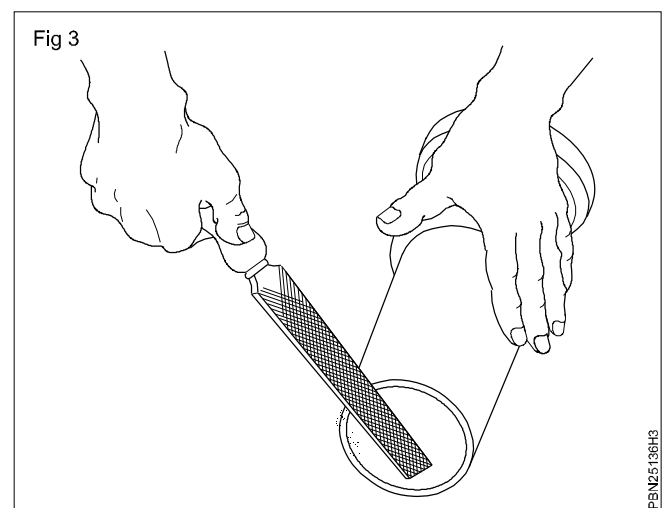
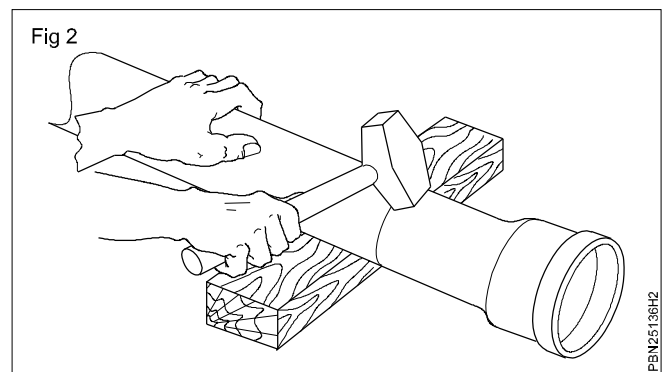
### PROCEDURE

#### TASK 1 : Cutting of cast iron pipe

- 1 Measure accurately length of pipe required.
- 2 Make square round the pipe.
- 3 Place the pipe over wooden "V" block.
- 4 Cut the pipe along the mark (Fig 1).



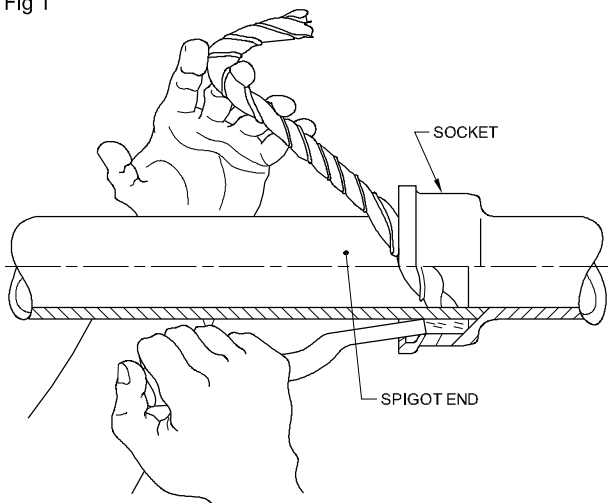
- 5 Tap the end of the pipe after 3 or 4 cut around the pipe (Fig 2).
- 6 Rotate the pipe if the cut does not break.
- 7 Repeat cutting and taping till pipe is cut.
- 8 File the edge with flat file (Fig 3).



#### TASK 2 : Joining cast iron pipe

- 1 Clean the socket inside and outside of pipe (spigot end) to be jointed.
- 2 Place the spigot end inside the socket (Fig 1).
- 3 Yarn the joint tightly to a depth of 1/3 the socket lengths.

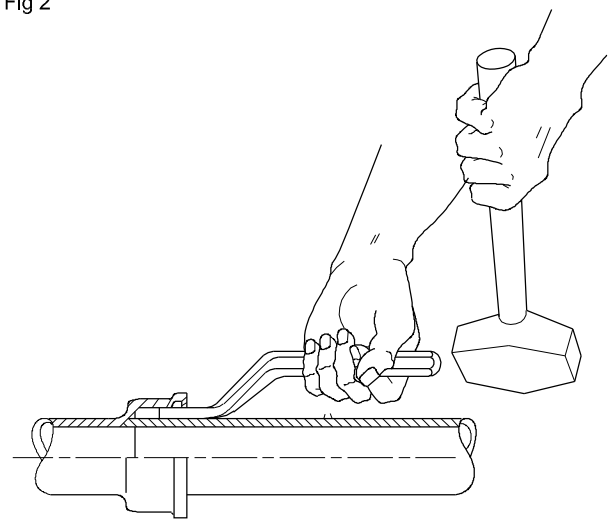
Fig 1



PBN25136J1

- 4 Compact the yarning material solidly right around the joint with right yarning iron (Fig 2).

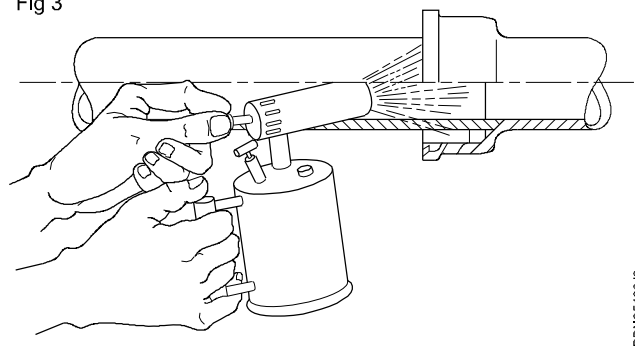
Fig 2



PBN25136J2

- 5 Burn off any loose strand of material. Sticking up from the joint (Fig 3).
- 6 Apply powdered resin or a small amount of glease to the joint. (Incase of vertical joints molten lead can be poured now.)
- 7 Place flexible asbestors cord/rope approximately 25mm  $\phi$  around the pipe.

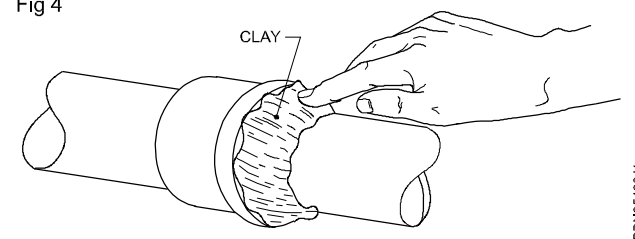
Fig 3



PBN25136J3

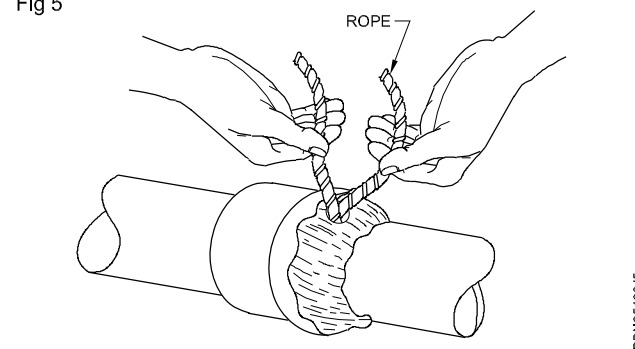
- 8 Push the cord firmly up in the socket.
- 9 Wrap stiff clay around the rope. Shape the mould by wet thumb (Fig 4).
- 10 Remove rope carefully leaving the pour hole on top of the pipe (Fig 5).

Fig 4



PBN25136J4

Fig 5



PBN25136J5



## Process of C.I pipe fitting for waste water pipe from bath tub, wash basin and sink

**Objectives:** At the end of this exercise you shall be able to

- measuring and marking of fixing the pipe as per drawing
- connecting the pipe and fittings
- check the joints.

### Requirements

#### Tools/Instruments

- |                        |            |                        |            |
|------------------------|------------|------------------------|------------|
| • Hammer, chisel       | - as reqd. | • Brand C.I. pipe      | - as reqd. |
| • Diamond point chisel | - as reqd. | • Vent cowl            | - as reqd. |
| • Measuring tape       | - as reqd. | • Door etc.,           | - as reqd. |
| • Caulking tool        | - as reqd. | • Clamp                | - as reqd. |
| • Sprit level          | - as reqd. | • Door cross 'Y' etc., | - as reqd. |
| • Spade, mortar pan    | - as reqd. | • Corrosion oil        | - as reqd. |
| • Plumb bob            | - as reqd. | • Russian blue         | - as reqd. |
| • Blow lamp            | - as reqd. | • Cement               | - as reqd. |
| • Trowel               | - as reqd. | • Sand                 | - as reqd. |

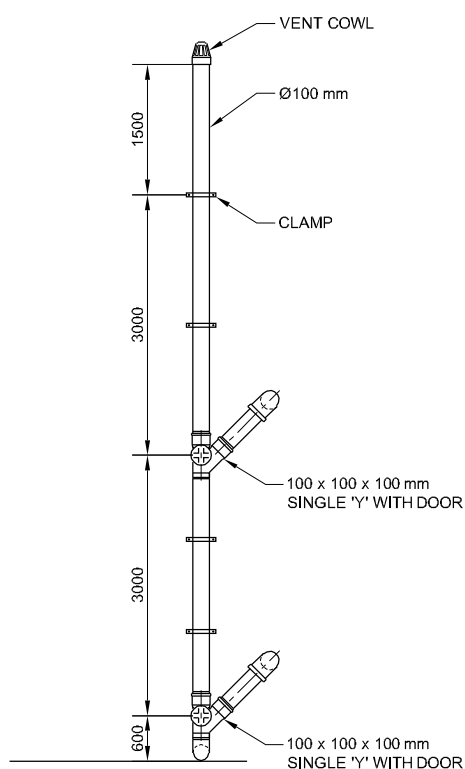
#### Equipment/Materials/Components

- |             |            |                  |            |
|-------------|------------|------------------|------------|
| • Metal pot | - as reqd. | • Aggregate      | - as reqd. |
| • Leadle    | - as reqd. | • Thread seal    | - as reqd. |
|             |            | • Clay spun yarn | - as reqd. |
|             |            | • Sprit level    | - as reqd. |

### PROCEDURE

- 1 Measure and mark out the centre line of the pipe work installation on wall.

Fig 1



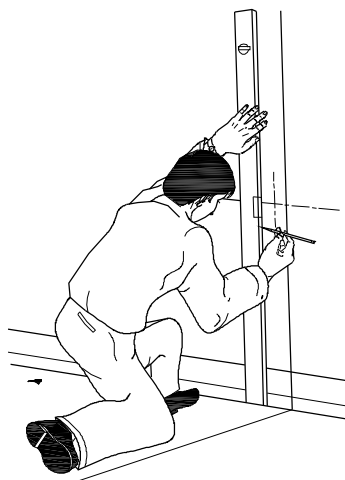
- 2 Mark the position of all fillings like 'Y' bend etc.
- 3 Check pipe and fitting for visible defects
- 4 Take measurement of the pipe work connecting the fitting including length entering the socket.
- 5 Fix brackets at standard intervals in structure.
- 6 Keep temporarily the pipe and fittings in position with aid to brackets fixed to structure along the centre line of the pipe work.
- 7 Ensure that each pipe is centered fully in to socket.
- 8 Centralise the joint using small wedge or packing.
- 9 Joint the pipe and fittings using lead/cement mortar starting from bottom.
- 10 Tighten the brackets.
- 11 Cure the cement joint.
- 12 Conduct test for leakage.

#### Safety

- Don't use the damaged tools.
- Fill the complete fitting check the before work.
- All marking accurately.
- Don't loose the clamp.

- Don't the break in the joint of lead.
- Vertical pipe right to angle in the fix.
- The horizontal line in the accurate slope.
- Complete all joint in neatly.
- Use four way, three way, Y bend, and bend before door fitting may use.
- Check the joints completely.

Fig 2



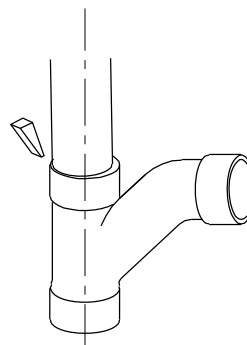
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Fig 3



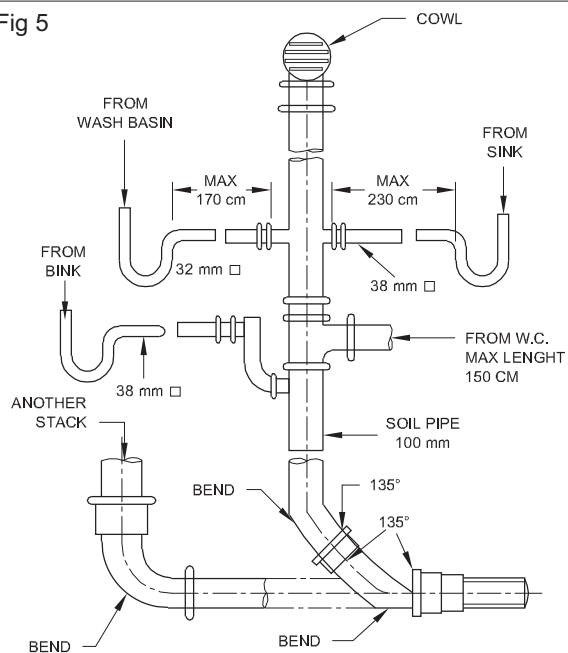
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Fig 4



PSN25137H4

Fig 5



PSN25137H5

**Fixing of soil pipe, external waste water pipe from W.C and urinal**

**Objectives:** At the end of the exercise you shall be able to

- read the drawing
- measure and marking as per drawing in work spot
- connect trap and exisiting line
- checkand test in pipe lines.

**Requirements**

**Tools/Instruments**

- Measuring tape - as reqd.
- Spade - as reqd.
- Trowel - as reqd.
- Mortar pan - as reqd.
- Plumb bob - as reqd.
- Sprit level - as reqd.
- Straight edge - as reqd.
- Water tube level - as reqd.

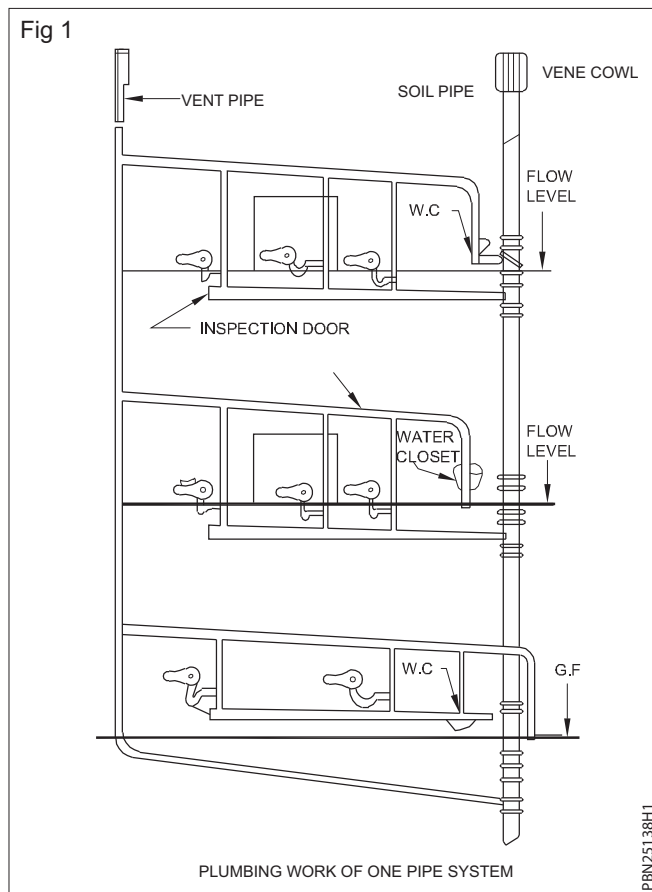
**Equipment/Materials/Components**

- PVC or C.I Pipe - as reqd.
- Spun yarn - as reqd.

- Hemp Yarn - as reqd.
- Lead - as reqd.
- Cement - as reqd.
- Solvent cement - as reqd.
- Fine grain river sand - as reqd.
- Aggregate - as reqd.
- Door band - as reqd.
- Door "Tee" - as reqd.
- Plain band - as reqd.
- Plain "Tee" - as reqd.
- Collar - as reqd.

