PLUMBER

NSQF LEVEL - 3

TRADE PRACTICAL

SECTOR : PLUMBING

(As per revised syllabus July 2022 - 1200 Hrs)

Directorate General of Training

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

NATIONAL INSTRUCTIONAL MEDIA INSTITUTE, CHENNAI

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

Sector : **Plumbing**

Duration : **1 - Year**

Trade : **Plumber - Trade Practical - NSQF Level - 3 (Revised 2022)**

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National Instructional Media Institute
Post Box No.3142
Guindy, Chennai - 600032
INDIA
Email: chennai-nimi@nic.in
Website: www.nimi.gov.in

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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 - Trade Practical - NSQF Level - 3 (Revised 2022)** in **Plumbing Sector** under **Yearly Pattern.** The NSQF Level - 3 (Revised 2022) 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 - 3 trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 3 (Revised 2022) 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

SHRI. ATUL KUMAR TIWARI., I.A.S.,
Secretary
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 syllabi 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 - NSQF Level - 3 (Revised 2022)** under the **Plumbing** Sector for ITIs.

MEDIA DEVELOPMENT COMMITTEE MEMBERS

Shri. D. Sundar	-	A.T.O Govt. I.T.I Ambattur, Chennai.
Shri. R. Sundar	-	A.T.O Govt. I.T.I North Chennai.
Shri. G. Elumalai	-	Training Officer, (Rtd) MDC member, NIMI, chennai.
Shri. R. Sekaran	-	Junior Training Officer, (Rtd) MDC member, NIMI, chennai.
Shri. D.M. Rejimon	-	Senior Instructor Govt. I.T.I, Chenneerkara Kerala.

NIMI - CO-ORDINATORS

Shri. Nirmalya Nath	-	Deputy Director NIMI - Chennai - 32
Shri. G. Michael Johny	-	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 intented to be used in practical 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 - 3 (Revised 2022) syllabus are covered.

This manual is divided into Twelve modules. The Twelve modules are given below.

Module 1	-	**Safety**
Module 2	-	**Hand Tools**
Module 3	-	**Fitter**
Module 4	-	**Welder**
Module 5	-	**Mason**
Module 6	-	**Plumber**
Module 7	-	**Piping System**
Module 8		**Pumps and PVC Joints**
Module 9	-	**Drainage Systems**
Module 10	-	**Water Supply System**
Module 11	-	**Bending and Systems of Water Supply**
Module 12	-	**Tank Installation, Tests and Maintenance**

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 Theory NSQF Level - 3 (Revised 2022) in Plumbing. The contents are sequenced according to the practical exercise contained in NSQF Level - 3 (Revised 2022) syllabus on Trade Theory attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This correlation is maintained to help the trainees to develop the perceptional 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 indications about the corresponding practical exercises are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise at least 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 for the purpose of self learning and should be considered as supplementary to class room instruction.

CONTENTS

LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

S.No.	Learning Outcome	Ref.Ex.No
1	Plan and organize the work to make job as per specification applying different types of basic fitting operation and Check for dimensional accuracy following safety precautions.[Basic fitting operation - marking, Hacksawing, Chiseling, Filing, Drilling, Taping, Threading and Grinding etc. Accuracy: ± 0.25mm] **(NOS:PSC/NO133v1.0) (NOS:PSC/NO132) (NOS:PSC/NO134) (NOS:PSC/NO135) (NOS:PSC/ N9901 v 1.0)**	1.1.01 - 1.2.13
2	Perform Inner & Outer Thread cutting on Metal &Studs and thread cutting on different types of pipes&fittings accessories. **(NOS:PSC/NO133)**	1.3.14 - 1.3.17
3	Carry out cutting of Pipes of Different dia in different angle and Joining of pipes by gas welding, Soldering and Brazing. **(NOS:PSC/NO133**	1.4.18 - 1.4.20
4	Construct Masonry brick wall and RCC casting. Brick wall cutting for concealing pipe line. **(NOS:PSC/NO133) (NOS:PSC/NO134) (NOS:PSC/NO134)**	1.5.21 - 1.5.28
5	Carry out Cutting and Bending of Pipes using Plumber's tools and equipment. **(NOS:PSC/NO133)**	1.6.29 - 1.6.35
6	Join Various type of PVC pipe by heat process or Welding. **(NOS:PSC/NO133)**	1.6.36 - 1.6.40
7	Construct complete pipe line circuit with different types of Joints and fixing Cocks & valve on Pipe line. **(NOS: PSC/NO133)**	1.6.41 - 1.6.46
8	Carry out Cutting of Different Types of PVC Pipe, joining and laying. **(NOS: PSC/NO133)**	1.6.47 - 1.6.50
9	Perform Water analysis test, Water Pressure test and Water distribution system by using Pipe line. **(NOS:PSC/NO133)**	1.6.51 - 1.6.59
10	Align and lay humid asbestos pipe line of different dia. and fitting & maintenance of drainage pipe line. **(NOS: PSC/NO135)**	1.7.60 - 1.7.66
11	Install and maintain different Electric pumps. **(NOS: PSC/NO135)**	1.8.67 - 1.8.71
12	Join fittings for different purposes on PVC pipe line. **(NOS:PSC/NO133)**	
13	Construct inspection chamber, manhole, gutter, septic tank, socket etc. **(NOS: PSC/NO135)**	1.8.72 - 1.8.76
	Test pipe line as per site drainage pipe line layout **(NOS: PSC/NO135)**	1.9.77 - 1.9.78
14	Perform removal of leakage in pipe line. **(NOS: PSC/NO133)**	
15	Install, fix & maintain different valve & cock and sensor system of sanitary fittings. **(NOS: PSC/NO136)**	1.9.79 - 1.9.82
16	Install & maintain water meter and water supply for different fixtures. **(NOS: PSC/NO133)**	1.10.83 - 1.10.86
17	Demonstrate method of bending for different materials & different pipe joint. **(NOS: PSC/NO133)**	1.10.87 - 1.10.91
18	Perform fitting and maintenance of Fixture at different place. **(NOS: PSC/NO136)**	1.10.92 - 1.10.97
19	Carry out fitting, fixing & laying installation of hot & cold water pipe line and symbolizing. **(NOS:PSC/NO133)**	1.11.98 - 1.8.101 1.11.102-1.11.106
20	Perform repairing & reconditioning of waste pipe line. **(NOS: PSC/NO133)**	1.11.107-1.11.112
21	Perform repairing& reconditioning, scraping & painting of sanitary fittings pipe line. **(NOS: PSC/NO133)**	1.12.113-1.12.116 1.12.117-1.12.123

SYLLABUS FOR PLUMBER

Duration	Reference Learning Outcome	Professional Skills (Trade Practical) with Indicative hours	Professional Knowledge (Trade Theory)
Professional Skill 100Hrs; Professional Knowledge 18Hrs	Plan and organize the work to make job as per specification applying different types of basic fitting operation and Check for dimensional accuracy following safety precautions.[Basic fitting operation - marking, Hacksawing, Chiseling, Filing, Drilling, Taping, Threading and Grinding etc. Accuracy: ± 0.25mm] **(NOS:PSC/NO133v1.0) (NOS:PSC/NO132) (NOS:PSC/NO134) (NOS:PSC/NO135) (NOS:PSC/ N9901 v 1.0)**	1 Importance of trade training, List of tools & Machinery used in the trade.(08hr) 2 Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (5hrs) 3 First Aid Method and basic training.(08hrs) 4 Safe disposal of waste materials like cotton waste, metal chips/ burrs etc. (05hrs) 5 Hazard identification and avoidance. (2 hrs) 6 Safety signs for Danger, Warning, caution & personal safety message.(06hr) 7 Preventive measures for electrical accidents & steps to be taken in such accidents.(04hrs) 8 Use of Fire extinguishers.(7 hrs) 9 Practice and understand precautions to be followed while working in the trade. (04hrs) 10 Safe use of tools and equipment used in the trade. (1 hr)	• Importance of safety and general precautions required for the trade. • Importance of the trade. • Types of work to be done by trainees in the institute. • Scope of a plumbing work. • Types of services have to plan. • Basic Bench fitting (04hrs)
		11 Use Steel rule and Steel Tape for measuring, Use Scriber and Divider formarking on raw materials.(10hrs) 12 Demonstrate use of different types of Vice:- Bench vice, Pipe vice, Chain Vice, Hand vice, Chain Wrench. (20 hrs) 13 Demonstrate use of various Hand Tools:- Different Files, Hammer, Centre Punch, Hacksaw, Chisel, Callipers, Pipe Wrench, Stock & Dies, Taps and Holders. (20hrs)	• Plumber's common hand tools - names, description and material from which they are made. • Description, types and uses of holding device, hammers & cold chisels, cutting tools. • Description of simple fitting operations hack sawing, punching and filing. • Types of files used commonly. • Marking instruments and their use of simple drilling machine. • Method of using drills. • Description of simple bench drilling Machine. • Description of Grinding and Chisel. • Description of different types of locking and fastening devices. (14 hrs)
Professional Skill 15Hrs; Professional Knowledge 06Hrs	Perform Inner & Outer Thread cutting on Metal &Studs and thread cutting on different types of pipes&fittings accessories. **(NOS:PSC/NO133)**	14 Thread Inner on M.S. flat by using Tap.(5hrs) 15 Use various locking device.(5hrs) 16 Outer thread on Pipe by using Die. (3hrs) 17 Fixing of different Pipe fittings in different position of Pipe. (2hrs)	• About different types of pipes- GI,CI,DI,PVC/CPVC,PPR,AC andHDPE etc. • About different Types of Pipe Fittings:- Socket, Elbow, Tee, Union, Bend, Cap, Plug, Cross, Ferrule etc. • About different types of Thread cutting. (06hrs)

Professional Skill 20Hrs; Professional Knowledge 06Hrs	Carry out cutting of Pipes of Different dia in different angle and Joining of pipes by gas welding, Soldering and Brazing. **(NOS:PSC/NO133)**	18 Cutting different diameter of MS pipes in different angles. (10 hrs) 19 Joining of Pipe in same dia by gas welding. (05hrs) 20 Joining of Pipes in different dia by gas welding. (05hrs)	**Gas Welding :-** • Purpose of Gas welding. • Method of gas welding • Safety precautions to be observed - Methods of soldering andbrazing -fluxes used & Types of fluxesprecautions to be observed. • Hard & soft solders -their properties, composition and uses. (06hrs)
Professional Skill 35Hrs; Professional Knowledge 06Hrs	Construct Masonry brick wall and RCC casting. Brick wall cutting for concealing pipe line. **(NOS:PSC/NO133) (NOS:PSC/NO134) (NOS:PSC/NO134)**	21 Demonstrate proper handling of Mason's hand tools:- Straight edge, Spirit level, Plumb bob, Square, Trowel etc. (5 hrs) 22 Setting out work with Tape, Rule, Square, Line pin and level as per drawing. (5hrs) 23 Prepare Cement mortars in different proportions to suit various purposes. (5 hrs) 24 Prepare Plane Cement Concrete and RCC in different proportions to suit various purposes. (5 hrs) 25 Benching and Channelling of base plate. (5hrs) 26 Damp proofing. (2 hrs) 27 Plastering the walls. (3 hrs) 28 Cutting of Masonry wall for concealing with Electric Cutting Tools. (5 hrs)	**Mason's works :-** • Names and description of Mason's hand tools and their uses. • Method of making holes in walls andfloors. • Types of tools used and various Processes. • Concept of bricks, lime and cement. • Preparation of mortars with various materials of varying composition. • Common brick joints. • Description of bonds. • Scaffolding &plastering. • Define Plain cement concrete, RCC and its proportion, • Grades of coarse aggregate and fine aggregate, • Knowledge of waterproofing compound. • Knowledge of Building Plan and Cross section of wall. • Identify plumbing services required for each type of building according to usage. (06hrs)
Professional Skill 40Hrs; Professional Knowledge 10Hrs	Carry out Cuttingand Bending of Pipes using Plumber's tools and equipment. **(NOS:PSC/NO133)**	29 Demonstrate proper handling of Plumber's Tools &Equipment. (05hrs) 30 Use and care of Plumber's Tools and Equipment. (05hrs) 31 Cutting of G.I Pipes of different Diameter and Sizes by cutting tools. (05hrs) 32 Cutting of C.I Pipe of different Diameter and Sizes by cutting tools. (05hrs) 33 Cutting of all kinds of PVC Pipe of different Diameter and Sizes by cutting tools. (05 hrs) 34 Bending of G.I Pipe as per drawing using Bending Machineup to 50 mm dia.(10hrs) 35 Bending of PVC Pipe as per drawing using heat process up to 50 mm dia. (5 hrs)	• Description of plumber tools and Equipment- Ratchet brace, Threading die, Pipe wrench, sliding wrench, Spanner set, Chain Wrench etc. and their safety. • Care & use of tools. • Pipes of different kinds • Method of Pipe bending in different dia. • Plumbing Symbols and Code for Tools & Materials on water line. (10hrs)
Professional Skill 25Hrs;	Join Various type of PVC pipe by heat process or Welding. **(NOS:PSC/NO133)**	36 Preparation of PVC pipe & Fittings in different dia. (1 hr) 37 Preparation and precaution of Electric Hot Plate.(1hr)	• Equipment and tools for hot gas welding and electric hot plate for PPR pipe joints. (08hrs)

Professional Knowledge 08Hrs		38 PVC Pipe welding various dia, using welding machine.(13hrs) 39 Weld various type of PVC Pipe with various dia, using welding machine. (5hrs) 40 PPR pipe welding joint various dia of pipe using welding machine.(5hrs)	
Professional Skill 25Hrs; Professional Knowledge 08Hrs	Construct complete pipe line circuit with different types of Joints and fixing Cocks & valve on Pipe line. **(NOS:PSC/NO133)**	41 CI/HCI Pipe Flange joint with Bend and Tee.(5hrs) 42 Socket joint of CI Pipes with lead. (5hrs) 43 Detachable joint of AC pressure Pipe. (5 hrs) 44 Titan/Socket & Spigot joint of Ductile Iron (DI) Pipe with Rubber ring.(4hrs) 45 Prepare and Study the drawing of Pipe line circuit and schedule use of Tools and accessories.(2hrs) 46 Make a Pipe line circuit on GI Pipe with Socket, Elbow, Bend, Flange, Tee, Union etc. And Fixing Cocks & Valves as per drawing. (4hrs)	• Types of fittings for different joints & different pipes.:- CI,HCI,AC,AC Pressure, DI, GI Pipes. Joints:- Flange joint, Socket joint with lead, Detachable joint, Socket & Spigot joints etc. • Description of pipe fittings. • Methods of joining and their uses. • Precautions to be taken while fixing (08hrs)
Professional Skill 25Hrs; Professional Knowledge 08Hrs	Carry out Cutting of Different Types of PVC Pipe, joining and laying. **(NOS:PSC/NO133)**	47 PVC pipe cutting & shaping in various dia, using Hacksaw and Pipe cutters. (10 hrs) 48 Preparation of PVC pipe and Fittings with emery paper.(5hrs) 49 Use & fixing of PVC fittings use Solvent Cement etc. (5hrs) 50 Layout of PVC pipe according to drawing. (5hrs)	• Different kinds of Joints, Fittings and Materials in joining pipes:- PVC/CPVC, PPR and HDPE etc. (08hrs)
Professional Skill 25Hrs; Professional Knowledge 08Hrs	Perform Water analysis test, Water Pressure test and Water distribution system by using Pipe line. **(NOS:PSC/NO133)**	51 Preparation of Water and Water analysis kit. (1 hr) 52 Water Analysis Test by Analysis Kits. pH, TDS,Temperature etc. (4hrs) 53 Preparation of Hydraulic Pressure Test Machine. (1 hr) 54 Static water pressure test by Hydraulic Pressure Test Machine apply on Plastic Water bottle.(4hrs) 55 Static water pressure test by Hydraulic Pressure Test Machine apply on Cistern and Tank.(4hrs) 56 Steps of simple pipe line connection as per drawing. (3 hrs) 57 Make a pipe line for water distribution as per drawing. (4hrs) 58 Make a pipe line for OHR water distribution system as per drawing. (02hrs) 59 Installation of water hammer arrester. (02 hrs)	**Composition of Water:-** • Sources of water • Hard & Soft water, temporary hardness &permanent hardness. • Impurities of water - organicand inorganic impurities. • Water purification stages and methods. • Static water pressures and measurement of pressures. Bursting pressure, • Expansion of water on freezing and heating. • Bernoulli's principles • Pascal's law. • Pressure of water on the sides of cistern or tank. • Water hammer in pipes. • Description and working of water hammer arrester. (08hrs)

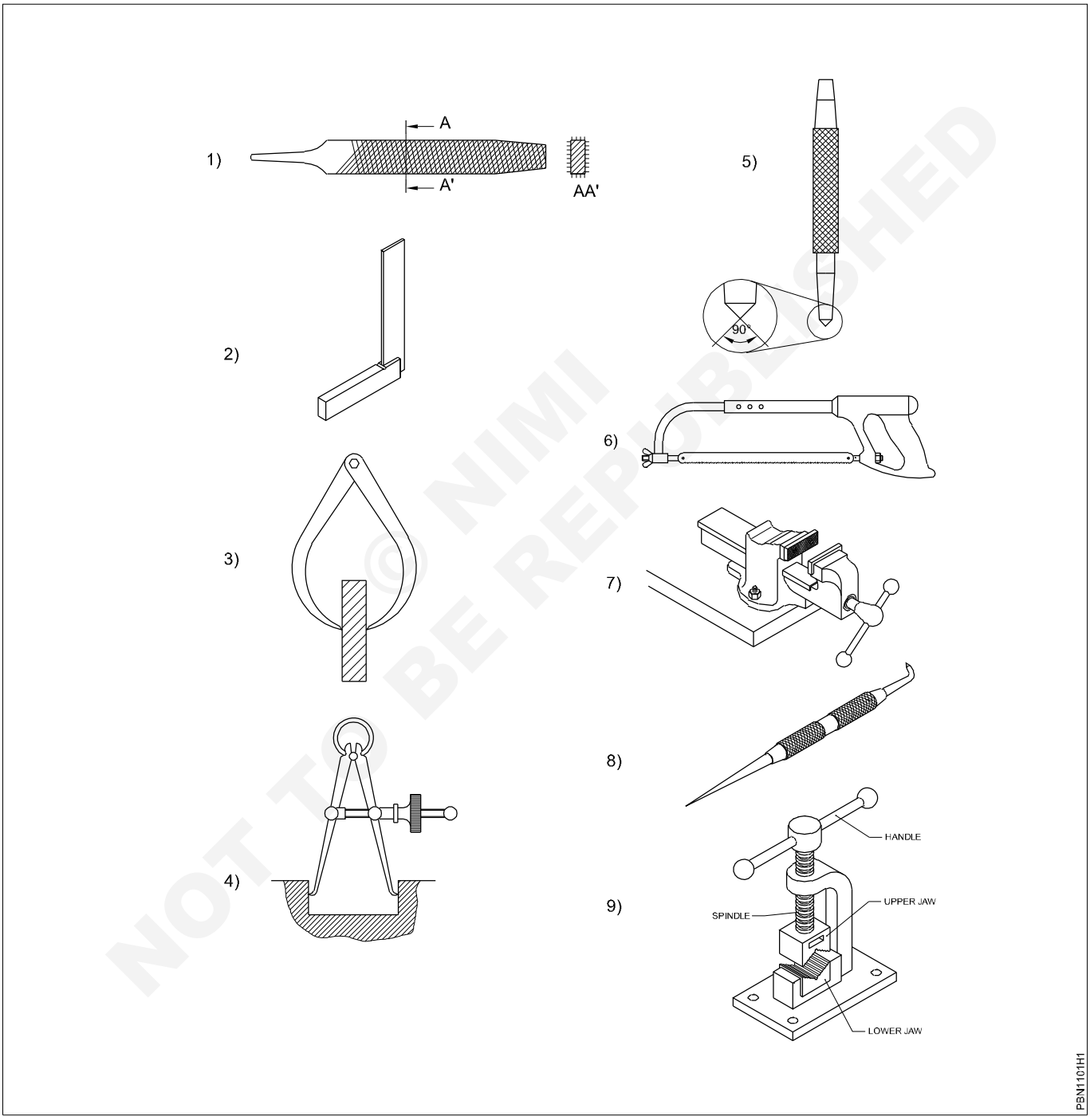
Professional Skill 45Hrs; Professional Knowledge 10Hrs	Align and layhumid asbestos pipe line of different dia. and fitting & maintenance of drainage pipe line. **(NOS:PSC/NO135)**	60 Interpret drawing of sanitary plumbing. (08hrs) 61 Lay & align hummed pipe. (05hrs) 62 Demonstrate use of specificdia in different location. (04hrs)	• Use of hummed and asbestos pipes of different sizes. • Method of laying out pipes alignment and joining. (05hrs)
		63 Use various sanitary fitting. (06hrs) 64 Use various fitting of different materials. (06hrs) 65 Use joining materials of pipe. (10hrs) 66 Join pipe as per laid down Procedure. (06hrs)	• Description of various pipe joints-straight, Branch, Taft and blow, Expansion joints. Solders and fluxes used in joints. (05hrs)
Professional Skill 60Hrs; Professional Knowledge 10Hrs	Install and maintain different Electric pumps. **(NOS:PSC/NO135)**	67 Demonstrate use of different pump. (10 hrs) 68 Demonstrate installation of electric pump (10 hrs) 69 Demonstrate maintenance of electric pump. (10 hrs) 70 Demonstrate working process of centrifugal, reciprocating, submersible pump. (15 hrs) 71 Demonstrate delivery of water to overhead tank through pump, presser head, delivery pipe, suction pipe, etc, (15 hrs)	• Description of Plumber's materials Lead, tin, Zinc, solder, copper, red lead etc. and their uses. • Water supply system of a small town. • Description and types of pumps viz. suction pump, Centrifugal pump etc. Contamination of water in a well. (10hrs)
Professional Skill 30Hrs; Professional Knowledge 06Hrs	Join fittings for different purposes on PVC pipe line. **(NOS:PSC/NO133)**	72 Produce BSP thread on pipe. (05 hrs) 73 Produce Internal and external thread on PVC pipes of different dia. (05 hrs) 74 Join PVC pipe with thread. (05hrs) 75 Join PVC pipe with solvent cement and heat process(05hrs) 76 Join PVC pipe as per layout. (10hrs)	• Description of pipe dies, their uses, care and precaution. • Metric specification of various pipes. • Standard pipe threads. • Method employed for bending, Joining and fixing PVC pipe. • Joining material for water and gas pipes. • Use of blow lamp. (06hrs)
Professional Skill 25Hrs; Professional Knowledge 07 Hrs	Constructinspection chamber, manhole, gutter, septic tank, socket etc. **(NOS:PSC/NO135)**	77 Demonstrate inspection chamber, manhole, gully trap, septic tank, soak pit. (04 hrs) 78 Construct inspection chambers, cesspool, septic tank, soak pit etc. (21 hrs)	• Inspection chamber, septic tank, description of drains, cesspools, soak pits etc. • Types of traps • layout of drainage system (07 hrs)
Professional Skill 25Hrs; Professional Knowledge 05Hrs	Test pipe line as per site drainage pipe line layout. **(NOS:PSC/NO135)**	79 Demonstrate drawing layout of drainage pipe line. (06 hrs) 80 Perform testing for smoke test, water test, smell test, ball test mirror test. (10 hrs) 81 Join heavy cast iron socket pipe. (03 hrs) 82 Sealing of heavy cast iron pipe joint with lead & caulking tools. (06 hrs)	• Method of bending pipes by hot and cold process. • Method of testing drainage lines (05hrs)
Professional Skill 25Hrs; Professional Knowledge 04Hrs	Perform removal of leakage in pipe line. **(NOS:PSC/NO133)**	83 Identify location of leakage pipe. (06 hrs) 84 Removing out leakages pipe. (10 hrs) 85 Removing of air locks (06 hrs) 86 Demonstrate rain water harvesting system. (03 hrs)	• Method of dismantling and renewal of the valves and pipes. Leaks in pipes and noises in plumbing. • Installation of water meters. Air lock in pipes and its removal. (04hrs)

Professional Skill 75Hrs; Professional Knowledge 10Hrs	Install, fix & maintain different valve & cock and sensor system of sanitary fittings. **(NOS:PSC/NO136)**	87 Demonstrate different cocks & valves including materials. (10hrs) 88 Employ cocks & valves at different place. (20 hrs) 89 Employ different cock& valve with sensor system. (20 hrs) 90 Demonstrate maintenance of different cocks & valves. (15 hrs) 91 Demonstrate use of packing washer gasket of different cock & valve. (10 hrs)	• Description of cocks & valves-their types, materials & advantages for particular work. • Description of different type of diverts i.e. two way and three way • Sensor system for urinals and wash basin etc.(10hrs)
Professional Skill 75Hrs; Professional Knowledge 14Hrs	Install & maintain water meter and water supply for different fixtures. **(NOS:PSC/NO133)**	92 Demonstrate location of meter. Fitting of water meter, bath tub, wash basin. (10 hrs) 93 Install water metre, bath tub, hand wash basin, water closet urinal, sink etc with sensor system. (20 hrs) 94 Demonstrate maintenance of water metre, bath tub, hand wash basin, water closet urinal, sink etc. (15 hrs) 95 Demonstrate testing of water metre, Bath Tub, Hand wash basin. (10 hrs) 96 Demonstrated rain water and drainage pipe system. (10hrs) 97 Installation of concealed flushing cistern. (10 hrs)	• Erecting rain water and drainage pipe system, • Installation of sanitary fitting s, inspection and testing of water supply system. • -Pipe alignment and slope. -Prevention of water hammer. • Storage tanks for general water supply propose. • Test for water supply pipes. • Description of sanitary fittings, • general points to be observed when choosing sanitary. • Description of concealed flushing cistern (14hrs)
Professional Skill 50Hrs; Professional Knowledge 05Hrs	Demonstrate method of bending for different materials & different pipe joint. **(NOS:PSC/NO133)**	98 Demonstrate bending of pipes in bending machine. (08 hrs) 99 Bend GI pipe of different diameter in different angle. (14 hrs) 100 Bend G.I. pipe as per drawing and measurement. (14 hrs) 101 Bend PVC pipe of different diameter in different angle with dry sand by heating. (14 hrs)	Method of bending galvanized mand other heavy pipes. (05hrs)
Professional Skill 50Hrs; Professional Knowledge 05Hrs	Perform fitting and maintenance of Fixture at different place. **(NOS:PSC/NO136)**	102 Demonstrate process of C.I pipe cutting & joining. (12 hrs) 103 Process of C.I. pipe fitting for waste pipe line in different section. (08 hrs) 104 Employ Process of fixing of external soil pipe. (12 hrs) 105 Demonstrate process of fixing of rain water gutter outlet and ground pipe. (10 hrs) 106 Demonstrate process of measurement of waste pipe line. (08 hrs)	**Domestic drainage system:** General layout, one pipe system, specifications of Materials required. Method of testing leakage. Different types of traps, ventilation, anti-syphonage and sinks. About Fire hydrants and their fittings. (05hrs)
Professional Skill 25Hrs; Professional Knowledge 06Hrs	Carry out fitting, fixing & laying installation of hot & cold water pipe line and symbolizing. **(NOS:PSC/NO133)**	107 Demonstrate working of solar water heating system. (02 hrs) 108 Analyse temperature of water (hot and cold). (02 hrs) 109 Layout pipe line for hot and coldwater distribution as per drawing. (04 hrs) 110 Install pipe line for distribution of hot & cold water. (08 hrs)	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.

		111 Install hot water system & solar water heating system. (08 hrs) 112 Symbolise distribution of hot & cold water pipe line. (01 hr)	Method of ventilating pipe. Precaution against air Poisoning. Fixing of solar water system. (06hrs)
Professional Skill 25Hrs; Professional Knowledge 06Hrs	Perform repairing & reconditioning of waste pipe line. **(NOS:PSC/NO133)**	113 Perform repairing of different trap, valve, cistern etc. (03 hrs) 114 Demonstrate construction of over head tank as per measurement. (08 hrs) 115 Maintenance and recondition pipe line. (10 hrs) 116 Perform smoke test far waste pipe line. (04 hrs)	Plumbing and sanitary symbols and plumbing codes for all tools and materials (06hrs)
Professional Skill 20Hrs; Professional Knowledge 02Hrs	Perform repairing& reconditioning, scraping & painting of sanitary fittings pipe line. **(NOS:PSC/NO133)**	117 Demonstrate cleaning of sanitary pipe line. (02 hrs) 118 Perform cleaning of sanitary pipe line. (02hrs) 119 Remove corrosion from pipe line. (02hrs) 120 Demonstrate scraping & painting. (02 hrs) 121 Perform scraping & painting of pipe line. (02hrs) 122 Maintenance of broken or cracked sanitary fitting. (05 hrs) 123 Estimate and work out abstract cost of plumbing work as per drawing/layout. (05 hrs)	Corrosion - causes and remedies, prevention. Corrosion due to electrolytic action. Effect of water and frost on materials. Layout of pipes as per drawing. Analysis quantity measurement and abstract rate of plumbing and sanitary work. **Bill of Quantity and Estimation :-** • Preparation of bill of quantity • Preparation of Estimation(02hrs)

Importance of trade training, list of tools & machinery used in the trade

Objectives: At the end of this exercise you shall be able to
- **identify the tools and equipments in the section**
- **record the names of tools, precautions to be carried out**
- **record the names of the industries where the plumbers are employed.**



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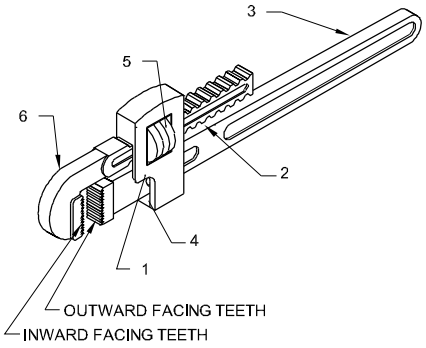

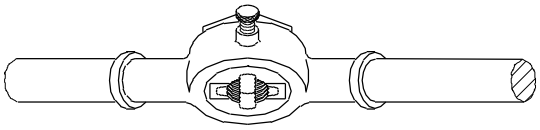

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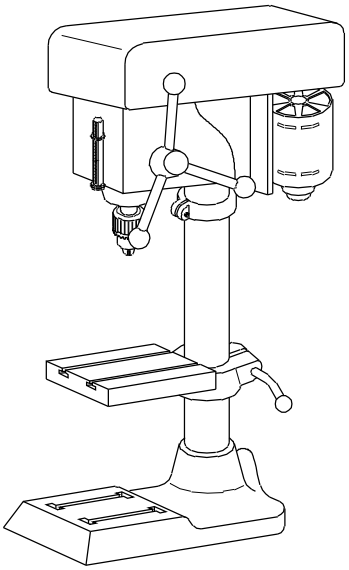

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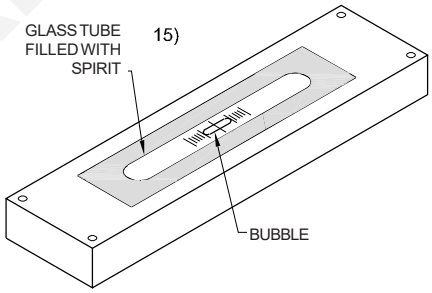

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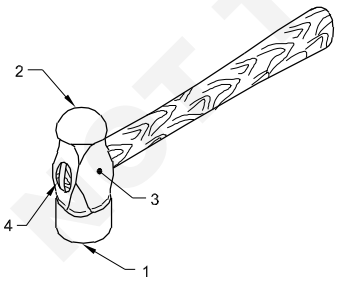
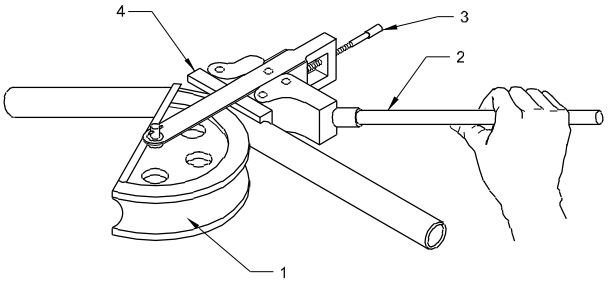




PBN11101H2

Job Sequence

Instructor shall display all the tools and equipments in the section and brief their names, uses and the safety point to be observed for each tool and equipment.

- Trainees will note down all the displayed tools names, uses and the precaution to be observed while working with each tool.
- Record it in Table 1.
- Get it checked by the instructor.

Table 1

Sl. No	Name of tool/equipment	Uses	Precaution to be observed	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

Instructor shall brief the role of a plumber in an industries. Emphasis more on the assembly shop by providing the names of the private and public sector industries, where the plumbers are largely employed. Ask the trainees to note down the names of the industries.

— — — — — — —

Safety attitude development of the trainee by educating them to use personal protective equipment (PPE)

Objectives: At the end of this exercise you shall be able to
- **identify personal protective devices**
- **interpret the different types of personal protective devices**
- **identify occupational hazards and the corresponding potential hazards.**

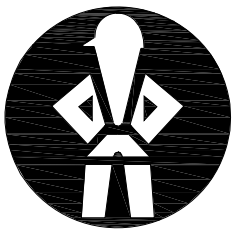


Fig 1

Fig 2

Fig 3

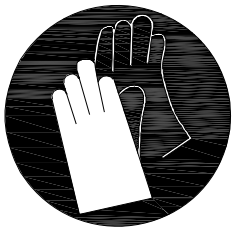


Fig 4

Fig 5

Fig 6

Fig 7

Fig 8

Fig 9

PSN1102H1

PROCEDURE

1 Read and interpret the visuals of personal protection equipment on real devices or from the charts.

2 Identify and select personal protection equipment used for different types of protection.

3 Write the name of the PPE and the corresponding type of protection and the hazards in table 1.

The instructor shall display the different types of personal protective equipments or charts and explain how to identify and select the PPE devices suitable for the work and ask the trainees to note down the hazards and type of protection in the Table 1.

Table 1

S.No.	Name of the PPE	Hazards	Type of protection
1			
2			
3			
4			
5			
6			
7			
8			
9			

4 Get it checked by your instructor.

Instructor may brief the various types of occupational hazards and their causes.

5 Identify the occupational hazard and the corresponding situation with the potential harm and record it in Table 2.

Table 2

S. No.	Source or potential harm	Type of occupational hazards
1	Noise	
2	Explosive	
3	Virus	
4	Sickness	
5	Smoking	
6	Non control device	
7	No earthing	
8	Poor house keeping	

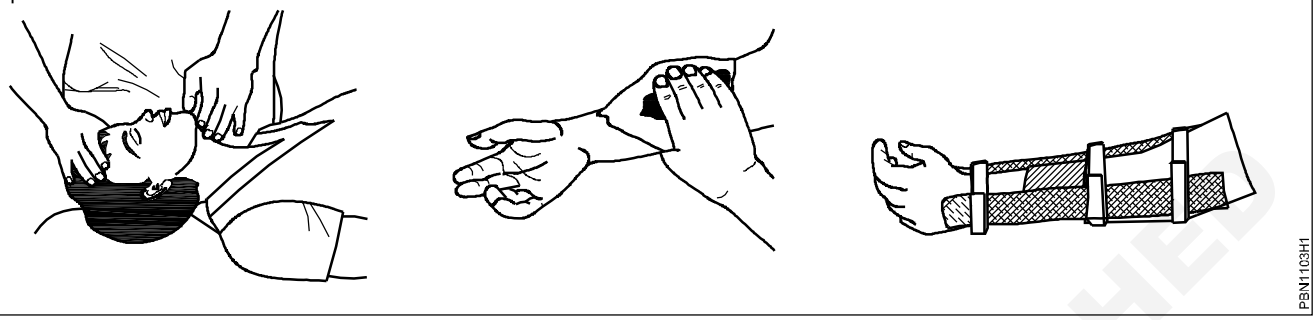
6 Fill up and get it checked by your instructor.

— — — — — — — —

First aid method and basic training

Objectives: At the end of this exercise you shall be able to
- **rescue breathing for an unconscious victim of different condition**
- **perform treatment for stopping of bleeding.**

Fig 1



PROCEDURE

Assumption - For easy manageability, Instructor may arrange the trainees in group and ask each group to perform one method of resuscitation.

TASK 1: **Prepare the victim to receive artificial respiration**

1 Loosen the tight clothing which may interfere with the victim's breathing.

2 Remove any foreign materials or false teeth from his mouth and keep the victim's mouth open.

3 Bring the victim safely to the level ground, taking necessary safety measures.

4 Start artificial respiration immediately without delay. Do not waste too much time in loosening the clothes or trying to open the tightly closed mouth.

5 Avoid violent operations to prevent injury to the internal parts of the victim.

6 Send word for a doctor immediately.

— — — — — — — —

TASK 2: **Resuscitate the victim by Nelson's arm - Lift back pressure method**

Nelson's arm-lift back pressure method must not be used in case there are injuries to the chest and belly.

1 Place the victim prone (that is face down) with his arms folded with the palms one over the other and the head resting on his cheek over the palms. Kneel on one or both knees near the victim's hand. Place your hands on the victim's back beyond the line of the armpits, with your fingers spread outwards and downwards, thumbs just touching each other as in (Fig 1).

2 Gently rock forward keeping your arms straight until they are nearly vertical, and steadily pressing the victim's back as shown in (Fig 2) to force the air out of the victim's lungs.

Fig 1

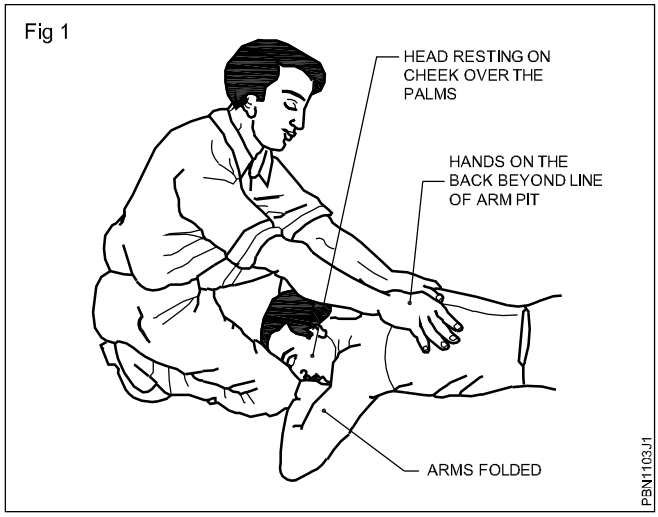
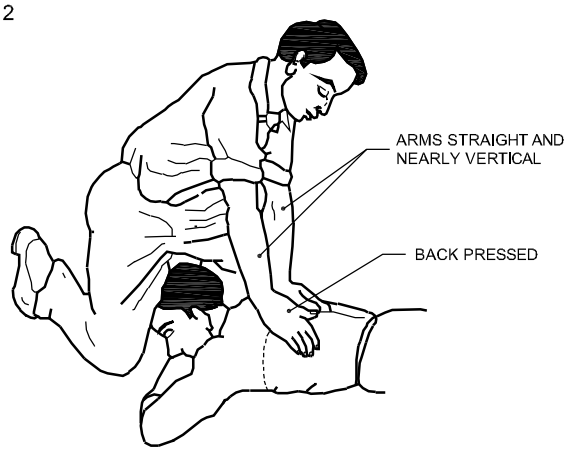
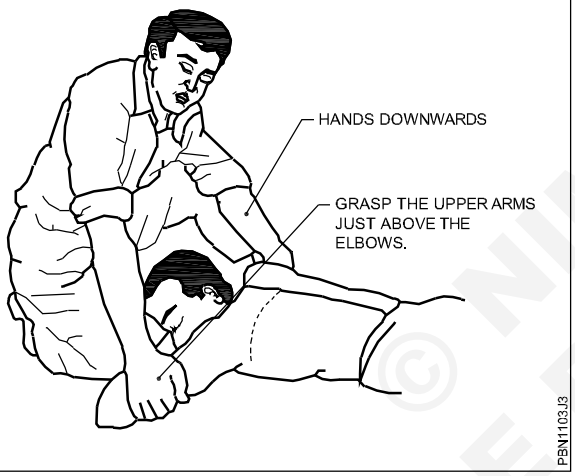


Fig 2



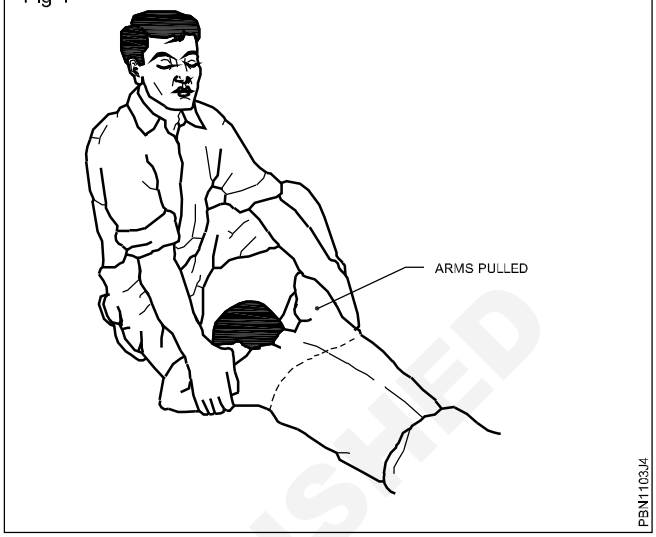
3 Synchronise the above movement of rocking backwards with your hands sliding downwards along the victim's arms, and grasp his upper arm just above the elbows as shown in (Fig 3). Continue to rock backwards.

Fig 3



4 As you rock back, gently raise and pull the victim's arms towards you as shown in (Fig 4) until you feel tension in his shoulders. To complete the cycle, lower the victim's arms and move your hands up to the initial position.

Fig 4



5 Continue artificial respiration till the victim begins to breathe naturally. Please note, in some cases, it may take hours.

6 When the victim revives, keep the victim warm with a blanket, wrapped up with hot water bottles or warm bricks; stimulate circulation by stroking the insides of the arms and legs towards the heart.

7 Keep him in the lying down position and do not let him exert himself.

Do not give him any stimulant until he is fully conscious.

TASK 3: **Resuscitate the victim by Schafer's method.**

Do not use this method in case of injuries to victim on the chest and belly.

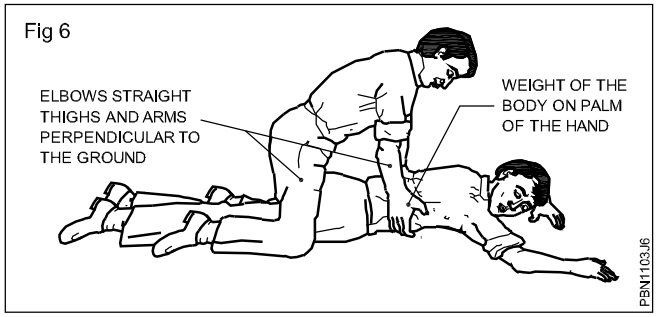
1 Lay the victim on his belly, one arm extended direct forward, the other arm bent at the elbow and with the face turned sideward and resting on the hand or forearm as shown in (Fig 5).

Fig 5

2 Kneel astride the victim, so that his thighs are between your knees and with your fingers and thumbs positioned as in (Fig 5).

3 With the arms held straight, swing forward slowly so that the weight of your body is gradually brought to bear upon the lower ribs of the victim to force the air out of the victim's lungs as shown in (Fig 6).

Fig 6

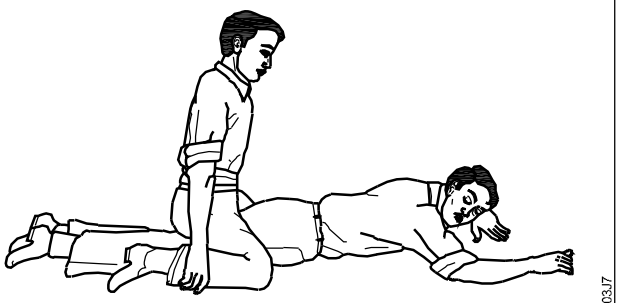


4 Now swing backward immediately removing all the pressure from the victim's body as shown in (Fig 7), thereby, allowing the lungs to fill with air.

5 After two seconds, swing forward again and repeat the cycle twelve to fifteen times a minute.

6 Continue artificial respiration till the victim begins to breathe naturally.

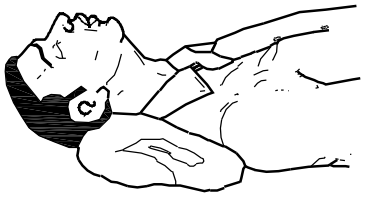
Fig 7



TASK 4: **Resuscitate the victim by mouth-to-mouth method**

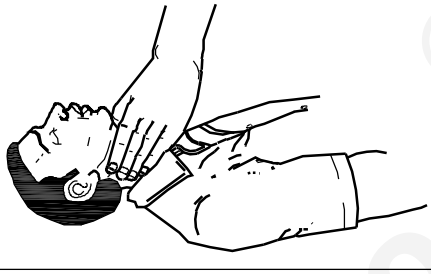
1 Lay the victim flat on his back and place a roll of clothing under his shoulders to ensure that his head is thrown well back. (Fig 8)

Fig 8



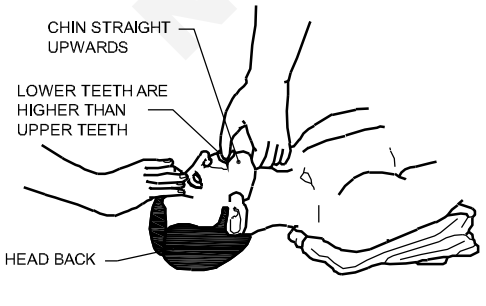
2 Tilt the victim's head back so that the chin points straight upward. (Fig 9)

Fig 9



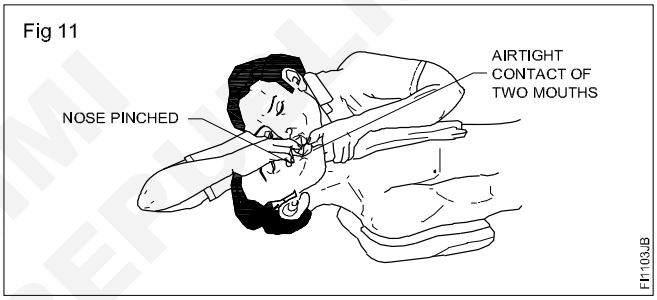
3 Grasp the victim's jaw as shown in (Fig 10), and raise it upward until the lower teeth are higher than the upper teeth; or place fingers on both sides of the jaw near the ear lobes and pull upward. Maintain the jaw position throughout the artificial respiration to prevent the tongue from blocking the air passage.

Fig 10



4 Take a deep breath and place your mouth over the victim's mouth as shown in (Fig 11) making airtight contact. Pinch the victim's nose shut with the thumb and forefinger. If you dislike direct contact, place a porous cloth between your mouth and the victim's. For an infant, place your mouth over his mouth and nose.

Fig 11



5 Blow into the victim's mouth (gently in the case of an infant) until his chest rises. Remove your mouth and release the hold on the nose, to let him exhale, turning your head to hear the rushing out of air. The first 8 to 10 breathings should be as rapid as the victim responds, thereafter the rate should be slowed to about 12 times a minute (20 times for an infant).

If air cannot be blown in, check the position of the victim's head and jaw and recheck the mouth for obstructions, then try again more forcefully. If the chest still does not rise, turn the victim's face down and strike his back sharply to dislodge obstructions.

Sometimes air enters the victim's stomach as evidenced by a swelling stomach. Expel the air by gently pressing the stomach during the exhalation period.

TASK 5: **Resuscitate the victim by Mouth-to-Nose method**

Use this method when the victim's mouth will not open, or has a blockage you cannot clear.

1 Use the fingers of one hand to keep the victim's lips firmly shut, seal your lips around the victim's nostrils and breathe into him. Check to see if the victim's chest is rising and falling. (Fig 12)

2 Repeat this exercise at the rate of 10 - 15 times per minute till the victim responds.

3 Continue this exercise till the arrival of the doctor.

Fig 12

PBN1103JC

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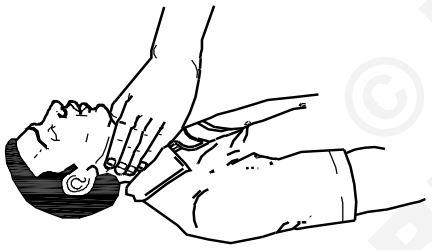
TASK 6: **Resuscitate a victim who is under cardiac arrest (CPR) cardio pulmonary**

In cases where the heart has stopped beating, you must act immediately.

1 Check quickly whether the victim is under cardiac arrest.

Cardiac arrest could be ascertained by the absence of the cardiac pulse in the neck (Fig 13), blue colour around lips and widely dilated pupil of the eyes.

Fig 13



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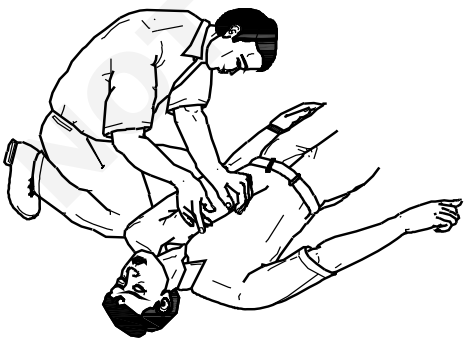
2 Lay the victim on his back on a firm surface.

3 Kneel alongside facing the chest and locate the lower part of the breastbone. (Fig 14)

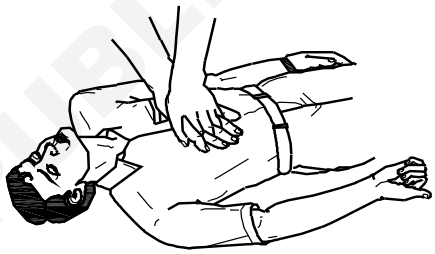
Fig 14



PBN1103JE

4 Place the palm of one hand on the centre of the lower part of the breastbone, keeping your fingers off the ribs. Cover the palm with your other hand and lock your fingers together as shown in (Fig 15).

Fig 15



PBN1103JF

5 Keeping your arms straight, press sharply down on the lower part of the breastbone; then release the pressure. (Fig 16)

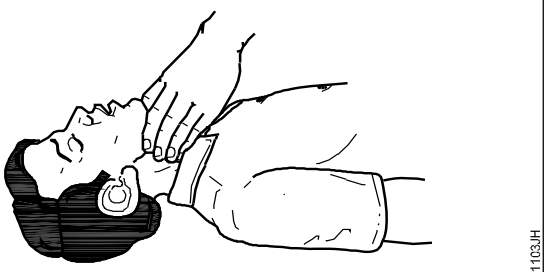
Fig 16

PBN1103JG

6 Repeat step 5, fifteen times at the rate of atleast once per second.

7 Check the cardiac pulse. (Fig 17)

Fig 17



8 Move back to the victim's mouth to give two breaths (mouth-to-mouth resuscitation). (Fig 18)

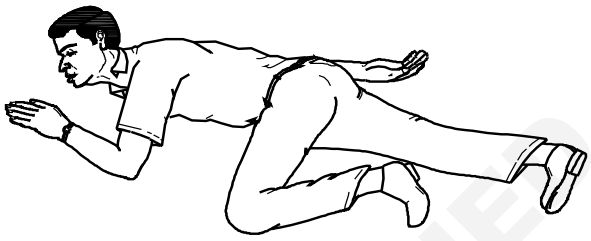
Fig 18

9 Continue with another 15 compressions of the heart followed by a further two breaths of mouth-to-mouth resuscitation, and so on, check the pulse at frequent intervals.

10 As soon as the heartbeat returns, stop the compressions immediately but continue with mouth-to-mouth resuscitation until natural breathing is fully restored.

11 Place the victim in the recovery position as shown in (Fig 19). Keep him warm and get medical help quickly.

Fig 19



Other steps

1 Send ward for a doctor immediately.

2 Keep the victim warm with a blanket, wrapped up with hot water bottles or warm bricks; stimulate circulation by stroking the insides of the arms and legs towards the heart.

— — — — — — — —

TASK 7: **Treatment for bleeding victim**

1 Determine the location of the bleeding.

2 Elevate the injured area above the heart if possible.

3 Apply direct pressure to the bleeding area with sterile cloth.

4 Keep the pressure on for 5 seconds.

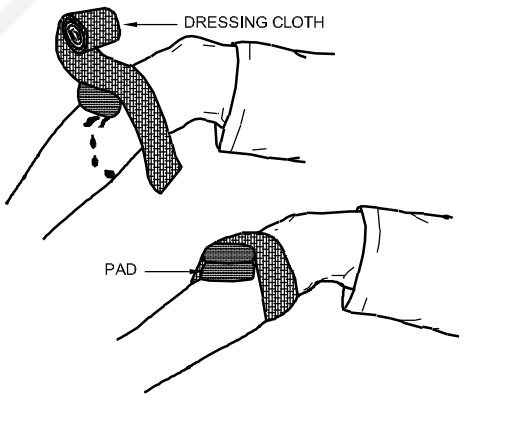
5 Check to see if the bleeding has stopped if not apply further pressure for 15 minutes.

6 Clean the wound.

7 Bandage the wound with pad of soft material. (Fig 20)

8 Advice vitim to take treatment from doctor.

Fig 20



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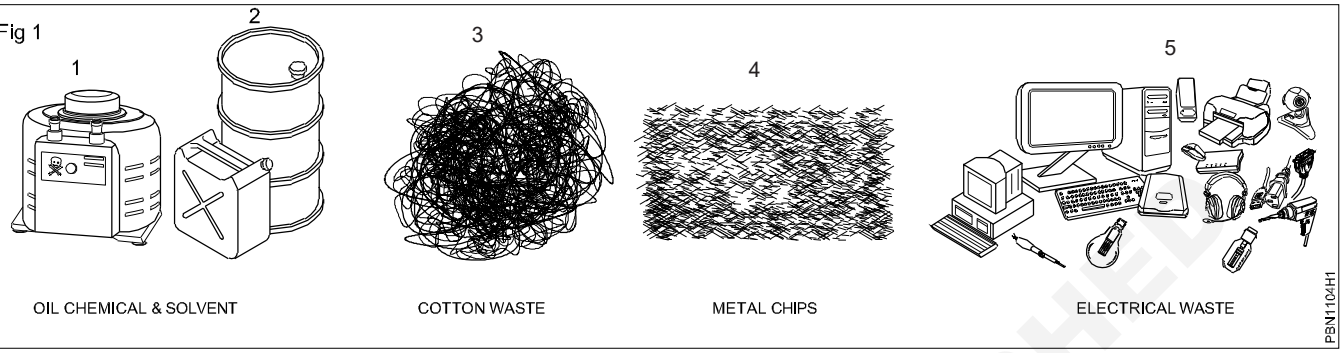
Safe disposal of waste materials like cotton waste, metal chips / burrs etc.

Objectives: At the end of this exercise you shall be able to
- **identify and segregate the waste material in workshop**
- **arrange the waste material in different bins.**

Fig 1



PROCEDURE

1 Separate the cotton waste.

2 Collect the chips by hand shovel with help of brush (Fig 2).

3 Clean the floor if oil is spill.

Do not handle the chip by bear hand

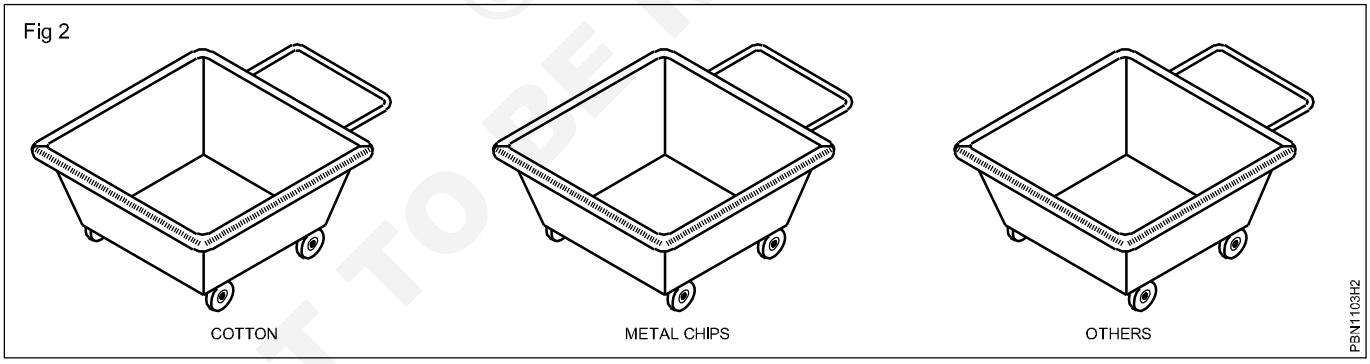
There may be different metal chips. So separate the chip according to metal.

4 Separate the cotton waste material and store in the bin provided to store the waste cotton material.

5 Similarly store the each category of metal chip in separate bins.

Each bin should have name of the material.

Fig 2



Identify the material given in Fig 1 and fill in Table 1

Table1

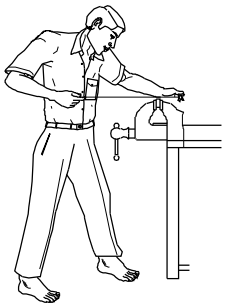
S. No.	Name of the waste material
1	
2	
3	
4	
5	

— — — — — — — —

Hazard identification and avoidance

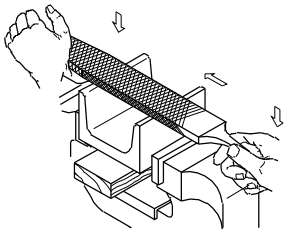
Objectives: At the end of this exercise you shall be able to
- **identify the occupational hazards by practicing**
- **suggest suitable methods to avoid occupational hazards in the table.**

1



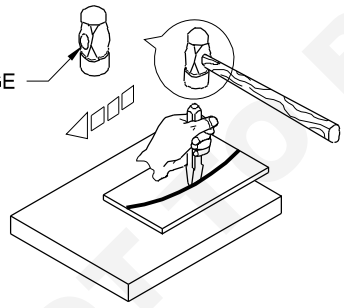
WORKING BARE FOOT IN SHOP FLOOR

2



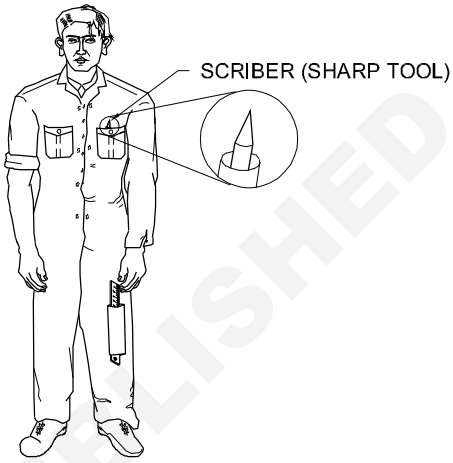
USING FILE WITHOUT HANDLE

3



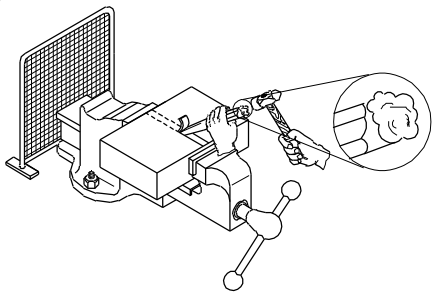
STRIKING ON CHISEL HEAD WITH BALL PEIN HAMMER WITHOUT WEDGE

4



KEEPING SCRIBER SHARP EDGE OPEN IN POCKET

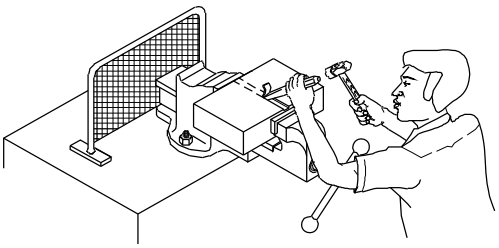
5



CHIPPING METAL SURFACE WITH MUSHROOM HEAD CHISEL

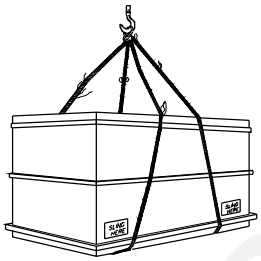
PBN1105H1

6



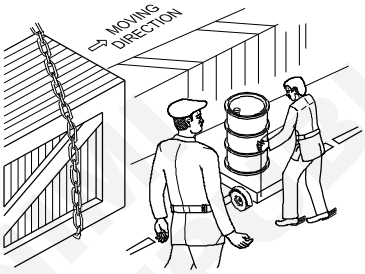
CHIPPING ON METAL SURFACE
WITHOUT SAFETY GOGGLES

7



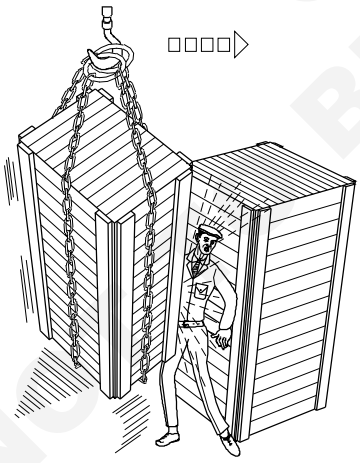
LIFTING LOAD WITH DAMAGED SLINGS

8



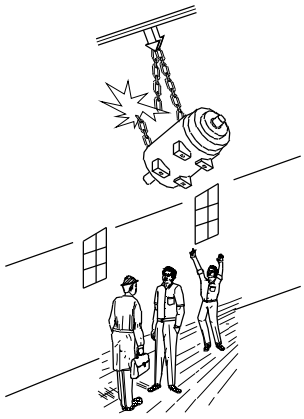
NO OBSTACLE WHILE MOVING THE LOAD

9



LIFTING A LOAD WHILE PEOPLE
WORKING NEARBY

10



STANDING BELOW A SUSPENDED LOAD

PBN1105H2

Job Sequence

The instructor shall emphasise the importance of hazard and avoidance to the students and insist them to follow properly and list it out in the table.

- Study the drawing of industrial hazards.
- Identify the type of hazards.
- Name the hazards against their names.
- Record the hazards and avoidance in Table 1.

Table 1

Sl.No	Identification of hazards	Avoidance
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

- Get it checked by your instructor

— — — — — — — —

Safety sign for danger, warning, caution & personal safety message

Objectives: At the end of this exercise you shall be able to
- **identify the basic categories of safety sign**
- **record the meaning of safety sign in the table given.**

Fig 1

Fig 1 Fig 2 Fig 3 Fig 4

Fig 5 Fig 6 Fig 7

Fig 8 Fig 9 Fig 10

Fig 11 Fig 12 Fig 13 Fig 14

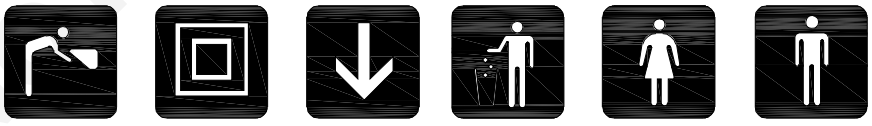


Fig 15 Fig 16 Fig 17 Fig 18 Fig 19 Fig 20

PSN1106H1

Job Sequence

Instructor shall provide various safety signs; chart categories and explain their meaning, description. Ask the trainee to identify the sign and record in Table 1.

- Identify the safety sign from the chart.
- Record the name of the category in Table 2.
- Mention the meaning description of the safety sign in Table 1.

Table 1

Fig. No.	Basic Categories/Safety sign	Meaning - description
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

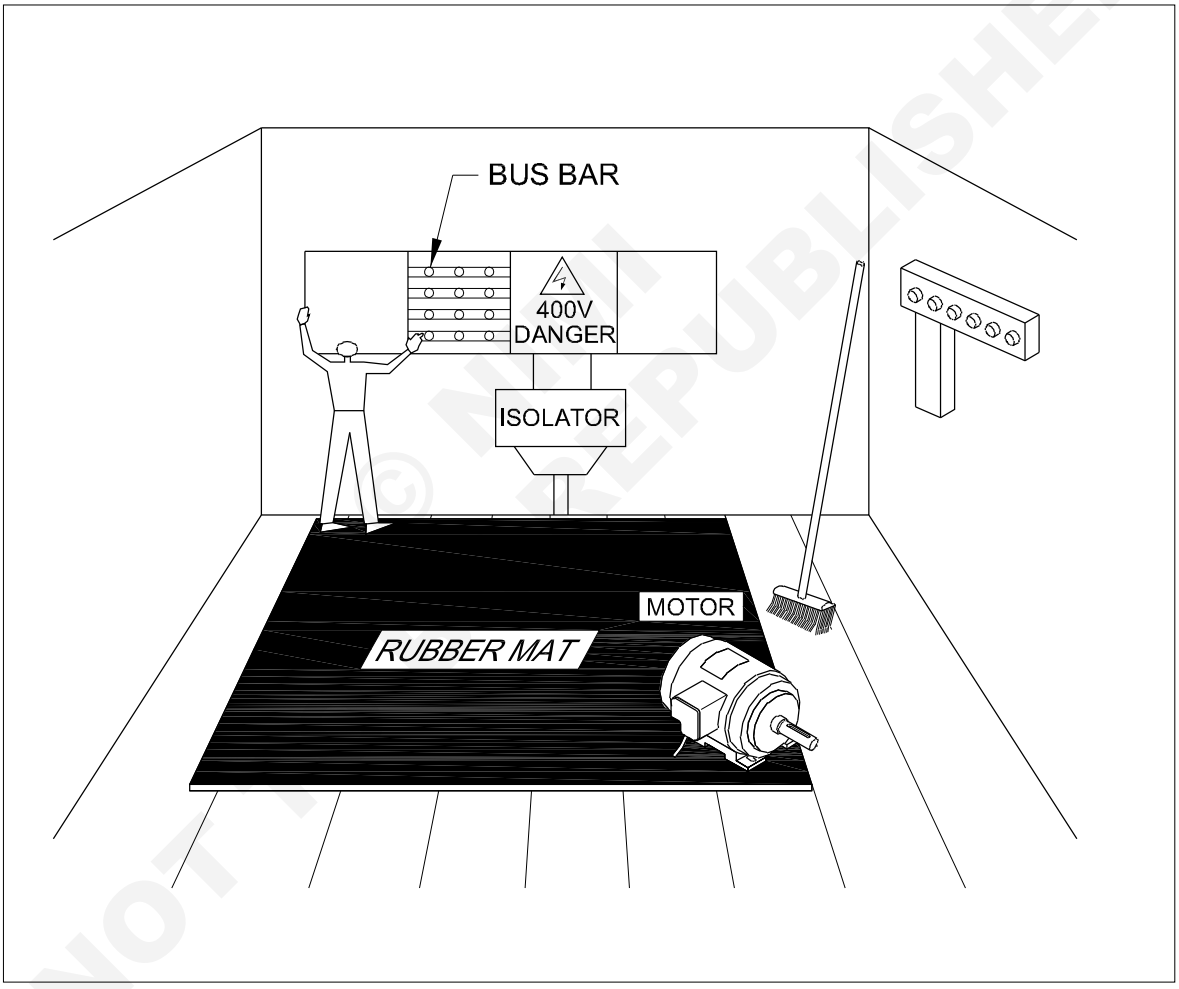
Get it checked by your instructor

— — — — — — — —

Preventive measures for electrical accidents and steps to be taken in such accidents

Objective: At the end of this exercise you shall be able to
- **rescue a person from live wire.**

Fig 1



PBN1107H1

PROCEDURE

Disconnecting a person (mock victim) from a live supply (simulated).

1 Observe the person (mock victim) receiving an electric shock. Interpret the situation quickly.

2 Remove the victim safely from the 'live' equipment by disconnecting the supply or using one of the items of insulating material.

Do not run to switch off the supply that is far away.

Do not touch the victim with bare hands until the circuit is made dead or the victim is moved away from the equipment.

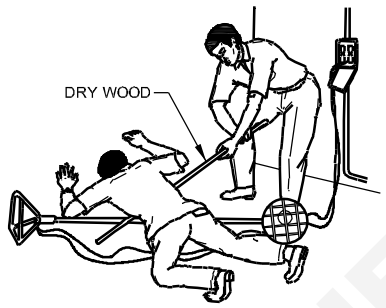
Push or pull the victim from the point of contact of the live equipment, without causing serious injury to the victim. (Fig 1)

3 Move the victim physically to a nearby place.

4 Check for the victim's natural breathing and consciousness.

5 Take steps to apply respiratory resuscitation if the victim is unconscious and not breathing.

Fig 1



Use of fire extinguishers

Objectives: At the end of this exercise you shall be able to
- **select the fire extinguisher according to the type of fire**
- **operate the fire extinguisher**
- **extinguish the fire.**

PROCEDURE

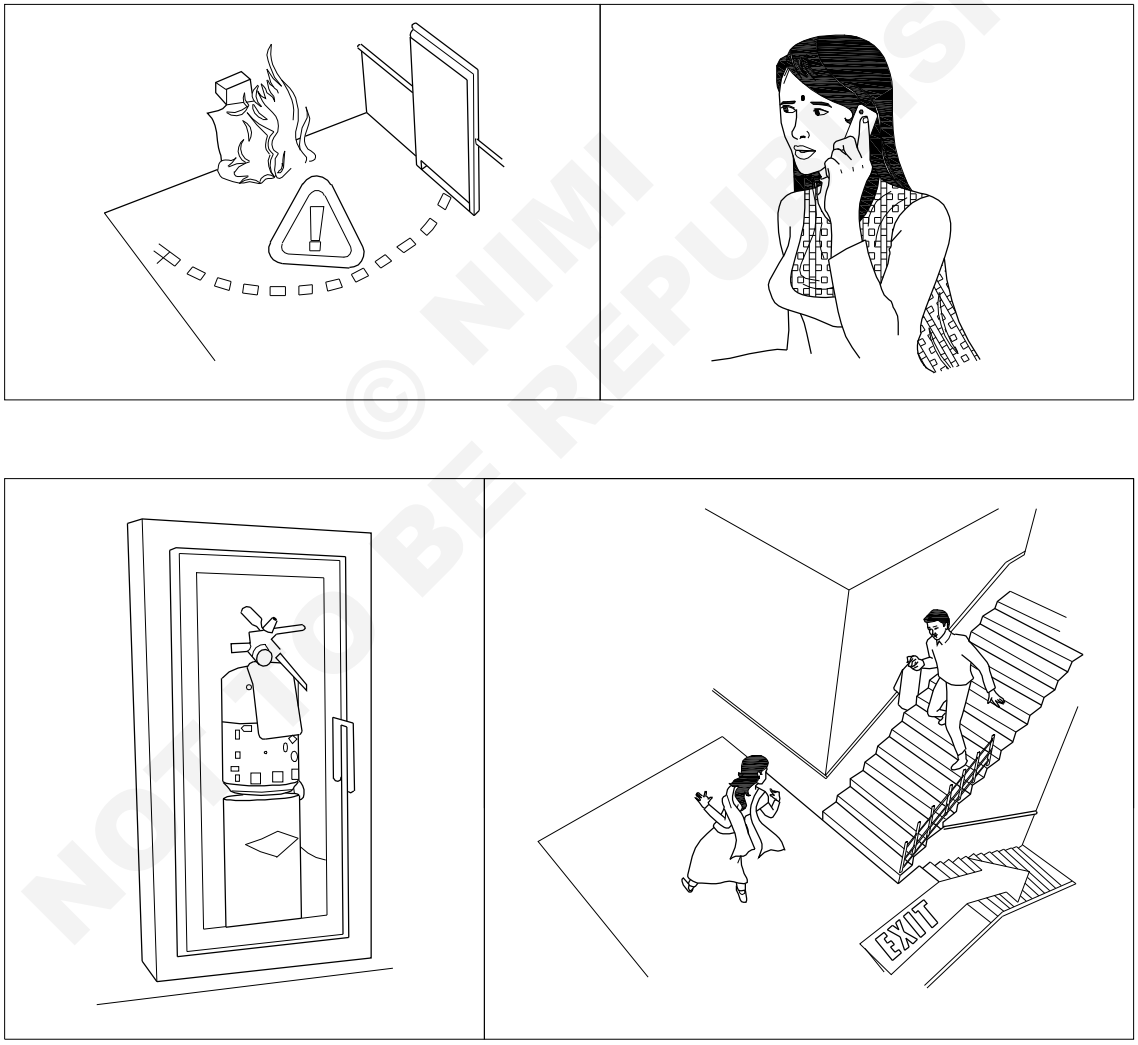
1 Alert people surrounding by shouting fire, fire, fire when observe fire.

2 Inform fire service or arrange to inform immediately.

3 Open emergency exist and ask them to go away.

4 Put "Off" electrical power supply.

Fig 1



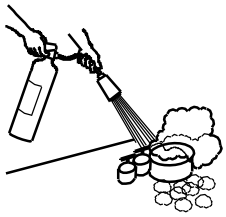
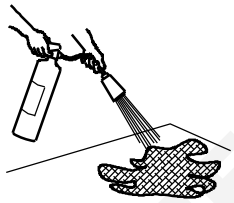
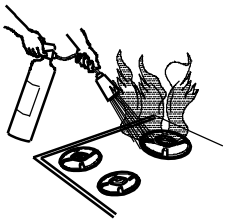
PSN1108H1

Do not allow people to go nearer to the fire.

5 Analyze and identify the type of fire. Refer Table1.

Assume the fire is 'B' type (flammable liquefiable solids)

Table 1

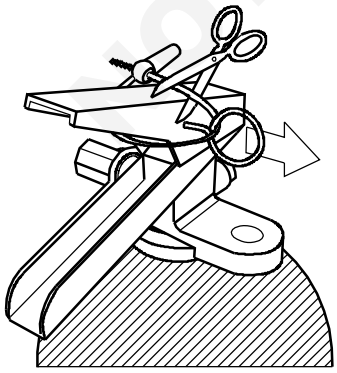
Class 'A'	Wood, paper, cloth, solid material	
Class 'B'	Oil based fire (grease, gasoline, oil) & liquefiable solids	
Class 'C'	Gas and liquefied gases	
Class 'D'	Metals and electrical equipment	

6 Select CO_2 (carbon dioxide) fire extinguisher

7 Locate and pick up CO_2 fire extinguisher. Check for its expiry date.

8 Break the seal. (Fig 3)

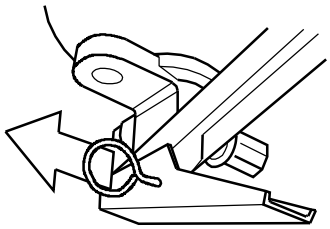
Fig 3



PBN1108H3

9 Pull the safety pin from the handle (Fig 4) (Pin located at the top of the fire extinguisher). (Fig 4)

Fig 4

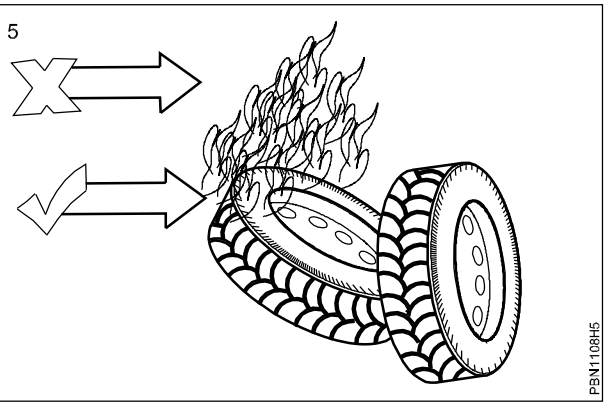


PBN1108H4

10 Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire). (Fig 5)

Keep yourself low.

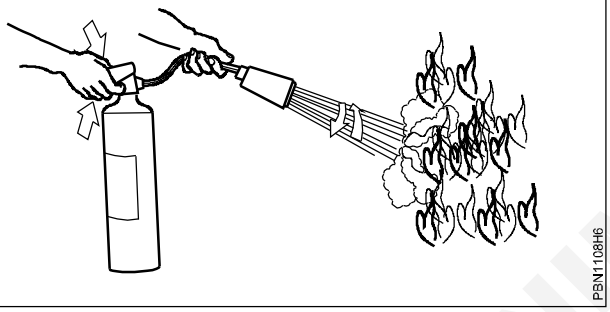
Fig 5



11 Squeeze the handle lever slowly to discharge the agent. (Fig 6)

12 Sweep side to side approximately 15 cm over the fuel fire until the fire is put off. (Fig 6)

Fig 6



Fire extinguishers are manufactured for use from the distance.

Caution

1 While putting off fire, the fire may flare up.

2 Do not be panic so long as it put off promptly.

3 If the fire doesn't respond well after you have used up the fire extinguisher move away your self away from the fire point.

4 Do not attempt to put out a fire where it is emitting toxic smoke, leave it to the professionals.

5 Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of fire extinguisher.

Remember

P.A.S.S. This will help to use fire extinguisher

P for pull

A for aim

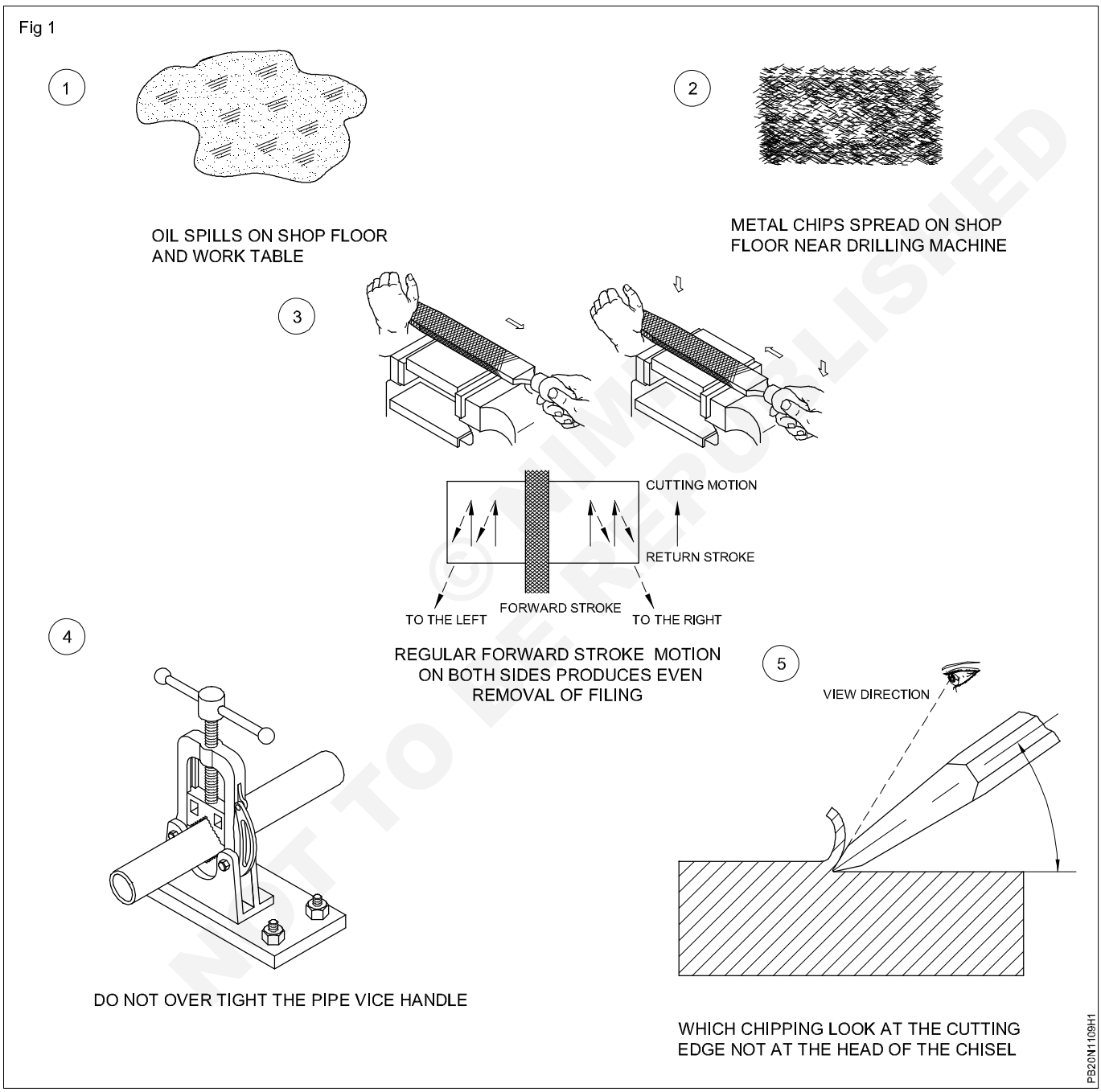
S for squeeze

S for sweep

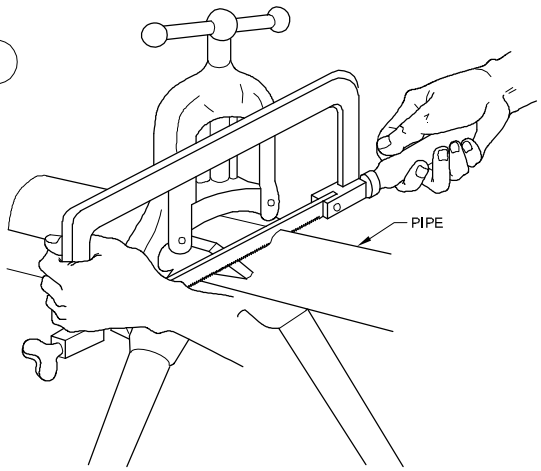
Practice and understand precautions to be followed while working in the trade

Objective: At the end of this exercise you shall be able to
- **record the precaution to be followed while working in the trade.**

Fig 1

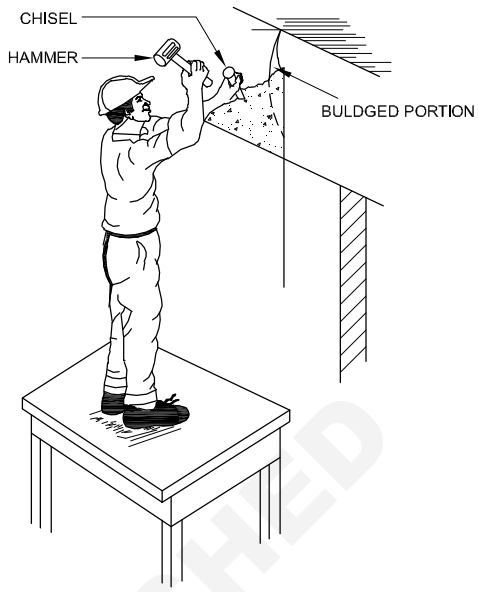


6



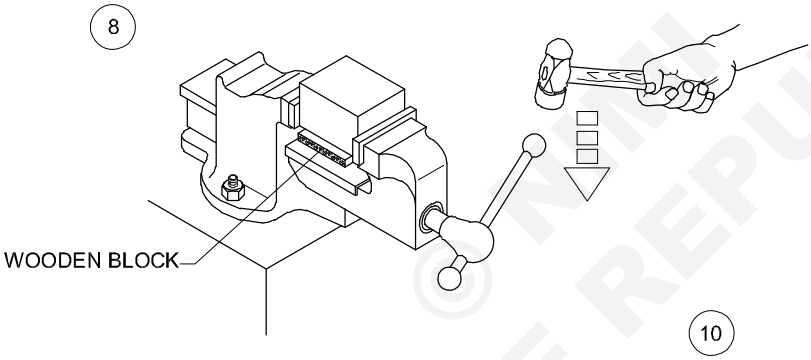
MOVE THE BLADE TO AND FRO ON THE MARKED GROOVE @40-50 STROKE PER MINUTE FOR FULL LENGTH OF BLADE

7



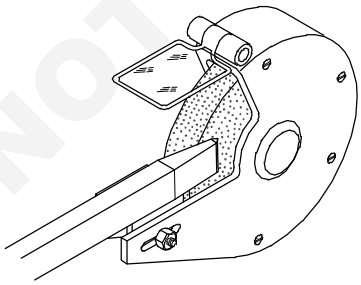
WEAR GOGGLES WHILE CHIPPING CONCRETE

8



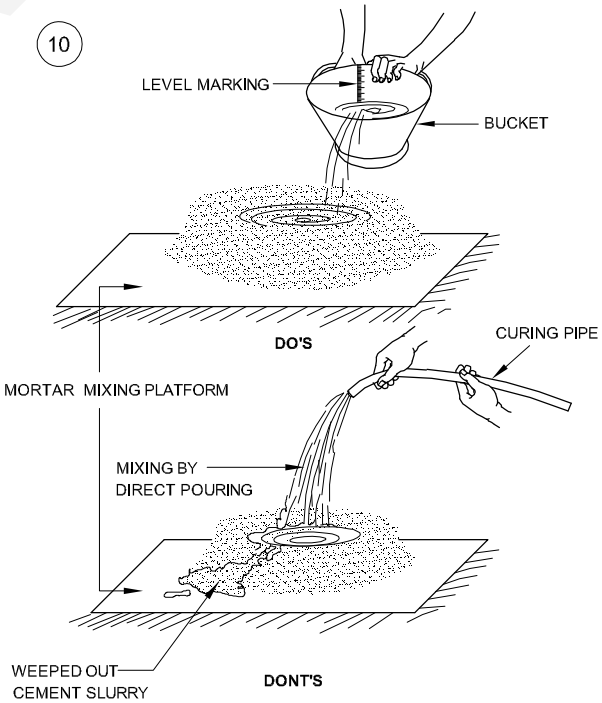
STRIKING ON VICE HANDLE WITH HAMMER TO GRIP THE WORK PIECE

9



GRINDING A FLAT CHISEL IN SIDE WAYS OF GRINDING WHEEL

10



PREPARING CEMENT MORTAR MIXING WATER (DO'S & DONT'S)

PB20N1109H2

Job Sequence

The instructor shall guide and demonstrate the students to practice and understand precautions to be followed while working in fitting jobs.

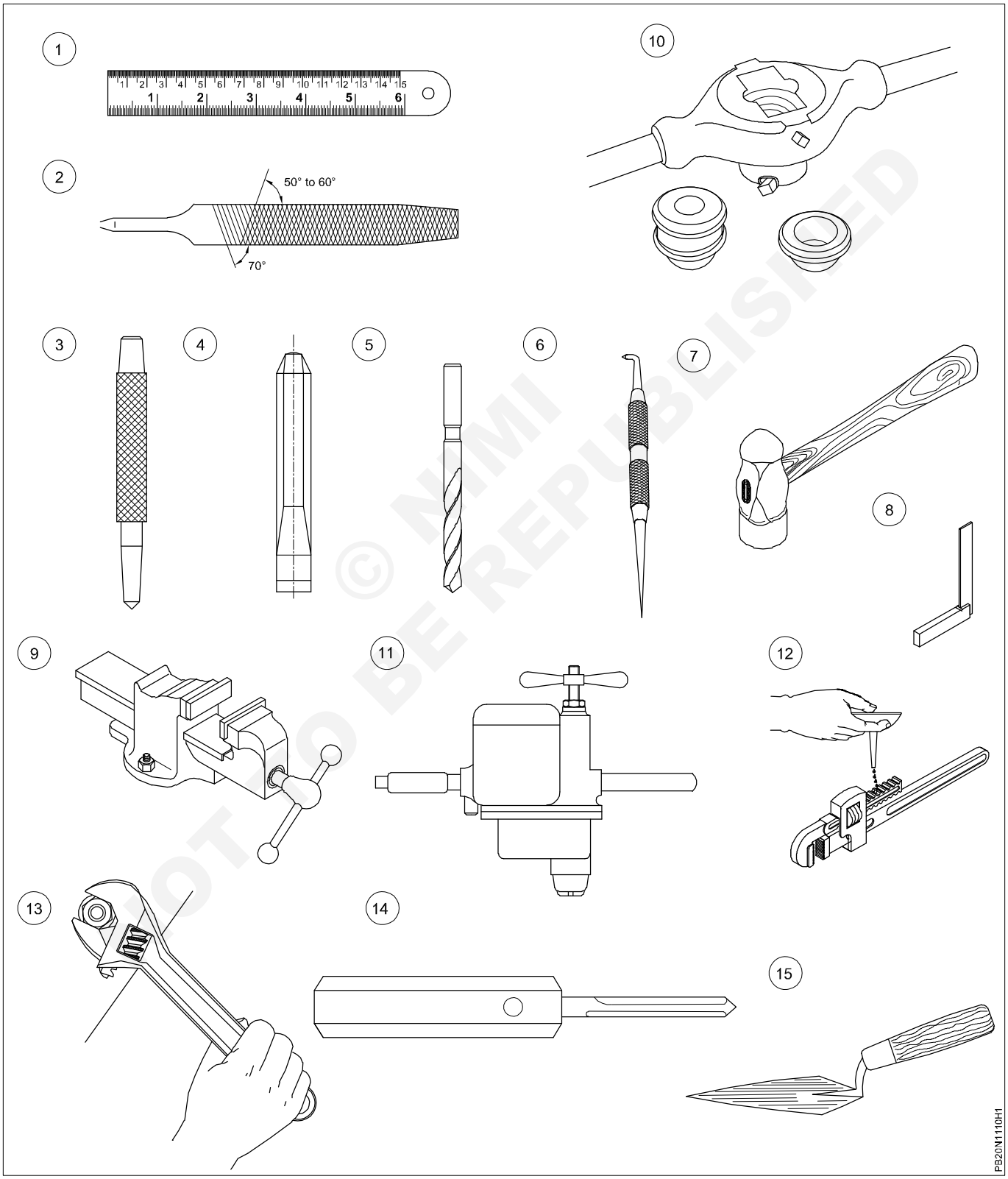
- Record the precautions to be followed while working in fitting job in Table 1.

Fig. No.	Description	Record precautions to be followed while working in fitting job
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

2 Fill up and get it checked by your instructor.

Safe use of tools and equipment used in trade

Objective: At the end of this exercise you shall be able to
- **record the safety points while using the fitter trade tool and equipments.**



Job Sequence

The instructor shall emphasize the students about the safe use of tools and equipments used in trade and guide them to record the safety points.

- Record the precautions to be followed while working in fitting job in Table 1.

Table 1

Fig. No.	Description	Record precautions to be followed while working in plumbing job
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

2 Fill up and get it checked by your instructor.

— — — — — — — —

Use steel rule and steel tape for measuring, use scriber and divider for marking on raw materials

Objectives: At the end of this exercise you shall be able to
- **measure the dimension in material fully (or) partly**
- **measure length with steel tape**
- **perform marking in materials with scriber**
- **divide arcs circle using divider in the job.**

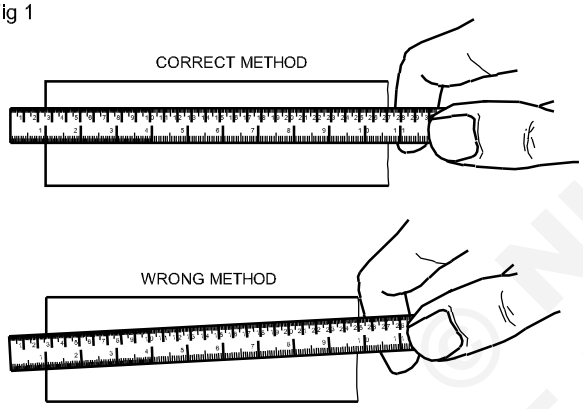
PROCEDURE

Measuring with a steel rule and steel tape

1 Place the rule either directly on to the length to be measured or at right angle to the reference plane.

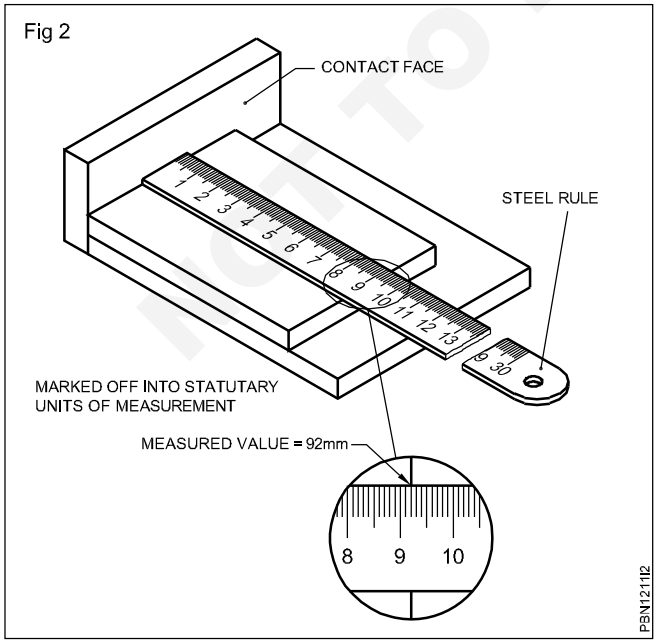
2 Use a contact face, if possible and read off measurements by looking at the steel rule directly. (Fig 1)

Fig 1



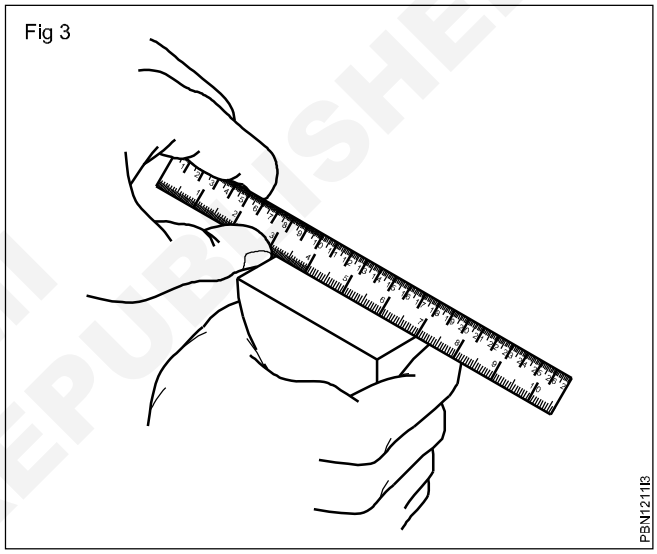
3 Measure with a rule starting off from the 1 cm line if the edge of the rule is worn out or damaged. (Fig 2)

Fig 2



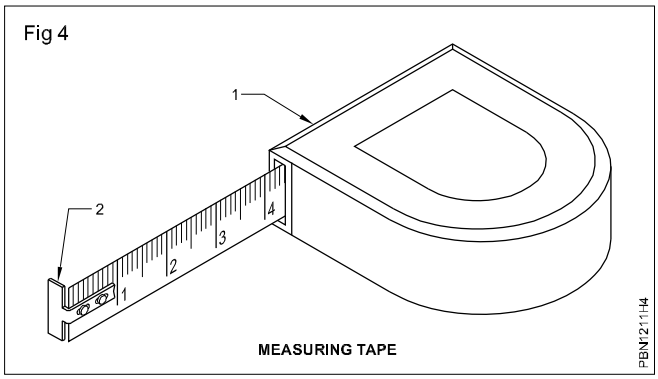
4 The rule must be held parallel to the edge of the work as otherwise the measurement will not be correct. (Fig 3)

Fig 3



5 Always keep the steel rule away from the cutting tools to avoid any scratches/damages (Fig 4).

Fig 4



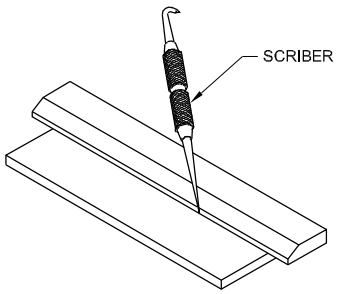
6 Use steel tape for measuring larger lengths.

7 Always use British measurements for measuring trenches and lengthier pipes.

Scriber

1 While scribing lines, hold the scriber close to the straight edge as shown in (Fig 5).

Fig 5

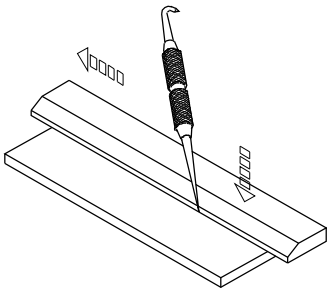


PBN1211J6

2 Incline the scriber at an angle of 45^0 approximately as shown in (Fig 6) and scribe a line towards you along the edge of the straight edge.

3 Don't apply excessive pressure while scribing lines using the scriber to avoid the removal of the metal. (Fig 6).

Fig 6

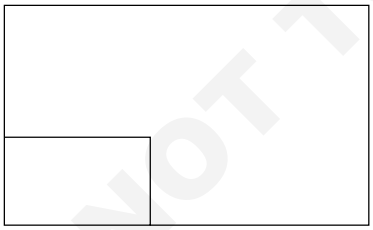


PBN1211J7

For economical marking

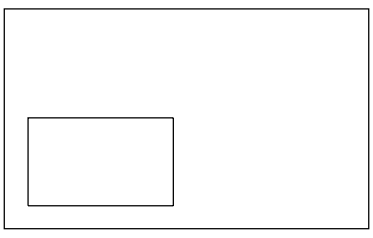
To avoid wastage, always scribe lines from left hand bottom corner as shown in (Fig 7) but not as in (Fig 8).

Fig 7



PBN1211JA

Fig 8

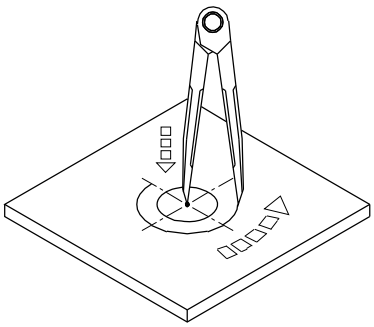


PBN1211JB

Divider

1 One leg of divider is placed at the center portion of the job (Fig 9)

Fig 9

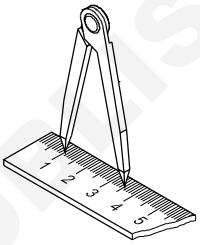


FIRM JOINT DIVIDER

PBN1211M2

2 Another leg of divider is used for measuring in the steel rule and arcs are drawn (Fig 10)

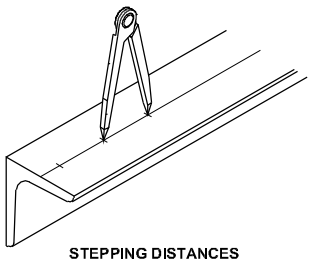
Fig 10



PBN1211HA

3 Used for marking the divided measured parts (Fig 11)

Fig 11



STEPPING DISTANCES

PBN1211HB

Divider are not grinded for sharpening the legs. Because it becomes soft.

Legs should be sharpened by using oil stone frequently.

Record safety precautions while working in plumber work at the table 1.

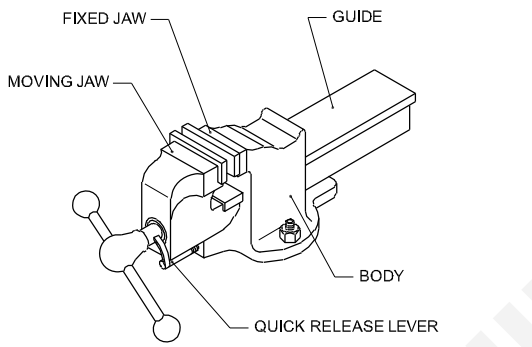
Demonstrate use of different types of vices - Bench vice, pipe vice, chain vice, hand vice, chain wrench

Objectives: At the end of this exercise you shall be able to
- **test the functioning of different vices**
- **perform the method of adjusting the jaws according to the job pieces**
- **select the correct size according to the work pieces**
- **operate handle in anticlock vice to loosening the job and clockvice to tight the job**
- **perform the method of handle chain wrench with pipe and fitting.**

PROCEDURE

1 Bench Vice (Fig 1)

Fig 1

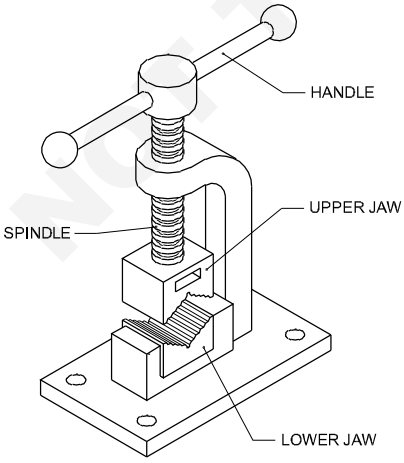


- Identify the part of benchvice.
- Operation and function.
- Handling job piece firmly, filing flat.

Handling the job piece in one hand and operate the handle in another hand otherwise job slips and damage

2 Pipe vice (Fig 2)

Fig 2

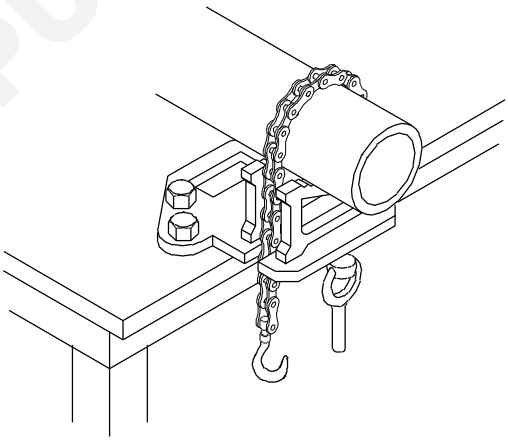


- Identify the parts of pipe vice
- Especially round object holding in the pipe vice
- Threads providing fittings joints with pipe and dismantling.

Should not over tight the handle because pipe get damage

3 Chain vice (Fig 3)

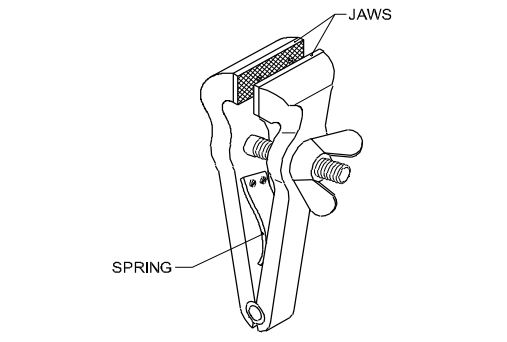
Fig 3



- Method of functioning of chain wrench.
- Method application on larger dia pipes.

4 Hand vice (Fig 4)

Fig 4



- Hold the small objects like split pin, screws etc.,
- Straighten the split pin used for castle nut, float valve, check valve, etc.,
- Loose the wing nut and release the split pin.

5 Chain pipe wrench (Figs 5 & 6)

- Place the chain wrench head in the pipe bit above 50mm dia.
- Hold the pipe using chain till the teeth grips the pipe.
- Tighten the pipe bit until it firmly grips as shown in (Figs 5&6).

Fig 5

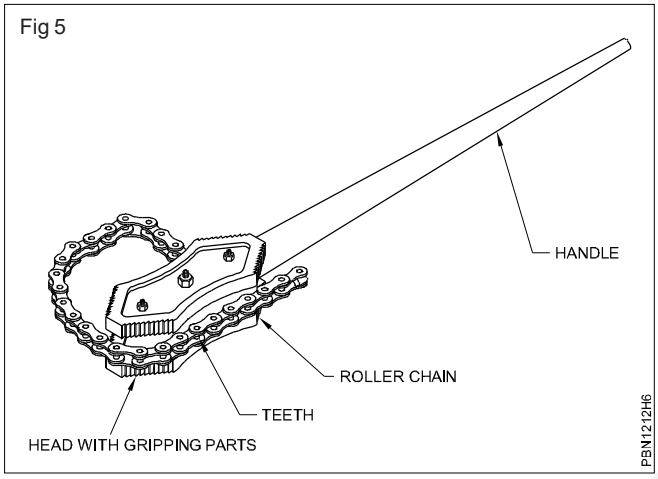
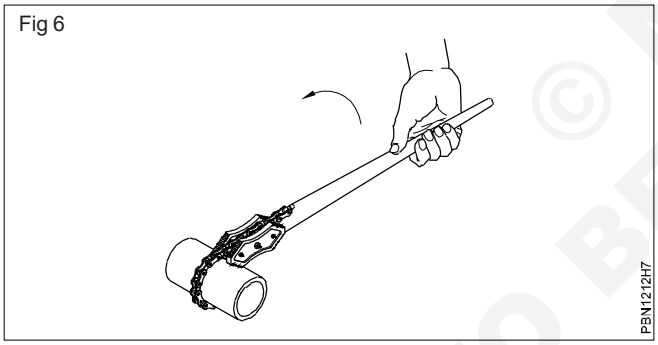


Fig 6



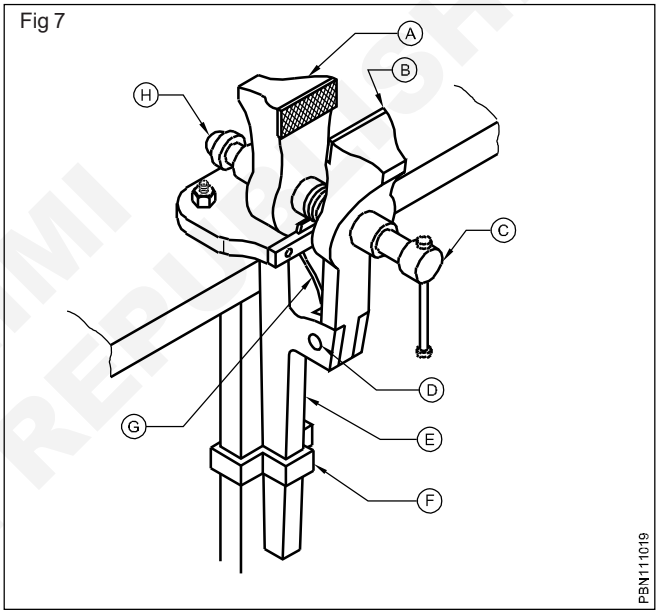
Main pats of a leg vice (Fig 7)

The following are the main parts of a leg vice.

1 Solid jaw
2 Movable jaw
3 Threaded jaw
4 Spindle
5 Spring
6 Pivot
7 Leg
8 Clamp

Since the hinged jaw moves in a radial path, the job held in this vice in not gripped properly because of the line contact. Hence a work which can be carried out on a bench vice is not held on a leg vice. Jobs which require hammering only are held on a leg vice.

Fig 7



Demonstrate use of various hand tools:- Different Files, hammer, centre punch, hacksaw, chisel, calipers, pipe wrench, stock & dies, taps and holders

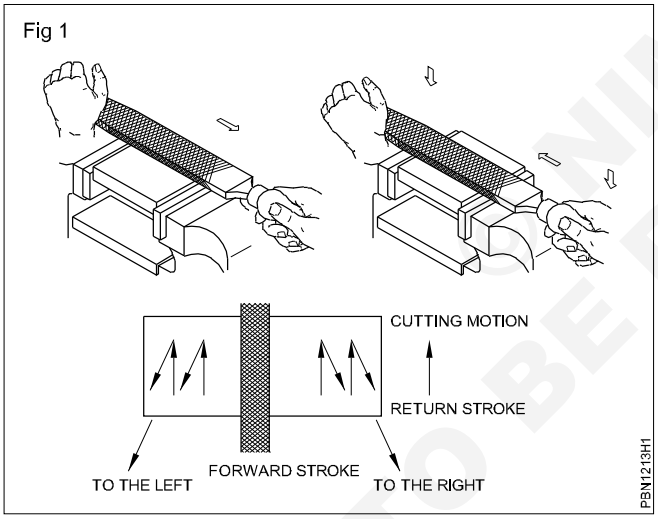
Objectives: At the end of this exercise you shall be able to
- **perform filing method by practice**
- **hold the hammer and striking for chipping by practice**
- **hold the centre punch and making dot by practice**
- **hacksaw cutting by practice**
- **perform chipping with chisel by practice**
- **use caliper for finding the size of pipe by practice**
- **use pipe wrench with pipe by practice**
- **perform external thread cutting method by using die stock and dies by practice**
- **perform internal thread cutting method by using taps and holders by practice.**

PROCEDURE

1 Files

- Hold the workpiece in the bench vice.
- Choose the correct file for filing.
- Filing the workpiece as shown in (Fig 1).

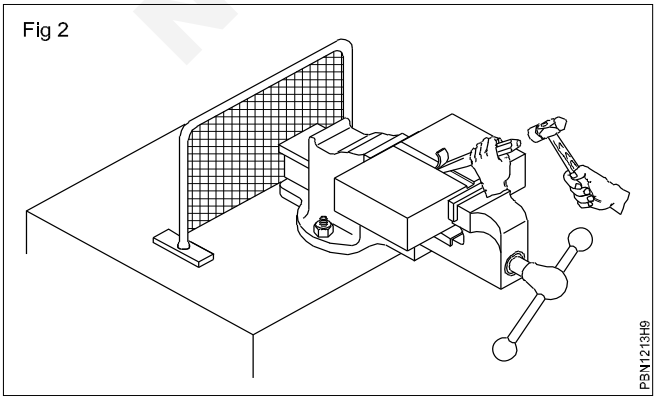
Fig 1



2 Hammer

- Place the workpiece in the bench vice and grip.
- Hold the hammer correctly.
- Make the chipping operation as shown in (Fig 2).

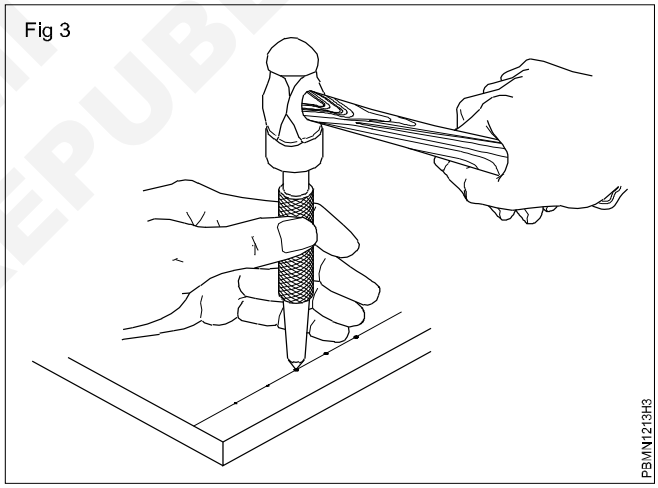
Fig 2



3 Centre punch

- Hold the centre punch rigidly.
- Place it on the workpiece.
- Make punch dots as shown in (Fig 3).

Fig 3



4 Hacksaw (Fig 4)

- Hold the pipe in the pipe vice and grip.
- Select the correct pitch of blade and fix in forward teeth position.
- Hold the block frame rigidly and cut the pipe as shown in (Fig 4).

5 Chisel

- Place the workpiece in the bench vice and grip tightly.
- Hold the chisel in correct angle.
- Chipping the workpiece as shown in (Fig 5).

6 Calipers

- Select the workpiece.
- Place it in the workpiece.

Fig 4

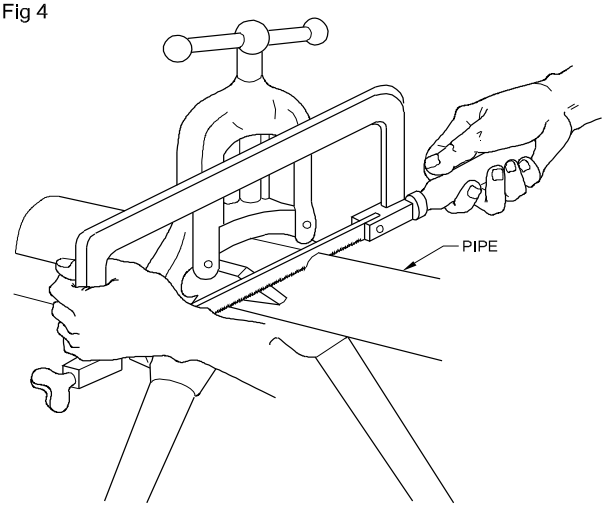
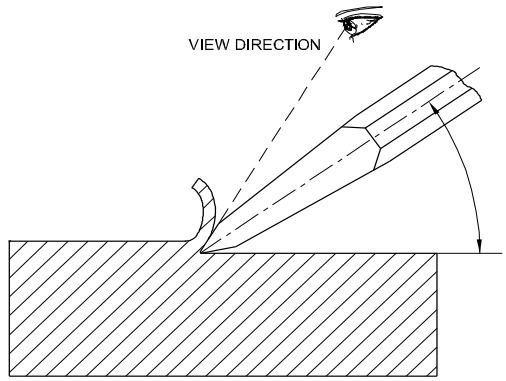
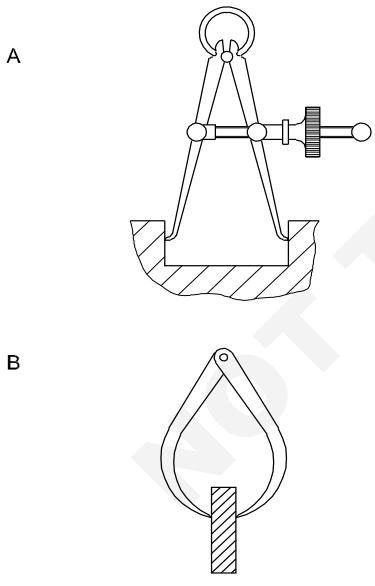


Fig 5



- Use the calipers to find size of the inside diameter and outside diameter as shown in (Fig 6A & 6B).

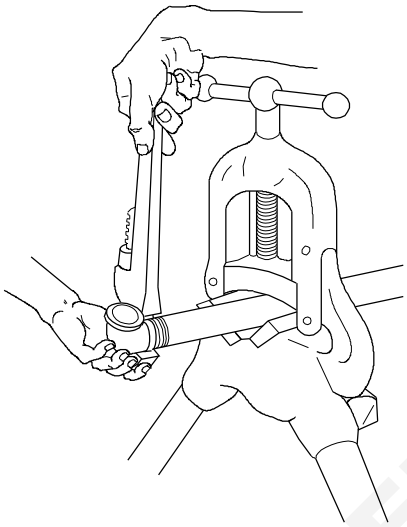
Fig 6



7 Pipe wrench

- Select the correct numbers of pipe wrench according to the dia of pipe.
- Hold the pipe in pipe vice and grip tightly.
- Adjust the pipe wrench till it grips rigidly on pipe.
- Proceed the operation as shown as (Fig 7).

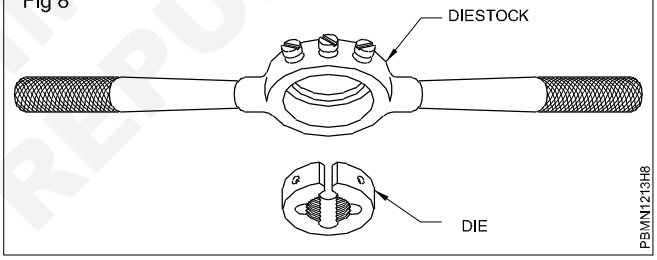
Fig 7



8 Stock and dies

- Select the correct size metric dies.
- Fix it in the die-stock and lock it.
- Adjust the dies according to the workpiece. (Fig 8)
- Proceed the external threading operations.

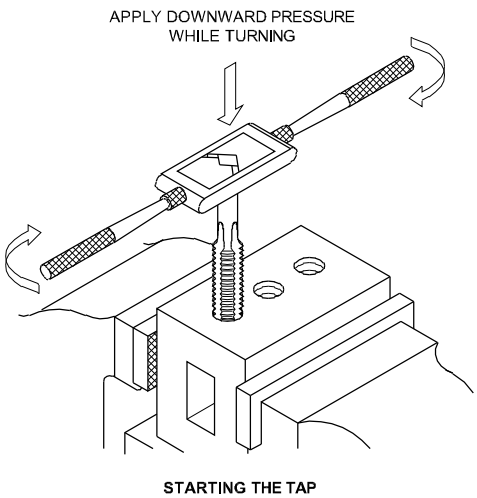
Fig 8



9 Taps and holders

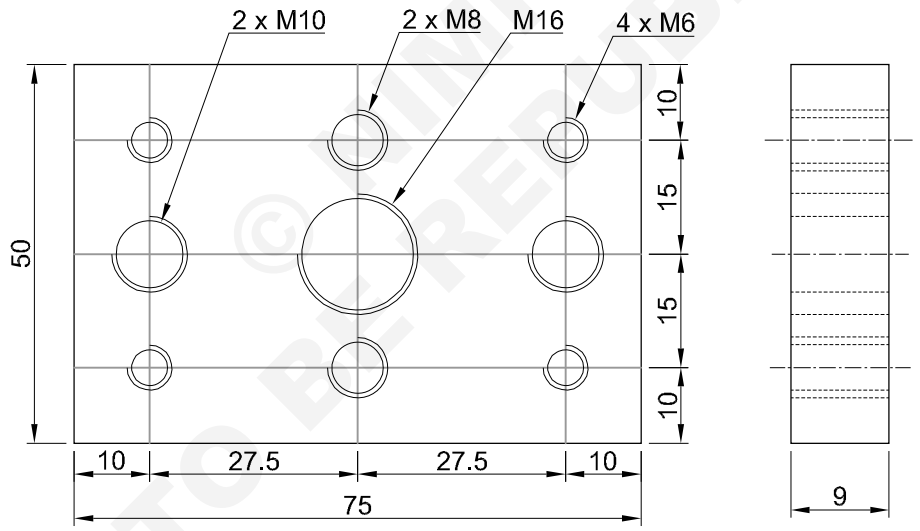
- Select the tap for initial work.
- Place it in the workpiece as shown in the (Fig 9).
- Make the internal threading operations using first, second and bottoming taps with holders.

Fig 9



Thread inner on M.S. flat by using tap

Objectives: At the end of this exercise you shall be able to
- **locate holes on workpiece with a scribing block**
- **drill through holes using pillar/bench drilling machine**
- **determine the tap drill size for internal threading**
- **provide internal threads using hand taps and tap wrench.**
- **cut internal threads using hand taps.**



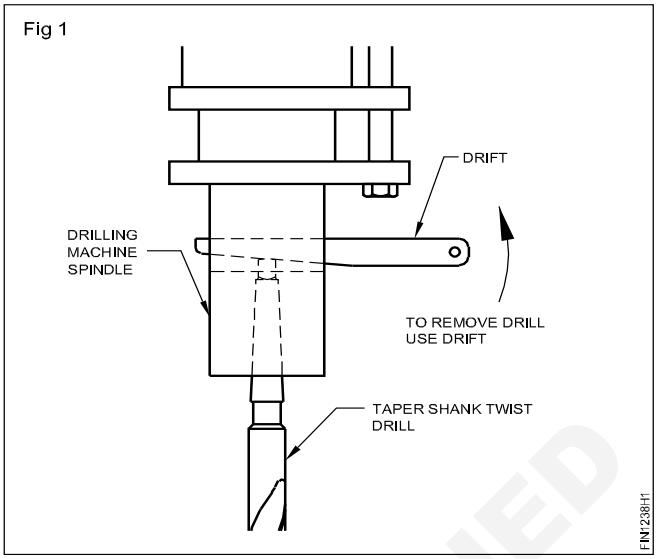
Job Sequence

- Check the raw material for its size.
- Apply marking media.
- Mark as per the drawing dimensions and punch the centre of hole with centre punch.
- Periphery of the big holes should be punched with prick punch 60^0.
- Fix the job on the machine vice.
- Fix Ø4mm drill in drill chuck.
- Set the spindle speed for Ø4 mm drill.
- Ø4mm drill can be used as a pilot for all the holes.
- Fix Ø8, Ø10 and Ø16mm drill one by one and drill through holes as per job drawing.
- Use coolant while drilling.

Caution: Use chuck key for tightening the drill in the drill chuck

- Use drift to remove the taper shank drill from drilling machine spindle. (Fig 1)

Fig 1



12 Do not hammer on drift to remove it out.

13 Adjust the rpm of the spindle to suit the diameter of the drill. Ask your instructor.

14 Finish the job and deburr all corners.

15 Apply thin coat of oil and preserve it for evaluation.

Skill Sequence

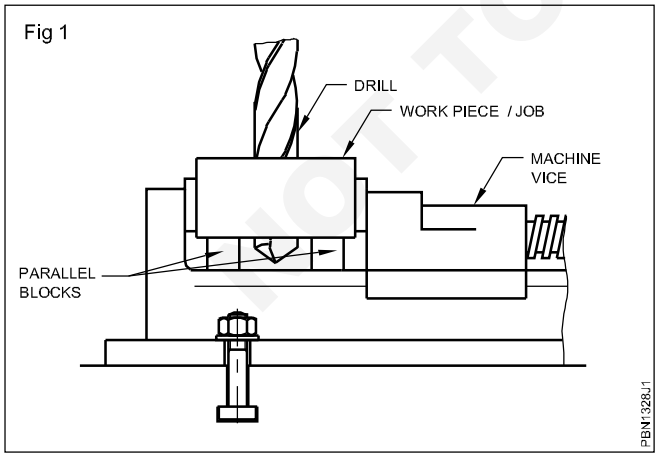
Drilling through holes

Objective: This shall help you to
• drill holes of different diameter in a drilling machine.

Punch the centre of the hole to be drilled by a centre punch.

Set the job in the machine vice securely by using two parallel bars to clear the drill (Fig 1)

Fig 1



Fix the drill chuck into the spindle of the drilling machine.

Fix the 4 mm dia drill in the drill chuck for pilot hole.

Select the spindle speed by shifting the belt in the appropriate cone pulleys.

Drill all the holes first by 4mm drill. This will serve as a pilot hole for 8.5 mm, 10 mm and 16 mm dia drills.

Drill Ø8 mm.

Drill Ø10 mm hole.

Remove the drill and drill chuck.

Caution: Do not remove chips with your bare hands- use brush.

Do not try to change the belt while the machine is running.

Ensure that the drill do not penetrate into the vice.

Fix securely the drill deep into the drill chuck. (Fig 2)

Since the web of large diameter drills are thicker, the dead centres of those drills do not sit in the centre punch marks. This can result in the shifting of the hole location. Thick dead centres can not penetrate into the material easily and will impose severe strain on the drill.

These problems can be overcome by drilling pilot holes initially. (Fig 3)

Fig 2

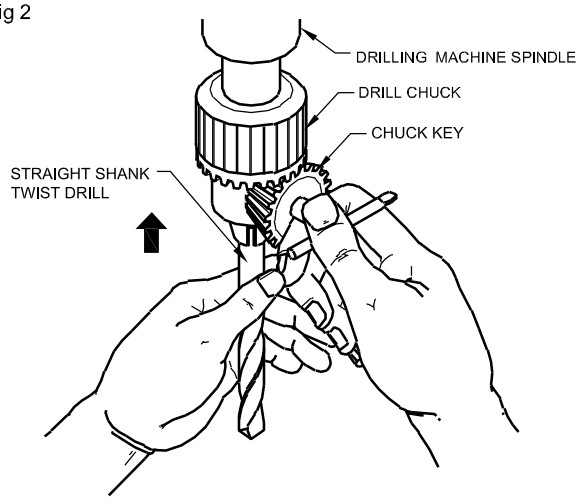
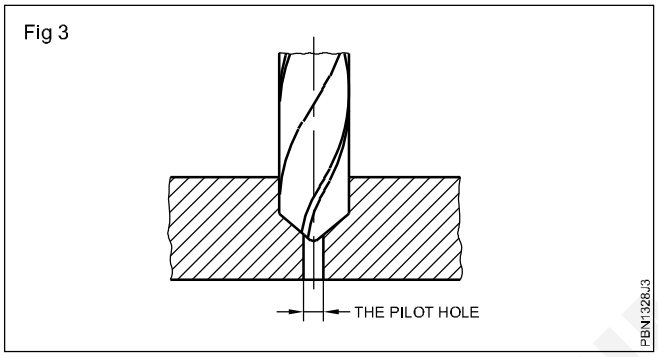


Fig 3



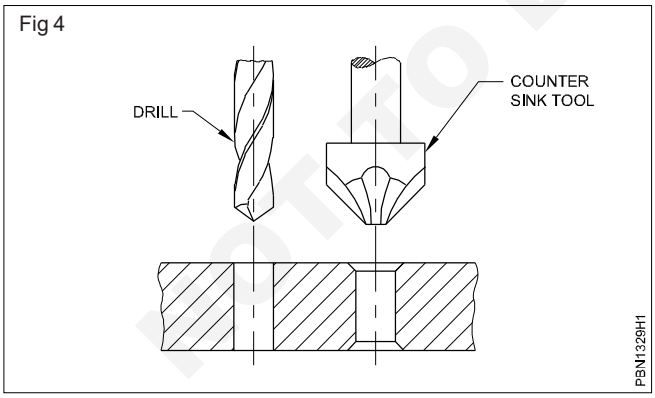
Tapping through holes

Determine the tap drill size either using the formula or the table.

Drill the hole to the required tap drill size. [An undersized hole will lead to breakage of the tap].

Chamfer the end of the drilled hole for easy aligning and starting of the tap. (Fig 4)

Fig 4

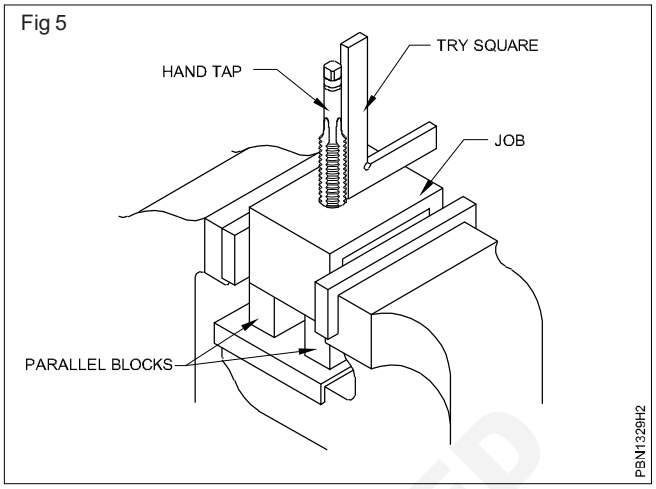


Hold the work firmly and horizontally in the vice. The top surface of the job should be slightly above the level of the vice jaws. This will help in using a try square without any obstruction while aligning the tap. (Fig 5)

Fix the first tap (taper tap) in the correct size tap wrench. Too small a wrench will need a greater force to turn the tap. Very large and heavy wrenches will not give the 'feel' required to turn the tap as it cuts and may lead to breakage of the tap.

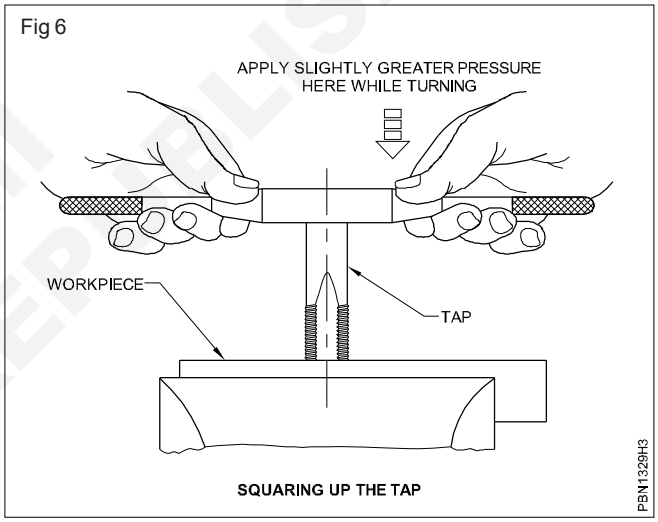
Position the tap in the chamfered hole vertically by ensuring the wrench is in a horizontal plane.

Fig 5



Exert steady downward pressure and turn the tap wrench slowly in the clockwise direction to start the thread. Hold the tap wrench close to the centre. (Fig 6)

Fig 6



Remove the wrench from the tap when you are sure of starting the thread without disturbing the setting.

Check and make sure that the tap is vertical by using a try square in two positions at 90° to each other. (Figs 7 & 8)

Fig 7

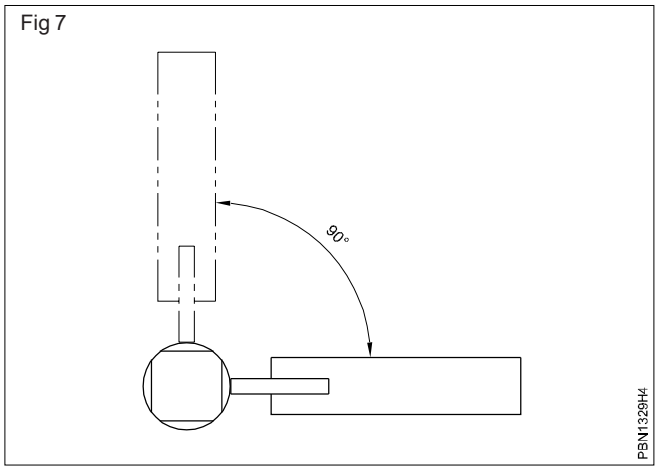
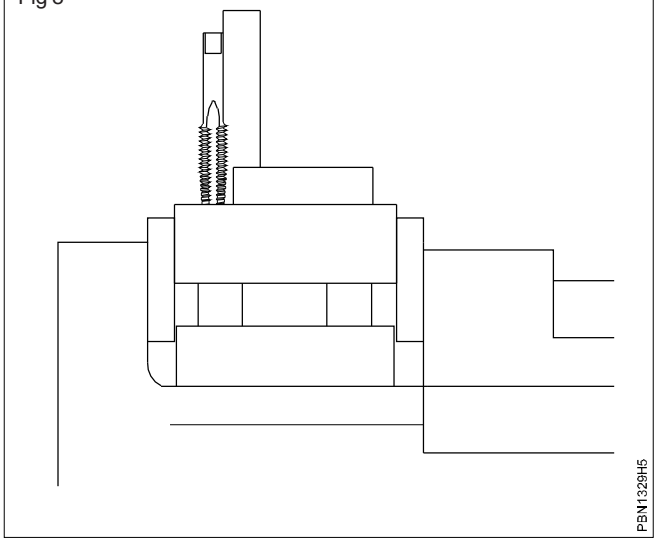


Fig 8



Make correction if necessary by exerting slightly more pressure on the opposite side of the tap inclination.

Check the tap alignment again. The tap alignment should be corrected within the first few turns. If it is tried afterwards there is a chance of breaking of the tap.

Turn the wrench lightly by holding at the ends without exerting any downward pressure after the tap is positioned vertically. The wrench pressure exerted by the hands should be well balanced. Any extra pressure on one side will spoil the tap alignment and can also cause breakage of the tap. (Fig 9).

Continue cutting the thread. Turn backwards frequently about quarter turn, to break the chips. (Fig 10)

Stop and turn backwards when any obstruction to the movements is felt.

Use a cutting fluid while cutting the thread to minimise friction and heat.

Cut the thread until the hole is totally threaded.

Finish and clean up using the intermediate and plug tap. The intermediate and plug tap will not cut any thread if the first tap has entered the hole fully.

Remove the chips from the work and clean the tap with a brush.

Fig 9

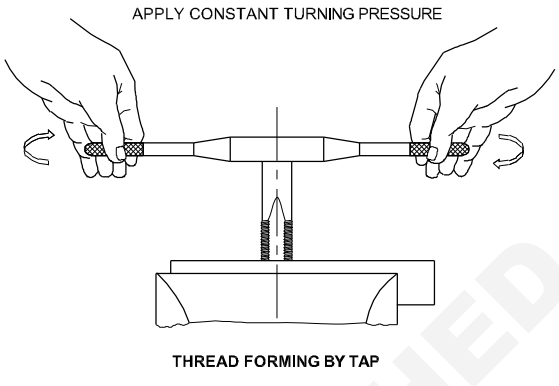
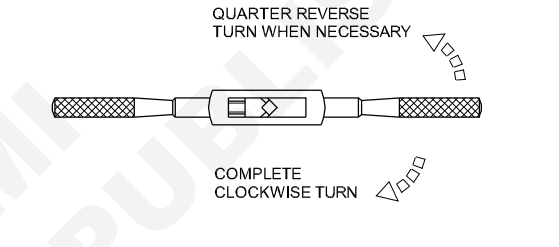


Fig 10



Make sure that the dia of the hole to be tapped is correct for the given size of the tap.

Turn backwards to break the chip after every quarter turn.

Select the length of wrench suitable to the size of the tap. Over length of wrench may cause the breakage of tap.

Tapping of C.I. water lines in domestic water supply

Objective: This shall help you to
- **tap from C.I water mains.**

- Close the supply.
- Mark the position for tapping. It should only be on top of main).
- Fix the ratchet brace to the pipe “C” clamp.
- Insert drill keeping on mark.
- Drill the hole by rotating handle and tightening the top screw. (Fig 1)
- Remove the ratchet drill.
- Cut the internal threads with taper pipe tap. (Fig 2)
- Fit up ferrule to form the necessary connection.
- Open the valve inside ferrule and close the cap.

Fig 1

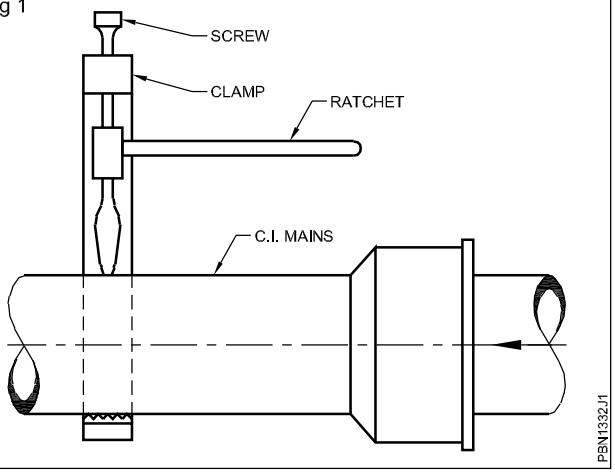
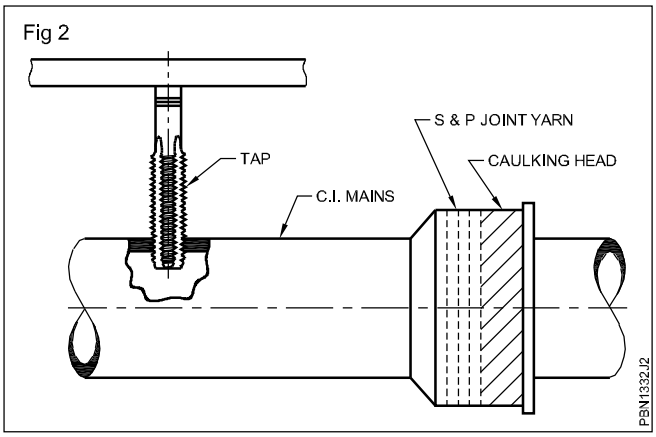


Fig 2



Use various locking device

Objective: At the end of this exercise you shall be able to
- **perform fixing of locking devices.**

Requirements

Tools/Instruments

- Double ended spanner - 1 No.
- Ring spanner - 1 No.

Materials/Components

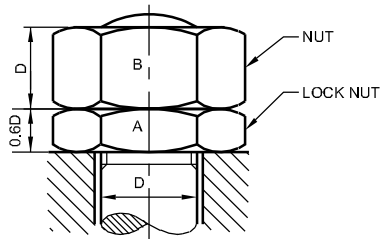
- Bolt & Nuts, cotter - as reqd.
- Cotter pin - as reqd.

Job Sequence

Lock nut (Fig 1)

- Fit locking nut to bolt.
- Fit nut to the bolt.

Fig 1



Castle nut (Fig 2)

- Fit the nut to bolt.
- Cut slot in cylindrical collar on top of the nut.
- Insert cotter pin in the slot of collar.

Slotted nut (Fig 3)

- Cut slot in upper end of bolt.
- Cut slot in cylindrical collar on nut.
- Insert a split pin through the slot of nut and bolt.

Fig 2

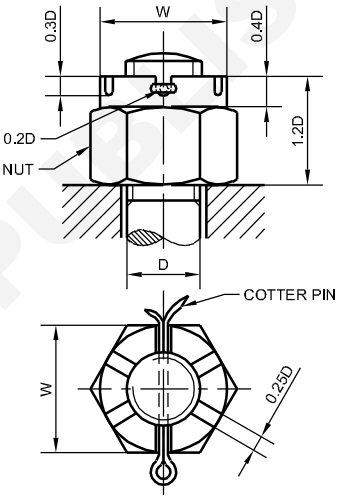
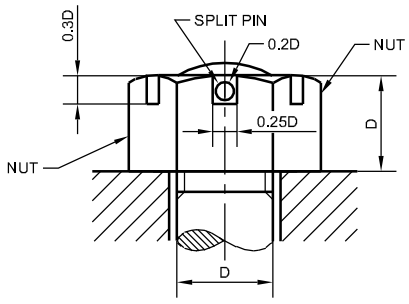


Fig 3



Outer thread on pipe by using die

Objective: At the end of this exercise you shall be able to
- **select outer thread providing die set**
- **identify outer thread providing hand tools**
- **use method adopted for external thread process**
- **identify the external thread providing pipes and its types.**

Requirements

Tools/Instruments

• B.S.P die stock and dies	- 1 No.
• Pipe vice	- 1 No.
• Measuring tape	- 1 No.
• Hack saw frame and blade	- 1 No.
• Oil can	- 1 No.

Materials/Components

• 20mm G.I pipe	- as reqd.
• 25mm G.I pipe	- as reqd.
• Oil	- as reqd.
• Cotton waste	- as reqd.

Job Sequence

A Ratchet type die stock with one handle

- Select a set of dies, and ratchet-type die stock. (Figs 1&2)

Fig 1

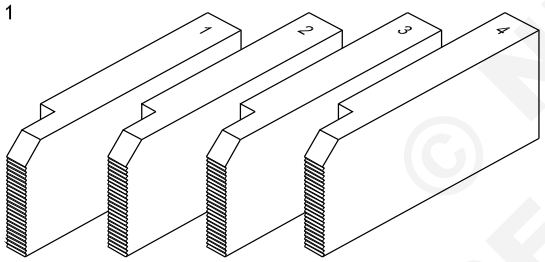
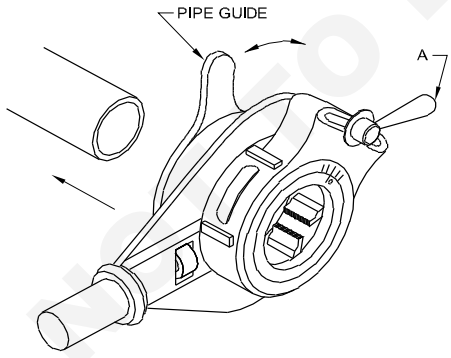


Fig 2



- Open the adjustment lever. (A)
- Coincide the zero setting mark 'O' die stock and then insert the four dies according to the number on the dies and die stock respectively.
- Ensure that the dies sit in the correct position.

Ensure that the number on the top edge of the die corresponds with the number of the slot into which it is to be placed.

- Fix the pipe in a pipe vice and tighten to prevent it from rotating. (Figs 3 & 4)

Fig 3

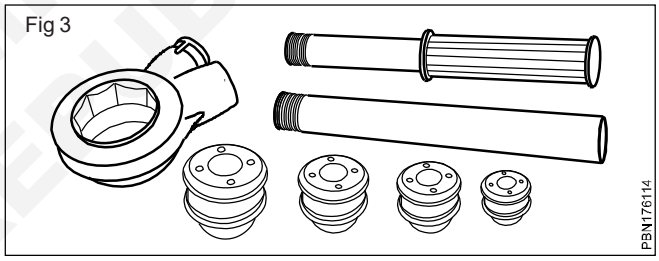
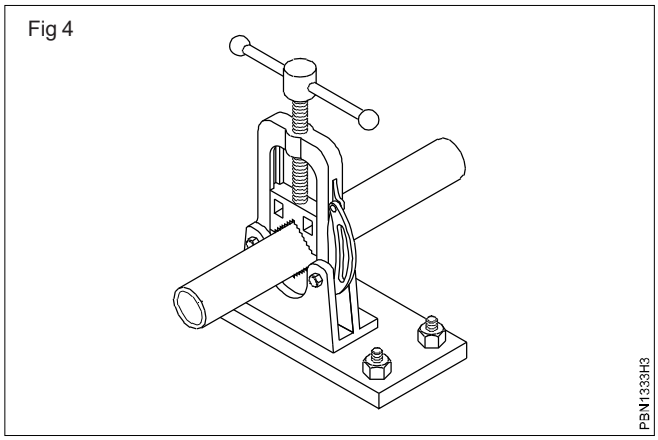


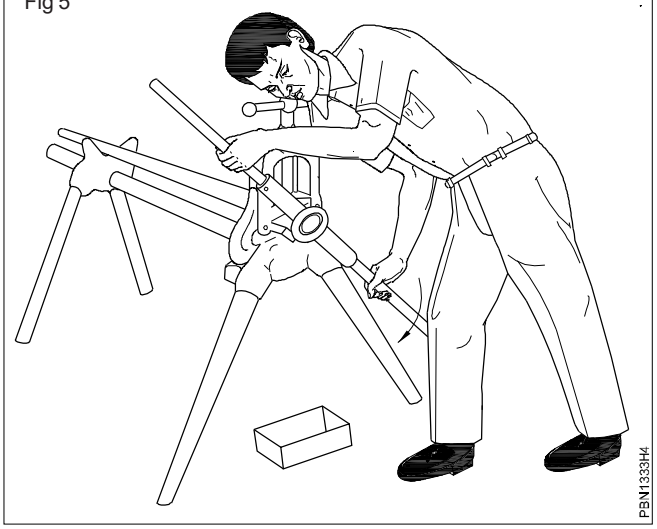
Fig 4



Ensure that the projection of the pipe is within 150-250 mm from the vice.

- Open the self-centering pipe guide and slide the stock over the end of the pipe.
- Adjust the pipe guide for correct sliding, fit and lock into position (Fig 5)

Fig 5



- Apply a cutting lubricant to the part which is to be threaded.

Use lubrication oil when threading G.I.pipes

- Apply a little pressure to the stock and keep the handle at right angle to the pipe axis.
- When the dies cut into the pipe, stop pushing and continue the rotation by moving the handle up and down.
- Apply the lubricant to the pipe after the first thread has been cut.

12 Keep rotating the handles clockwise and check the length of the pipe thread.

Ensure that the length of the thread is sufficient to fit half way into the socket or coupling.

- If the die stock and the die stick, turn the stock anticlockwise to break the chips.
- Reverse the ratchet knob, ease the handle and turn the stock anticlockwise till the stock and dies come out of the pipe.
- Clean the thread with a wire brush.
- Form thread until the pipe extends about one or two threads beyond the end of the stock.
- Remove the stock and dies by operating the quick-release lever and clean off the thread with a wire brush.
- Check the formation of thread with a standard fitting.

Repeat the operation if the thread is too tight, by adjusting the dies.

B Two handle stock and dies ratchet type

- Open the vice and insert the pipe into the pipe vice.
- Close and tighten the pipe vice.
- Open the self centering pipe guide and slide the stock over the end of the pipe.(Figs 6 & 7).
- Adjust the pipe guide for correct sliding, fill and lock in position.
- Apply a cutting lubricant to the part to be threaded.
- Apply heavy pressure to the stock and keep the two handles at right angles to the pipe axis.
- Rotate the handle clock wise with heavy pressure towards the pipe in a plane right angle to pipe axis.
- Apply lubricant to the pipe.
- Keep rotating the handle clockwise.
- Check the lengths of the pipe thread.
- Check thread with a socket.
- Remove the stock and die and clean off the thread with a wire brush and cloth.

Fig 6

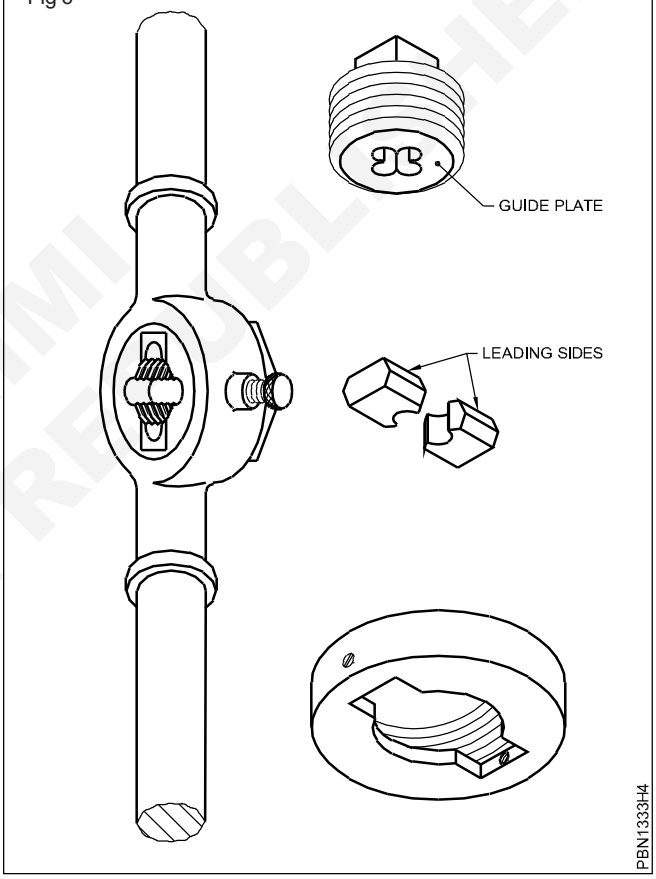
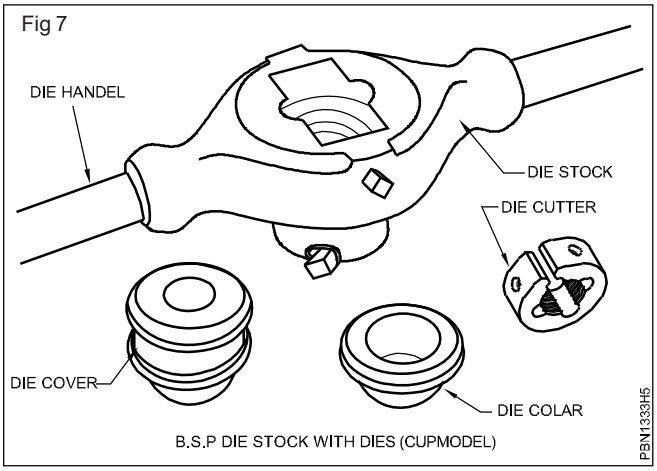


Fig 7



B.S.P DIE STOCK WITH DIES (CUPMODEL)

Fixing of different pipe fittings in different position of pipe

Objectives: At the end of the exercise you shall be able to
- **fix different G.I fittings**
- **perform G.I fitting, assembling with G.I pipe in different position.**

Requirements

Tools/Instruments

- Screw driver - 1 No.
- Pipe wrench - 1 No.
- Hacksaw frame - 1 No.
- Die set - 1 No.
- Adjustable spanner - 1 No.
- Ball peen hammer - 1 No.

Equipment/Machines

- Pipe vice - 1 No.
- Bench vice - 1 No.
- Oil can - 1 No.

Materials/Components

- C.P. Bib 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.
- G.I. Barrel nipple - as reqd.
- G.I. Tee - as reqd.
- G.I Elbow - as reqd.
- G.I. Bend - as reqd.
- G.I. Coupling - as reqd.
- G.I. Pipe - as reqd.
- G.I. Nipple - as reqd.
- G.I. Bush - as reqd.

PROCEDURE

1 Choose the pipe bits as per drawing.

2 External threads providing using die-set.

3 Thread seal making using white lead, shellac and thread ball.

4 Assembling G.I tee, G.I pipe nipple, G.I reducer coupling, G.I coupling, G.I bend, G.I elbow using pipe wrench.

5 Decide the place for fixing bib cock.

6 Fix bibcock to reducer socket using adjustable spanner pipe wrench after adopting the procedure.

7 Remove any excess hemp string or sealing thread after completing the joints using hacksaw blade. (Fig 1)

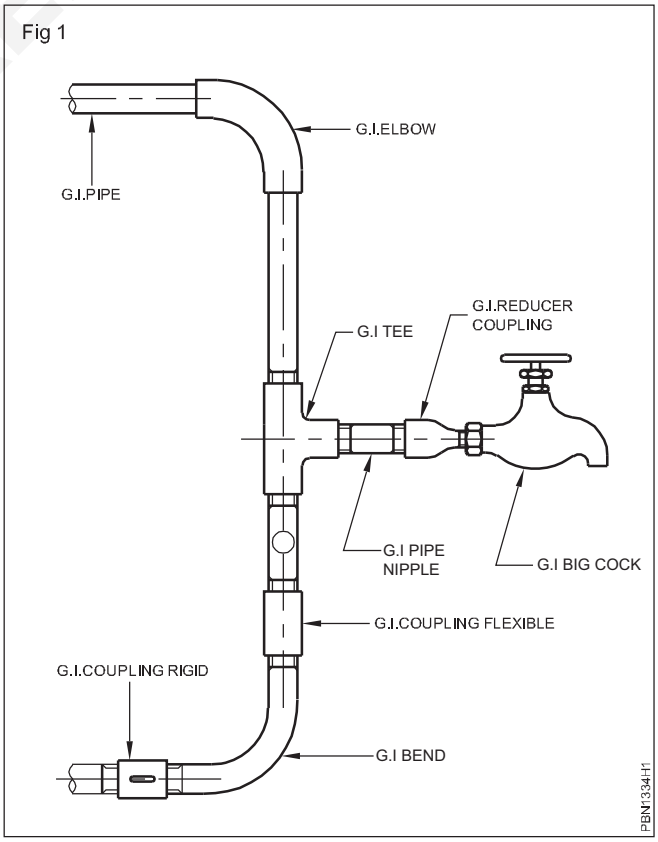
Safety

1 Put the Bibcock in the correct position.

2 Don't over tight the G.I fittings.

3 Use only adjustable spanner for fixing water tap.

Fig 1



Cutting different diameter of MS pipes in different angles

Objectives: At the end of this exercise you shall be able to
- **draw the development for 90° 'T' branch**
- **cut and prepare the pipes as per dimensions**
- **set 90° angle of the branch pipe using try square**
- **tack-weld the pipe and recheck the angle**
- **start and complete the weld in two halves**
- **manipulate the blowpipe and filler rod holding them at the required angles during welding**
- **clean and inspect for external weld defects.**

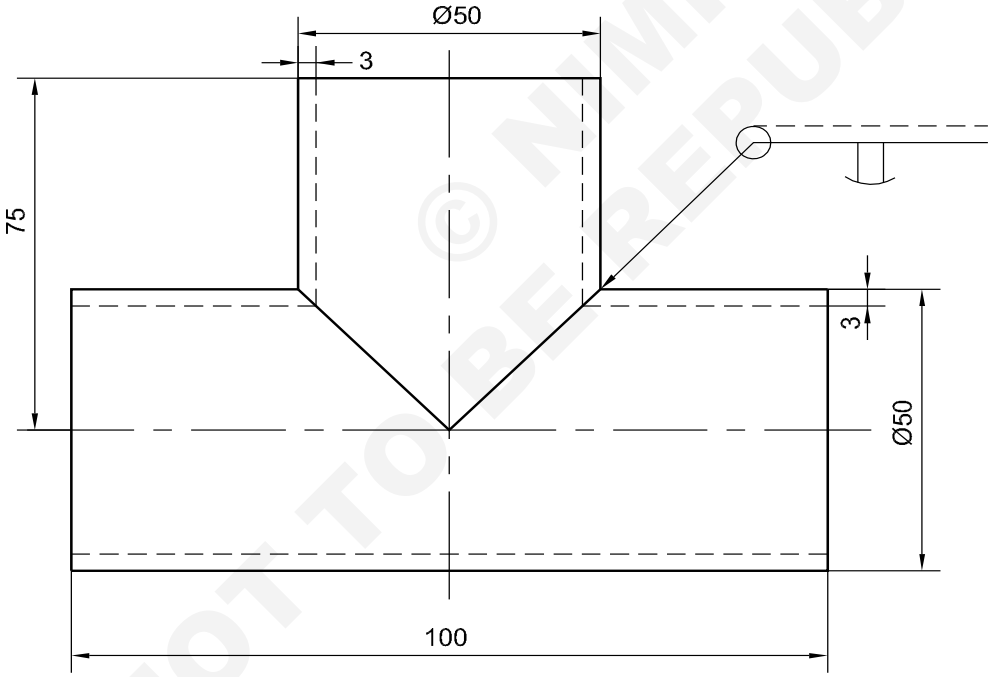
Requirements

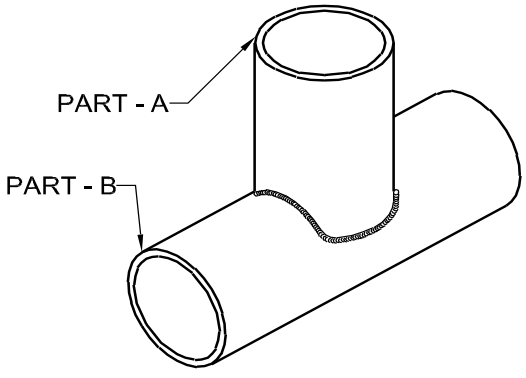
Tools/Instruments

- Pipe vice - 1 No.
- Bench vice - 1 No.
- Hack saw frame - 1 No.
- Flat file - 1 No.
- Try square - 1 No.
- Steel rule - 1 No.
- Scriber - 1 No.

Materials/Components

- M.S pipe - 50 ∅ mm - as reqd.
- Hacksaw blade - as reqd.

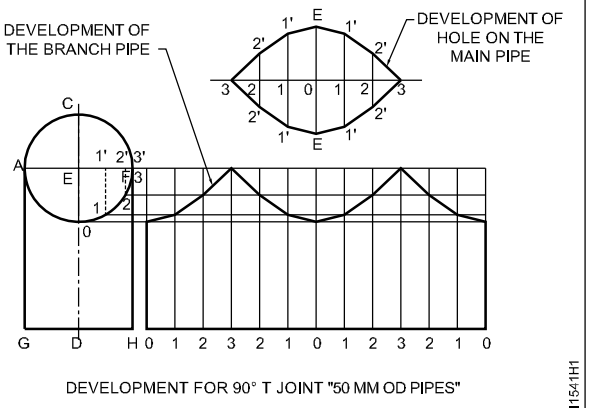




Job Sequence

- Ensure the correct size of pipes are used.
- Prepare development for 90° branch. (Fig 1) on a drawing sheet.

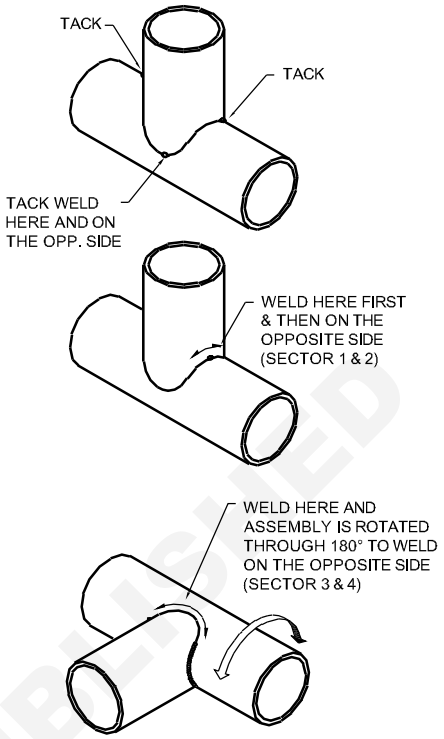
Fig 1



DEVELOPMENT FOR 90° T JOINT "50 MM OD PIPES"

- Cut and paste it on the pipes.
- Punch mark the profile of the development on both pipes. Cut the branch pipe along the punch marked profile and file it. Cut the profile marked on the main pipe by gas cutting and file it.
- Deburr the gas cut edges and file the edges.
- Clean the surface of the pipe to remove any oxide and other contaminants.
- Set and align the branch pipe with the main pipe at an angle of 90°. (Fig 2)
- Select no.7 nozzle, ø3mm CCMS rod and use neutral flame.
- Follow necessary safety precautions.
- Tack-weld the joint at 4 place with 90^0 interval and with a 2 mm root gap to ensure root penetration.
- Weld the joint by manipulating the blow pipe and filler rod without rotation of the pipe.
- Compete the weld in 4 sectors 1, 2, 3 and 4 along the curved joint using leftward technique. (Fig 2)

Fig 2



Avoid excess penetration.

- Clean the weld and inspect the weldment for defects.

Ensure the tacked pipe "T" joint is positioned properly to make it convenient to manipulate the blow pipe and filler rod without any obstruction.

Maintain keyhole throughout the welding and give side to side motion to the blow pipe to ensure good root penetration and fusion of both the edges of the joint.

Take care to properly fuse the crater of the previous sector welded with the starting of the new sector.

Pipe welding 45° angle joint on M.S. pipe ø50mm and 3mm wall thickness (1G)-(OAW-16)

Objectives: At the end of this exercise you shall be able to
- **prepare the development of pipe for 45° branch joint**
- **cut and prepare the pipes as per dimensions**
- **tack and complete the welding by manipulating the torch and filler rod.**

Procedure for development of 45° branch pipe: Refer (Fig 1). Draw a center line AB.

Mark the points C, D, E and F taking the radius and the length of the given pipe with the center line AB as reference line.

On the line "CD" locate the position of the 45° branch pipe. This will be "G".

Draw a 45° angle at the point "G".

Choose a suitable height and mark the height of the branch pipe (GI) in 45° line from point G.

Fig 1

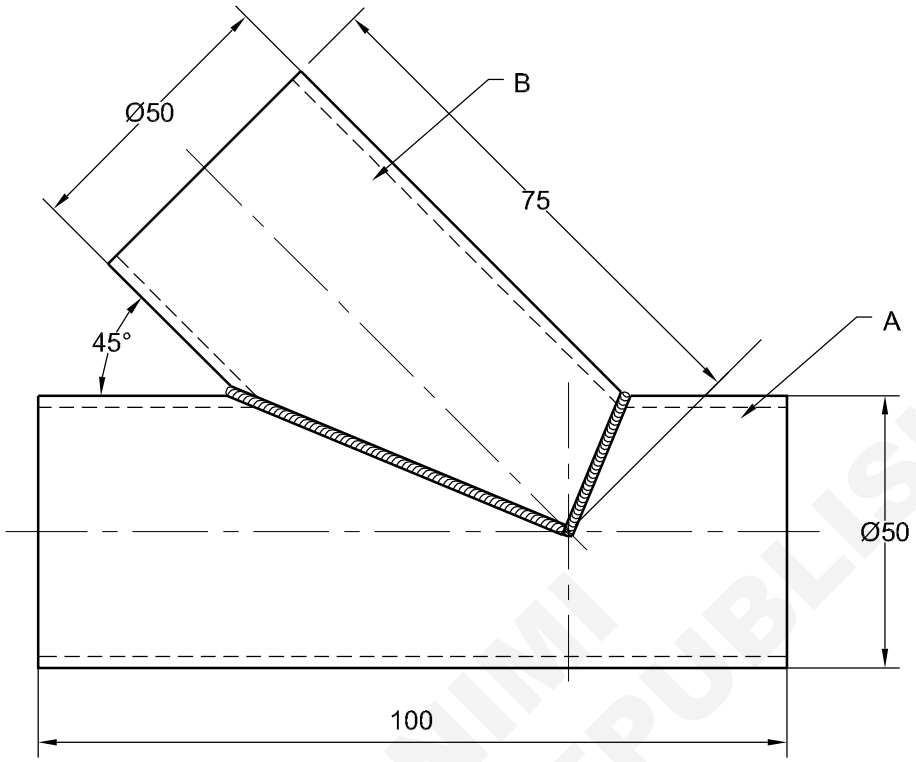
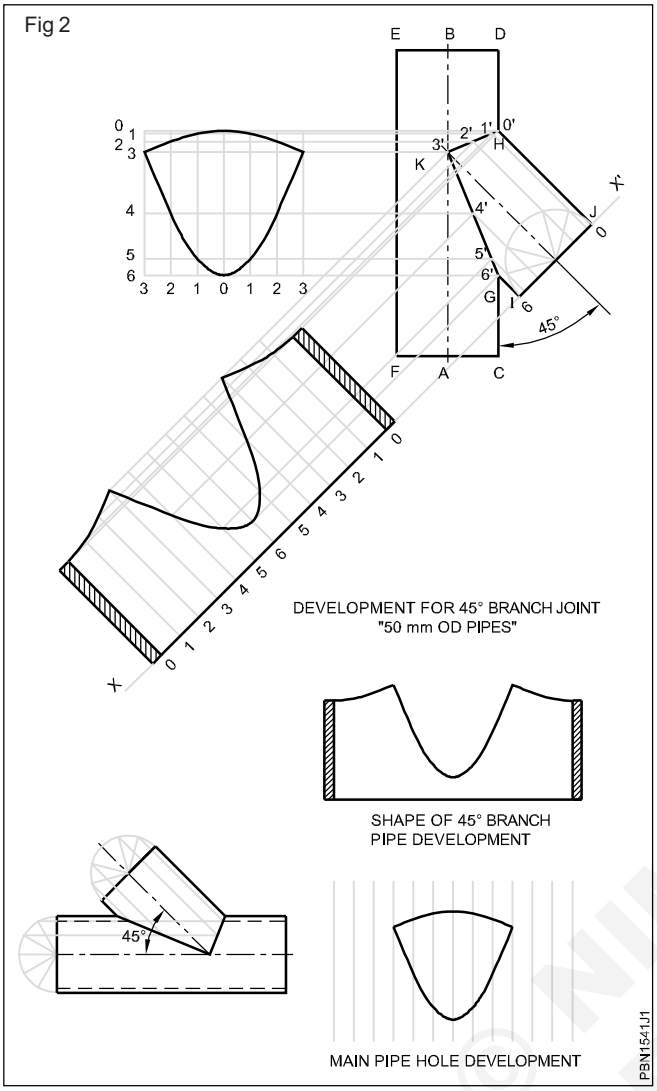


Fig 2



From I, draw a horizontal line on both sides (XX'). This XX' will be the base line for drawing development.

From I, plot the outside diameter of the branch pipe IJ on the line XX'.

Draw a center line for the branch pipe. This line will cut the main pipe's center line AB at K.

Join GK. Draw a perpendicular line to GK at K which meets CD at H. Join KH. Now IGKHJ will be the shape (outline) of the branch pipe.

Draw a semicircle equal to the branch pipe outside diameter.

Divide the semicircle into 6 equal parts as 0-1; 1-2; 2-3; 3-4; 4-5 & 5-6.

Draw vertical lines from these points 1,2,3,4,5. Already there will be two vertical lines IG from the point 6 and JH from point 0. These vertical lines will cut the branch pipe lines 'GK' and 'KH' at points 6', 5', 4', 3', 2', 1' & 0'. Note that points 6' and G as well as points 0' and H are the same points. In the base line XX' plot 13 points equal to the distance of '0-1' as 0, 1,2,3,4,5,6,5,4,3,2,1,0.

Draw vertical lines to XX' from these 13 points.

Draw horizontal lines parallel to XX' from points 6', 5', 4', 3', 2', 1', 0'. These 7 horizontal lines will cut the 13 vertical lines from the base line at 13 points.

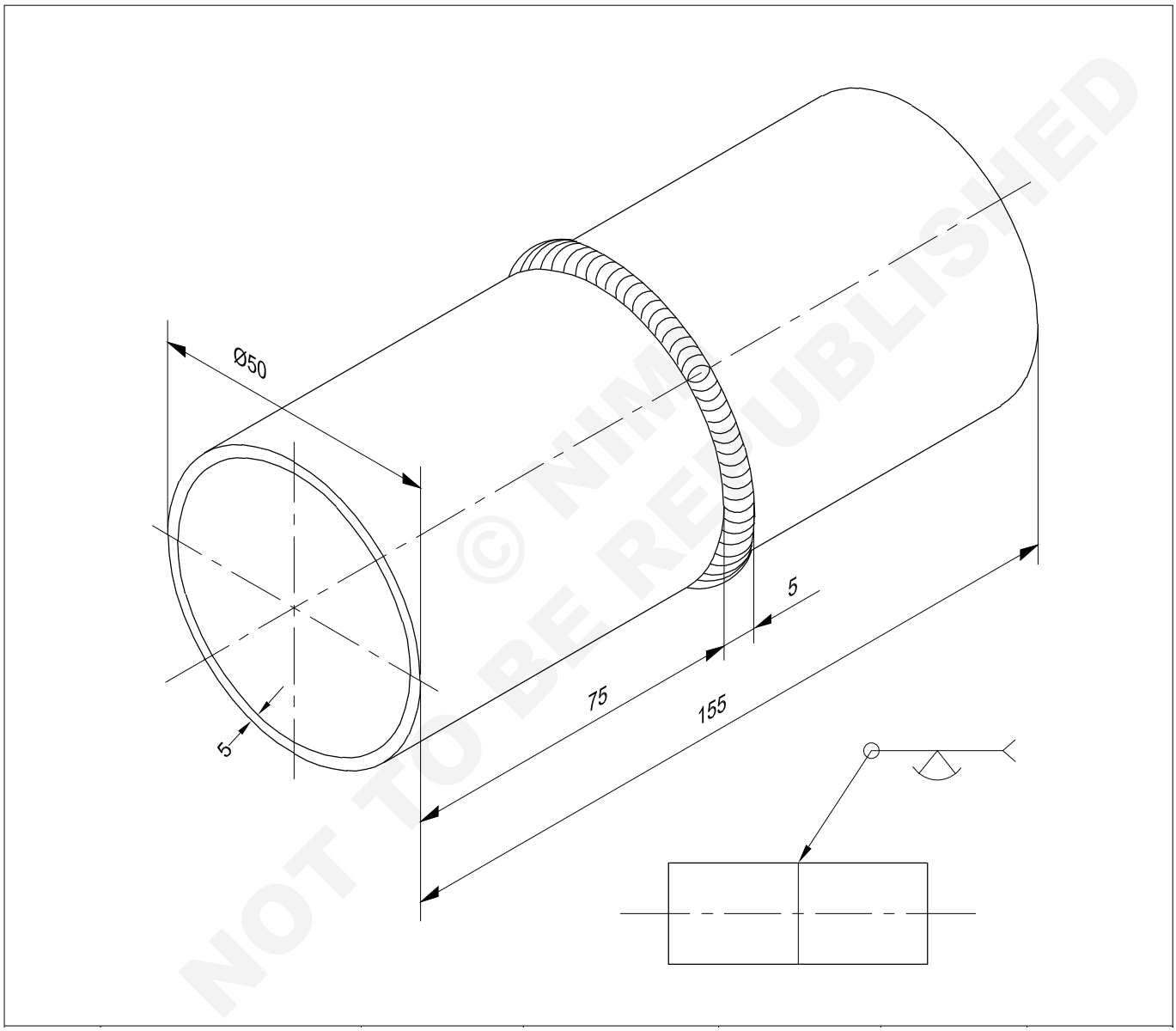
Join the 13 cutting points with a regular smooth curve. Now the required development for the 45° branch pipe will be ready. Give allowance of 3 to 5mm at the edges of the development. (Fig 2)

For developing a hole in the base pipe: Above the main pipe, draw 7 lines parallel to AB namely 3,2,1,0,1,2,3 equal to the distance of 0-1 on the semi circle.

Draw vertical lines from 0', 1', 2', 3', 4', 5', 6'. These vertical lines will intercept the 7 horizontal lines. Join the intercepting points with a smooth curve. The required development for hole is now ready.

Joining of pipe in same dia by gas welding

Objectives: At the end of this exercise you shall be able to
- **cut and bevel the pipe for welding**
- **tack pipes for butt welding**
- **make root run by rotation method**
- **make filling run by rotation**
- **clean the job and inspect for defects.**



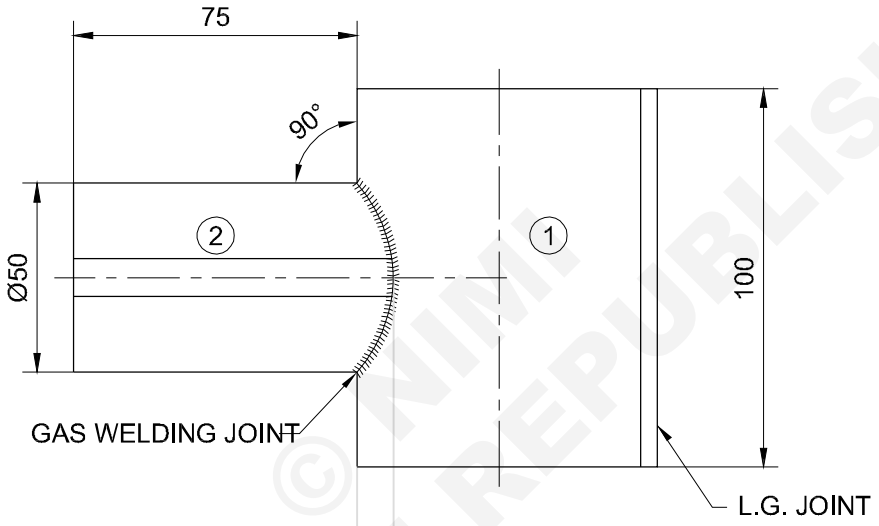
Job Sequence

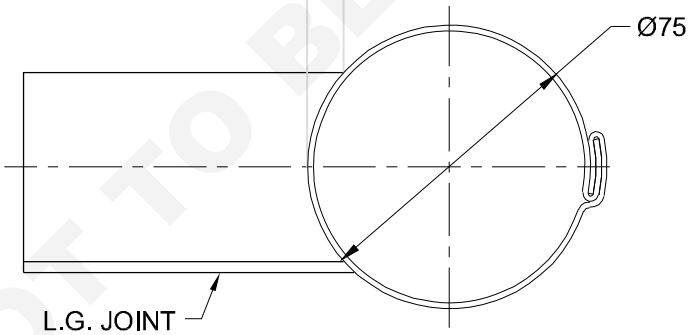
- Cut the pipes to 75mm length by hacksaw and file its end square to 75mm length. Chamfer the outside edge of the pipe to 30 - 35^0 angle leaving a root face/land of 1.5mm at the bottom edge of the pipe.
- Clean the inside and outside surfaces of the cut pipes after deburring.
- Fix no.5 size nozzle, select 1.6mmø CCMS filler rod and set 0.15 kgf/cm^2 pressure for both gases.
- Set the 2 pipes on an angle or channel fixture to form a co-axial pipe butt joint with proper root gap.
- Follow necessary safety precautions.
- Set neutral flame.
- Tack weld in 3 places (120^0 apart) keeping 1.5mm root gap between the pipes.
- Divide the pipe circumference into four segments. Keep the pipe horizontally on the fixture.
- Deposit the root run starting from 3 0'clock position to 12 0'clock position using proper blowpipe and filler rod angles. (I segment)
- Turn the pipe joint in the clockwise direction so that the end of the root run already made in I segment comes to the 3 0'clock position.
- Continue to weld the root run for the second quarter segment as done for the first segment.
- Similarly, complete root run of 3rd and 4th segments.
- Ensure the root penetration by maintaining a keyhole at the root throughout the root run.
- Clean the root run by steel wire brush.
- Fix No.7 size nozzle, select 3mmø CCMS filler rod and set 0.15 kg/cm^2 gas pressure.
- Set neutral flame and fill the V groove by depositing the 2^{nd} run using slight weaving to the blowpipe so that both the faces of the Vee and the root run will fuse properly.
- Ensure proper bead size, profile and weld reinforcement as well as avoid undercut and other weld defects.
- Clean the joint and inspect for external defects.

— — — — — — — —

Joining of pipes in different dia by gas welding

Objectives: At the end of this exercise you shall be able to
- **develop and layout the pattern for a 90° Tee unequal dia pipes by parallel line development**
- **cut and prepare the pipes as per the job drawing**
- **check the pipes as per the job drawing**
- **clean the pipe end which is to be gas welding**
- **tack the pipe by gas welding, check the angle and gas welding the joint.**

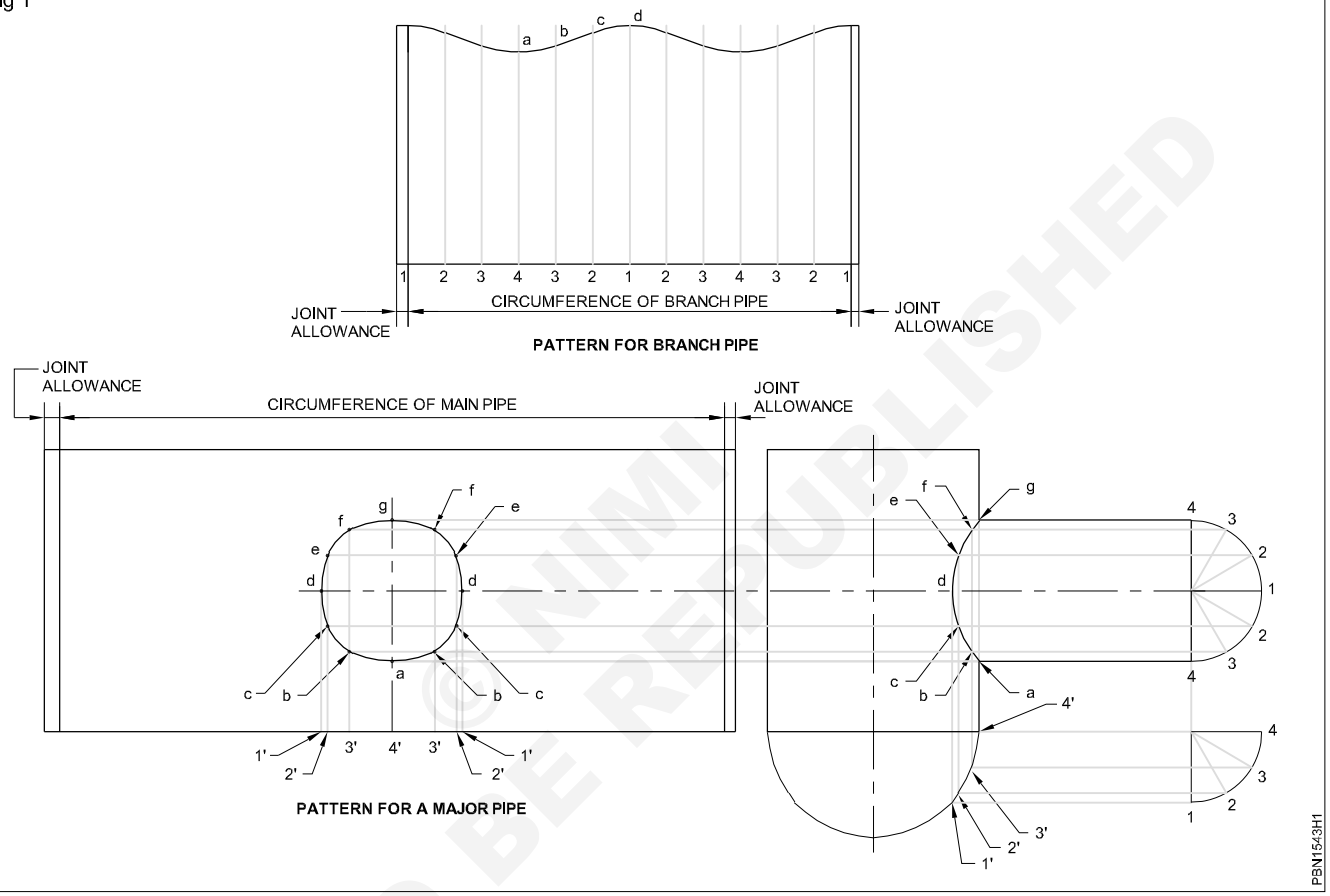




Job Sequence

- Develop and layout the pattern for the 90° Tee pipes with cutout on the main pipe by parallel line development. (Fig 1)
- Cut, form and lock groove the joints of the pipe as per the job drawing.
- Check, set and align the two pipes as per job drawing.
- Tack the joint by gas welding and check for perpendicularity using a try square.
- Complete the joint by gas welding. (Fig 1)
- Wash the job to avoid corrosion.