**PROCEDURE**

1 Find the line's.

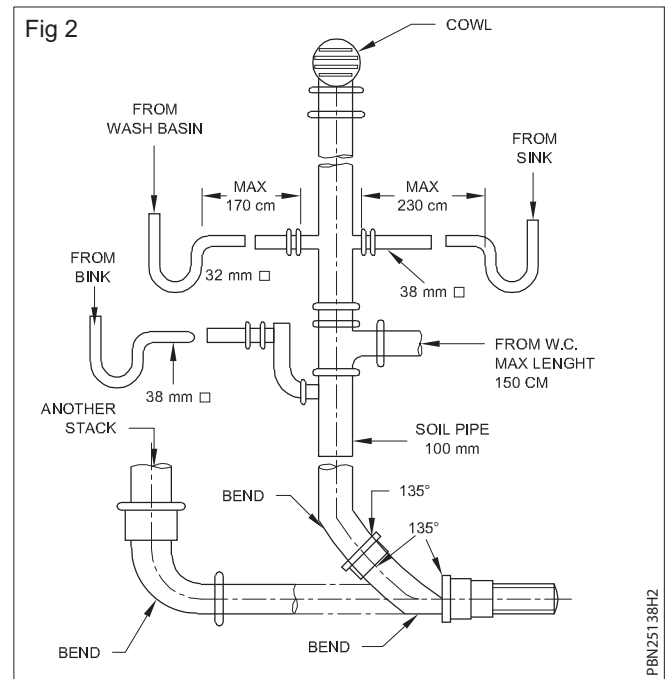


2 Measure and mark the exisiting line to trap.

3 Prepare the material required.

4 Connect the trap out let to the required chamber.

**If need fittings to connect the pipe lines as per the drawing.**



5 Check the piping system.

**If available test smell, smoke, odour, water.**

**Safety**

- Don't use the damaged tools.
- All the complete fitting to be check before work.

- Ensure all marking accurate.
- The horizontal line should be in the accurate slope.
- Complete the joint of good finishing.
- Check the level of W.C fixing.
- Check the joint completely.

— — — — — — — —

**Demonstrate the process of fixing rain water gutter outlet & ground pipe**

**Objectives:** At the end of the exercise you shall be able to

- fix the rain water cutter on the metal shoe end
- connect the PVC pipe to the gutter
- assemble the pipe shoe on end of the pipe.

**Requirements**

**Tools/Instruments**

• Measuring tape	- 1 No.	• Mason pits	- as reqd.
• Hammer	- 1 No.	• Pipe PVC 6"	- as reqd.
• Chisel	- 1 No.	• Pipe shoe PVC	- as reqd.
• Trowel	- 1 No.	• Swan	- as reqd.
• Screw driver	- 1 No.	• Neck pipe off set pipe	- as reqd.
• Sprit level	- 1 No.	• Metal sheet	- as reqd.
• Mortar pan	- 1 No.	• Gutter	- as reqd.
• Plumb bob	- 1 No.	• Clamp, Cement, Sand	- as reqd.
• Spade	- 1 No.	• Aggregate	- as reqd.
• Roval jumper	- 1 No.	• Solvent cement	- as reqd.

**Equipment/Materials/Components**

• Drilling machine	- as reqd.	• Pipe shoe	- as reqd.
		• PVC bend	- as reqd.
		• Bracket	- as reqd.

**PROCEDURE**

**TASK 1 : Demonstrate to the trainee about fixing rain water gutter outlet and ground pipe**

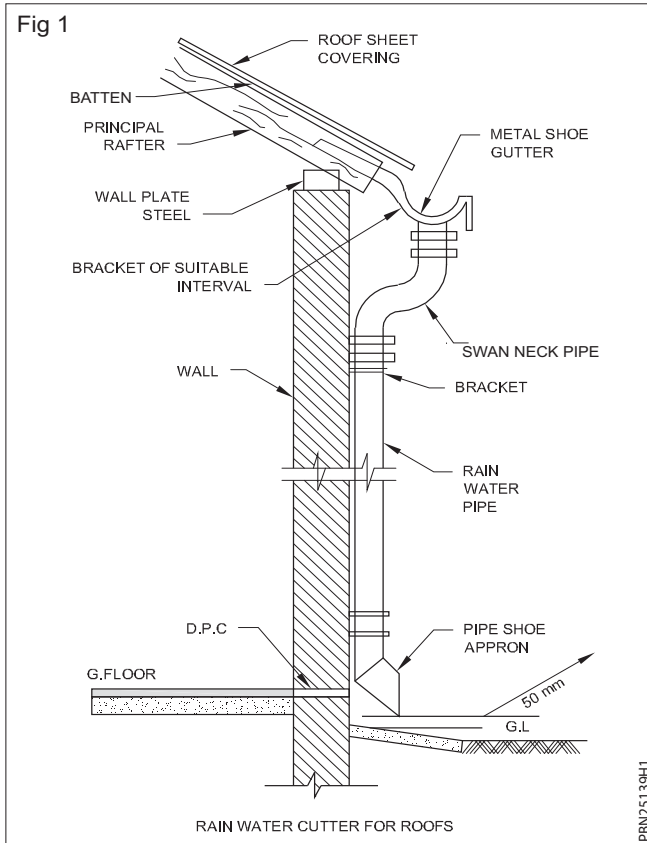
**TASK 2 : Fixing rain water gutter**

- 1 Place the gutter
- 2 Fix the gutter on metal shoe end.
- 3 Measure and mark out the centre line of the rainwater pipe.
- 4 To connect the rain water pipe in a gutter out let.
- 5 Fix the rain water pipe with bracket at required length.
- 6 Join the pipe from bottom of cutter.
- 7 Test vertically of pipe with plumb bob.

**Safety**

- Check the complete fitting on the joints.

**If in the bottom of the pipe we must provide pipe shoe to fix shoe above 50mm height of the ground level.**



**Demonstrate process of measurement waste pipe from wash basin & bath to gully chamber**

**Objectives:** At the end of the exercise you shall be able to

- read the layout
- prepare the materials list
- joint the pipe for existing pipe line
- take measurement.

**Requirements**

**Tools/Instruments**

- Pipe wrench 250mm, 300mm - as reqd.
- Spanner set - as reqd.
- Hammer - as reqd.
- Chisel - as reqd.
- Tester - as reqd.
- Water pump plier - as reqd.
- Screw driver - as reqd.

**Equipment/Materials/Components**

- Hammer drilling machine - as reqd.
- P.V.C connection 1/2" heavy duty - as reqd.
- G.I fitting - as reqd.
- G.I pipe - as reqd.
- Thread seal material - as reqd.
- Marking media - as reqd.
- Special clamp - as reqd.

**PROCEDURE**

**TASK 1 : Demonstrate process of measurement of water pipe line**

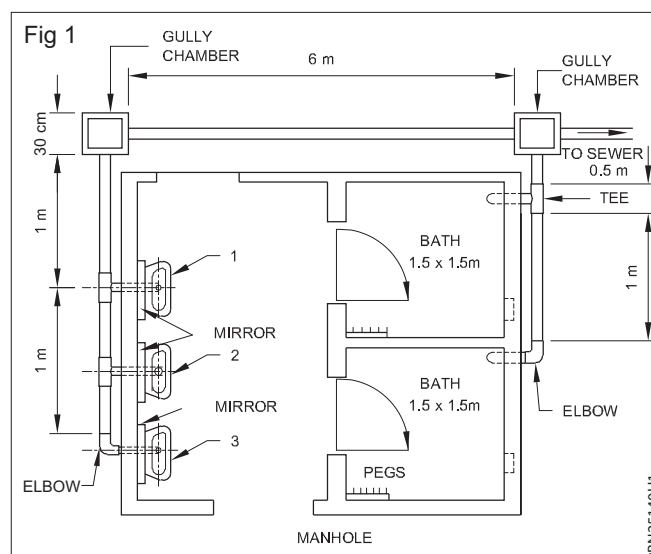
- 1 Use a ruler or measuring tape to find the circumference or the length between the tip of the string.
- 2 Always measure the outside diameter of waste pipe to the nearest millimeter.
- 3 Use a tape measure or vernier gauge, then find this size down the left hand column read across the four coloured columns on the right to find the group and description of pipe size.
- 4 To determine the waste pipe slope subtract the two manhole inverts and divide the difference by the pipe distance and multiply by one hundred to obtain the percentage grade of the pipe.
- 5 Check and measure the slope of sewer pipe it should  $\frac{1}{4}$ " inches.
- 6 Waste water pipes shall not less than  $1\frac{1}{4}$  inches in diameter.
- 7 Always measure waste pipe with outside diameter only.

**TASK 2 : Demonstrate process of measurement of waste pipe line**

- 1 Connect the pipe from wash basin to inspection chamber using with elbow-1 no, tee-2 nos with 2m of pipes.
- 2 Connect the pipe from one chamber to another chamber using 6m pipe.
- 3 Another side bathroom waste water line connect to the chamber with the help of elbow-1no., tee-1no. and pipe 1.5 m.
- 4 End of pipe line connect man hole.

**Estimation**

- Elbow - 2 nos
- Tee - 3 Nos.
- Pipe - 9.5 m
- Solvent cement - 200 ml.
- Gully chamber - 30 x 30 cm.
- Chamber frame with cover



## Demonstrate working of solar water heating system

**Objectives:** At the end of the exercise you shall be able to

- identify the parts of solar water heater
- locate the hot and cold pipes lines.

### Requirements

#### Tools/Instruments

- Plumber tool kit - 1 No.
- Measuring tape - as reqd.
- Tester - as reqd.
- Spanner set - as reqd.

#### Equipment/Materials/Components

- Solar water heater - as reqd.
- Mobil oil - as reqd.
- Insulater - as reqd.
- Pipes and fittings - as reqd.
- Cement motar - as reqd.

### PROCEDURE

#### TASK 1 : Demonstrate working of solar water heating system

- 1 Identifying the parts of solar water heater system (Fig 1).
- 2 Check the water pipe lines connection (Fig 2).
- 3 Check the mounting of solar water heater.
- 4 Inspect the electrical connection given as per layout.
- 5 Switch on and check the heating element function.
- 6 Check the freeze protection system.
- 7 Inspect the over heat protection system function (Fig 3&4).

Fig 1

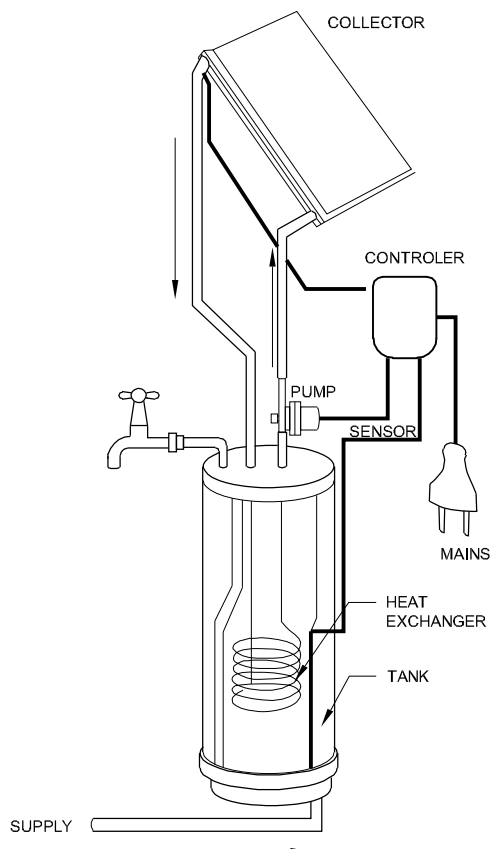
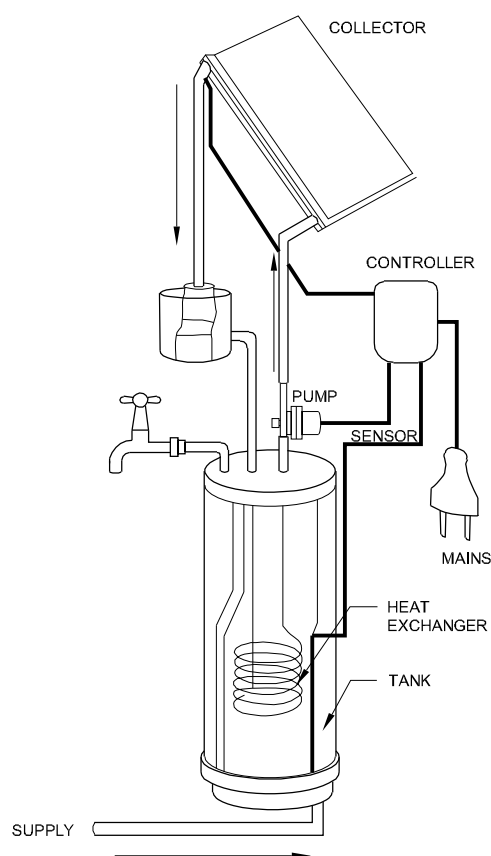
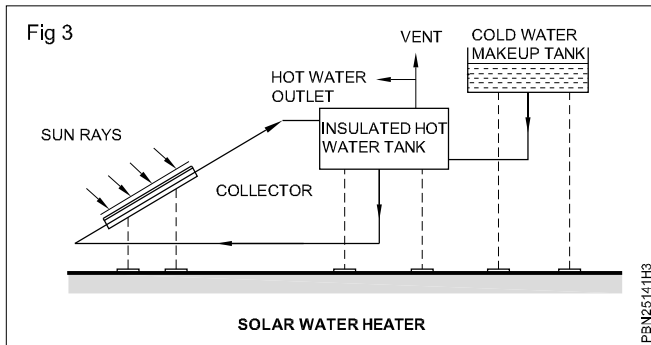


Fig 2

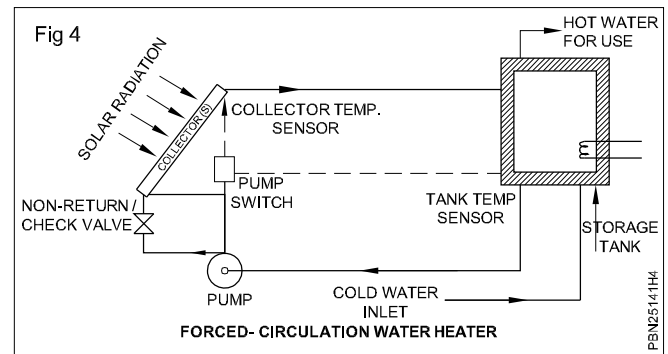


### Safety tips

- Use proper tools.
- Use safety equipment.
- Do not tamper electrical lines.



- Check the electrical point and board.
- Hot water connection to be provided in left hand side only.





**Analysis temperature of water heating system**

**Objectives:** At the end of the exercise you shall be able to

- **prepare the thermometer**
- **test the temperature of hot water and cold water.**

Requirements			
<b>Tools/Instruments</b>			
• Tool kit	- as reqd.	• Gloves	- as reqd.
<b>Equipment/Materials/Components</b>		• Goggles	- as reqd.
• Thermometer	- as reqd.	• G.I data sheet	- as reqd.

**PROCEDURE**

**TASK 1 : Analyse temperature of hot water**

- 1 Find a good location for depth measurements. (Identify this would happen from a dock or boat where you would have access to deeper water.)
- 2 Put on protective gloves if you are sampling near shore.
- 3 Measure the temperature of the water at the surface by submerging the temperature probe to a depth of 5cm in several locations.
- 4 Either weight and lower your digital thermometer or, use the TERC water pump, take water samples at depths of 5 (if you did not do surface testing), 10cm, 50cm, 100cm, 150cm and (optional) 200cm and so on.
- 5 Measure the temperature of these water samples in the field using the temperature probe.

**TASK 2 : Analyse temperature of cold water**

- 1 Using the temperature probe or a thermometer, measure the air temperature in several locations over the body of water.
- 2 Be sure to measure in both sunny and shady locations.
- 3 Mark the temperature on data sheet.