Fig 1



Demonstrate proper handling of mason's hand tools - Straight edge, spirit level, plumb bob, square, trowel etc.

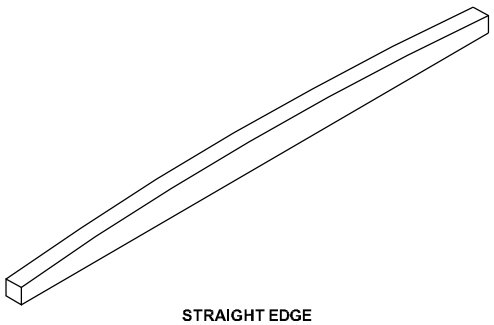
Objective: At the end of this exercise you shall be able to
- **demonstrate the uses of mason's hand tools by practice.**

PROCEDURE

1 Straight edge (Fig 1)

- Check the flatness if coarse laid using 2 meters length.
- Check the vertically of coarse laid.
- Remove the excess plastering by placing and levelling.

Fig 1



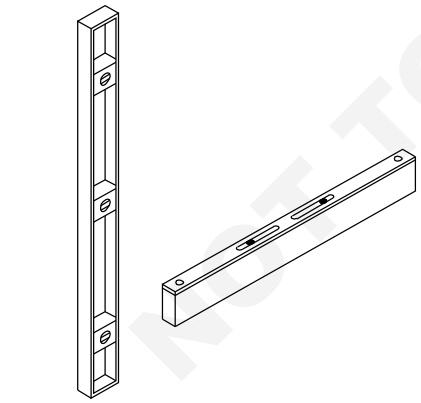
STRAIGHT EDGE

PBN1650H1

2 Spirit level (Fig 2)

- Check the large surface of flooring for slope.
- Check the length of wall for flatness using 1 metre long.

Fig 2



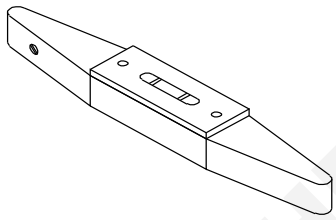
SPIRIT LEVELS

PBN1650H2

3 Boat level Spirit level (Fig 3)

- Check the flatness of plumbing fittings laid.
- Check the small surface area flatness using for slope.
- Check the flatness of bricks laid.

Fig 3

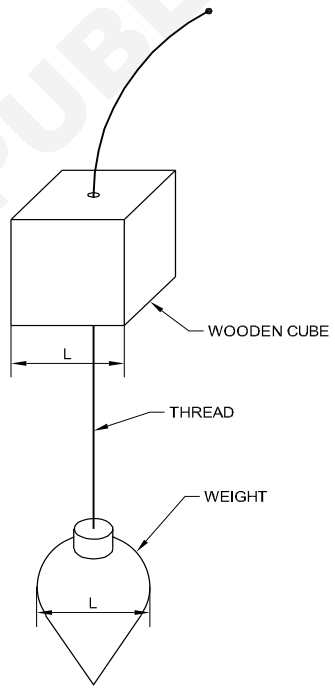


BOAT LEVEL

PBN1650H3

4 Plumb bob (Fig 4)

Fig 4



PBN1650H4

- Check the vertically of brick laid.
- Check the vertical plastering over brick walls.

5 Plumb rule (Fig 5)

- Check the brick laid to ensure very accurate verticality.

6 Block Trowel (Fig 6)

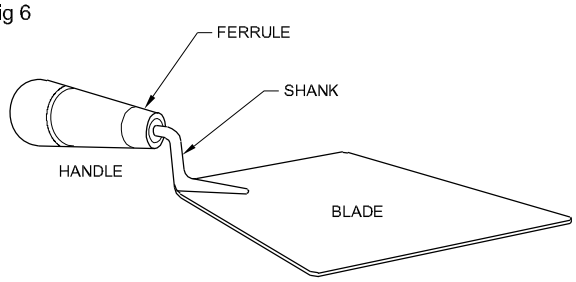
- Pick mortar from mortar board.
- Spread mortar for need joints cross joints on blocks.
- Cut excess mortar.
- Tapping down the laid blocks and rough cutting.

Fig 5

PLUMB RULE

PBN1650H5

Fig 6



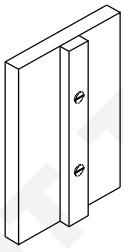
BLOCKLAYING TROWEL

PBN1650H6

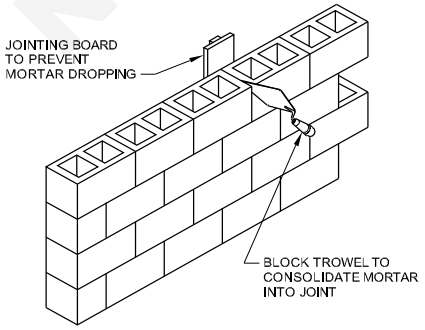
7 Jointing Board (Fig 7)

- Use the 300mm x 75mm x 25mm for placing cement mortar.
- Use to fill the cross joints.
- Use to prevent cement mortar dropping.

Fig 7



JOINTING BOARD

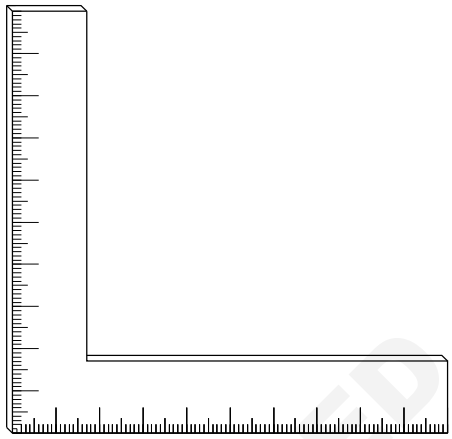


PBN1650H7

8 Steel square (Fig 8)

- Check the angle formed by two walls meeting to 90° one another.

Fig 8



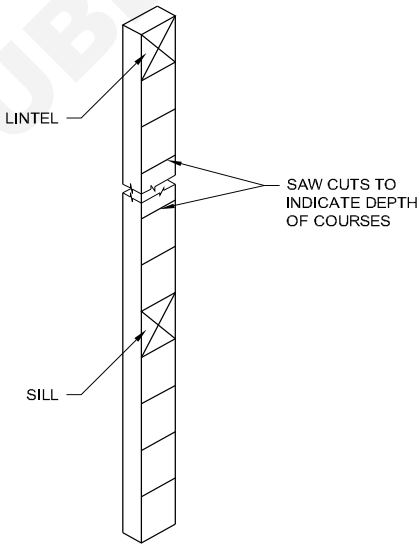
STEEL SQUARE

PBN1650H8

9 Gauge Rod or Rule (Fig 9)

- Check the mortar joints thickness.
- Check the sill level and spring level.

Fig 9



GAUGE RULE

PBN1650H9

10 Line and Pins (Fig 10)

- Place this to the two opposite ends for making coarse wall.
- Use as a guide to construct wall coarse.

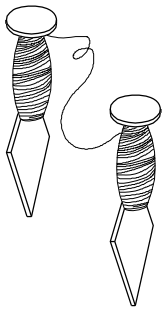
11 Corner blocks (Fig 11)

- Place this alternate to line and pins where joints are tight.
- Use this as guide to construct wall coarse to hold the line tant.

12 Tingle plate (Fig 12)

- Use to prevent sag of the line by using three fingers.
- Helps to construct wall in stright.

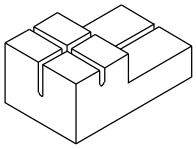
Fig 10



LINE AND PINS

PBN1650HA

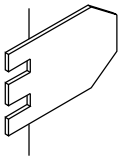
Fig 11



ENLARGED VIEW OF CORNER BLOCK

PBN1650HB

Fig 12



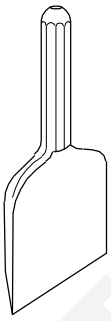
TINGLE PLATE

PBN1650HC

13 Bolster (Fig 13)

- Use to cut blocks and concrete for correct size.

Fig 13



BOLSTER

PBN1650HD

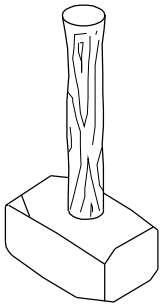
14 Club Hammer (Fig 14 & 15)

- Used together with bolster to cut concrete for correct size.

15 Scutch (Fig 16)

- Use to trim a block after cut.

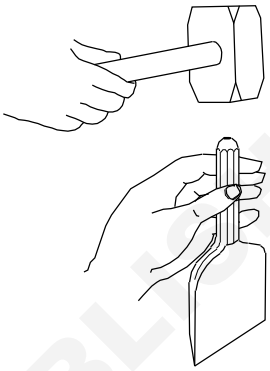
Fig 14



CLUB HAMMER

PBN1650HE

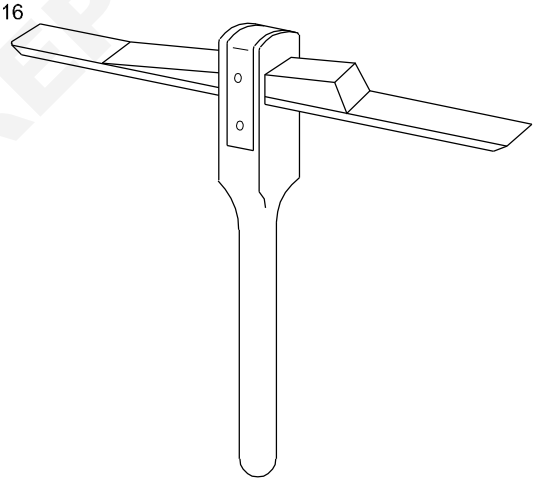
Fig 15



CUTTING WITH BOLSTER AND HAMMER

PBN1650HF

Fig 16



SCUTCH

PBN1650HG

Instructor shall display all the masonary tools and equipments in the section and brief their names uses and the safety point to be observed for each tools and equipments

Record the safety to be observed table - 1

Table - 1

Fig. No.	Remarks	Precaution to be follow while working on masonry work
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

— — — — — — — —

Setting out work with tape, rule, square, line pin and level as per drawing

Objectives: At the end of this exercise you shall be able to
- **mark third line of the building**
- **mark fourth line of the building**
- **drive nails on the pegs.**
- **verify diagonal distance between profile markings.**

Requirements

Tools

- Builders square steel 75 cm x 50 cm — 1 No.
- Nylon marking thread
- Hammer Mason (club) 11/2 / 1 lbs — 1 No.
- Measuring tape 30 m — 1 No
- Plumb bob — 1 No.
- Steel try square — 1 No.
- Spirit level - 1 No.

Materials

- Wooden pegs (about 80 to 100mm diameter and 450 to 600mm casuarina poles), 35mm long and wire nails
- Wooden profiles - as reqd.
- Wire Nails - as reqd.
- Lime powder - as reqd.

PROCEDURE

TASK 1: **Mark third line of the building (see Fig 1)**

1 Measure an arbitrary distance of one meter from boundary DC and locate points P5 and P6 so as to cover the overall diamensions of the rear side of the building and also foundation excavation width and safe distance.

While measuring, stretch and hold the steel tape without sag, and as low as possible clear above the ground and truly horizontal to the ground.

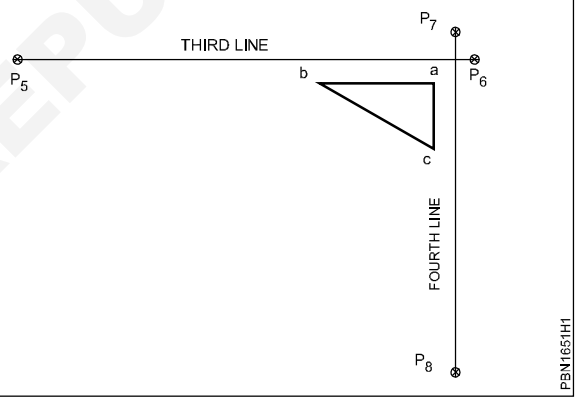
2 Drive pegs at points P5 and P6

3 Drive nail on center of peg P5 and tie line thread

4 Stretch the line thread at right anlges using the builders square (see Fig 1) to line P3, P4 and to appear on peg at P6

5 Locate nail point on peg P6 and drive nail so as to be at center of line thread.

Fig 1



Verify correctness of measurement and adjust the line thread and nail point only at peg P6.

Tie the line thread on the nail in peg P 6 and obtain the Third line P5 P6 at right angles to line P3 P4 and parallel to line P1 P2.

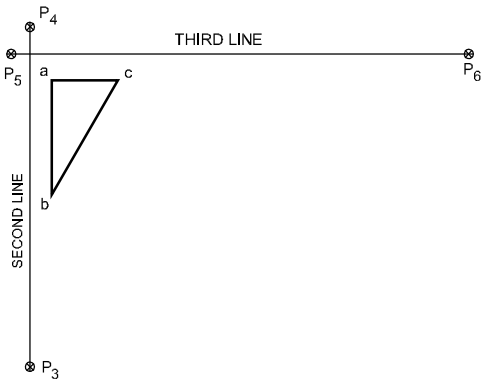
— — — — — — — —

TASK 2: **Mark fourth line of the building (see Fig 1)**

1 Measure an arbitary distance of one meter from boundary C B and locate points P7 and P8 to as to cover the overall dimensions of the right side of the building and also foundation excavation width and safe distance.

While measuring, stretch and hold the steel tape without sag, and as low as possible clear above the ground and truly horizontal to the ground.

Fig 1



2 Drive pegs at points P7 and P8.

3 Drive nail on center of Peg P7 and tie line thread.

4 Stretch the line thread at right angles using the builders square (see Fig 1) to line P5 P6 and to appear on peg at P8.

5 Locate nail point on Peg P8 and drive nail so as to be center of line thread.

Verify correctness of measurement and adjust the line thread and nail point only at peg P8.

Tie the line thread on the nail in Peg P 8 and obtain the Fourth line P7 P8 at right angles to line P5 P6 and parallel to the line P3P4.

Note:

1 Measure diagonal distance between intersection points e and h (see Fig 3)

2 Measure diagonal distance between intersection, points g and f (See Fig 3)

The diagonal distances thus verified must be equal, if not correct right angle turnings and arrive at equality between diagonals.

3 All the line threads must travel at same level and separated only by thickness of threads.

4 Use Builders square to turn and check the back right angle of thread line as shown in Fig (3a,b,c and d).

Drive nails on the pegs

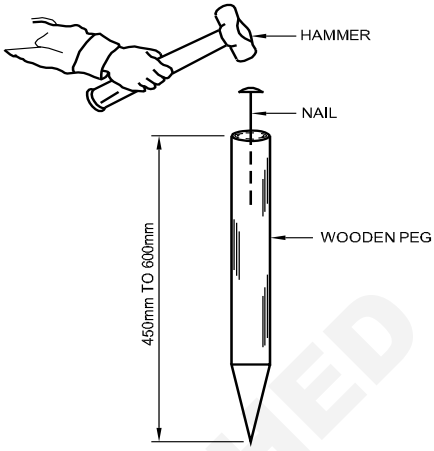
Steps

Mark with a pencil the approximate center point of the flat surface of the driven peg.

Hold the nail vertical with the sharp point on the center mark.

Strike gently with a claw hammer the nail head and fix. (Fig 2)

Fig 2



DRIVING NAIL USING HAMMER

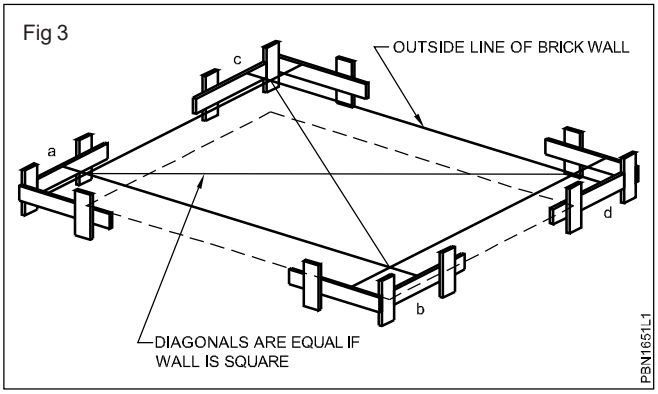
Verify diagonal distance between profile markings

Steps

- Tie thread lines between profiles to run on the center line mark.
- Obtain intersection points on the line thus stretched.
- Measure the distance between diagonally opposite intersection points.
- The distance between two such pairs should be equal.

If the two diagonal distance's are not equal, verify all right angles obtained at the intersection points and correct where necessary keeping any one line between two intersecting points as base not to be altered.

Fig 3

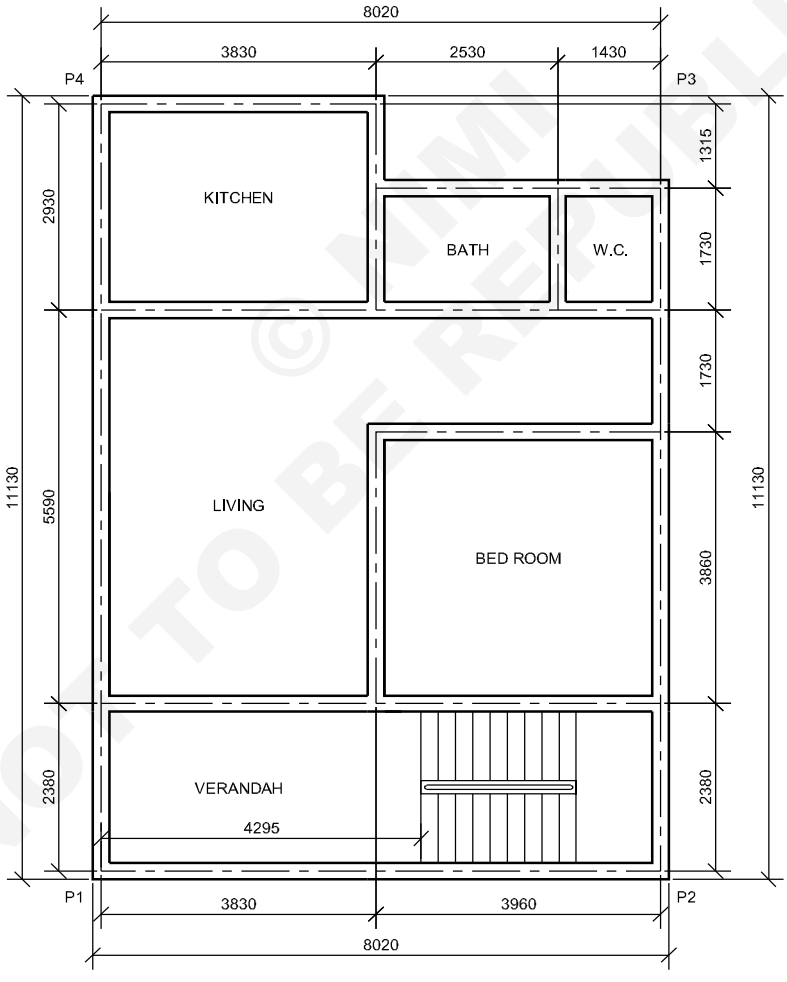


Set out a building - Marking the center line layout of the building

Objective: This shall help you to
- **produce center lines of the building on the profiles**
- **transfer center line mark, on the ground.**

- Trace center line plan of the building (Fig 1) and orientation of the building.
- Tie all line threads at almost same level (Levels separated only by thread thickness) between pegs P1 P2, P3 P4, P5 P6 and P7 P8.
- Calculate half wall width ie 115mm plus the balance two meter = 2115mm for locating the center line pegs for the front wall of the building.
- Measure this distance of 2115 mm on the line thread P3 P4 from the intersection point e and locate and drive peg P9.
- Measure once again the distance 2115 mm from the inspection point e and locate the nail point on peg P9 and drive nail.
- Repeat the process from intersection point f and locate peg P10 and drive nail.
- Now tie line thread between P9 P10.
- Mark a safe distance (say half a meter) in front of peg P9 towards the building and drive a profile.
- Repeat the same procedure in front of peg P10 and drive another profile.
- Mark the center line on these profiles.
- Remove line thread P9 P10 and tie between these two profiles and obtain center line of the building front wall.
- Repeat process to obtain all other center lines as per the center line drawing.

Fig 1



NOTE:
1. ALL DIMENSION'S ARE IN MILLIMETER

CENTER LINE PLAN

PBN1651X1

Prepare cement mortars in different proportions to suit various purposes

Objectives: At the end of this exercise you shall be able to
- **prepare of mortar ingredients for specific mix**
- **mix mortar manually**
- **follow correct safety precautions.**

Requirements

Tools/Equipments

- Spade - 1 No.
- Bucket - 1 No.
- Mug - 1 No.
- Mortar pan - 1 No.
- Measuring Box (Figs 5 and 6) - 1 No.
- Mason Trowel - 1 No.
- G.I. Sheets (For Platform) - as reqd.

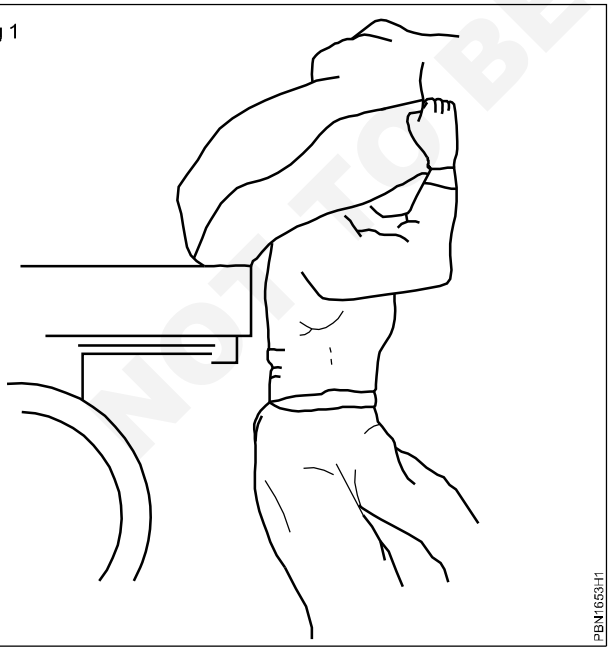
Materials

- Cement (0.034 m^3 or 1 bag) - 1 box
- Sand Add 20% for bulking - 5 box (0.17 m^3)
- Water - as reqd.

Job Sequence

- Level the area where mixing is to be done.
- Place adequate numbers of G.I. sheets on the levelled ground.
- Bring the required quantity of sand and water near the mixing area.
- Measure sand using measuring box, and spread it into a heap.
- Transport cement bag (Fig 1) and place on the heap of sand.

Fig 1



- Cut open the cement bag (Fig 2) pour and spread slowly the cement evenly on the sand.

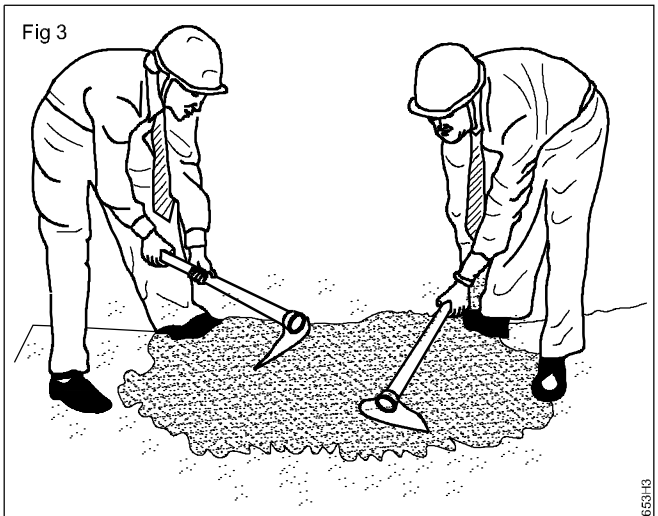
Fig 2

EMPTYING CEMENT BAG

Caution:

- Wear dust mask.
- Cut cement bags without spoiling the bag.
- Use spade to dry mix the contents uniformly. (Fig 3) Mix of all the ingredients well, until uniform colour is achieved.
- Add the sufficient quantity of water (As per water cement radio) to get consistency of mortar. (Fig 4)

Fig 3



DRY MIXING OF CEMENT AND SAND

PBN1653H3

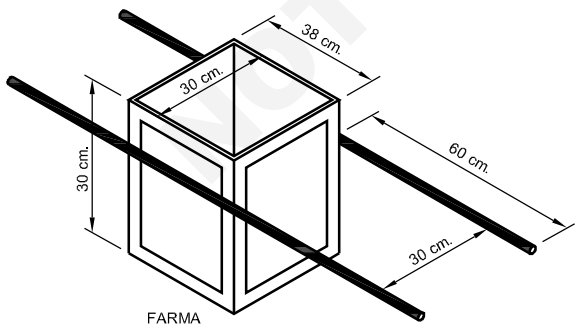
Fig 4

ADDING WATER IN DRY MIX

PBN1653H4

- Mix quickly without allowing the water to keep out of the heap. (Figs 5&6)

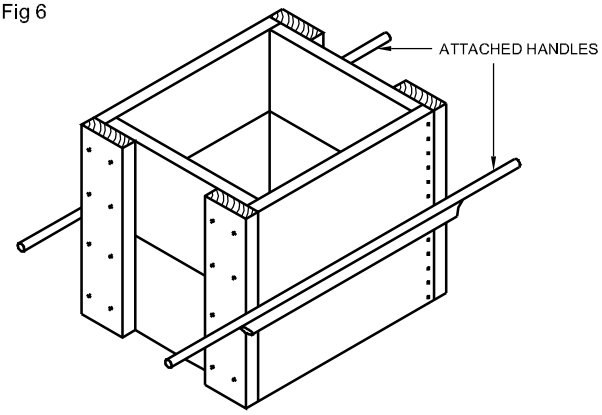
Fig 5



STEEL MEASURING BOX

PBN1653H5

Fig 6



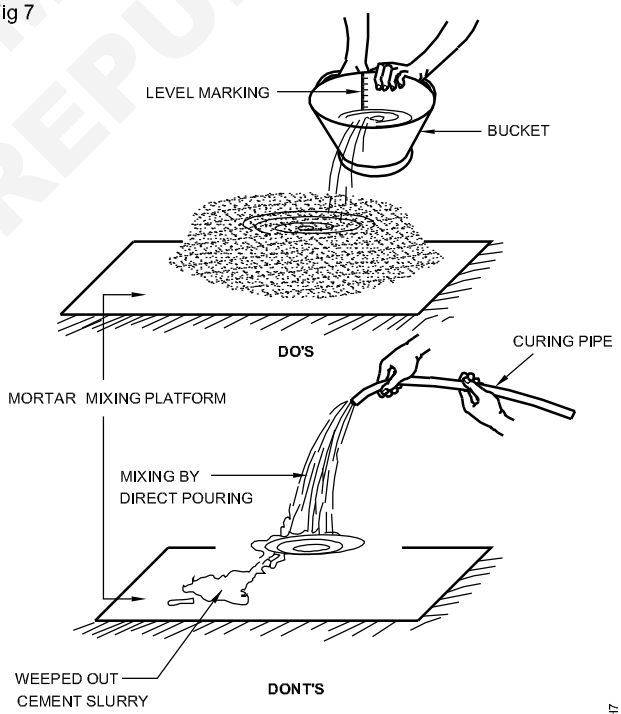
WOODEN MEASURING BOX

PBN1653H6

Caution:

- When mixing is done in poorly ventilated area wear a dust mask.
- Again pour the balance quantity of water using mug slowly mug by mug (Fig 7) and same time continue mixing.
- Don't add water with a curing pipe as shown in (Fig 7).
- Keep mixing until uniform colour and consistency of mortar is obtained.

Fig 7



MIXING WATER (DO'S & DONT'S)

PBN1653H7

Caution:

- Do not pour excess water since mix will become lean.
- After mixing use the mortar with in 30 minutes.

Skill Sequence

Measure ingredients using measuring box

Objective: This shall help you to
- **measure ingredients using measuring box.**

Keep the measuring box near the sand.

Fill the measuring box in layers by using mortar pan.

When the box is full remove the excess of sand with trowel.

Caution:

Slightly shake the measurement box when full to enable ingredients to full without voids.

Two persons can hold the handles on both sides of the measuring box and lift it and pour the sand.

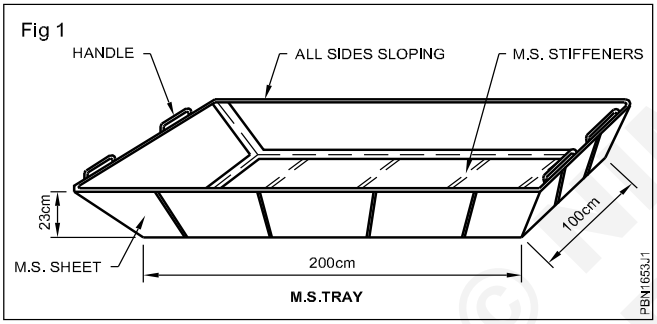
Mixing the cement mortar

Objectives: This shall help you to
- **mixing the cement mortar**
- **pour water and mix for consistency.**

Mix the mortar using the water tight platform.

(M.S. Tray for smaller quantity or G.I. sheet for large quantity).(Fig 1)

Fig 1



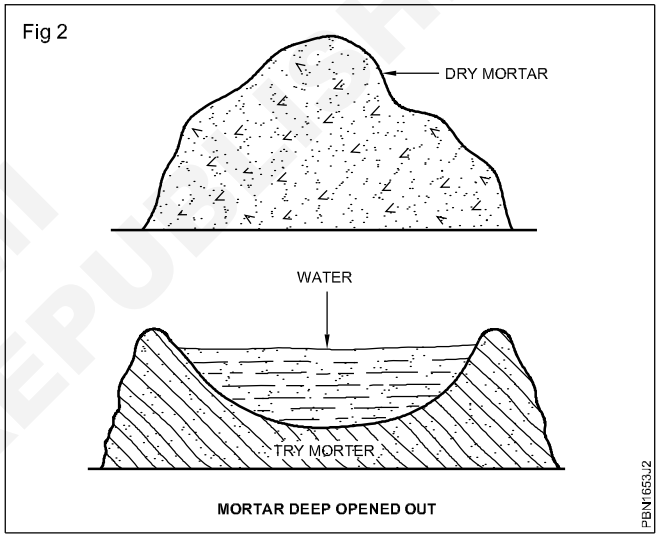
Required quantity of sand and cement mixed in dry condition (Fig 2). By turning them over, from one end to another end and cutting with a shovel until the mix appears uniform colour.

Turning is done three times for dry mixing in opposite directions and make heap.

Make a pond in the middle of heap.

Add required quantity of water by pouring mug by mug into pond in the heap slowly, while keeping the mixing in progress.

Fig 2



Mix until the uniform colour and required consistency is achieved.

Caution:

Add Water according to water cement ratio.

— — — — — — — —

Plumbing — Exercise 1.5.24
Plumber - Mason

Prepare plain concrete and RCC in different proportions to suit various purposes

Refer Exercise No. 1.5.23

Benching and channeling of base plate

Objectives: At the end of this exercise you shall be able to
- **lay 23cm thick corner wall in English bond**
- **make the benching and channeling for inspection chamber and manhole**
- **cover fixing with channel and slope providing.**

Requirements

Tools

• Steel tape	- 1No.
• Mason's trowel	- 25 cm long.
• Mortar pan	- 1No.
• Spirit level	- 30 cm long.
• Forming tools	- 1No.
• Hammer, chisel	- No.

Materials

• Brick bats	- as reqd.
• Cement	- as reqd.
• Sand	- as reqd.
• Aggregate	- as reqd.
• Water	- as reqd.
• Rungs (foot steps)	- as reqd.

PROCEDURE

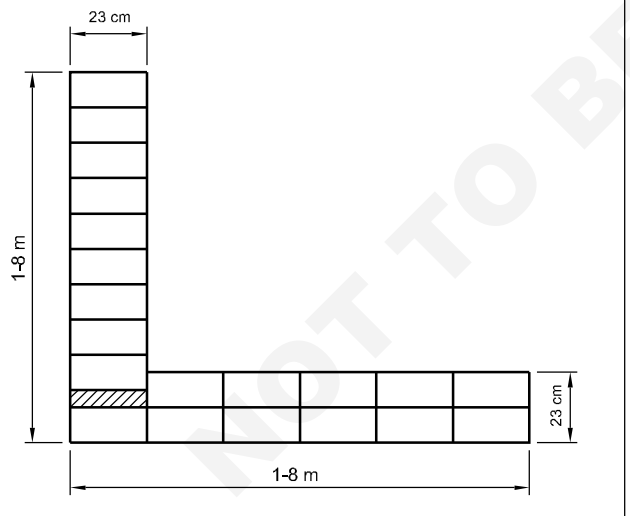
TASK 1**: Lay 23 cm thick corner wall in English bond**

1 Mark line with chalk and set out the position of the job.

2 Use accurately dry bricks mark the overall dimensions of the model job ensure that the thickness of the wall is not more or less the length of one brick.

3 Lay first stretcher of the first course at one end of the front elevation of the model job and lay queen closer next to the corner brick of first course (Fig 1)

Fig 1



4 Check width of the first course of front end rear. (Fig 2)

5 Lay the second stretcher at the opposite end of the front elevation of the job and check the level from the first stretcher of the job and check the level from the first stretcher layed. (Figs 3&4)

Fig 2

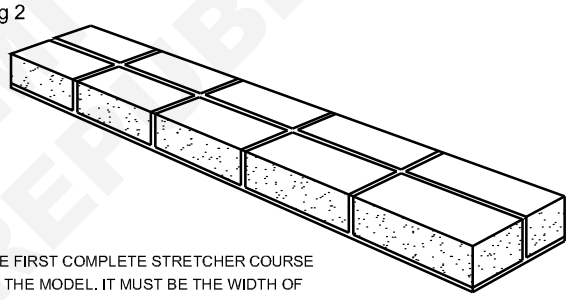


Fig 3

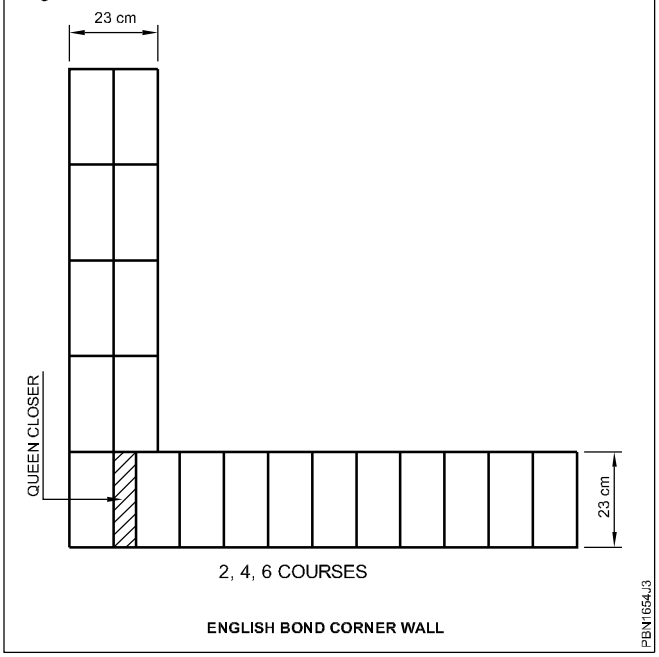
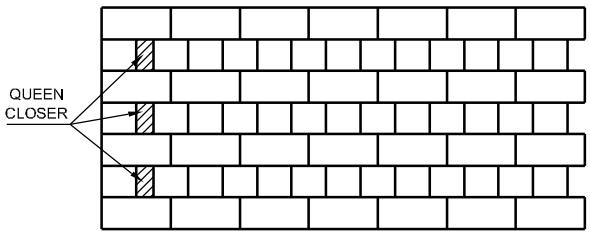


Fig 4



ELEVATION OF ENGLISH BOND

PBN1654J4

6 Lay the bed for the rear elevation of the first course of stretchers.

7 Draw the trowel point along the front elevation stretchers to form an additional furrow.

8 Check for alignment level and width.

9 Build up one end of the job with a header closer and header on the second course.

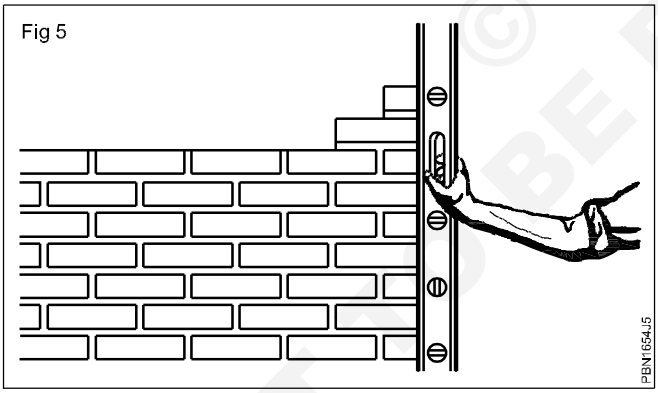
10 Check for gauge, level, plumb ranging in width as the work proceeds repeat at the other end of the job using line and pins.

11 As the lack of the stretcher course is layed make sure that the mortar led is furrowed clear of the lack of the bricks already laid on the course.

12 As the headers are layed make sure that they are level across the width of the wall.

13 This job needs accurate setting out and squaring of the ends on the first course (Fig 5)

Fig 5



PBN1654J5

14 Check stepped end of wall (Fig 6).

15 The closers must be cut to the correct size.

16 The headers and the back course of stretchers must be level across the width of the wall.

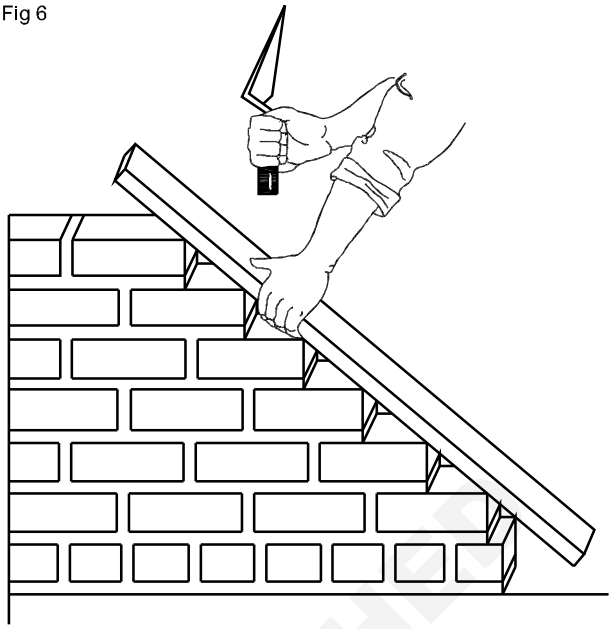
17 The headers must be central over the across joints or stretchers below.

18 The cross joints should be of uniform width.

19 Use full bricks except closers.

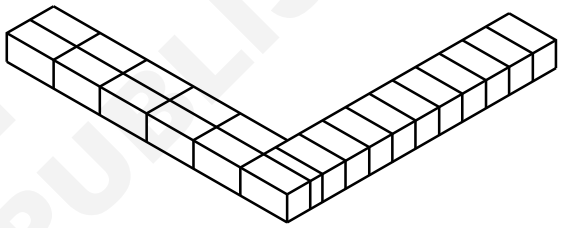
20 Isometric view of corner wall (Figs 7,8 & 9).

Fig 6



PBN1654J6

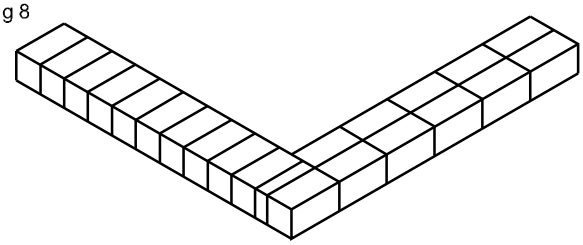
Fig 7



ISOMETRIC VIEW

PBN1654J7

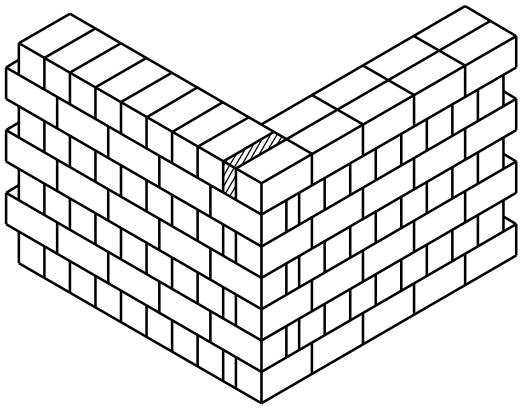
Fig 8



ISOMETRIC VIEW

PBN1654J8

Fig 9



ISOMETRIC VIEW

PBN1654J9

Layout and build one brick or 23cm wall in flemish bond

Objectives: At the end of this exercise you shall be able to
- **lay bricks alternate headers and stretchers**
- **lay the queen closer.**

TASK 1: **Lay bricks alternate headers and stretchers**

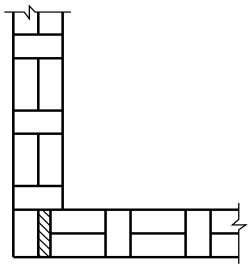
1 Assemble the bricks in the work area.

2 Mix the mortar and load the mortar pan.

3 Snap a chalk line longer than the required length.

4 Mark a line for 90° angle at one end of the straight line already marked. (Fig 1&2)

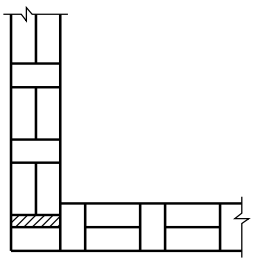
Fig 1



(1, 3, 5 .....COURSES)
PLAN

PBN1654Y1

Fig 2



(2, 4, 6 .....COURSES)
PLAN

PBN1654Y2

5 Lay out the corner with a stretcher.

6 Lay one header and one stretcher alternate in each course.

7 Provide over lap should 1/4 brick to avoid continuous vertical joints.

8 Provide uniform bed joints and vertical joints.

TASK 2: **Lay the queen closer**

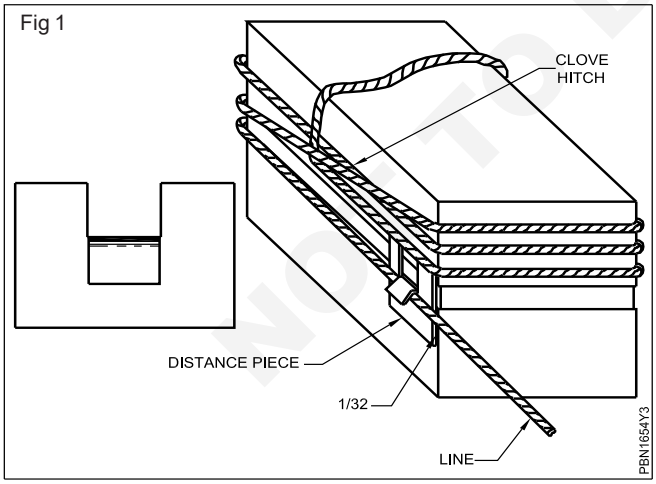
1 Plumb and level after laying the first course check the align.

2 Lay queen closer next to the quoin header, to avoid the vertical joints.

3 Attach the line by pushing a nail to which the line is attached under the end of the brick on the left end of the wall.

4 Pull the line up over the top of the brick and push the line to the face of the bricks as shown in (Fig 1).

Fig 1



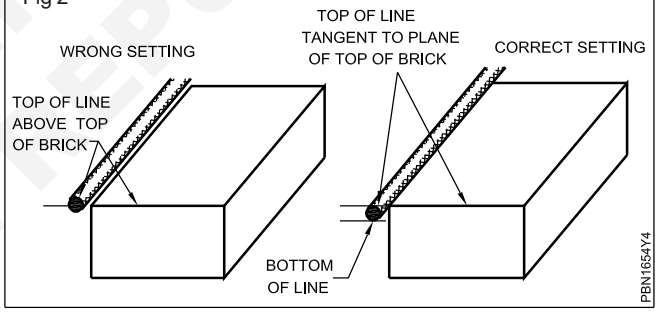
PBN1654Y3

5 Set the line correctly 2mm out from the edge of the brick and the top surface even with the top of the brick as shown in (Fig 2).

6 Fill the space between the leads, using line as guide after fixing line.

7 Resume building leads upto the specified height and fill the wall to the line.

Fig 2



PBN1654Y4

8 The correct bonding arrangement with proper bond followed.

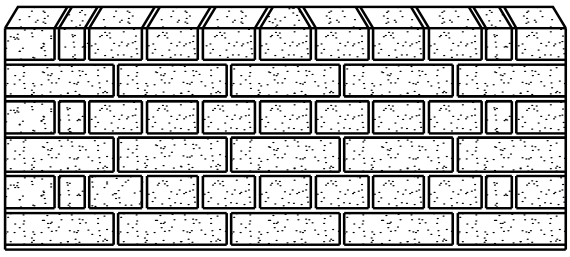
9 Check the work for the correct height.

10 Check again square, level, plumb and Alignment of straightness.

11 Brush the work at completion and pointing.

12 Complete the work as shown in (Fig 3).

Fig 3



FRONT ELEVATION OF MODEL IN PERSPECTIVE

PBN1654Y5

TASK 3: **Inspection chamber**

1 Mix cement concrete with brick bats, cement, sand and water.

2 Mix cement concrete with cement, sand, aggregate and water.

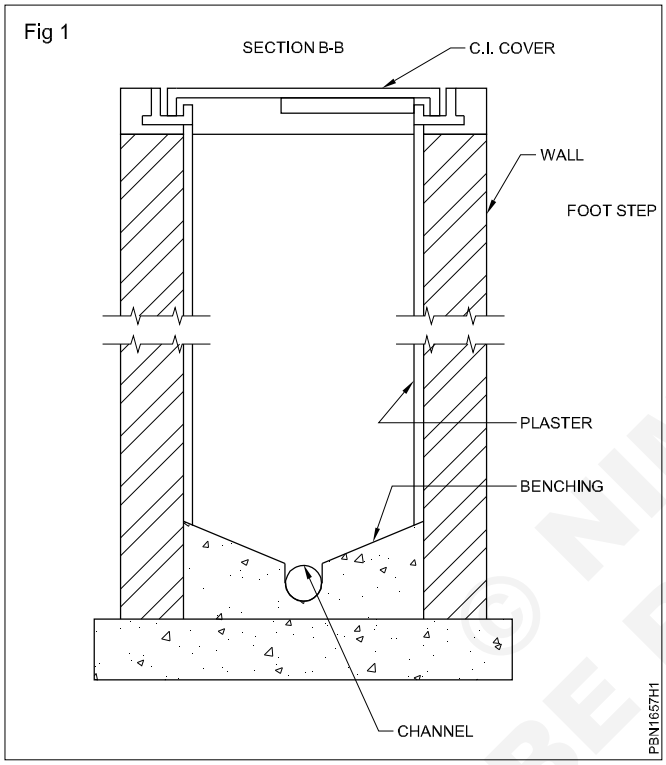
3 Place the cement mortar with aggregate to the base inside the inspection chamber.

4 Make channelling as per the (Fig 1) using forming tools.

5 Make the benching as per the (Fig 1) using forming tools.

6 Provide covers with channel and make 45° slope benching using brick bat cement mortar at the top.

Fig 1



Manholes (Fig 2)

1 Mix cement concrete with aggregate.

2 Place the cement concrete at the inside base of manhole.

3 Benching and channeling providing using forming tools.

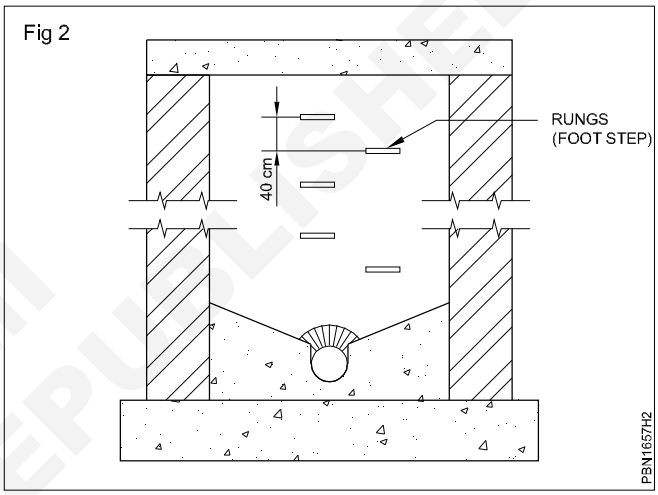
4 Rungs providing for deep manholes.

5 There are three kinds of C.I covers for the man holes.

6 Cover with channel providing at the top of manholes.

7 Slope providing to prevent rain water entering.

Fig 2



Damp proofing

Objectives: At the end of this exercise you shall be able to
- **repair the damaged portion of wall celling and roofs**
- **repair the dampness of floors**
- **repair the sink bed.**

Requirements

Tools

• Jointers	- 1No.
• Hammer bell pien	- 1No.
• Trowel	- 1No.
• Wooden float	- 1No.
• Mortar pan	- 1No.
• Cold chisel flat	- 1No.
• Straight edge	- 1No.
• Spirit level	- 1No.
• Chipping hammer	- 1No.

Materials

• Cement	- as reqd.
• Sand	- as reqd.
• Aggregate	- as reqd.
• Asphalt	- as reqd.
• Aluminium sheet	- as reqd.
• Copper sheet	- as reqd.
• Lead sheet	- as reqd.
• Bituminous felts	- as reqd.
• M.S. Rod	- as reqd.

PROCEDURE

1 Select proper hand tools and materials for repairing work.

2 Inspect door frame window sanitary joints, Rain water outlet.

3 Cracks in the walls should be properly plastered using rich cement mortar.

4 Identify old bathroom pipe joints damaged portions.

5 Rectify the damaged pipes by repaking and leakages rectifying using suitable materials and hand tools.

6 To avoid water seepage in the terrace, damped portions to be clipped.

7 After dry rich mortar and water proofing compound should be used and plastered and level to be checked.

8 Old rusted damaged pipes to be removed.

9 New pipe joints should be replaced.

10 Identifying the leakages in the kitchen sink, washbasin, washing machine bathtub outlet drains.

11 Leakages to be rectified by replacing new waste outlet and white cement.

12 Overhead RCC water tank cracks should be inspected and small piece of iron rod in the cracks to be placed.

13 Rich cement mortar and water proofing compound should be used for plastering the cracked portions.

14 Remove old white cement joints in the sanitary fittings.

15 New white cement joints to be provided in the sanitary fittings joint.

16 Identify the concealed water pipeline leakages.

17 Rectify by replacing new pipe lines in the concealed portions and rich cement mortar to be used for plastering.

18 Inspect bathroom floor tiles, toilet floor tiles and identifying the leakage.

19 Replace broken tiles by replacing new floor tiles and joints to be plastered using asphalt, aqua proof, white cement.

20 Identifying the leakages in the balancing leakages should be rectified by replacing new pipe joints.

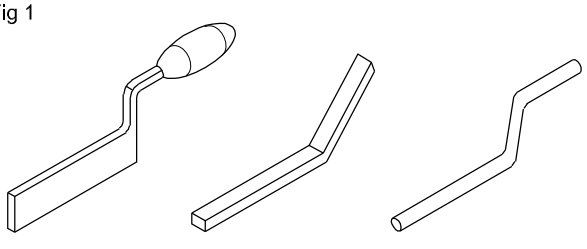
21 The following tools are used for rectifying the leakages.

Jointing tools

These are called as jointers, There are three types of jointers. (Fig 1 to 11)

The following repairs occurs rectifying methods:

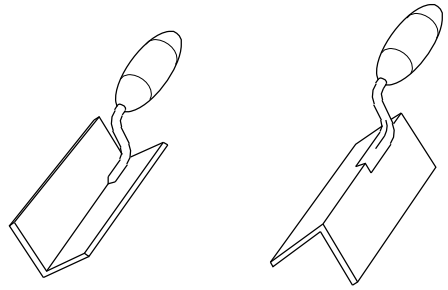
Fig 1



JOINTERS

PBN16658H1

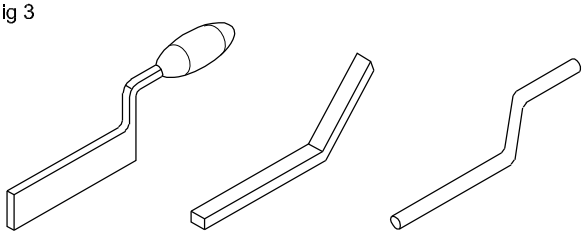
Fig 2



INTERNAL ANGLE TOOL EXTERNAL ANGLE TOOL

PBN1658H2

Fig 3



JOINTERS

PBN1658H3

Fig 4

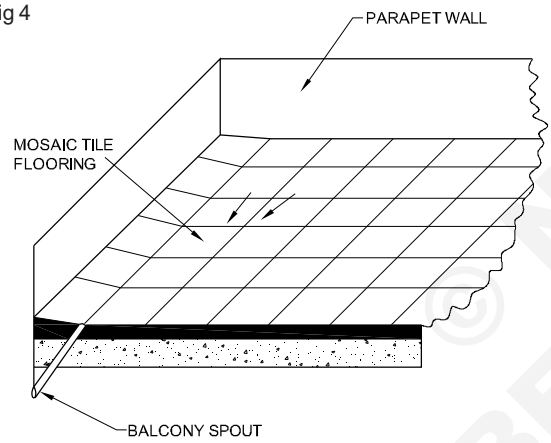


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Fig 5

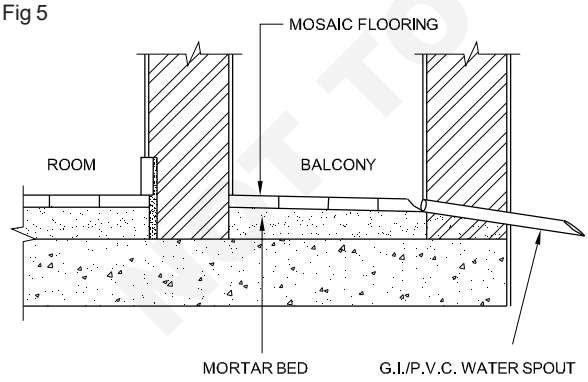

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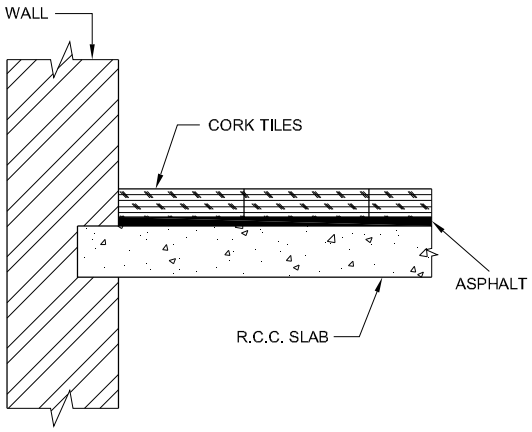
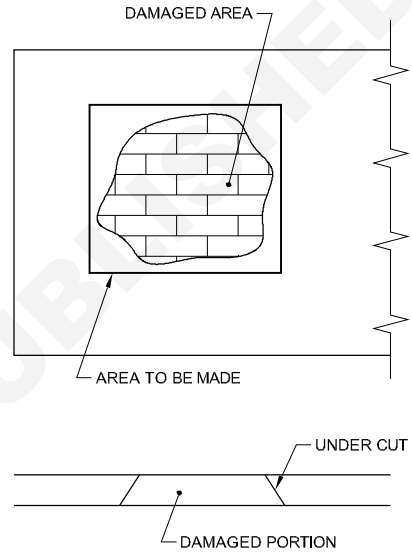
Fig 6



PBN1658J3

Fig 7



PBN1658J4

Fig 8

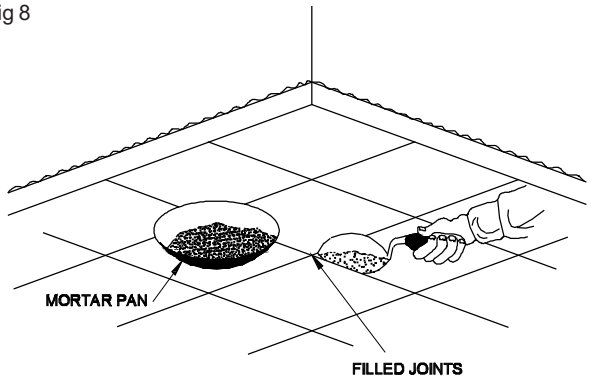


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Fig 9

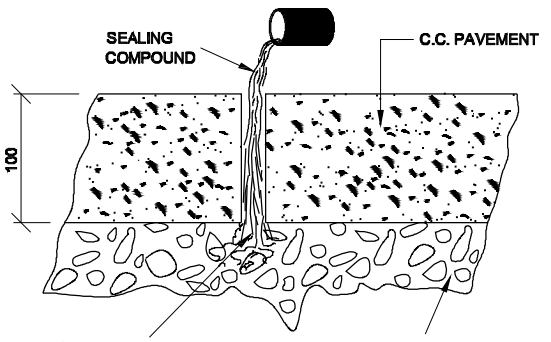


Fig 10

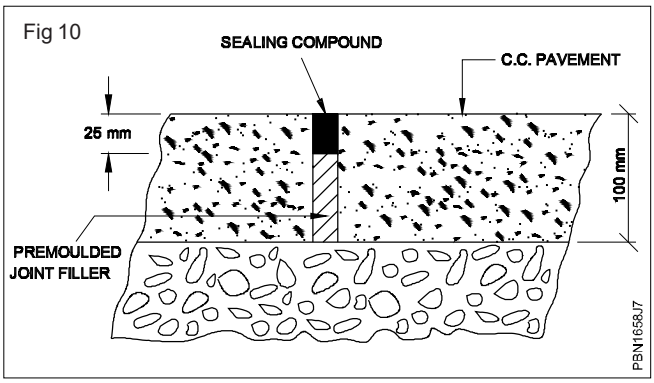
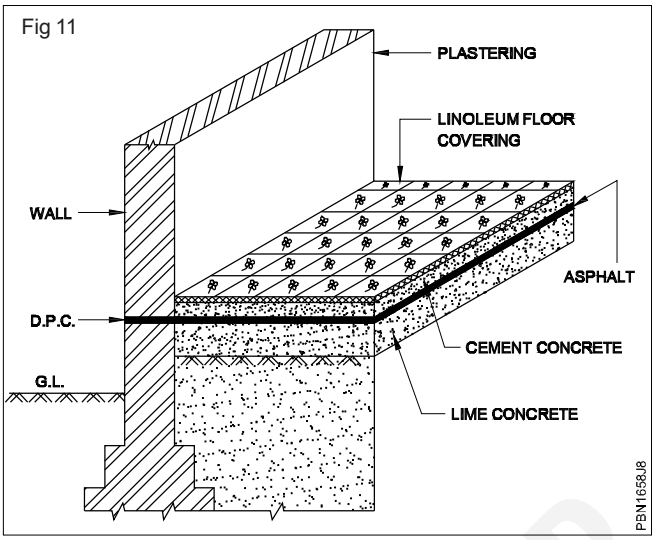


Fig 11



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Plumbing **Exercise 1.5.27**
Plumber - Mason

Plastering the walls

Refer Exercise No. 1.5.26

— — — — — — — —

Cutting of masonry wall for concealing with electric cutting tools

Objectives: At the end of this exercise you shall be able to
- **make the holes using portable hand operated drilling machine**
- **cut the brick wall with cold chisel flat and pointed**
- **make the holes for plumbing fixtures by line**
- **fill and plastered the holes and chases portions.**

Requirements

Tools

- Portable hand operated drilling machine - 1No.
- Portable chase machine - 1No.
- Hammer ball pein - 1No.
- Cold chisel flat and pointed - 1No.
- Rawl jumper - 1No.
- Trowel - 1No.
- Wooden float - 1No.
- Straight edge - 1No.
- Mortar pan - 1No.
- Wall jumper - 1No.
- Spirit level - 1No.
- Plumb bob - 1No.

Materials

- Cement - as reqd.
- Sand - as reqd.
- Aggregate - as reqd.
- Water - as reqd.
- Pipes - as reqd.
- Clamps - as reqd.
- Screws - as reqd.
- Plug wood - as reqd.
- M.S. Rod - as reqd.

PROCEDURE

1 Cut the chase in brick wall using chasing machine. (Fig 1)

2 Cut the box hole in brick wall using cold chisel flat and pointed.

3 Make through hole using wall jumper. (Fig 2)

4 Make holes for wall tight plug to fix clamps.

5 Make through hole using portable hand operated drilling machine.

6 Fill the chases with rich cement mortar.

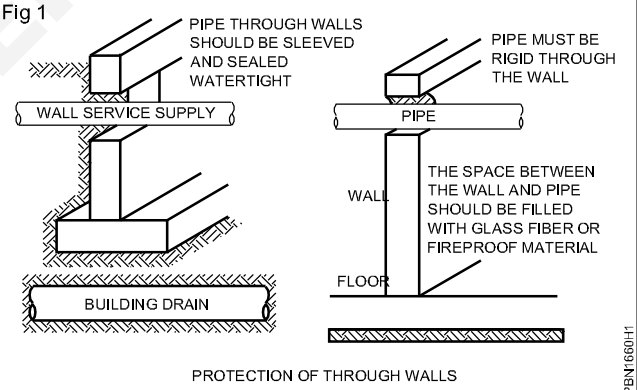
7 Fill the holes with cement mortar.

8 Plaster the portions with cement mortar.

9 Level with straight edge and wooden float.

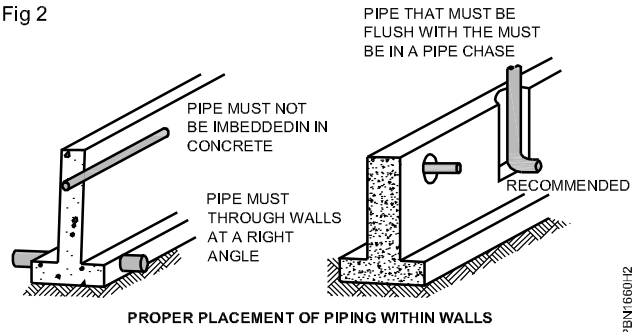
10 Check the level with spirit level and plumb bob.

Fig 1



PROTECTION OF THROUGH WALLS

Fig 2



PROPER PLACEMENT OF PIPING WITHIN WALLS

Demonstrate proper handling of plumber's tools & equipment

Objectives: At the end of this exercise you shall be able to
- **place the measuring tools in the workpiece and measure for the required length by practice**
- **use cutting tools by practice**
- **use adjustable wrench, water pump plier and pipe wrench by practice**
- **use the ratchet die-set for external thread cutting on pipes by practice**
- **use screw drivers, washers and spanners by practice.**

Display of plumber hand tools

PROCEDURE

1 Steel rule (Figs 1 & 2)

Fig 1

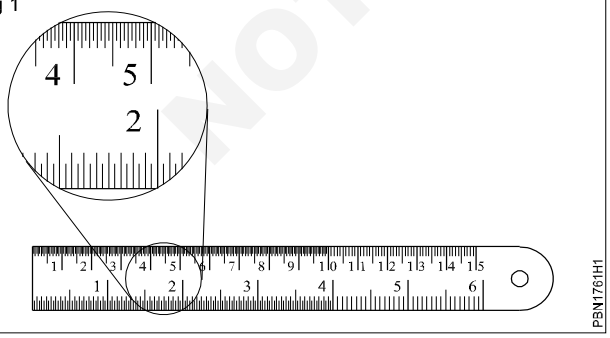
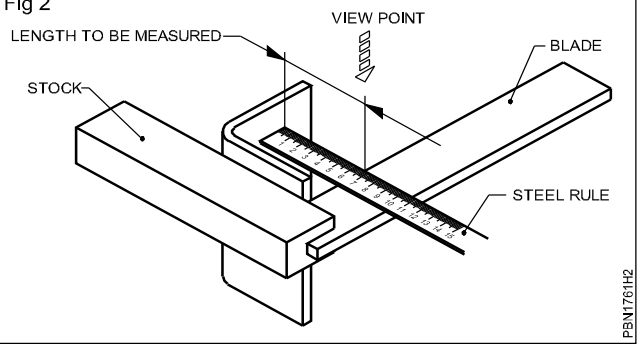


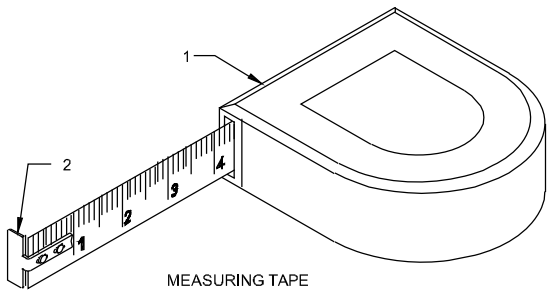
Fig 2



- Place the steel rule on the workpiece and measure to the given dimension.
- Mark the required length.

2 Steel tape (Fig 3)

Fig 3



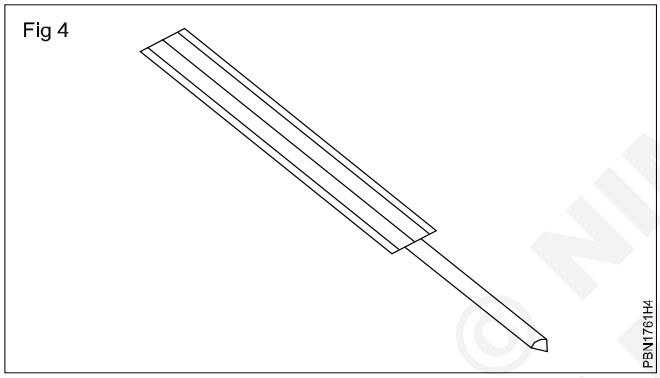
- Measure according to the given dimension.
- Mark the measured portion.

3 Four-fold box wooden rule

- Place the four fold box wooden rule to measure the given dimension on workpiece.
- Mark the measured portion.

4 Rawl Jumper (Fig 4)

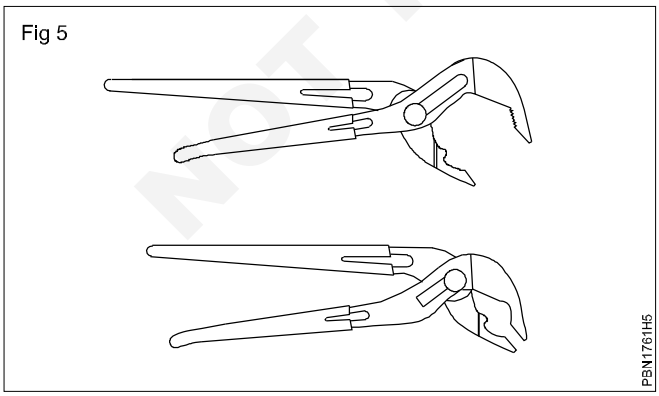
Fig 4



- Hold the rawl jumper to required angle.
- Place it on the place to make hole in wall (or) concrete.
- Stroke with hammer on the top of rawl jumper.
- Rotate the rawl jumper frequently.
- Make hole to the required depth.

5 Water pump plier (Fig 5)

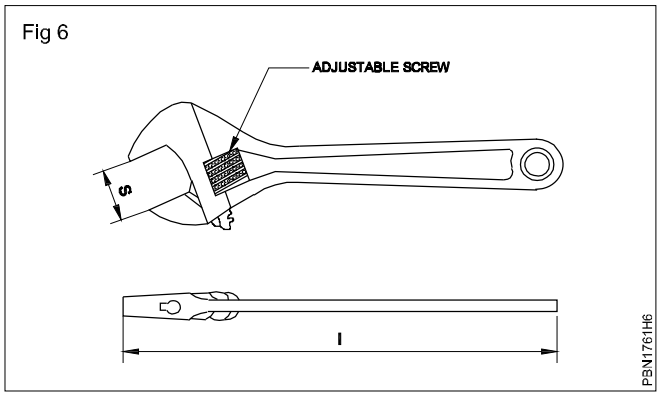
Fig 5



- Hold the workpiece with jaws.
- Work to tight or loose by gripping the water pump plier.
- Work with round objects like spindles, stems made of non-ferrous.

6 Adjustable wrench (Fig 6)

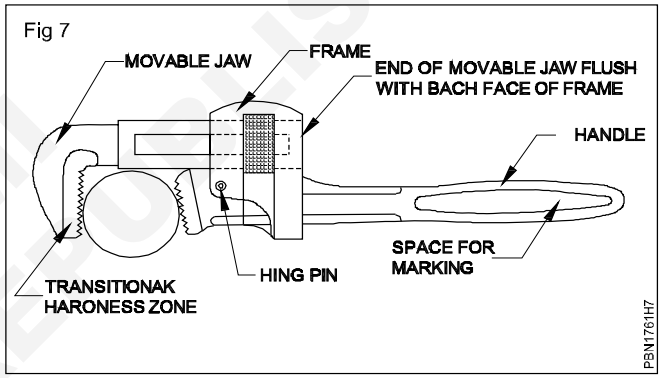
Fig 6



- Place the adjustable wrench to the stuffing box of bib cock.
- Grip and work to tighten or loose the nuts.
- Use to dismantle hand pump parts.
- Use to assemble flange bolt and nuts to the suction pipe.

7 Pipe wrench (Fig 7)

Fig 7



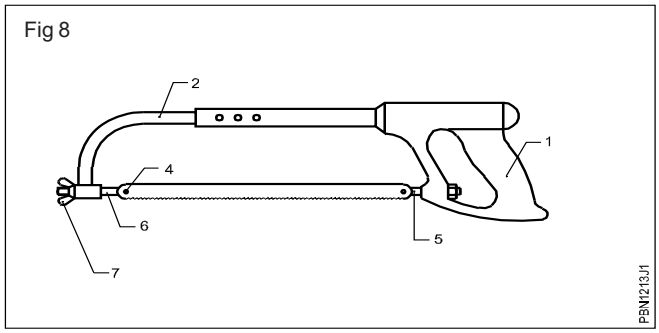
- Place the pipe wrench on round objects (or) pipe and fittings
- Grip well and work to dismantle (or) assemble pipe with fittings.
- Use the correct size pipe wrench according to the size of pipe (or) fittings.

8 Hacksaw frame and blade (Figs 8 to 13)

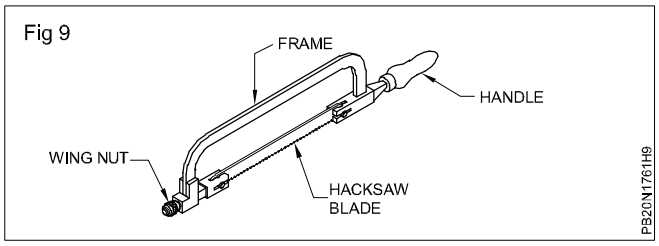
- Use hacksaw for cutting flats, pips and sections.
- Use fixed hacksaw for fixed length, adjustable hacksaw for different length blades.
- Use deep cutting for cutting bigger dia pipes and tubes.
- Select the correct pitch blades according to the cutting workpieces.

Tubular (Fig 8)

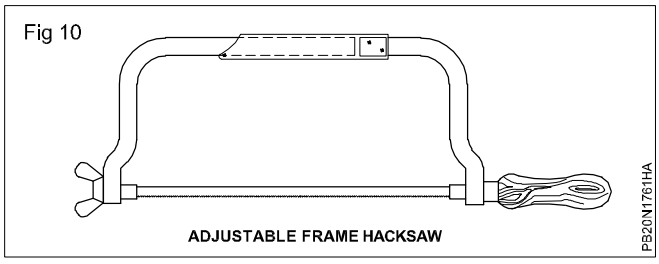
Fig 8



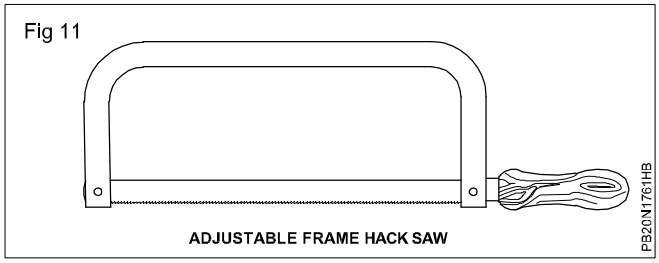
Fixed flat (Fig 9)



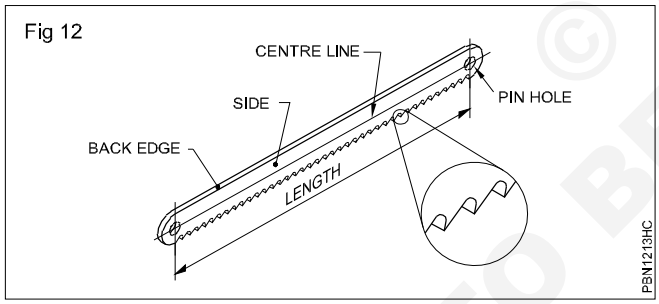
Adjustable flat (Fig 10)



Deep cutting (Fig 11)

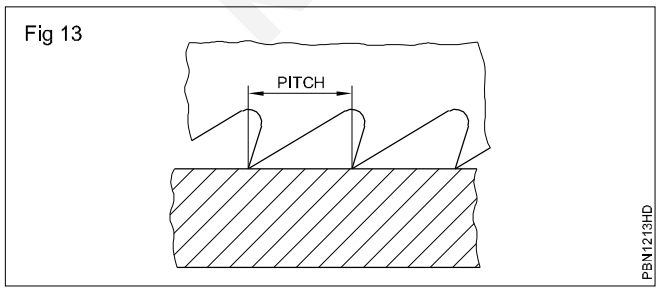


Parts of a hacksaw blade (Fig 12)

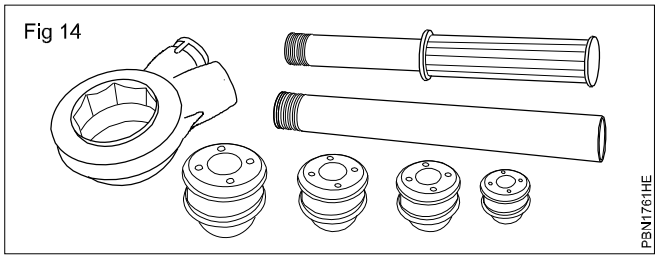


1 Back edge
2 side
3 Centre line
4 Pin holes

Pitch of the blade (Fig 13)

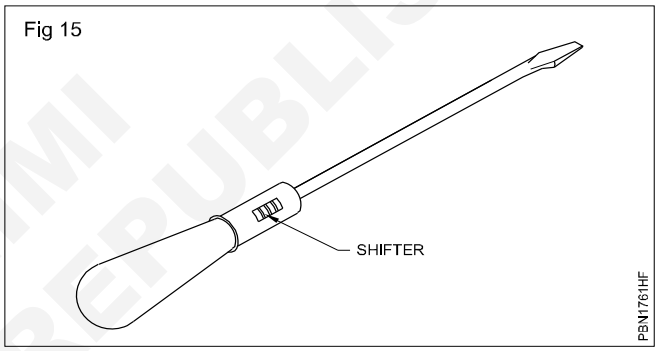


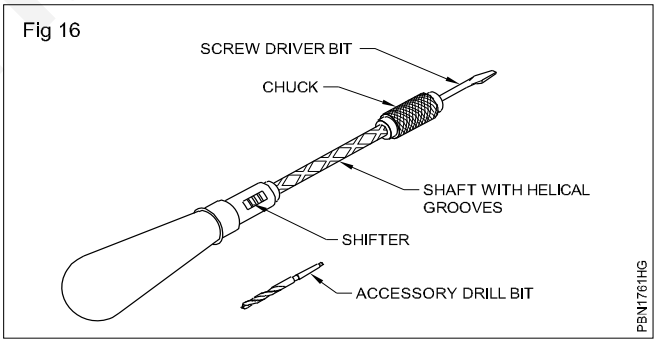
9 Ratchet die-set (Fig 14)

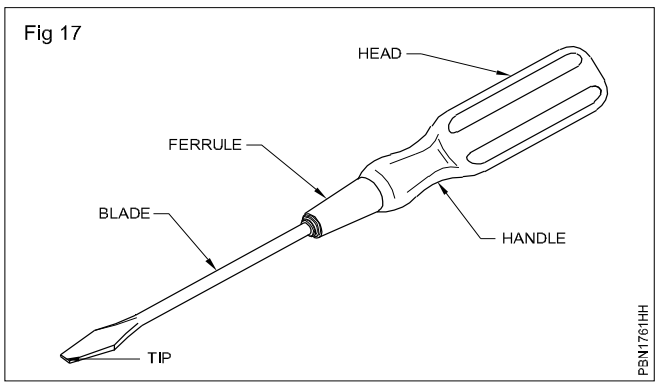


- Select the die according to the size of the pipe.
- Place the dies in the die-stock.
- Place the die-set on the pipe end held rigidly in pipe vice.
- Rotate in clock-wise direction to cut external threads on pipe end.
- Reverse the action by changing the gear of ratchet die-stock.
- Check the threads using female threaded fittings.
- Use lubricant oil frequently while thread cutting operation.

10 Screw drivers (Figs 15,16 &17)





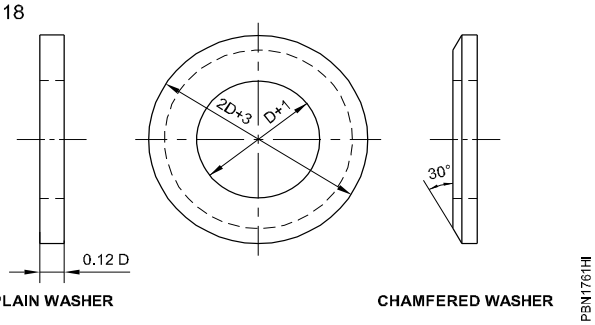


- Use correct length of screw driver bit to drive screws to the brick wall.
- Use ratchet for quick and easy screwing operation.

- Use reversible screw driver for star head and flat head screwing operation.

11 Washers (Fig 18)

Fig 18



- Place the washers in between the bolt and nut for tightening the flanges.
- Place the washers for various locking operations of two metal objects.

12 Spanners (Figs 19 to 22)

- Select the correct size of correct end spanners for locking nuts.
- Use single end for specific purpose.
- Use double end spanner for two different size of nut to tightening.
- Use ring end for firm grip to tighten the bolt and nuts where obstruction close to the side.

Fig 19

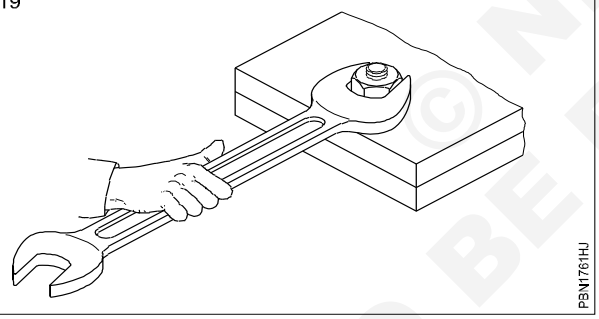


Fig 20

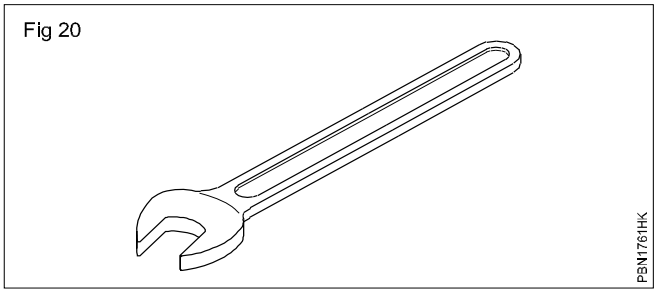


Fig 21

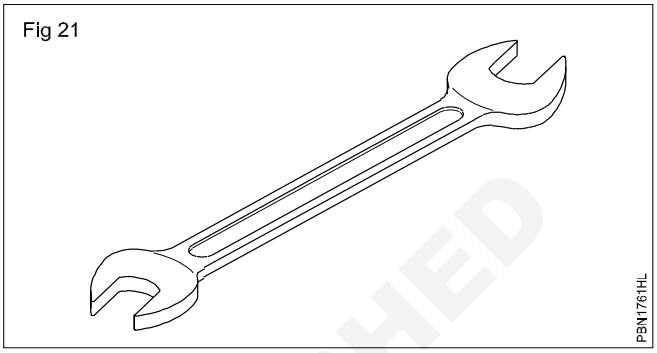
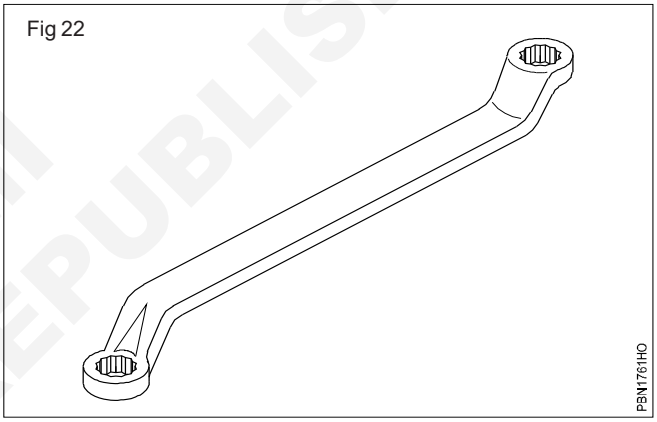


Fig 22



Instructor shall display all the plumber tools and equipments in the section and brief their names, uses and safety points to be observed for each tools and equipments

Record the safety to be observed in table 1

Fig. No.	Remarks	Safety to be observed while doing plumbing work
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
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17		
18		
19		
20		
21		
22		

Use and care of plumbers tools and equipment

Objectives: At the end of this exercise you shall be able to
- **identify the importance of plumbers' hand tools and their application**
- **plumber's hand tools care and maintenance methods.**

PROCEDURE

Uses of plumber Hand tools refer to Exercise: 1.7.61

Steel Tape

- Should not fold the end portion of steel tape.
- After finishing the measuring work should be cleaned without wet.

Rawl jumper

- Should be rotated frequently while striking.
- Should be taken out in frequent intervals to remove cut materials.

Hacksaw frame with blade

- Should not over tight the wing nut.

Flat file

- Should not use as striking tool.
- After completion of filing works remove the chips through file card.

Chisel cold flat

- Should not use the mushroom headed chisels.
- While using chisels horizontally should not strike downwards with hammers.

Screw driver

- Should be used to fix tip correctly to the head of screw.
- Should not use as a chisel.

Water pump plier

- Should not use for heavy gripping and tightening works.

Adjustable wrench

- Do not strike the handle portion with hammer while handling heavy works.

Pipe wrench

- Do not use as hammer.
- Lever should be avoided.
- Use correct size according to the size of pipe.

Spirit level

- Do not throw after using from one place to another.

Ball pein hammer

- Do not use without wedge.
- Do not throw from the height to downwards.

Double end spanner

- Do not use for striking.
- Do not use with lever.

Trowel

- Do not use without ferrule.
- Do not use cracked or bend trowel.

Die stock with dies

- Do not give more depth to cut quickly.
- Should use lubrication oil frequently.

Pipe vice

- Do not over tight the handle.
- Do not use lever to over tight the handle.

Cutting of G.I pipes of different diameter and sizes by cutting tools

Objectives: At the end of this exercise you shall be able to
- **perform the method adopted for G.I pipe cutting.**

Requirements

Tools/Instruments

- Pipe vice - 1 No.
- Hack saw frame - 1 No.
- Pipe cutter - 1 No.
- Try square - 1 No.
- Flat file - 1 No.
- Pencil - 1 No.

Material

- G.I Pipe 1½ ∅ - 1 No.

Job Sequence

- Hold G.I pipe in pipe vice tightly.
- Mark the required lengths as per drawing.
- Cut as per marking with hacksaw frame.
- Filing the edges with flat file.
- Remove the burrs.
- Check the level with try square.

Skill Sequence

Holding pipe in a pipe vice

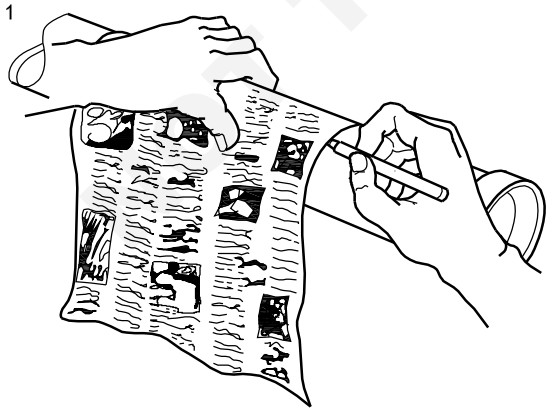
Objectives: This shall help you to
- **clean and check the vice for its functioning**
- **adjust the movable jaw of pipe vice to suit for the pipe.**
- **rest the pipe on the fixed jaw keeping the part to cut close to jaw.**
- **tighten the pipe using movable jaw.**

Marking the required length

Measure length for cutting as per drawing.

Wrap a sheet of rectangular size paper at marked place around the pipe. (Fig 1)

Fig 1



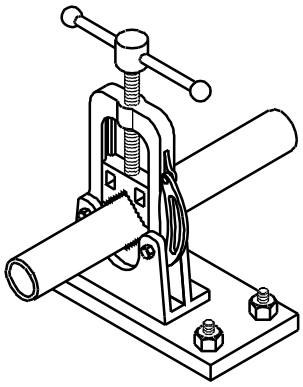
PBN1763H1

Bring the edges of paper together.

Mark around the edge of paper with pencil.

Cutting G.I. pipe (Fig 2)

Fig 2



PBN1763H2

Mark the place of cutting.

Make a small "V" groove on cutting line with help of knife edge file.

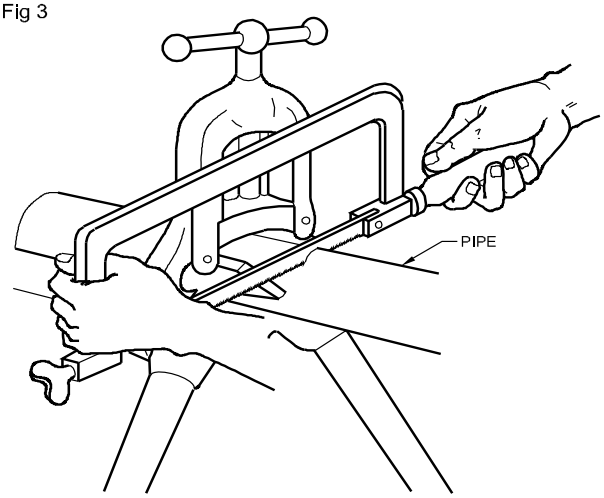
Fix fine tooth blade in hacksaw.

Hold hack saw handle in right hand.

Hold hack saw frame in left hand.

Move the blade to and fro on the marked groove @ 40 - 50 stroke per minute for full length of blade. (Fig 3).

Fig 3



Apply coolant during cutting.

Cutting large diameter pipes

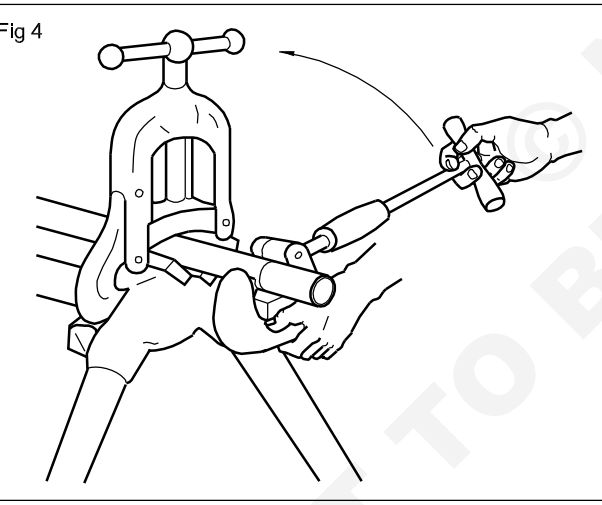
Rotate the pipe after cutting half depth.

Repeat the procedures.

Cutting with pipe cutter

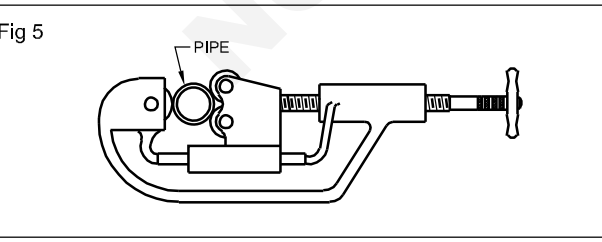
Fix the pipe in pipe cutter. (Fig 4).

Fig 4



Rotate the handle to adjust the cutter till 3 wheels are in contact with pipe. (Fig 5).

Fig 5



Rotate the pipe cutter around the pipe.

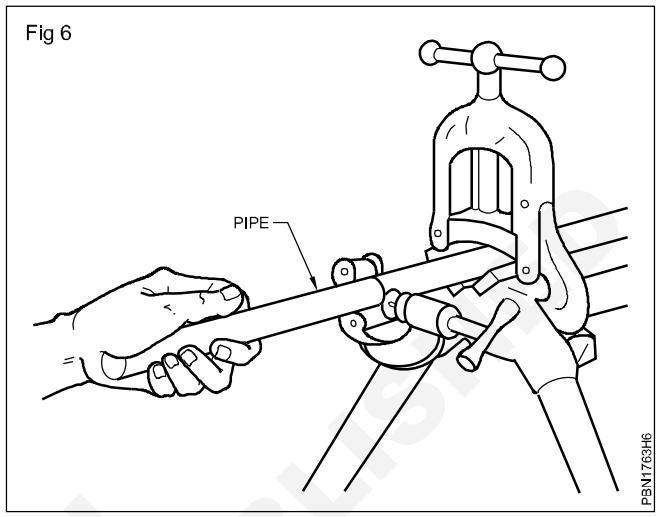
Check whether cutting wheel is sitting exactly on scribed line after one or two turns.

Put extra pressure on cutting wheel after two or three turns.

Continue the procedure.

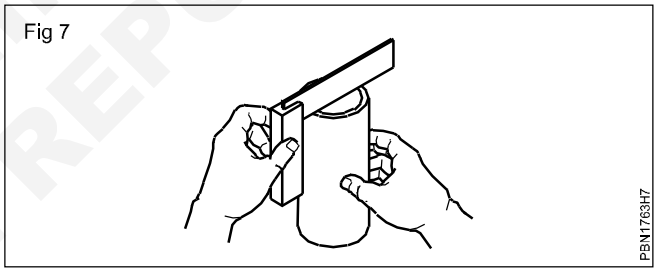
Support the pipe with free hand to avoid fall of pipe. (Fig 6).

Fig 6



Continue to procedure till it is cut. Check the squareness of end. (Fig 7)

Fig 7

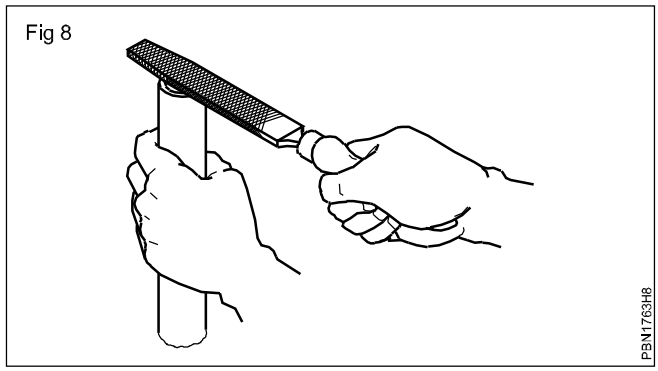


File square by using a half round file. (Fig 8).

Check condition of cutter.

Clean it thoroughly.

Fig 8



Cutting of cast iron pipe of different diameter and sizes by cutting tools

Objectives: At the end of this exercise you shall be able to
- **perform the method adopted for cast iron pipe cutting.**

Requirements

Tools/Instruments

- Cold flat chisel - 1 No.
- Hammer - 1 No.
- Flat file - 1 No.
- Try square - 1 No.

Material

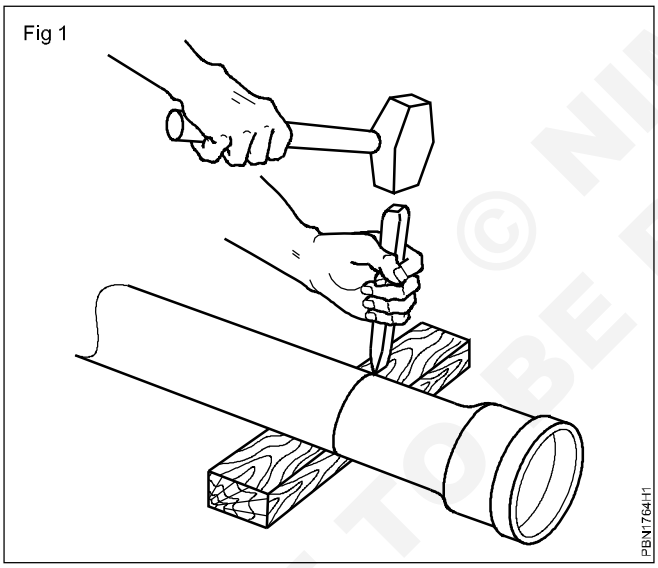
- 4" ∅ cast iron pipe - 1 No.

Job Sequence

- Measure accurately length of pipe required.
- Make square round the pipe.
- Place the pipe over wooden "V" block.

4 Cut the pipe along the mark. (Fig 1)

Fig 1



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

Fig 2

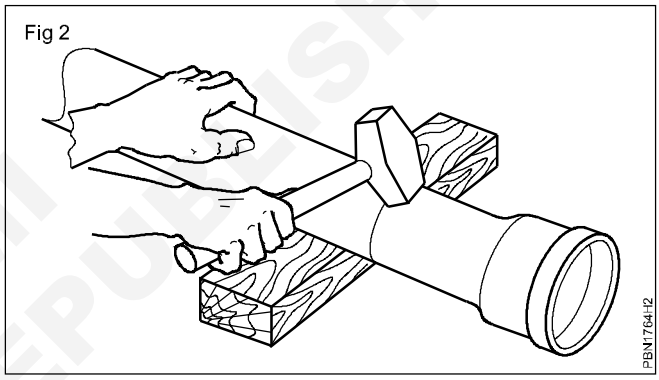
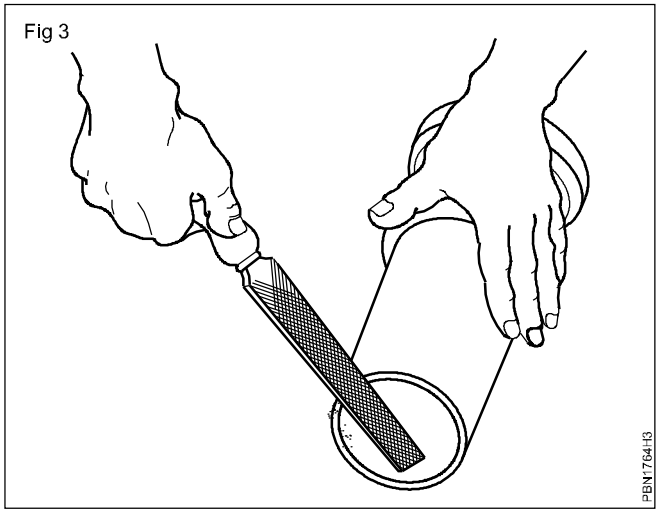


Fig 3



Cutting of all kinds of PVC pipe of different diameter and sizes by cutting tools

Objectives: At the end of this exercise you shall be able to
- **perform the method adopted for P.V.C pipe cutting.**

Requirements

Tools/Instruments
- Pipe vice - 1 No.
- Hack saw frame with blade - 1 No.
- Flat file - 1 No.
- Try square - 1 No.

Material
- 50mm" ∅ P.V.C pipe - 2 No.

Job Sequence

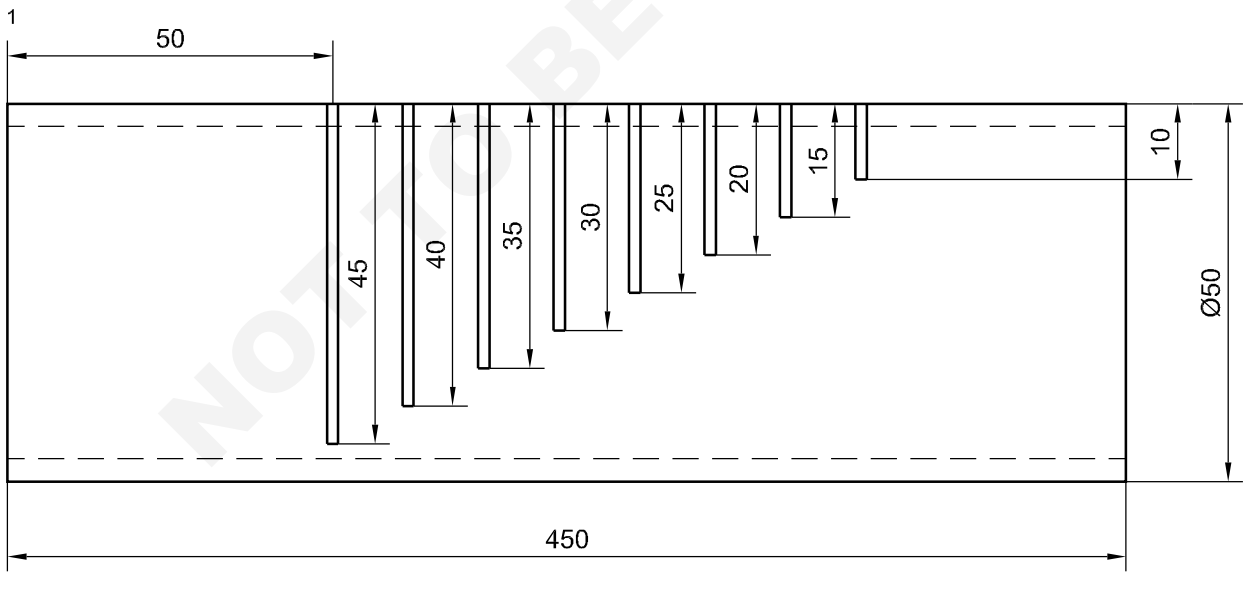
- Hold PVC pipe in pipe vice tightly.
- Mark the required lengths as per drawing. (Fig 1).
- Step cut PVC pipe for depth of 5, 10, 15, 20, 25, 30, 35, 40, 45, 50mm.
- Cut the PVC pipe with hacksaw.

Holding PVC pipe in a pipe vice

Marking the required length

Cutting of PVC pipe
- Mark the place of cutting.
- Fix fine tools blade in hacksaw.
- Hold hacksaw handle in right hand.
- Hold hacksaw frame in left hand.
- Move the blade to and fro on the mark @ 40 strokes per minutes for full length of blade.
- Filing the edges with rasp file.
- Level checking using try square.

Fig 1



Bending of G.I pipe, as per drawing using bending machine up to 50 mm dia

Objectives: At the end of this exercise you shall be able to
- **bend G.I pipe by hot method**
- **bend G.I pipe by cold method.**

Requirements

Tools/Instruments

- Steel tape, marker - 1 No.
- Cold flat chisel - 1 No.
- Ball pine hammer - 1 No.
- Hacksaw frame with blade - 1 No.
- Wedge, template - 1 No.

Equipments

- Pipe bending machine - 1 No.
- Bench vice, - 1 No.
- Blow lamp - 1 No.
- Flat file - 1 No.
- Try square - 1 No.

Material

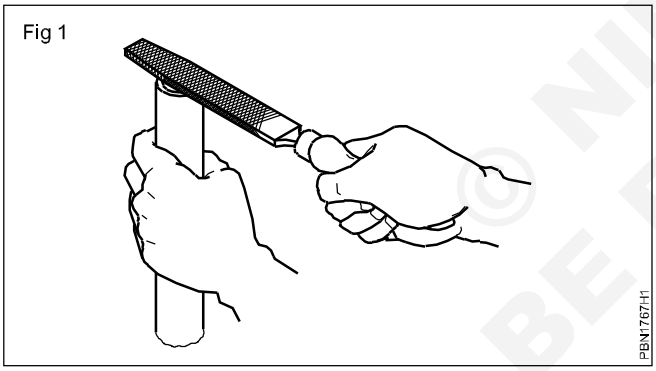
- G.I pipe - 1 No.
- Sand - 1 No.
- Cotton waste - 1 No.
- Wooden plug - 1 No.

PROCEDURE

1 File the pipe ends square. (Fig 1)

2 Remove burrs.

Fig 1



3 Calculate the length of pipe.(Fig 2)

If D = diameter of bend
ϕ = 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) x 0.01745 x ϕ.

Total length of pipe = $L_1 + L_2 + l$.

4 Measure and mark off the pipe:

- centre of the bend (Fig 3)
- 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. (Fig 4)

Fig 2

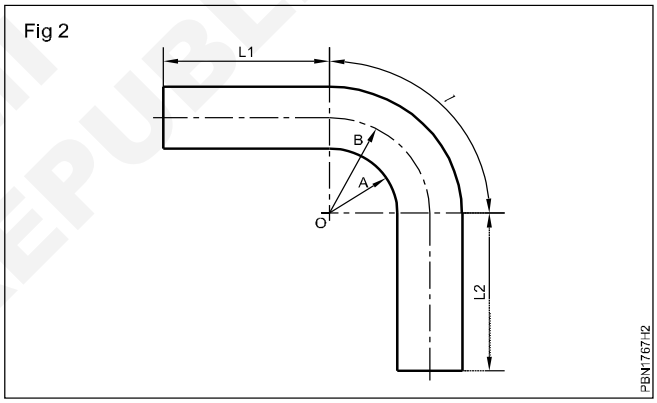


Fig 3

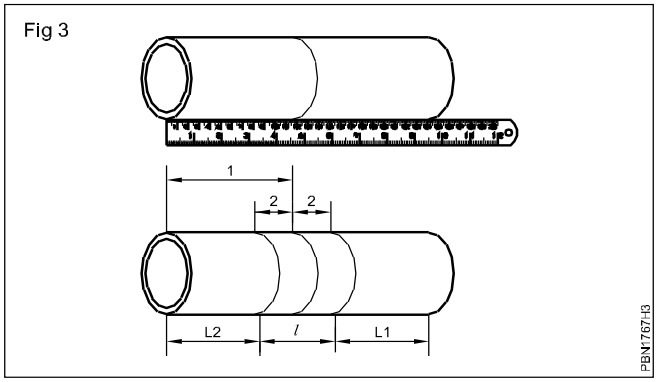
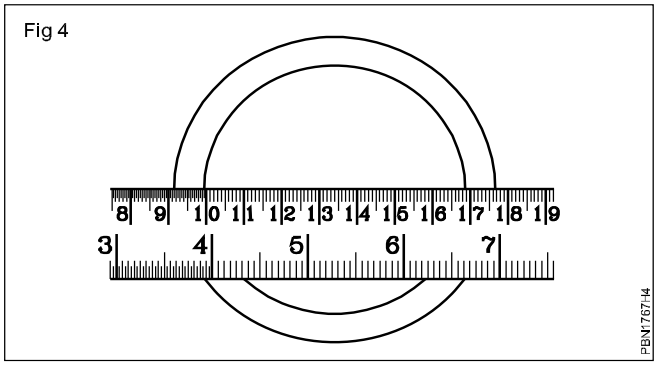
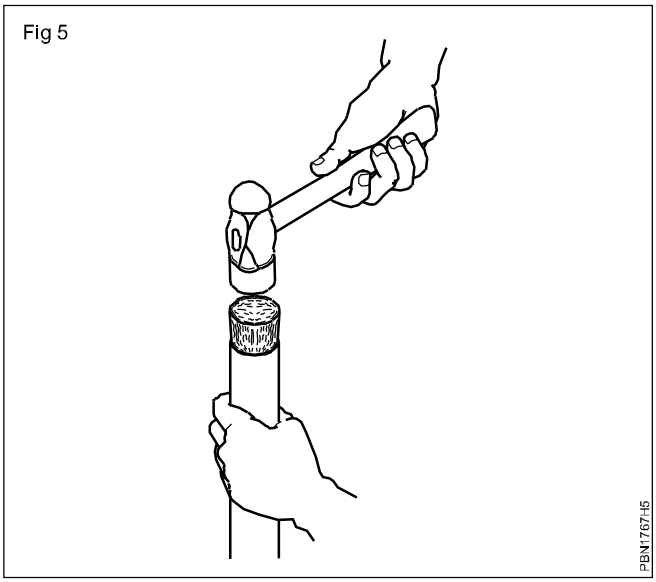


Fig 4



6 Plug one end of the pipe with a wooden peg. (Fig 5)

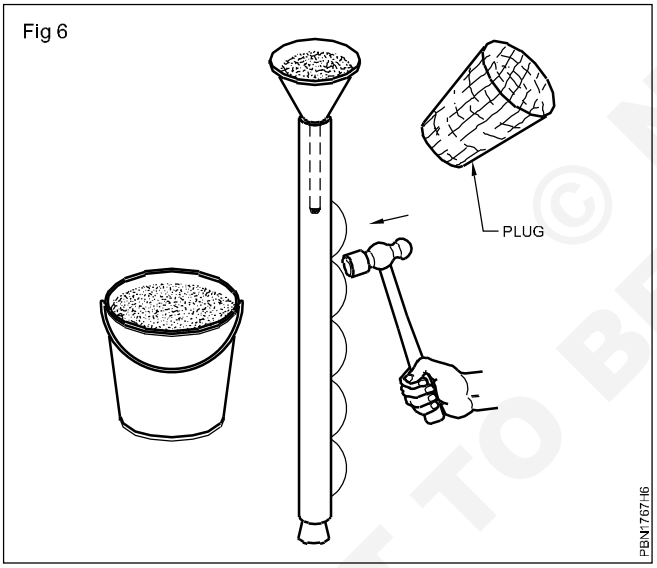
Fig 5



7 Fill the pipe with clean, dry and fine sand (Compress the sand by tapping the pipe up and down with a soft hammer.) (Fig 6) and plug the other end.

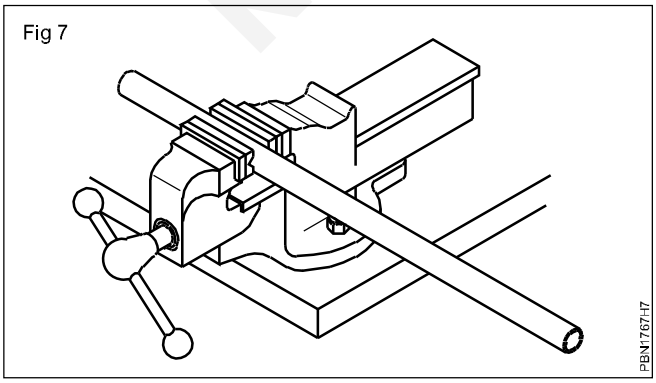
Ensure that the entire pipe is filled with sand.

Fig 6



8 Clamp one end of the pipe in a vice and protect the clamped portion of the pipe with lead or copper shims. (Fig 7)

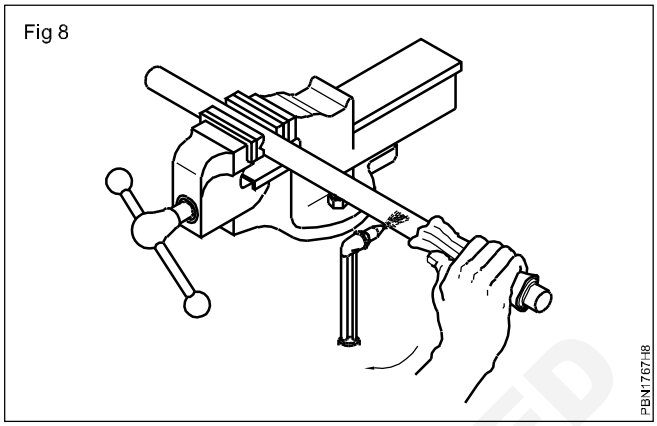
Fig 7



9 Heat the area to be bent with oxy-acetylene torch evenly until it glows dull red. (Fig 8)

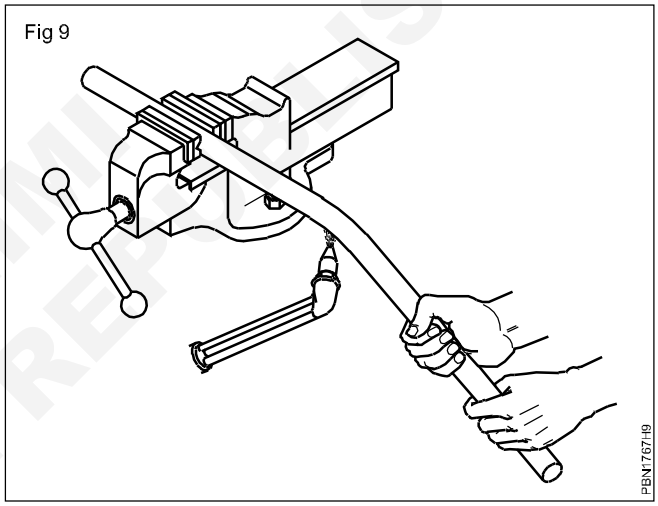
The bend area should not be overheated.

Fig 8



10 Pull down the pipe gently in the direction of the bend. (Fig 9)

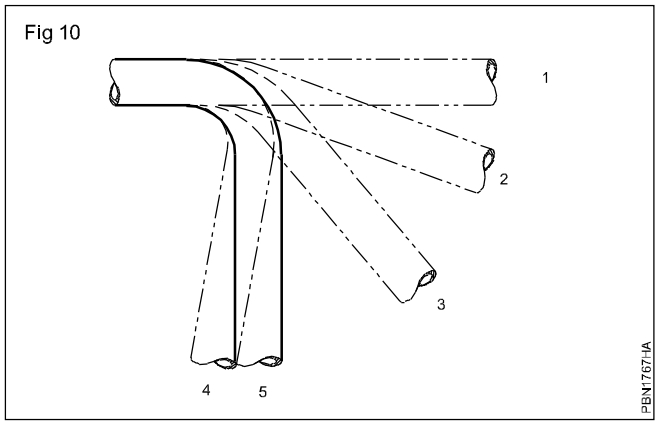
Fig 9



11 Take short pulls until the correct bend angle is reached.(Fig 10-1,2,3,5,4)

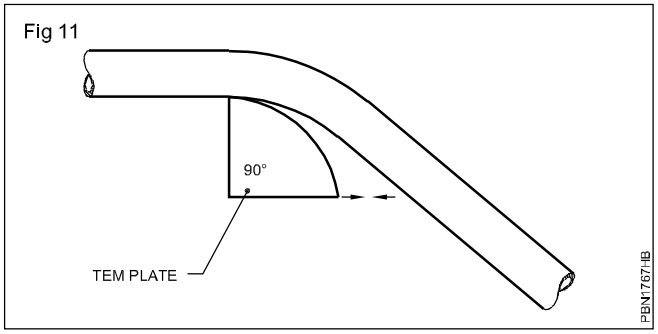
12 Check the bend radius with a template. (Fig 10)

Fig 10



13 Apply heat throughout the whole operation and over bend slightly and straighten out the final bend. (Fig 11)

Fig 11



14 Remove one end of the plug.

Ensure that the pipe is cooled before removing the plug.

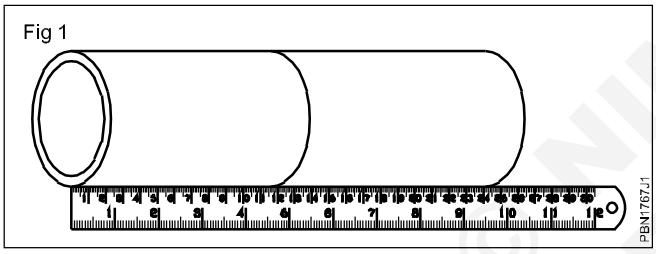
15 Remove the sand by tapping the pipe gently with a hammer.

Bending pipes

Objective: At the end of this exercise you shall be able to
- **bend pipe in cold condition using a pipe bending machine.**

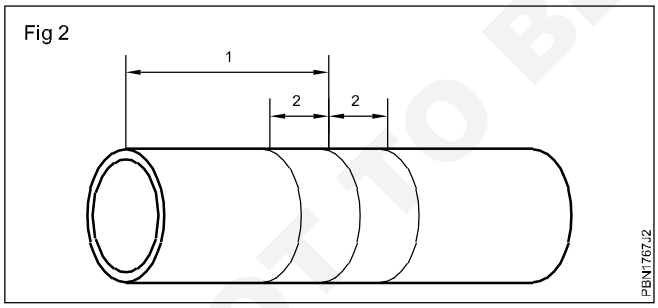
Check the pipe for squareness and ensure it is free from burrs. Measure and mark off the centre of the bend. (Fig 1)

Fig 1



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

Fig 2



Select the former to suit the size of the pipe.(Fig 3)

Clamp the bending machine in a bench vice.

Keep the former in position and lock with a pin. (Fig 4).

Fix the back-stop with a pin. (Fig 5)

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 6) and set the roller on the bending arm by adjusting the screw and lock nut. (Fig 7)

Fig 3

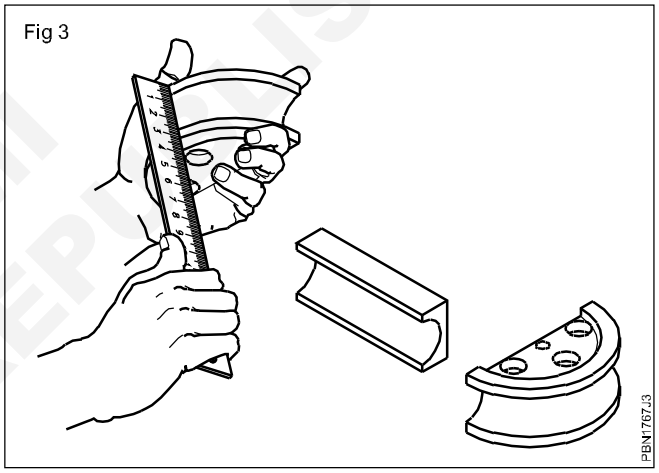


Fig 4

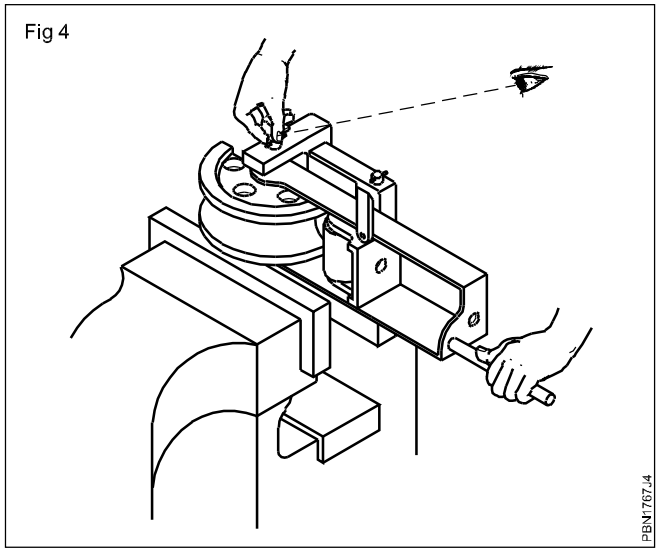
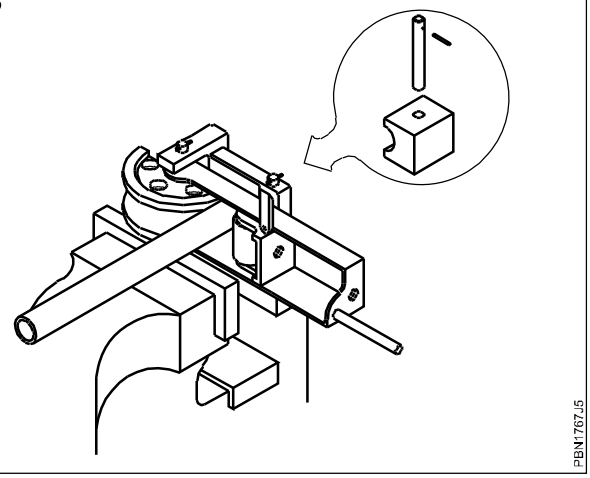
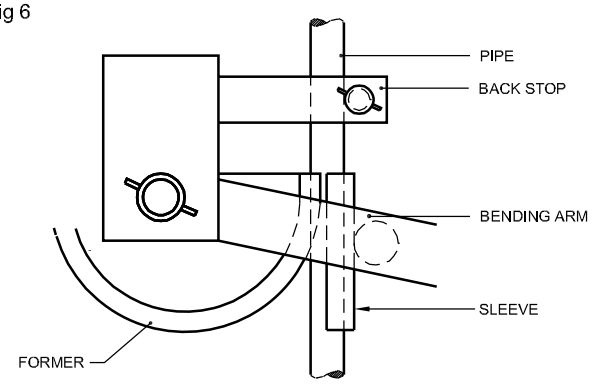


Fig 5



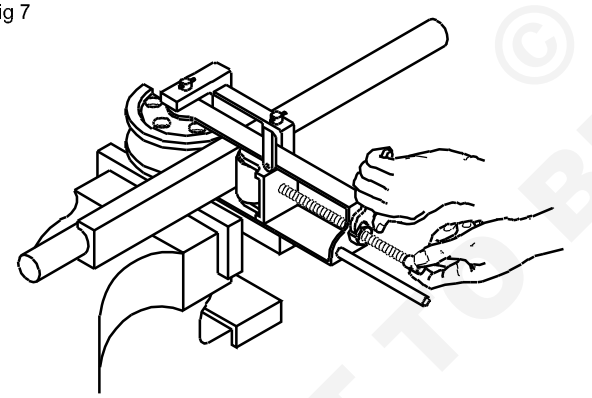
PBN1767.J5

Fig 6



PBN1767.J6

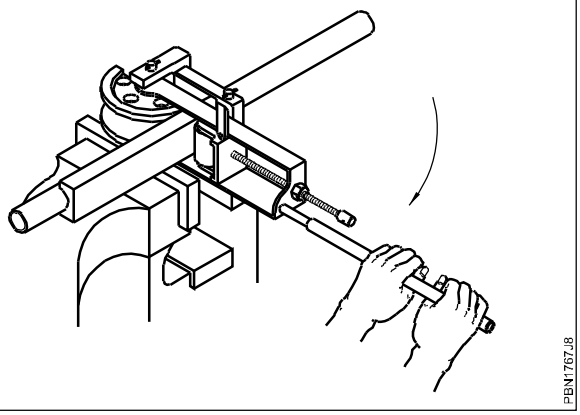
Fig 7



PBN1767.J7

Bend the pipe by pulling the bending arm towards your body. (Fig 8)

Fig 8



PBN1767.J8

Ensure that the stance is properly balanced while bending.

Check the angle and radius of bend using templates. (Fig 9 & 10)

Fig 9

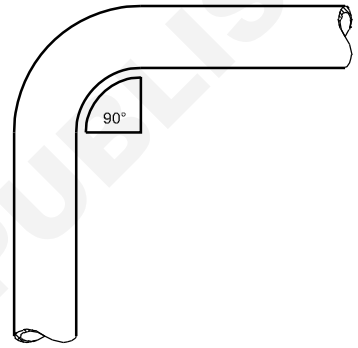


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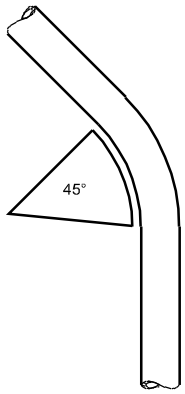
Fig 10



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Plumbing — Exercise 1.6.35

Plumber - Plumber

Bending of P.V.C pipe as per drawing using heat process upto 50mm dia

Refer Exercise No. 1.6.34

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Preparation of PVC pipe & fittings in different dia

Objectives: At the end of this exercise you shall be able to
- **identify different types of P.V.C pipe and P.V.C fitting**
- **use P.V.C pipes and P.V.C fittings for different usage**
- **use P.V.C pipe and P.V.C fitting used for specific work.**

Job Sequence

- Hold P.V.C pipe in pipe vice tightly.
- Mark the required lengths as per drawing.
- Cut as per marking to 90°.
- Cut the pipe with pipe cutter.
- File the edges with rasp file
- Checking flatness with try square
- Scraping the pipe ends and inside of the P.V.C fitting.

Skill Sequence

Holding pipe in a pipe vice

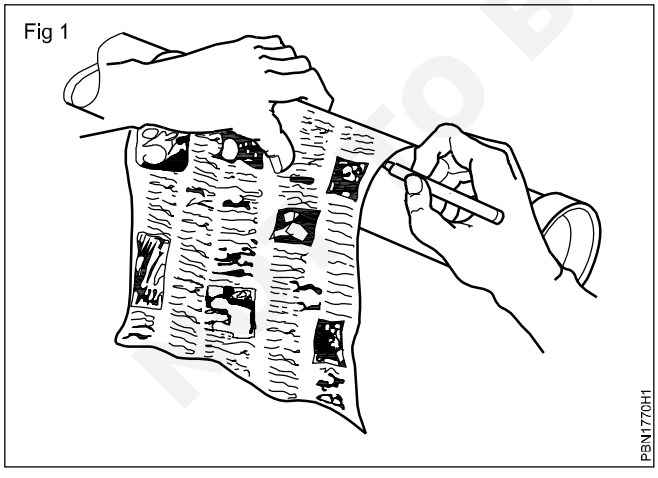
Objectives: This shall help you to
- **clean and check the vice for its functioning**
- **adjust the movable jaw of pipe vice to suit for the pipe**
- **rest the pipe on the fixed jaw keeping the part to cut close to jaw**
- **tighten the pipe using movable jaw.**

Marking the required length

Measure length for cutting as per drawing.

Wrap a sheet of rectangular size paper at marked place around the pipe. (Fig 1).

Fig 1

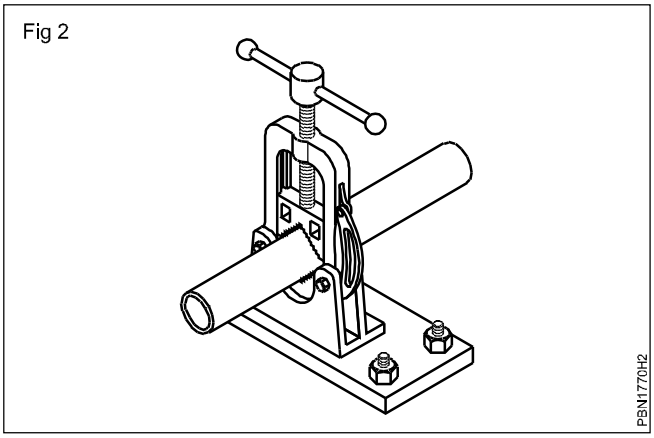


Bring the edges of paper together.

Mark around the edge of paper with pencil.

Cutting P.V.C pipe (Fig 2)

Fig 2



Mark the place of cutting.

Make a small "V" groove on cutting line with help of knife edge file.

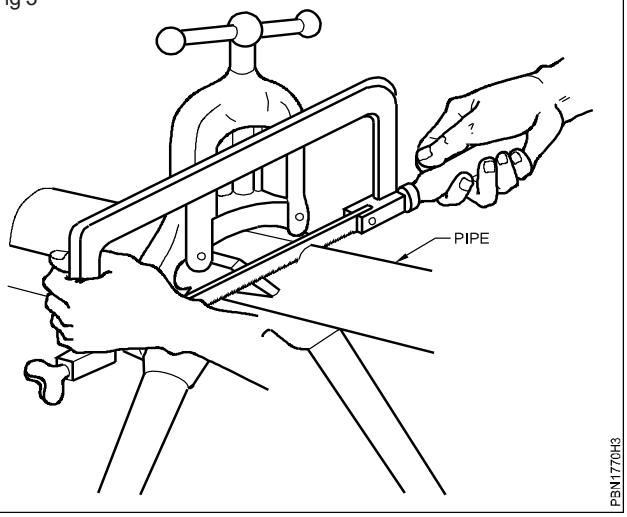
Fix fine tooth blade in hacksaw.

Hold hack saw handle in right hand.

Hold hack saw frame in left hand.

Move the blade to and fro on the marked groove @ 40 - 50 stroke per minute for full length of blade. (Fig 3).

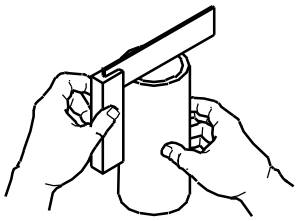
Fig 3



Apply coolant during cutting.

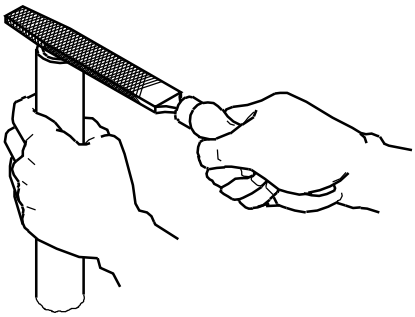
Continue to procedure till it is cut. Check the squareness of end. (Fig 4)

Fig 4



File square by using a half round file. (Fig 5).

Fig 5



Check condition of cutter.

Clean it thoroughly.

Oil, grease, wet and dust should be perfectly cleaned in Inner surface of P.V.C fittings and outer surface of P.V.C pipes.

While jointing the P.V.C pipe with P.V.C fittings joint should not be prolonged than the marked portion of the pipe.

Do not excessive rubbing the P.V.C pipe external end and P.V.C fittings inner surface because the front will be loose.

- Different types of P.V.C fittings (Fig 6)

Fig 6

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Preparation and precaution of electric hot plate

Objectives: At the end of this exercise you shall be able to
- **adopt safety while working.**

Requirements

Tools/Instruments

- Measuring steel tape - 1 No.
- PPR pipe cutter - 1 No.
- PPR hot plate welding machine stand - 1 No.
- Flat smooth file - 1 No.

Equipments/Machines

- PPR welding machine - 1 No.
- PPR male unit and socket unit - 1 No.

Material

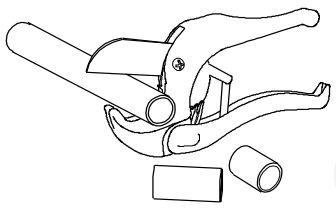
- PPR-pipe - as reqd.
- PPR-pipe fittings - as reqd.
- Cotton waste - as reqd.
- White cloth - as reqd.

PROCEDURE

TASK 1: **PPR pipe welding joint**

1 Pipe length should be marked as required. (Fig 1)

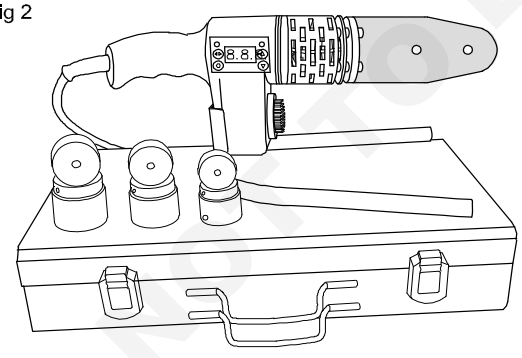
Fig 1



PBN1771H1

2 Attach the PPR fusion welder & work bench using bench vice. (Fig 2)

Fig 2



PB20N1771H2

3 Seat the fusion welder in the bench stand.

Ensure that fusion welder is firmly attached to the bench stand

4 Attach aquaplast welder.

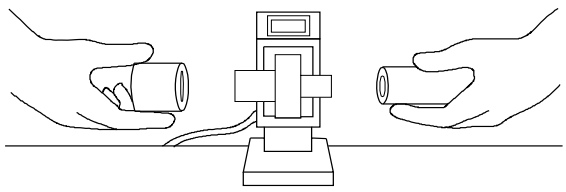
5 The extension should be thoroughly secured to avoid moment during welding.

6 Power 'on' is indicated by Red/green lights.

7 When the equipment attain temperature of 260°C green lamp will pulse continuously.

8 Allow extension for further 10 minutes for temperature stabilization before welding. (Fig 3)

Fig 3



PBN1771H3

9 Warning up time starts when both components are simultaneously pressed.

10 Adopting time starts when components are removed from welder.

11 Connection time is the components being pushed with each other with lateral pressure.

When connecting do not twist the components only lateral pressure need to be applied.

12 Handling time is the joint to get cooled and free from physical stresses.

13 Use clean cloth or tissue with an alcohol to remove any oils or grease may be on to surface of the components.

14 After allowing the required hardening time, the joint is completed and free from stresses.

PVC pipe welding various dia using welding machine

Objective: At the end of this exercise you shall be able to
- **to weld P.V.C pipe with two types of welding machine by application**
- **prepare the surface of pipe**
- **make the PVC pipe welding using heated tool**
- **make the PVC pipe welding using hot gas.**

Requirements

Tools/Instruments

• Gas heated type torch	- 1 No.
• Work bench	- 1 No.
• Welding gun	- 1 No.
• Electric power source	- 1 No.
• Smooth file half round	- 1 No.
• Gloves and goggles	- 1 No.
• Gum boot	- 1 No.

Material

• Filler rod	- as reqd.
• Flux	- as reqd.
• PVC pipe	- as reqd.
• Soft cloth	- as reqd.

PROCEDURE

1 PVC pipe should be placed in the fire brick.

2 Welding unit is prepared to with stand heat up to 288°C (or) 550°F.

3 Welding filler rod are placed at 75° angle above the surface to bewel.

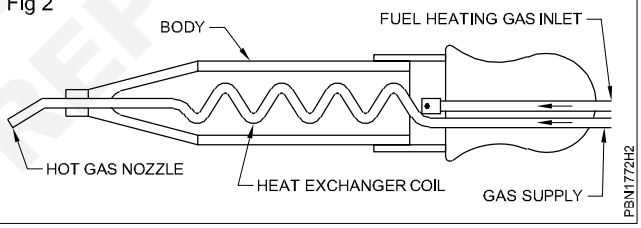
4 Welding filler rod are welded one to two full circle. (Fig 1).

Fig 1

PBN1772H1

5 (Fig 2) PVC pipe is welding torch used for PVC welding.

Fig 2



PBN1772H2

PVC pipe surface are cleaned using fine abrasive paper, detergent cleaner and cloth.

Weld various type of PVC pipe with various dia, using welding machine

Objectives: At the end of this exercise you shall be able to
- **prepare the surface of pipe**
- **perform the welding.**

Requirements

Tools/Instruments		Material	
• Gas heated type Torch	- 1 No.	• Filler rod	- 1 No.
		• PVC pipe	- as reqd.

PROCEDURE

TASK 1: **Prepare the surface of pipe**

1 Clean the surfaces from oil, grease and dirt.

2 Remove all the sharp edges from the edge which is to be welded.

Use fine abrasive paper, detergent cleaner and a cloth.

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TASK 2: **Make the welding**

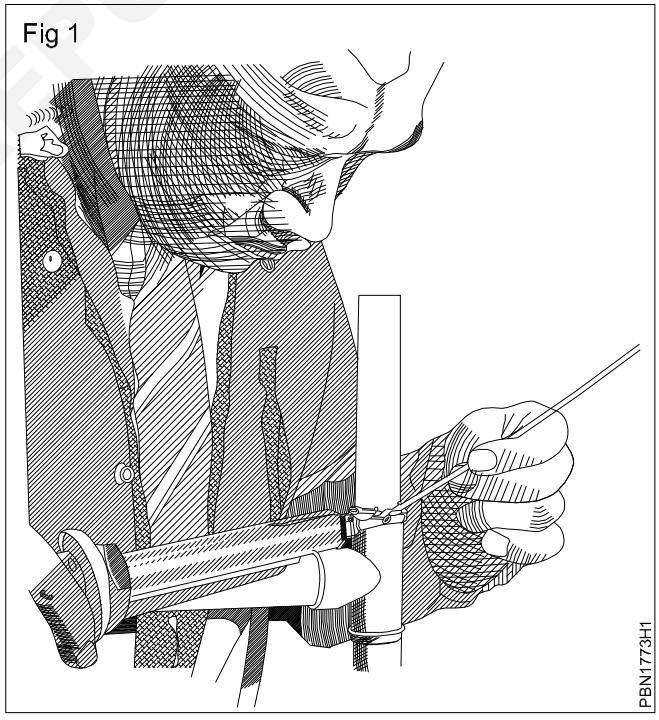
1 Place the pipe on fire brick or other heat resistant material for welding.

2 Make the welding unit capable of heating the surface to weld at a temperature of 550°F or 288°C.

3 Keep the position of welding filler rod at an angle of about 750 to the weld surface.

4 Weld one or two beads over the hole in the pipe. (Fig 1)

Fig 1



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PPR pipe welding joint various dia of pipe using welding machine

Refer Exercise No. 1.6.37

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CI/HCI pipe flange joint with bend and Tee

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 & nut in C.I.pipe flange**
- **check the jointed area.**

Requirements

Tools/Instruments

- Hammer
- Spanner
- Try square
- Spirit level
- Wedge

Materials/Components

- Flange
- Gasket
- Nut
- Bolt

PROCEDURE

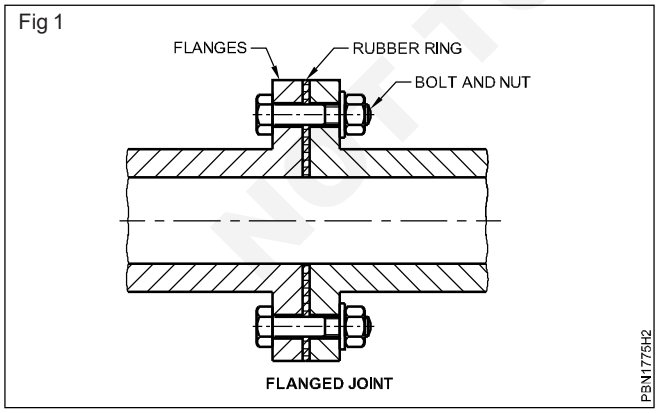
1 Place the flange end of the C.I pipe.

2 Place flange face to face.

3 Place Gasket middle of the two flange

4 Tight the nut & bolt flange by using spanner. (Fig 1)

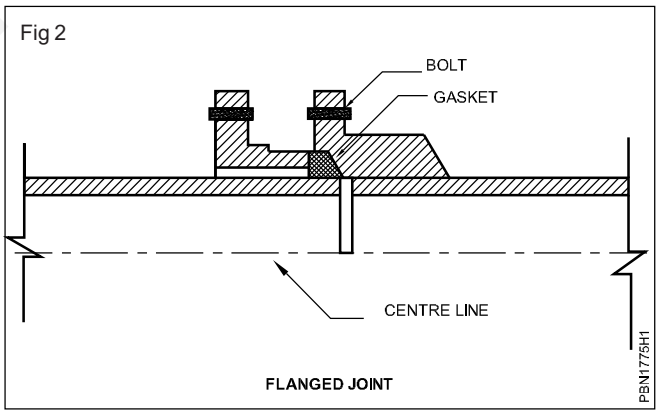
Fig 1



5 Check the joint by using spirit level. (Fig 2)

6 Check the alignment of pipe line.

Fig 2



7 Align C.I Tee and bend with heavy cast iron pipe (Fig 3 & 4)

8 Joint providing with gasket, bolt & nuts.

Safety

1 Use proper hand tools.

2 Don't over tight the flange

3 Don't fix flange without Gasket.

Fig 3

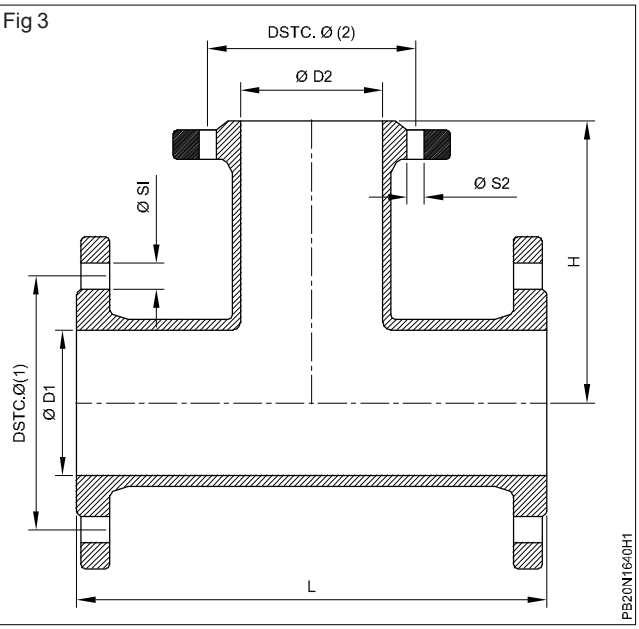
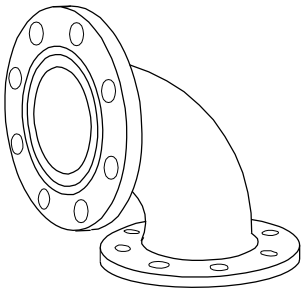


Fig 4



Socket joint of cast iron pipes with lead

Objectives: At the end of the exercise you shall be able to
- **melt & pour the molten lead in socket & spigot jointed area**
- **caulk the socket & spigot joint area by using set of caulking tool.**

Requirements

Tools/Instruments

• Wire brush	- 1 No.
• Chisel	- 1 No.
• Hammer	- 1 No.
• Caulking tool	- 1 No.
• Melting pot	- 1 No.
• Straight edge	- 1 No.
• Spirit level	- 1 No.
• Tongs	- 1 No.
• Blow lamp	- 1 No.

Materials/Components

• C.I pipe	- as reqd.
• Lead	- as reqd.
• Spun yarn	- as reqd.
• Clay	- as reqd.
• Kerosene	- as reqd.
• Cotton waste	- as reqd.

PROCEDURE

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.

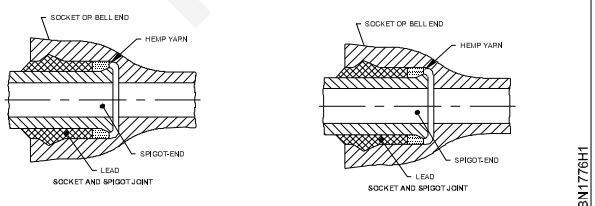
6 Place the flexible abstract rope approximately Ø25mm around the pipe.

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. (Fig 1)

Fig 1



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.

Safety

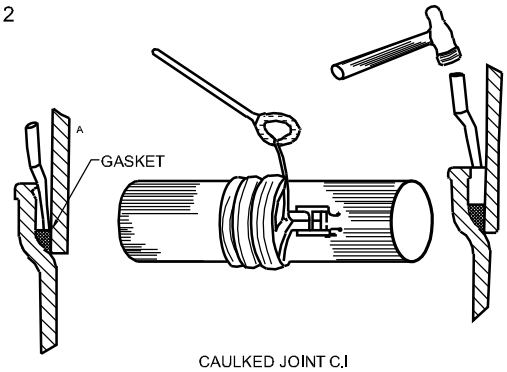
1 Handle proper tool use proper handle in a hammer.

2 Handle molten lead carefully by using Pot and Tongs.

3 Fill the molten lead continuously.

4 Caulk the lead after pouring. (Fig 2)

Fig 2



Joining cast iron pipe

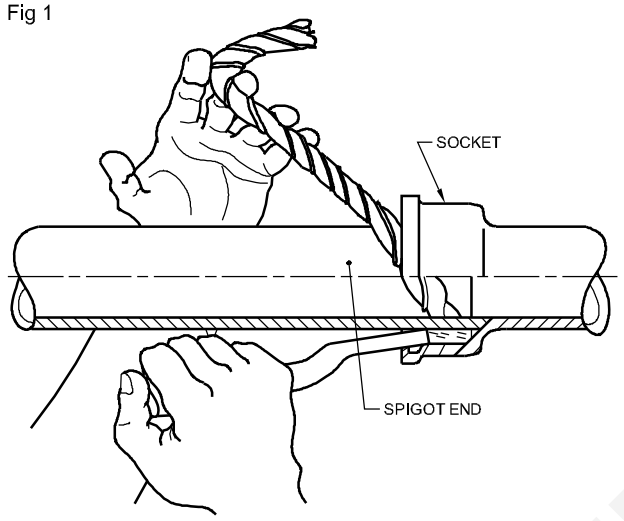
Objectives: At the end of this exercise you shall be able to

- **select and prepare the materials necessary to make or mould joint runner for pouring molten lead into a joint**
- **assemble or build the joint runner in position or locations to be specified**
- **pour the joint and dismantle the runner prior to caulking the joint.**

1 Clean the socket inside and outside of pipe (spigot end) to be jointed.

2 Place the spigot end inside the socket. (Fig 1)

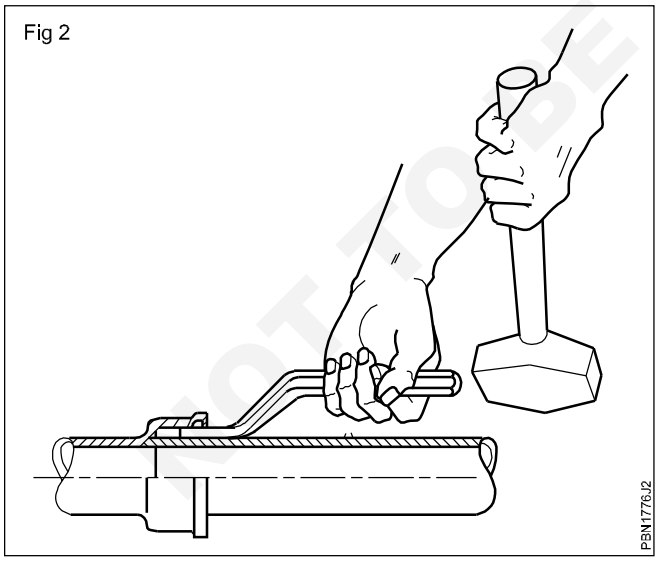
Fig 1



3 Yarn the joint tightly to a depth of 1/3 the socket lengths.

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

Fig 2

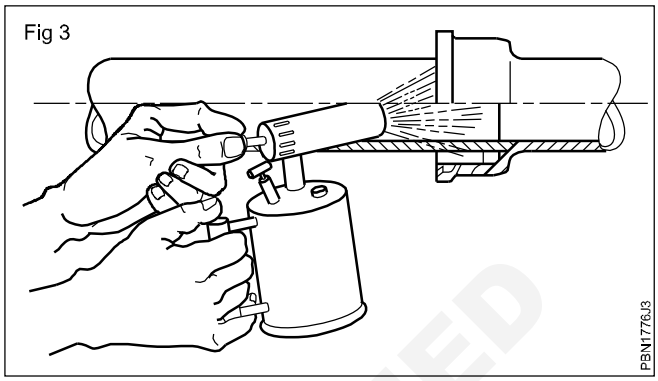


5 Burn off any loose strand of material. Sticking up from the joint. (Fig 3).

6 Apply powdered resin or a small amount of glease to the joint.

(In case of vertical joints molten lead can be poured now).

Fig 3

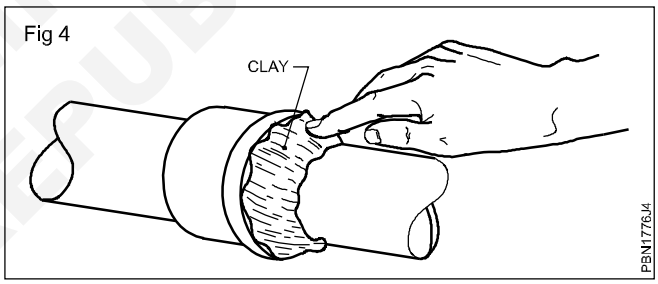


8 Place flexible asbestors cord/rope approximately 25mmϕ around the pipe.

9 Push the cord firmly up in the socket.

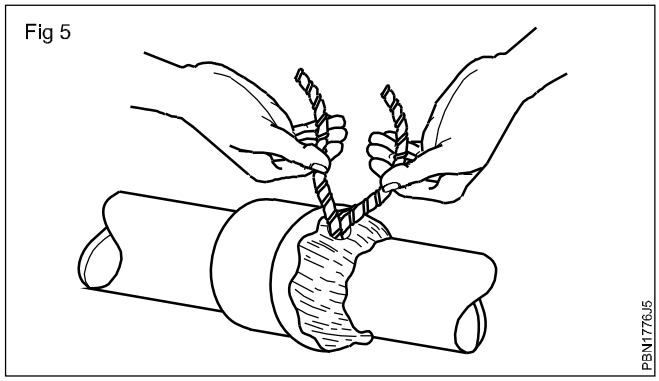
10 Wrap stiff clay around the rope. Shape the mould by wet thumb. (Fig 4).

Fig 4



11 Remove rope carefully leaving the pour hole on top of the pipe. (Fig 5).

Fig 5

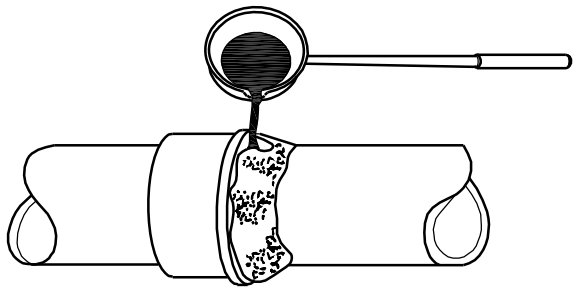


12 Pour hot moulten lead slowly but continuously into the joint through the pouring hole. (Fig 6).

13 Remove the clay mould. Cut away the lump of lead that formed in the pouring hole.

14 Chisel away the lead plug.

Fig 6



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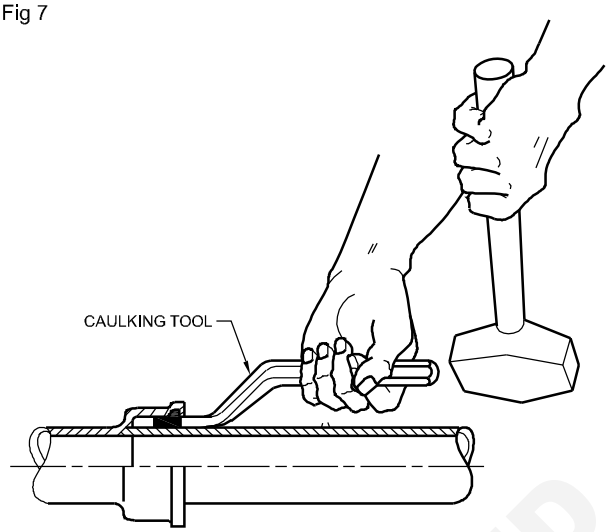
15 Hammer the caulking around the joint using caulking tool and hammer. (Fig 7) Check the joint has been correctly caulked all round.

Fig 7



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Detachable joint of AC pressure pipe

Objectives: At the end of this exercise you shall be able to
- **lay and join asbestos cement pressure pipe for external work**
- **join cast iron detachable joint**
- **perform the method of A.C pipe detachable joint.**

Requirements

Tools/Instruments

- Hammer - 1 No.
- Spanner - 1 No.
- Try square - 1 No.
- Spirit level - 1 No.
- Wire brush - 1 No.
- Chisel - 1 No.
- Caulking tool - as reqd.
- Trowel - as reqd.
- Crow bar - as reqd.

Materials/Components

- A.C Collar - as reqd.
- Rubber ring - as reqd.
- Bolt and nut with washer - as reqd.

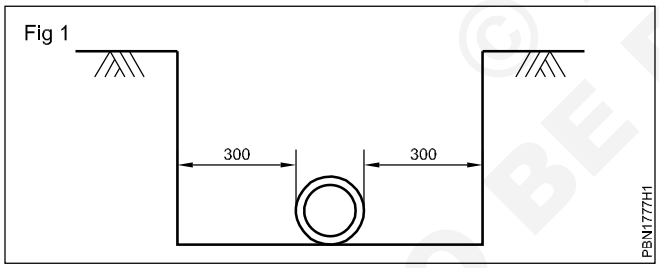
PROCEDURE

TASK 1: **By cast iron detachable joint**

1 Store the pipe in pyramid shape or lay lengthwise and crosswise in alternate layers upto maximum height of 1.5m.

2 Dig the trench of width keeping 300mm on either side of the pipe to a depth keeping 750mm soil cover. (Fig 1).

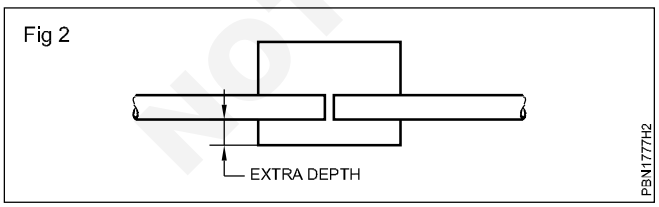
Fig 1



(When the soil has a poor bearing capacity the pipes shall be laid on a concrete cradle).

4 Dig extra depth of 100mm for each joint place. (Fig 2).

Fig 2

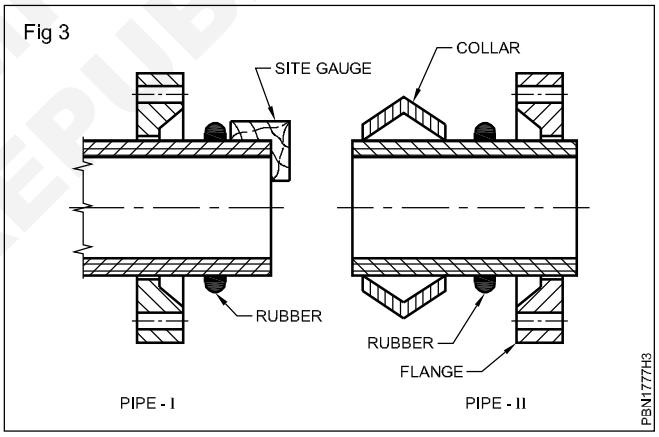


5 Clean the ends of the pipe with a hard wire brush.

6 Place one flange and rubber ring on the end of already laid pipe. (Fig 3).

7 Place the other flange, ring and central collar on to the pipe to be assembled.

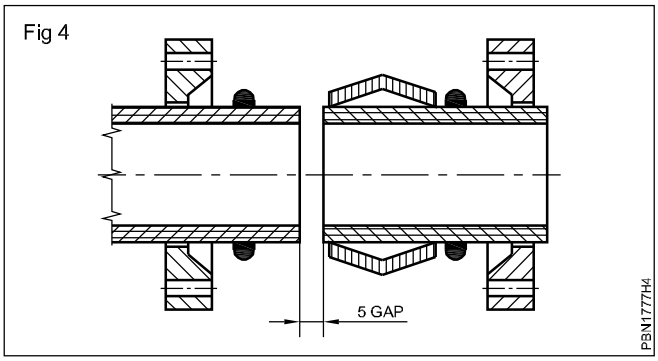
Fig 3



8 Keep the rubber ring at the half the collar width less 2.5mm from the end of the pipe already laid using a site gauge.

9 Bring the other pipe nearer leaving a gap of 5mm between two pipe ends. (Fig 4).

Fig 4



10 Slide the collar to site square around the rubber ring on pipe no.1.

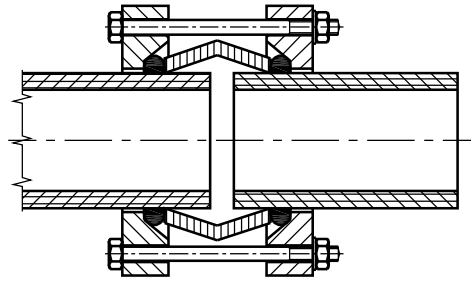
11 Roll the rubber ring on pipe-II to site around the collar.

12 Move the flanges on both ends to enclose rubber ring. (Fig 5).

13 Insert the fastening bolts through holes of the flanges.

14 Tighten the bolt alternatively and evenly.

Fig 5



TASK 2: **By asbestos cement collar**

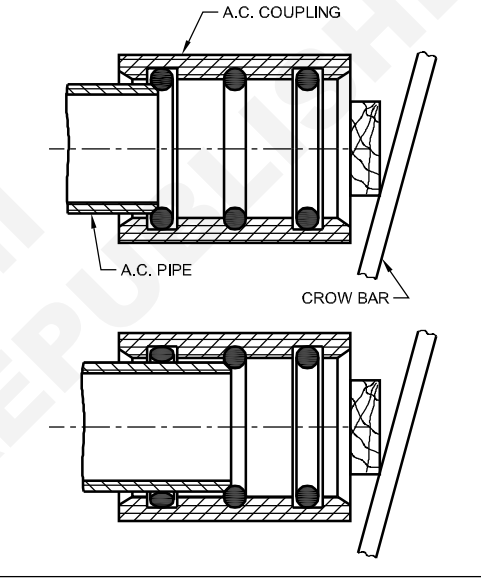
1 Clean the collar and rubber ring.

2 Lubricate the end of the pipe and collar with a soft soap solution.

3 Seat the rubber rings in the grooves of collar.

4 Push the assembly (collar with rubber ring) with the help of wooden block and crowbar. (Fig 1).

Fig 1



Tyton / socket and spigot joint of ductile iron (DI) pipe with rubber ring

Objectives: At the end of this exercise you shall be able to
- **state the importance of ductile icon pipe in drinking water supply**
- **state the socket and spigot jointing methods by application**
- **state the D.I joint materials with details by application**
- **state the importance of cement lining give to D.I pipe.**

Requirements

Tools/Instruments

• Crow bar	- 1 No.
• Spade	- 1 No.
• Rammer	- 1 No.
• Double end spanner	- 1 No.
• Adjustable wrench	- 1 No.
• Screw driver	- 1 No.

Materials

• Ductile iron pipe	- as reqd.
• Flexible metal split ring	- as reqd.
• Rubber gasket	- as reqd.
• Brush	- as reqd.
• Cotton waste	- as reqd.

Job Sequence

- Select the appropriate hand tools and materials.
- Select the proper DI pipe; flexible metal split ring, rubber gasket. (Figs 1 to 6)
- Place the DI pipe two pieces in horizontal position. (Figs 7 to 11)
- Place the rubber gasket inside the socket at step provided. (Fig 12)
- Place the flexible metal spit ring inside the socket by adjust in step. (Fig 12)
- Press the spigot end with pressure to seat properly inside the socket clean the work area with cotton waste and brush. (Fig 13)

At present these ductile iron pipes are used in spite of cast-iron heavy pipes.

These DI pipes durability are more than cast iron pipes because of inside cement lining.

Do not use pointed tools to fix rubber gasket.

Do not strike with hammer while fixing the flexible metal split ring.

Fig 1

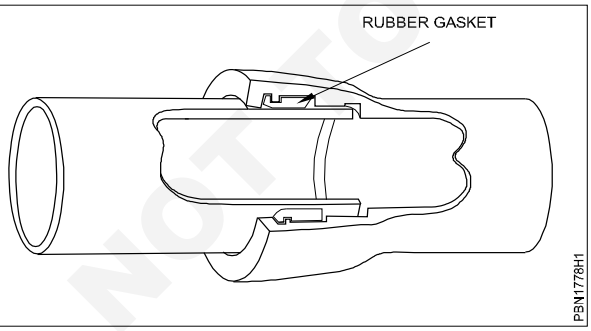


Fig 2

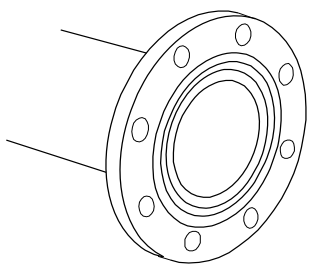


Fig 3

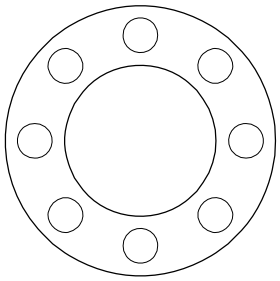


Fig 4

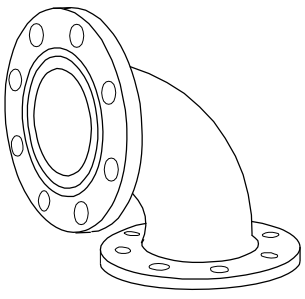


Fig 5

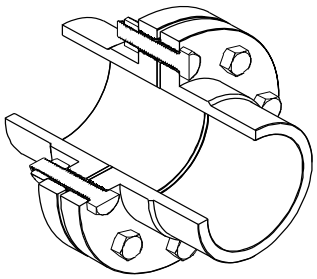


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Fig 6

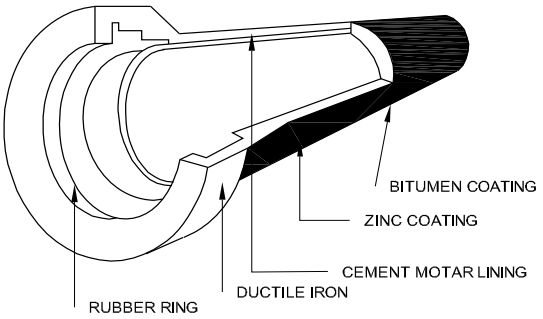

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Fig 7

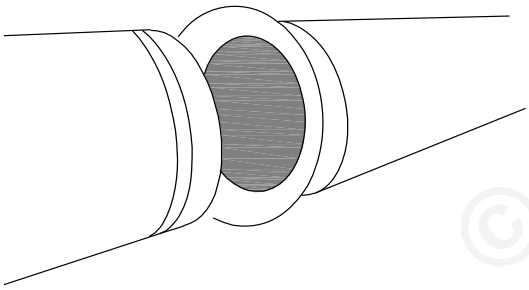

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Fig 8

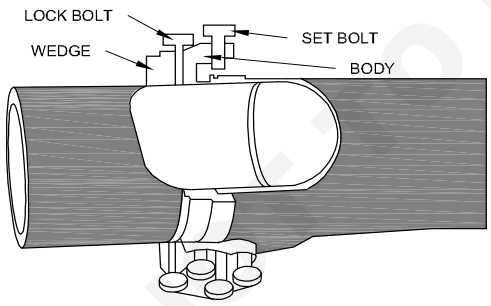

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Fig 9

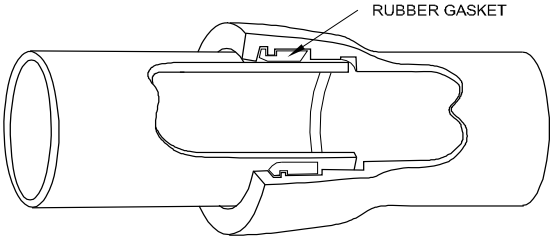

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Fig 10

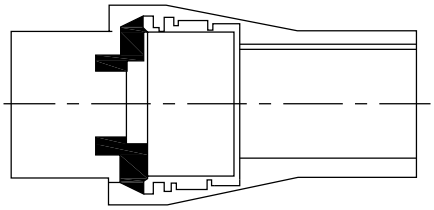

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Fig 11

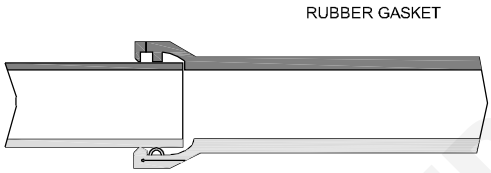

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Fig 12

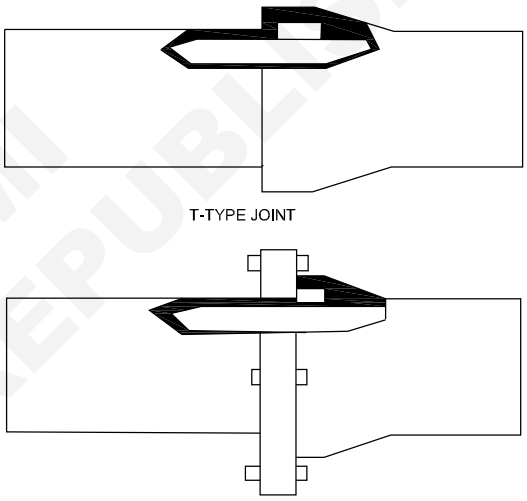

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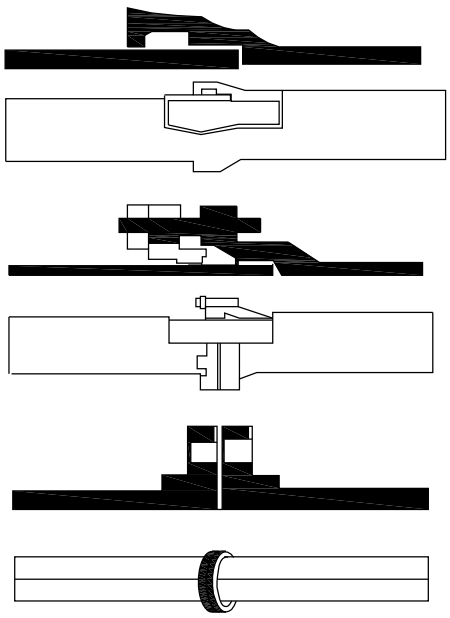
Fig 13



PBN1778HD

Prepare and study the drawing of pipe line circuit and schedule use of tools and accessories

Objectives: At the end of this exercise you shall be able to
- **identify the method of preparing drawing**
- **identify the materials used in the drawing**
- **demonstrate the hand tools used for assembling the materials as per drawing.**

Requirements

Tools/Instruments

- Measuring steel tape - 1 No.
- Marker (or) pencil - 1 No.
- Pipe vice - 1 No.
- Hacksaw frame - 1 No.
- Flat file rough and smooth - 1 No.
- BSP die stock with dies - 1 No.
- Oil can - 1 No.
- Double end spanner - 1 No.
- Adjustable wrench - 1 No.
- Water pump plier - 1 No.
- Pipe wrenches - 1 No.

Materials

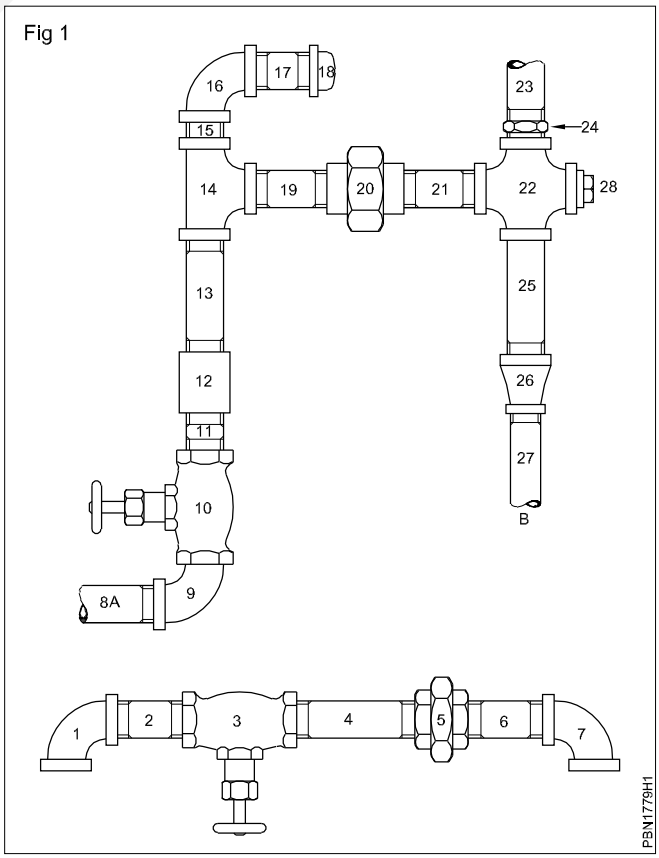
- G.I. pipe bits - 4,8,13,23,25,27 - as reqd.
- G.I. Elbow - 1,7,9 & 16
- G.I.Tee - 14 - as reqd.
- G.I. cross - 22 - as reqd.
- G.I.coupling - 12,17 - as reqd.
- G.I. union - 5, 20 - as reqd.
- G.I. pipe nipple - 2,6,11,15,19 & 21 - as reqd.
- G.I. hex nipple - 24 - as reqd.
- G.I. Reducer coupling - 26 - as reqd.
- G.I. cap - 18 - as reqd.
- G.I. plug - 28 - as reqd.
- Globe valve gunmetal - 3 & 10 - as reqd.
- A - Inlet - as reqd.
- B - outlet - as reqd.
- Cotton waste - as reqd.
- Lubrication oil - as reqd.
- Hack saw blade - as reqd.

Job Sequence

- Prepare the pipeline layout. (Fig 1)
- State the pipe and fittings.
- State the specific use of materials.
- State the hand tools used as per drawings.

Trainees should prepare various diagram and should get trained by state the materials and state the hand tools used as per drawing.

Fig 1



Make a pipe line circuit on G.I pipe with socket, elbow, bend, flange, tee, union etc, and fixing cocks and valves as per drawing

Objectives: At the end of this exercise you shall be able to
- **identify the different classes of G.I pipes and GI fittings through application**
- **identify the process of G.I pipe BSP threading**
- **perform of jointing G.I fittings with G.I pipe using thread seal**
- **make joining methods of cast iron flanges, gun metal valve and C.P.Bib-cock.**

Requirements

Tools/Instruments

- Measuring steel tape
- Hack saw frame with blade
- Pipe vice
- BSP Die - stock with dies
- Pipe wrench
- Adjustable spanner
- Ball pein hammer
- Screw driver
- Rawl jumper
- Oil can

Equipments/Machines

- Hammering drilling machine portable

Materials

- G.I pipe
- G.I. Elbow
- G.I.Tee
- G.I. socket rigid
- G.I. Bend
- G.I. union with washer
- Casting flange oval with washer and bolt & nut
- Casting flange round with washer and Bolt & nut
- Gunmetal globe valve
- C.P. Bib cock
- Cotton waste
- Brush
- Lubrication oil

Job Sequence

- Select the appropriate hand tools and materials according to the drawing. (Fig 1)
- Hold the G.I. Pipe in pipe vice and cut the bits to the required size with hacksaw frame blade. (Figs 2&3)
- File the edges to flat with flat file and burrs remove. (Fig 4)
- BSP Threads provides in the G.I. pipe bits with BSP die stock and dies. (Fig 6)
- Thread seal provide using shellac (or) white lead with thread ball. (Figs 7 & 9)
- Connect the G.I socket, G.I elbow, G.I Bend, G.I, Tee, G.I. Union as per drawing.
- Connect the C.P Bibcock.
- Clean the work pieces with cotton waste and work places with brush.
- Clean the hand tools.

Grip the G.I. pipe into the G.I. fittings up to five thread through hand and remaining threads through pipe wrench upto eight threads. While threading operation use lubrication oil frequently should not overtight the flanges, globe valve and bib-cock exceeding the threads in the fittings.

Fig 1

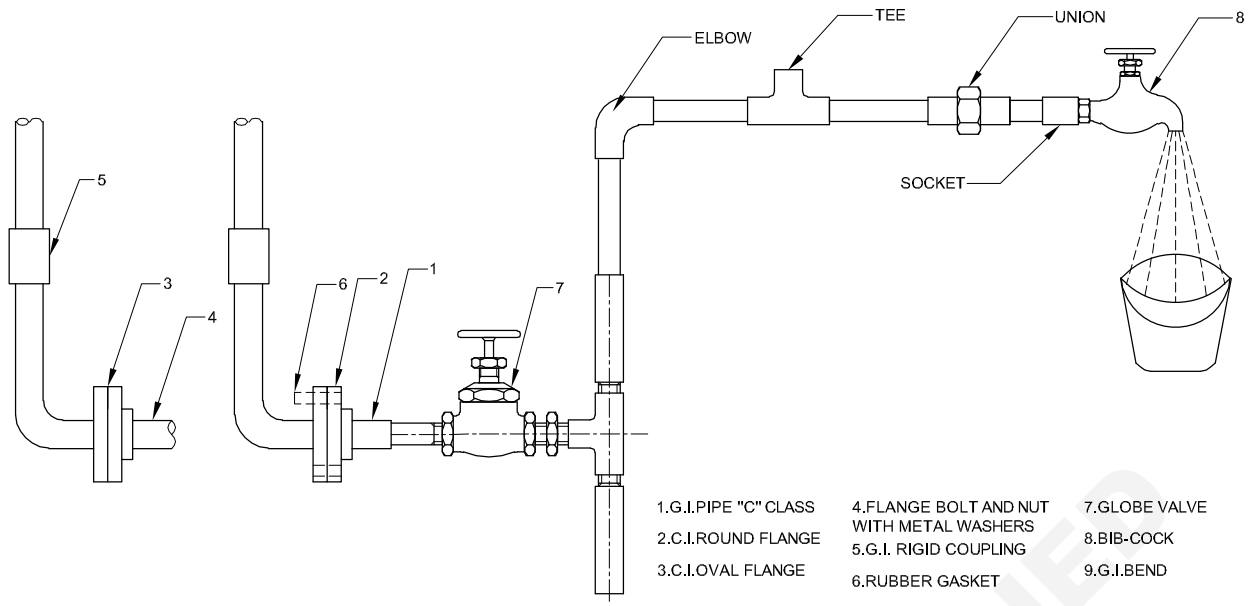


Fig 2

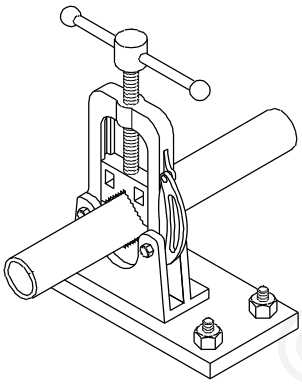


Fig 3

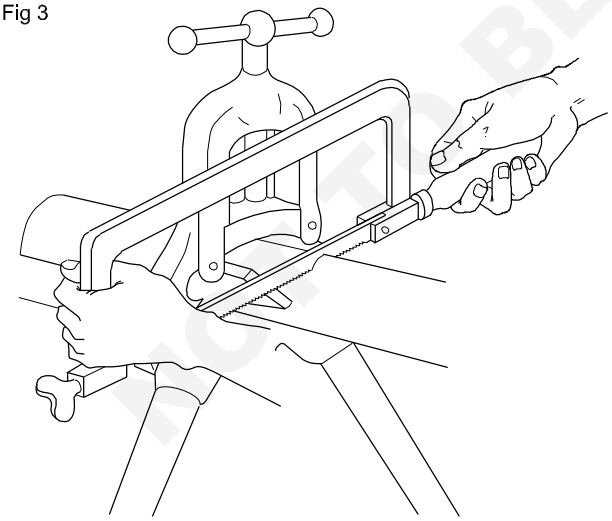


Fig 4

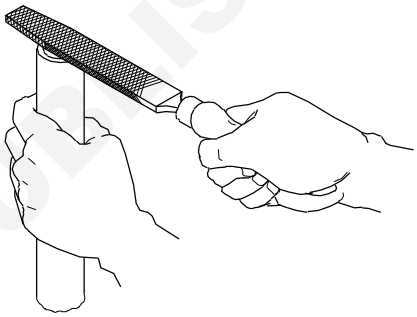


Fig 5

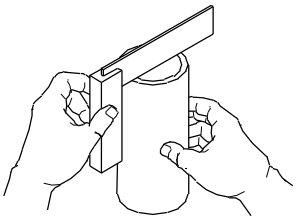


Fig 6

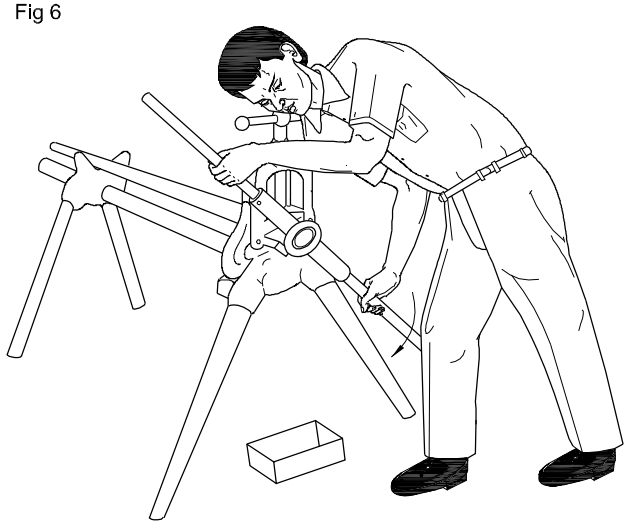


Fig 7

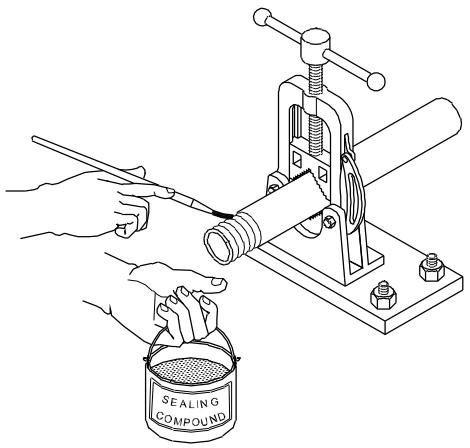


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Fig 8

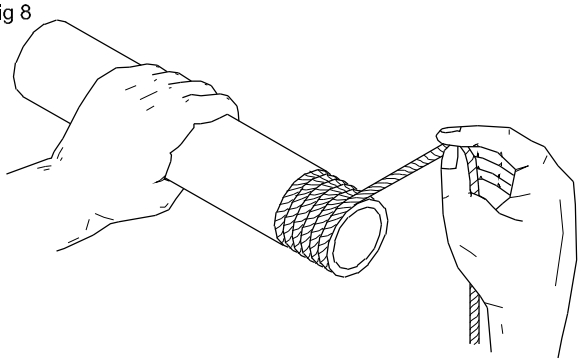

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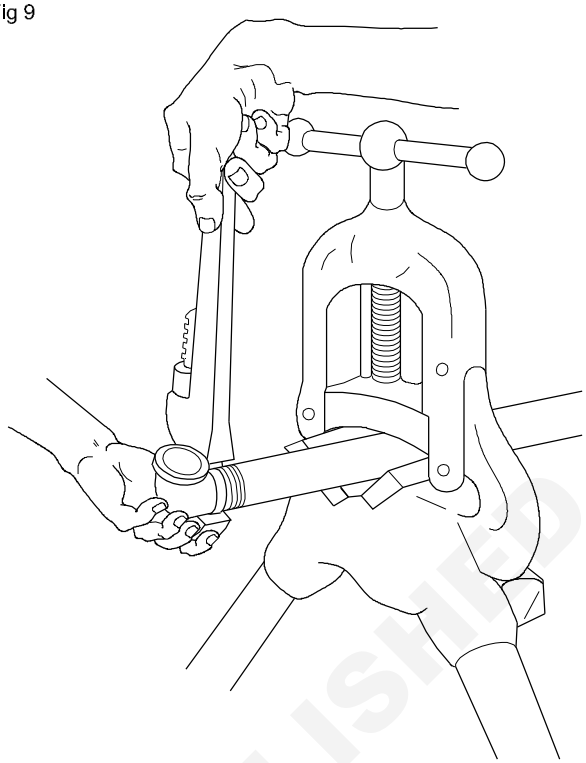
Fig 9



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Plumbing **Exercise 1.6.47**
Plumber - Plumber

P.V.C pipe cutting & shaping in various dia, using hacksaw and pipe cutters

Refer Exercise No. 1.6.36

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Plumbing **Exercise 1.6.48**
Plumber - Plumber

Preparation of P.V.C pipe and fittings with emery paper

Refer Exercise No. 1.6.36

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Use & fixing of P.V.C fittings use solvent cement etc

Objectives: At the end of the exercise you shall be able to
- **hold P.V.C pipe with pipe vice**
- **cut the P.V.C pipe to given length**
- **clean the spigot and socket in dry condition**
- **apply solvent to the chamfered end of the pipe**
- **push the pipe firmly into the socket.**

Requirements

Tools/Instruments

- Hacksaw - 1 No.
- Steel rule - 1 No.
- Steel tape - 1 No.