**TASK 3 : Analyse temperature of hot and cold water**

- 1 Always fix hot water on the left side.
  - 2 Ensure cold water pipe placed on right side.
  - 3 Water pipe line located bellow ground to withstand cold temperature 55°F during winter season.
  - 4 Check the water heater have build in heat traps to limit migration of hot water.
  - 5 Inspect the maximum operating temperature for PVC pressure pipe is not to exceed 140°F.
  - 6 Always use PVC pipes for hot water.
  - 7 To prevent tap water scalds the hot water should be not hotter than 49°C (120°F).
  - 8 Check the water by touching you should not get so hot. It should be designed to be well insulated.
  - 9 Ensure hot and cold water pipes approximately 6 inches apart to ensure that cold water line does not pickup heat from the hot water line.
  - 10 All the water pipe lines that are ¾ inch or larger must be insulated.
  - 11 Check that there is no back flow for from hot and cold water system which increase pressure and temperature.
  - 12 Ensure that the sediments accumulated in the bottom of the tank not to affect the heating elements effectiveness.
- Safety tips**
- Ensure proper pipe line excavations procedure.
  - Use appropriate PPE while working.
  - Inspect all tools used on site.
  - Ensure clear and easy route to emergency exits and equipments.
  - Always use correct procedure while insulating water pipe lines.

**Layout pipe line for hot and cold water lines to bath tub and wash basin**

**Objectives:** At the end of the exercise you shall be able to

- preparation of materials list
- give hot water connection to bath tub and wash basin
- fix of water heater.

**Requirements**

**Tools/Instruments**

- Pipe wrench 250mm, 300mm - as reqd.
- Spanner set - as reqd.
- Hammer - as reqd.
- Chisel - as reqd.
- Tester - as reqd.
- Water pump plier - as reqd.
- Screw driver - as reqd.

**Equipment/Materials/Components**

- Hammer drilling machine - as reqd.
- P.V.C connection 1/2" heavy duty - as reqd.
- G.I. fitting - as reqd.
- G.I. pipe - as reqd.
- Thread seal material - as reqd.
- Marking media - as reqd.
- Special clamp - as reqd.

**PROCEDURE**

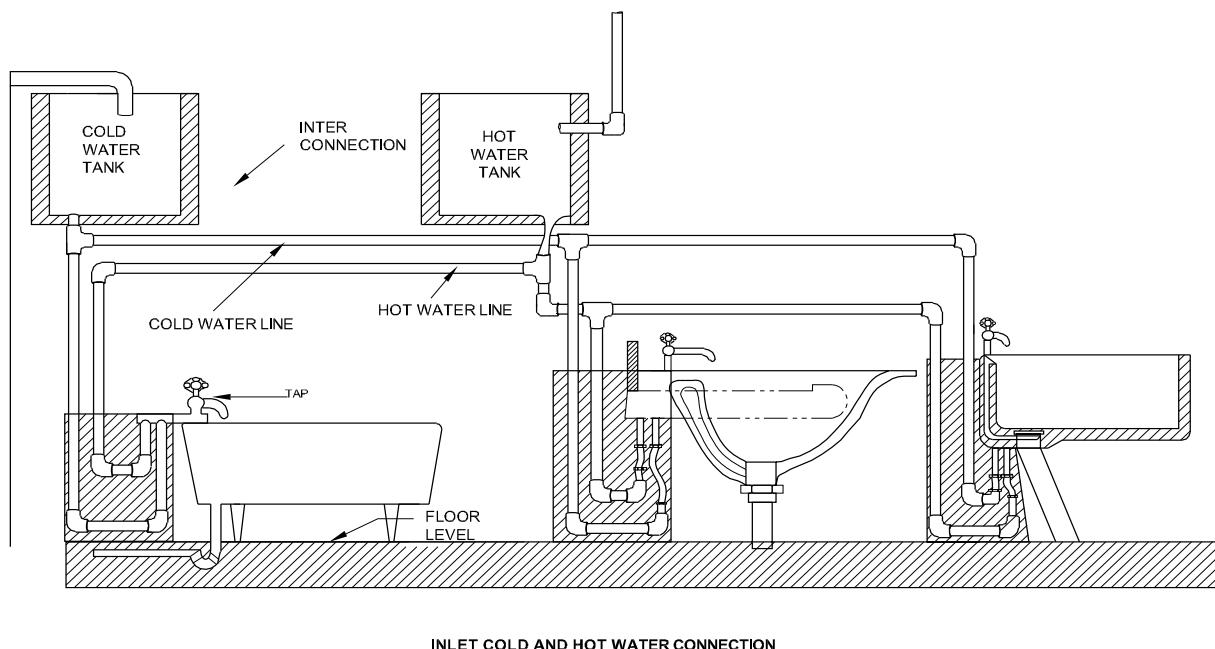
**TASK 1 : Hot water connection to bath tub and water basin (Fig 1)**

- 1 Connect inlet connection to the water heater.
- 2 Outlet connection to provide wash basin and bath tub as per the layout from heater.
- 3 Check the connection of outlet pipe from water heater.
- 4 Switch on the water heater and check the flow of hot water.

**Safety**

- Provide proper earth connection of the water heater.
- Hot water connection should be provide left hand side only.

Fig 1



PSN25143H1

**TASK 2 : Fix water heater**

- 1 Preparation of materials for connection hot and cold water lines.
- 2 Connect the hot and cold lines to bath tub & wash basin.
- 3 Fixing of water heater.

**Install pipe line for distribution of hot and cold water**

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Refer the exercise 2.5.143

**Install hot water system and solar water heating system**

**Objectives:** At the end of the exercise you shall be able to

- **measure and mark the work spot**
- **fix water heater in the wall**
- **connect inlet and outlet pipes & fittings.**

Requirements			
<b>Tools/Instruments</b>			
• Chisel	- 1 No.	• Marking media	- as reqd.
• Hammer	- 1 No.	• Special clamp	- as reqd.
• Pipe die	- 1 No.	<b>Materials/Components</b>	
• Hand hacksaw	- 1 No.	• Water heater complete	- as reqd.
• Spanner set	- 1 No.	• Socket, Tee (G.I)	- as reqd.
• Screw driver	- 1 No.	• Elbow (G.I)	- as reqd.
• Measuring tape	- 1 No.	• Nipple (G.I)	- as reqd.
• Trowel	- 1 No.	• Union (G.I)	- as reqd.
• Pipe vice	- 1 No.	• Bend (G.I)	- as reqd.
• Oil can	- 1 No.	• P.V.C connection	- as reqd.
• Plier	- 1 No.	• Nut & Bolt	- as reqd.
• Plumber tool kit	- 1 No.	• Cement motor	- as reqd.
• Drilling machine	- 1 No.	• Angle cock	- as reqd.
• Pipe wrench 250mm, 300mm	- 1 No.	• G.I.pipe	- as reqd.
• Tester	- 1 No.	• Hand hacksaw blade	- as reqd.
• Water pump plier	- 1 No.	• Safety valve	- as reqd.
<b>Machinery/Equipments</b>		• Pressure relief valve	- as reqd.
• Pipe vice	- 1 No.	• Mobil oil	- as reqd.
• Solar water heater system	- 1 No.	• White lead	- as reqd.
• Hammer drilling m/c	- 1 No.	• Thread seal material	- as reqd.
• G.I.fitting as required	- 1 No.	• As per manual of solar water heater	- as reqd.
• G.I.pipe as required	- 1 No.	• Insulator	- as reqd.
		• Pipes and fittings	- as reqd.

**PROCEDURE**

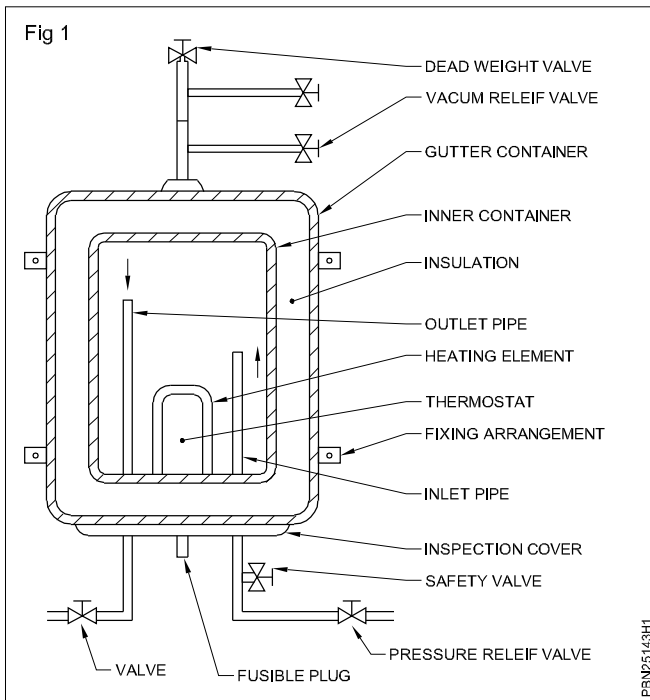
**TASK 1 : Installation of water heater**

- 1 Chose the place of fixing.
- 2 Hold it on the place.
- 3 Marking the holding point.
- 4 Take chasing in wall
- 5 Fix bolt required position in cement concrete 1:2:4 size of bolt select from manufacture catalogue.
- 6 Cure the concrete.
- 7 Fix the heater in position through bolt.
- 8 Put the nut & tighten.
- 9 Check the vertically connect inlet after fixing a valve & using flexible pipe.

- 10 Connect outlet after fixing pressure relay valve and flexible pipe.
- 11 Plug the heater to electric supply.
- 12 Test if for leakages.

**Marking on the Wall**

- 1 Mark out one point measuring using the given distance from floor.
- 2 Mark out the 2<sup>nd</sup> point at the same level of point using water tube level.
- 3 Rechalk the string by rubbing a piece of chalk along the length of the string.
- 4 Plug the string.



5 Mark a point vertically from point. In between inlet & outlet.

6 Hold the plumb bob at point.

#### Safety

- Fixing the bolt wall cement concrete 1:2:4 ratio.
- Bolt fix the wall after then hanging the water heater.
- Check the vertically line.
- Check the electric point & board.

## Installation of solar water system

**Objectives:** At the end of the exercise you shall be able to

- mount the collector
- install solar storage, heat exchanger
- laying pressure pump and pipe line
- install water lines with control drive.

### Installation steps

The basic steps to install a closed - loop solar water heating system are;

1 Mount the solar collectors on the roof

2 Install the solar storage tank and heat

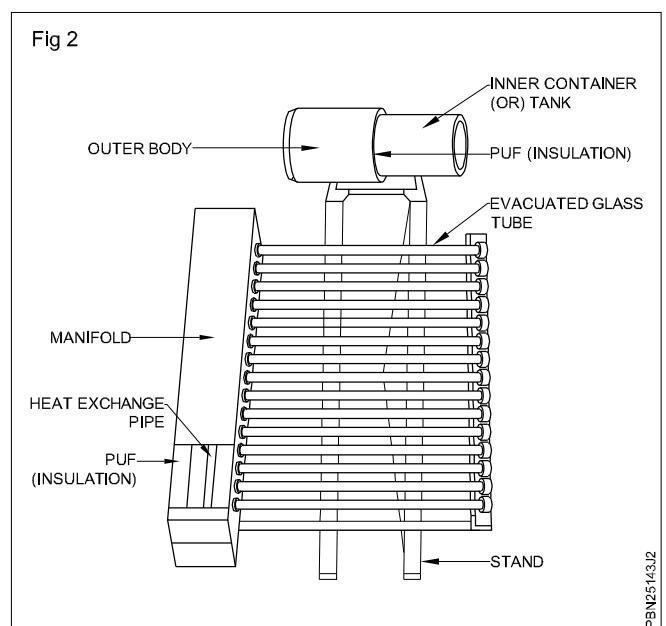
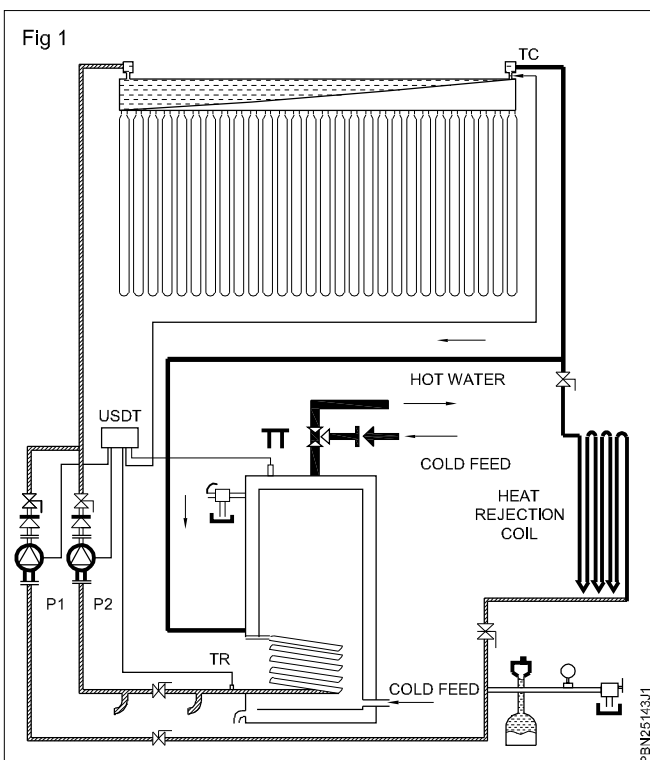
3 Install the piping and pressure pump for the glycol loop

4 Install the water piping

5 Install the controls

6 Fill the system

7 Insulate the water and glycol lines



Symbolise distribution of hot and cold water pipe line

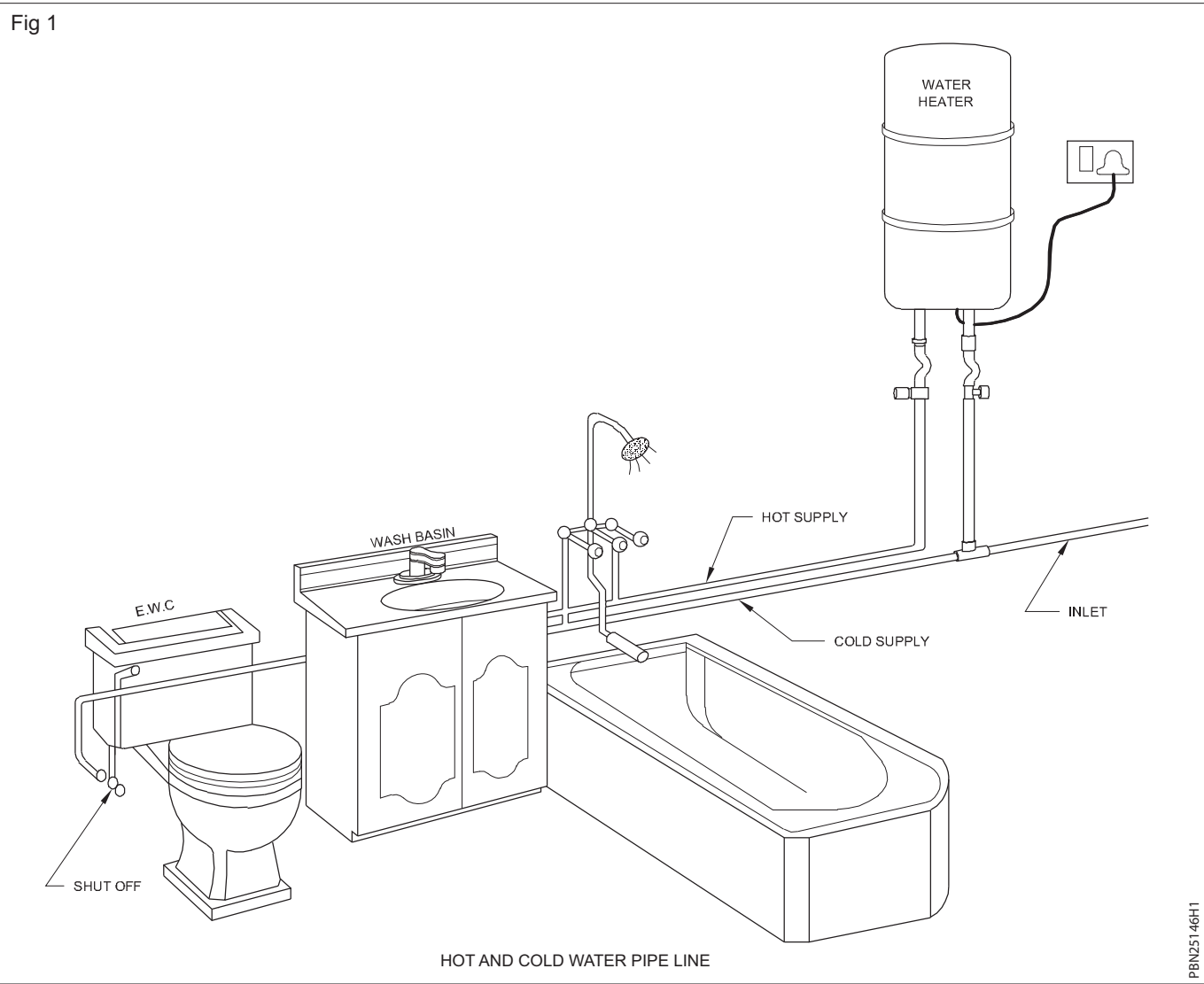
**Objective:** At the end of the exercise you shall be able to

- symbolise distribution of hot and cold water pipe line.