Materials/Components

- P.V.C Pipe - as reqd.
- P.V.C fittings - as reqd.
- 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. (Fig 1)

6 Chamber the edge of the pipe to be inserted at an angle of about 15^0 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 flammable material so proper care is needed.

Safety

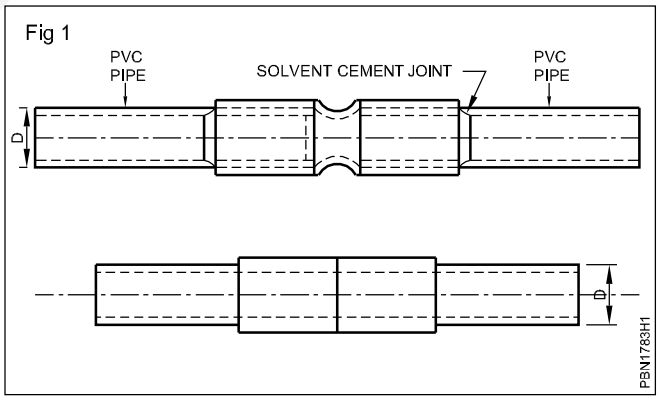
1 Use proper tool.

2 Turn only 45º after the apply solvent cement.

3 Uniformly apply solvent cement.

4 Doesn't splash solvent cement on our eye and head.

Fig 1



Layout of P.V.C pipe according to drawing

Objectives: At the end of this exercise you shall be able to
- **do the work according to drawing**
- **to select the materials for the work according to drawing**
- **join P.V.C joints, fix with proper clamps**
- **state the shower jointing work.**

Requirements

Tools/Instruments

- Pipe vice - 1 No.
- Pipe wrench - 1 No.
- Measuring steel tape - 1 No.
- Ball pein hammer - 1 No.
- Die stock & dies - 1 No.
- Rawl jumper - 1 No.
- Hack saw frame with blade - 1 No.

Equipments/Machines

- Hammer drilling machine portable - 1 No.

Materials

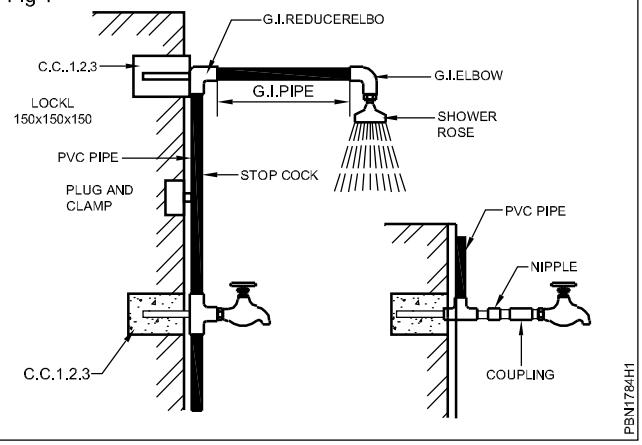
- G.I. pipe, P.V.C pipe, G.I. tee, G.I. reducer tee
- G.I. reducer elbow shower rose c.p. stop cock female end, C.P. Bib cock, wall clamp, wall plug
- P.V.C M.T.A & FTA, Emery paper, Thread ball, Teflon tape, P.V.C solvent cement.

Job Sequence

- Select proper hand tools and materials according to the drawing.
- Measure and mark the P.V.C pipe for required length.
- Hold the P.V.C pipe in pipe vice tightly ad cut as per marking with hack saw frame and blade.
- Rub the inner portion of P.V.C fittings and out end of the P.V.C pipe with emery paper or sand paper.
- Joint the P.V.C pipe with G.I tee, G.I reducer tee, G.I reducer elbow, G.I. elbow, G.I. coupling and G.I. Nipple with M.T.A, F.T.A using solvent cement.
- C.P stop cock female end shower rose, C.P bib cock assembling with thread seal.
- Wall champs fixing using hand drilling machine hammer type and well plus.
- Plain cement concrete providing in the wall for grip as per drawing.
- Check the joints and cleaning the work places.(Fig 1)

- **P.V.C pipe pasted joint with G.I fittings should be properly jointed according to the directions.**
- **P.V.C pasted joints should be carefully done do not twist.**
- **Hold tightly for atleast 30 seconds after jointing with solvent cement.**

Fig 1



Preparation of water and water analysis kit

Objectives: At the end of this exercise you shall be able to
- **prepare the water analysis kit**
- **apply the various checking methods to know TDS**
- **check the quality of water using TDS meter**
- **to learn basic water quality tests**
- **identify the of the importance of water quality**
- **state the factors that contribute to water quality**
- **state that each of us has responsibility for maintaining the quality of our water.**
- **measure the temperature**
- **apply TDS meter to test pH values of water**
- **measure the DO, BOD, nitrate, turbidity and TCB.**

PROCEDURE

1 Prepare the water analysis kit.

2 Testing the temperature of water by shielded thermometer.

3 Testing the nitrates content in water.

4 Testing the pH value of water.

5 Testing the TDS and salinity contents in the water. (Fig 1)

6 Testing the dissolved oxygen contents in the water.

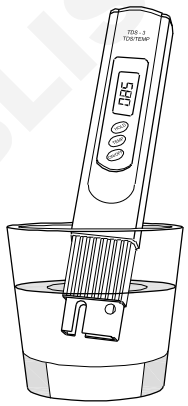
7 Testing the turbidity contents.

8 Testing the B.O.D contents.

9 Testing the total coliform bacteria in water.

10 Use protective clothes before commencing the test.

Fig 1



PB20N1785H1

Test 1:	Temperature	Shielded thermometer
Test 2:	pH	2 test tubes with caps 50 ml wide range indicator 2 octet color comparators
Test 3:	Dissolved Oxygen	Sampling bottle 25 ml of manganous sulphate 25 ml of alkaline potassium iodide axide 25 ml of sulfuric acid 25 ml of starch indicator solution 50 ml of sodium thiosulfate Titration tube with cap Titrator
Test 4:	BOD	5 additional DO sampling bottles
Test 5:	Nitrates	Plastic sampling bottle 100 ml mixed acid reagent Nitrate reducing agent (powder) .1g measuring spoon

		test tube with cap
		octet color comparator
Test 6:	Turbidity	2 cylinders with dots in the bottom
		50 ml standard turbidity reagent
		stirring rod
		tube brush
Test 7:	TDS and Salinity	TDS Tester (digital meter)
		graduated cylinder (for salinity dilution)
		eye dropper (for salinity dilution)
		demineralized water bottle
Test 8:	Coliform	6 lactose broth tubes
	Miscellaneous	neutralizing liquid for DO and BOD tests
		bleach for disinfecting coliform samples
		waste collection bottle (for nitrate test)
		empty bottles for student practice
		MSDS booklet

Interpreting Results

0 ppm		Demineralized water or "pure" water
10 ppm		Rain water
40 ppm		Tap water
500 ppm		Harmful to plumbing in water systems
<1000 ppm	(<l ppt)	Fresh water
1000-35,000 ppm	(1-35 ppt)	Brackish water
35,000 ppm	(35 ppt)	Sea water

Sample Calculation (Brackish water)

Sample meter reading for a 1:50 dilution = 675?s

1 Multiply by the level of dilution

675 x 50 = 33,750 ps

2 Multiply by the standard factor of .5

33,750 x 0.5 = 16,875

3 Put the results into the proper units

Salinity = 16,875 ppm OR 16.9 ppt

(Both of these are correct. TDS is generally measured in ppm; salinity is generally measured in ppt.)

— — — — — — —

Plumbing — Exercise 1.6.52
Plumber - Plumber

Water analysis test by analysis kits P.H TDS, Temperature etc

Objectives: At the end of the exercise you shall be able to
- **prepare water analysis kit**
- **testing P.H value, T.D.S and temperature.**

Refer Exercise No. 1.6.51

— — — — — — —

Preparation of hydraulic pressure test machine

Objectives: At the end of the exercise you shall be able to
- **perform the method adopted for preparing hydraulic pressure testing machine.**

Requirements

Tools/Instruments

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

Equipment/Materials/Components

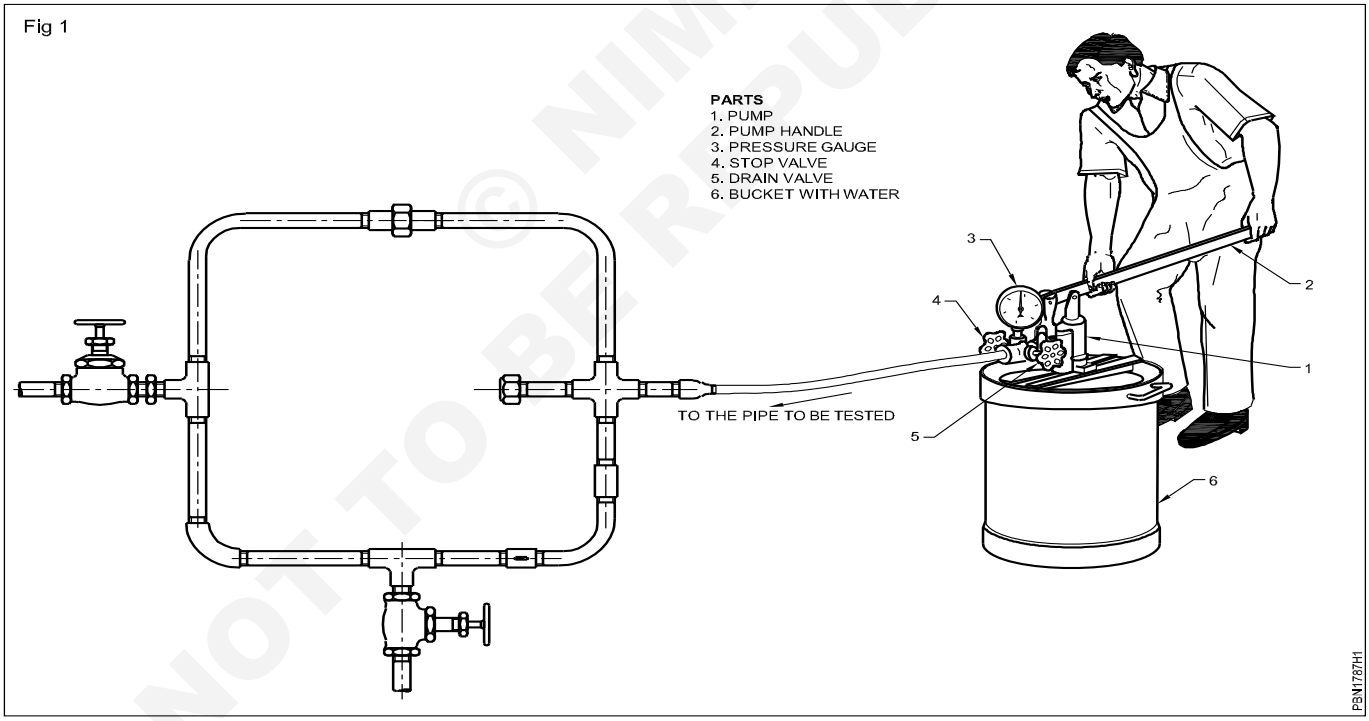
- Hydraulic pressure testing m/c - as reqd.
- Required testing pipe line - as reqd.
- Hydraulic oil - as reqd.
- Cotton waste - as reqd.
- Cleaning materials - as reqd.
- Broom stick - as reqd.
- Wire brush - as reqd.

PROCEDURE

1 Plug all the opening in the section of test line with pipe nipples socket and plug. (Fig 1)

2 Pump the water into the pipe line completely without any air pocket.

Fig 1



This can be achieved if after pressure pumping water and opening the valve at highest point and releasing the air

3 Continue the process till pressure gauge shows steady reading.

4 Keep it under required pressure.

5 Observe any leakage in the joints & pipes.

6 Rectify the leaking joints & pipes.

7 Repeat the test till pressure is maintained for 3 to 4 hours.

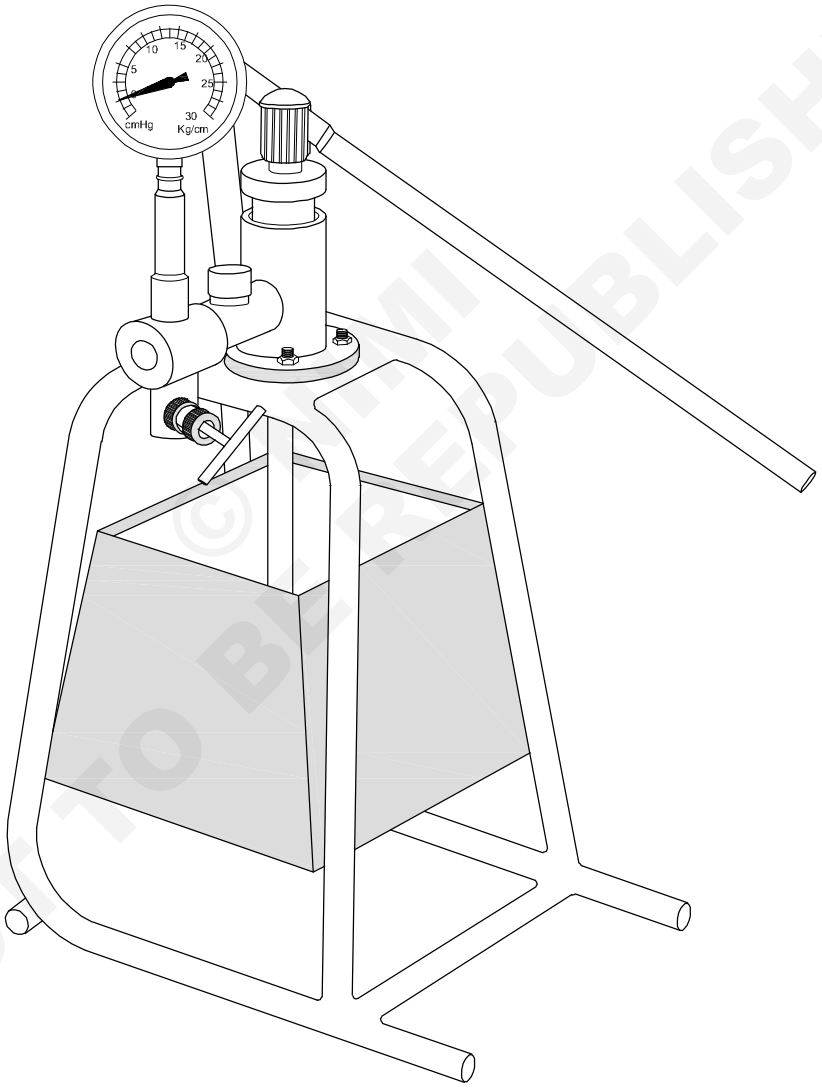
— — — — — — — —

Static water pressure test by hydraulic pressure test machine apply on plastic water bottle

Objectives: At the end of this exercise you shall be able to
- **use pressure testing machine to know various defects in water line fixtures**
- **perform the methods of testing the water tank and cistern.**

Note: Exercise 1.6.53 Procedure should be followed

Fig 1



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Static water pressure test by hydraulic pressure test machine apply on cistern and tank

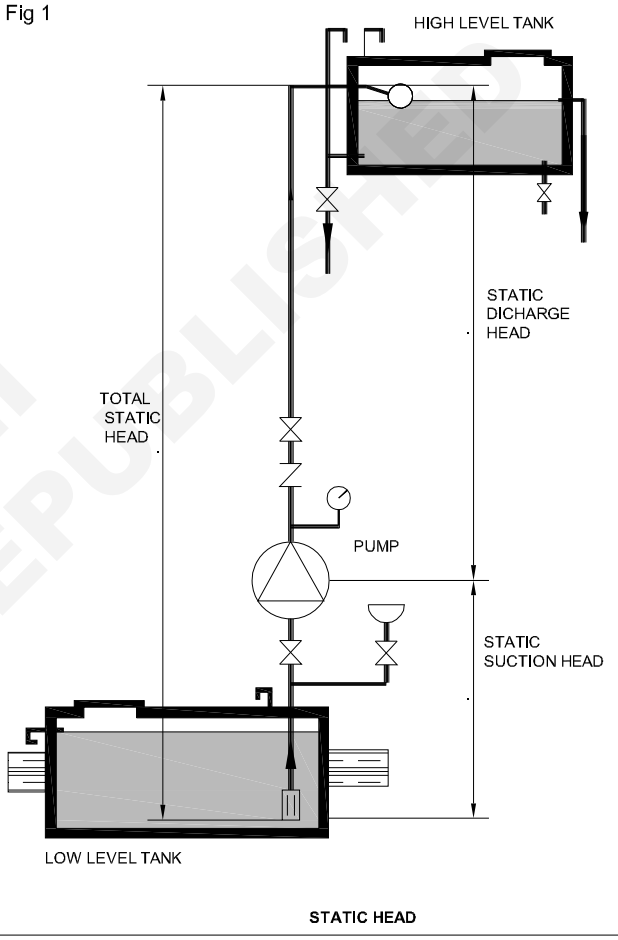
Objectives: At the end of this exercise you shall be able to
- **identify the static head**
- **identify typical plumbing system of gravity distribution through diagram**
- **identify typical plumbing system of pressure water distribution through diagram**
- **use pressure testing machine to know methods of pressure testing the pipe joints.**

Static head (Fig 1)

static head in plumbing installation is defined as the vertical distance/elevation between two points in a water distribution system, expressed in meters. Static head is one of the parameters in determining selection of pumps.

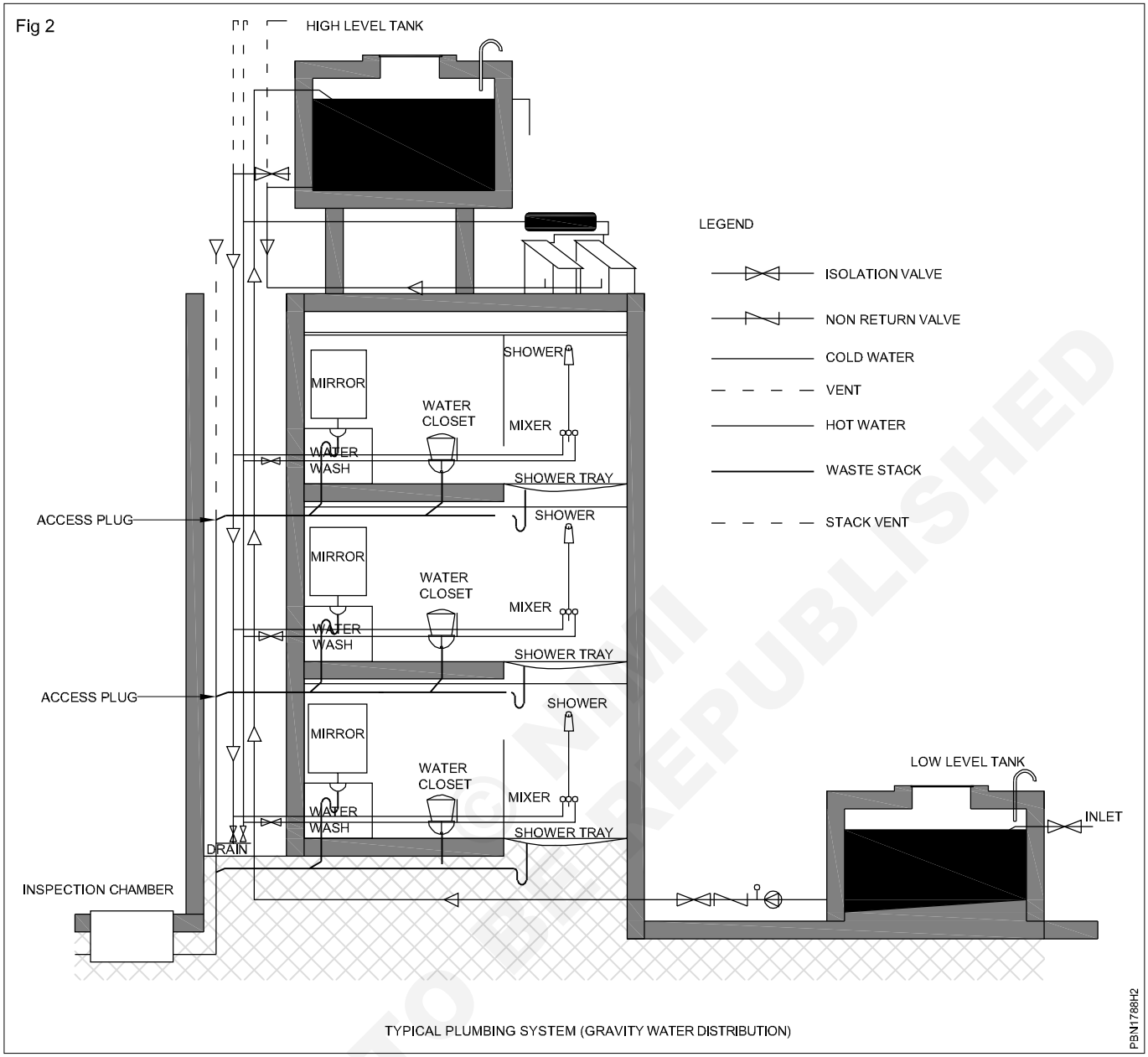
Note: Exercise 1.6.53 Procedure should be followed.

Fig 1



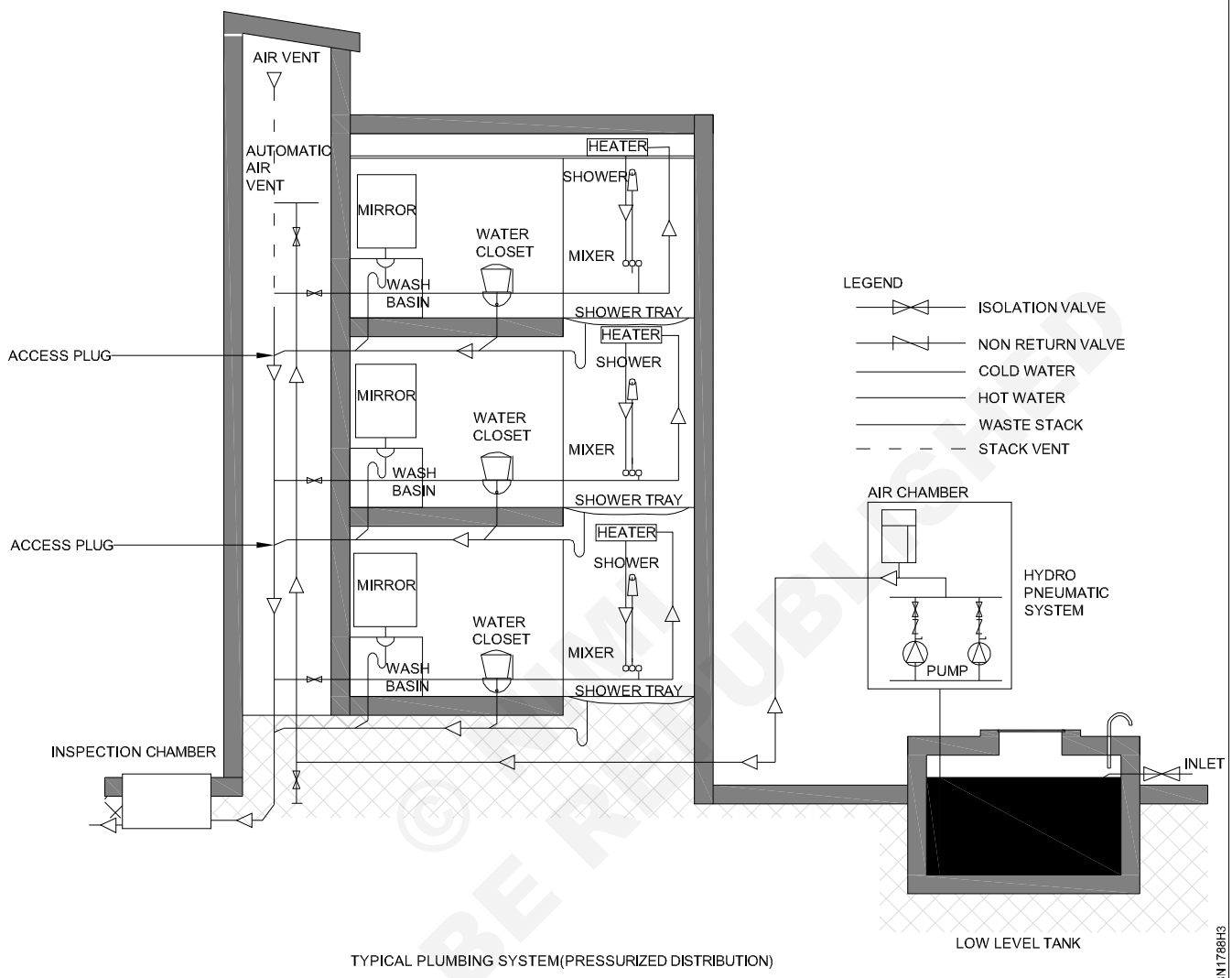
STATIC HEAD

Typical plumbing system (Gravity water distribution)
(Fig 2)



Typical plumbing system (Pressurized water distribution)
(Fig 3)

Fig 3



TYPICAL PLUMBING SYSTEM(PRESSURIZED DISTRIBUTION)

Steps of simple pipe line connection as per drawing

Objective: At the end of this exercise you shall be able to
- **fix the G.I pipes with fittings as per drawing.**

PROCEDURE

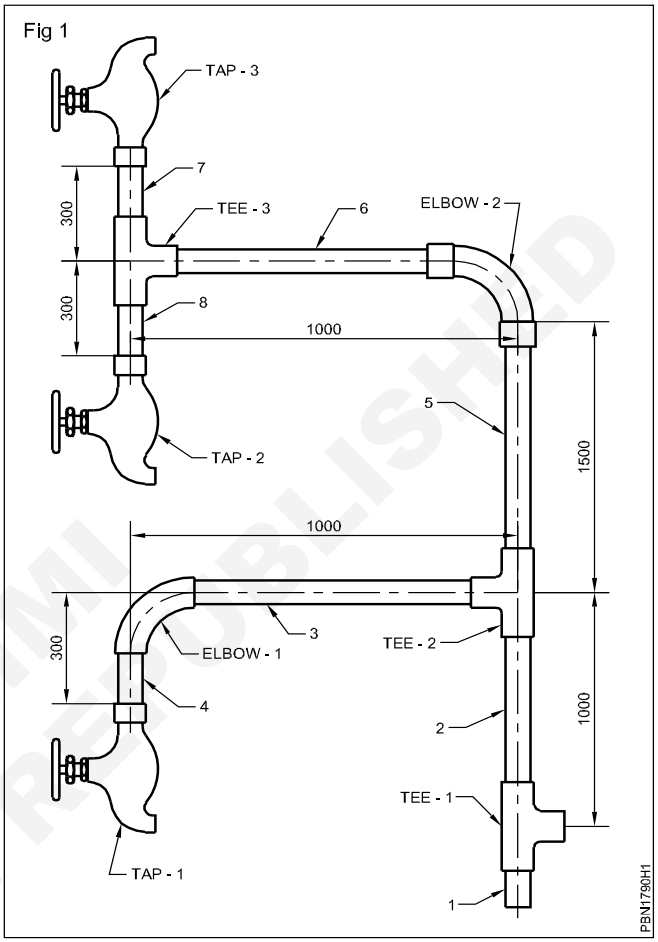
1 Calculate the length of pipes required based on drawing. (Fig 1).

2 Cut the pipes as per calculated length using pipe cutter/ hacksaw.

3 Cut thread at the end of pipe using die stock.

4 Assemble pipe with standard fittings.

Fig 1



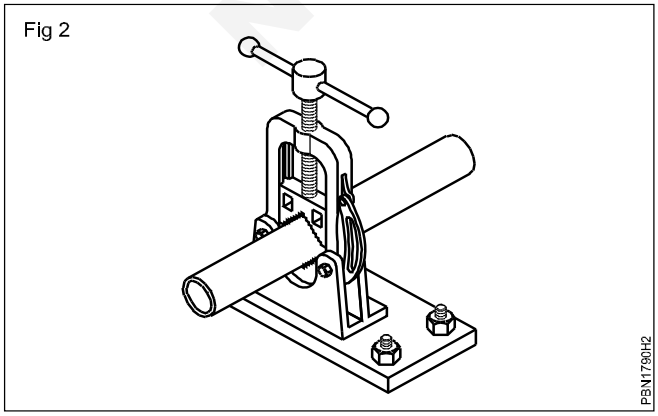
Skill Sequence

Pipes and pipe fittings

Objectives: This shall help you to
- **assemble pipe and pipe fittings**
- **fix fittings to pipe.**

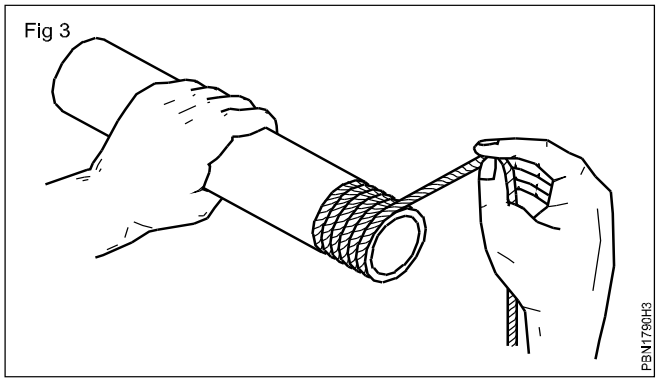
- Hold the pipe 1 in a pipe vice. (Fig 2)

Fig 2



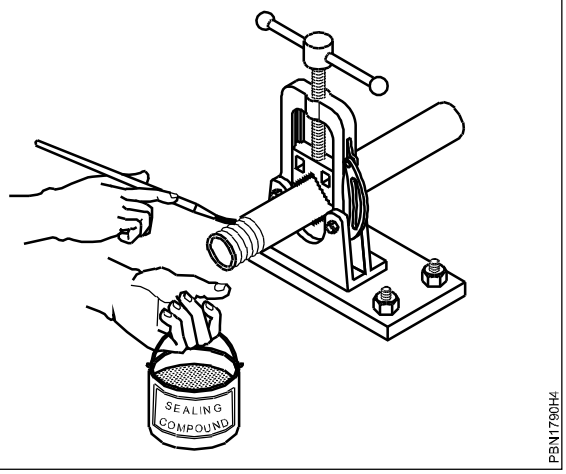
- Wind the hemp packing/cotton thread material on the external threads of the pipe. (Fig 3).

Fig 3



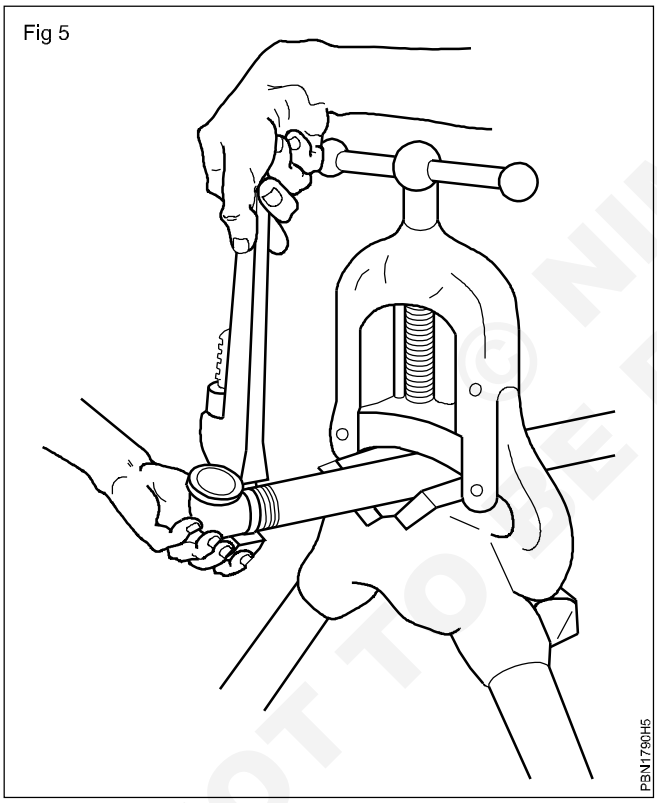
- Apply sealing compound over the pipe threads. (Fig 4).
- Adjust the pipe wrench to suit the pipe/pipe fittings.

Fig 4



- Continue the screwing process till full threads are inside. (Fig 5).

Fig 5



- Fit tee 1 to the pipe I using pipe wrench.
- Fit the pipe 2 to tee 1 using pipe wrench after adopting the procedure.
- Fit tee 2 to pipe 2 using pipe wrench after adopting the procedure.
- Fit pipe 3 to tee 2 using pipe wrench after adopting the procedure.
- Fit elbow to pipe 3 using pipe wrench after adopting the procedure.
- Fit pipe 4 to elbow using pipe wrench after adopting the procedure.
- Fit a socket to pipe 4 using pipe wrench after adopting the procedure.
- Fit bibcock to socket using pipe wrench after adopting the procedure.
- Fit pipe 5 to tee 2 using pipe wrench after adopting the procedure.
- Fit socket to pipe 5 using pipe wrench after adopting the procedure.
- Fit bend to socket using pipe wrench after adopting the procedure.
- Fit socket to bend using pipe wrench after adopting the procedure.
- Fit pipe 6 to socket using pipe wrench after adopting the procedure.
- Fit tee 3 to pipe 6 using pipe wrench after adopting the procedure.
- Fit pipe 7and 8 to tee using pipe wrench after adopting the procedure..
- Fit socket to pipe 7 and 8 using pipe wrench after adopting the procedure.
- Fit bibcock to sockets using pipe wrench after adopting the procedure.
- Remove any excess hemp, string or sealing tape after completing the joints, using hacksaw blade or a blow lamp. (Figs 6 to 20)

Fig 6

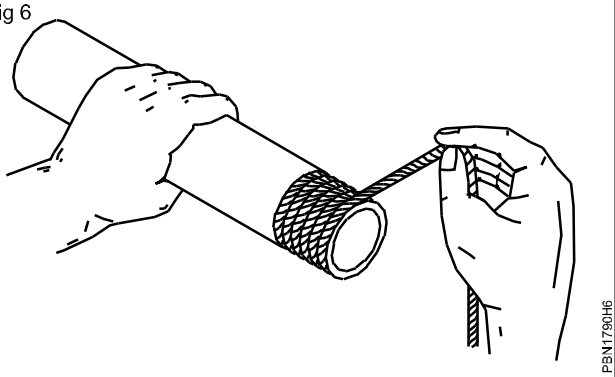


Fig 7

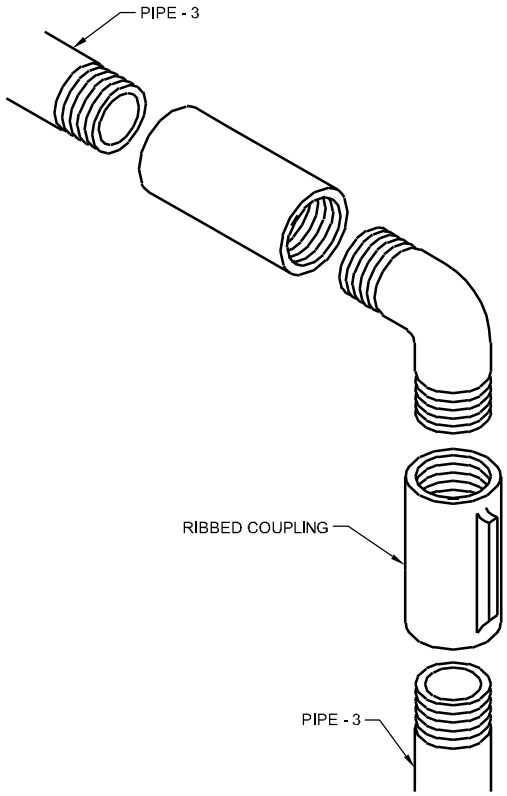


Fig 8

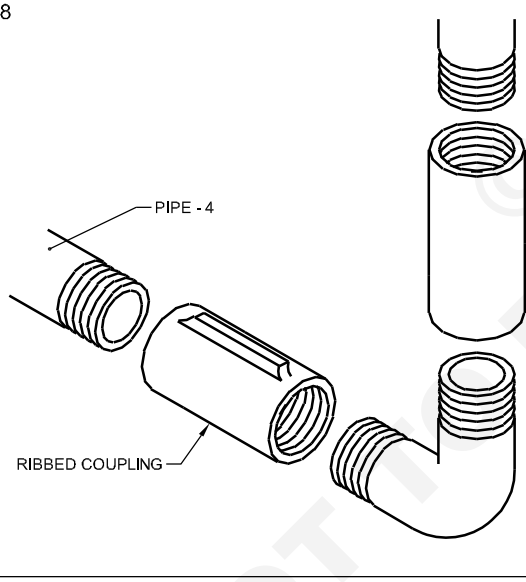


Fig 9

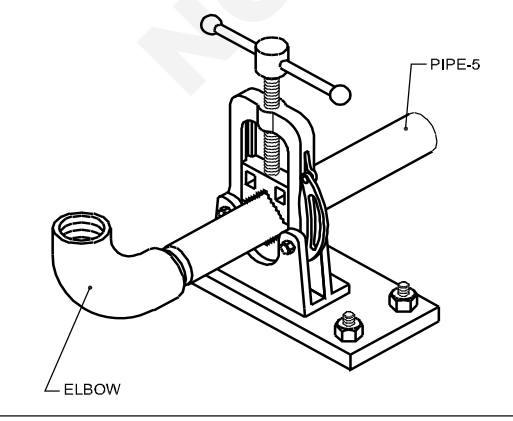


Fig 10

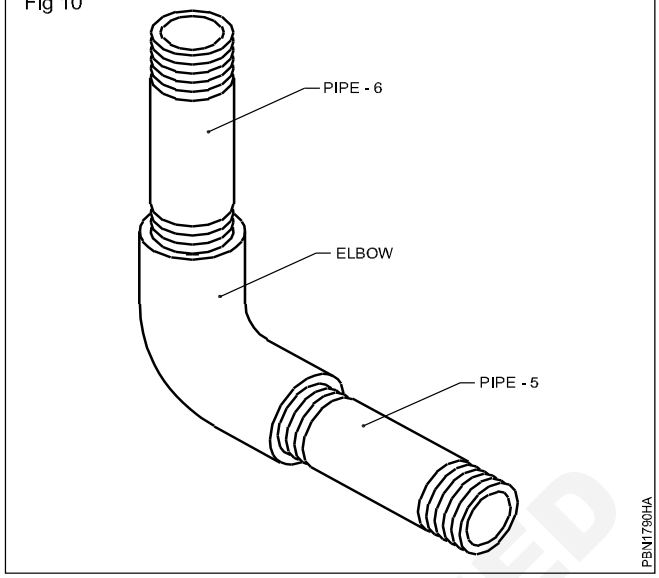


Fig 11

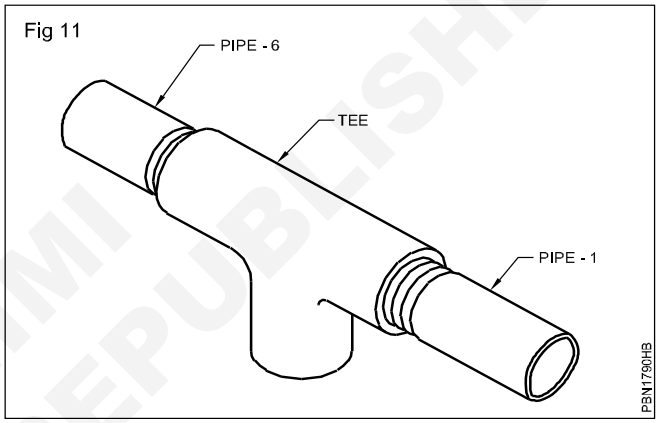


Fig 12

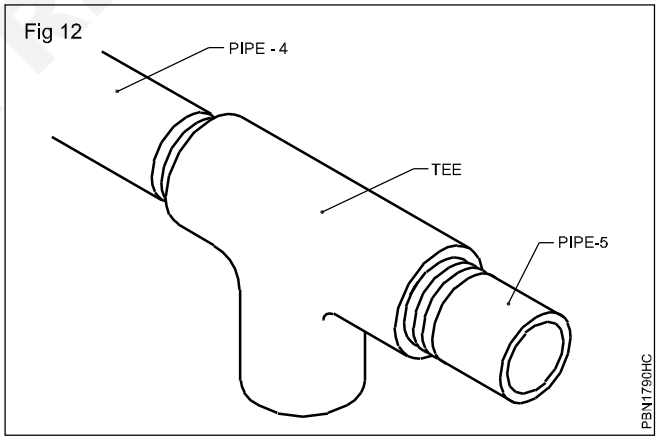


Fig 13

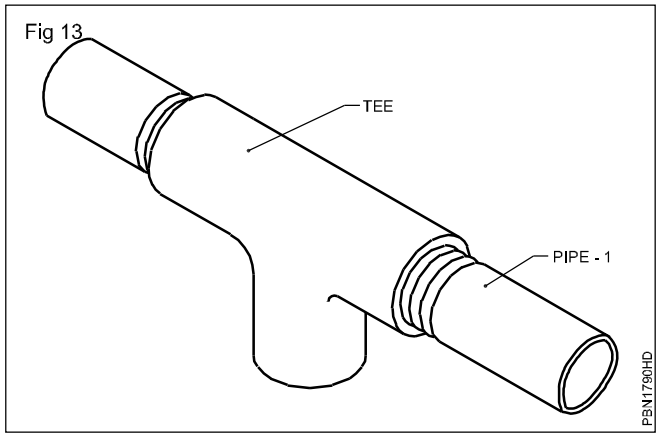


Fig 14

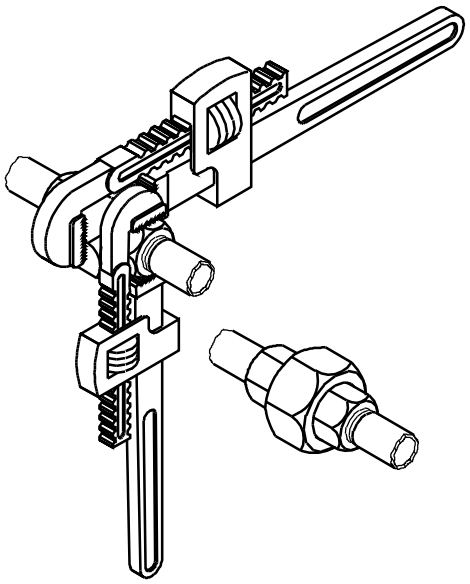


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Fig 15

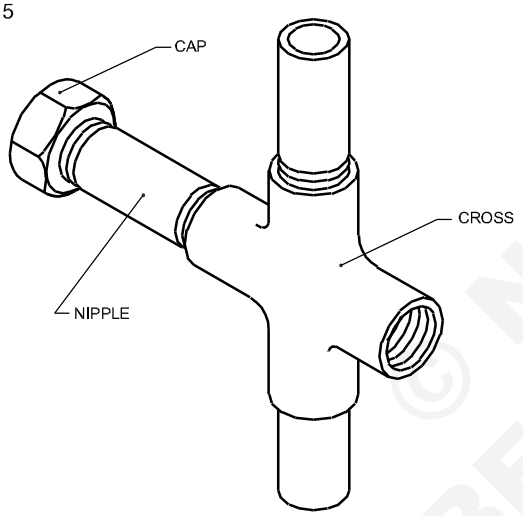

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Fig 16

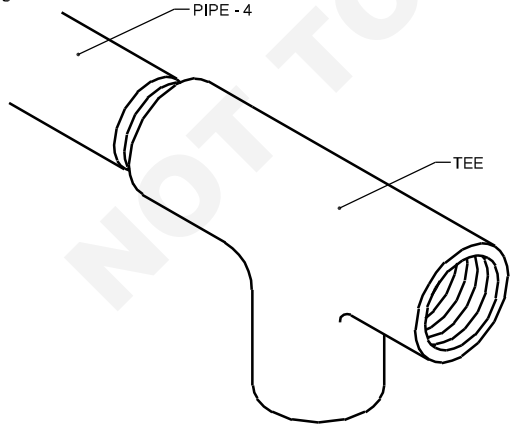

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Fig 17

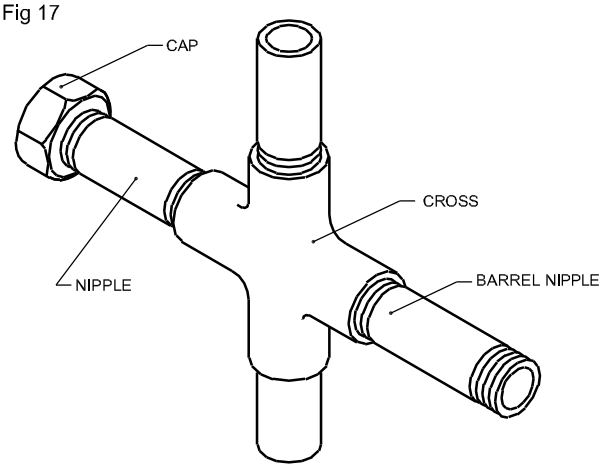

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Fig 18

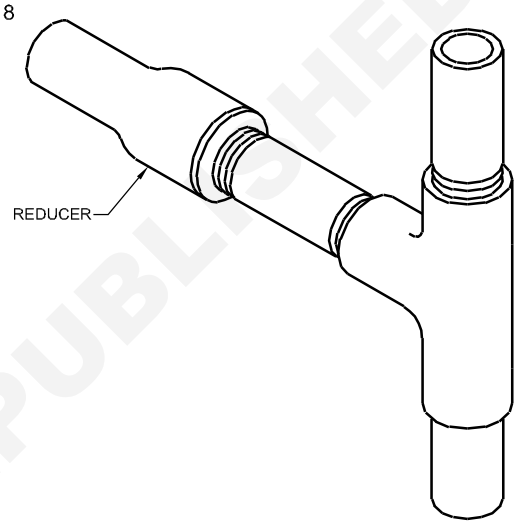

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Fig 19

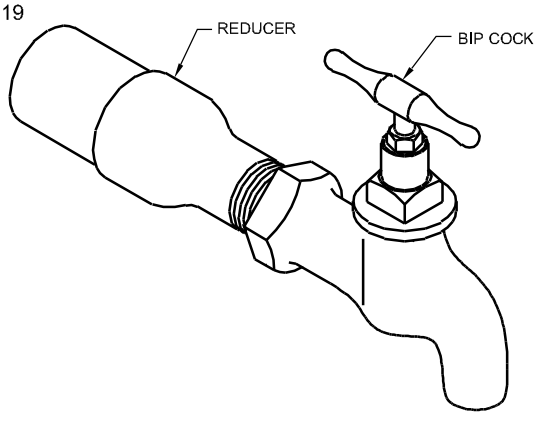

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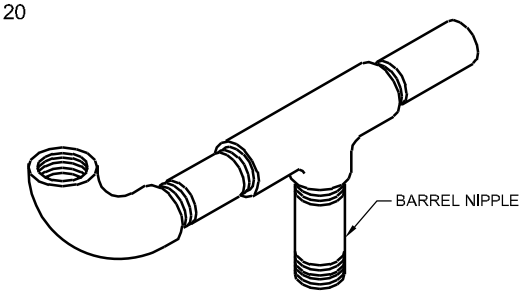
Fig 20



PBN1790HK

Make a pipe line for water distribution as per drawing

Objectives: At the end of this exercise you shall be able to
- **fix the elbow with G.I. pipe**
- **fix the union with G.I. pipe**
- **fix valves with G.I. pipe**
- **assemble pipe with standard fittings.**

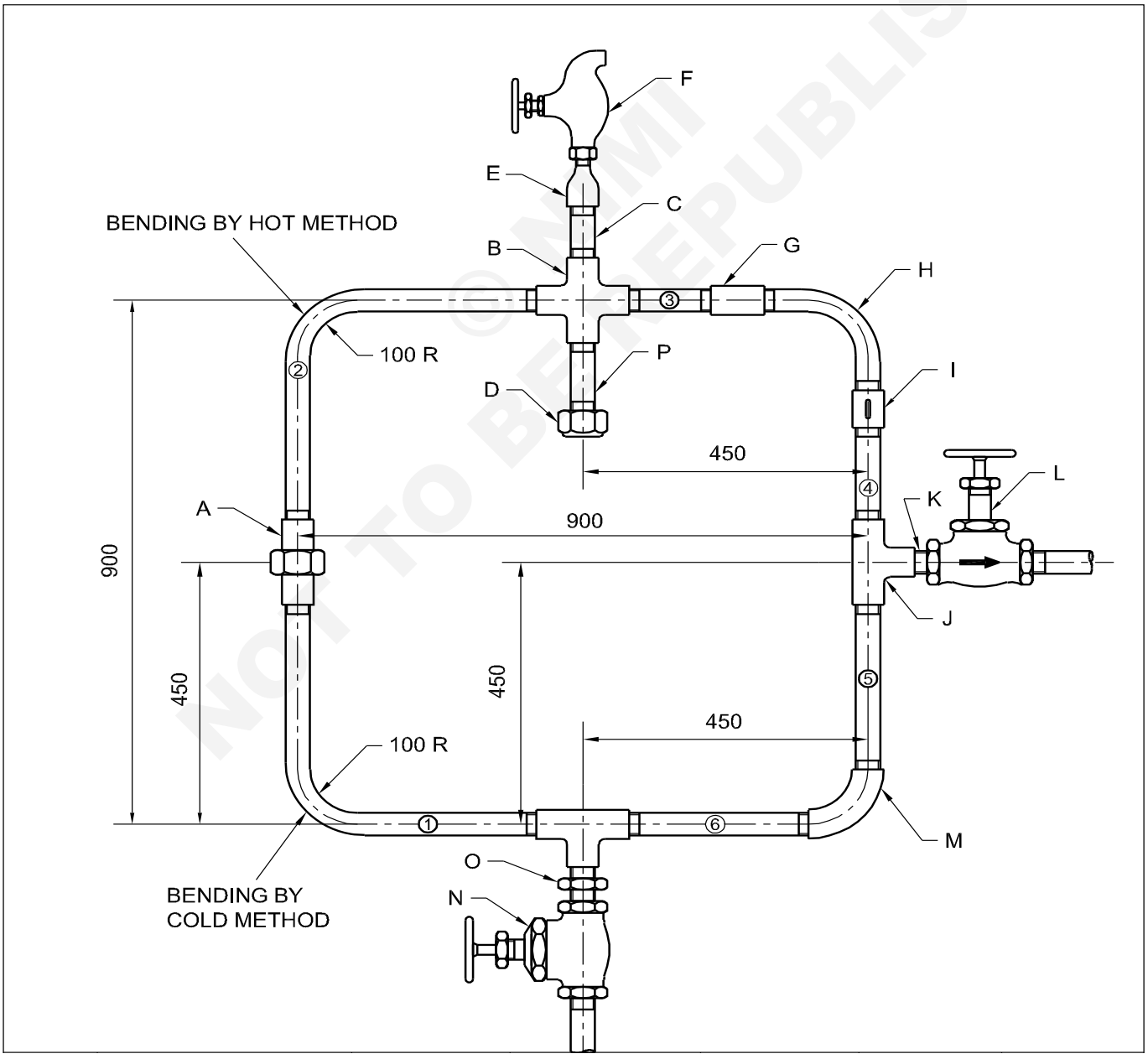
Requirements

Tools/Instruments

• Measuring steel tape	- 1 No.
• Hack saw frame with blade	- 1 No.
• Pipe vice	- 1 No.
• Cup model die stock with dies	- 1 No.
• pipe wrench	- 1 No.
• Ball pein hammer	- 1 No.
• Screw driver, Cutting plier,	- each 1No.
• Rawl jumper	- 1 No.

Equipment/Materials/Components

• G.I pipe,	- as reqd.
• G.I elbow, G.I Tee, G.I Bend, G.I union	- as reqd.
• G.I coupling, G.I Four way, G.I Cap	- as reqd.
• G.M wheel valve	- as reqd.
• G.I reducer coupling	- as reqd.
• Brass Bib cock	- as reqd.



Job Sequence

- Join pipe No. 2 with the 4-way cross. (B)
- Fit pipe No.3 with the 'cross'.
- Join plain coupling (G) to the other end of the pipe No. 3.
- Assemble G.I.bend (H) to the plain coupling.
- Fit the ribbed coupling (I) to the other end of the bend.
- Join pipe No. 5 to the opposite end of 'T'.
- Assemble elbow (M) with pipe No. 5,
- Fit pipe No. 6 with the other end of the elbow.
- Join 'T' with pipe No. 6.
- Fit pipe No. 1 with the opposite end of 'T'.
- Join pipe Nos. 1 & 2 with union. (A)
- Fit 150mm barrel nipple (P) to the left side of the 'cross' and put cap (A) for it.
- Put another 100mm barrel nipple (C) to the right side of the cross.
- Join the reducer (E) to the barrel nipple.
- Assemble the bib-cock (F) to the other end of the reducer.
- Put the hexagonal nipple (0) to the left side 'T'.
- Assemble the gate-valve to the nipple.
- Test the joints for leakage.

NO.OFF	STOCK SIZE	DESCRIPTION	MATERIAL	DRG. NO. (ASSY)	PART NO.	EX. NO.
1	25 x 150 mm	BRASS NIPPLE	G.I.	P	P	07
1	25 x 25 mm	HEXAGONAL NIPPLE	G.I.	O	O	07
1	25 mm	GATE VALVE	COPPER ALLOY	N	N	07
1	25 mm	ELBOW	G.I.	M	M	07
1	25 mm	GLOBE VALVE	COPPER ALLOY	L	L	07
1	25 x 100 mm	BARREL NIPPLE	G.I.	K	K	07
2	25 mm	TEE	G.I.	J	J	07
1	25 mm	RIBBED COUPLING	G.I.	I	I	07
1	25 mm	BEND 90°	G.I.	H	H	07
1	25 mm	PLAIN COUPLING	G.I.	G	G	07
1	1/2 INCH	BIB COCK	BRASS	F	F	07
1	25 x 15 mm	REDUCER	G.I.	E	E	07
1	25 mm	CAP	G.I.	D	D	07
1	25 x 100 mm	BARREL NIPPLE	G.I.	C	C	07
1	25 mm	CROSS	G.I.	B	B	07
1	25 mm	UNION (WITH WASHER)	G.I.	A	A	07
1	Ø25 x 4.05 - 405	PIPE (CLASS B)	G.I.	6	6	07
1	Ø25 x 4.05 - 410	PIPE (CLASS B)	G.I.	5	5	07
1	Ø25 x 4.05 - 290	PIPE (CLASS B)	G.I.	4	4	07
1	Ø25 x 4.05 - 300	PIPE (CLASS B)	G.I.	3	3	07
2	Ø25 x 4.5 - 820	PIPE (CLASS B)	G.I.	1 & 2	1 & 2	07

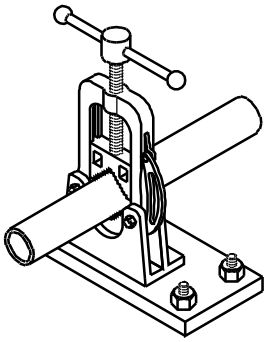
Skill Sequence

Assemble G.I. pipes with standard fittings

Objective: This shall help you to
- **assemble pipe and pipe fittings.**

Hold the pipe No.2 in a pipe vice. (Fig 1)

Fig 1



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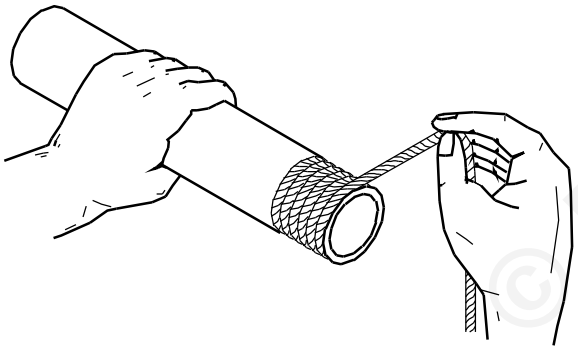
Wind the hemp packing/cotton thread material on the external threads of the pipe. (Fig 2)

Fig 2



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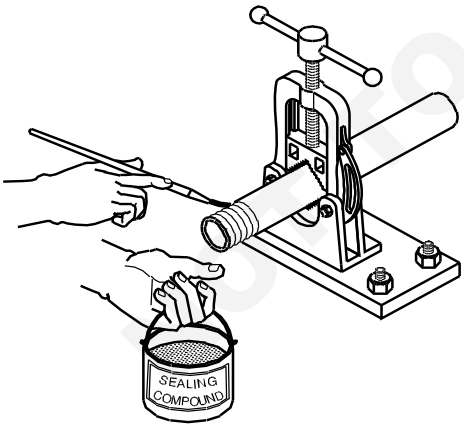
Apply sealing compound over the pipe threads. (Fig 3).

Fig 3



PBN1791H3

Fix the 4 way cross to pipe No.2 and tighten it using a pipe wrench.

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 4).

Fix pipe No. 3 with the cross. (Fig 5)

Fig 4

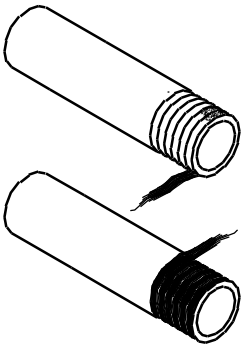


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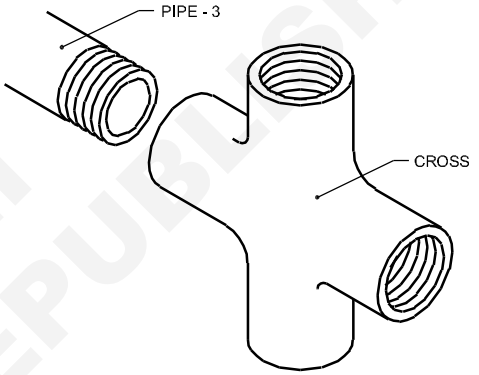
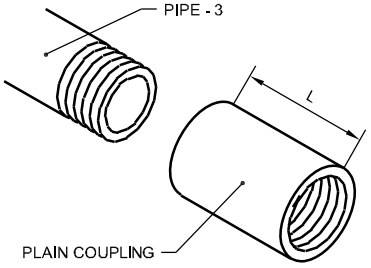
Fig 5



PBN1791H5

Join the plain coupling to the other end of the pipe No. 3 (Fig 6)

Fig 6



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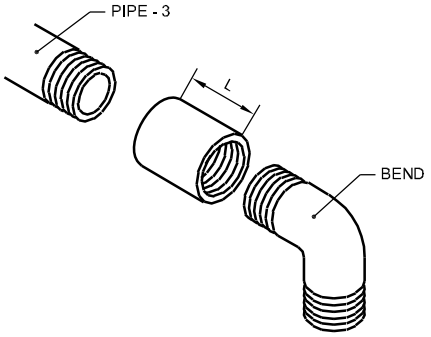
Fix the G.I bend to the plain coupling. (Fig 7)

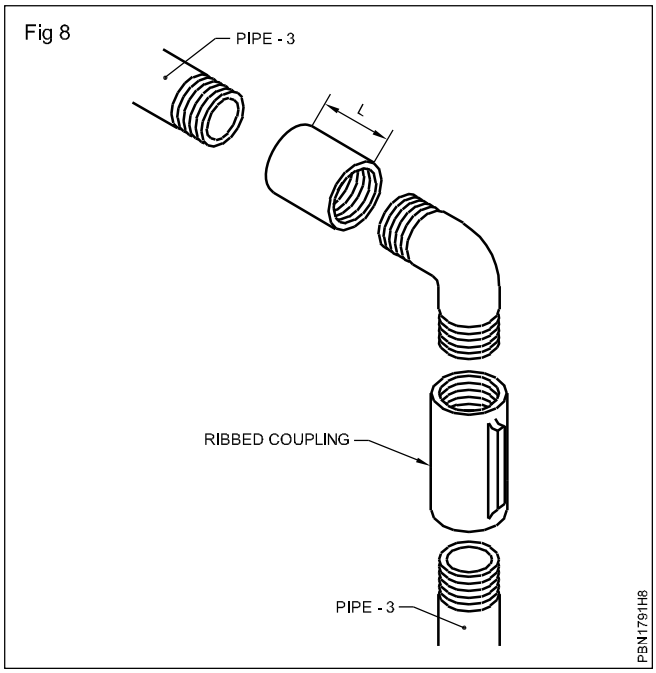
Fig 7



PBN1791H7

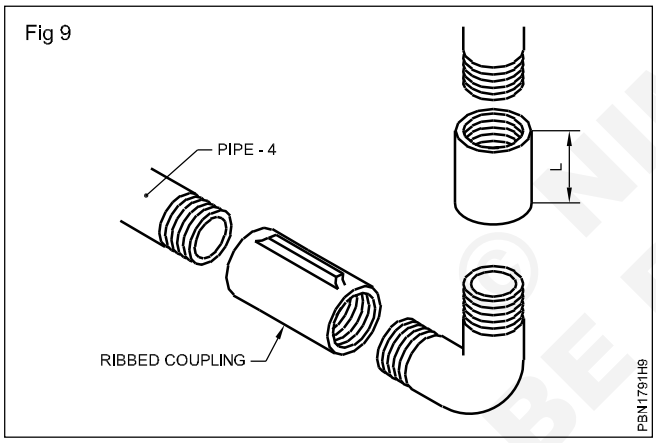
Assemble the step coupling to the other end of the G.I.bend. (Fig 8)

Fig 8



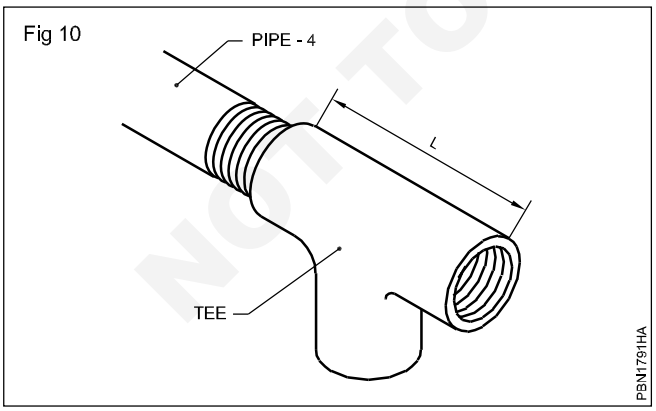
Connect pipe No. 4 to the step coupling. (Fig 9)

Fig 9



Fit 'T' with pipe No. 4. (Fig 10)

Fig 10



Connect pipe No. 5 to the opposite end of 'T'. (Fig 11) Clean the machine thoroughly.

Assemble the elbow with pipe No. 5. (Fig 12)

Fix pipe No. 6 with the other end of the below. (Fig 13)

Fig 11

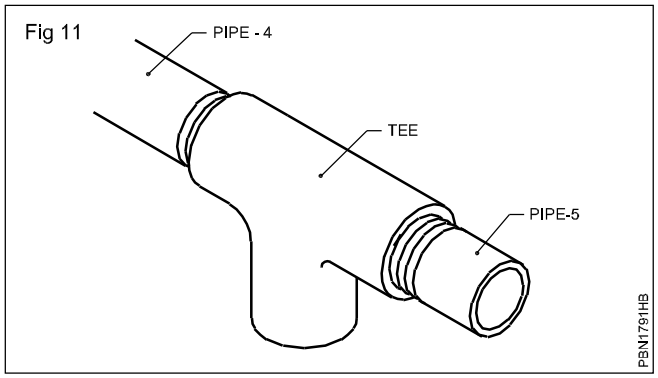


Fig 12

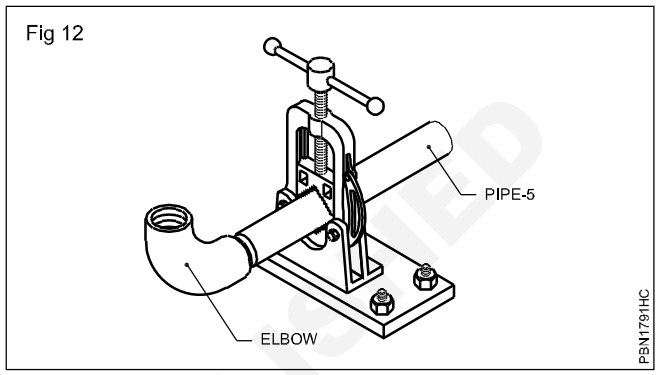
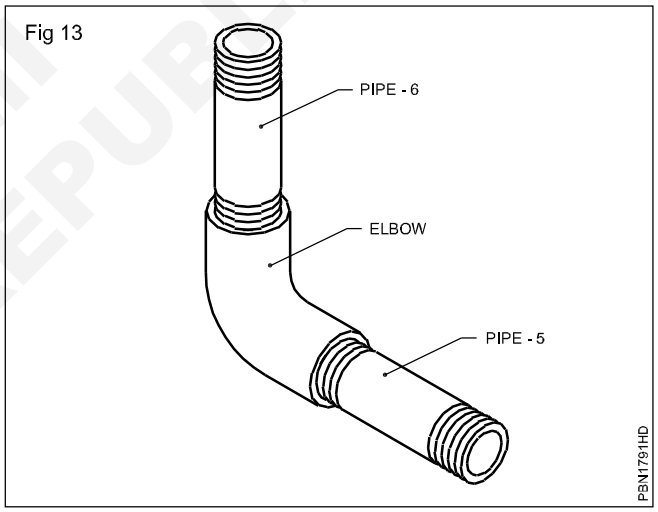
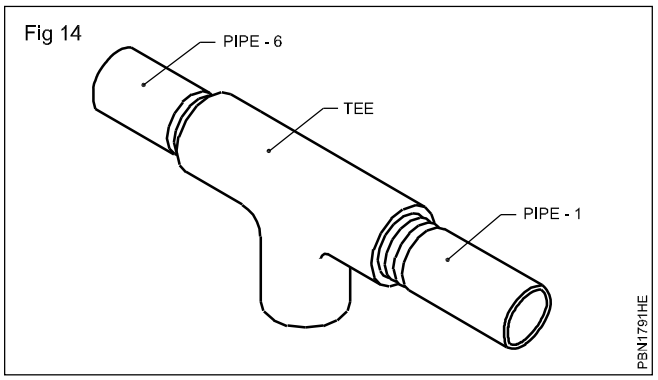


Fig 13



Connect 'T' with pipe No. 6 (Fig 14)

Fig 14



Fix pipe No. 1 with the opposite end of 'T'. (Fig 15)

Fix the rubber washer into the union. Set pipe Nos. 1&2 with the union.

Hold one side of the union in pipe wrench and the ring of union in the other. (Fig 16)

Fig 15

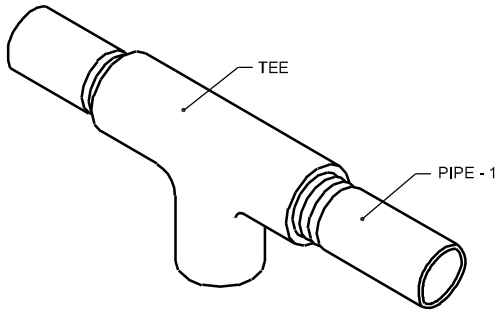
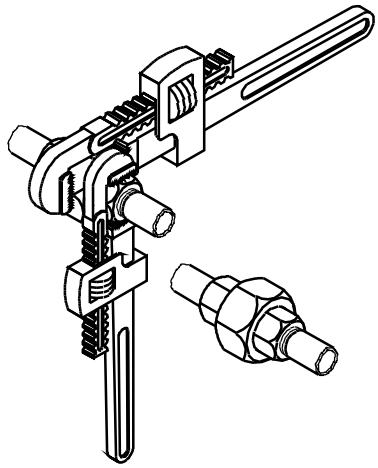


Fig 16

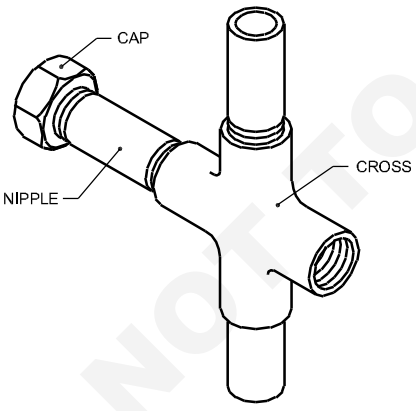


Turn the two pipe wrenches gently in opposite directions and assemble.

Use grease or vaseline on the union joint for easy disconnection.

Fix a 150mm barrel nipple to the left side of the cross and put a cap for it. (Fig 17)

Fig 17



Join another 150mm barrel nipple to the right side of the cross. (Fig 18)

Connect the reducer to the barrel nipple. (Fig 19)

Assemble a bib-cock to the other end of the reducer. (Fig 20)

Fix a 100mm barrel nipple to the bottom side of 'T'. (Fig21)

Assemble the gate-valve to the 100mm barrel nipple. Allow a clearance between the valve and pipe as shown in (Fig 22).

Fig 18

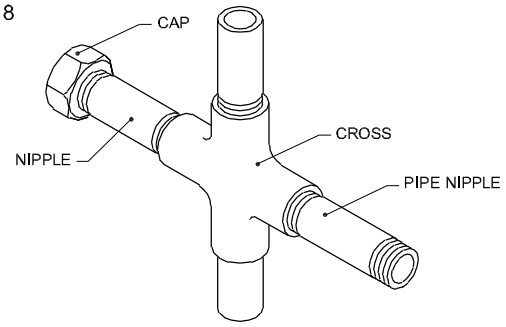


Fig 19

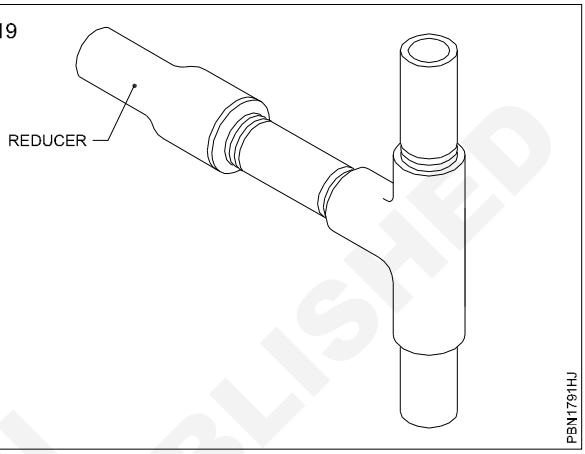


Fig 20

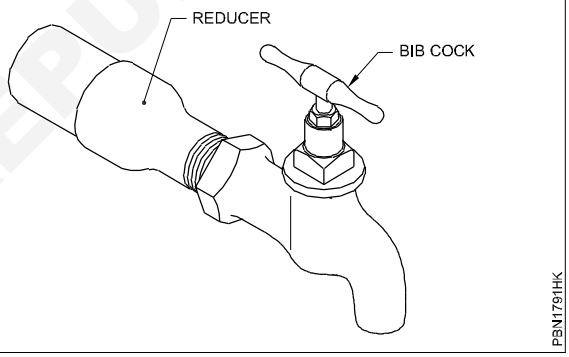


Fig 21

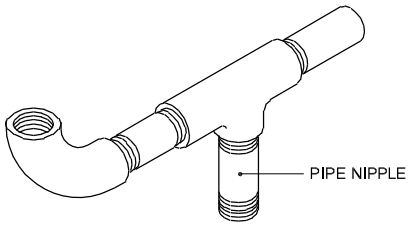
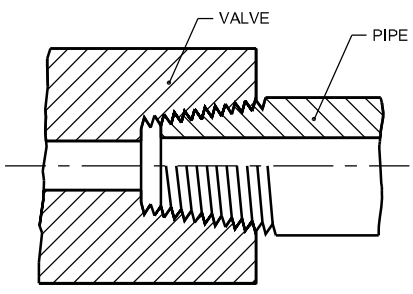


Fig 22



Make a pipe line for OHR water distribution system as per drawing

Objectives: At the end of this exercise you shall be able to
- **identify overhead tank location understanding through diagram**
- **state the method of gravity distribution, pressurised distribution system, water level controller**
- **state the method of pipeline connections to building**
- **use fittings in water distribution systems to arrest water hammer.**

PROCEDURE

1 Identify the various overhead reservoir through pictures.

2 Understand the required pipes, fittings, faucets, appurtenances needed for making pipe line connections. (Fig 1)

3 Identify the underground storage tank connections through figures.

4 Give connections according to the drawing using various pipes and fittings.

5 Gives inlet connections to the sanitary fittings using various pipes and fittings.

6 Fix water level controller to the OHT to maintain water level.

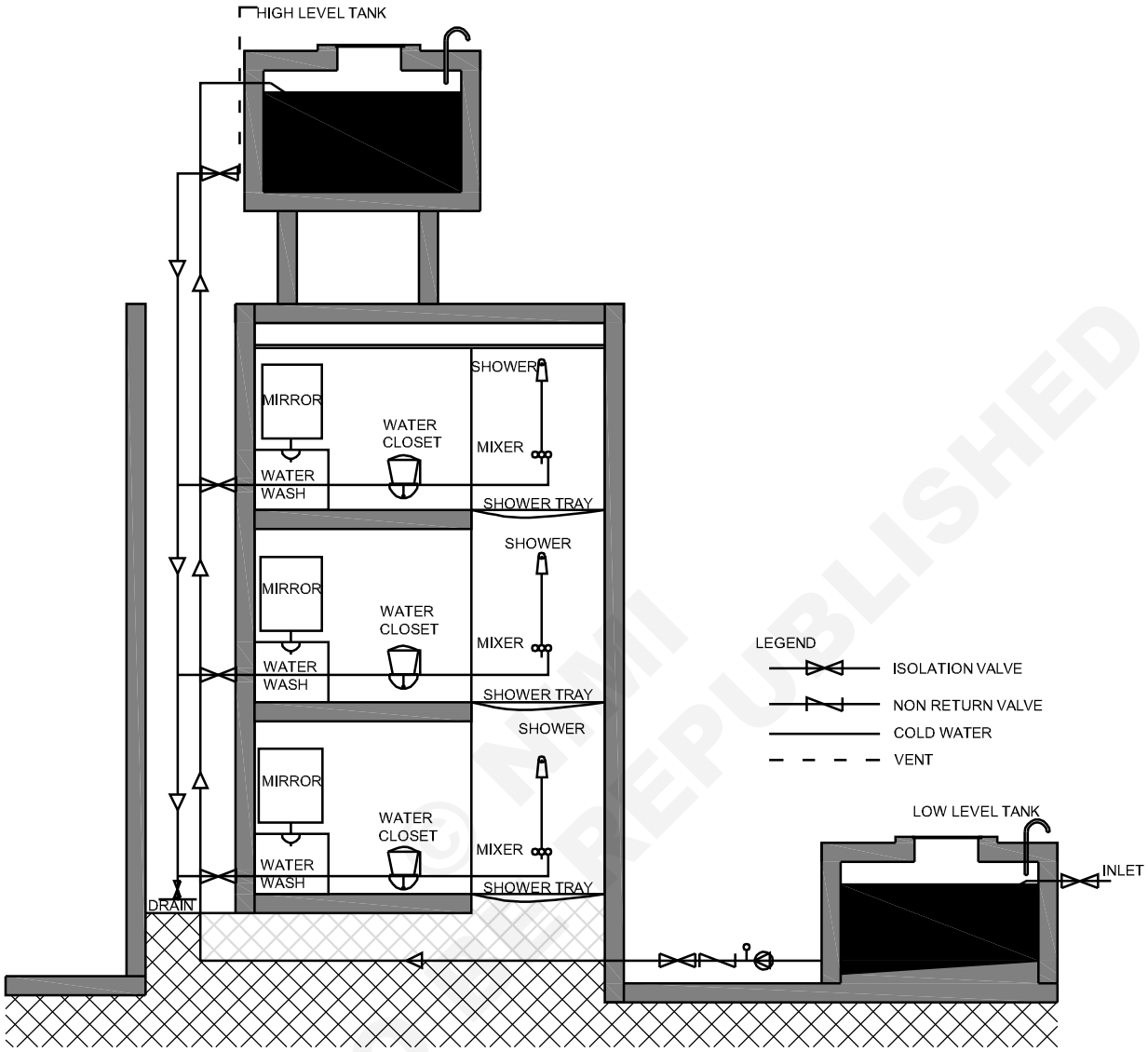
7 Fix water hammer arrestor to protect water hammer.

8 Fix pump set to the sump for pumping water to overhead tank.

9 Fix non-return valve, float valve, ball valve to the sump.

10 Air vent, inspection opening providing for both OHT and sump.

Fig 1



WATER SUPPLY - GRAVITY SYSTEM

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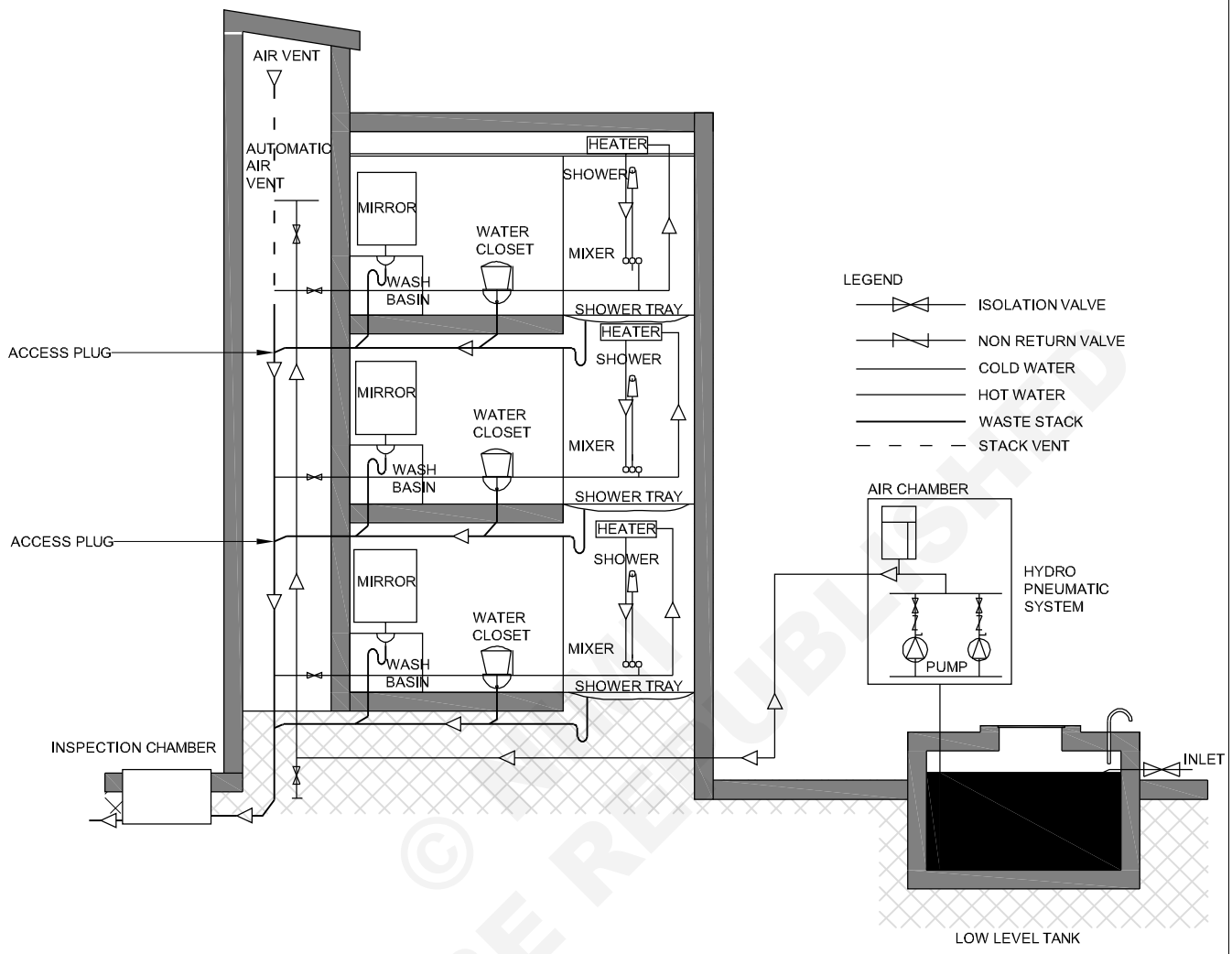
Typical plumbing system (Pressurized water distribution)
(Fig 2)

Fig 2



Water level controller (Figs 3&4)

Water level controllers are used for facilitating the operation of pumps for automatic filling of storage tanks. Level sensors provided at pre-determined high and low levels within water tanks dictate starting and stoppage of pumps in the absence of water in the tank.