PROCEDURE

TASK 1 : Symbols of hot and cold water pipe line (Fig 1)

S.No	Description	Symbol
1	Hot water pipe line	———— HW ————
2	Cold water pipe line	———— CW ————



## TASK 2 : Symbolic distribution of hot and cold water pipe line

### Factors related to symbolic distribution of hot and cold water pipe lines

- 1 Ensure that the quality should not get determined in the distribution system.
- 2 Must be capable of supplying water at all the intended places with sufficient pressure head.
- 3 Check the PH of drinking water. It should not be less than 6.5 which causes health problems.
- 4 Provide special vapour barrier wrapped pipe insulation to prevent warm air from reaching the pipe.
- 5 Ensure proper insulation around the hot water pipe to reduce heat loss, while water travels to the faucet.
- 6 Inspect the heating elements.
- 7 Check the sediments in the water tank if the hot water flow so slow.
- 8 Check the dip tube function if dip tube broken it will lead to sudden loss of hot water temperature.

— — — — —

**Perform fitting of different trap, valve and cistern**

**Objectives:** At the end of the exercise you shall be able to

- perform fitting of multi-floor trap
- install the gate valve
- construction of gully trap
- perform fitting of floor trap in house drainage
- installation the flushing, cistern in sanitary appliances.

Requirements			
<b>Tools/Instruments</b>			
• Plumber tool kit	- 1 No.	• Pipes	- as reqd.
• Sprit level	- 1 No.	• Cement	- as reqd.
• Plumb bob	- 1 No.	• Sand	- as reqd.
• Masonry hand tools	- 1 No.	• Multi floor trap	- as reqd.
• Spanner set	- 1 No.	• PVC pipe Ø 32mm, Ø40mm, Ø50 mm	- as reqd.
• Pipe wrench	- 1 No.	• Solvant cement	- as reqd.
• Adjustable spanner	- 1 No.	• Pipe vice	- as reqd.
• Screw driver	- 1 No.	• Bench vice	- as reqd.
• Water pump pliers	- 1 No.	• Oil can	- as reqd.
• Screw driver	- 1 No.		
• File	- 1 No.	<b>Materials/Components</b>	
• Hacksaw	- 1 No.	• Drilling machine	- as reqd.
• Hammer	- 1 No.	• Gate valve	- as reqd.
• Die set	- 1 No.	• Asbestos rope	- as reqd.
• Screws panner	- 1 No.	• Rubber sheet	- as reqd.
• Pliers	- 1 No.	• Leather sheet	- as reqd.
• File	- 1 No.	• Emery sheet	- as reqd.
• Die set	- 1 No.	• Grease	- as reqd.
• Measuring tape	- 1 No.	• Thread seal	- as reqd.
• Spade	- 1 No.	• Nut	- as reqd.
• pick axe	- 1 No.	• Washer	- as reqd.
• Mortar pan	- 1 No.	• Brush	- as reqd.
• Trowel	- 1 No.	• Required size of pipe	- as reqd.
• Mason square	- 1 No.	• Gland rope	- as reqd.
• Mason axe	- 1 No.	• Union	- as reqd.
• Thread with nails	- 1 No.	• Thread seal material	- as reqd.
• Straight edge	- 1 No.	• Chalk powder	- as reqd.
• Water tube level	- 1 No.	• Gully trap	- as reqd.
• Caulking tool	- 1 No.	• Grating	- as reqd.
• Wooden planner	- 1 No.	• Hemp yarn	- as reqd.
• Iron planner	- 1 No.	• Class I type bricks	- as reqd.
• Wooden smoother	- 1 No.	• Brick	- as reqd.
		• Brick gravels	- as reqd.
<b>Equipments</b>		• Aggregate	- as reqd.
• Screws	- 1 No.	• River fine grain sand	- as reqd.
• Wooden Pegs	- 1 No.	• C.I.Frame with cover	- as reqd.
• Thread seal materials	- 1 No.		

**PROCEDURE**

**TASK 1 : Perform multi-floor trap**

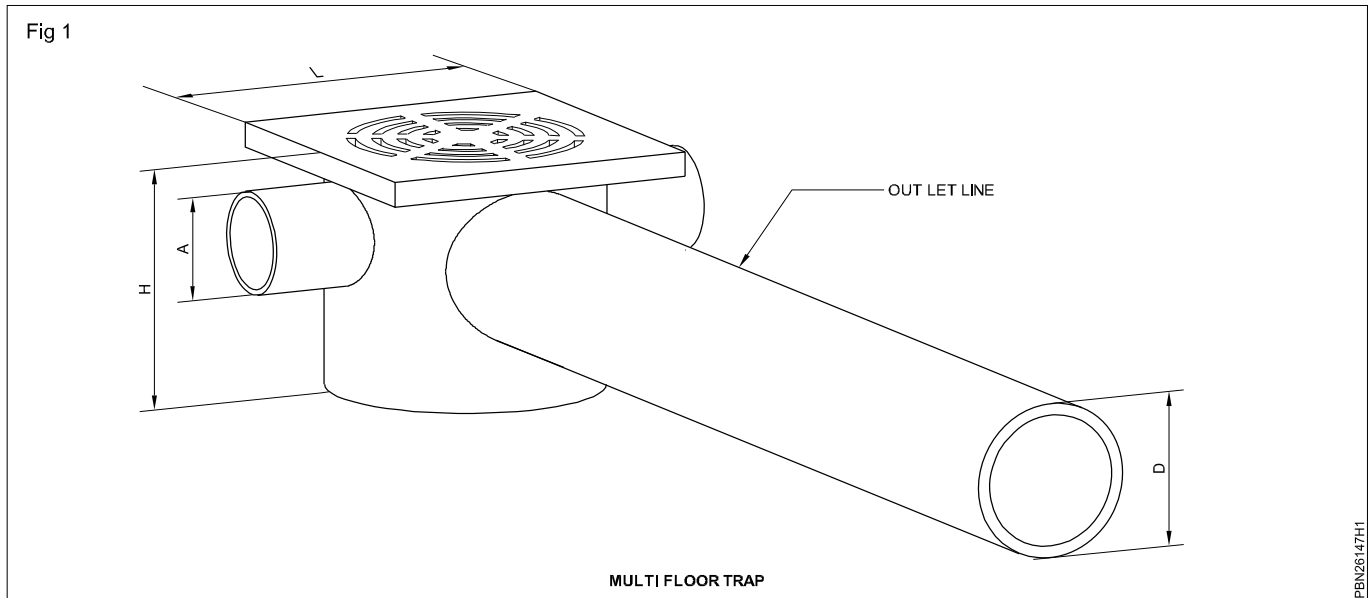
- 1 Select the required place (both room).
- 2 Prepare floor trap chamber at required area.
- 3 Laying the cement mortor in the chamber.
- 4 Fix the multi floor trap over the cement mortar.



- 5 Outlet end may back entry towards the gully chamber.
- 6 Inlet end may connect from wash basin waste pipe, washing machine waste pipe, both room floor.
- 7 Provide the inlet and outlet slop towards the gully trap.
- 8 Pack and finish the inlet, floor trap and outlet area.
- 9 Fix the grinding on the floor.

### Safety

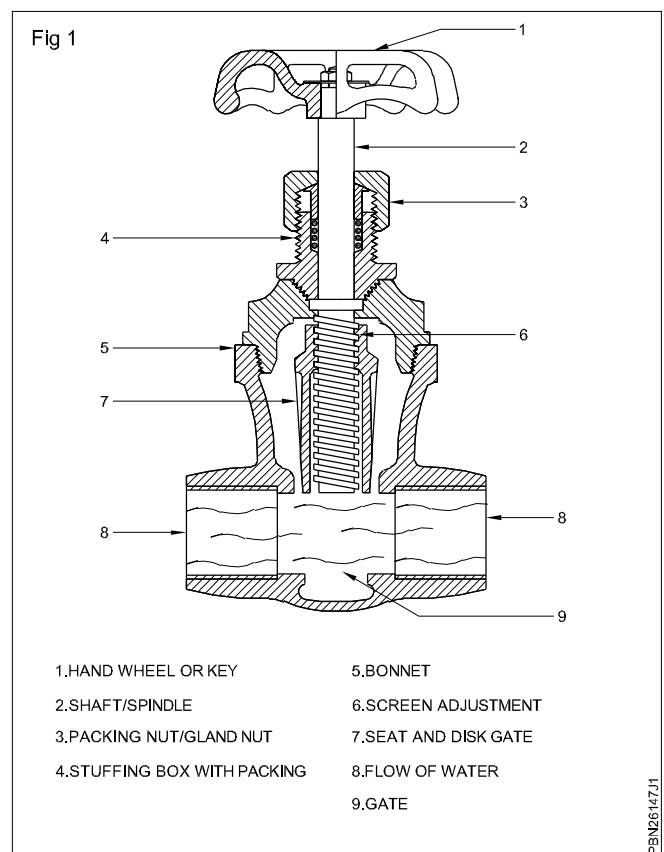
- Check the floor trap. (Visible defect)
- Water seal maintain door is not remove while fixing.
- Water seal always should maintained.
- Fix the grinding only after flooring.



### TASK 2 : Install gate valve/full way valve

- 1 Close the gate valve by turning the hand wheel clock wise.
- 2 Remove the nut with a spanner and lift of the wheel.
- 3 Remove the gland nut from the bonnet by turning it in the anticlock wise direction.
- 4 Remove the stuffing gland.
- 5 Clean out the old packing in the stuffing box.
- 6 Cut a standard asbestos rope to make a new packing.
- 7 Assemble and spindle gate to the bonnet.
- 8 Assemble the hand wheel and tighten the hand wheel nut.
- 9 Open the gate valve and tighten the gland nut until the packing is compressed sufficiently to stop the water escaping from the gland nut.
- 10 Removal of spindle set and gate part.
- 11 Hold the spanner at bonnet neck.
- 12 Loosen the bonnet two or three turn, again loosen the bonnet 2 or 3 turn.

- Clean the disk gate with emery sheet, if not over emery.

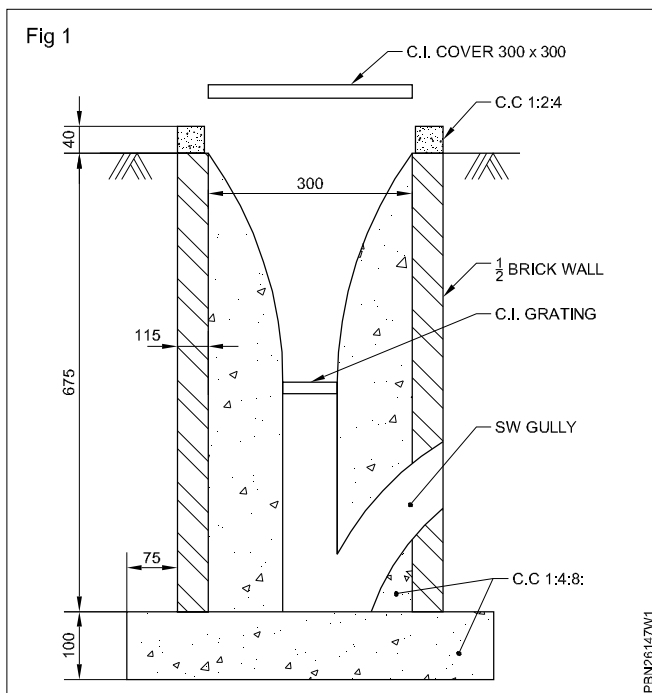


### Safety

- Don't over tight the gland nut.
- Filling the gasket should not be too enough.

- 1 Excavate for gully trap as per (Fig 1) to dimensions and levels.
- 2 Lay the concrete as per drawing.
- 3 Check the quality of gully trap.

4 Place gully trap in level.



- Check gully and branch grain for pass through outlet to entrap the silt from the gully trap periodically gully trap may cleaned.**

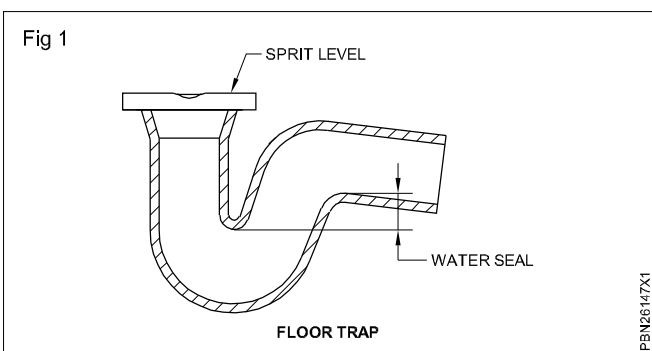
- 7 Construct 1.15 mm thick brick masonry chamber 300 x 300 mm inside a round gully trap from top of the bed concrete upto the ground level.
- 8 Fill the gap between the chambers walls and trap with cement concrete.
- 9 Plaster the upper portion of the chamber. i.e above the top level of the trap with cement mortar 1:3.
- 10 Finish the plaster area with a floating coat of meat cement. Round off the corners and bottom of the chamber so as to slope towards the grating.
- 11 Fix C.I grading 300x300 on top of the brick masonry with cement concrete 1:2:4.
- 12 Render the concrete smooth finished to level of cover shall be about 4cm below the adjacent ground level.

## Safety

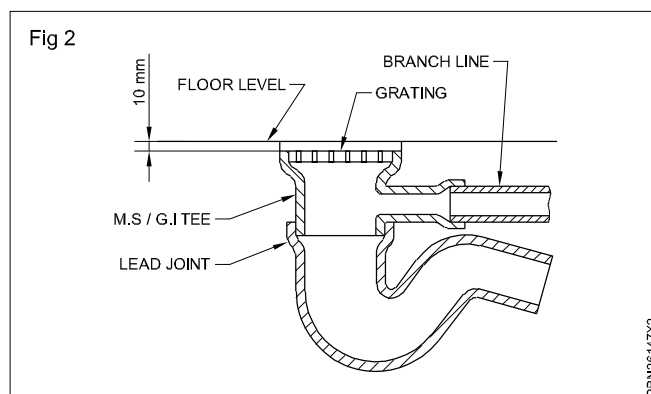
- Check the required materials.
- Don't use the damaged tools.
- The gully trap chamber construction, non baking brick.
- The gully trap chamber construction of the gully quality of bricks (Class - I).
- Quired brick only use for construction.

#### TASK 4 : Perform the floor traps in house drainage

- 1 Choose the correct type of floor trap (Fig 1).



- 2 Check the water seal depth.
- 3 Mark the position of floor trap (it shall be near external wall and away from doors).
- 4 Dig for the required depth considering branch connection and depth of floor trap (Fig 2).
- 5 Place bed concrete.



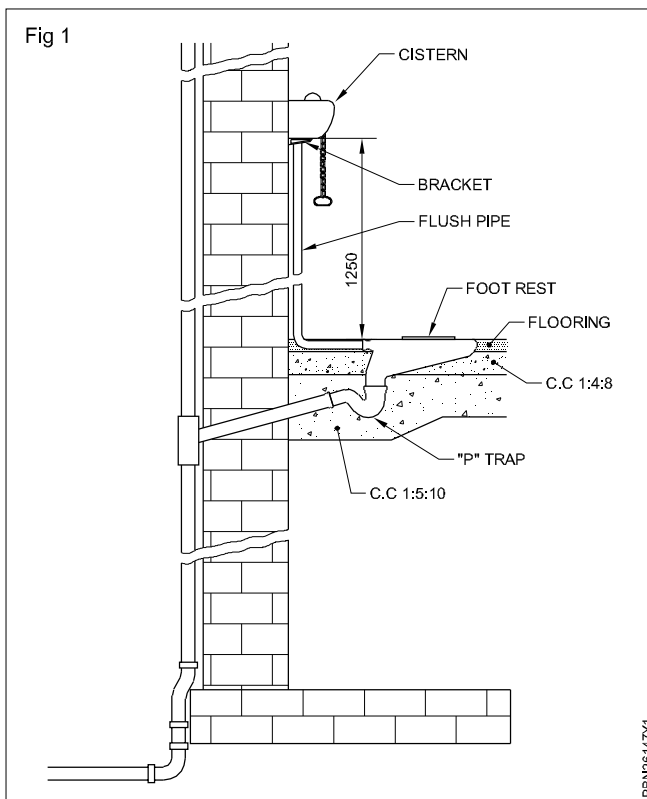
- 6 Place the trap in level at top.
- 7 Join M.S or G.I tee in lead wool joint if branch to join.
- 8 Place the grating 10mm below the floor level.

**In case of upper floors slabs shall be sink at the time of slab casting, to the required depth.**

## TASK 5 : Installation of flushing cistern in sanitary appliances

### High level cistern

- 1 Fix C1 canti lever bracket on wall in cement concrete 1:2:4 of block size 100 x 75 x 150mm at a height on top of bracket 125cm from top of pan. (S.S) (Fig 1).

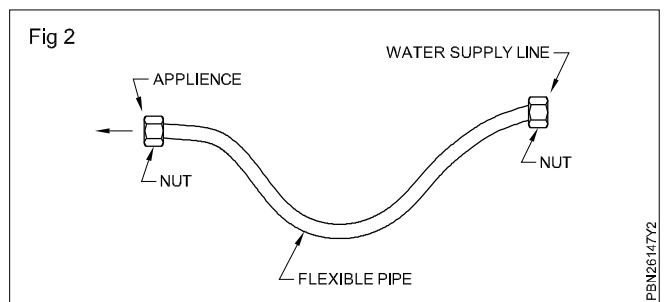


- 2 Paint the inside cistern with anticorrosive paint.
- 3 Place the cistern over bracket after it sets properly i.e. after curing.
- 4 Fix 185cm long G.I pipe of 20mmf to the overflow outlet.
- 5 Fix mosquito proof coupling at the end of overflow pipe.
- 6 Fix the clamps in wall in cement mortar 1:3 for flush pipe. Connect the outlet of flush pipe to pan with cement mortar 1:3.

- 7 Fix clamps for the flush pipe.
- 8 Fix stop cock to supply line.
- 9 Connect the water supply inlet to flush tank with a flexible pipe using pipe wrench.
- 10 Check the functioning and leakage after joints are set.

### Low level cistern

- 1 Mark the bottom of low level cistern at 300mm above top of the pan.
- 2 Keep the bottom of the low level cistern on the marked line.
- 3 Mark the position of screw hole on wall.
- 4 Drill hole in wall.
- 5 Insert wooden plug in the hole.
- 6 Keep the cistern in position and fix it to wooden plug by means of screws.
- 7 Connect the cistern to supply line using flexible pipe (Fig 2).



- 8 Connect the cistern to pan with flush bend.
- 9 Fill the joint in the cement mortar.
- 10 Check the joint.
- 11 Open the inlet
- 12 Check functioning of cistern and leakages.

## TASK 6 : Fixing of sluice valve

Refer the Exercise No: 2.4.123 for Task 3.

## TASK 7 : Fixing of stop cock

Refer the Exercise No: 2.4.123 for Task 2.

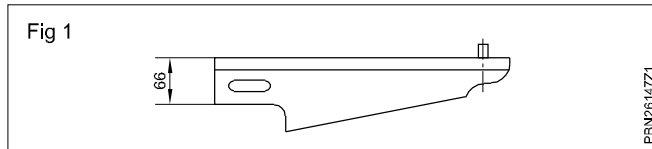
## Skill Sequence

### Fixing bracket for cistern

**Objective:** This shall help you to

- fix the bracket for cistern, wash basin, sink etc.,

Mark the position of bracket on wall with pencil (Fig 1).

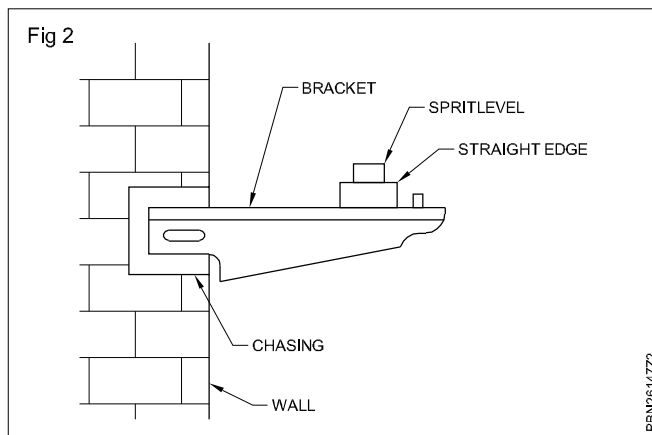


Make chasing in the wall of size so that cement concrete of 50mm on allround can be filled after fixing bracket.

Clean the chasing by pouring water.

Keep the bracket in position temporary in the chase.

Check the level by placing a straight edge on top of bracket (Fig 2 & 3).



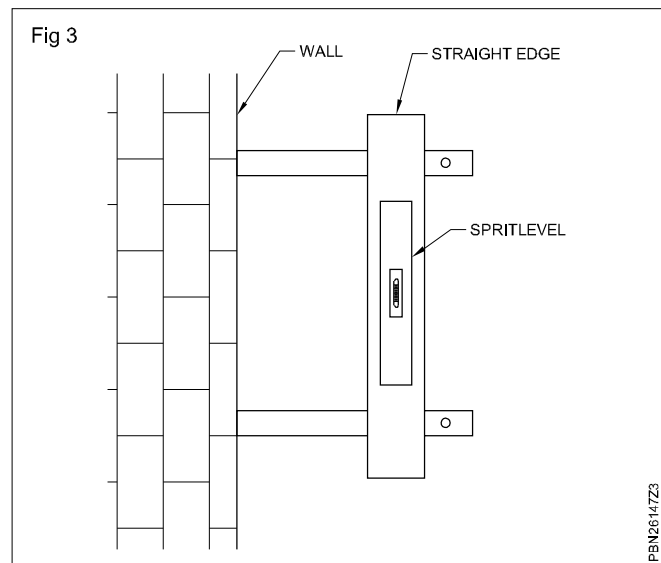
Place sprit level on the straight edge.

Adjust the height of bracket by lowering or raising so that bubble in sprit level is in centre.

Concrete the gap in the chasing with cement concrete 1:2:4.

Cure the concrete till it sets.

Paint the bracket.



## Demonstrate construction of over head tank as per measurement

**Objectives:** At the end of the exercise you shall be able to

- demonstrate construction of R.C.C over head water tank
- demonstrate construction of flat base tank
- demonstrate construction of storage tank (sump).

### PROCEDURE

- 1 The instructor should demonstrate. Each tank name and construction are shown in Fig 1 to 3.
- 2 Instructor should arrange a chart.
- 3 R.C.C square over head tank DATA (Fig 1).

- Size of the tank - 3300x3300mm.
- Height of wall of the tank - 3m.
- Free board - 0.5m.
- Thickness of bottom slab 150mm.
- Thickness of cover slab 100mm.
- Size of beam at top of column 250x250mm.
- Size of braces - 250x250xmm.
- Size of braces - 250x300mm.

- Height of column from G.L 6m.
- Size of manhole - 600mmx600mm.
- Depth of water inside the tank - 2.5m.
- Depth of foundation below G.L - 1200mm.

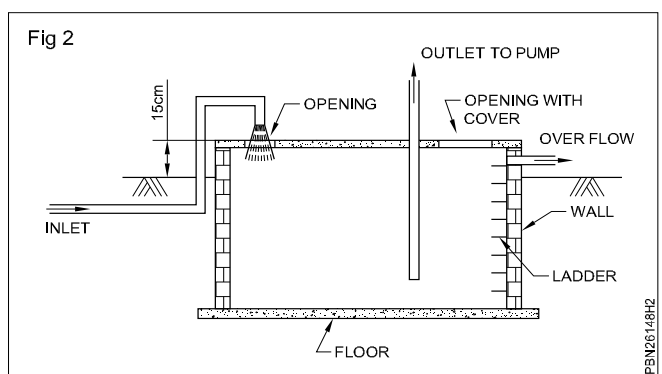
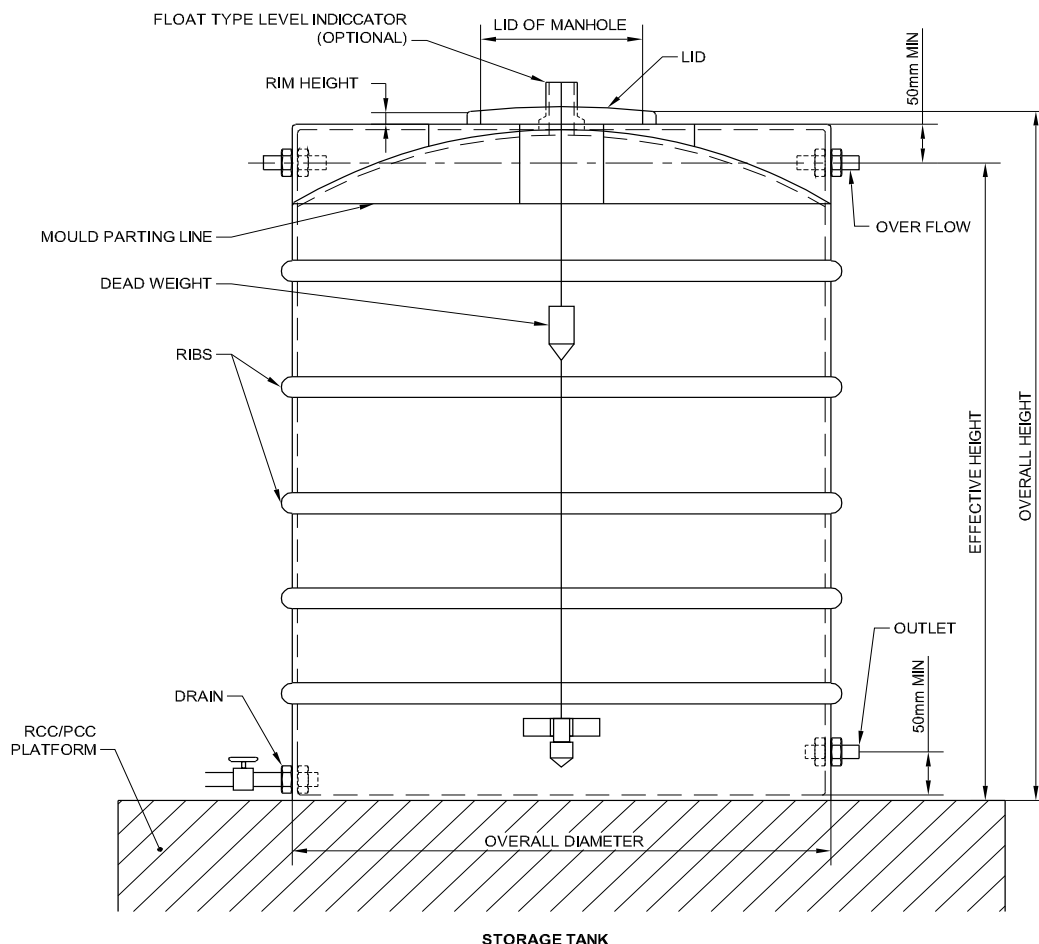
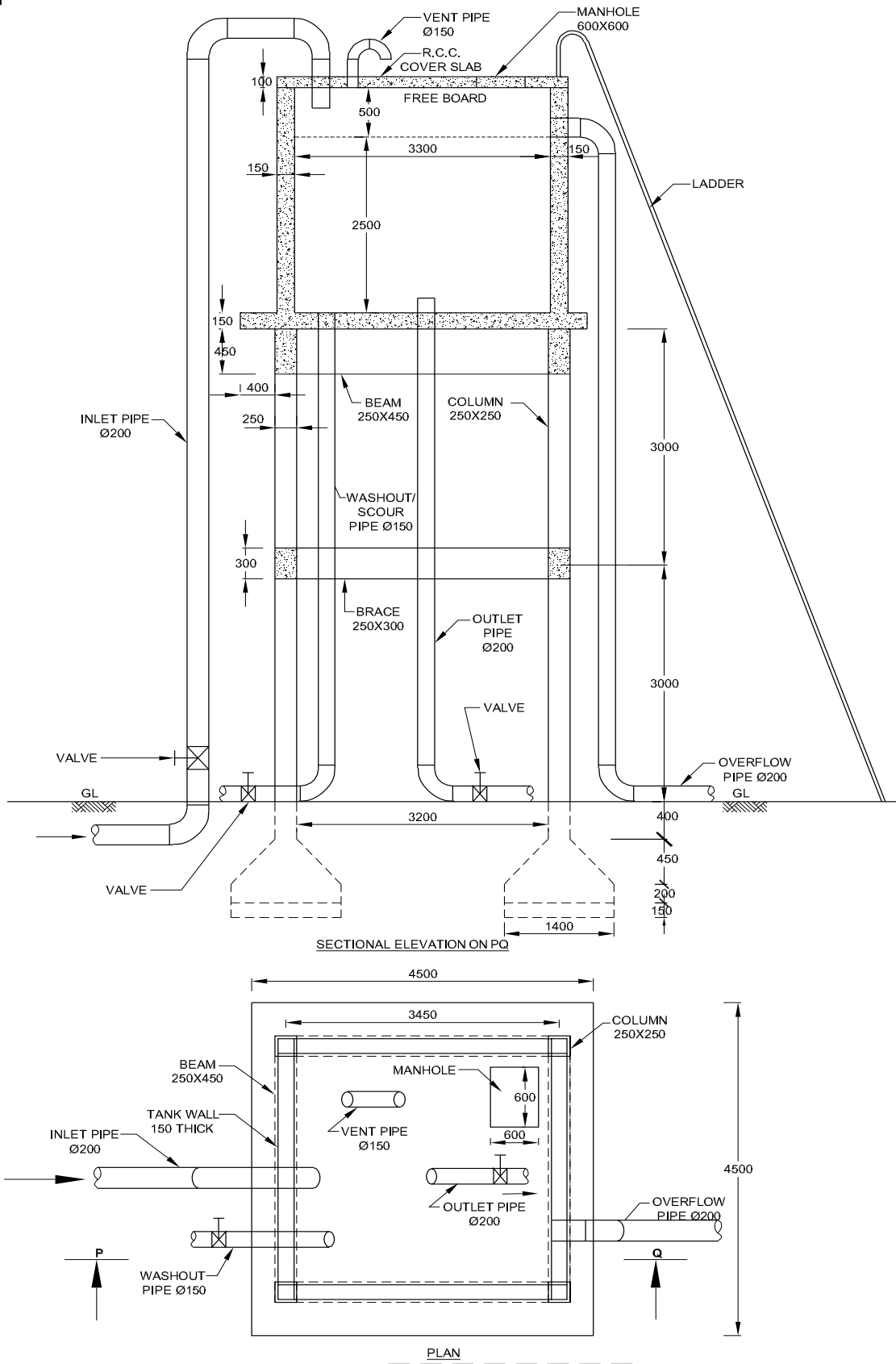


Fig 3



- Size of column footing - 1400x1400mm.
- Diameter of inlet, outlet and overflow pipes - 200mm.
- Diameter of scour pipe - 150mm.
- Diameter of vent pipe - 150mm.
- Any more data required may be assumed suitably.

Fig 1



PBN26148-H1

## Maintenance and recondition pipe line

**Objectives:** At the end of the exercise you shall be able to

- preparation of material for repairing the connection to leakage
- detect leakage in water supply system, bath tap, wash basin and sink
- decide the joint in water supply pipe lines
- repair the joints in water supply system bath tap, wash basin and sink.