Fig 3

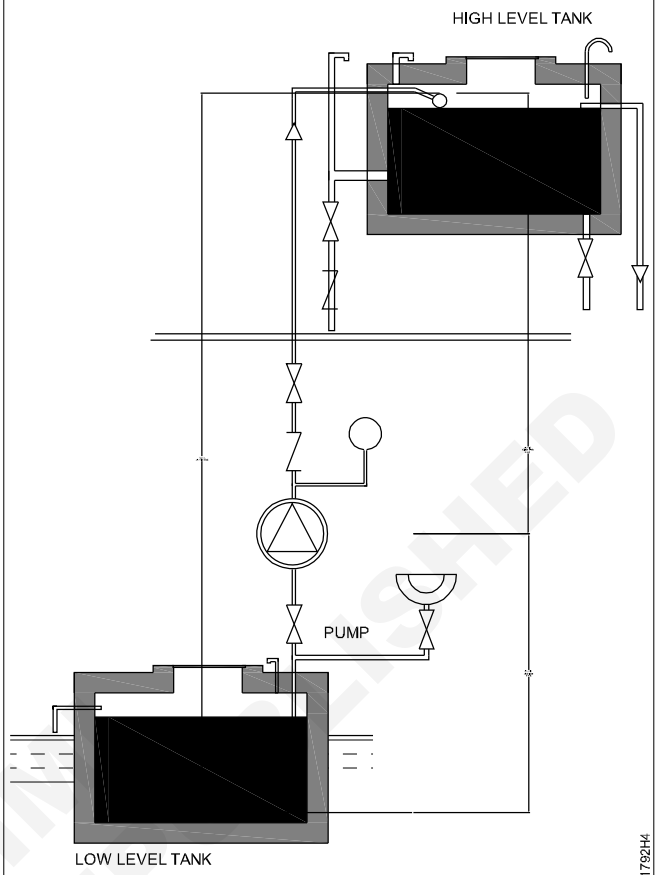
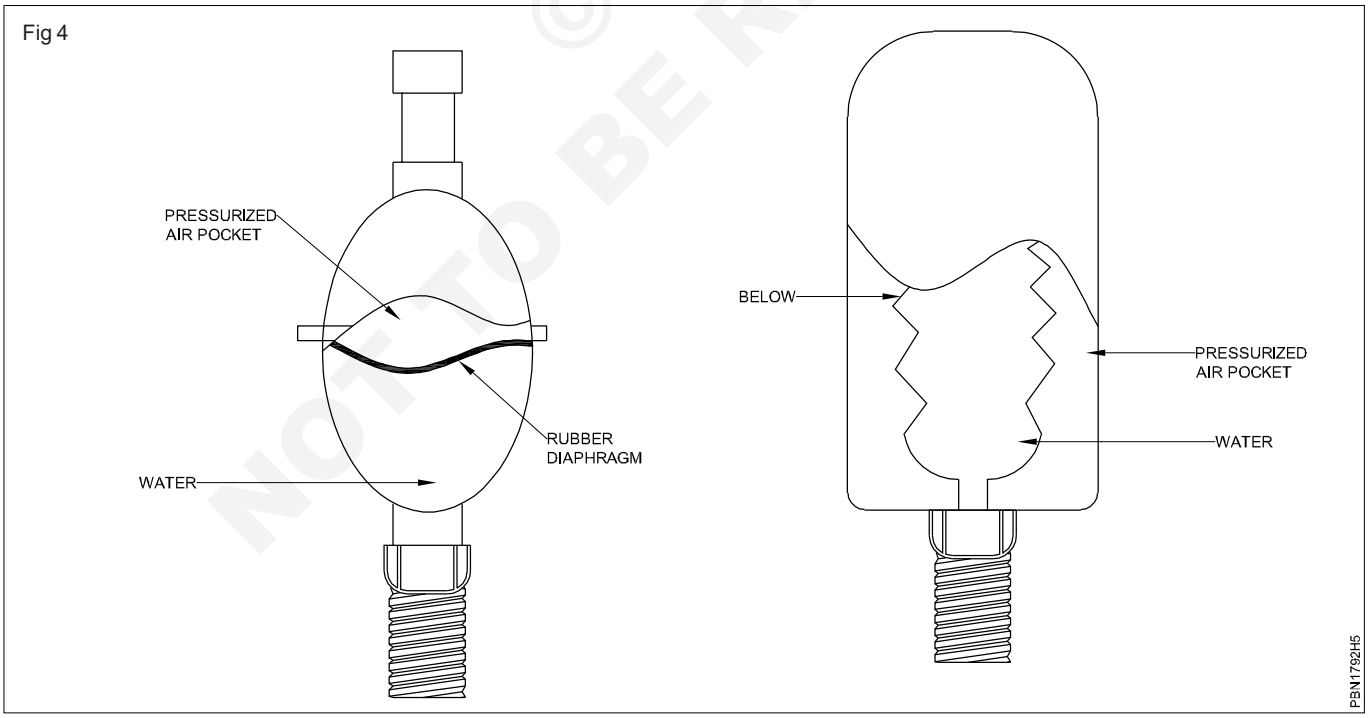


Fig 4



Installation of water hammer arrester

Objectives: At the end of this exercise you shall be able to
- **prepare materials for water hammer arrester**
- **connect the water hammer arrester the pipe line**
- **test the proper working of water hammer arrester.**

Requirements

Tools/Instruments

• Pipe wrenches	- 1 No.
• Water pump plier	- 1 No.
• Adjustable spanner	- 1 No.
• Screw driver	- 1 No.
• Hack saw frame	- 1 No.
• Hammer	- 1 No.

Equipment/Materials/Components

• Water hammer arrester	- as reqd.
• G.I or P.V.C threaded tee	- as reqd.
• Hexagonal nipple	- as reqd.
• Hack saw blade	- as reqd.
• Thread seal materials	- as reqd.

PROCEDURE

1 Draw a diagram by seeing job sheet.

2 Select proper tools and materials according to the diagram.

3 Identify and choose the correct water hammer arrester to be fix. (Figs 1 & 2)

4 Make a pipe line circuit as per diagram using B.S.P die set and pipe vice.

5 Assemble the water hammer arrester in the tee fitting in vertical position.

6 Identifying different water hammer arrester according to their usage by seeing figures.

7 Check the pressure by opening the valve and identify the water leakages.

8 To avoid water hammer and shock or noise always use slow turning screw down taps and valves in the high pressure pipe line.

Fig 1

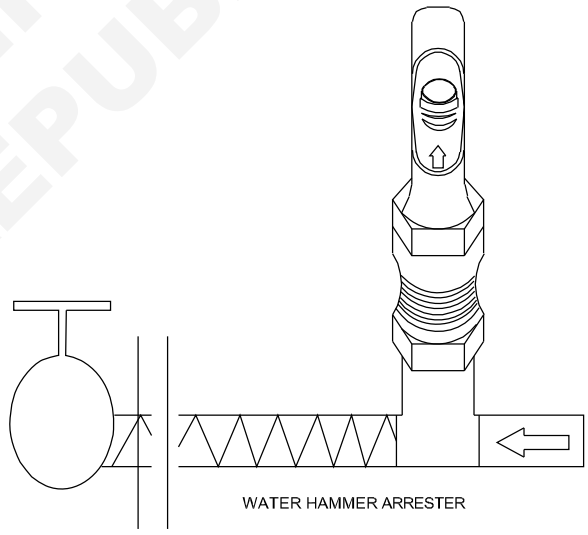
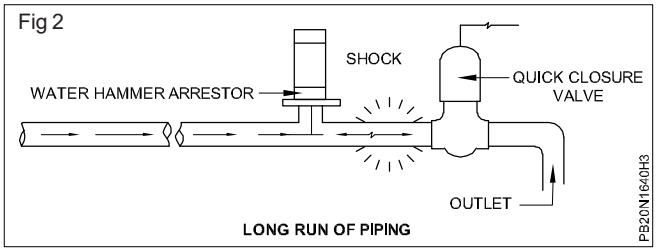


Fig 2



Interpret drawing of sanitary plumbing

Objectives: At the end of the exercise you shall be able to
- **demonstrate the layout of drainage system**
- **idenfity 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.

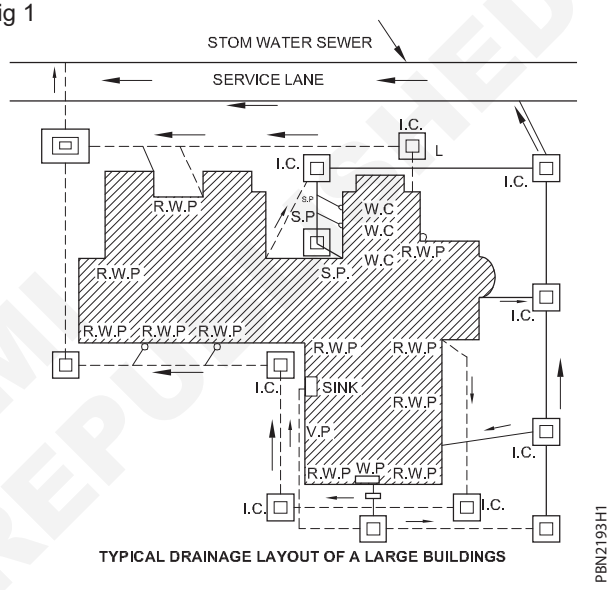
6 Identify the plumbing symbols as per drawing.

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 as 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.

Fig 1



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.

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.

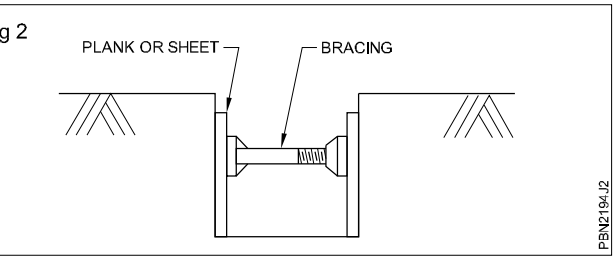
Fix a straight rail at mark.

Tie a string from sight rail A to B tightly. (Fig 2)

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.

Fig 2



Lay and align hummed pipe

Objective: At the end of the exercise you shall be able to
- **lay underground pipes (hummed pipe).**

Requirements

Tools/Instruments

• Spade	- 1 No.
• Pick axe	- 1 No.
• Shovel	- 1 No.
• Sight rail	- 1 No.
• Bonning rod	- 1 No.
• Baseline string	- 1 No.
• Mortar pan	- 1 No.
• Trowel	- 1 No.
• Caulking tool	- 1 No.
• Spirit level	- 1 No.
• Plumb bob	- 1 No.
• Marking media (blue)	- 1 No.
• Measuring tape	- 1 No.
• Ball peen hammer	- 1 No.
• Screw driver	- 1 No.
• Chisel	- 1 No.

Equipments

• Hoisting accessories	- as reqd.
• Hammer drill m/c	- as reqd.

Material

• Hummed pipe 150~300 mm x 10'	- 2 Nos.
• Spun yarn rope	- as reqd.
• Portland cement	- as reqd.
• AC pipe	- as reqd.
• Fine river sand	- as reqd.
• 'U' Clamp (or) Special clamp	- as reqd.
• Cotton waste	- as reqd.
• Jute yarn	- as reqd.
• Screws	- as reqd.
• Wall tight plug wood	- as reqd.
• AC Bend (90°)	- as reqd.
• AC off set	- as reqd.
• AC shoe	- as reqd.
• Gutter	- as reqd.
• Swan neck	- as reqd.

PROCEDURE

TASK 1:

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.

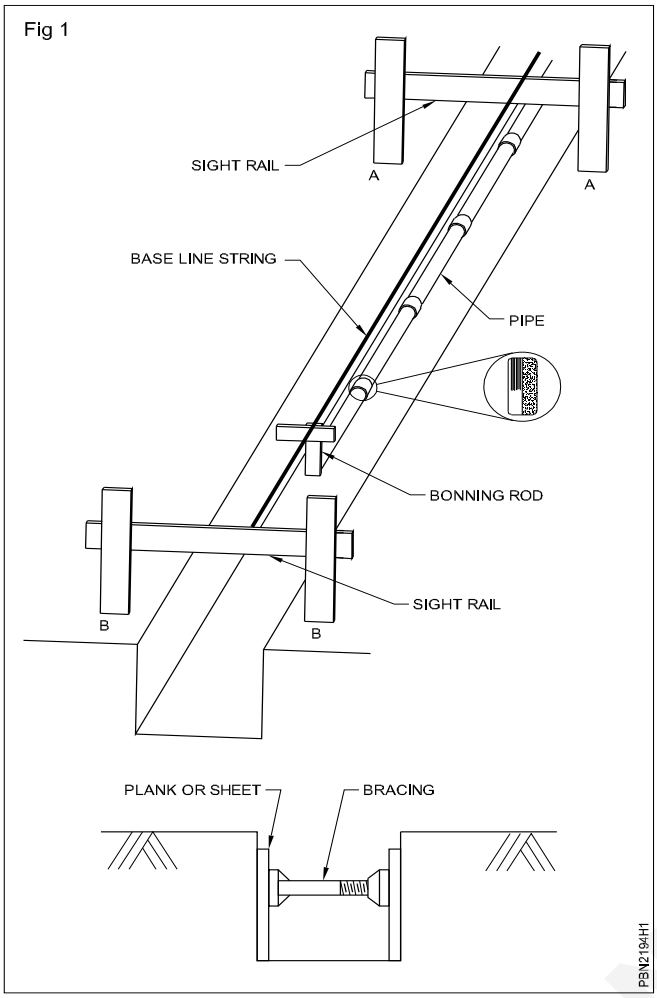
3 Dig the Trench

- 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. (Fig 1)

Fig 1



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.

Joints in stone ware pipe

Objective: At the end of this exercise you shall be able to
- **joint stone ware pipe.**

TASK 1: **Joints in stone ware pipe**

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

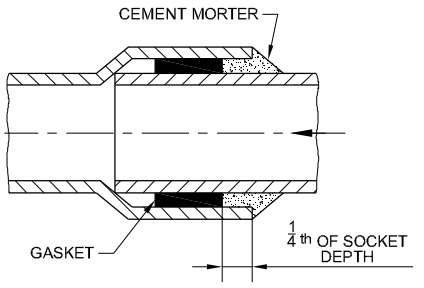
2 Place tarred gasket of hemp yarn soaked in thick cement slurry around the spigot end (Fig 1).

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

Socket end to face up stream

1 Adjust the pipe alignment.

Fig 1



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

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

4 Form a fillet round the joint with a trowel at 45^0 angle.

5 Remove foreign materials from inside pipe.

6 Cure the joint for 7 days.

Test the pipe joints

Objective: At the end of this exercise you shall be able to
- **test the joints.**

TASK 1: **Test the pipe joints**

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

2 Fill the system with water (Fig 1).

3 Join a knuckle bend temporary at top end.

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

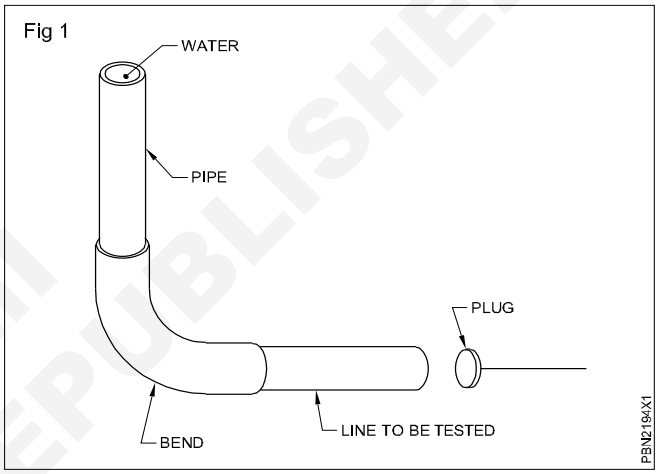
5 Fill this pipe also with water.

6 Check for leakage.

7 Rectify the leakage or sweating if any.

8 Re-test.

Fig 1



Refill the trench

Objective: At the end of this exercise you shall be able to
- **refill the trench if not bedded in concrete.**

TASK 1: **Refill the trench**

1 Pack refill material by hand under and around the pipe.

2 Ram with a shovel and light tamper.

3 Continue upto 600mm above top of pipe. (Don't tamp with in 150mm of top of pipe.)

4 Refill the balance area.

Lay the cement concrete

Objective: At the end of this exercise you shall be able to
- **lay concrete to stoneware pipe.**

TASK 1: **Lay the cement concrete**

1 Ram the bottom of trench.

2 Water the ramed area.

3 Mark the height of bedding (Fig 1).

4 Lay concrete.

5 Lay the pipe and joint.

6 Lay the concrete upto the haunch of pipe.

7 Finish with mortar.

8 Prepare two template of the required shape as per drawing.

9 Fix the template at two ends.

10 Put concrete in line with template shape.

11 Finish the surface neatly.

12 Cure it.

W = D + X

Where

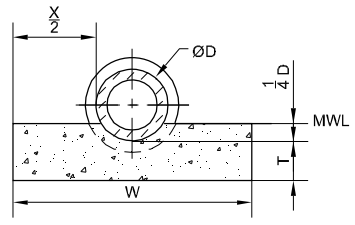
D - is the external diameter of the pipe.

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

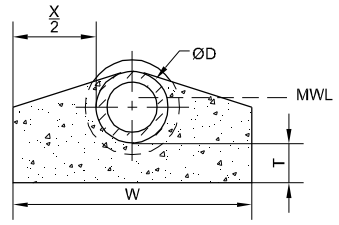
T - 100mm for pipes under 150mm, 1/4th internal diameter subject to a minimum of 150mm and maximum of 300mm for pipes more than 150mm

MWL - Maximum water level

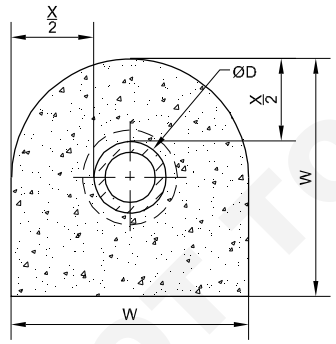
Fig 1



CONCRETE BEDDING



CONCRETE UPTO HAUNCHES



CONCRETE ALROUND

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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. (Figs 1&2)

8 Test the joints.

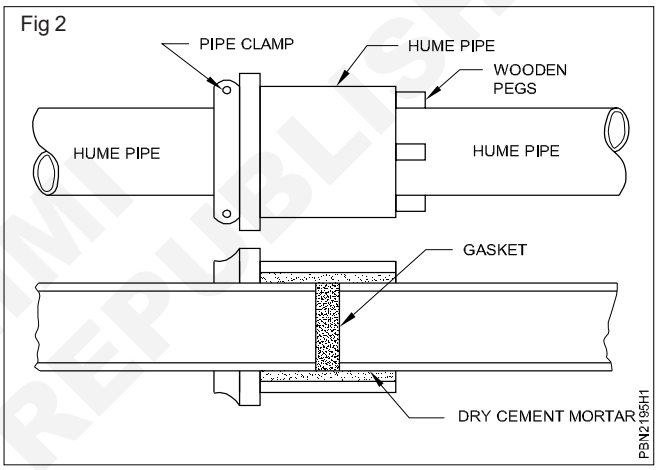
9 Lay the concrete as per standard.

10 Refill the trench.

1 Read the drawing for calculating raw material required.

2 Prepare the material as per job sheet.

Fig 2



Demonstrate use of specific dia in different location

Objectives: At the end of the exercise you shall be able to
- **identify the different dia pipes**
- **specify the pipes used in different locations.**

Requirements

Tools/Instruments

- Trowel - 1 No.
- Tin bond - 1 No.
- Pipe cutter - 1 No.
- Plumb bob, hammer, rawl jumper - 1 No.

Equipments

- Drilling machine - 1 No.

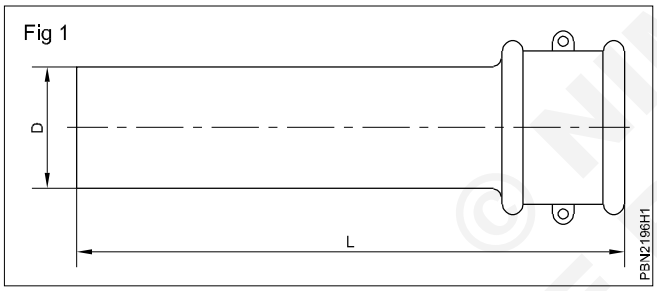
Material

- Cotton waste - as reqd.
- Rubber - as reqd.
- Gasket rubber - as reqd.
- Cement - as reqd.
- Sand - as reqd.
- Sand cast iron pipe - as reqd.

PROCEDURE

TASK 1: **Types of pipes used for waste and ventilation (Fig 1)**

Fig 1



1 Sand cast iron pipe for waste water

2 Sand cast iron pipe for soil water

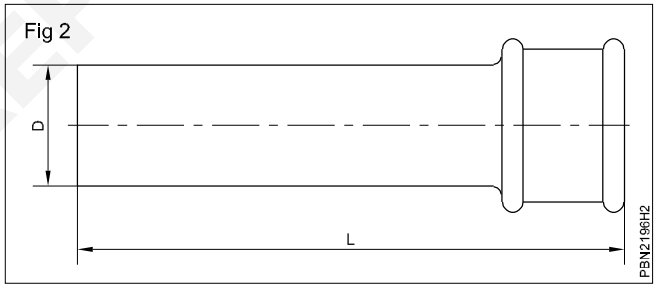
3 Sand cast iron pipe for rain water

4 Sand cast iron pipe for ventilation

5 Working pressure not more than 50% of test pressure for pumping mains and 67% for gravity mains.

Refer Ex. No 1.10.96 (Jointing method)

Fig 2



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Use various sanitary fitting

Objectives: At the end of the exercise you shall be able to
- **troubleshoot hummed pipe**
- **repair of hummed pipe.**

Requirements

Tools/Instruments

- Spade - 1 No.
- Pick axe - 1 No.
- Showel - 1 No.
- Crow bar - 1 No.
- Mortar pan, trowel - 1 No.
- Caulking tool - 1 No.
- Chisel - 1 No.
- Ball peen hammer - 1 No.
- Screw driver - 1 No.
- Hacksaw frame with blade - 1 No.
- Spirit level - 1 No.
- Wedge - 1 No.
- Marking thread - 1 No.
- Plumb bob - 1 No.
- Tube level - 1 No.
- Wood raps file - 1 No.
- Mallet - 1 No.
- Measuring tape - 1 No.

Equipments

- Hammer drill m/c - 1 No.

Material

- Jute yarn - as reqd.
- Gasket (hemp yarn) - as reqd.
- Concrete pipie - as reqd.
- Cement - as reqd.
- Fine riversand - as reqd.
- Rubber rings - as reqd.
- Concrete collar - as reqd.
- Cotton waste - as reqd.

PROCEDURE

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. (Figs 1 & 2)

Fig 1

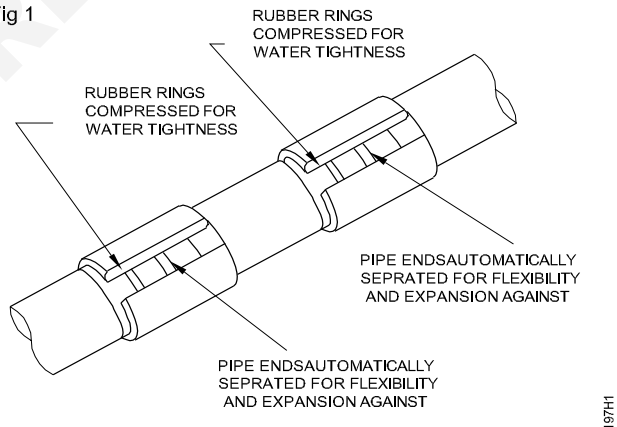
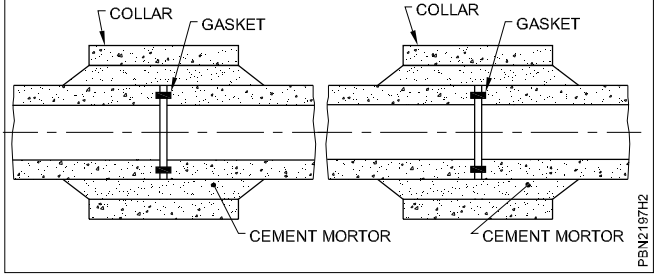


Fig 2



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 compact 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.

Safety
- Handle proper tool use proper handle in a hammer.
- Handle molten lead carefully by using Pot and Tongs.
- Fill the molten lead continuously.
- Caulk the lead after pouring. (Figs 1&2)

Fig 1

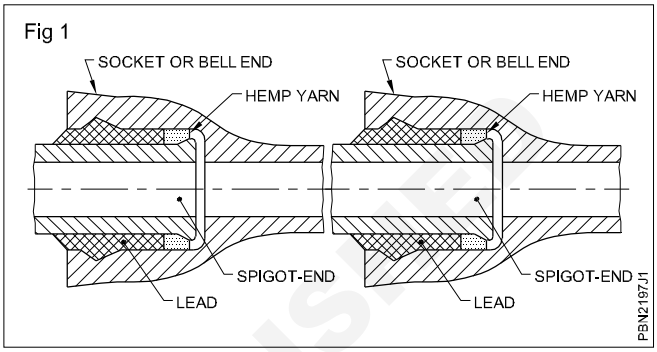
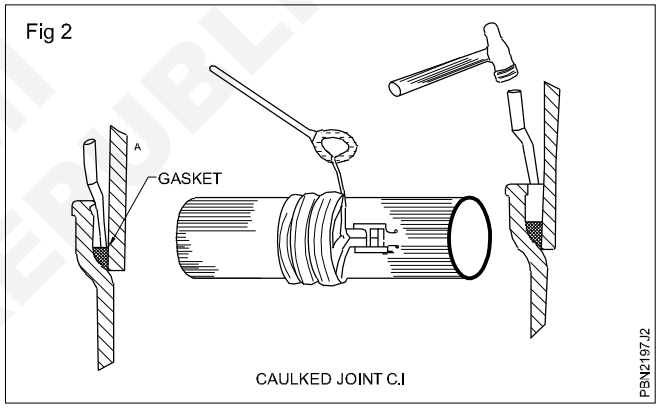


Fig 2



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. (Fig 1)

3 Place Gasket middle of the two flange

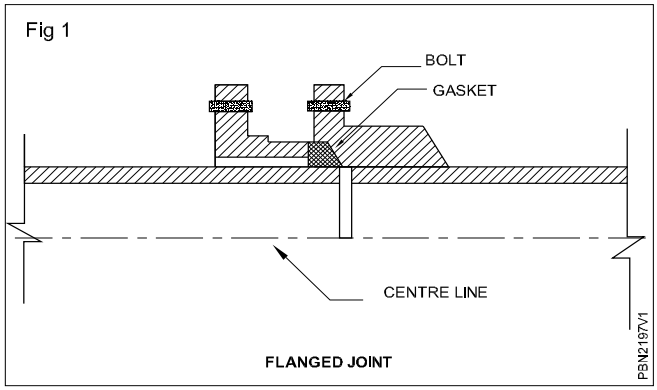
4 Tight the nut & bolt flange by using spanner.

5 Check the joint by using sprit level. (Fig 2)

6 Check the alignment of pipe line.

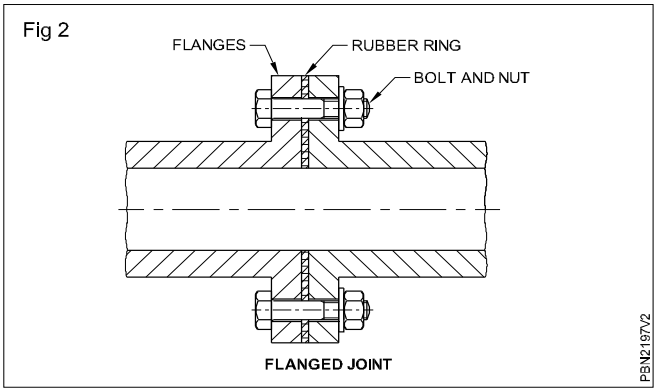
Safety
- Use proper hand tools.
- Don't over tight the flange
- Don't fix flange without Gasket.

Fig 1



FLANGED JOINT

Fig 2



FLANGED JOINT

S.W Pipe (socket and spigot) Joint

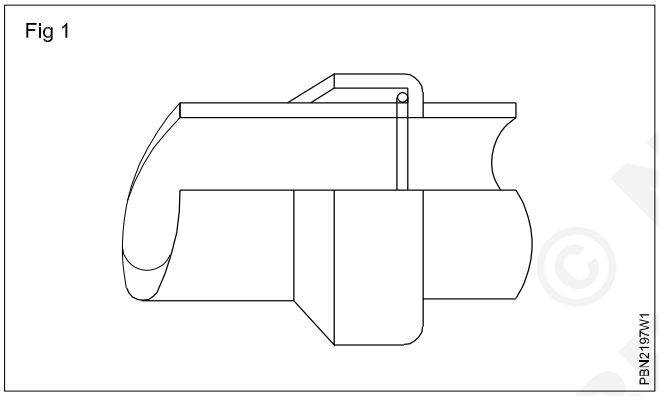
Objectives: At the end of the exercise you shall be able to

- **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.

Fig 1



3 Adjust the pipe in correct positions giving uniform gap around.

4 Insert hemp yarn socks in cement morter 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
- Don't allow cement mortar inside the pipe
- Mortar preparation should be proper ratio.

Plumbing **Exercise 1.7.64**
Plumber - Piping System

Use various fitting of different material

Refer the Exercise : 1.7.63

— — — — — — — —

Plumbing **Exercise 1.7.65**
Plumber - Piping System

Use joining materials of pipe

Refer the Exercise : 1.7.63

— — — — — — — —

Plumbing **Exercise 1.7.66**
Plumber - Piping System

Join pipe as per laid down procedure

Refer the Exercise : 1.7.63

— — — — — — — —

Demonstrate use of different pump

Objectives: At the end of the exercise you shall be able to
- **prepare installation material for bed forming**
- **commission the pump and motor's onto the bed**
- **connect the suction line and delivery line**
- **test the suction line and delivery line.**

Requirements

Tools/Instruments

- Pipe wrench - 1 No.
- Spanner set - 1 No.
- Screw driver - 1 No.
- Spirit level - 1 No.
- Trowel - 1 No.
- Hammer - 1 No.
- Chisel - 1 No.
- Measuring tape - 1 No.
- Feeler gauge - 1 No.
- Tin bond - 1 No.
- India mark special tool kit - 1 No.
- Hacksaw frame - 1 No.
- Pipe vice - 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.

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 pump set - 1 No.
- Foundation template, Bolt & Nuts - 1 No.
- Submersible pump - 1 No.
- Teflon tape - 1 No.
- Insulation tape - 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.
- Strainer, Gasket washer - as reqd.
- Existing borewell - as reqd.
- Rigid couplings - as reqd.
- Hacksaw blade - as reqd.
- Lubricating oil - as reqd.
- Grease - as reqd.
- Flange washer - as reqd.
- Union - as reqd.
- Nipple - 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.

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.

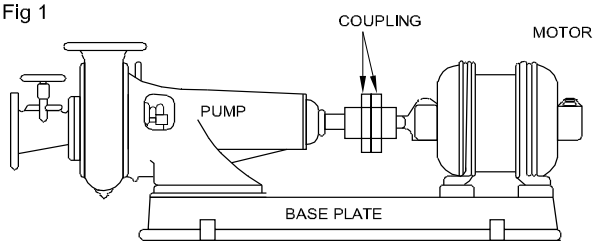
e Remove the template and levelling the bed.

f Erecting the bed.

g g Commissioning the pump and motor on the bed with help of sprit level and feeler gauge.

h Alignment the pump pulley & motor pulley.

Fig 1



SMALL CENTRIFUGAL PUMP AND MOTOR ON A COMMON CASTIRON BASE

Alignment pulley

To assemble pump pulley & motor pulley properly.

If not properly alignment following defects are developed.

- **Love 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 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

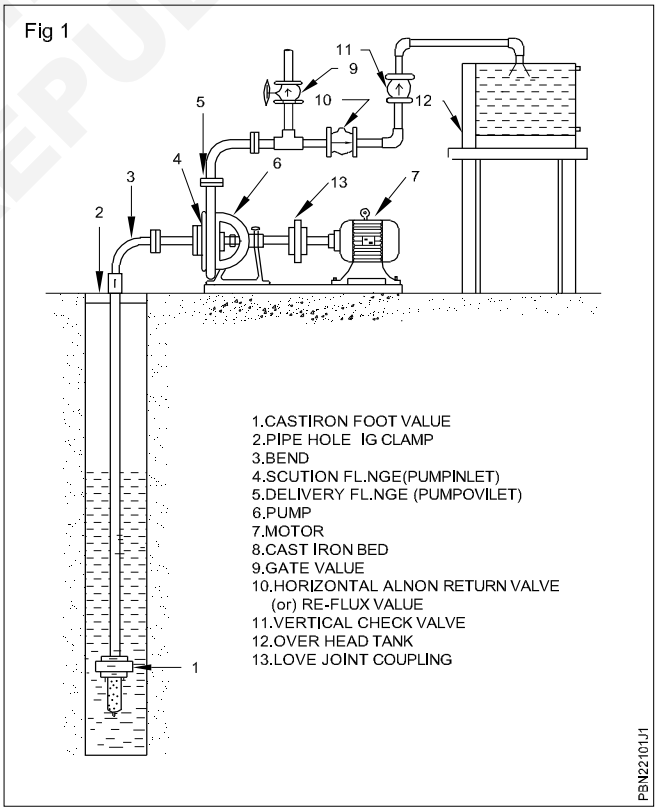
9 Switch on the pump.

10 Check the suction pipe & delivery pipe.

Safety

- Use proper hand tool.

Fig 1



- 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.

Fig 2

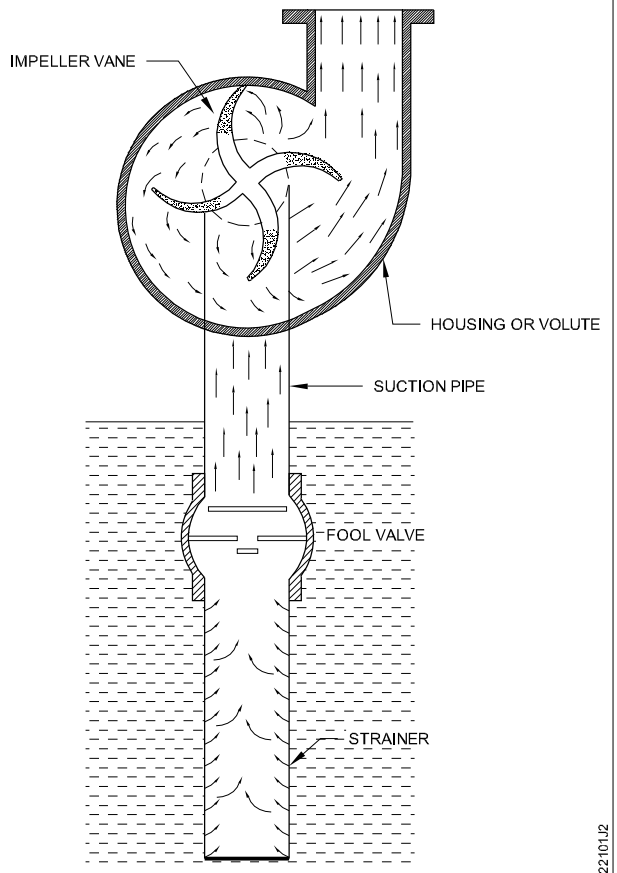
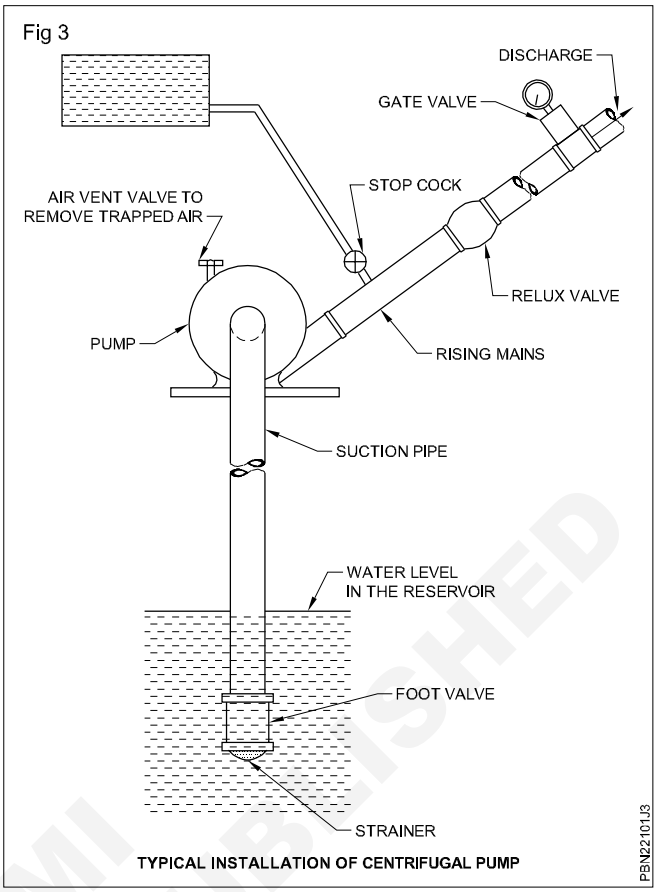


Fig 3



TYPICAL INSTALLATION OF CENTRIFUGAL PUMP

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)**
- **commission the pump in the wall brackets/bed**
- **connect the suction and delivery line**
- **test 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 quring.

5 Fixing the suction pipe with check valve.

6 To provide pump base with weight washer (or) air washer

Weight washer placed at cylinder base.

7 Connect the cylinder fix on the base with bolt & nuts.

8 To assemble cup washer with plunger rod.

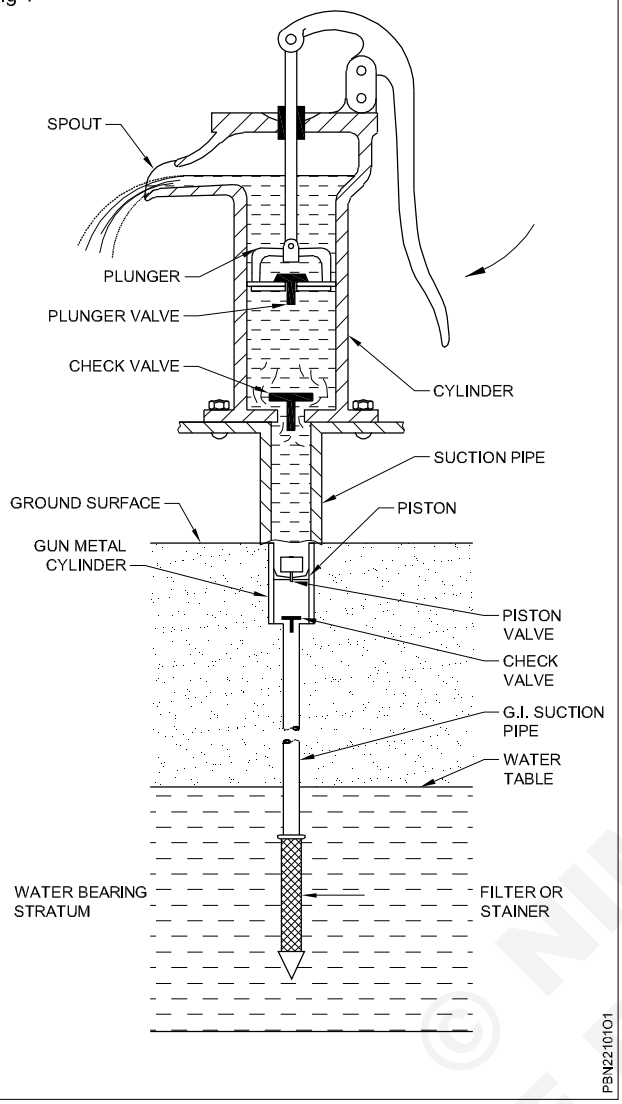
9 To fix the plunger rod with hand lever.

10 To connect plunger rod assembly with cylinder head.

Plunger valve must be fixed in proper position.

11 To operate the hand lever to up and down motion.

Fig 1



TASK 2 : **Power operated reciprocating pump**

Make foundation bed (Fig 1)

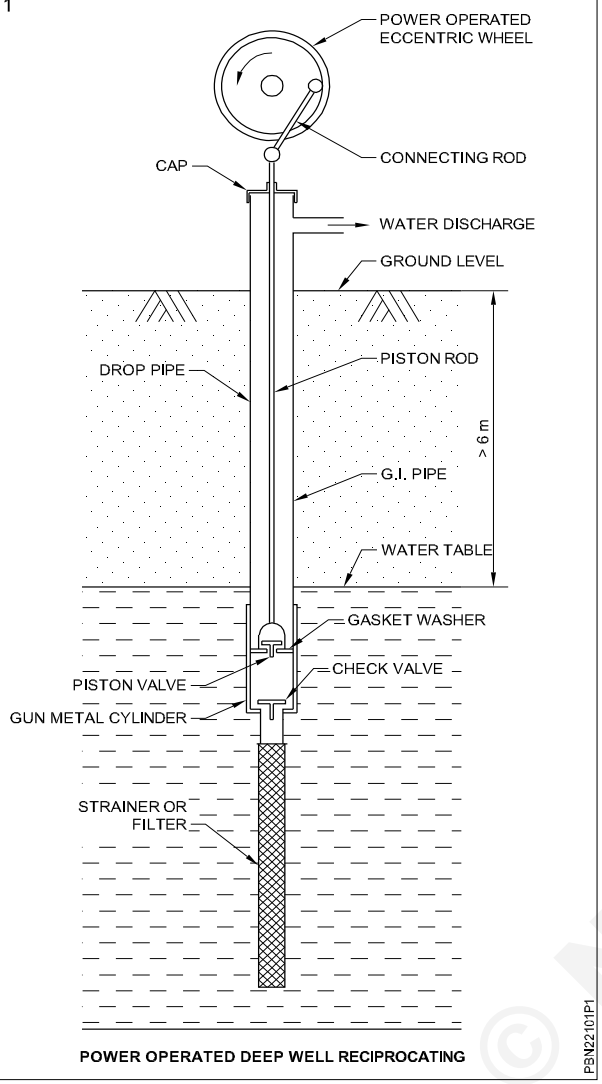
1 Prepare installation material for bed.

- Make a cement mortar as per ratio (1:2:4).
- Grounding the foundation bolt & nut with help templates.
- Fill the cement mortar in the grounded area.
- Allow to quring.
- Remove the template and levelling the bed.
- Erecting the bed.
- Commissioning the pump and motor on the bed with help of sprit level and feeler gauge.
- Alignment the pump pulley & motor pulley.

Alignment pulley

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

Fig 1



POWER OPERATED DEEP WELL RECIPROCATING

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
- **Install 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 ∅ 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 90° vertical position the ground with help of sprit level.

2 Must use proper self locking clamp for assemble suction pipe and connection rod.

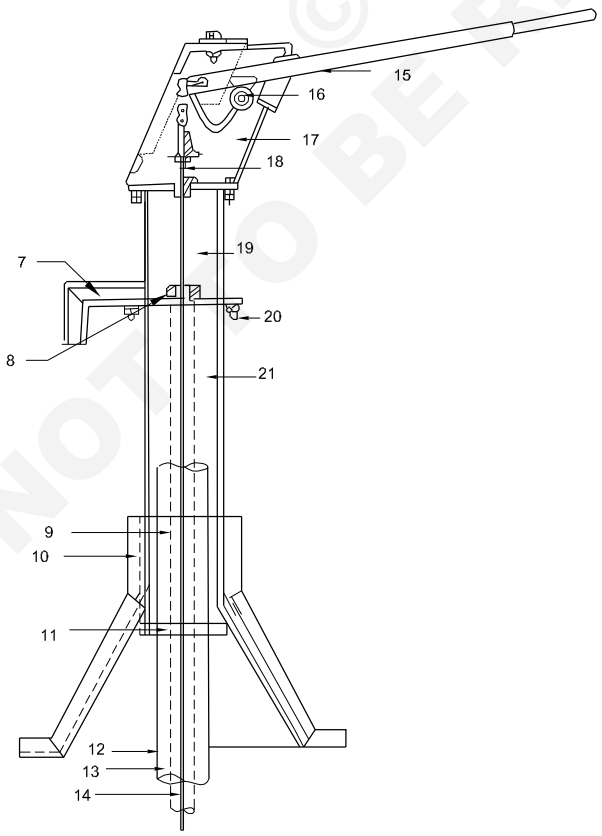
3 Properly assembled cylinder body and suction pipe.

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.

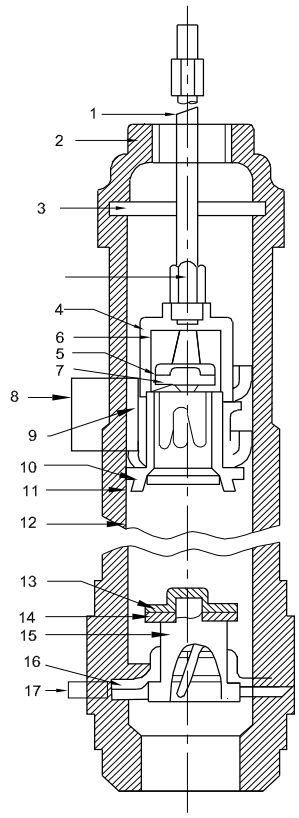
Fig 1



1.COVER BOLT
2.INSPECTION COVER
3.CHAIN BOLT & NUT
4.CHAIN
5.CHAIN COUPLING
6.GUIDE PUSH
7.SPOUT
8.RISER PIPE HOLDER
9.INSTALLATION MARK
10.LEQ
11.SUPPORTING FOR CASING PIPE
12.CASING PIPE
13.RISER PIPE
14.CONNECTING ROD
15.HANDLE ASSEMBLY
16.AXIL WASHER
17.HEAD ASSEMBLY
18.CONNECTING ROD WITH CHECK NUT
19.WATER TANK ASSEMBLY
20.BOLT NUT FOR WATER TANK ASSEMBLY
21.STAND ASSEMBLY

PBN2101S1

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 SUIDE
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**
- **test the suction line and delivery line**
- **commission the pump over the bed.**

TASK 1 : **Installation material for bed (Figs 1&2)**

1 Make foundation bed.

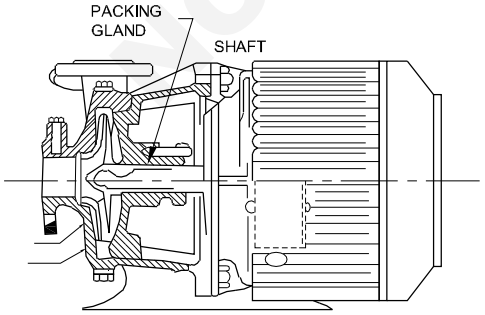
2 Make a cement mortar as per ratio (1:2:4).

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



MONO BLOCK PUMP

PBN22101U1

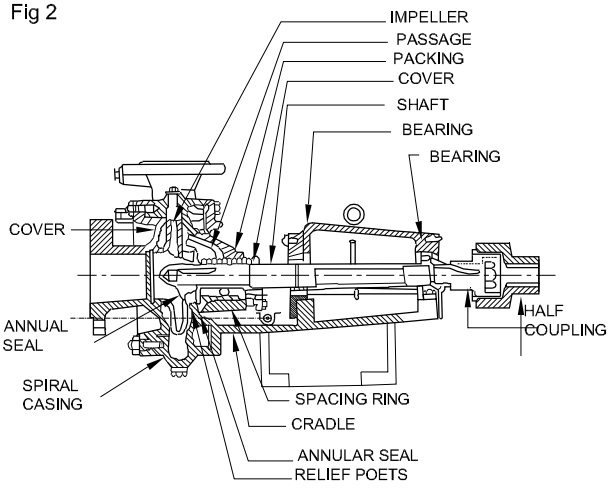
5 Allow to quring.

6 Remove the template and levelling the bed.

7 Erecting the bed.

8 Comissioning the pump and motor on the bed with help of sprit level and feeler gauge.

Fig 2



PBN22101U2

TASK 2 : **Connect the suction line and delivery line (Fig 1**

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 Primming the suction pipe.

Primming

1 To release air from the suction pipe

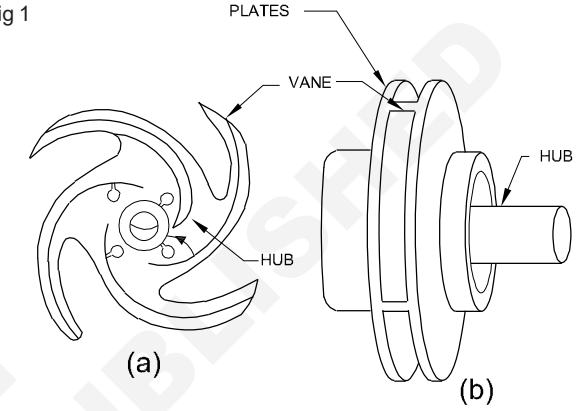
9 Switch on the pump.

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.

Fig 1



OPEN AND CLOSED TYPE IMRELLERS

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.

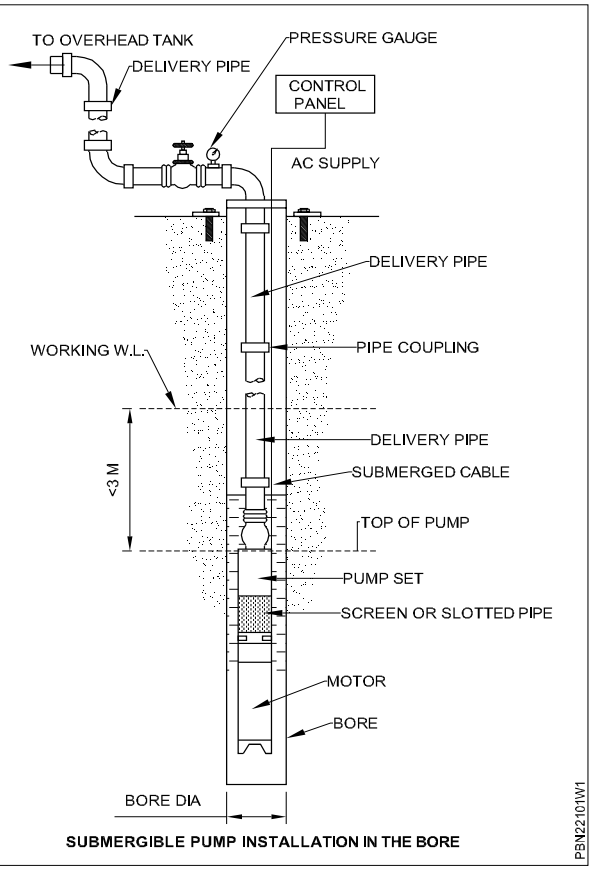
3 Check working condition, electrical condition.

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.

Fig 1



SUBMERGIBLE PUMP INSTALLATION IN THE BORE

TASK 2 : **Installing the pump with polyethylene pipe**

1 Fix the adopter 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 polyethylene pipe to soften the pipe.

4 Press the polythene pipe over the adopter.

5 Tighten the clamp securely around the pipe over the adopter 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 assembles 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 primming pipe.

7 Connect the delivery line after the control valve.

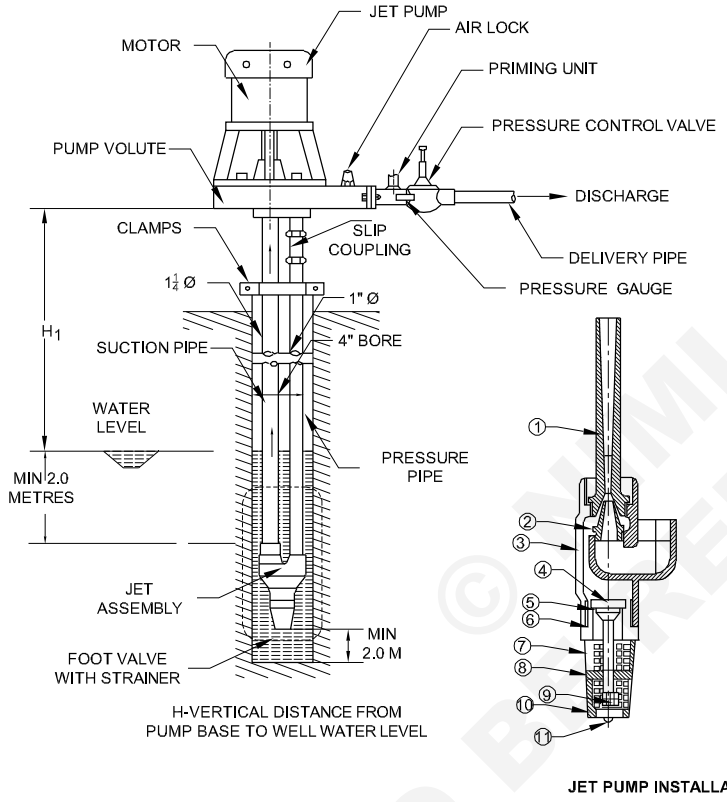
To fix primming, control valve and delivery pipe above the pump parts.

8 Primming 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

PBN221101X1

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.

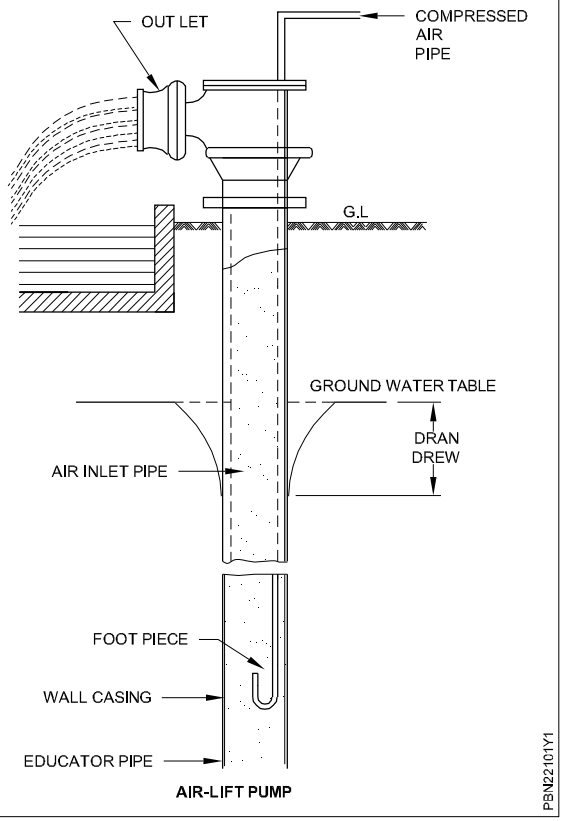
6 To connect suction air pipe to pump minimum 6m length of G.I.pipe should be used.

7 Connect the delivery pipes, if required length.

8 Run the air lift pump.

9 Check water flow off.

Fig 1



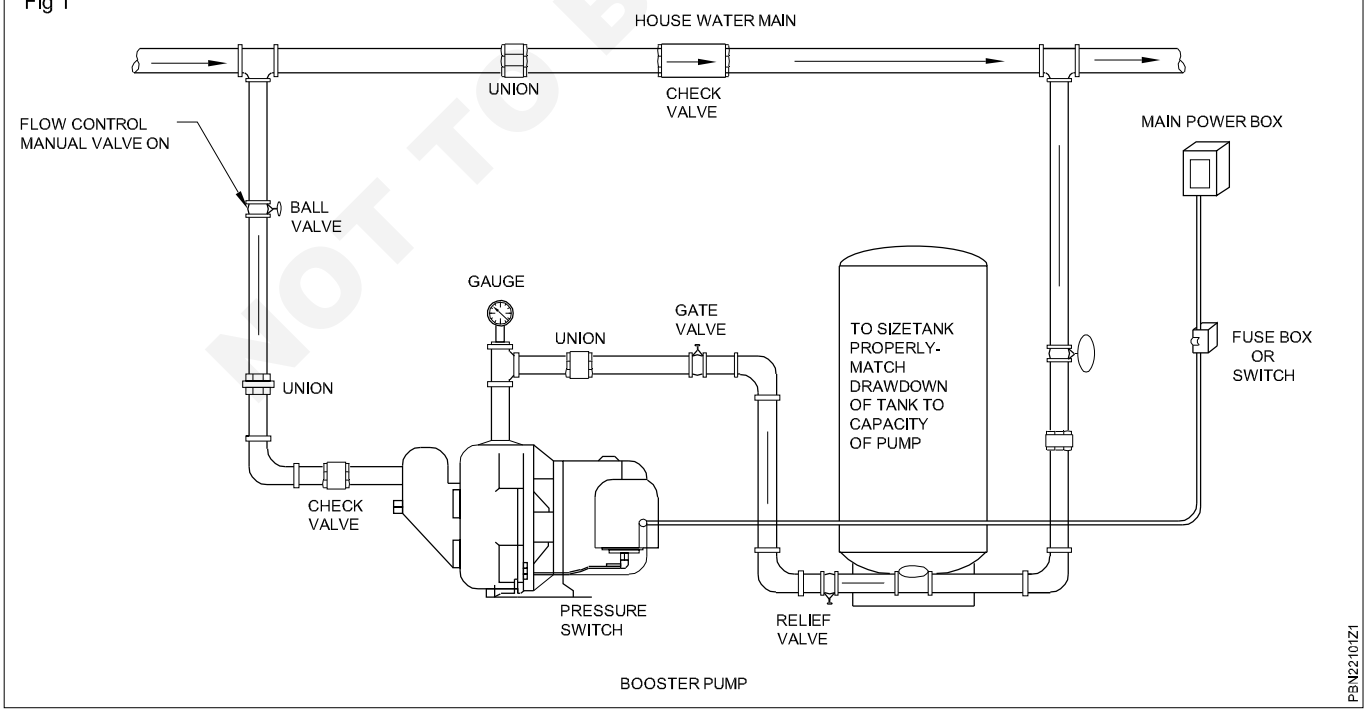
AIR-LIFT PUMP

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**

Fig 1



BOOSTER PUMP

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 ball 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.

— — — — — — — —

Plumbing — Exercise 1.8.68
Plumber - Pumps and PVC Joints

Demonstrate installation of electric pump

Refer the Exercise : 1.8.67

— — — — — — — —

Plumbing — Exercise 1.8.69
Plumber - Pumps and PVC Joints

Demonstrate maintenance of electric pump

Refer the Exercise : 1.8.67

— — — — — — — —

Plumbing — Exercise 1.8.70
Plumber - Pumps and PVC Joints

Demonstrate working process of centrifugal, reciprocating, submersible pump

Refer the Exercise : 1.8.67

— — — — — — — —

Plumbing — Exercise 1.8.71
Plumber - Pumps and PVC Joints

Demonstrate delivery of water to over head tank through pump, pressure head, delivery pipe, suction pipe etc

Refer the Exercise : 1.8.67

— — — — — — — —

Plumbing **Exercise 1.8.72**
Plumber - Pumps and PVC Joints

Produce BSP thread on pipe

Refer the Exercise : 1.3.16

— — — — — — — — —

Plumbing **Exercise 1.8.73**
Plumber - Pumps and PVC Joints

Produce internal and external thread on PVC pipes of different dia

Refer the Exercise : 1.3.16

— — — — — — — — —

Joint P.V.C pipe with thread

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

Requirements

Tools/Instruments

- Die stock - as reqd.
- Hacksaw frame - as reqd.
- Steel rule - as reqd.
- Steel tape - as reqd.
- Pipe wrench - as reqd.

Machines/Equipments

- Pipe vice - as reqd.

Materials/Components

- P.V.C Pipe - as reqd.
- Screwed socket - as reqd.
- Thread Seal (Hemp/Thread ball/ Teflon tape) - as reqd.
- Hacksaw blade - as reqd.

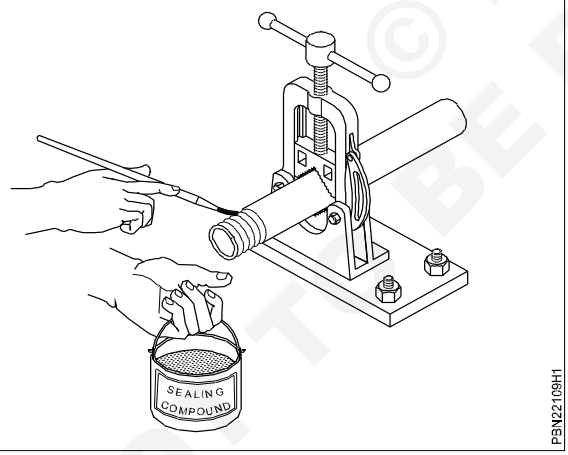
PROCEDURE

1 Select the fittings & required materials.

2 Hold the pipe in a pipe vice (Fig 1).

3 Marking the pipe as given length.

Fig 1



4 Cut the pipe as given length.

5 Chambering the PVC pipe use with rough file.

6 Cut the thread on PVC pipe by using of Die-stock.

7 Check the thread with standard fittings.

8 Apply thread seal if suitable material (Fig 2&3).

9 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).

Fig 2

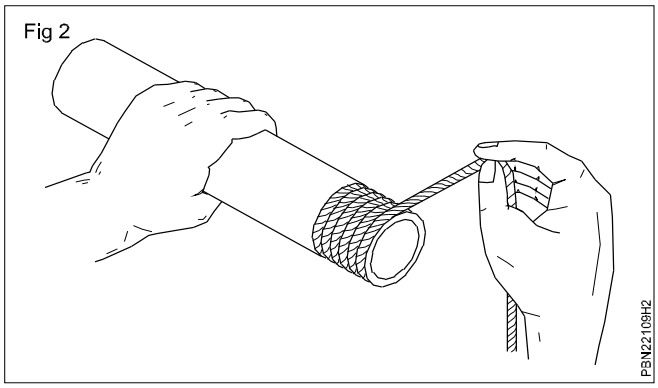
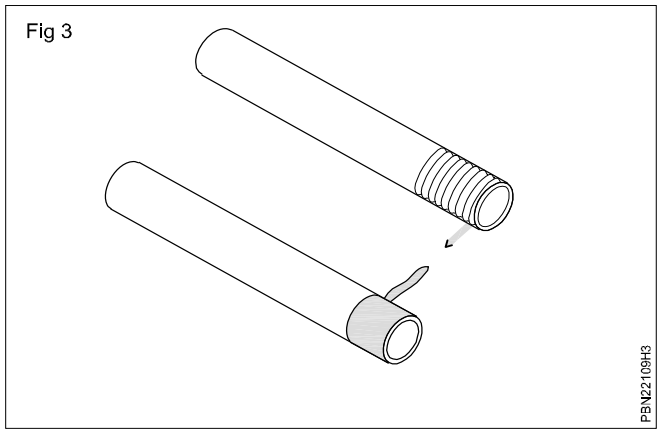


Fig 3



Joint P.V.C pipe with solvent cement and heat process

Objectives: At the end of the exercise you shall be able to
- **collect wooden sawdust**
- **heat P.V.C pipe end**
- **make socket**
- **perform scratching**
- **join with P.V.C pipe.**

Requirements			
Tools/Instruments		• Oil	- as reqd.
• Mortar pan	- as reqd.	• Wooden wastes	
Equipment		• cotton waste	- as reqd.
		• wet cloth	- as reqd.
• Blow lamp	- as reqd.	• P.V.C pipe	- as reqd.
Materials/Components			
• Match box	- as reqd.		

PROCEDURE

TASK 1:

Refer Exercise 1.6.49

— — — — — — — —

TASK 2: **Joint P.V.C pipe by heat process**

1 Collect sawdust, wooden waste and flammable materials in mortor pan.
2 Lightening fire using match box (or) heating with blow lamp.
3 Heating the P.V.C pipe end
4 Socket making using another P.V.C pipe bit.
5 Cleaning carbon using wet cloth and wiping the shrinkages.
6 Scratch the socket end and pipe end with emery paper.
7 Apply solvent cement in the pipe outer end and inside the socket end.
8 Joining immediately by lateral pressure the socket and pipe end.

— — — — — — — —

Join P.V.C pipe as per layout

Refer the Exercise : 1.6.50

— — — — — — — —

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

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

PROCEDURE

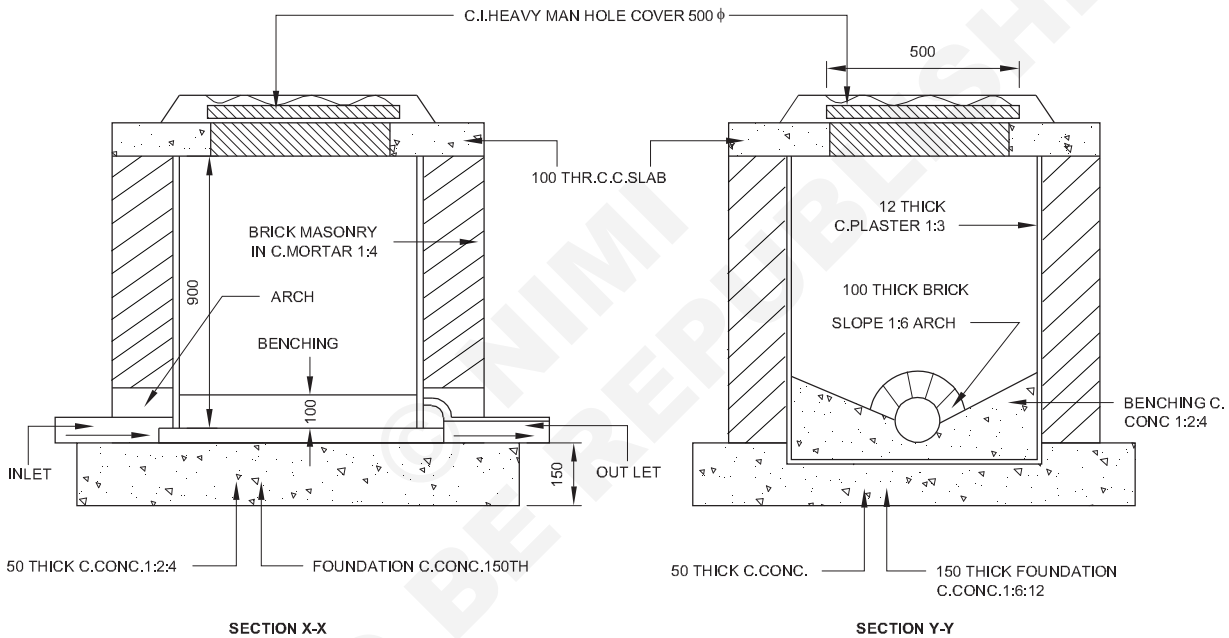
Instructor shall display and demonstrate to the students regarding inspection chamber, manhole, gulley trap, septic tank and soak pit.

1 Trainees will note down all the displayed different drainage fittings (Figs 1 to 6).

2 Record in the Table 1.

3 Get it checked by the instructor Table 1.

Fig 1



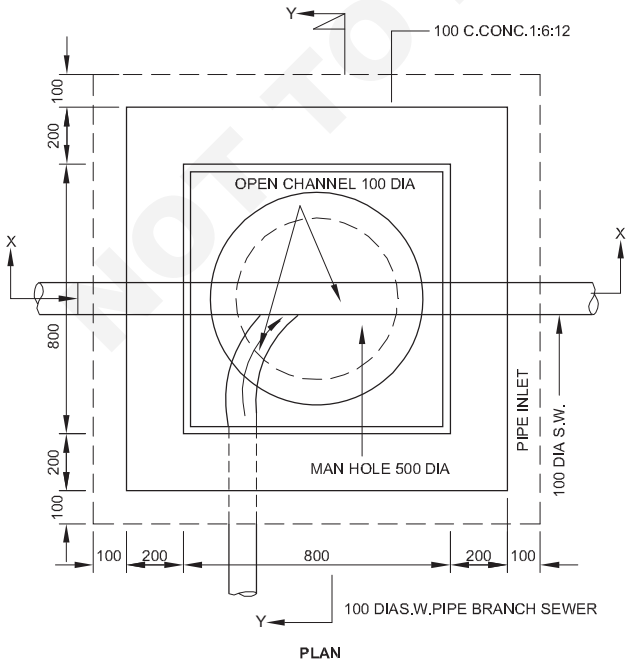


Table 1

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

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Fig 2

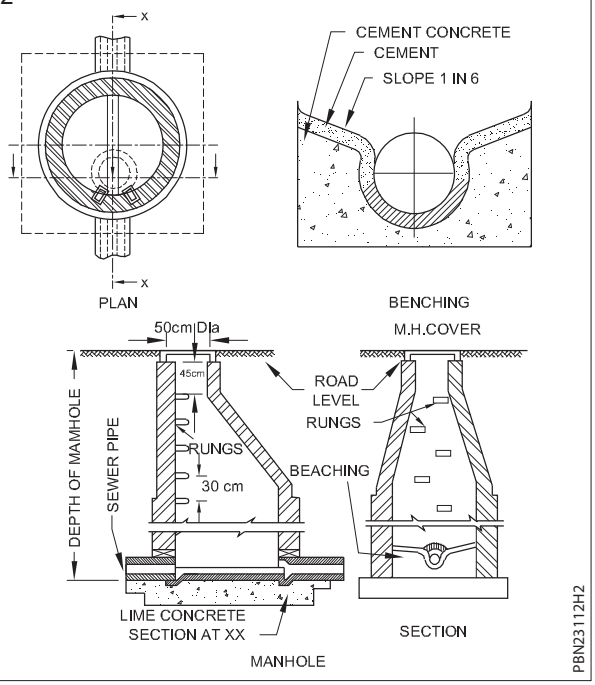


Fig 3

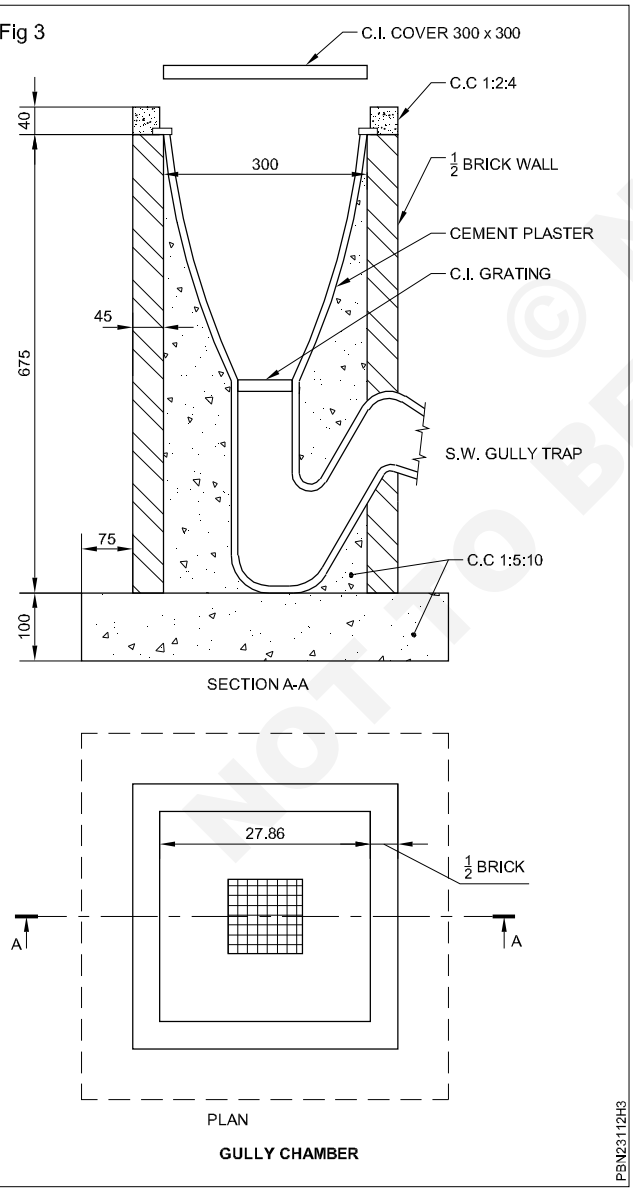


Fig 4

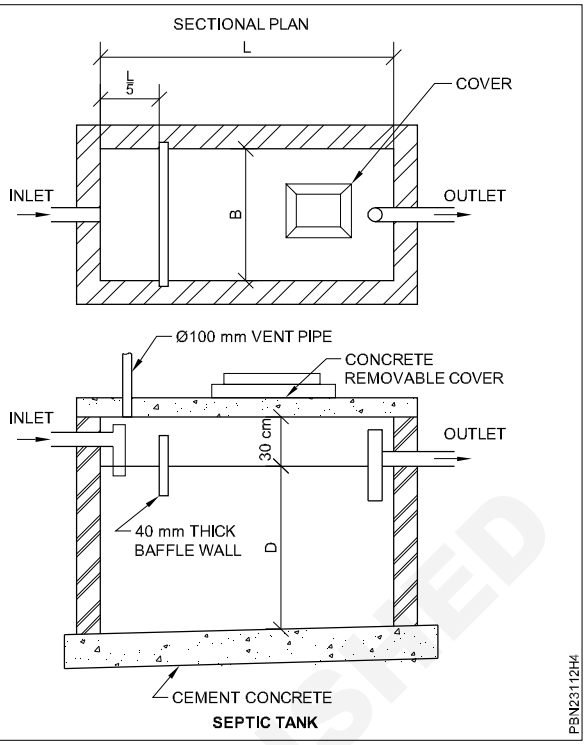


Fig 5

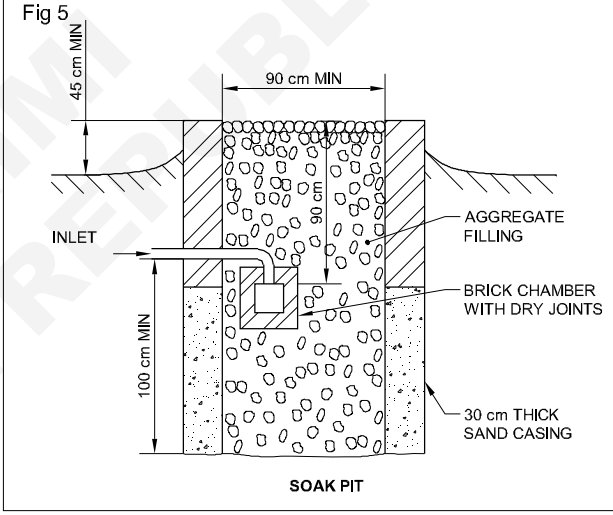
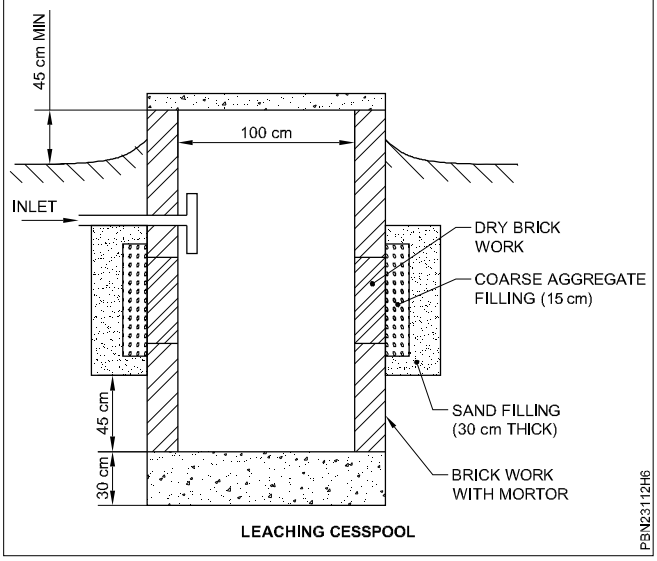


Fig 6



Construct inspection chamber, cesspool, septic tank, soak pit etc.

Objectives: At the end of the exercise you shall be able to
- **measuring marking for inspection champer**
- **excavate and cement motor bed providing**
- **perform wall construction, benching, channeling**
- **provide slope at the top and C.I. cover fixing.**

Requirements

Tools/Instruments

- Measuring tape - 1 No.
- Spade - 1 No.
- pick axe - 1 No.
- Mortar pan - 1 No.
- Trowel - 1 No.
- Spirit level - 1 No.
- Plumb bob - 1 No.
- Straight edge - 1 No.
- Tube level - 1 No.
- Crow bar - 1 No

Equipment/Materials/Components

- Lime powder - as reqd.
- Cement - as reqd.
- Brick - as reqd.
- Brick bats - as reqd.
- Aggregate - as reqd.
- River fine sand - as reqd.
- C.I.Frame with cover - as reqd.

PROCEDURE

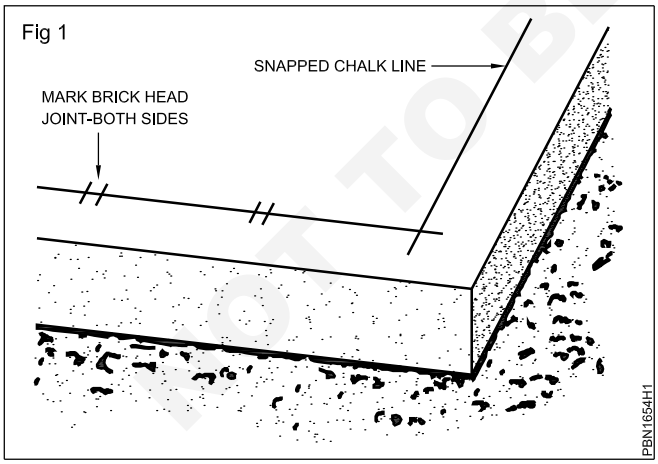
TASK 1**: Layout and build half brick thick corner wall (stretcher)**

1 Assemble the materials in the work area.

2 Set the mortar pan back from the wall approximately one meter to provide sufficient working space.

3 Layout the 'L' corner on the floor using the steel square and pencil or chalk (Fig 1).

Fig 1

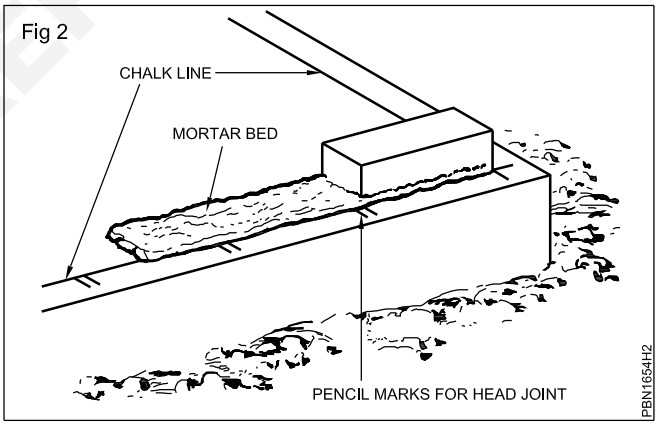


4 Extend the line a little longer than the actual corner measures with chalk.

5 Layout the first course 'Dry bond' keeping head joint uniform (10mm using the fore finger)

6 Remove the corner brick (brick number 1) spread the mortar and re-lay without moving the bricks in between. (Fig 2)

Fig 2



7 Remove the end brick (Brick No. 2) spread the mortar.

8 Level and plumb brick No. 1 with brick No. 2 and straighten the edge and plumb rule or with straight edge.

9 Lay the brick No. 3 level plumb and straighten the edge with brick No. 1 as shown in (Figs 3&4).

Fig 3

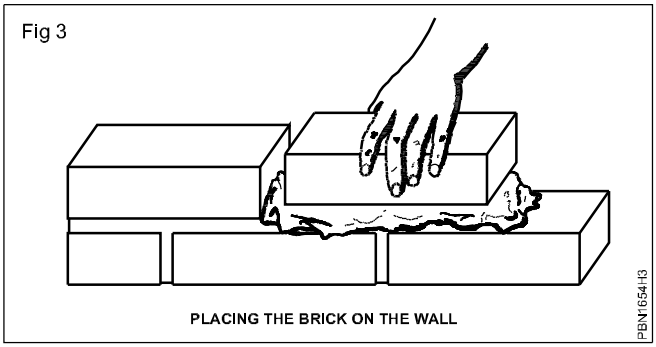
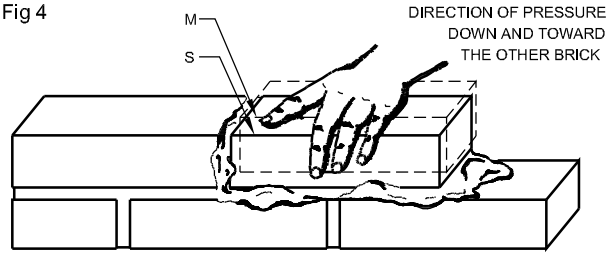


Fig 4

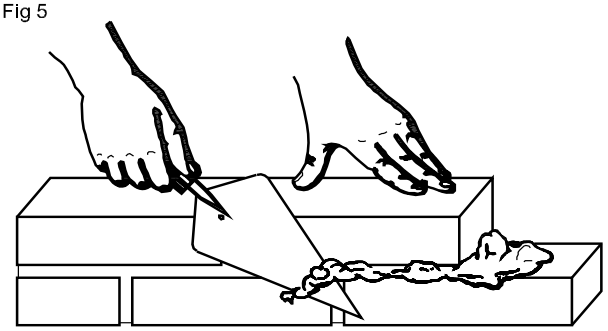


SHOWING THE BRICK INTO POSITION

PBN1654H4

10 Remove excess mortar (Fig 5) in each course in laid.

Fig 5



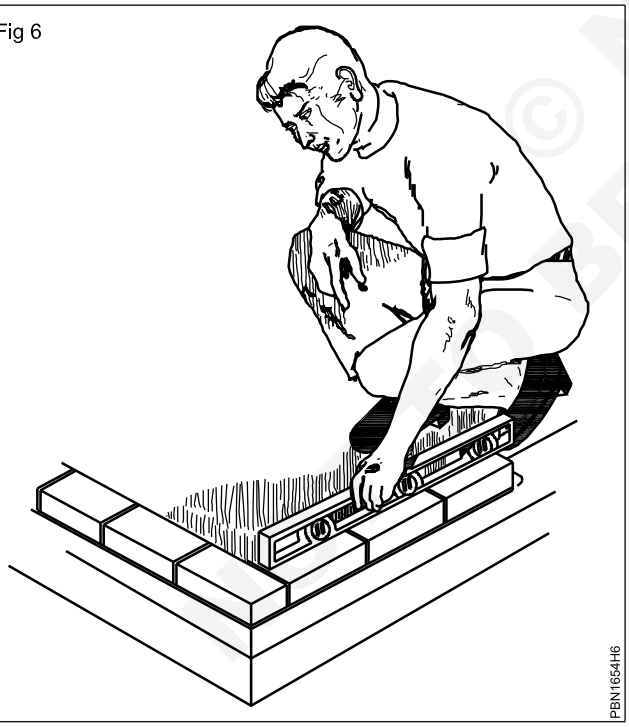
CUTTING OFF EXCESS MORTAR

PBN1654H5

11 All the joints should be uniform thickness.

12 Check the corner of squareness after laying the first course of brick. (Fig 6)

Fig 6



PBN1654H6

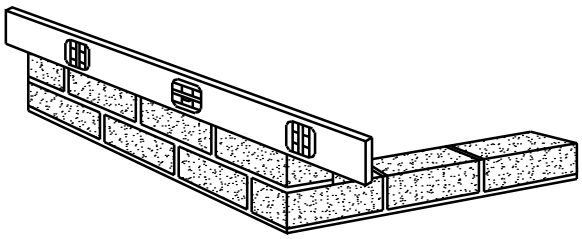
13 Check the second course for level. (Fig 7)

14 Take mortar sufficiently to form a bed and lay three or four bricks and spread in (Figs 8 & 9).

15 Turn the trowel and moved along the bed the deposit the mortar. (Fig 10)

16 Lay the mortar in centre of the bed area.

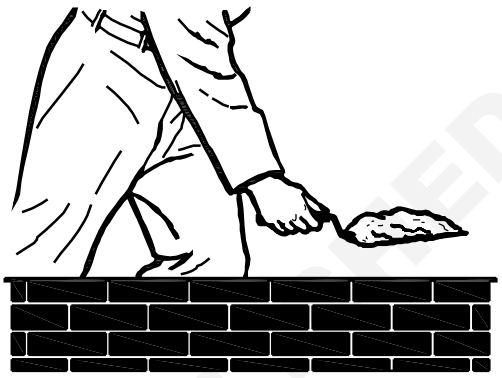
Fig 7



CHECKING THE SECOND COURSE FOR LEVEL

PBN1654H7

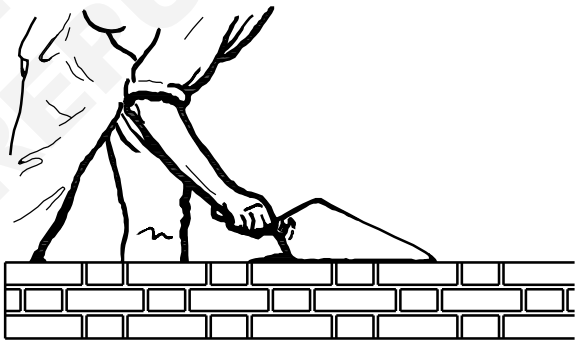
Fig 8



A FULL TROWEL-LOAD OF MORTAR

PBN1654H8

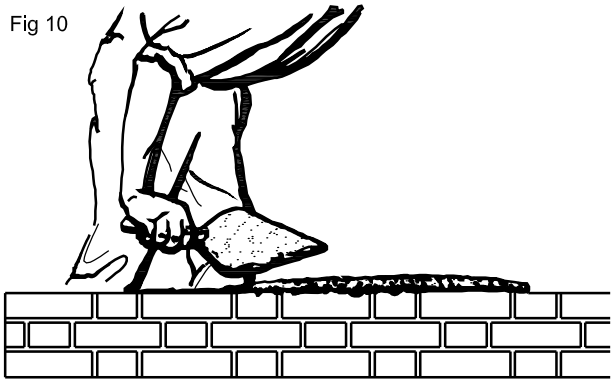
Fig 9



STARTING TO SPREAD MORTAR

PBN1654H9

Fig 10



SPREAD THE MORTAR WITH A SMOOTH SWING OF THE ARM
WITH FINGERS RELAXED

PBN1654HA

17 Proceed this method till all the nine courses and complete the work.

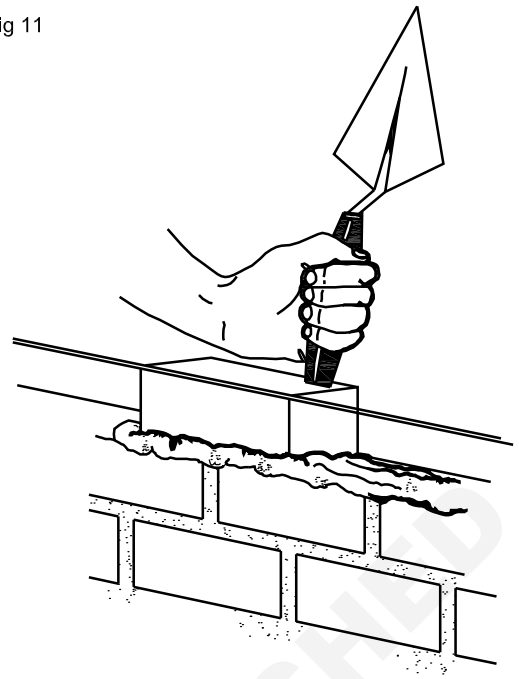
18 Remove the excess cement mortar in the external and internal surface of wall.

19 Lay the corner brick exact corner.

20 Use the trowel to tap it into Fig 11.

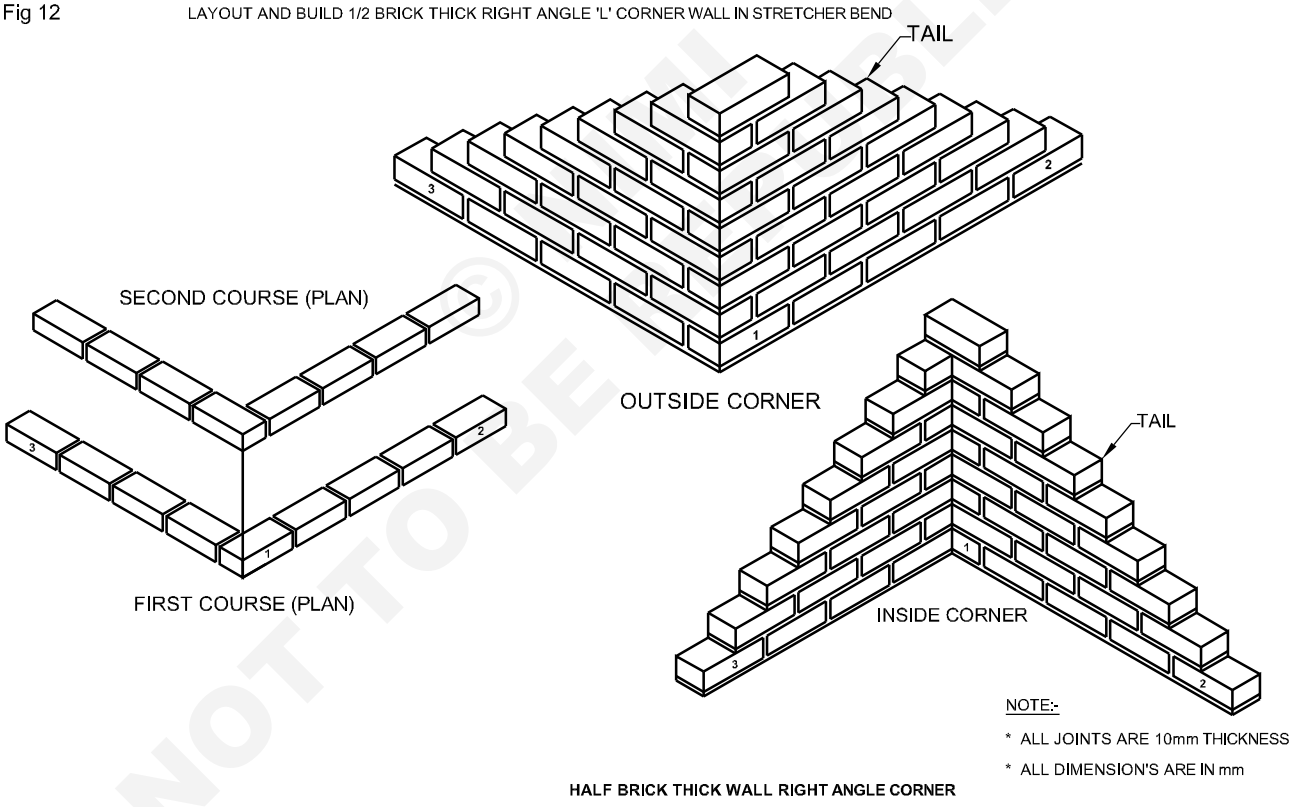
21 Lay the corner brick exact corner. (Fig 12)

Fig 11



PBN1654HB

Fig 12 LAYOUT AND BUILD 1/2 BRICK THICK RIGHT ANGLE 'L' CORNER WALL IN STRETCHER BEND



HALF BRICK THICK WALL RIGHT ANGLE CORNER

PBN1654HC

— — — — — — — —

TASK 2 : **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 Figs 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.

Fig 1

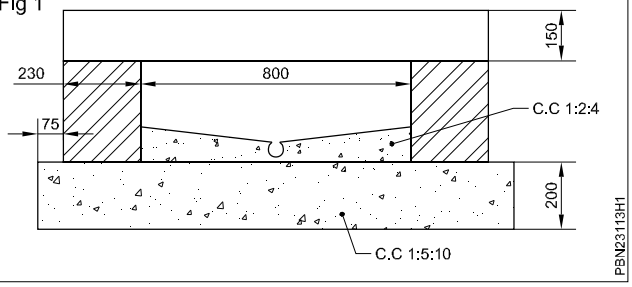
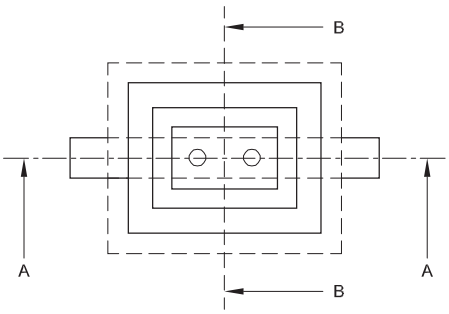
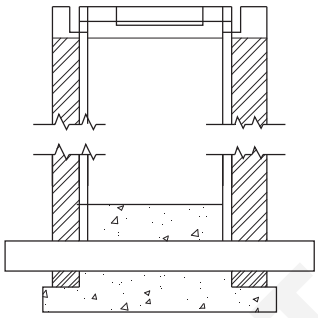


Fig 2





SMOKE TESTING OF HOUSE SEWER LINES AND SULLUGE WATER LINE

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.

9 Render smooth with neat cement (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.

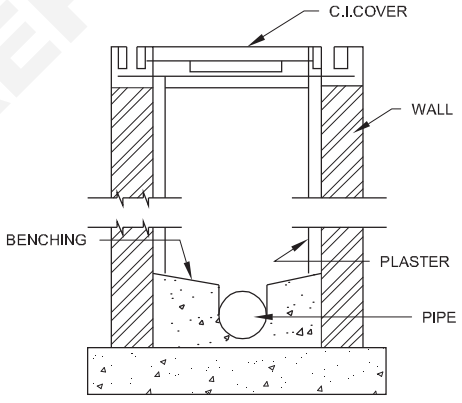
14 Cure the work.

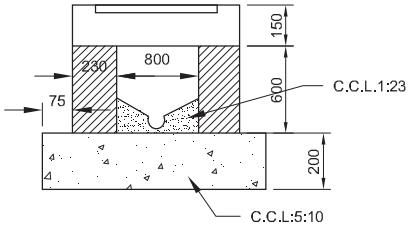
15 Remove centering and render remove block.

Safety

- Don't use damaged tools
- The inspection chamber and construction for use the good bricks.
- The inspection chamber and man hole 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 plum bob for vertical straightness
- The inspection chamber and manhole complete of the dry wall in the plaster. (Fig 3)

Fig 3





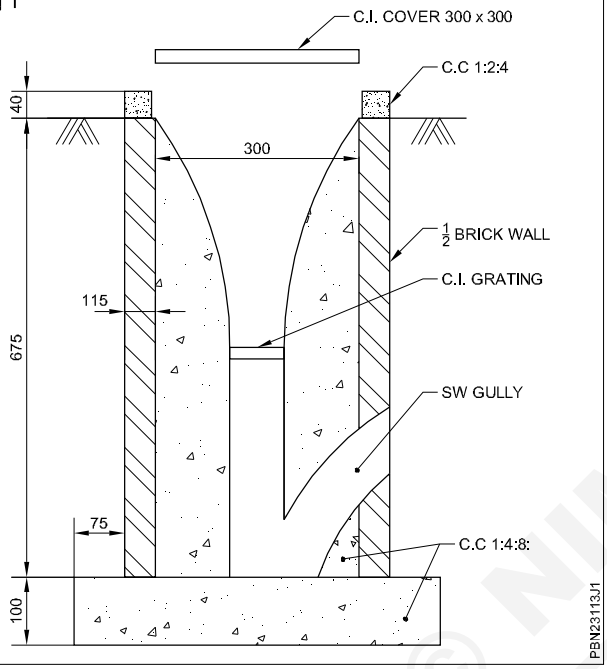
SMOKE TESTING OF HOUSE SEWER LINES AND SULLUGE WATER LINE

Construction of gully chamber

Objectives: At the end of the exercise you shall be able to
- **perform drawing reading marking in the area**
- **excavate and laying of cement concrete**
- **perform gully trap installing and wall providing**
- **plaster the wall**
- **fix the C.I light duty cover.**

1 Excavate for gully trap as per (Fig 1) to dimensions and levels.

Fig 1



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.
- Don't 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)
- Quire 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**
- **construct wall, provide benching and chennel**
- **fix of foot rest**
- **do plastering of wall, C.I cover providing.**

1 Excavate for the man hole as per drawing true to dimension and level. Read drawing carefully to prepare required size of materials.

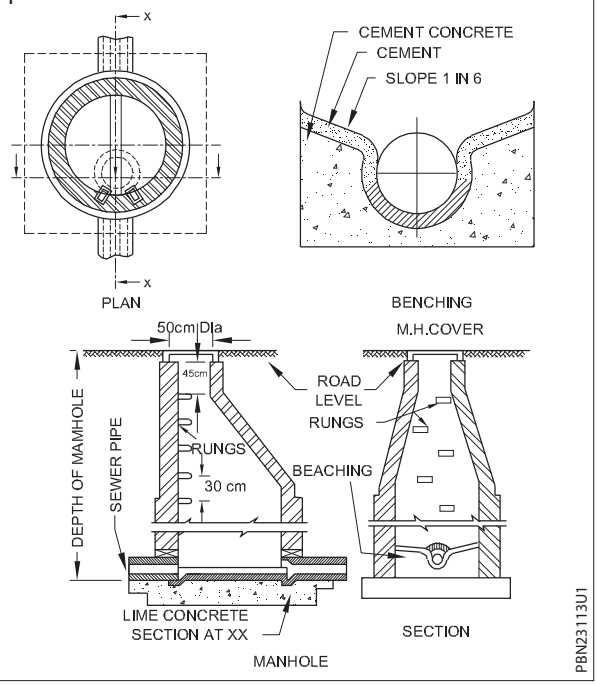
2 Lay the concrete as per drawing (Fig 1). Prepare cement concrete for base of free chamber proper ratio. (1:5:10)

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.

Fig 1



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 (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.

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 plumb bob for vertical straightness
- The inspection chamber and manhole complete of the with dry wall in 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 for foundation**
- **construct brick courses with bonding, airvent providing.**

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.

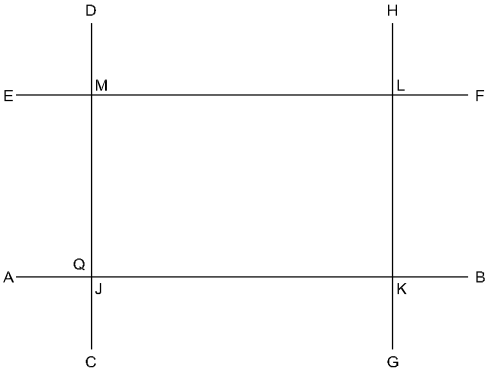
3 Mark JK equal to 5.10m.

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.

Fig 1



TASK 2: **Lay the cement concrete**

1 Place the base concrete 1:2:4 for the thickness of 25cm and rammed well.

2 Level top surface of the concrete bed with slope of 1 in 10.

— — — — — — — —

TASK 3: **Lay the brick courses with bonding (Fig 1)**

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 above water level

4 Keep the outlet pipe 100mm bottom level of sewage level.

5 Fill all the joints inside of septic tank.

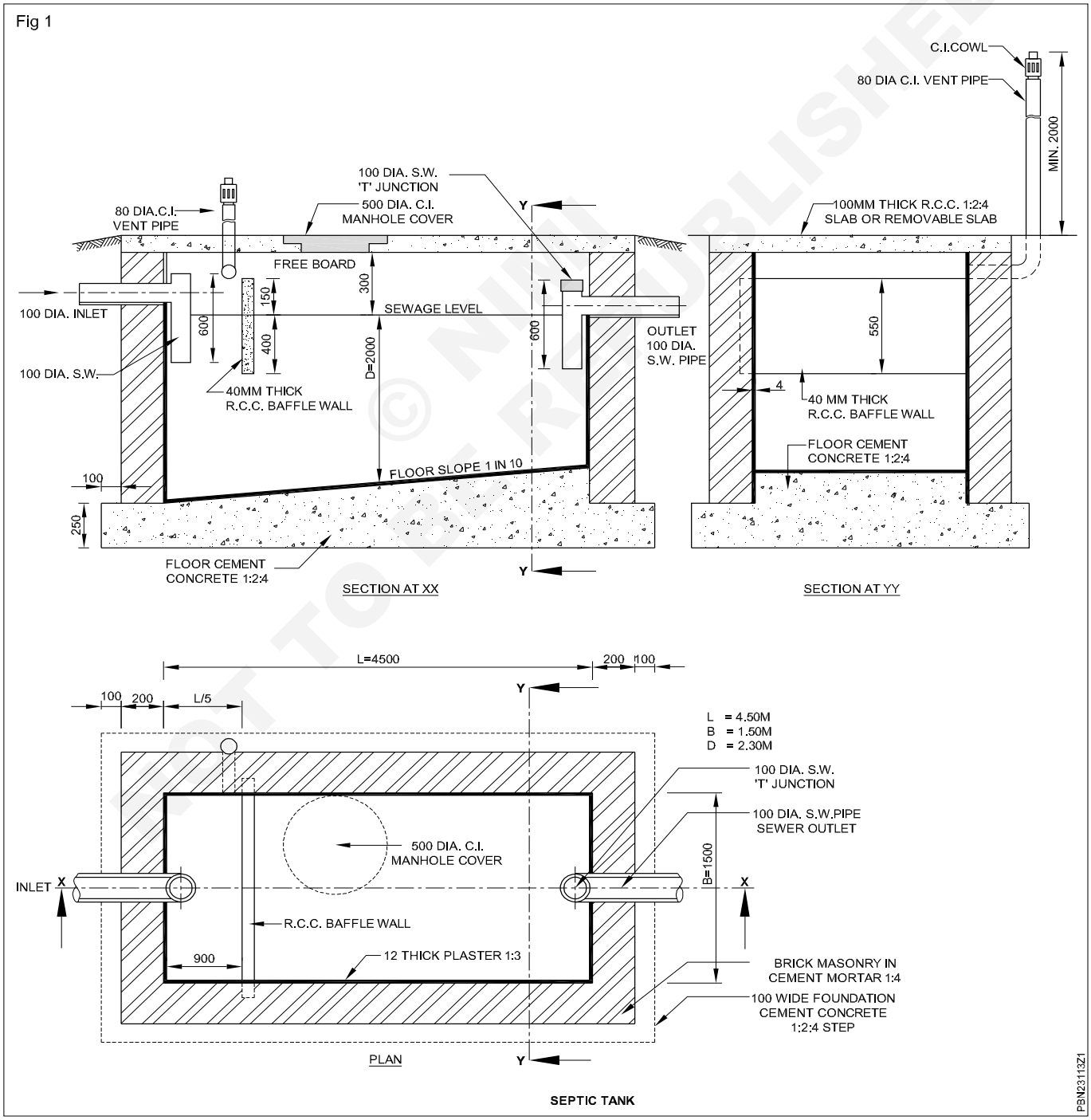
6 Fix 80mm C.I. vent pipe.

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



Construction of soak pit

Objectives: At the end of this exercise you shall be able to
- **do marking circular according to the size**
- **excavate trench**
- **construct brick wall with dry joint**
- **fill with brick bats**
- **inlet bend installing**
- **air light cover providing.**

1 Excavate 1m circular and 2m depth pit.

2 Wall constructing using broken bricks or broken rock.

3 Filling the trench with brick bat (or) rock bat

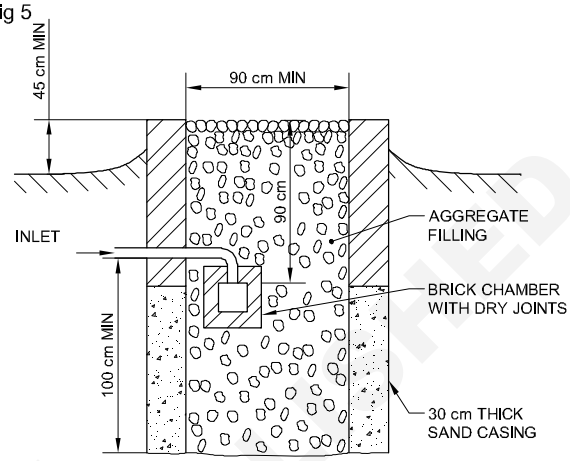
4 Fixing inlet with stoneware (or) P.V.C with 100cm gap from bottom.

5 Sand casing providing upto 30cm in the sides.

6 Construct soak pit upto 45cm height to the ground level.

7 Provide R.C.C airtight cover to prevent rain water. (Fig 1)

Fig 5



SOAK PIT

— — — — — — —

Construct cess pool

Objectives: At the end of this exercise you shall be able to
- **determine the size and marking**
- **excavate pit according to marking**
- **provide foundation bed using cement concrete**
- **provide water discharge at the sides**
- **open top portion.**

1 Marking according to the size in the diagram. (Fig 1)

2 Excavating pit according to the marking.

3 Providing cement concrete for the foundation bed.

4 Providing filter media at the sides of the cesspool.

5 Filter media provided minimum 45cm gap from foundation.

6 Providing stoneware or P.V.C Tee for inlet in downward position.

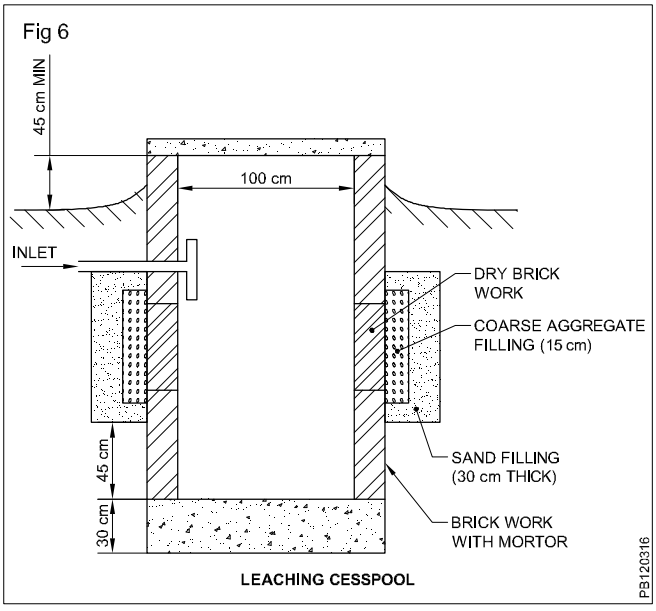
7 construct 45cm height from level to prevent rainwater entering.

8 Inside dia should be minimum 100cm.

9 Providing dry construction and course aggregate for 15cm.

10 30cm sand casing filling adjacent to course aggregate.

Fig 6



LEACHING CESSPOOL

Demonstrate drawing layout of drainage pipe line

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**
- **test and refill the trench.**

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

Refer the Exercise 1.7.61

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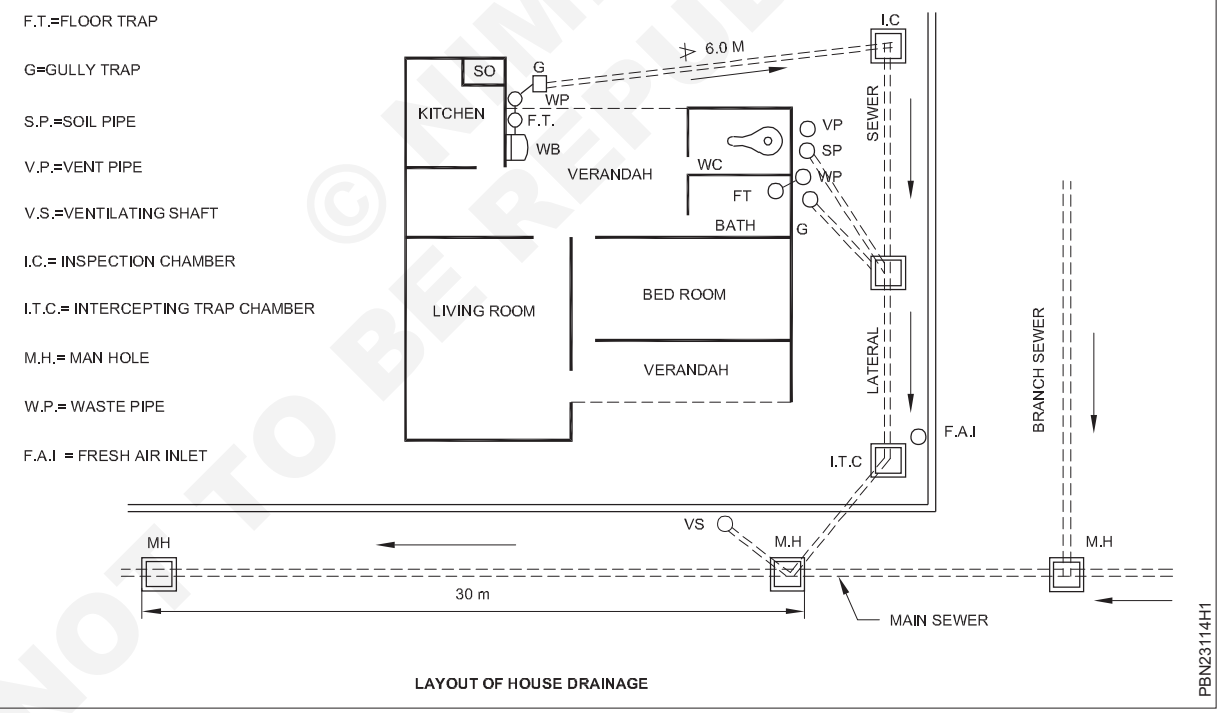
TASK 2: **Demonstrate layout of house drainage (Fig 1)**

Fig 1



LAYOUT OF HOUSE DRAINAGE

— — — — — — — —

Perform testing for smoke test, water test, smell test, ball test, mirror test

Objective: At the end of the exercise you shall be able to
- **layout the smoke test, smell test water test, odour test, ball test and mirror test**
- **to install the drain plug on new piping line (sewer line and sullage line)**

Requirements

Tools/Instruments

- Funnel - 1 No.
- Drain plug - 1 No.
- Pipe wrench - 1 No.
- Spanner set - 1 No.

Materials/Components

- Brass ball - 1 No.
- C.I.pipe - as reqd.
- Fitting - as reqd.
- Mirror - as reqd.
- Smoke filling machine - as reqd.
- Newly committed pipelines - as reqd.
- Tar paper - as reqd.
- Oil choacked cotton waste - as reqd.
- Pepper mint oil - as reqd.

PROCEDURE

TASK 1: **Smoke test of the house sewer lines (Figs 1 & 2)**

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.

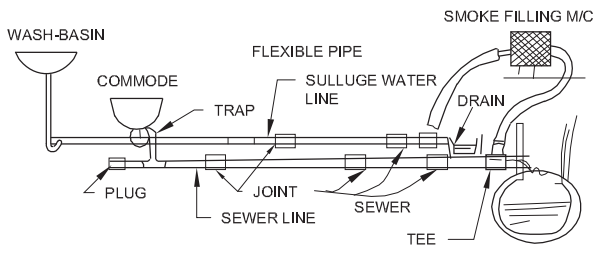
Inlet probe may connect at lower end of the drainage system.

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.

Fig 1

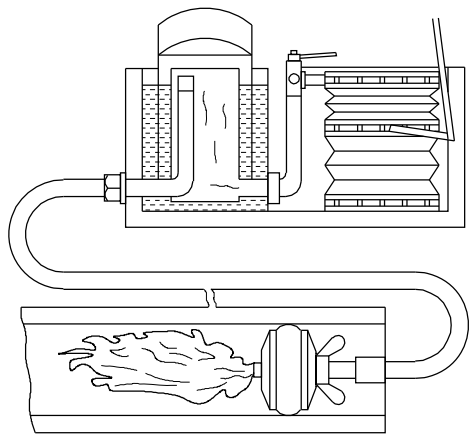


SMOKE TESTING OF HOUSE SEWER LINES AND SULLUGE WATER LINE

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.

Fig 2

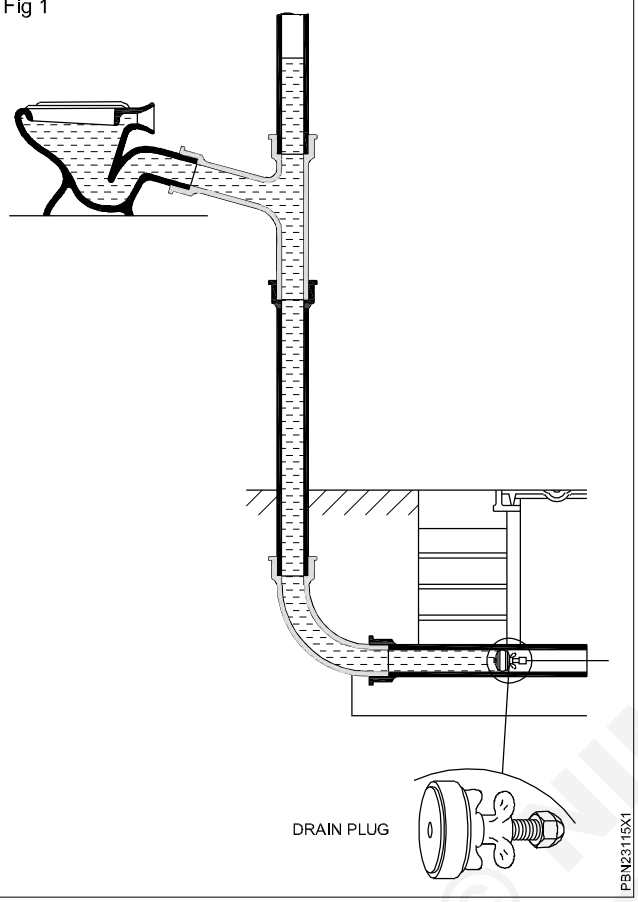


SMOKE GENERATOR

TASK 2 : **Water test**

1 Plug the soil pipe outlet (Fig 1) with an expanding drain plug.

Fig 1



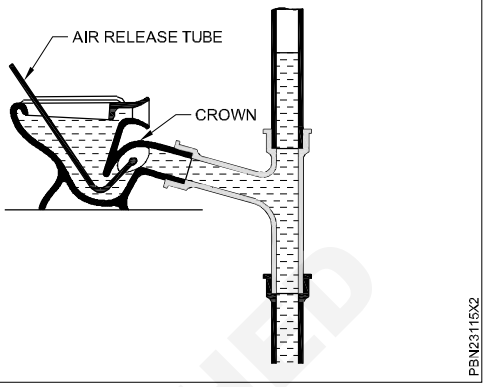
2 Fill the stack with water through an appliance.

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)

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 : **Odour (or) smell test**

1 Close the outlet end of all vent pipes.

Except top most one vent pipes must be open.

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

6m length of pipe line must be used.

1 50gms to 60gms →Pepper mint (or) Odour ferrous substance → used

2 5 liters of boiled water.

3 Pour 5 liters 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 odour comes out made a repair, in 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 brass 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 stop.

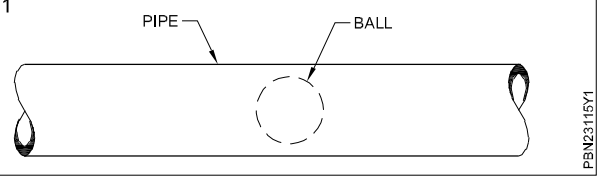
6 The point where it stop is marked on a rod so that the exact position can be measured of along the pipe.

7 The problem can be rectified by there.

8 Realigning the pipe to the correct fall.

9 Removing the obstruction.

Fig 1



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

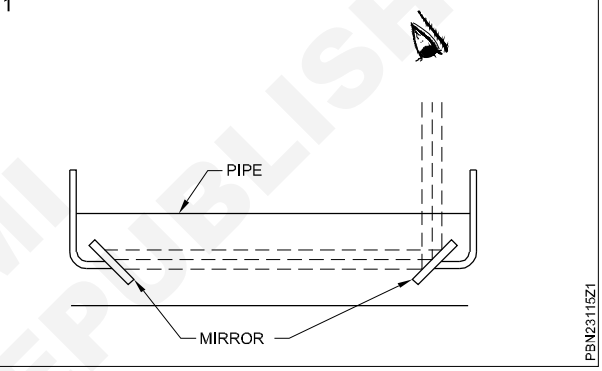
1 Check the alignment and condition of the in side of the pipes.

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 reflected along the pipe.

Fig 1



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Plumbing — Exercise 1.9.81
Plumber - Drainage Systems

Join heavy cast iron socket pipe

Refer the Exercise : 1.7.42

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Plumbing — Exercise 1.9.82
Plumber - Drainage Systems

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

Refer the Exercise : 1.7.42

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Identify location of leakage pipe

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

Requirements

Tools/Instruments

• Spade	- as reqd.
• Pick axe	- as reqd.
• Crow bar	- as reqd.

Equipment/Materials/Components

• Sounding rod	- as reqd.
• Chalk powder	- as reqd.
• Water tap assembly	- as reqd.
• Gate - valve assembly	- as reqd.

PROCEDURE

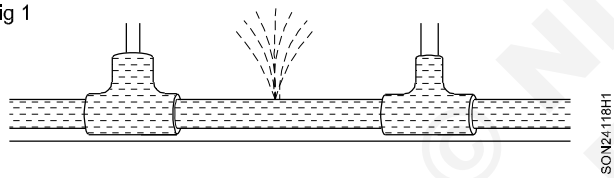
1 Check distribution line.

2 Hearing the sound in pipe line.

3 Listen the sound of bursting water.

4 Identify the leak in water line locate under the floor (Fig 1).

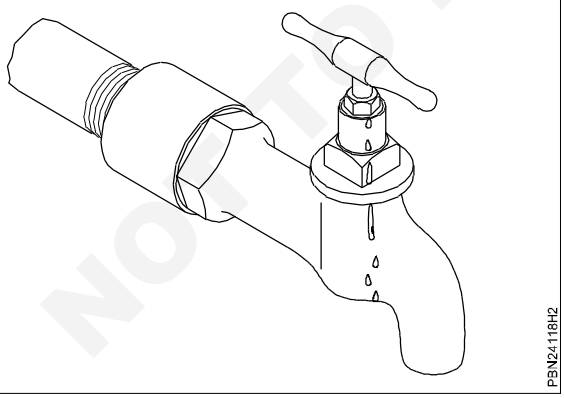
Fig 1



5 Close the inlet valve.

6 Identify the leak in water tap (Fig 2).

Fig 2

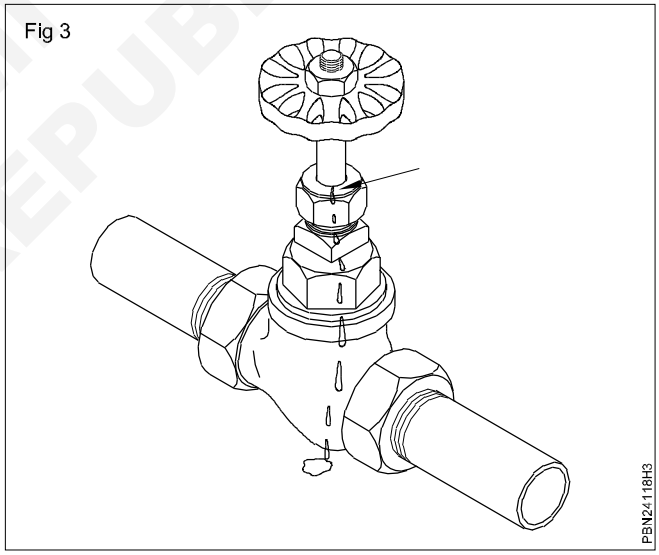


7 Close the stop valve by turning the handle clockwise.

8 Identify the leak in gate valve (Fig 3).

9 Close the gate valve by turning the hand wheel clockwise.

Fig 3



Safety

- Don’t make damage to the pipe line while tracing.

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

• Hacksaw	- as reqd.
• Pipe wrenches	- as reqd.
• Chisel and hammer	- as reqd.
• Spade	- as reqd.
• Pick axe	- as reqd.
• Spanner set	- as reqd.

Equipment/Materials/Components

• Pipe	- as reqd.
• Pipe fittings	- as reqd.
• Thread seal materials	- 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 with the use of GI union.

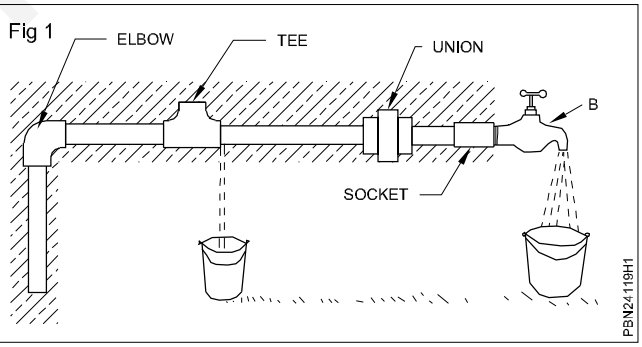
10 Check if any further leakage.

11 Finish the job.

Safety

- Clear the pipe slowly without making more damage.
- Close the pipe line before cutting.
- Cut straightly.
- Join the union correctly with washer.
- Tight slowly the lock nut. (Fig 1)

Fig 1



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Removing of air locks

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

Requirements

Tools/Instruments

- Chisel - 1 No.
- Hammer - 1 No.
- Spanner set - 1 No.
- Pipe wrench - 1 No.

Equipment/Materials/Components

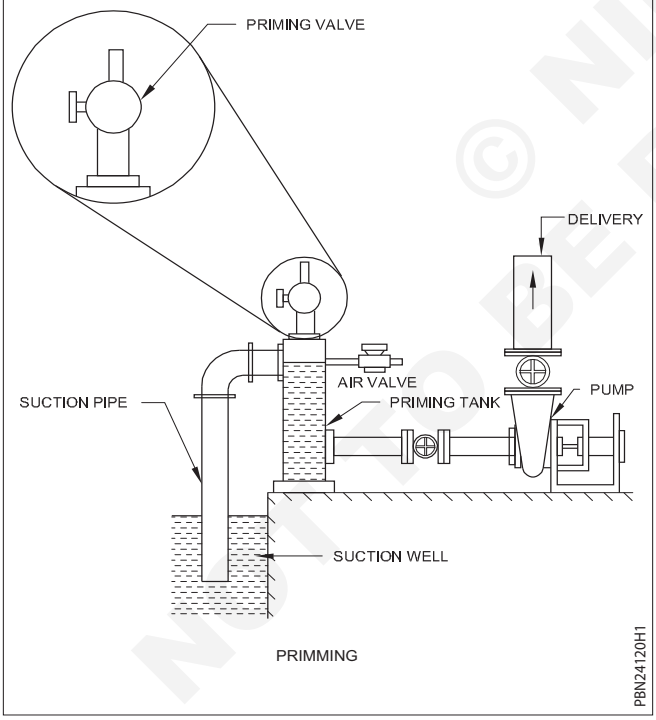
- Air valves - as reqd.
- Saddle - as reqd.
- Pipes - as reqd.

PROCEDURE

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

1 Remove the air in the suction line.

Fig 1



2 Open the cap/valve at priming line.

3 Fill the water in the priming line.

4 Open the air cock. (Fig 1)

5 Allow the air bubbles fully come out.

6 Close the air cock.

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.

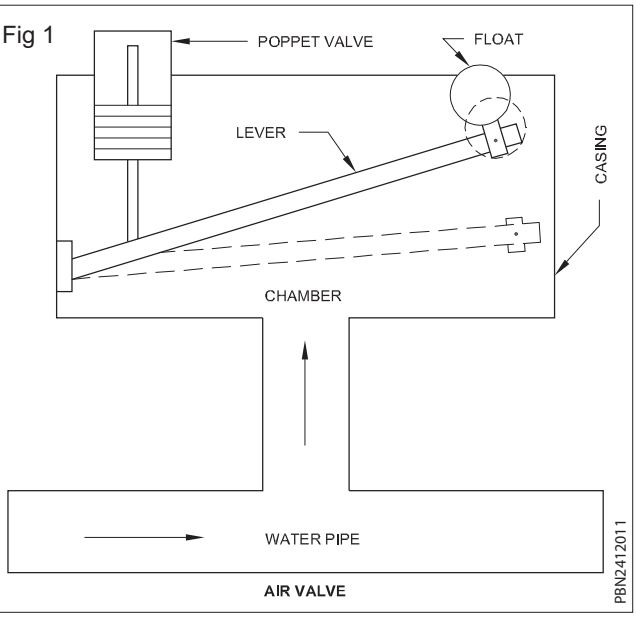
3 Disconnect the fitting nearest point. (highest pipeline portion)

4 Modify inspection chamber of air valve

5 Fix the air relief valve at inspection chamber. (Fig 1)

6 Air relief valve to release the air lock in the pipe line, air goes at the top of pipes.

Fig 1



7 Inspect air relief valve chamber.

Ball may worn out.

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

1 Close the valve inlets.

2 Open the all outlets. (Valve lock)

3 Open the valve inlets.

4 Check the flow off water 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. (Fig 1)

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

9 The length of pipe and inlet finish of the pipe.

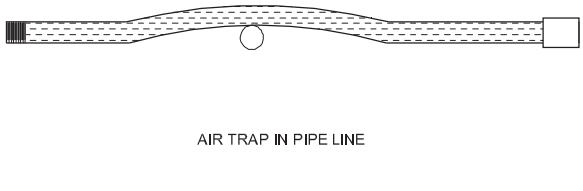
10 calculate head of water.

11 Types of bends and number of bends are required in the line.

Safety

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

Fig 1



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Demonstrate rain water harvesting system

Objectives: At the end of the exercise you shall be able to
- **make pit and fill the pit with gravels**
- **fix 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 1x1x½m on the top of the pit up to ground level.

4 Fix a rain water pipe from the roof. (Fig 1)

5 Connect the pipe to the pit

6 Fill the pit with gravel or pebbles

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. (Fig 1)
- Fix side support while digging loose soil.

Fig 2

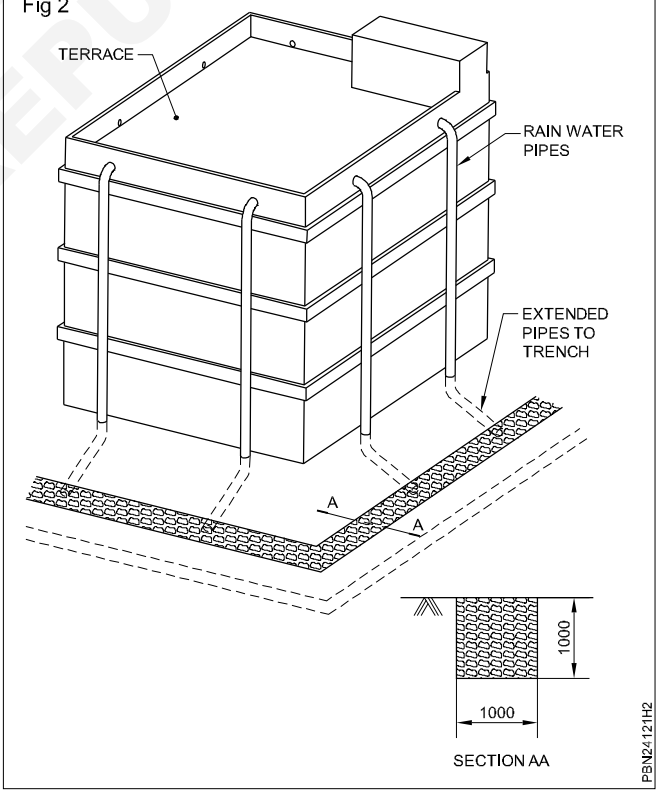
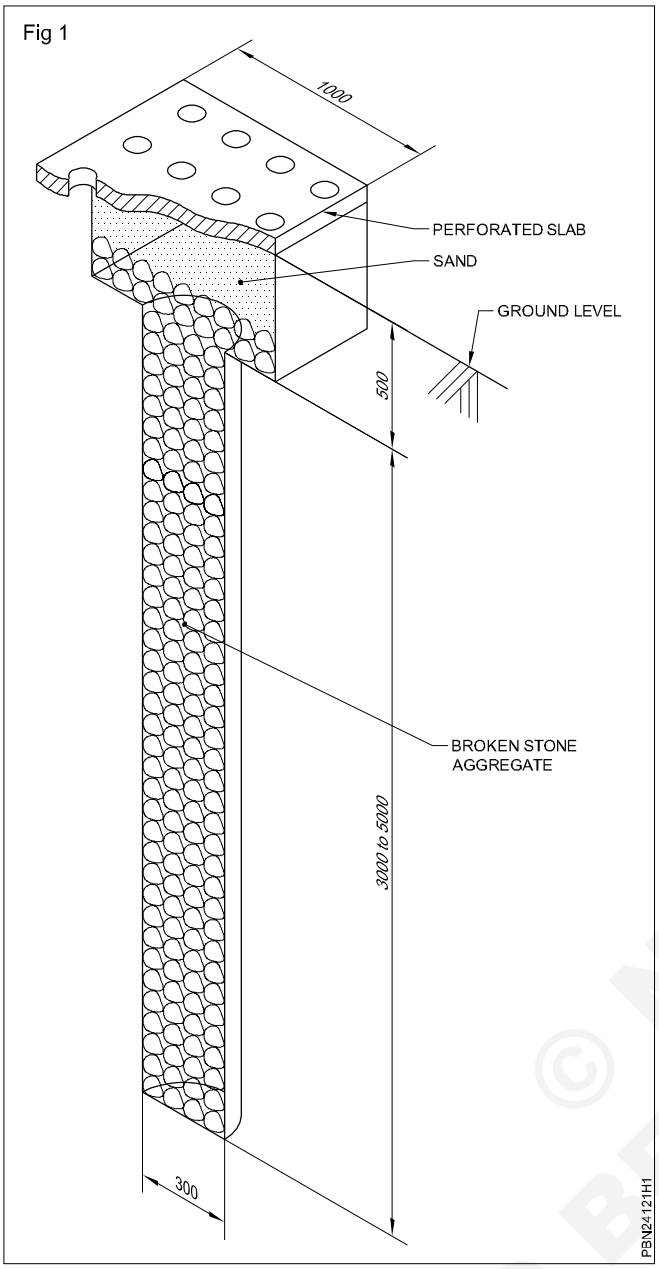


Fig 1



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 dismantling of cocks and valves**
- **explain different types of sensor tap.**

Requirements

Tools/Instruments

• Pipe wrench	- 1 No.
• Adjustable wrench	- 1 No.
• Water pump plain	- 1 No.
• Spanner set	- 1 No.
• Screw driver	- 1 No.
• Pocker	- 1 No.
• Chisel	- 1 No.
• Hammer	- 1 No.

Equipment/Components

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

Materials

• Stop cock	- as reqd.
• Different types valves	- as reqd.
• Sensor taps	- as reqd.
• Fittings	- as reqd.
• RCC cover/grating	- as reqd.

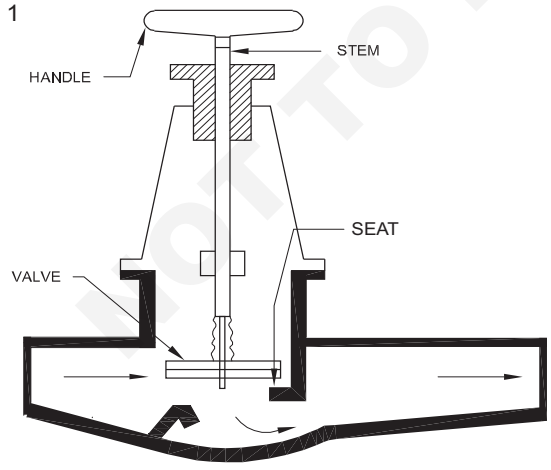
PROCEDURE

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.

Fig 1

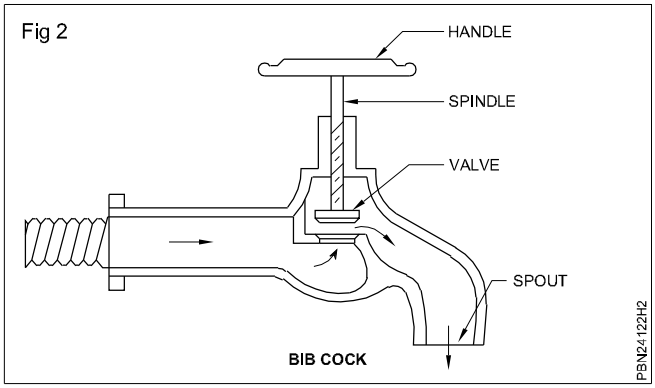


A TYPE STOP COCK

2 Bib cocks (Fig 2)

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

Fig 2

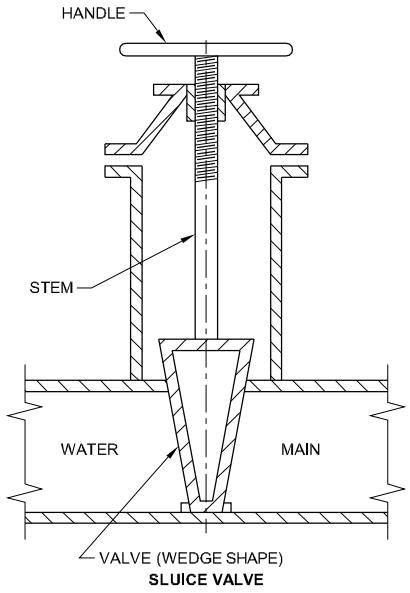


BIB COCK

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

1 Sluice valve (Fig 1)

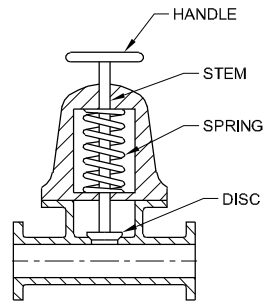
Fig 1



SLUICE VALVE

- 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).

Fig 2



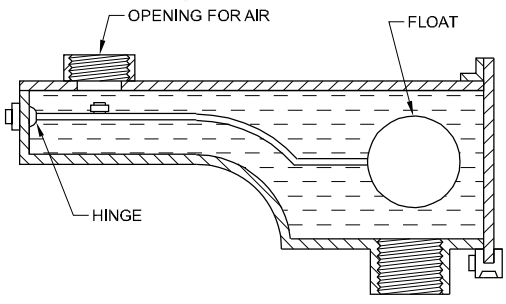
PRESSURE RELIEF VALVE

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

2 Types of different valves

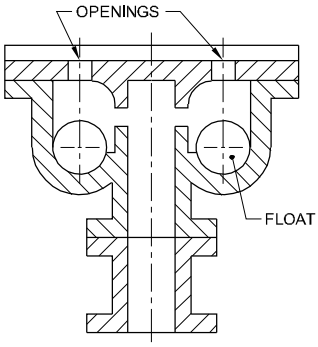
- Air relief valve (Fig 3).

Fig 3



- Double float air relief valve (Fig 4).

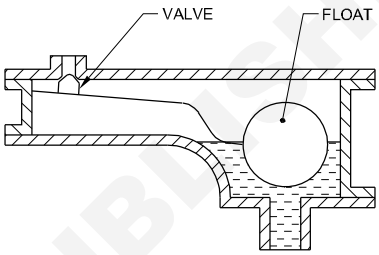
Fig 4



DOUBLE-FLOAT AIR RELIEF VALVE

- Single float air relief valve (Fig 5).

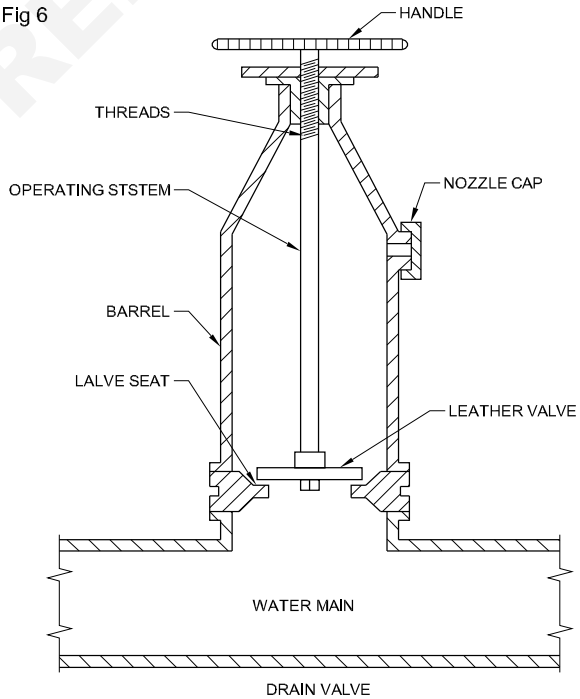
Fig 5



SINGLE-FLOAT AIR RELIEF VALVE

- Drain valve (Fig 6).

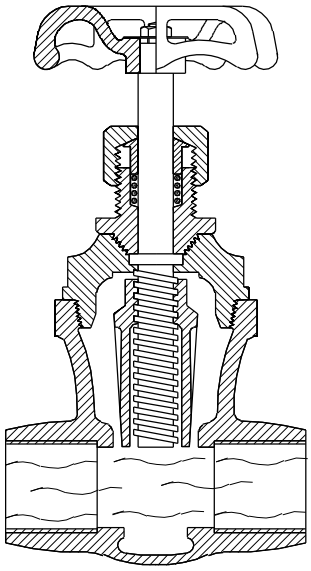
Fig 6



DRAIN VALVE

- Gate valve (Fig 7).
- Globe valve (Fig 8).
- Needle valve (Fig 9).
- Non-return valve/check valve (10a,10b,10c)
- Plug valve (Fig 11)

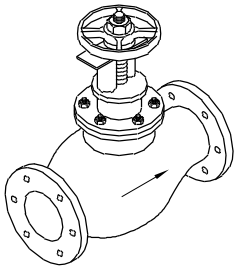
Fig 7



GATE VALVE

PBN24122J7

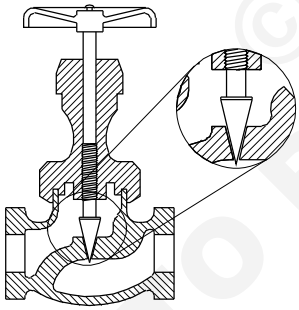
Fig 8



GLOBE VALVE

PBN24122J8

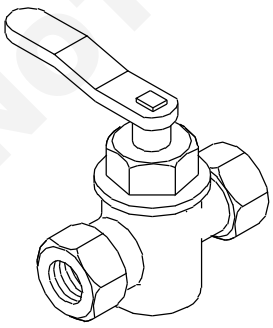
Fig 9



NEEDLE VALVE

PBN24122JB

Fig 11



PLUG VALVE

PBN24122JC

Fig 10

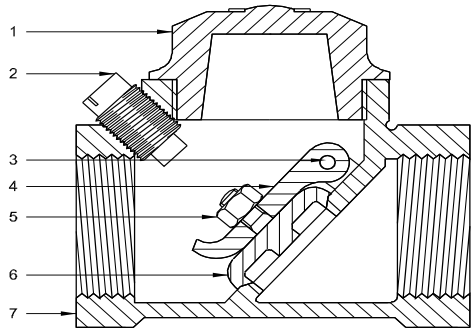


Fig A

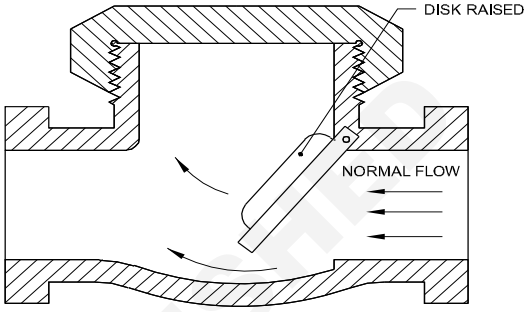
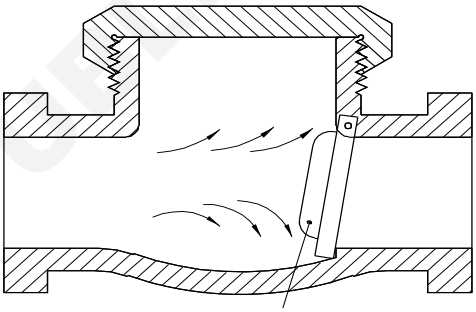


Fig B

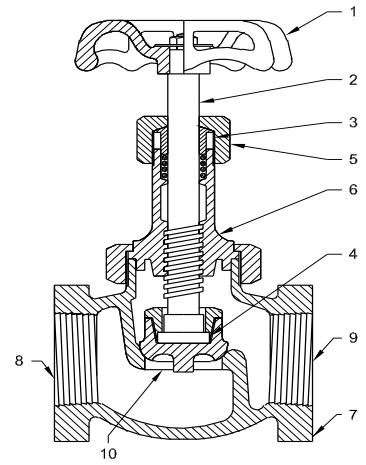


Non return valve (Horizontal) (or) reflux valve

PBN24122JA

- Wheel valve (Fig 12)

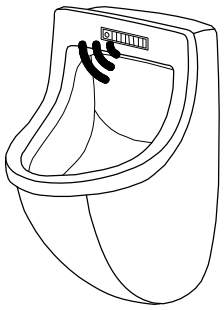
Fig 12



PBN24122J9

- Sensor urinal (Fig 13)

Fig 13

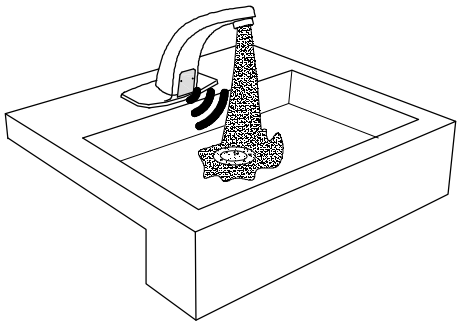


SENSOR URINAL

PB20N111122HD

- Sensor wash basin tap (Fig 14)

Fig 14



SENSOR WASH BASIN

PB20N111122HE

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.

— — — — — — — —

Employ cocks and valves at different place

Objectives: At the end of the exercise you shall be able to
- **select the place for the bib cock, and stop cock**
- **fix bib cock**
- **fix sluice valve**
- **fix stop cock**
- **Identify different types of valve**
- **identify different types of diverters two way & three way**
- **test the valve function**
- **Fix two way and three way diverters.**

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 spanner	- 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 nipple	- as reqd.
• Union	- as reqd.
• Washer, nut, brush	- as reqd.
• Gland rope	- as reqd.
• Two way divertion	- as reqd.
• Three way divertion	- as reqd.

PROCEDURE

TASK 1: **Fixing bib cock (Fig 1)**

1 Decide the place for fixing bib cock.

2 Fix bibcock to socket using pipe wrench after adopting the procedure.

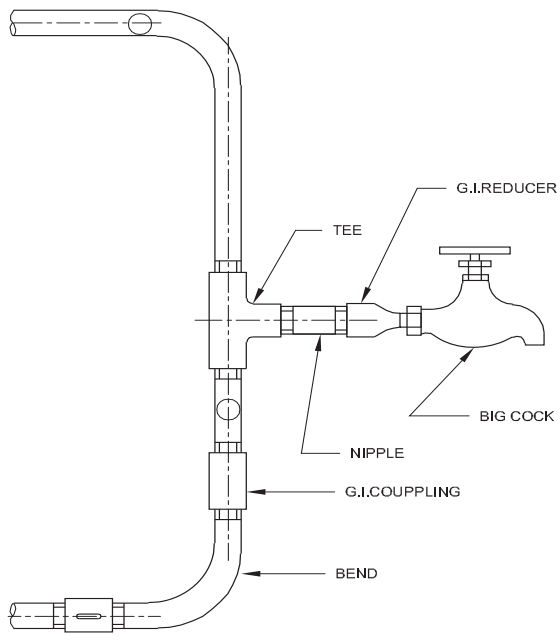
3 Fix a rubber washer between the joint.

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 position.
- Don't over tight.
- Use only spanner while fixing water tap.
- Use correct spanner size only.

Fig 1



TASK 2: **Fixing Stop cock (Fig 1)**

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.

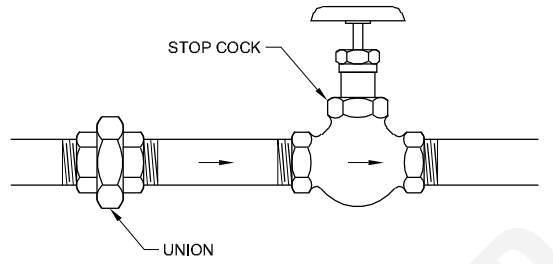
5 Test the pipe line through the stop cock.

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



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TASK 3: **Fixing sluice valve (Fig 1)**

1 Decide to place for fixing sluice valve.

2 Fix big dia cast iron or G.I pipe.

3 Tight the nut subsequenty.

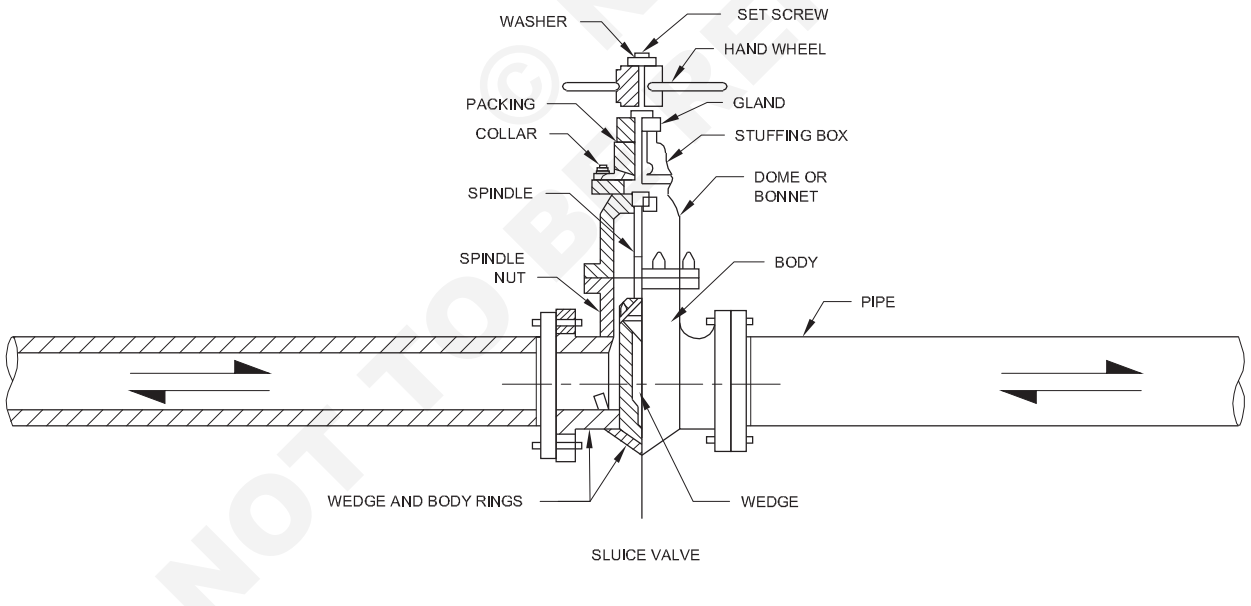
4 Fix a rubber or leather gasket between the joint.

5 For flanges may be fitted by screwing, welding.

Safety

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

Fig 1



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TASK 4: **Fixing of two way diverter (Fig 1& 2)**

1 Set the drawing of two way diverter.

2 Select the materials for fixing the two way diverter.

3 Select the correct hand tools for fixing.

4 Fix the wall mixer uses adjustable wrench.

5 Fix the overhead tee in the wall with 8cm brass extension pipe

6 Fix the brass overhead pipe of size 1.1m.

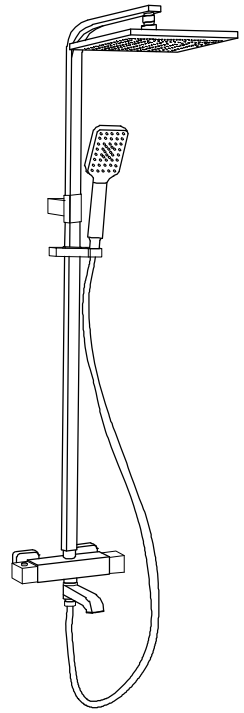
7 Connect the C.P 2 way diverter using adjustable wrench.

8 Connect overhead shower with shower arm.

9 Connect hand shower with P.V.C tube.

10 Fix wall hook for hand shower

Fig 1



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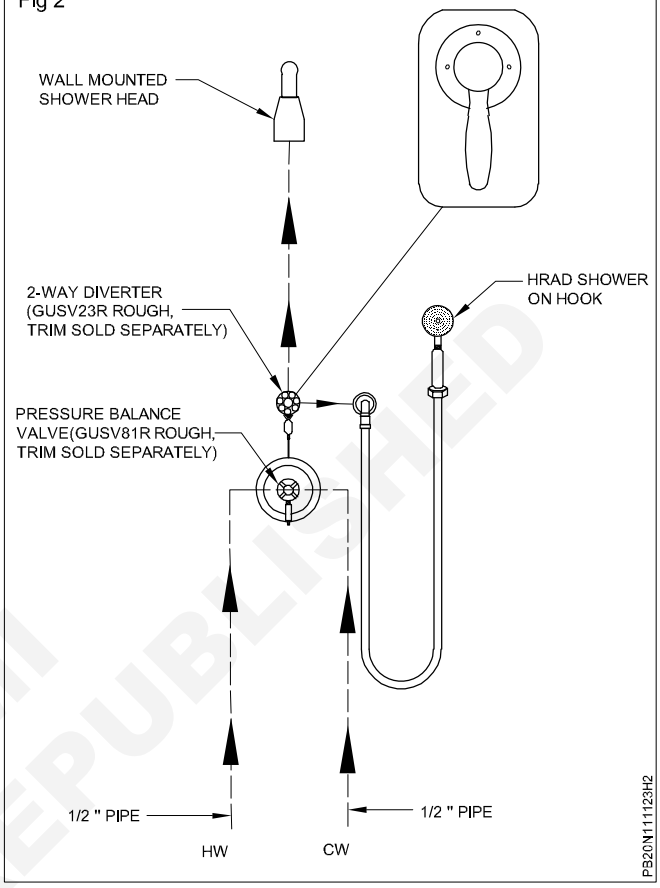
This simplified 2 way diverter is part of a wall mixer spout C.P brass pipe has eliminated the connection bend

Fig 2



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TASK 5: **Fixing of three way diverter (Figs 1,2,3 & 4)**

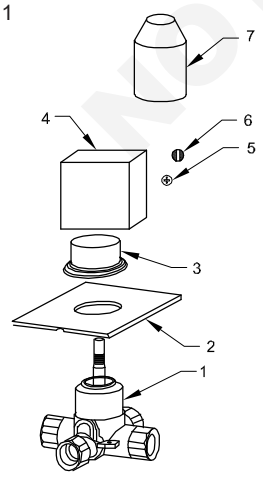
1 Road the diagram with parts assembly. (Fig 1)

2 Select the place for fixing the three way diverter.

3 Select the correct materials and hand tools for fixing

4 Identify the fixing details as per (Fig 1)

Fig 1

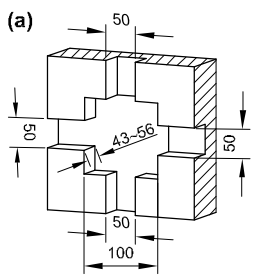


THE COMPONENT LIST	QTY.
1.MAIN BODY	1
2.COVER PLATE	1
3.ADJUSTIVE COVER	1
4.HANDLE	1
5.SCREW	1
6.DECORATIVE PLUG	1
7.PROTECTIVE COVER	1

PB20N111123H3

5 Assemble main body to the pipe line (Fig 2)

Fig 2



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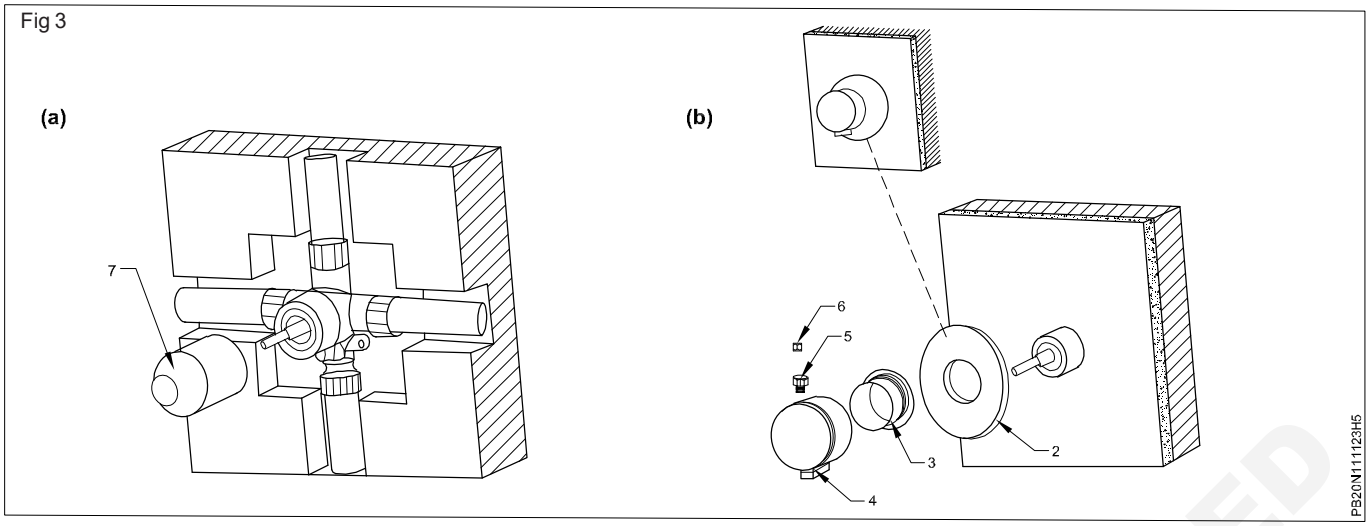
6 Connect cover plate to the main body fixing.

7 Fix adjustable cover to cover plate fixing.

8 Fix handle to the cover plate and screwing (Fig 3)

Fig 3



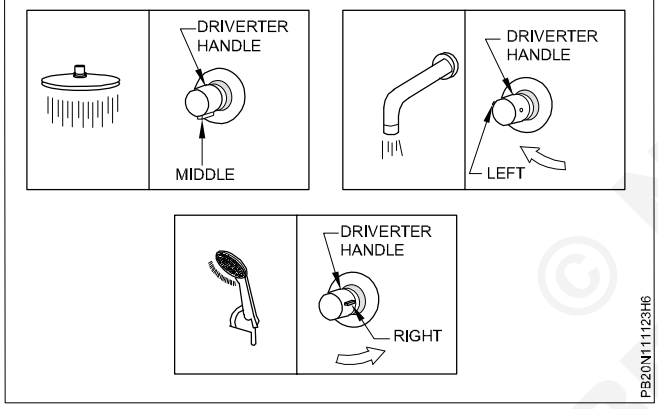
9 Decorative plus and protective cover fixing.

10 Identify the usage of accessories. (Fig 4)

To keep clean & shining flush with clean water and dry with soft cloth only

If any dirt clean with soft liquid (or) transparent glass detergent

Fig 4



TASK 6: **Repairing of water tap replacing of washer**

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

2 Keep the water tap to be repaired in the "open" position. (Fig 2)

Fig 1

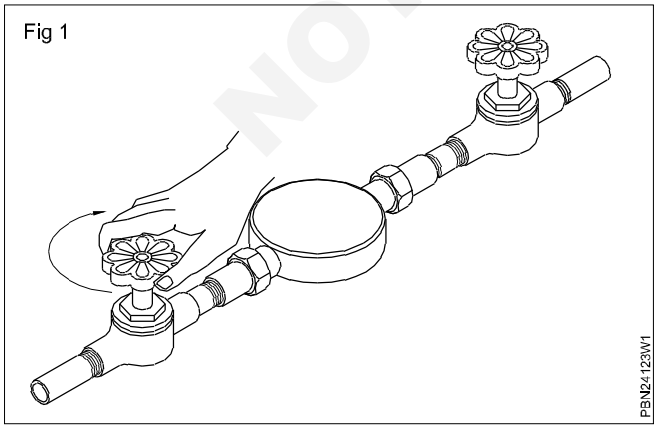
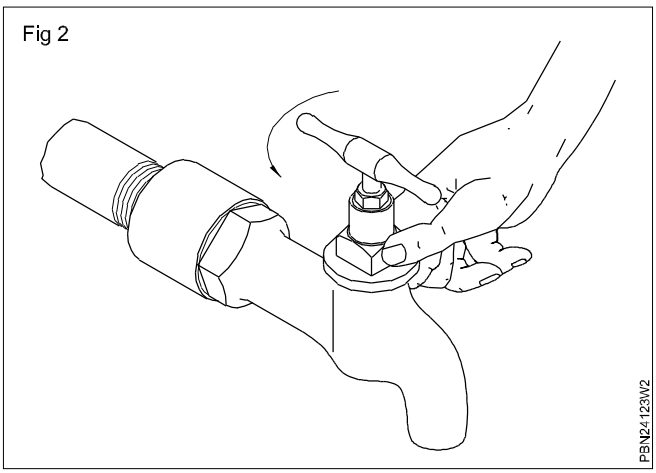
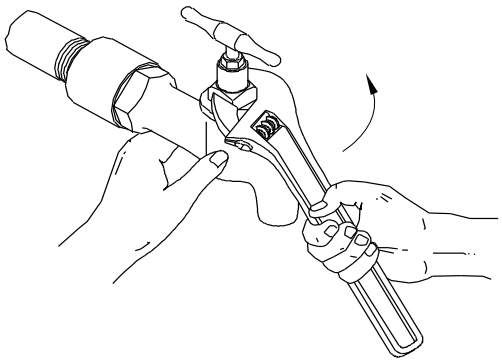


Fig 2



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

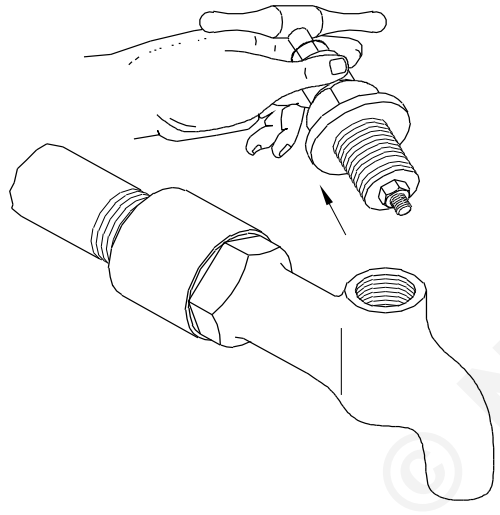
Fig 3



PBN24123W3

4 Inspect the washer for damage (Fig 4).

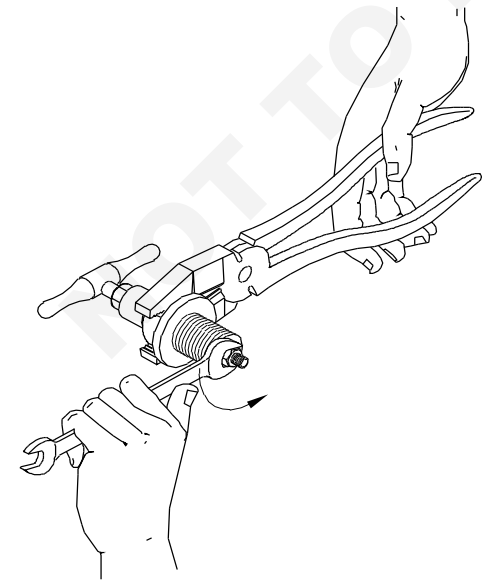
Fig 4



PBN24123W4

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

Fig 5



PBN24123W5

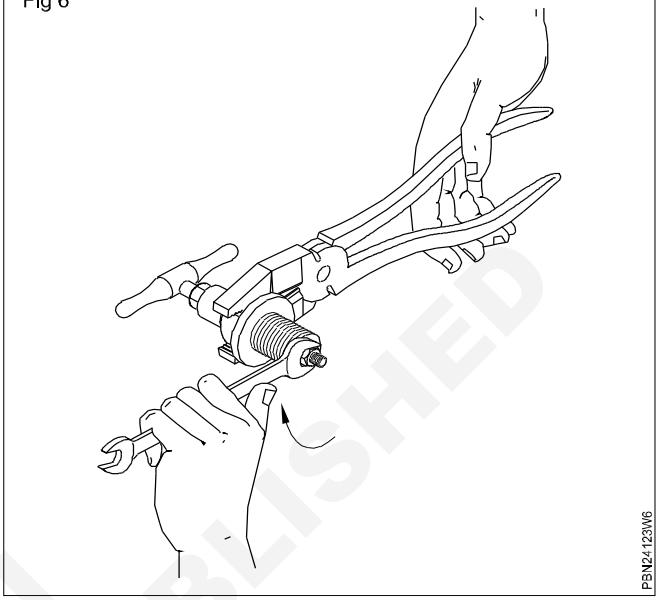
6 Remove the washer from its seating.

7 Press the new washer into position.

Use fiber washer for hot water tap.

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

Fig 6



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

Fig 7

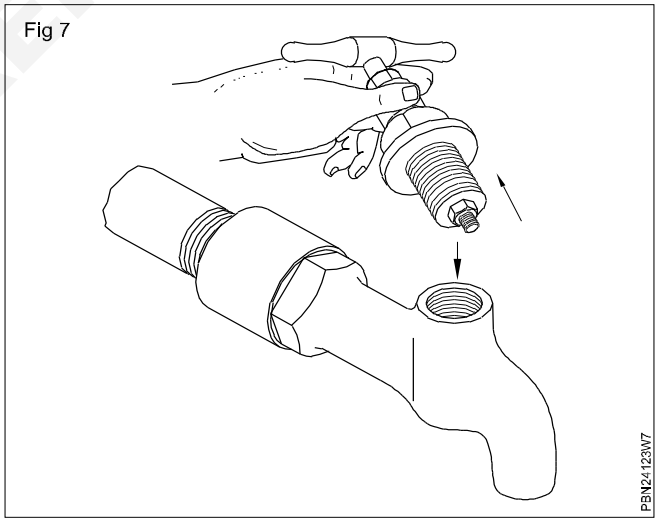

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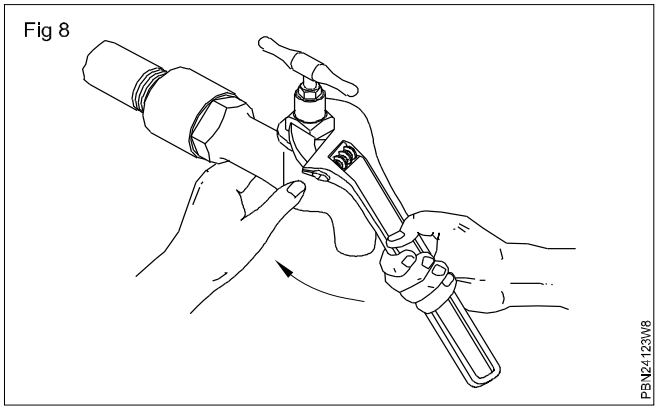
Fig 8



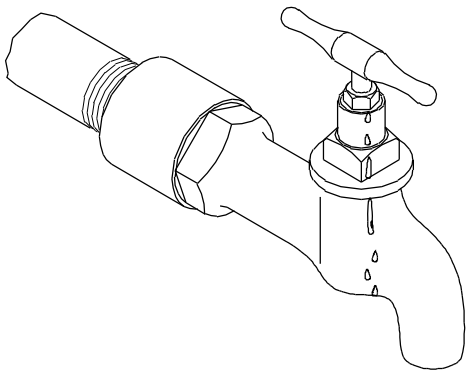
PBN24123W8

TASK 7: **Repair water tap replacing of packing material**

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

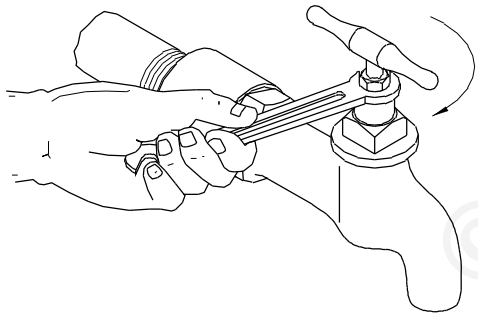
2 If water escapes from the water tap's gland nut, close the stopcock by turning the handle clockwise as this will stop the water in the tap to be repaired (Fig 1).

Fig 1



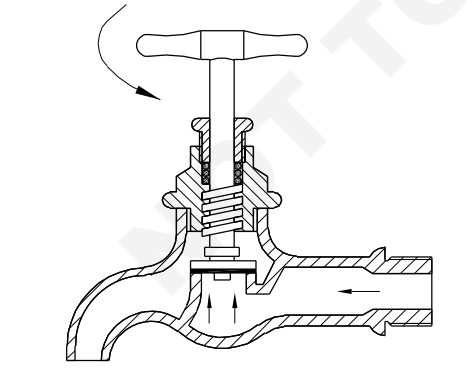
3 Tighten the gland nut to compress the packing around the shaft (Fig 2).

Fig 2



4 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).

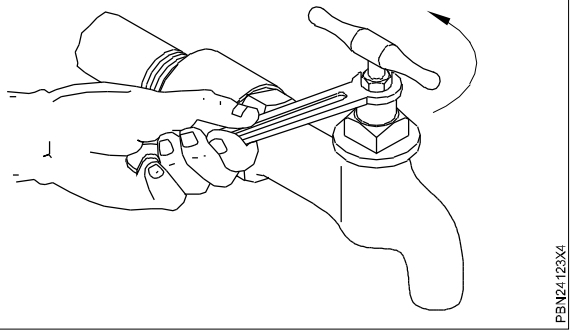
Fig 3



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

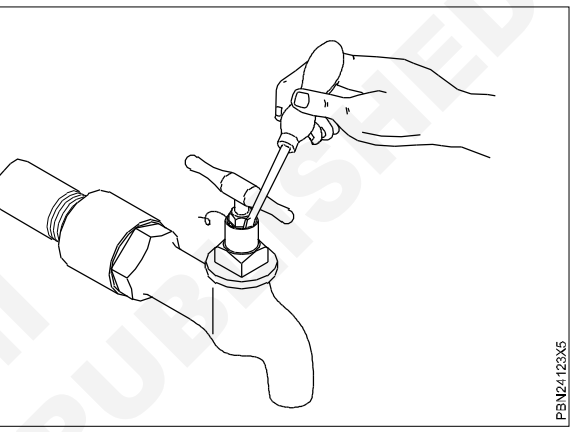
6 Loosen the gland nut from the bonnet by turning it anticlockwise with a spanner (Fig 4).

Fig 4



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

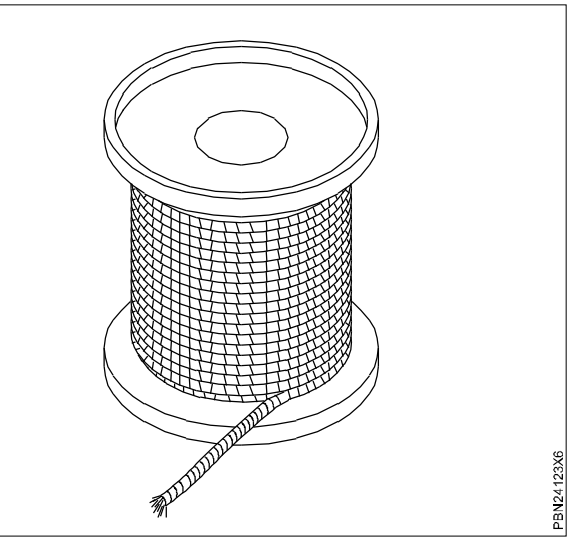
Fig 5



Do not damage the bore of the stuffing box.

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

Fig 6

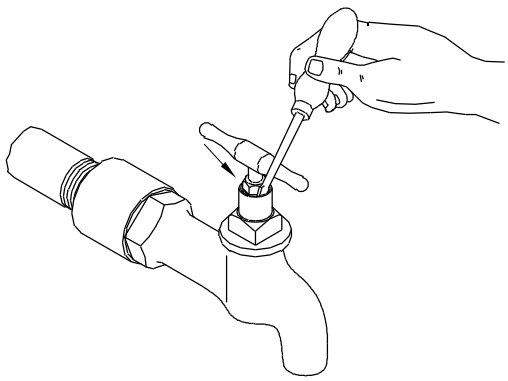


9 Coil the new packing around the shaft and push it down with a small screw driver (Fig 7).

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

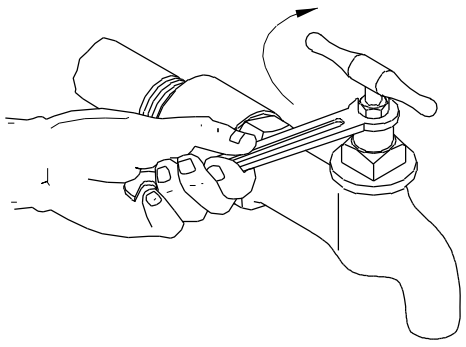
11 Open the main gate valve and test the water tap for leakage.

Fig 7



PBN24123X7

Fig 8



PBN24123X8

TASK 8: **Dismantle and service of gate valve**

1 Shut off the water by closing the main valve.

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

3 Remove the gland nut from the bonnet.

4 Clean out the old packing in the stuffing box.

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

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

7 Assemble the spindle gate to the bonnet.

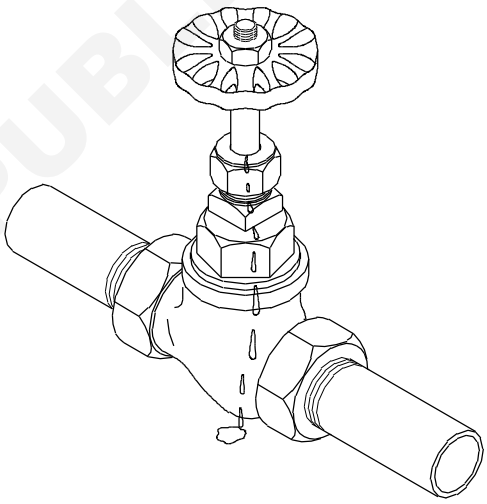
8 Assemble the gland nut, hand wheel and tighten the hand wheel nut.

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.

Do not use the gate-valve to regulate the flow.

It should be either in fully opened or fully closed condition.

Fig 1



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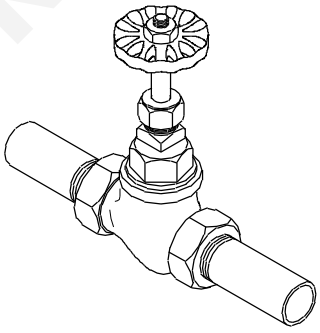
TASK 8: **Repair a gate valve**

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

Fig 1



PBN24123Y1

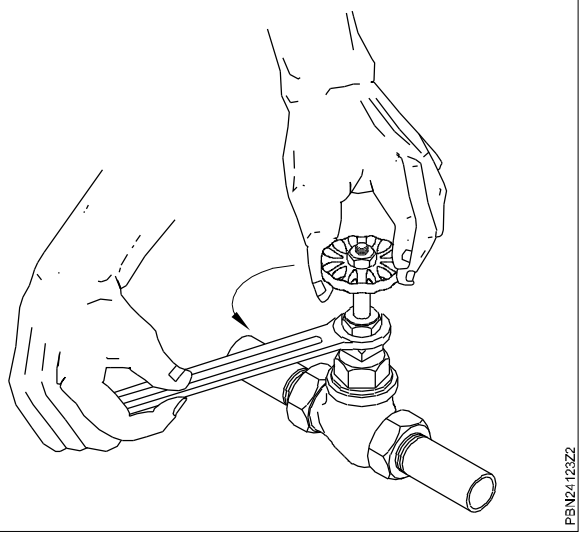
This will stop the water in the valve to be repaired.

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 (Fig 3).

4 Remove the stuffing gland (Fig 4).

Fig 2



PBN2412322

Fig 3

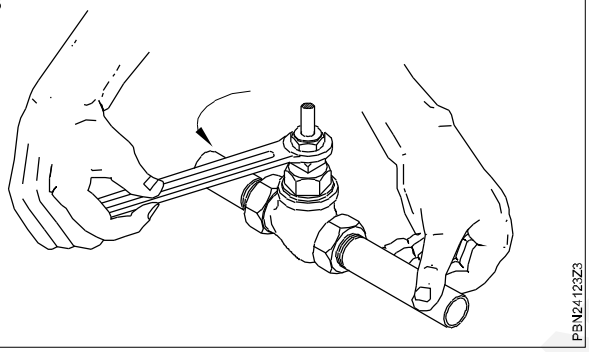


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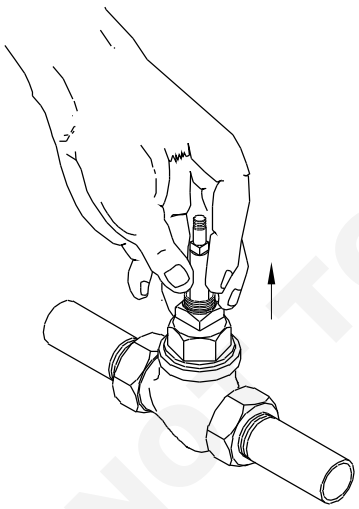
Fig 4



PBN2412324

Fig 5

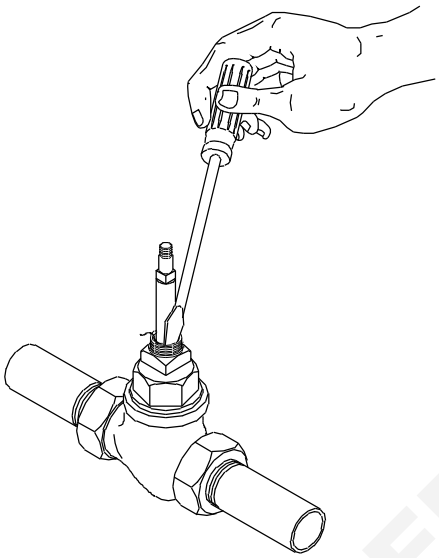


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Fig 6

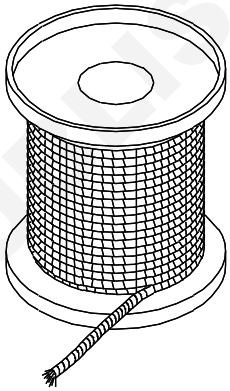

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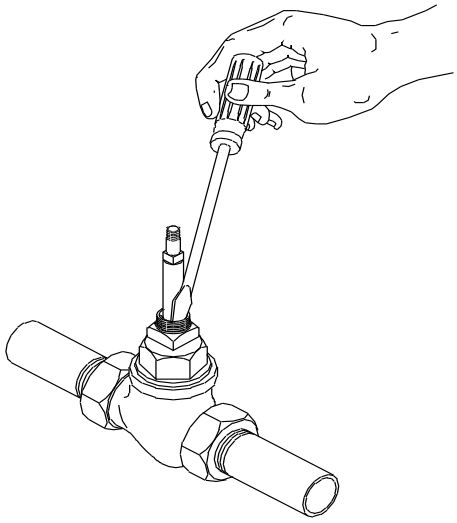
Fig 7



PBN2412327

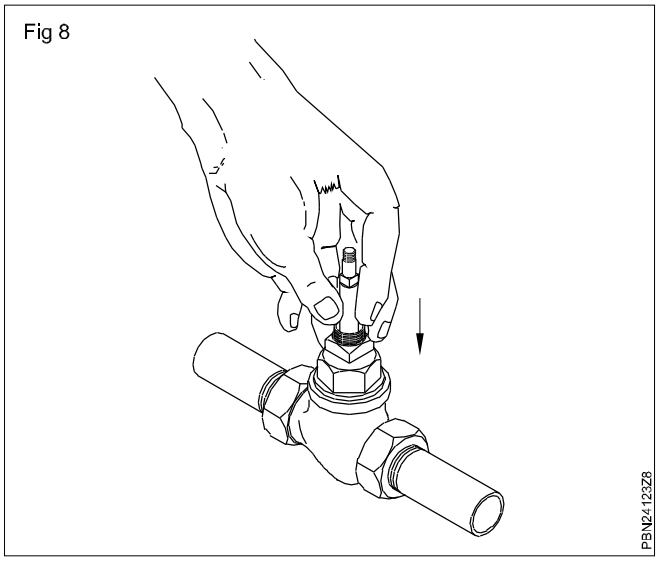
5 Clean out the old packing in the stuffing box (Fig 5)

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

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

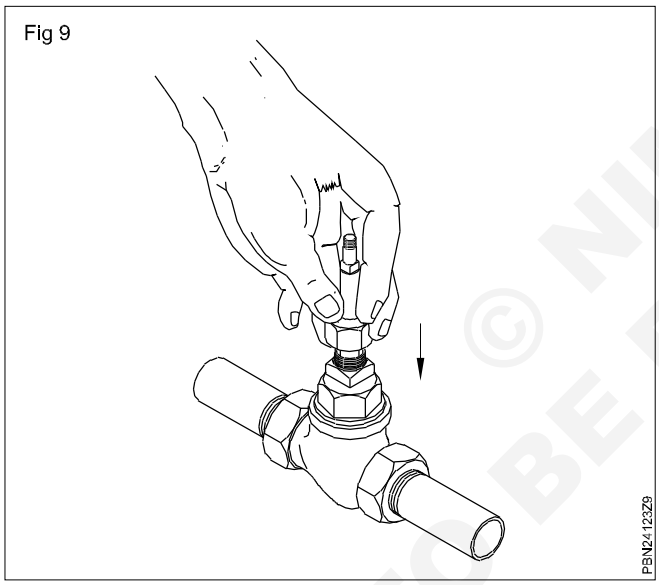
8 Push in the stuffing gland and check that it fits tightly in the stuffing box (Fig 8).