### Requirements

#### Tools/Instruments

- |                              |         |
|------------------------------|---------|
| • Hacksaw                    | - 1 No. |
| • Chisel and hammer          | - 1 No. |
| • Spade                      | - 1 No. |
| • Pick axe                   | - 1 No. |
| • Spanner set measuring tape | - 1 No. |
| • Pipe wrenches              | - 1 No. |

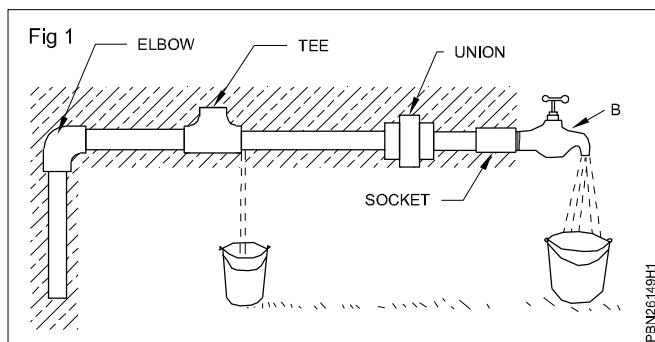
#### Equipment/Materials/Components

- |                              |            |
|------------------------------|------------|
| • Wooden cone                | - as reqd. |
| • Wash basin and sink        | - as reqd. |
| • Pipe & pipe fittings       | - as reqd. |
| • Thread seal materials      | - as reqd. |
| • Repaired existing bath tub | - as reqd. |

## PROCEDURE

### TASK 1 : Recondition pipe line

- 1 Clear the pipe by removing the soil on the pipe line.
- 2 Detect the reason of leak.
- 3 If any loose joint, tight it perfectly.
- 4 Close the main line.
- 5 If it is a break of pipe clear from soil to the both sides of the pipes up to 2m length.
- 6 And cut the broken piece.
- 7 Measure the length of the cut piece.
- 8 Cut a piece of pipe less than 2cm of the cut piece.
- 9 Arrange and fix on both ends and connect them to the pipe line.
- 10 Check if any further leakage.
- 11 Finish the job.



### Safety

- Clear the pipe slowly without making more damage.
- Close the pipe line before cutting.
- Cut straightly.
- Put the rings correctly.
- Tight slowly the nuts..

### TASK 2 : Recondition bath tub, wash basin and sink (Fig 1)

- 1 To find leakage in the lines from tank to sanitary inlet.
- 2 If any fittings damage or worn out replace it.
- 3 Any loose threading is in fitting tightness.
- 4 If any C - lock nut, spindle (or) check nut loose (or) worn out replace it.
- 5 Clean the over flow line and remove the bloakage.
- 6 If unable to remove the blockage replace the over flow line to drain line.

### Drain blockage

- 7 Clean the drain blockage of bath tub and remove the blockage up to gully chamber.

### Non-storing of water in the both

- 8 Check the pop of coupling.
- 9 If worn out the spring, rubber washer, replace the spares on pop of coupling.

### In wash basin

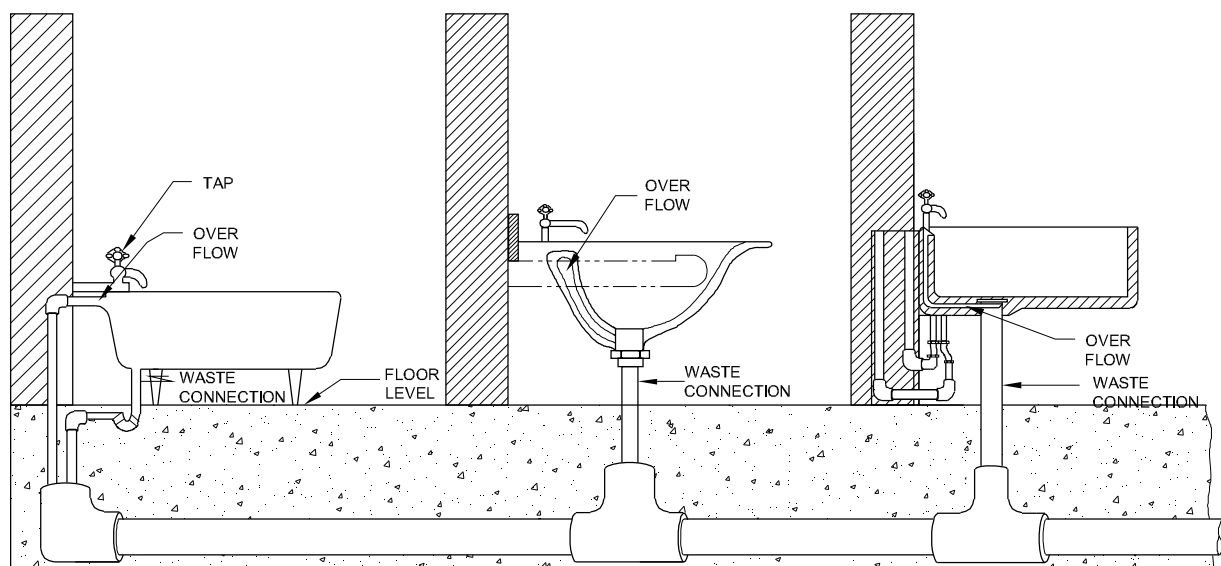
- 10 Check the inlet connection above process of bath tube.
- 11 Over flow the drain water into wash basin.
- 12 Remove the blockage of wash basin.
- 13 Made half threaded waste coupling to avoid the over flow in the basin.
- 14 Check the bottle trap and clean the bottle trap.
- 15 If drain will not flow after the tub.
- 16 Check the outlet line towards nani trap.

### In sink

- 17 Check the inlet connection above process of bath tub and wash basin. Waste outlet water blockage in the sink.

- 18 Remove and clean the waste strainer/coupling.
- 19 If necessity of coupling (or) strainer may be replace it.
- 20 Maintain length of drain pipe from the sink to trap cover.
- 21 Clean the multi-floor if drain water is not flow properly.
- 22 Remove the blockage. Common waste line.
- 23 Any leakage their in the waste line.
- 24 Replace the rubber gasket.
- 25 If it is worn out fitting replace it.
- 26 Clean the blockage of lines.
- 27 Open the cleaning door.
- 28 Clean and remove the blockage of the waste line (seams) with hub of seams.

Fig 1



MAINTENANCE OF PIPE LINE

PBN26149.1



## Perform pressure test by hydraulic test machine

**Objectives:** At the end of the exercise you shall be able to

- applying pressure testing machine to know pressure testing methods
- measure hydraulic pressure
- provide the pressure for test
- explain various defects in water line fixtures.

### Requirements

#### Tools/Instruments

- |                                |         |
|--------------------------------|---------|
| • Pipe wrenches 250mm to 350mm | - 1 No. |
| • Spanner set                  | - 1 No. |
| • Hammer                       | - 1 No. |
| • Screw driver                 | - 1 No. |
| • Pipe wrench 300mm            | - 1 No. |

#### Equipment/Materials/Components

- |                                      |            |
|--------------------------------------|------------|
| • Hydraulic pressure testing machine | - as reqd. |
| • Required testing pipe line         | - as reqd. |
| • Hydraulic oil                      | - as reqd. |
| • Cotton waste                       | - as reqd. |
| • Cleaning materials                 | - as reqd. |
| • Broom stick                        | - as reqd. |
| • Wire brush                         | - as reqd. |

### PROCEDURE

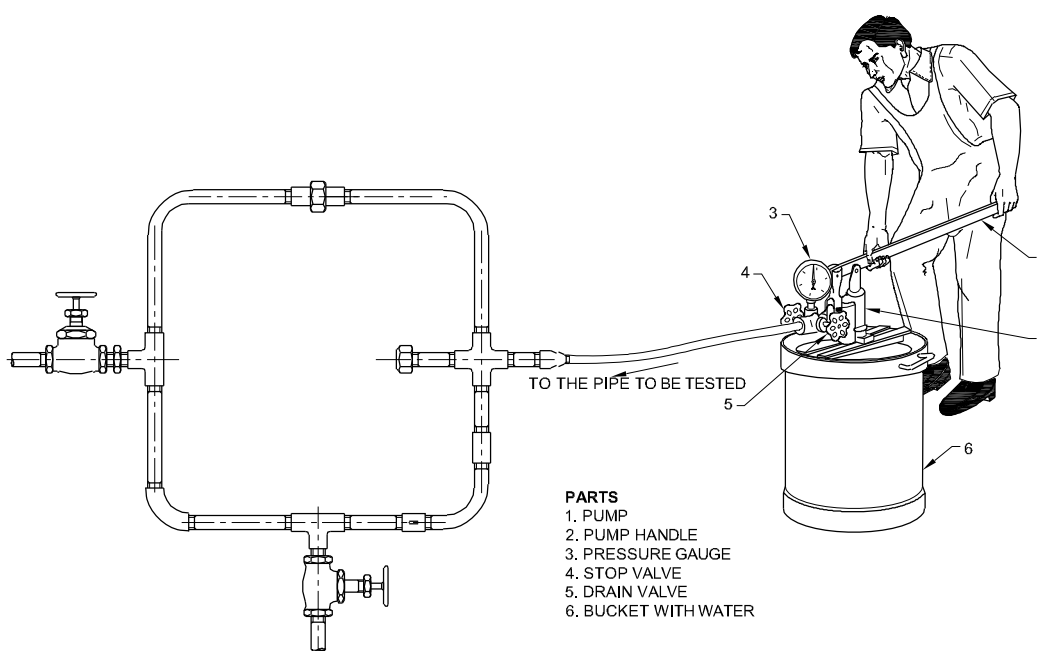
- 1 Plug all the opening in the section of test line with pipe nipples socket and plug.
- 2 Pump the water into the pipe line without any air pocket.
- 3 Pressurise the system to the specified test pressure.
- 4 Continue the process till the pressure gauge shows steady reading.
- 5 Test the pressure tightness by shutting off the supply valve.
- 6 Observe any leakage or pressure less in the joints pipes.

- 7 Rectify the leaking joints and pipes.

#### Safety

- Always lower the hydraulic working units to the ground before leaving the machine.
- Always wear safety goggles and protecting clothing while using hydraulic equipment.
- Block up the working units when you must work on the system while raised do not rely on the hydraulic lift.

Fig 1



Demonstrate cleaning of sanitary pipe line

- Objectives:** At the end of the exercise you shall be able to
- demonstrate the cleaning of sanitary pipe line
  - demonstrate the cleaning tools and uses.

PROCEDURE

Instructor shall displays and demonstrate to the students regarding the method of cleaning of sanitary pipe line and cleaning tools and uses.

- 1 Trainees will note down all the displayed different cocks and valves name and maintenance.
- 2 Record it in Table 1 and 2.
- 3 Get it checked by the instructor.

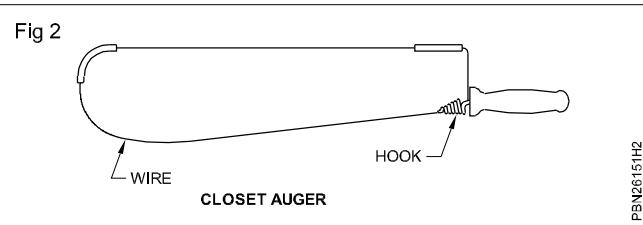
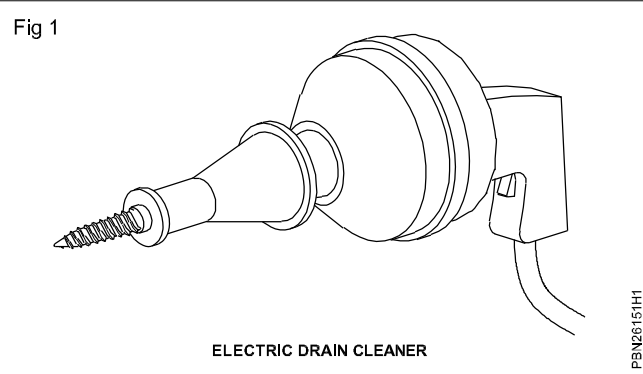
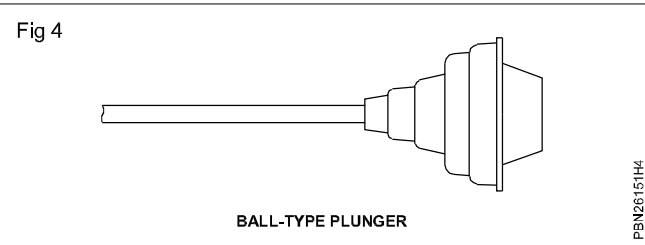
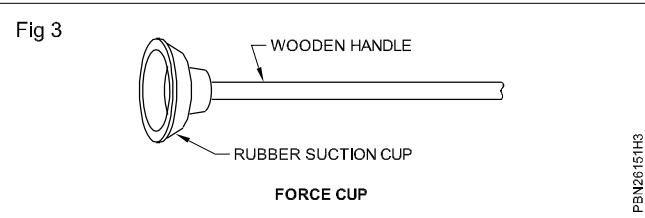


Table 1		
Fig No	Name of the tools	Uses
1		
2		
3		
4		



## Clean the sanitary pipe line

**Objectives:** At the end of the exercise you shall be able to

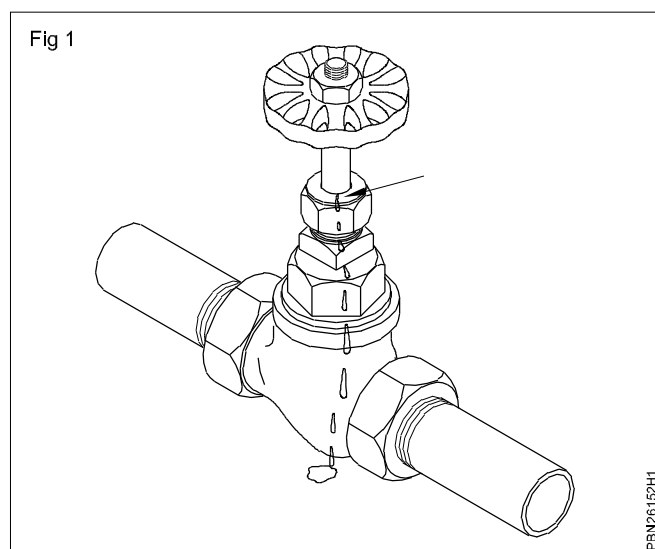
- clean the sanitary pipe line.

Requirements			
<b>Tools/Instruments</b>		<b>Materials</b>	
• Plumber tool kit	- 1 No.	• Pipe	- as reqd.
<b>Machinery Equipment</b>		• Pipe fittings	- as reqd.
• Ball type plunger (or) Force cup	- as reqd.	• Thread seal material	- as reqd.
		• white cement	- as reqd.
		• pop	- as reqd.

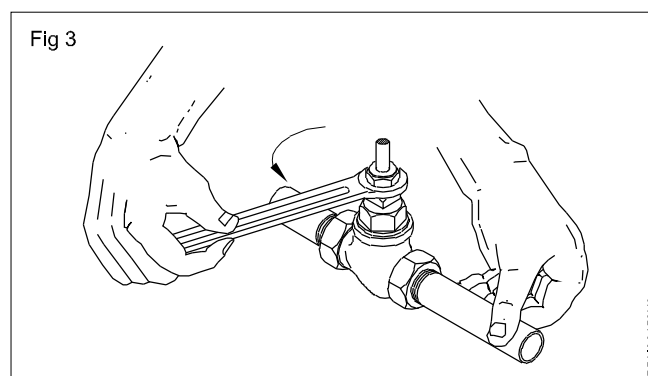
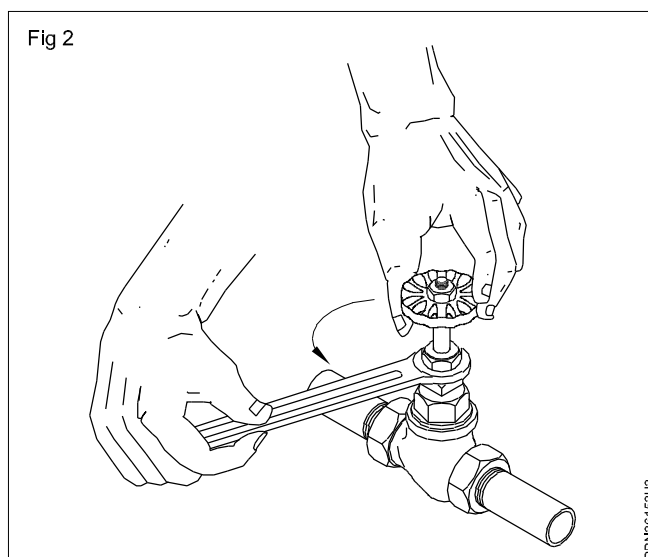
## PROCEDURE

- 1 Close the gate-valve by turning the hand wheel clockwise (Fig 1).

**This will stop the water in the valve to be repaired.**

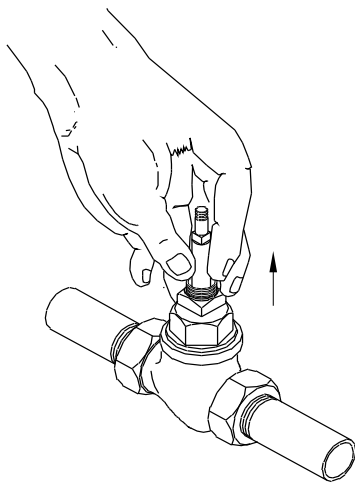


- 2 Remove the nut with a spanner and lift off the wheel (Fig 2).
- 3 Remove the gland nut from the bonnet by turning it in the anticlockwise direction.
- 4 Remove the stuffing gland.
- 5 Clean out the old packing in the stuffing box.
- 6 Cut a strand of asbestos rope to make a new packing. (Smear it with water pump grease or graphite paste.).
- 7 Coil the new packing round the shaft and push it down with a screwdriver (Fig 3).
- 8 Push in the stuffing gland and check that it fits tightly in the stuffing box (Fig 4).



- 9 Reassemble and leave the gland nut hand tight.
- 10 Assemble the hand wheel and tighten the hand wheel nut.
- 11 Open the gate-valve and tighten the gland nut until the packing is compressed sufficiently to stop the water escaping from the gland nut.

Fig 4



PSN26152H4

## Skill sequence

### Repairing of waste outlet

**Objectives:** This shall help you to

- find the blockage (or) leakage in waste outlet
- repair the waste outlet lines.

Check the waste outlet line.

- If any fitting are damage or worn out replace it.

Check the line weather

- Waste water leakage

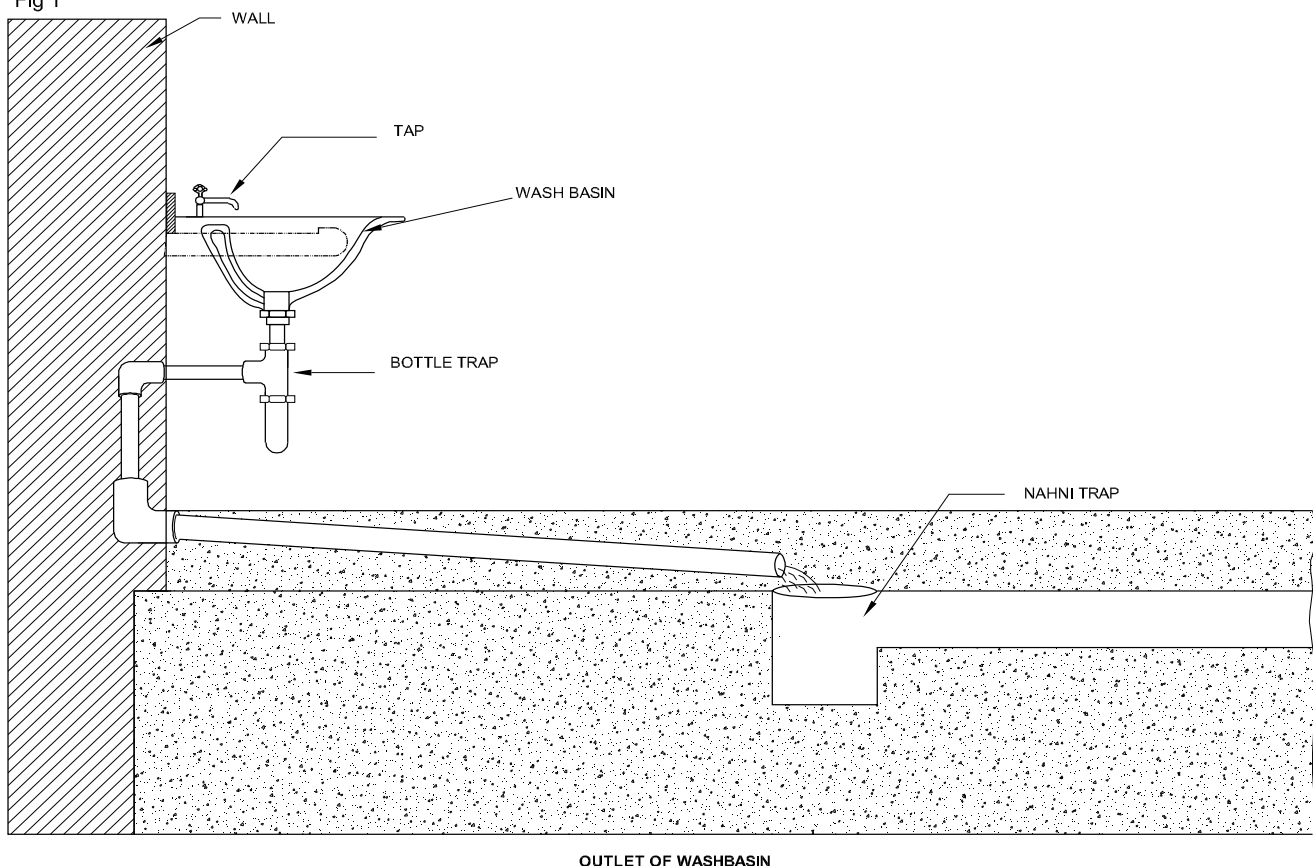
Select and use proper fittings on proper place.

Joints are made water tight with sealing materials.

#### Blockage of the line

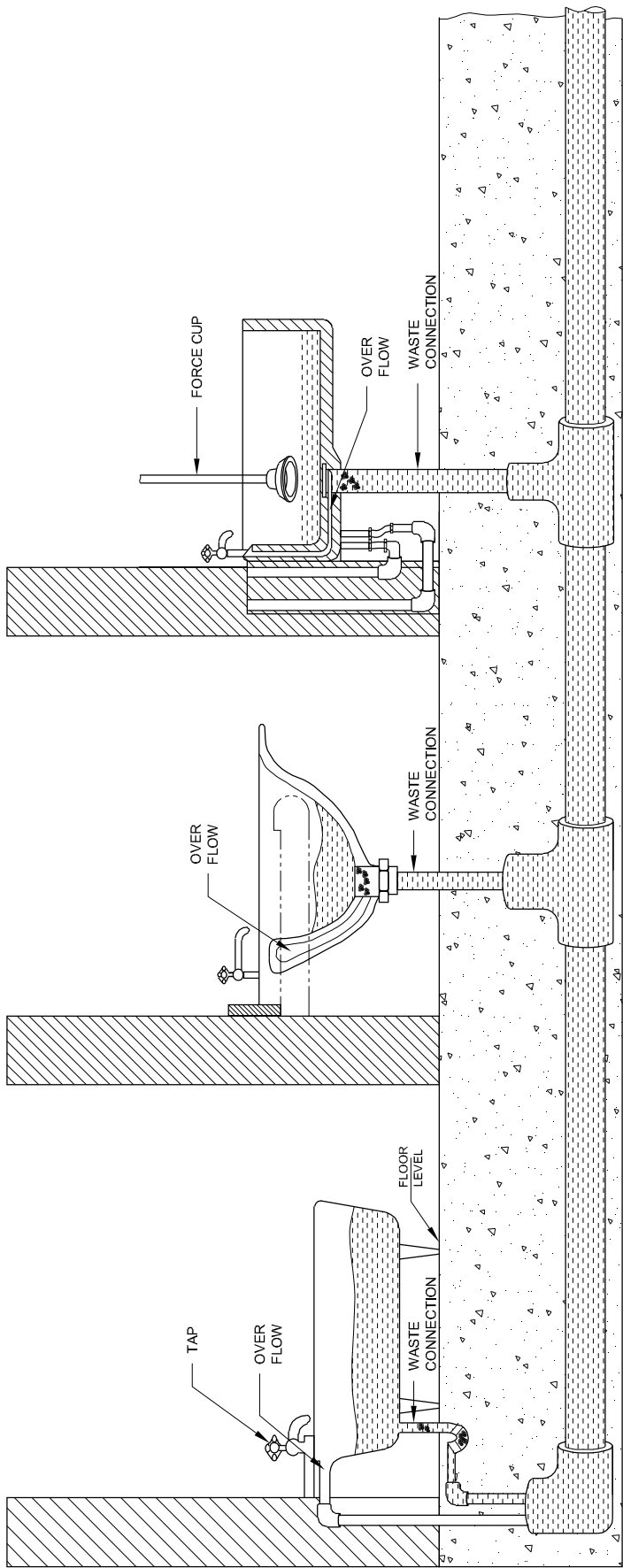
Clean the drain (or) trap with help of force cup

Fig 1



PSN26152J1

Fig 2



Remove corrosion from pipe line

**Objective:** At the end of the exercise you shall be able to

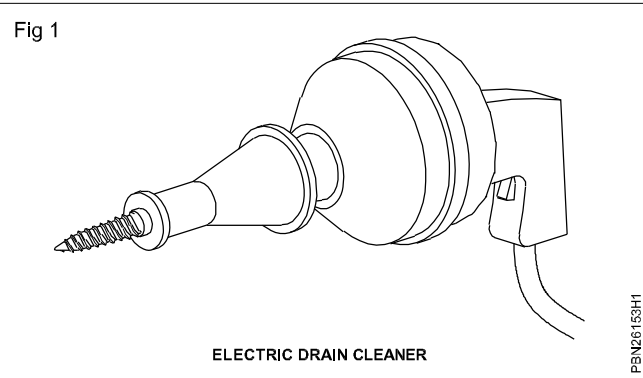
- remove corrosion from pipe line.

Requirements			
Tools/Instruments		Machinery Equipment/Materials	
• Plumber tool kit	- 1 No.	• Electric drain cleaner	- as reqd.
		• Closet auger	- as reqd.
		• Force cup	- as reqd.

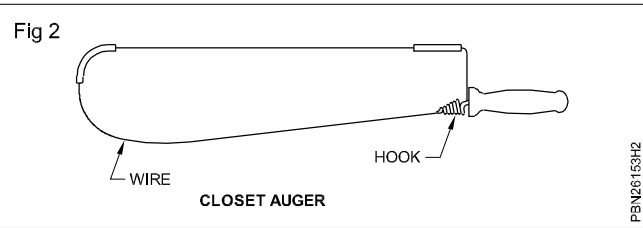
PROCEDURE

- 1 Clogs in wash basin trap can be cleaned blocks by remover (Fig 1).
- 2 Rotate clockwise and anticlockwise.
- 3 Pencil, brushes and other substance dropped into toilet.

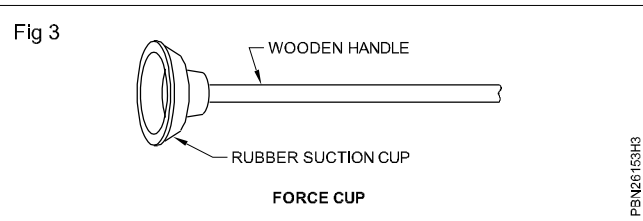
May be removed by using a closet auger. It consists of a coil of wire within a tube.



- 4 Coil has a hook at one end other hooked end is inserted in the trap of the toilet.
- 5 Substance can be removed by pushing and revolving the oil.
- 6 Blockage in small fixtures can be removed by using a force cup/plumber friend (Fig 2).
- 7 Place the force cup over waste inlet.



- 8 Block over flow outlet pushing up and down (Fig 3).



If alternately creates a suction that causes a surging of water in the pipe and remove the blockage.

A ball type plunger.

An electric hand drain cleaner can remove stubborn blocks.

Don't use caustic drain cleaner while working with force cup.

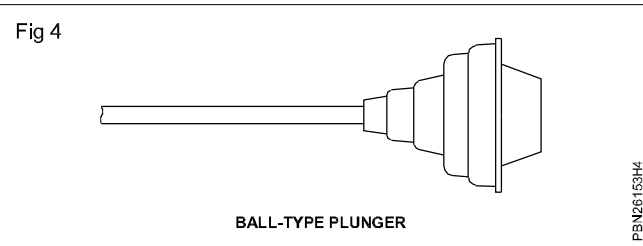
It cause to splash your body and eyes.

Don't use steam water to the PVC pipe line.

- 9 Maintenance of drain and soil waste line (Fig 4).

If there is leakage find the fault.

If we replace the fitting or repair the soils and waste pipe.



**Demonstrate scraping and painting**

- Objectives:** At the end of the exercise you shall be able to
- demonstrate scraping the pipe line
  - demonstrate painting the pipe line.

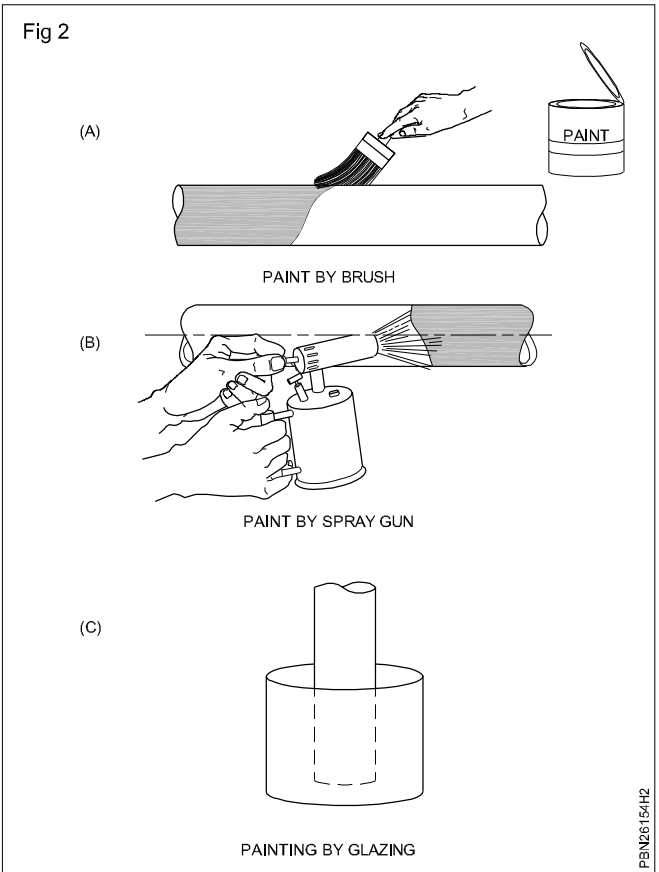
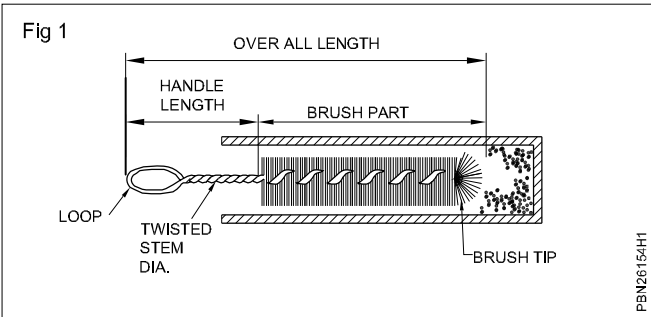
**PROCEDURE**

**Instructor shall display and demonstrate to the students regarding the method of scraping the pipe (Fig 1) and method of painting the pipe (Fig 2).**

- 1 Trainees will note down all the displayed method of scraping and painting.
- 2 Record it in table 1.
- 3 Get it checked by the instructor.

**Table 1**

Fig No	Name of method
1	
2A	
2B	
2C	



PBN26154H2

## Perform scraping and painting of pipe line

**Objective:** At the end of the exercise you shall be able to

- **scraping and painting the pipe.**

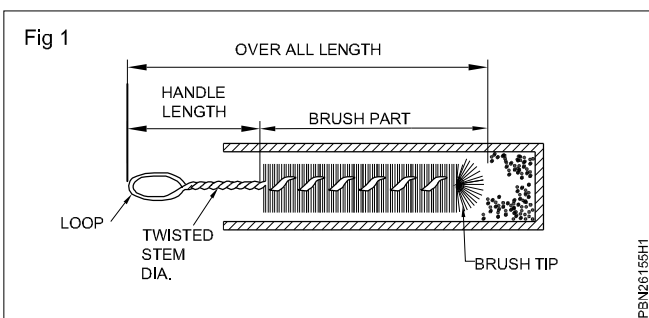
Requirements			
<b>Tools/Instruments</b>		<b>Materials</b>	
• Putty blade	- 1 No.	• Emery paper	- as reqd.
• long scribe	- 1 No.	• Cotton waste	- as reqd.
• Plumber tool kit	- 1 No.	• Broken hacksaw blade	- as reqd.
<b>Equipment</b>			
• Power operated buffing wheel	- as reqd.		

### PROCEDURE

#### TASK1 : Scraping the pipes (Fig 1)

##### In existing pipe lines (out side)

- 1 Identify the needed place of scraping the pipe.
- 2 Clean it oil, grease and dry mortar from the pipe.



- 3 Scratching the pipe in rusted area.
- 4 Remove the dust from the scratching area.

##### In side the pipes

- 1 Removal of de scale by scracher and packing rod or wire.

- 2 Dismantle the pipe.
- 3 Hold the pipe in a vice
- 4 Inside scratch the pipe with help of packing rod (or) wire.
- 5 Flush the water and clean the pipe.
- 6 If required repeat the process.

##### Scraping and painting of pipes

- 1 Clean the surface of pipe with sand paper
- 2 To key the surface with wire wool.
- 3 a reply two coats of oil-based glass paint.
- 4 Make sure you apply the second coat on the day after the first.
- 5 So, the first coat will pull the second onto it as it finishes hardening.

#### TASK2 : Painting the pipe (Fig 2)

##### Material required

Hard bristed wire brush, Exterior primer, exterior paint, paint brush or spray can.

- 1 Clean off old paint or rust.
- 2 Wash off pipes.
- 3 Prime the metal pipe with primer.

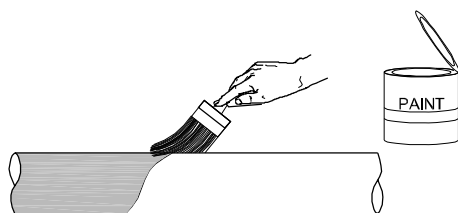
- 4 Paint the pipe with exterior paint.
- 5 Then leave it for 6 hours to dry
- 6 Use the pipes.

**Service and background color (colour coding of pipe lines)**



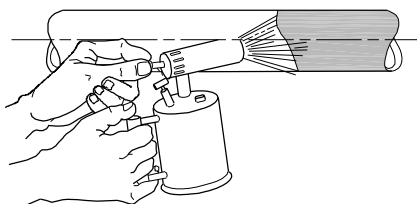
Fig 1

(A)



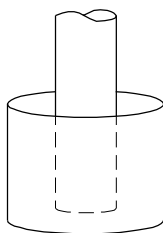
PAINT BY BRUSH

(B)



PAINT BY SPRAY GUN

(C)



PAINTING BY GLAZING

PBN26155J1

Potable water	- Green
Non potable water	- Yellow
Cold water supply	- Green
Hot water supply	- Yellow
Sanitary drain	- Green
Plumbing vent	- Green
Waste	- Green
Waste (corrosive)	- Yellow
Storm drain	- Green
Roof drain	- Green
Fire protection	- Red

## Repairing of broken or craked sanitary fittings

**Objectives:** At the end of the exercise you shall be able to

- prepare the materials list
- joint the pipe for existing pipe line and take measurement
- replace the float valve and syphonic washer.

### Requirements

#### Tools/Instruments

- Plumber tool kit - 1 No.
- Chisel - 1 No.
- Hammer - 1 No.
- Plier - 1 No.
- Hand drill - 1 No.
- Trowel - 1 No.

- Morter pan - 1 No.
- Screw driver - 1 No.

#### Equipment/Materials/Components

- As and when required materials to be arrange.

## PROCEDURE

### TASK 1 : Repairing of cracked sanitary fittings

- 1 Inspect and find out the crack.
- 2 Close the inlet water connections if any

Fig 1



- 3 Disconnect the cracked fitting from other parts or fitting.
- 4 Measure the size and type to be fixed.
- 5 Fix and replace new one instead of broken or cracked fitting.
- 6 Connect it with other parts.
- 7 Connect the water supply.
- 8 Check and finish it.

#### Safety

- Use glouse gum boots while working.
- Dismantle gradually the broken fittings.
- Give sufficient care while handling of broken fittings.

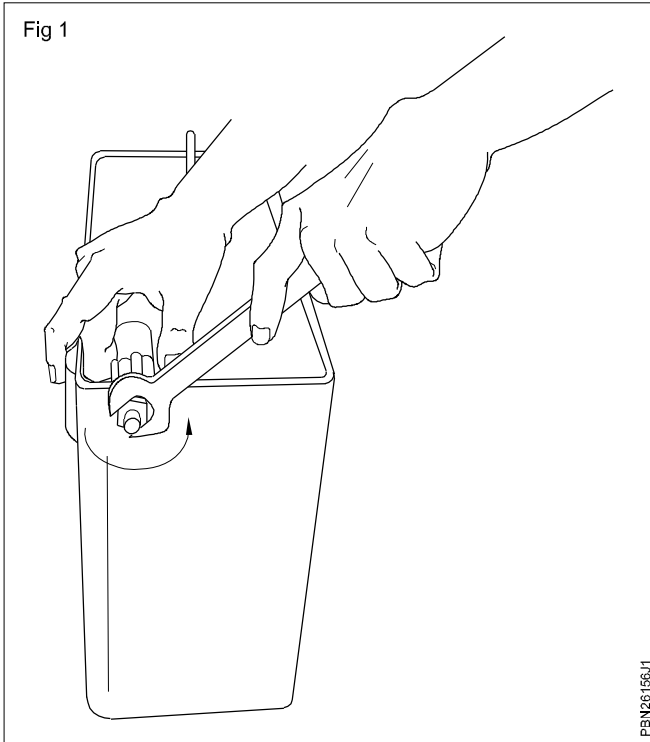
### TASK 2 : Reconditioning of flushing cistern

- 1 Turn off the water supply to the flushing cistern by closing stop cock.
- 2 Find out the water level when full and level of over flow pipe.
- 3 Flush the cistern to drain water spout.
- 4 Mope inside with a sponge or cloth.
- 5 Remove the flexible pipe from cistern using pipe wrench.
- 6 Unscrew the ball cock and remove it.
- 7 Check the condition of valve, washer, lever are etc.,

**if it beyond replace the seat with new one.**

- 8 Tighten the lock nut with finger at bottom.
- 9 Tighten the check nut of flexible pipe to cistern.
- 10 Check the ball valve moves free.
- 11 Turn on water supply.
- 12 Check the leakage of out let and inlet.
- 13 Check proper function.

Fig 1



PBN26156J1

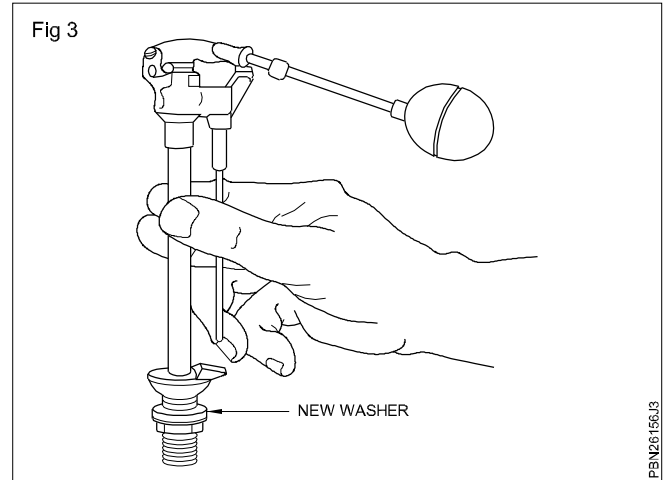
14 Bend the float arm down if water level is high, ie above from the required level. (25mm below overflow level) (Fig 4).

15 Bend the rod up if the water level is low.

### Safety

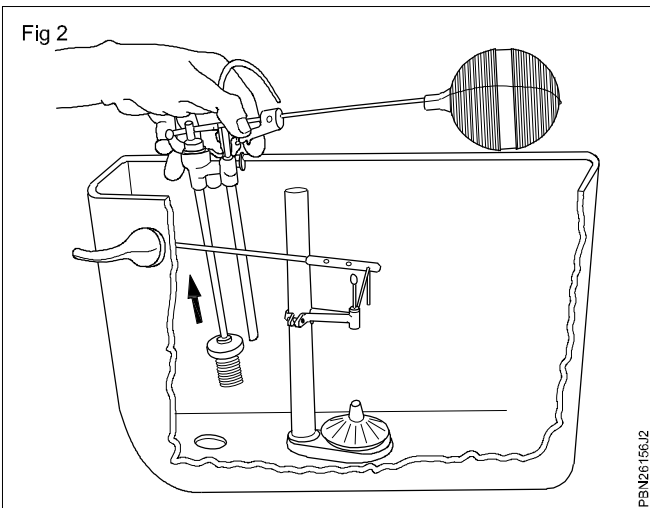
- Use proper tools
- Float valve removing only by spanner.

Fig 3



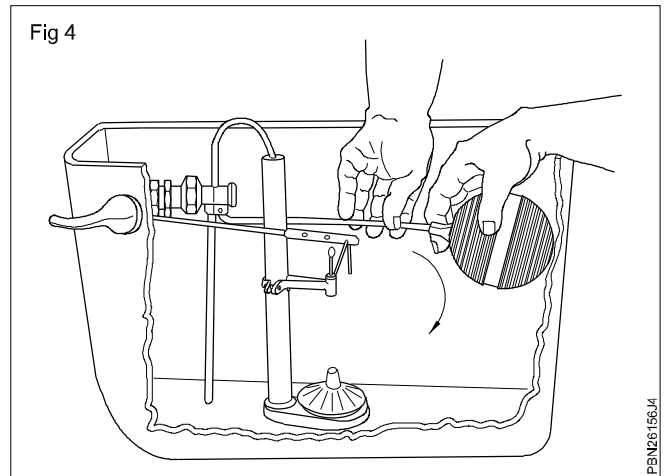
PBN26156J3

Fig 2



PBN26156J2

Fig 4



PBN26156J4

### TASK 3 : Syphonic water

**If water leakage from closet.**

- 1 Remove the flush tank handle lever.

- 2 Remove the syphonic unit with rubber washer.

**If washer worn out, replace it.**

### TASK 4 : Improper syphonic washer

**If flush tank water not properly function.**

- 1 Remove the check nut on bottom of the flush tank.

- 2 Replace the syphonic unit.
- 3 Reassemble the unit.
- 4 Check the water flow.

**Estimate and work out abstract cost of plumbing work as per layout**

**Objectives:** At the end of the exercise you shall be able to

- estimate the plumbing material
- arrive abstract cost of plumbing work.

**PROCEDURE**

**TASK 1 : Estimation of plumbing work**

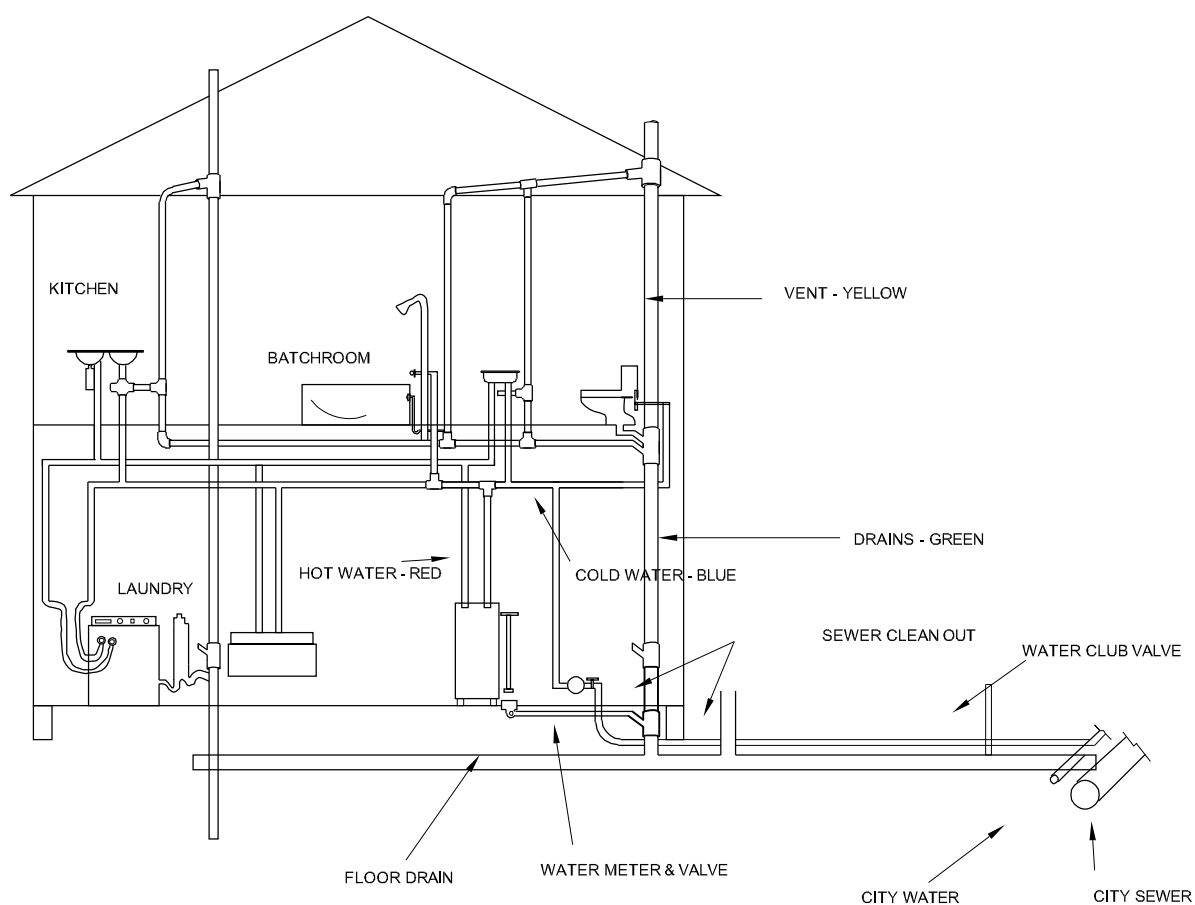
- 1 Plan the plumbing work as per the drawing.
- 2 Prepare the tools and materials as per requirement.
- 3 Check the correct method of plumbing work followed.
- 4 Arrange the plumbing work in the correct sequence to avoid time delay.
- 5 Ensure the plumbing material utilised in the proper way to avoid wastage.
- 6 Check the factors affecting pricing of plumbing job.

**How to set the plumbing quotations**

Before pricing calculation, ensure industry standards for job estimates are followed;

- Check the flat rates are standard for jobs like toilet and shower installation.
- Check and understand the salary need in your area.
- Assess the site before giving any estimate.

Fig 1



PEN26157H1

- Inspect the unforeseen challenges which increase the overall cost.
- Check the size of job and depth of job that require research.
- Add 3% as a buffer cost while determining estimate for research and subcontractors.
- Ensure extra materials and expenses are included in the estimate.

— — — — —

#### TASK 2 : Arriving abstract cost of plumbing work as per layout

- |   |  |
|---|--|
| 1 Check the size of bathroom the material required.                                   | Plaster = 39.6 sq.m x 80 Rs = 3168                             |
| 2 List the sanitary and plumbing fixtures required.                                   | Water proofing = 0.756 Cu.M x 108 = 81.64                      |
| 3 Prepare market rate for skilled labour pricing.                                     | Cement sheet = 3.22 sq.m x 37 = 119.14                         |
| 4 Labour and material Rs100 to 120/- per square feet based on economic specification. | Tiling 19.8 sq.m x 15.5 Rs/sqm = 6.9                           |
| 5 In general bathroom size 2.1 meter x 1.2 meter and height would be 2.5 to 3 meters. | Mixer 1 = @ Rs.900/-   |
|   | Shower 1 = @ Rs.450/-  |
|   | Trap 1 = @ Rs.150/-  |
|   | Total approximately 5281.28                                    |
|   | (Water proofing and slope of flooring tile is prime important) |

#### Material

Brick work = 1.32 Cu.m x 80 = 105.6

Plumbing pipe = Approx x 25 running meters

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