Fig 8



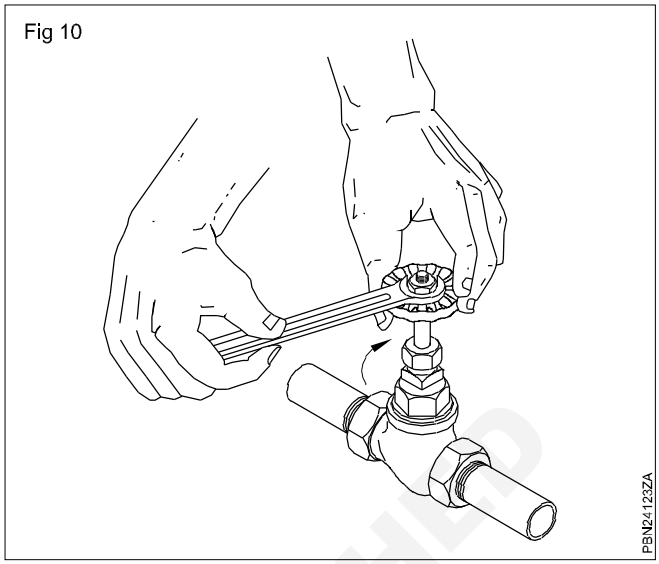
9 Re-assemble and leave the gland nut hand tight (Fig 9).

Fig 9



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

Fig 10



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.

Removal of spindle set and gate part.

Hold the spanner at bonnet neck.

Loosen the bonnet two or three turn again closen the bonnet 2 or 3 turn

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

• Spirit level	- as reqd.
• Pipe wrench	- as reqd.
• Measuring tape	- as reqd.
• Hammer	- 1 No.
• Screw driver	- 1 No.
• Hacksaw	- 1 No.
• Plum bob	- 1 No.
• Water pump plier	- 1 No.
• Chisel	- 1 No.

Machines / Materials/Components

• Urinal sensor type	- as reqd.
• PVC pipe and fitting	- as reqd.
• Wall clamp	- as reqd.
• White cement	- as reqd.
• Solvent cement	- as reqd.
• Angle cock	- as reqd.
• Urinal spreader	- as reqd.
• Wash basin	- as reqd.
• Pillar tap (sensor type)	- as reqd.
• PVC connector	- as reqd.
• Rag bolt	- as reqd.
• Rubber plug	- as reqd.
• Plaster of paris	- as reqd.

PROCEDURE

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

1 Mark the position of rag bolt 800mm from floor.

2 Drill the mark position for rag bolt.

3 Fix the rag bolt.

4 Check the wash basin any defect.

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.

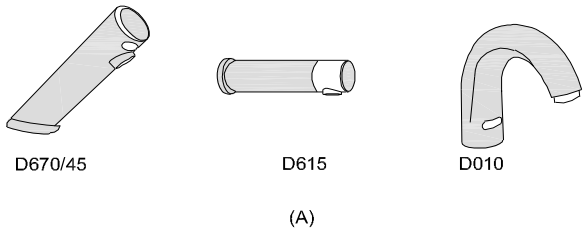
9 Repeat the same process for your outlet pipe.

10 Connect bottle trap.

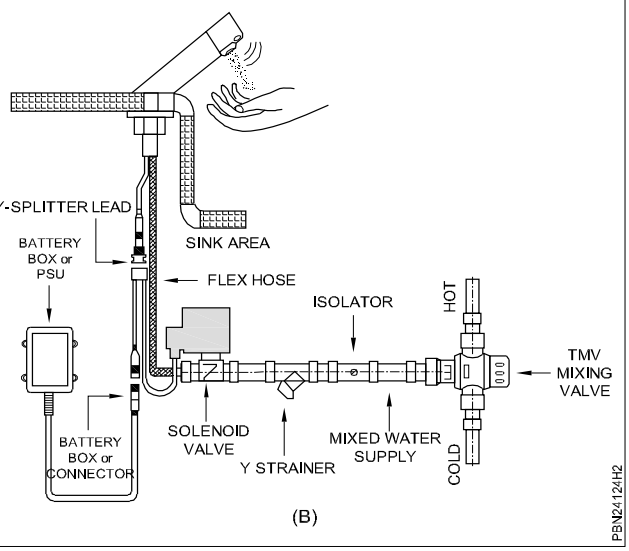
11 Leave the bottle trap to floor trap semi-circular open drain etc.,

12 Test the functioning.

Fig 1



(A)



(B)

TASK 2: **Installation of sensor urinal (Fig 1)**

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 ceramic lid on the top.

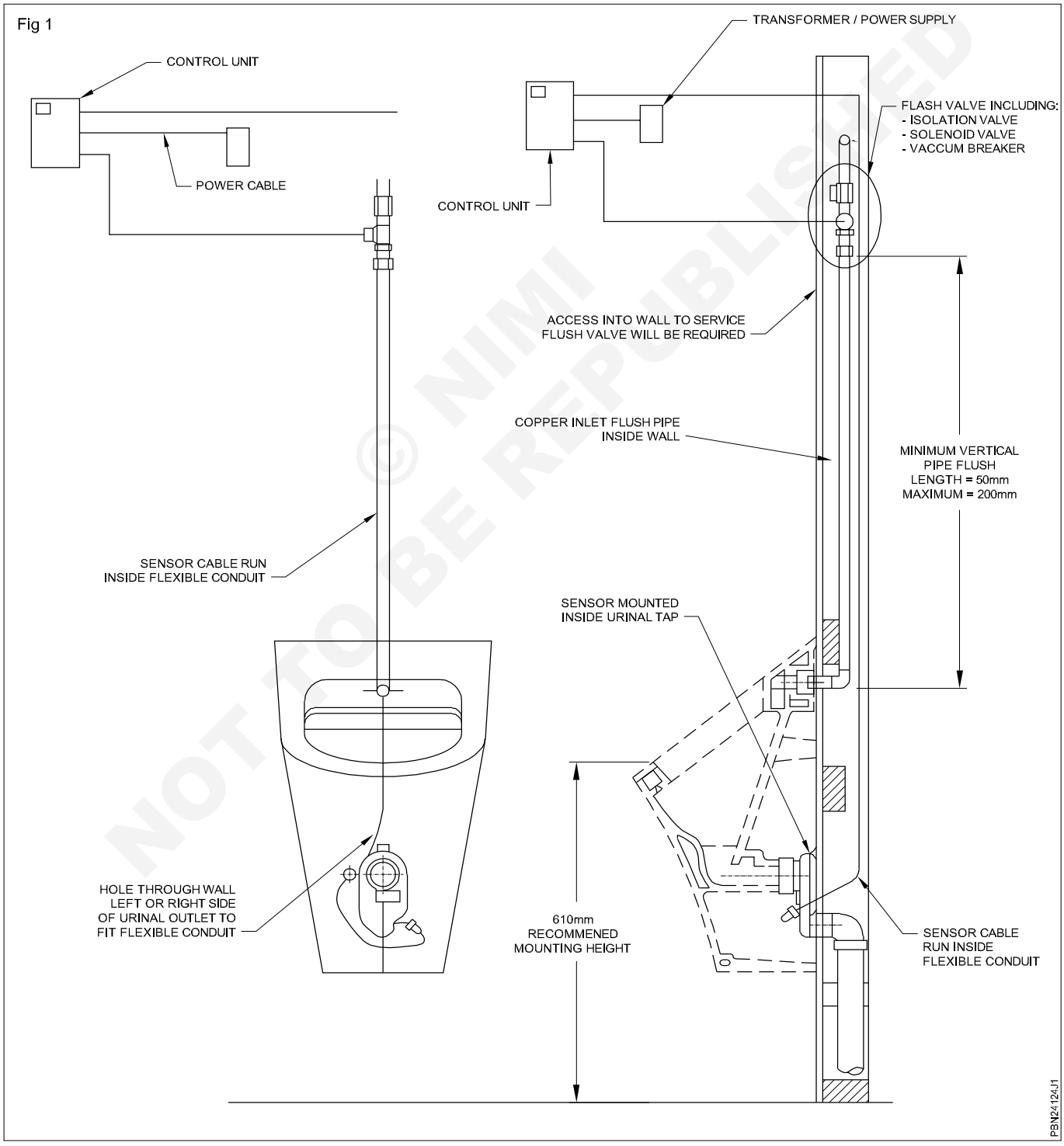
9 Turn the screw clock wise.

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



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 display and demonstrate to the trainees regarding the name and maintenance of different cocks and valves. The figure shown in Exercise 1.10.87 & 1.10.88

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		
13		
14		

— — — — — — — —

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 display and demonstrate to the trainees regarding use of washer gasket different cocks and valves.

Refer the Exercise 1.10.88 (TASK 6,7,8,9)

— — — — — — — —

Demonstrate location of meter, fitting of water meter, bath tub, wash basin

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**
- **lay the consumer pipe line.**

Requirements

Tools/Instruments

- Pipe wrench - as reqd.
- Tap set - 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.
- Mortar pan - 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 water meter (Fig 1)**

1 Arrange the proper tools and materials.

2 Close the main line valve.

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.

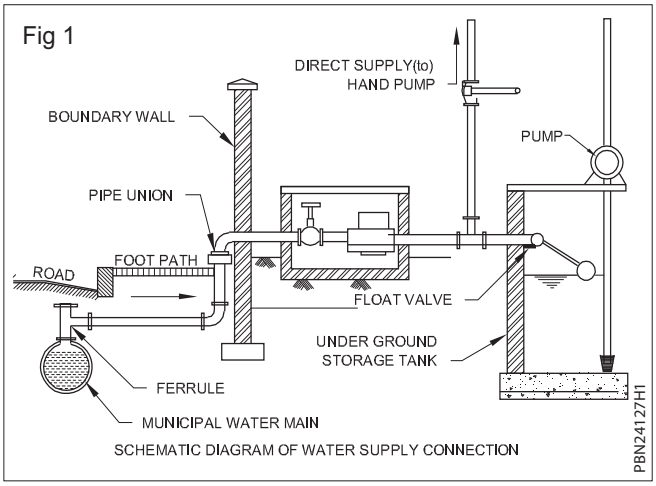
10 Fix a stop cock or gate valve on inlet and out let of water meter location.

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.

Fig 1



SCHEMATIC DIAGRAM OF WATER SUPPLY CONNECTION

14 Fix the water meter between two union, as per the direction to coinside 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.)

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

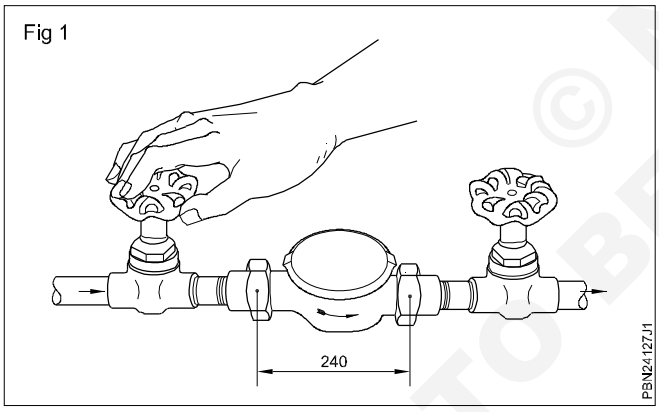
Installation of water meter in domestic water supply

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).

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 coinside with the arrow mark on the water meter.

Fig 2

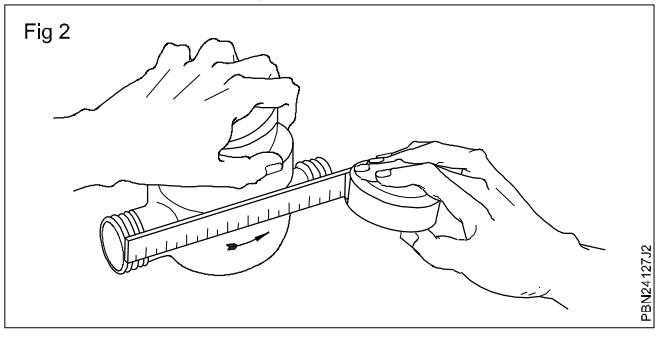
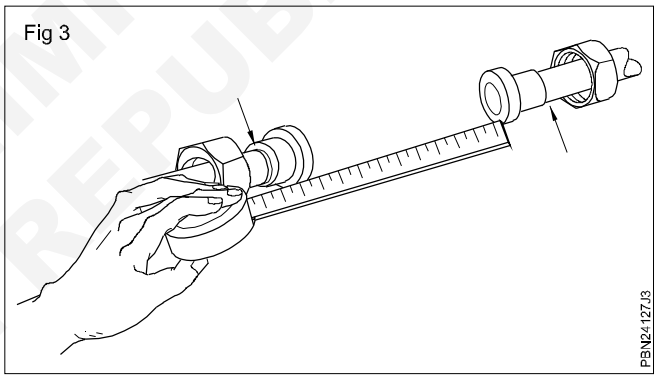
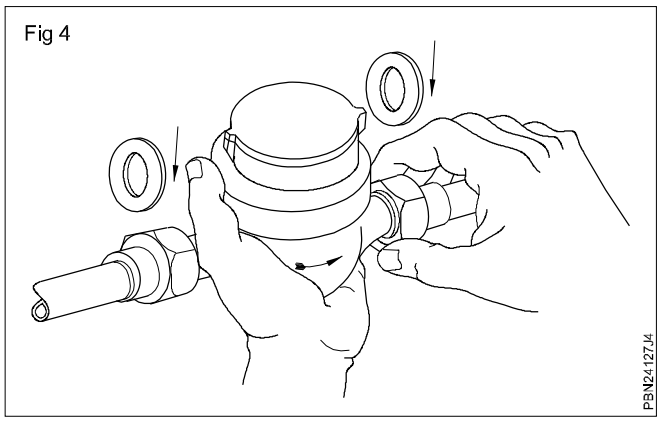


Fig 3



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

Fig 4



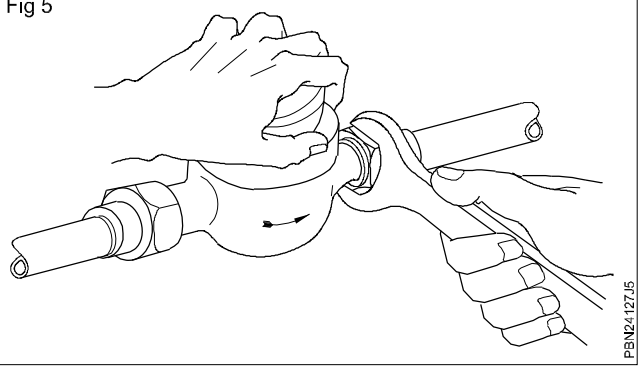
Screw the nut on the coupling.

Repeat the same procedure for other side.

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

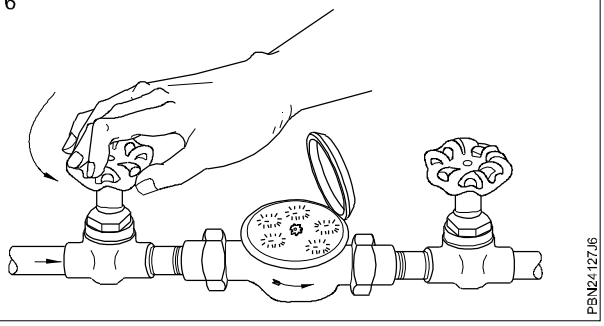
Open the outlet and inlet valve (Fig 6)

Fig 5



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

Fig 6



Demonstrate of wash basin and bath tub

Refer Ex.No. 1.10.93

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Install water meter, bath tub, hand wash basin, water closet, urinal, sink etc with sensor system

Objective: At the end of the exercise you shall be able to
- **measure and mark the area, inspect and alignment, level checking**
- **connect inlet and outlet connection.**

Requirements

Tools/Instruments

- Ball peen hammer - 1 No.
- Drilling Machine - 1 No.
- Chisel - 1 No.
- pipe wrench - 1 No.
- screw driver - 1 No.
- D.End spanner - 1 No.
- Hammer - 1 No.
- Hacksaw - 1 No.
- Trowel - 1 No.
- Pocker - 1 No.
- Sprit level - 1 No.
- Water tube level - 1 No.
- Measuring tape - 1 No.
- Plum bob - 1 No.
- Water pump plier - 1 No.
- Spade - 1 No.
- Straight edge - 1 No.
- Mortar pan - 1 No.

Machines/Equipment

- Pipe vice - as reqd.

Materials/Components

- GI Pipe & fitting - as reqd.
- Thread seal materials - as reqd.
- Wash basin with accessories - as reqd.
- Plaster of paris - as reqd.
- Urinal with accessories - as reqd.
- White cement - as reqd.
- Solvent cement - as reqd.
- Angle cock - as reqd.
- Push cock - as reqd.
- Sink with accessories - as reqd.
- Cement - as reqd.
- Fine sand - as reqd.
- IWC with accessories - as reqd.
- Bricks - as reqd.
- SW pipe or PVC pipe with fittings - as reqd.
- Water - as reqd.
- Valve - as reqd.

PROCEDURE

TASK 1: **Install water meter**

Refer Ex.No. 1.10.92

— — — — — — — —

TASK 2: **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 cushion (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 Fix the bath tub level to the top level. (Fig 1)

8 Fix the trap in the outlet.

9 Connect the hot water line in the left side of the mixture unit.

10 Their should be handles on the top of the tubs.

11 Fix chain with rubber for maintaining water tevel.

Safety

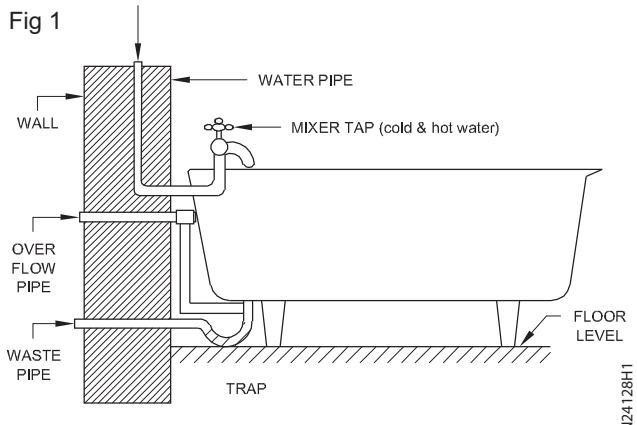
If any welded surface shall be cleaned off inside and outside of the bath tub

Inside the bath tub to provide enamel coating.

Overflow pipe must be connect before the trap.

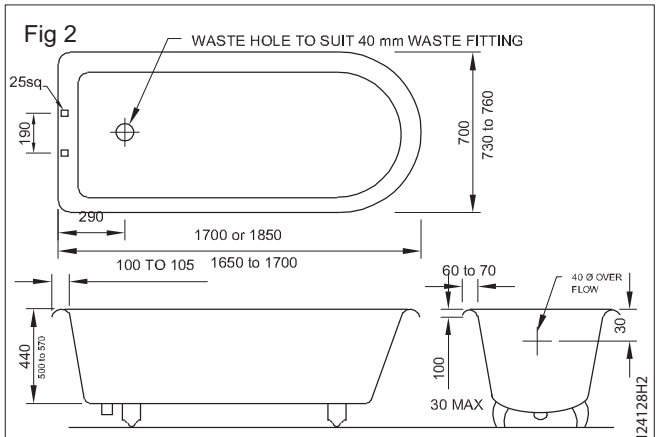
Always to connect left side of the mixer on hot water. Right side on cold water.

Fig 1



SECTION THROUGH A BATH

Fig 2



TYPICAL BATH TUB

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.**

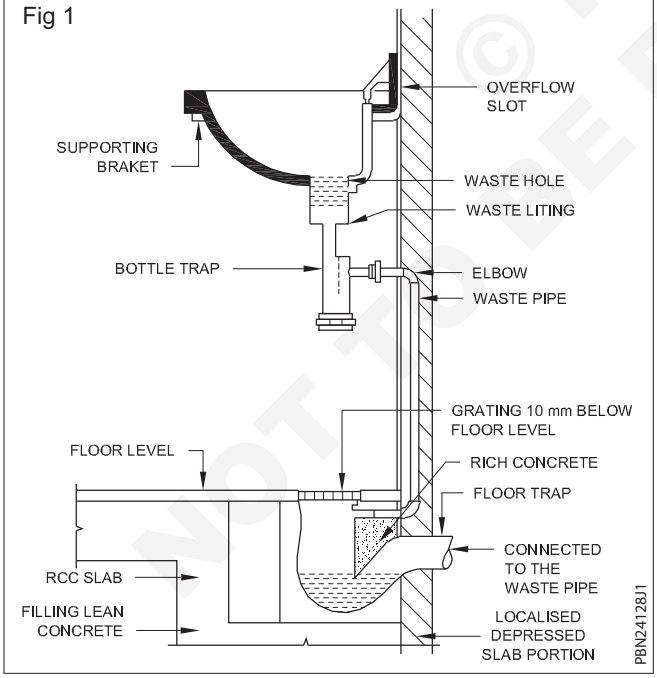
1 Mark the position of rag bolt so that of 800mm from floor.

2 Drill the mark position for rag bolt fixing.

3 Fix the rag bolt suitable distance.

4 Check the wash basin any visible defects.

Fig 1



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.

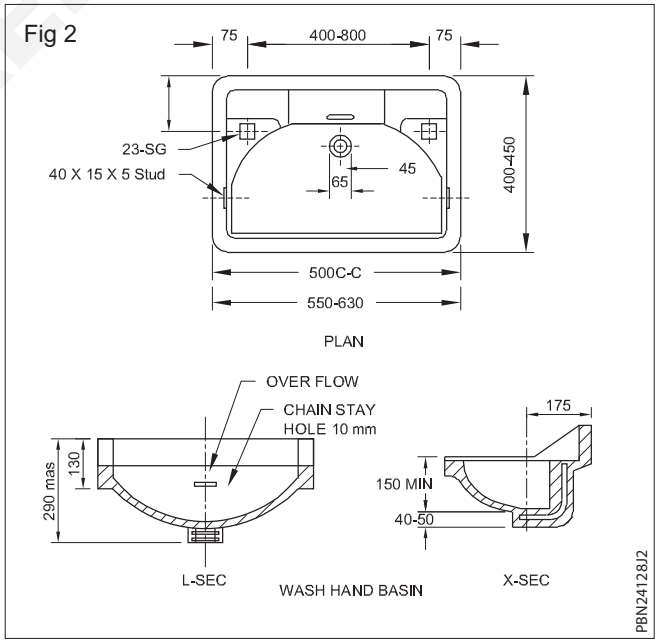
8 Connect bottle trap.

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.

Fig 2



Safety

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

Urinal fixing practice

Objectives: At the end of the exercise you shall be able to
- **measuring & marking as per layout**
- **do fix 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.

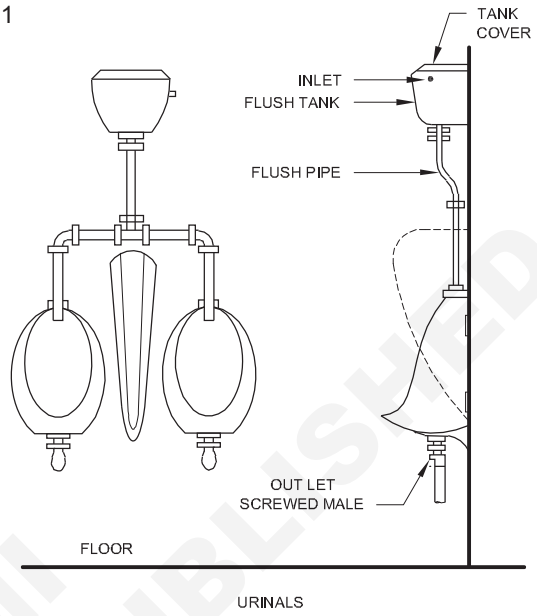
4 Fix the urinal and the tank on the plug provided with suitable screws.

5 Connect water supply to flushing cistern and check for any leak.

Safety

- Handle the urinal carefully.
- Fix the trap and check the level.
- Give minimum gradient to the floor.

Fig 1



Installation of sink

Objectives: At the end of the exercise you shall be able to
- **prepare sink for installation**
- **fix 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.

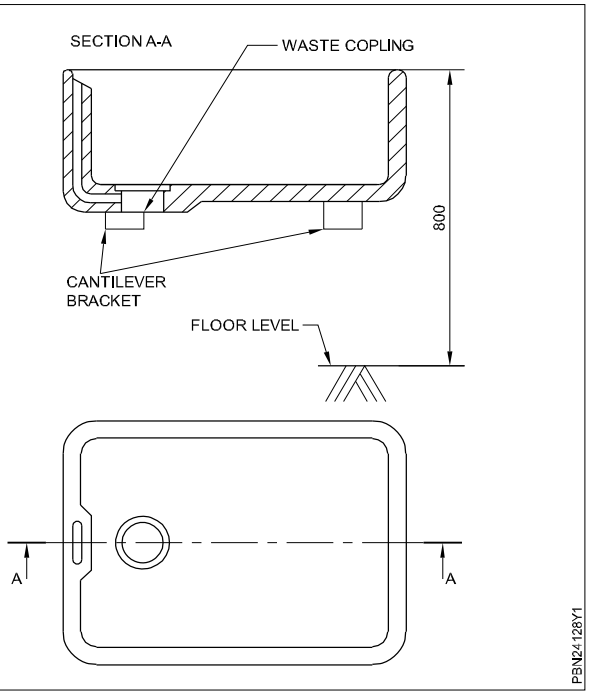
9 Connect G.I. or PVC pipe to union and leave to floor trap.

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) stricking on sink (or) brackets.

Fig 1



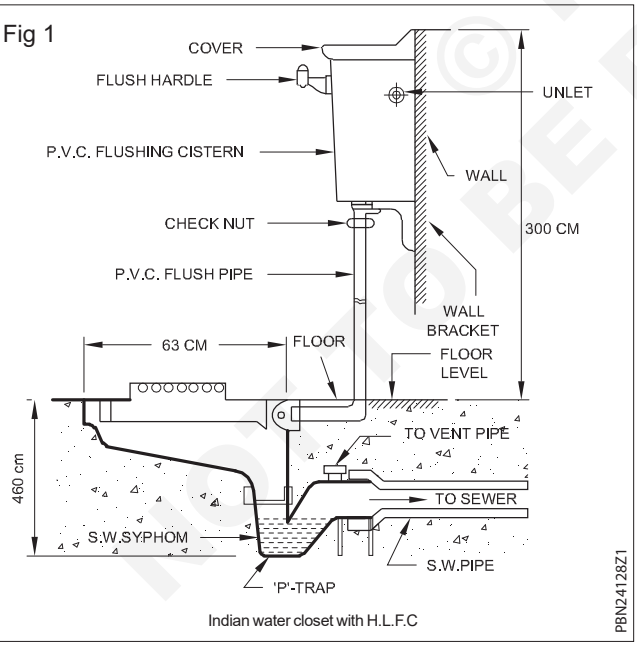
Installation of IWC

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

- **lay in particular spot**
- **fix the 'S' (or) 'P' trap with existing pipe line**
- **fix the wc over the trap**
- **fix the flushing cistern with flush pipe.**

1 Select the place for IWC.

Fig 1



Indian water closet with H.L.F.C

2 Mark the position for fixing closet keep the centre line of closet at 90^0 to rear wall.

3 Place the P or 'S' trap in level at required height .

4 Check any visible defects in IWC.

5 Joint the closet and trap 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 gradiant to the floor.

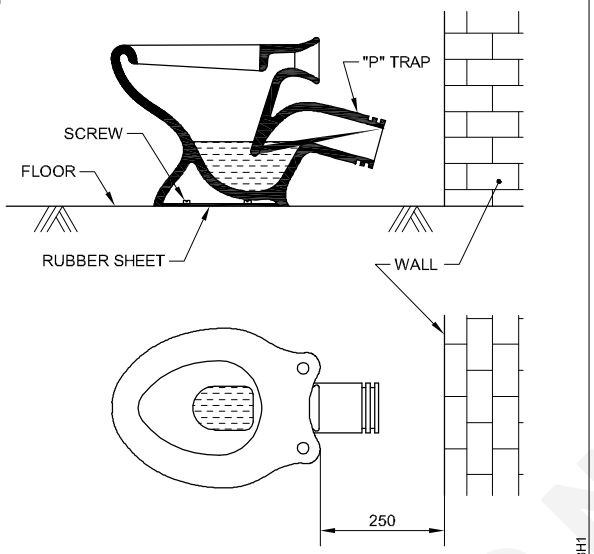
Installation of EWC

Objectives: At the end of the exercise you shall be able to
- **do leveling**
- **do measuring**
- **do marking**
- **do bonding**
- **do fixing**
- **do connecting**
- **do testing**

Select the place for EWC.

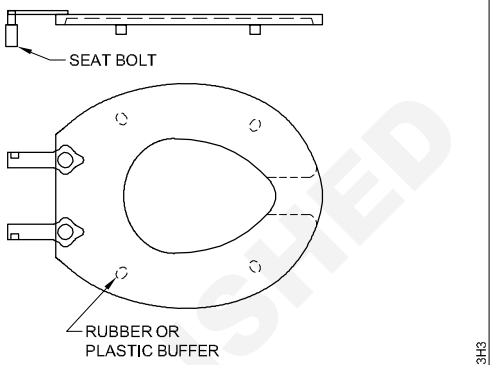
Fix the EWC on the floor as shown in (Fig 1)

Fig 1



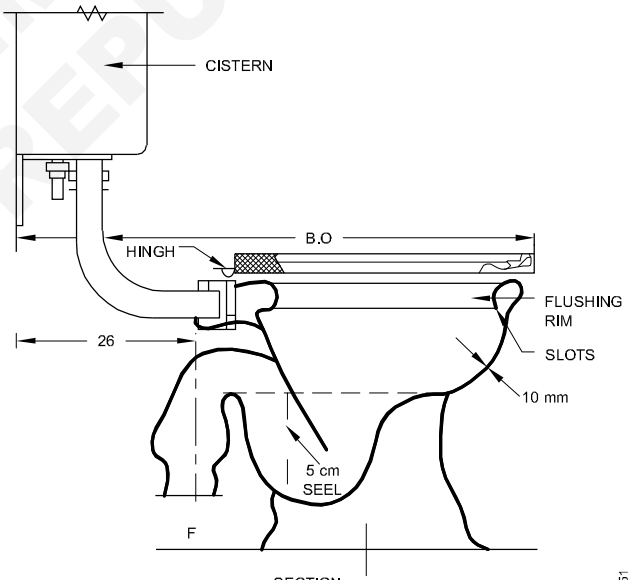
WASH DOWN (EUROPEAN)

Fig 2



PLASTIC SEAT

Fig 3



SECTION

European type W.C with L.L.F.C

Fix flushing unit in the wall as shown in the pictures.

With help of an PVC bend and PVC pipe connect to/EWC.

Connect the flush pipe to the inlet opening of EWC and connect the other end to the flush tank. (Fig 2)

Check the flush system and EWC for any leak.

Fix seat with cover and check the level. (Fig 3)

Safety

- Handle the closet carefully.
- Fix the trap in perfect level.
- Give minimun gradiant to the floor.

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

Objective: At the end of the exercise you shall be able to
- **check functioning of water meter**
- **test the cracks in the sanitary fittings**
- **check leakages and rectify in the joints**
- **test level and airvent joints**
- **check flush tank pipe connections**
- **check seat and cover in W.C.**

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:1.10.92 and 1.10.93

PROCEDURE

1 Water Meter

- Check the leak in joint repairing.
- Check the proper function and repairing.

2 Bath tub

- Check the water level for overflow and closing the mixer taps
- Ensure the cleanliness, keep always clean to avoid slippery.

3 Wash basin

- Avoid using acids to clean pillar tap and C.P waste coupling it will remove C.P coating and glazing.
- Clean the bottle trap frequently.

4 Water closet

- Use mild and diluted solution to clean.
- Must provide anti syphon pipe to protect water seal of the traps.
- Must provide P.V.C mesh to airvent cowl to prevent nests and mosquito.

5 Urinal

- C.P spreaders should be frequently cleaned.
- Use soft water to sanitary fittings to avoid stain and scaling.

6 Sink

- Avoid fixing sputs too hight it will result in splashing.
- Waste water from ablution fittings do not link directly to the inspection chamber.
- Waste water to be connected to gully chamber.

Demonstrate testing of water meter, bath tub, hand wash basin

Objectives: At the end of the exercise you shall be able to
- **trace line existing pipe line in the fittings**
- **mark the founded area**
- **repair the leak founded points.**

Requirements

Tools/Instruments

- Plumber tool kit - 1 No.

Machines/Equipment

- Compressor - 1 No.

Materials

- Soap oil - as reqd.
- Thread seal material - as reqd.

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.

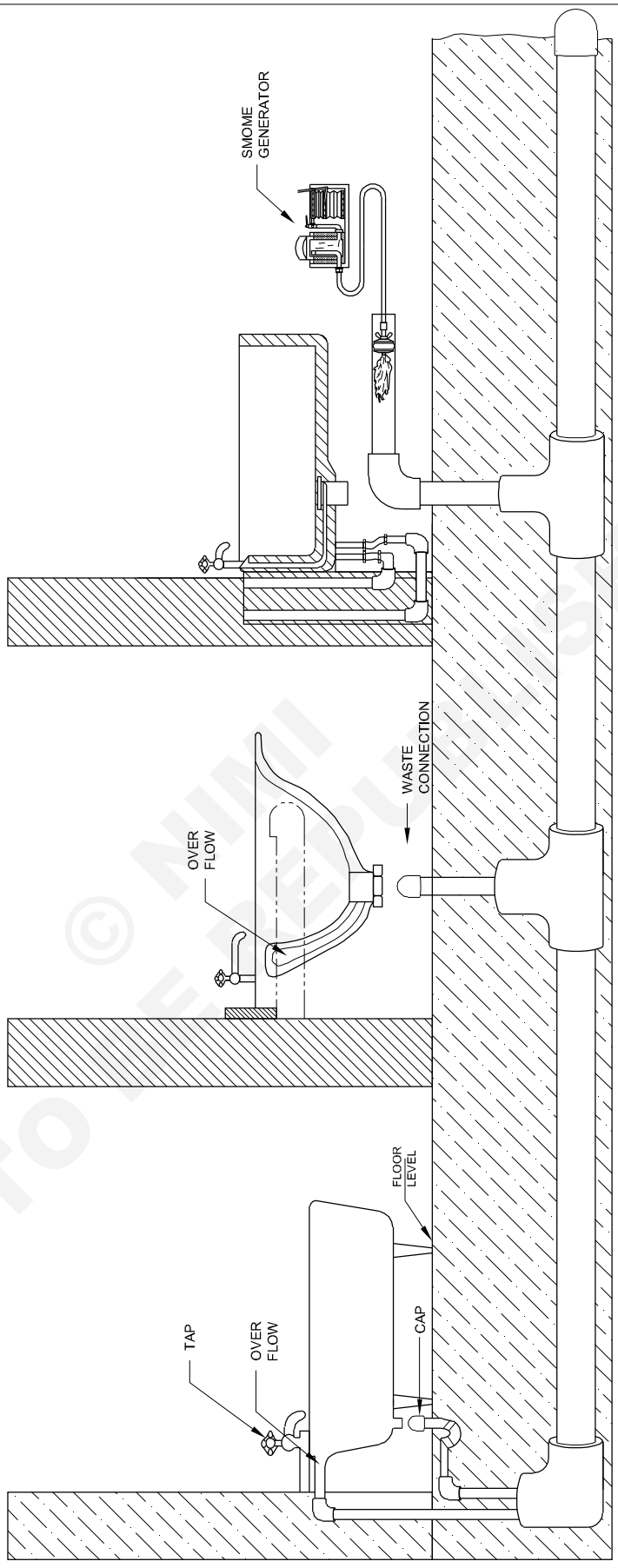
If the leaking point may be on fitting

1 Particular fitting may dismantle and replace of.

2 If any loose fitting

3 Make proper tighting of fitting with suitable thread seal materials.

Fig 1



PBN24130H1

Demonstrate rain water and drainage pipe system

Objectives: At the end of the exercise you shall be able to
- **fix the rain water gutter on the metal shop end**
- **connect the PVC pipe to the gutter**
- **assemble the pipe shoe at end of the pipe.**

Requirements

Tools/Instruments

- Measuring tape - 1 No.
- Hammer - 1 No.
- Chisel - 1 No.
- Trowel - 1 No.
- Mortar pan - 1 No.
- Plumb bob - 1 No.
- Spade - 1 No.
- Rawl jumper - 1 No.
- Caulking tool - 1 No.
- Spirit level - 1 No.
- Blow lamp - 1 No.
- Straight edge - 1 No.
- Water tube level - 1 No.

Equipment/Materials/Components

- Drilling machine - as reqd.
- Mason pits - as reqd.
- Pipe PVC 6” - as reqd.
- Pipe shoe PVC - as reqd.
- Swan neck pipe - as reqd.
- Off set pipe - as reqd.
- Metal sheet - as reqd.
- Gutter - as reqd.
- Clamp - as reqd.
- construction material - as reqd.
- Solvent cement - as reqd.
- Vent cowl - as reqd.
- Door cross ‘Y’ etc., - as reqd.
- Thread seal, materials - as reqd.
- Hemp Yarn - as reqd.
- Lead - as reqd.
- Door bend - as reqd.
- Door “Tee” - as reqd.
- Plain bend - as reqd.
- Plain “Tee” - as reqd.
- Collar - as reqd.

PROCEDURE

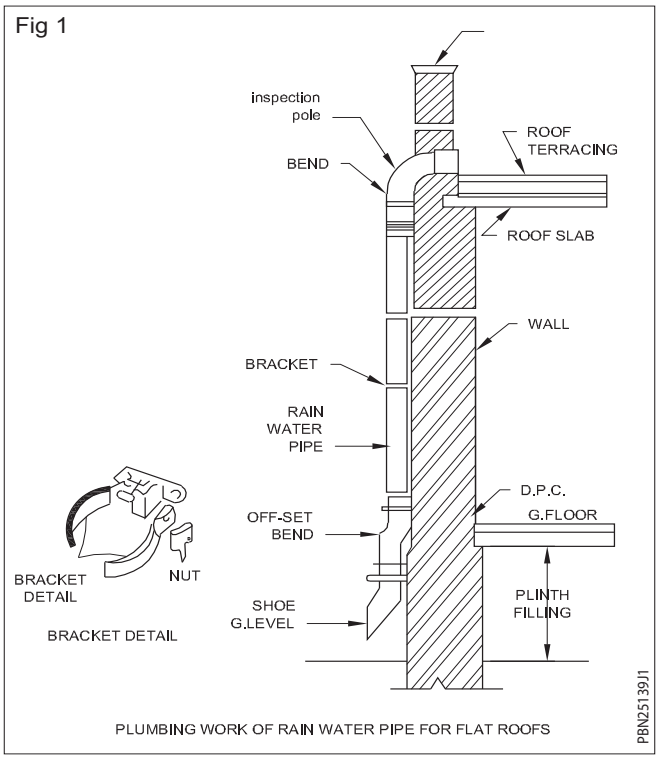
TASK 1 : **Measure and marking of rain water pipe (Fig 1)**

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 line
13 Test it for leakages.

Safety

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

Fig 1



PLUMBING WORK OF RAIN WATER PIPE FOR FLAT ROOFS

Fixing of drainage pipe system

Objectives: At the end of the exercise you shall be able to
- **measure mark and fix the pipe as per drawing**
- **connect 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.

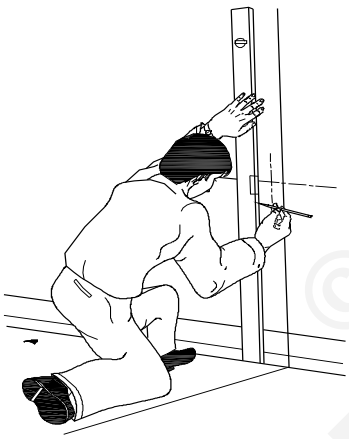
5 Fix brackets at standard intervals in structure.

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 entered fully in to socket.

8 Centralise the joint using small wedge or packing. (Fig 1)

Fig 1



PBN24131J1

9 Joint the pipe and fittings using lead/cement mortar starting from bottom.

10 Tighten the bracket

11 Cure the cement joint

12 Conduct test for leakage

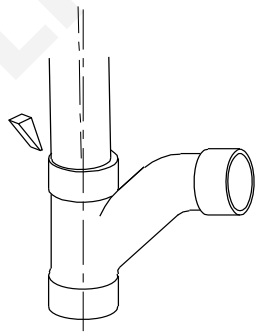
Safety

- Don't use the damaged tools.
- Should not fix loosely clamp.
- Fix the Vertical pipe to right angle. (Fig 2)
- The horizontal line should be accurate slope.
- Complete the joint neatly.
- Four way, three way, Y bend, and bend before door fitting may use. (Fig 3)
- Check the joints completely. (Fig 4)

Fig 2

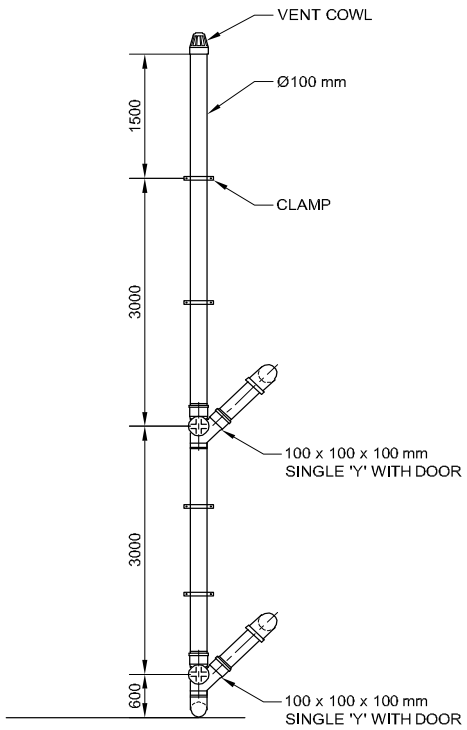
PBN24131J2

Fig 3



PBN24131J3

Fig 1



PB1501H1

Installation of concealed flushing cistern

Objectives: At the end of the exercise you shall be able to
- **prepare all the materials for concealed flushing cistern with accessories**
- **install the concealed flushing cistern**
- **connect the flushing cistern**
- **test the concealed flushing cistern.**

Requirements

Tools/Instruments

- Pipe wrench - 1 No.
- Measuring steel tape - 1 No.
- Spirit level - 1 No.
- Water pump plier - 1 No.
- Screw spanner - 1 No.
- Hammer - 1 No.
- Chisel cold flat - 1 No.
- Mortar pan - 1 No.
- Trowel - 1 No.

Equipment/

- Hammer drilling machine - 1 No.
- Wall chasing machine - 1 No.

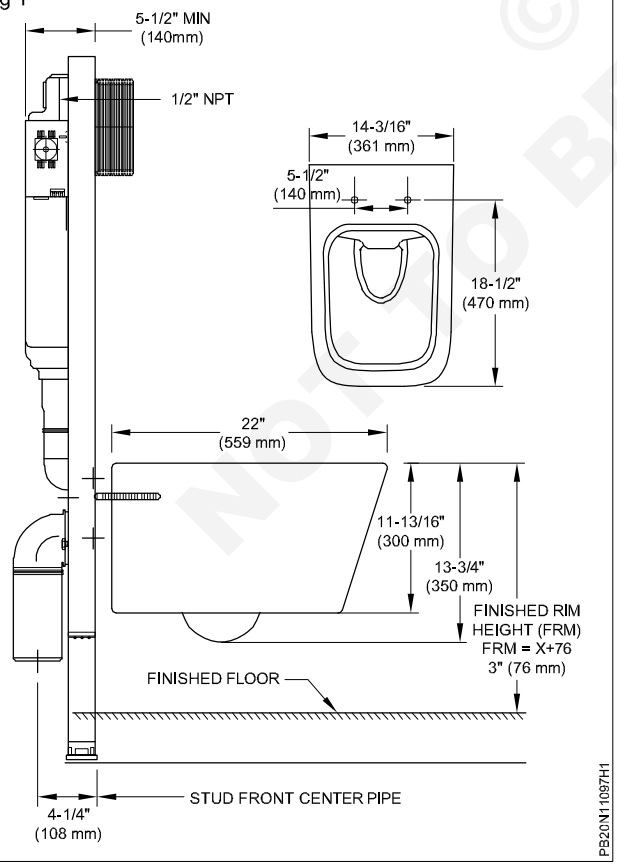
Materials/Components

- Concealed flushing cistern - as reqd.
- E.W.C - as reqd.
- Thread seal materials - as reqd.
- Cement - as reqd.
- Fine sand - as reqd.
- Cotton waste - as reqd.
- Hack saw blade - as reqd.
- White cement - as reqd.

PROCEDURE

1 Check the concealed flushing cistern with all accessories and any visual defects.

Fig 1



2 Select proper hand tools and materials.

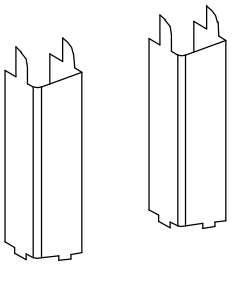
3 Draw a diagram by seeing job sheet. (Fig 1)

4 Mark the position in the brick wall for concealed flushing cistern.

5 Making holes with wall cutting machine, cold flat chisel and ball pein hammer (or) hammer drilling machine.

6 Wall tight plywood packing and wall bracket fixing. (Fig 2)

Fig 2



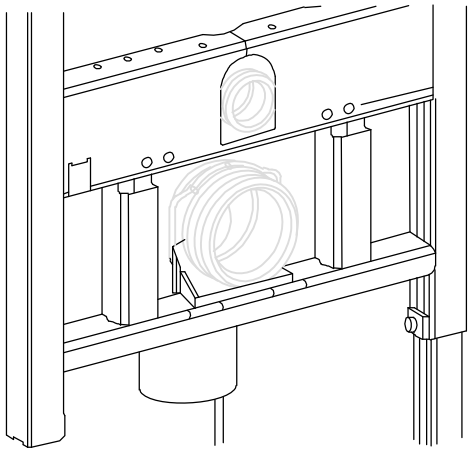
7 Fix the concealed flushing cistern on the bracket. (Fig 3)

8 Mark the flush pipe to E.W.C from flushing cistern.

9 Cut according to the marking using fine teeth hack saw blade (or) pipe cutter (Fig 4)

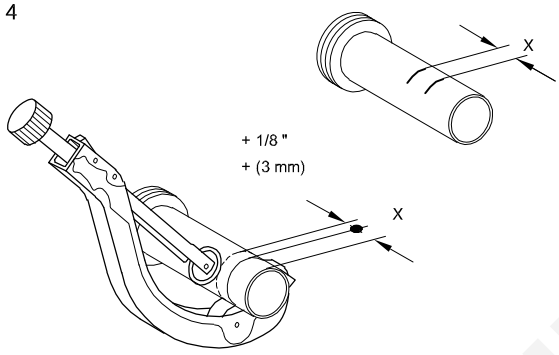
10 Bevel the sharp edge to assure a smooth insertion into the pipe hubs in the wall. (Fig 5)

Fig 3



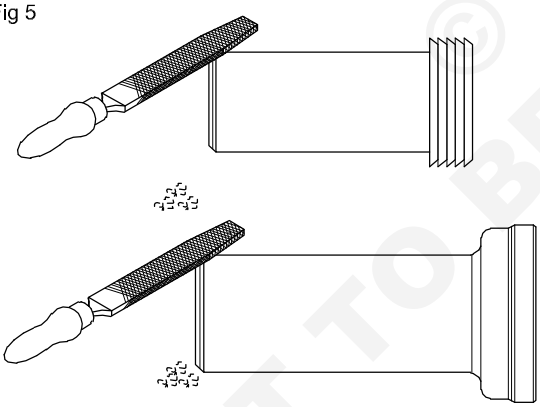
PB20N11097H3

Fig 4



PB20N11097H4

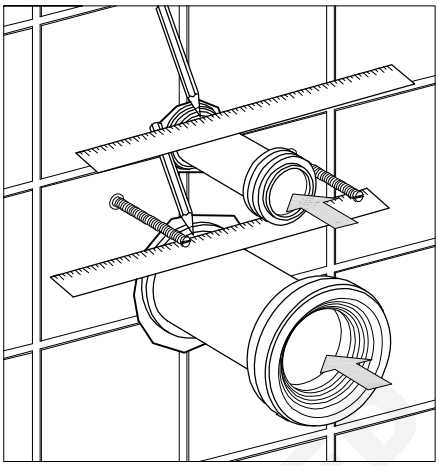
Fig 5



PB20N11097H5

11 Connect the flush pipe to the cistern and tighten the lock nut using proper hand tools. (Fig 6)

Fig 6



PB20N11097H6

12 Mark position of press button housing in the brick wall.

13 Drill 40mm hole using drilling machine, fix press button in position.

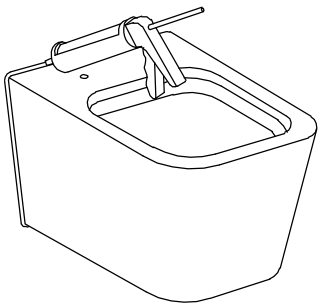
14 Tightening the back nut, clip the button housing with out bend or sink the cable.

15 Inlet valve adjusting to the water level in the cistern.

16 Connect the european water closed pan and fix the seat cover.

17 Seal gap around bowl with water proof cement or white cement. (Fig 7)

Fig 7



PB20N11097H7

18 Check the proper working of flushing cistern with out any water leakage.

19 House keeping and finishing the work.

Safety

Handle the flushing cistern and W.C pan carefully

Check the E.W.C level with the help of spirit level

Demonstrate bending of pipes in 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.
- Steel tape/rule - 1 No.
- Try square - 1 No.
- Soft hammer - 1 No.
- Marking tool - 1 No.

Equipment/Materials/Components

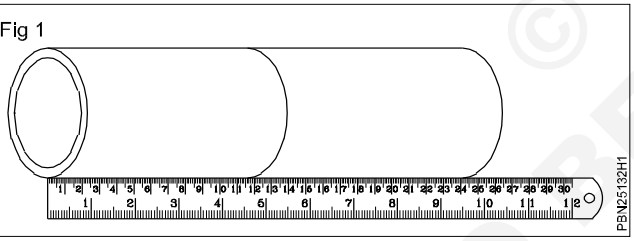
- Portable bending machine - as reqd.
- Hydraulic bending machine with all accessories - as reqd.
- Template - as reqd.
- G.I pipe (12mm - 75mm) - as reqd.
- Wooden plug - as reqd.
- Dry fine silica sand - as reqd.
- Hydraulic oil - as reqd.
- Marking media - as reqd.

PROCEDURE

TASK 1: **Portable hand operated pipe bender**

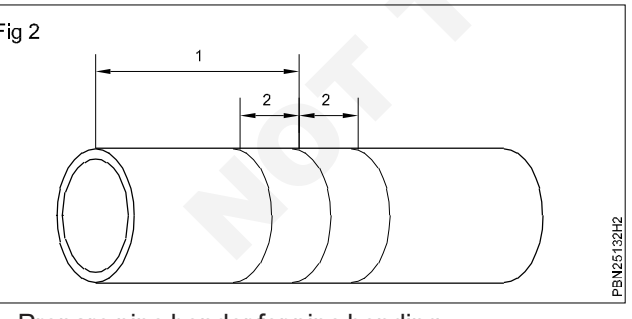
1 Check the pipe for squareness and ensure it is free from burrs. Measure and mark off the centre of the bend (Fig 1).

Fig 1



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

Fig 2



3 Prepare pipe bender for pipe bending.

4 Grouting the machine properly.

Ensure that the stance is properly balanced while bending.

5 Select the pipe for pipe bender.

6 Check the bender with all components (Fig 3).

7 Insert the pipe with suitable former.

8 Push off the leverage handle.

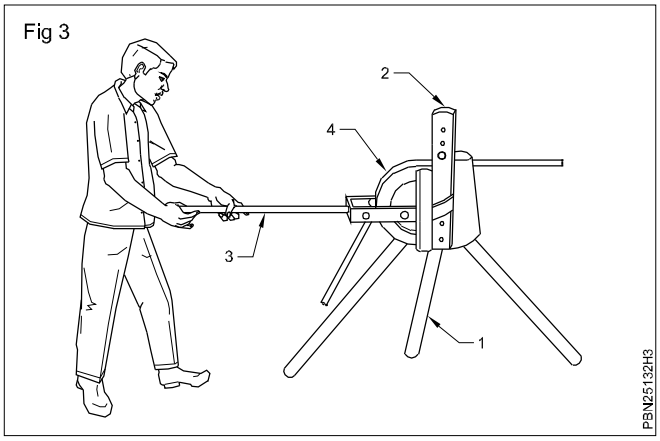
Give gradual load to the machine.

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)

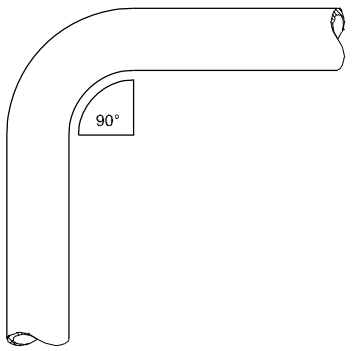
Fig 3



i Tripod stand ii Pipe stop lever

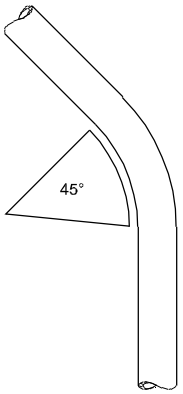
iii Handle (or) lever iv Inside former

Fig 4



PBN25132H4

Fig 5



PBN25132H5

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.

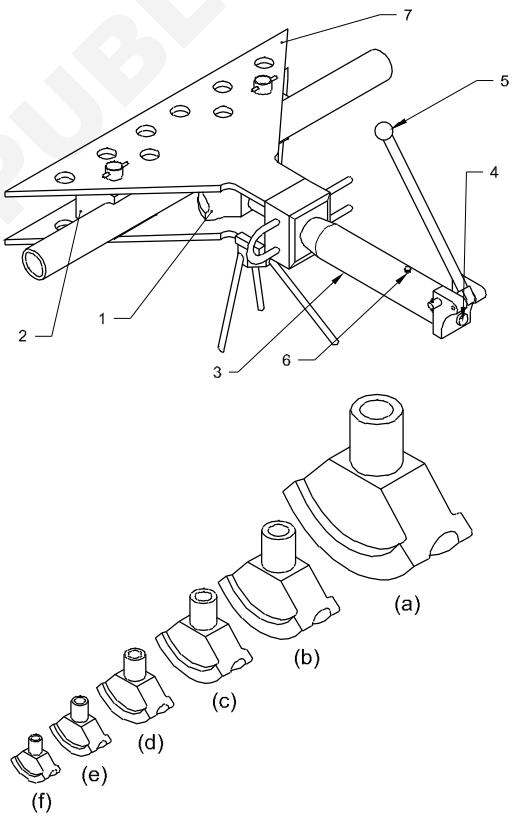
Achieve required angle to bend do the process of pull and push.

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



PBN25132J1

Plumbing **Exercise 1.11.99**

Plumber - Bending and Systems of Water Supply

Bend G.I pipe of different diameter in different angle

Refer Exercise No. 1.6.34

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Plumbing **Exercise 1.11.100**

Plumber - Bending and Systems of Water Supply

Bend G.I pipe as per drawing and measurement

Refer Exercise No. 1.6.34

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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.
- Respirator - 1 No.
- Heat resistant gloves - 1 No.
- Steel wool - 1 No.
- Sand paper - 1 No.
- Measuring tape - 1 No.
- Hacksaw - 1 No.
- Wooden metal - 1 No.

Equipment/Materials/Components

- Heat gun - as reqd.
- PVC pipe cutting machine - as reqd.
- PVC pipe bending heaters - as reqd.
- Bend spring 25mm - as reqd.
- P.V.C pipe 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. (Fig 1)

6 Slowly bend the pipe into your desired shape.

7 Empty the sand out and let the pipe cool.

Fig 1

PBN25135H1

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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.

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 1)

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Fig 2

PBN25135H2

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Plumbing — Exercise 1.11.102
Plumber - Bending and Systems of Water Supply

Demonstrate 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**
- **cut C.I pipes**
- **join the C.I pipes.**

Refer Exercise No. 1.6.32 & 1.6.42

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Plumbing — Exercise 1.11.103
Plumber - Bending and Systems of Water Supply

Process of C.I pipe fitting for waste pipe line in different section

Refer Exercise No. 1.10.96

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Employ process of fixing of external soil pipe

Objectives: At the end of the exercise you shall be able to
- **read the drawing**
- **measure and mark as per drawing in work spot**
- **connect trap and existing line**
- **check and test in pipe lines.**

Requirements

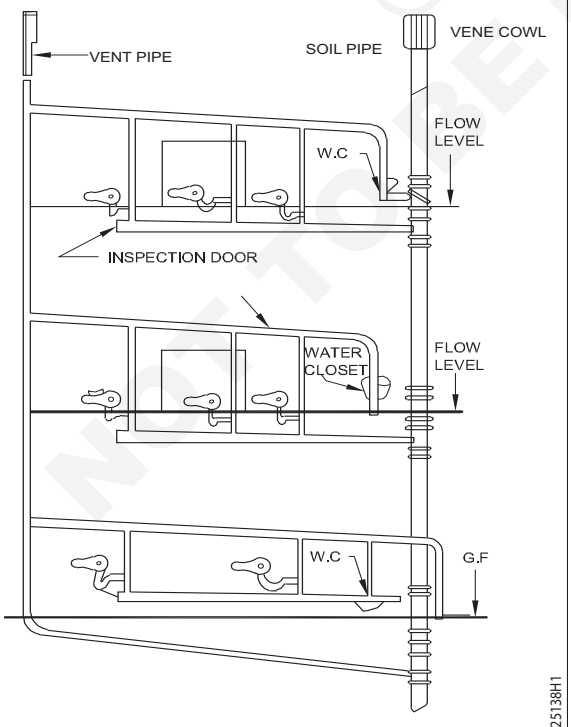
Tools/Instruments
- Measuring tape - 1 No.
- Spade - 1 No.
- Trowel - 1 No.
- Mortar pan - 1 No.
- Plumb bob - 1 No.
- Sprit level - 1 No.
- Straight edge - 1 No.
- Water tube level - 1 No.

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 river sand - as reqd.
- Aggregate - as reqd.
- Door bend - as reqd.
- Door "Tee" - as reqd.
- Plain bend - as reqd.
- Plain "Tee" - as reqd.
- Collar - as reqd.

PROCEDURE

1 Find the line's.
2 Measure and mark the existing line to trap.
3 Prepare the material required.
4 Connect the trap out let to the required chamber. (Fig 1)

Fig 1



PLUMBING WORK OF ONE PIPE SYSTEM

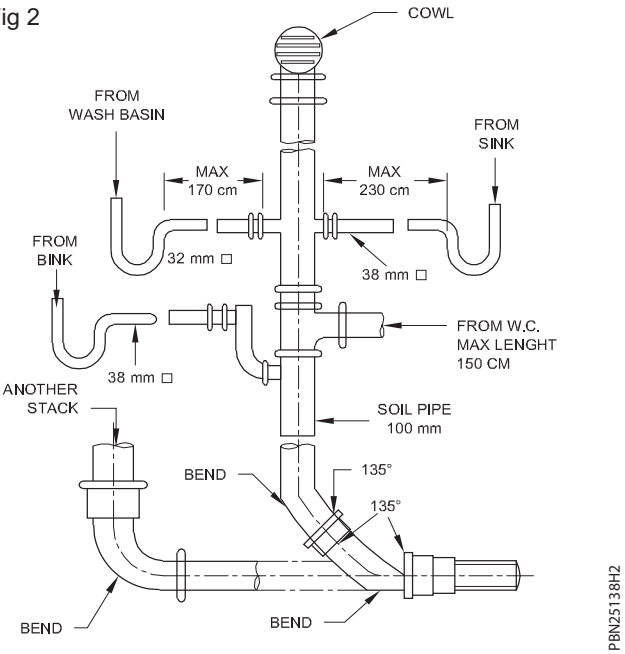
If need fittings to connect the pipe lines as per the drawing

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. (Fig 2)

Fig 2



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

Objectives: At the end of the exercise you shall be able to
- **fix the rain water gutter on the metal shop end**
- **connect the PVC pipe to the gutter**
- **assemble the pipe shoe at the 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 neck off set	- as reqd.
• Screw driver	- 1 No.	• Metal sheet	- as reqd.
• Sprit level	- 1 No.	• Gutter	- as reqd.
• Mortar pan	- 1 No.	• Clamp, Cement, Sand	- as reqd.
• Plumb bob	- 1 No.	• Aggregate	- as reqd.
• Spade	- 1 No.	• Solvent cement	- as reqd.
• Rawl/jumper	- 1 No.	• PVC bend	- as reqd.
		• Bracket	- as reqd.

Equipment/Materials/Components

- Drilling machine - 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 shop 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.

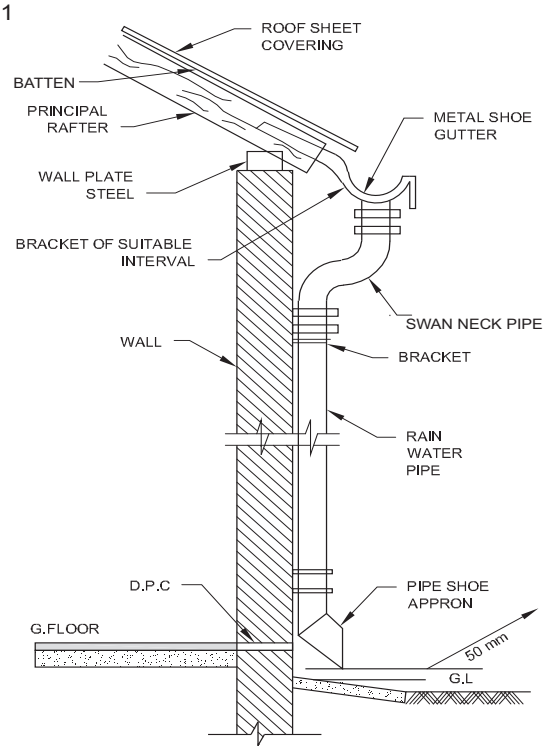
7 Test vertically of pipe with plumb bob.

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.

Fig 1



RAIN WATER CUTTER FOR ROOFS

Demonstrate process of measurement of waste pipe line

Objectives: At the end of the exercise you shall be able to
- **read the layout**
- **prepare the materials list**
- **join the pipe to the existing pipe line**
- **take measurement.**

Requirements

Tools/Instruments

- Pipe wrench 250mm, 300mm - 2 No.
- Spanner set - 1 No.
- Hammer ball pein - 1 No.
- Chisel flat - 1 No.
- Water pump plier - 1 No.
- Screw driver 12” - 1 No.

Equipment/Materials/Components

- Hammer drilling machine - 1 set.
- P.V.C connection 1/2” heavy duty - 1 No.
- G.I fitting - as reqd.
- G.I.pipe - as reqd.
- Thread seal material - as reqd.
- Marking media - as reqd.
- Special clamp - as reqd.

PROCEDURE

1 Connect the pipe from wash basin to inspection chamber using with elbow-1 no, tee-2 nos with 2m of pipes.

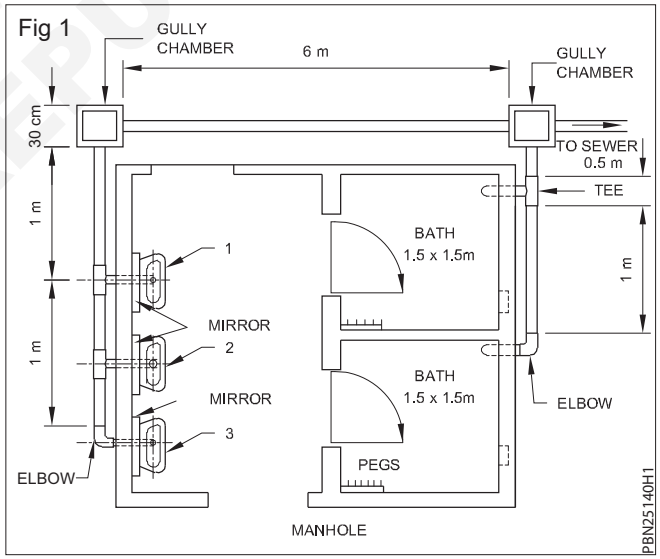
2 Connect the pipe from one chamber to another chamber using 6m pipe.

3 Another side bathroom waste water line connect to the chamber with the help of elbow-1no., tee-1no. and pipe 1.5 m. (Fig 1)

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

Fig 1



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	- 1 No.
• Tester	- 1 No.
• Spanner set 12”	- 1 No.

Equipment/Materials/Components

• Solar water heater	- as reqd.
• Mobil oil	- as reqd.
• Insulator	- as reqd.
• Pipes and fittings	- as reqd.
• Cement mortar	- 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.

Fig 1

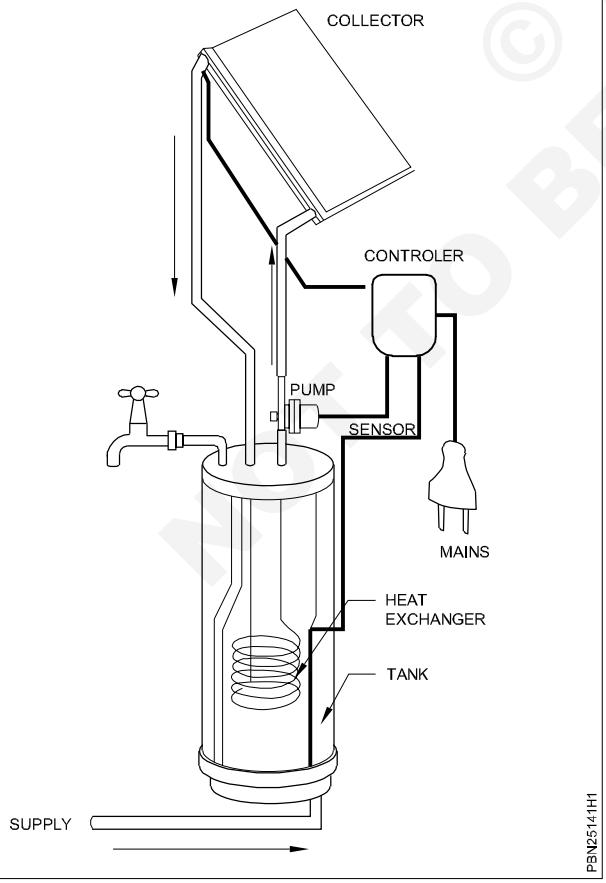
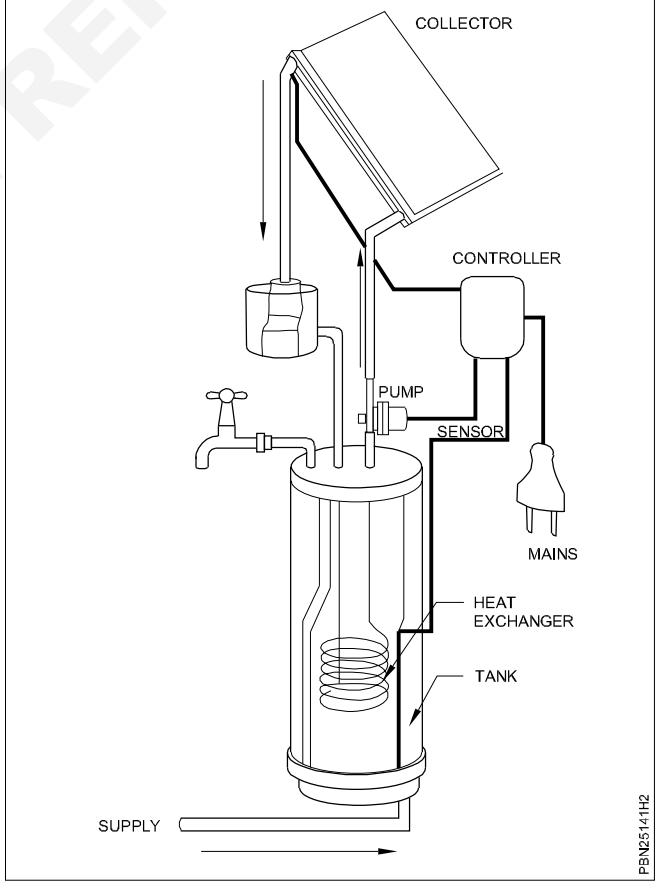


Fig 2

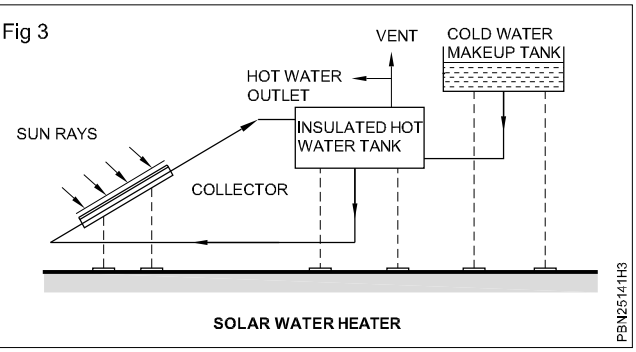


7 Inspect the over heat protection system function (Fig 3&4).

Safety tips

- Use proper tools.

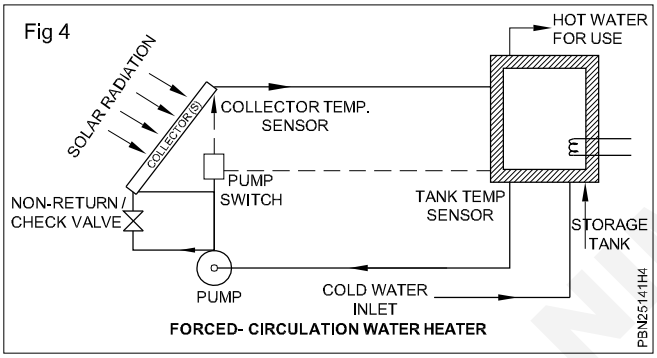
Fig 3



SOLAR WATER HEATER

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

Fig 4



FORCED- CIRCULATION WATER HEATER

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

Solar water Heaters for High Rise Buildings (Fig 5 & 6)

Fig 5

Fig 6

Analyse temperature of water (hot and cold)

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

Tools/Instruments

- Plumber tool kit - 1 No.

Equipment/Materials/Components

- Thermometer - 1 No.
- Gloves - as reqd.
- Goggles - 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 distribution as per drawing

Objectives: At the end of the exercise you shall be able to
- **do 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	- 1 No.
• Spanner set	- 1 No.
• Hammer	- 1 No.
• Chisel	- 1 No.
• Tester	- 1 No.
• Water pump plier	- 1 No.
• Screw driver	- 1 No.

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

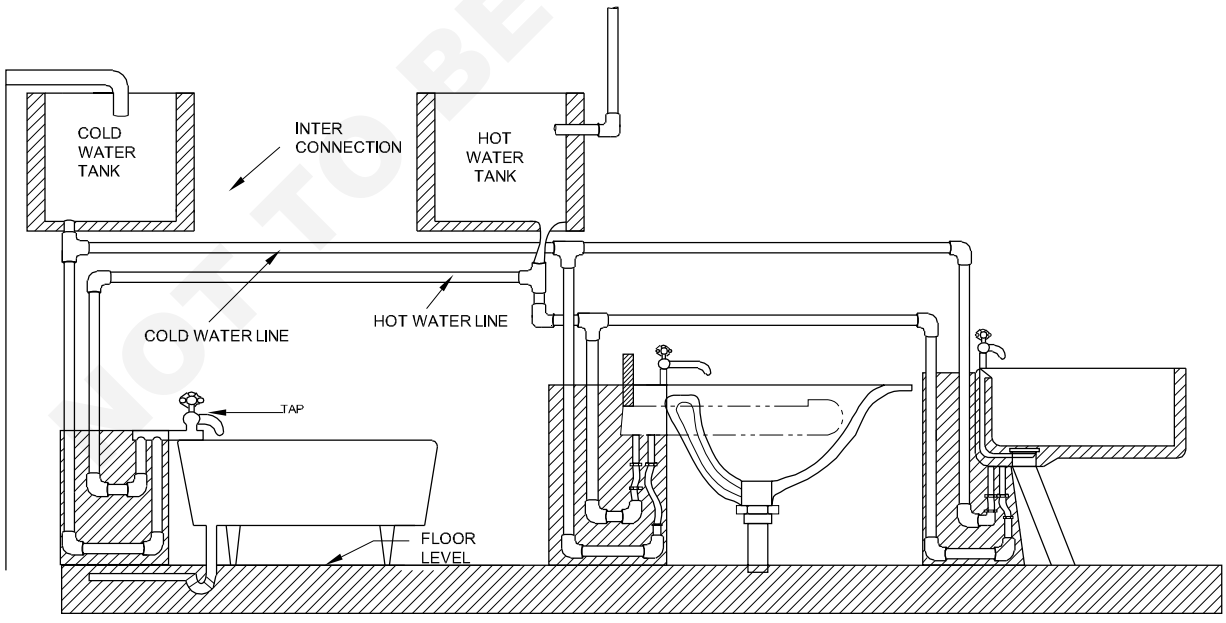
TASK 1 : **Hot water connection to bath tub and wash basin (Fig 1)**

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



INLET COLD AND HOT WATER CONNECTION

PBN25143H1

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.

— — — — — — — —

Plumbing **Exercise 1.11.110**

Plumber - Bending and Systems of Water Supply

Install pipe line for distribution of hot and cold water

Refer Exercise No. 1.11.109

— — — — — — — —

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

Tools/Instruments

- Chisel - 1 No.
- Hammer - 1 No.
- Pipe die - 1 No.
- Hand hacksaw - 1 No.
- Spanner set - 1 No.
- Screw driver - 1 No.
- Measuring tape - 1 No.
- Trowel - 1 No.
- Pipe wrench 250mm, 300mm - 1 No.
- Water pump plier - 1 No.

Machinery/Equipments

- Oil can - 1 No.
- Pipe vice - 1 No.
- Solar water heater complete set - 1No.
- Hammer drilling m/c - 1 No.
- Water heater complete set - 1 No.
- Tester - 1 No.

Materials/Components

- G.I pipe - as reqd.
- G.I fitting - as reqd.
- P.V.C connection - as reqd.
- Nut & Bolt - as reqd.
- Cement mortar - as reqd.
- Angle cock - as reqd.
- Hand hacksaw blade - as reqd.
- Safety valve - as reqd.
- Thread seal material - as reqd.
- Insulator - as reqd.

PROCEDURE

TASK 1 : **Installation of water heater (Fig 1)**

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 relief valve and flexible pipe.

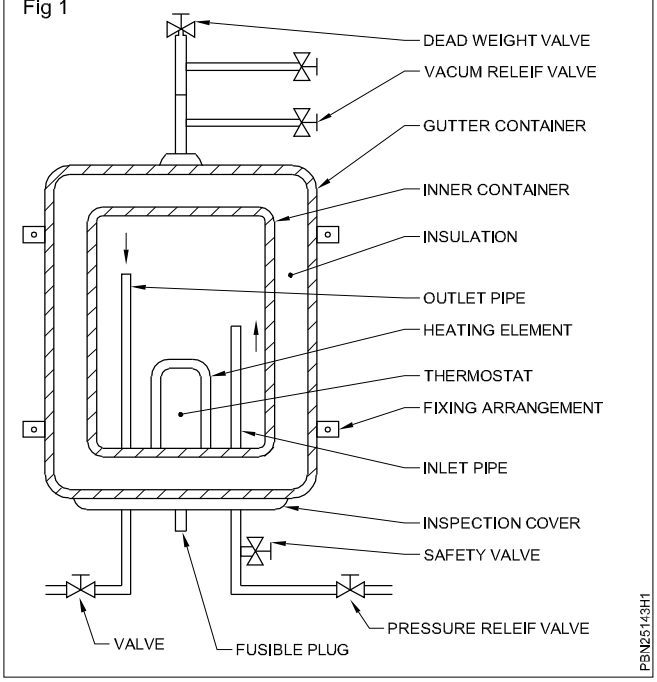
11 Plug the heater to electric supply.

12 Test if for leakages.

Safety

- Fixing the bolt in wall with cement concrete 1:2:4 ratio.
- After fixing bolt in the wall hang the water heater.
- Check the vertically line.
- Check the electric point & board.

Fig 1



Installation of solar water system

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

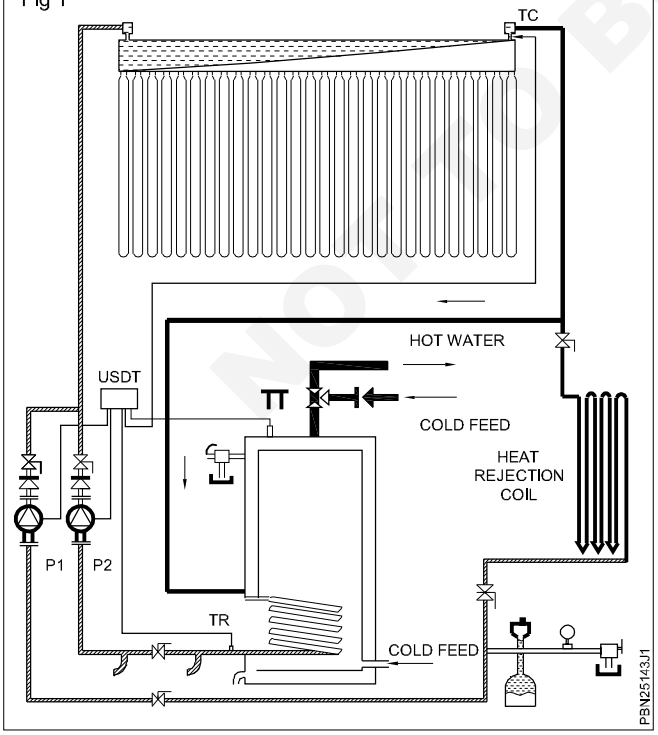
- **mount the collector**
- **install solar storage, heat exchanger**
- **lay pressure pump and pipe line**
- **install water lines with control drive.**

TASK 1 : **Installation steps**

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

1 Mount the solar collectors on the roof. (Fig 1)

Fig 1



2 Install the solar storage tank and heat exchanger.

3 Install the piping and pressure pump for the glycol loop.

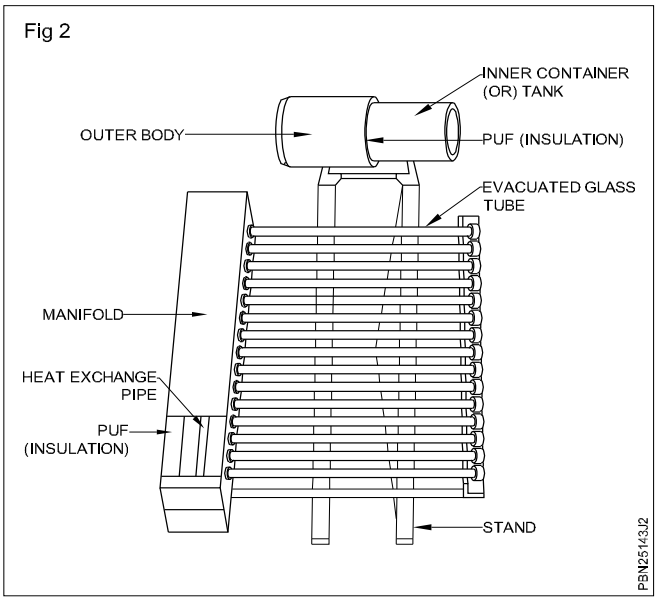
4 Install the water piping.

5 Install the controls.

6 Fill the system.

7 Insulate the water and glycol lines. (Fig 2)

Fig 2



Symbolise distribution of hot and cold water pipe line

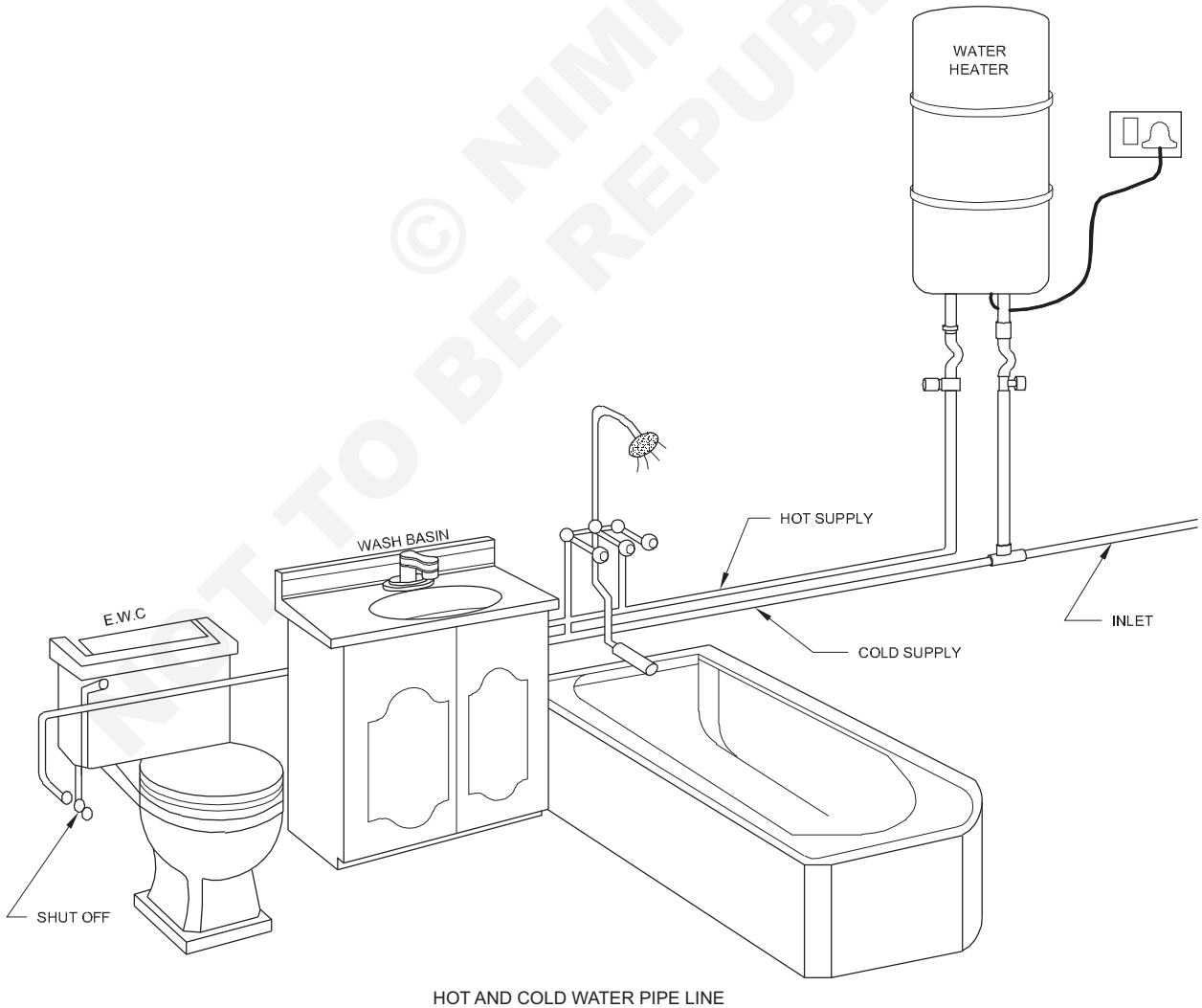
Objective: At the end of the exercise you shall be able to
- **symbolise distribution of hot and cold water pipe line.**

PROCEDURE

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

Sl .No	Description	Symbol
1	Hot water pipe line	——— HW ———
2	Cold water pipe line	——— CW ———
3	Hot water	——— H ———
4	Cold water	——— C ———

Fig 1



HOT AND COLD WATER PIPE LINE

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 get determinate 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 repairing of different tap, valve, cistern etc.,

Objectives: At the end of the exercise you shall be able to
- **perform repairing of water tap**
- **perform repairing of valves**
- **perform repairing of flushing cistern.**

Requirements

Tools/Instruments

- Plumber tool kit - 1 No.
- Masonry hand tools - 1 No.
- Die set - 1 No.

Equipments

- Pipe vice - 1 No.
- Bench vice - 1 No.
- Hammer drilling machine - 1 No.
- Oil can - 1 No.

Materials/Components

- Gate valve - as reqd.
- Asbestos rope - as reqd.
- C.P. angle cock - as reqd.
- Flush tank P.V.C - as reqd.
- ½ P.V.C hose connector - as reqd.
- Required size of pipe - as reqd.
- Gland rope - as reqd.
- Thread seal material - as reqd.
- Chalk powder - as reqd.
- Gully trap - as reqd.
- Grating - as reqd.
- Hemp yarn - as reqd.
- Brick - as reqd.
- Aggregate - as reqd.
- River fine sand - as reqd.
- C.I. Frame with cover - as reqd.
- Multi flow trap - as reqd.

PROCEDURE

TASK 1: **Repairing of water tap**

Refer to Ex. No. 1.10.88 (Task 7)

— — — — — — —

TASK 2: **Repairing of valves**

Refer to Ex. No. 1.10.88 (Task 8)

— — — — — — —

TASK 3 : **Repairing 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 float valve and remove it. (Figs 1&2)

7 Check the condition of valve, washer, lever are etc,. (Fig 3)

8 Tighten the lock nut with finger at bottom.

9 Tighten the check nut of flexible pipe to cistern.

10 Check the float valve moves free.

11 Turn on water supply.

12 Check the leakage of out let and inlet.

13 Check proper function. (Fig 2)

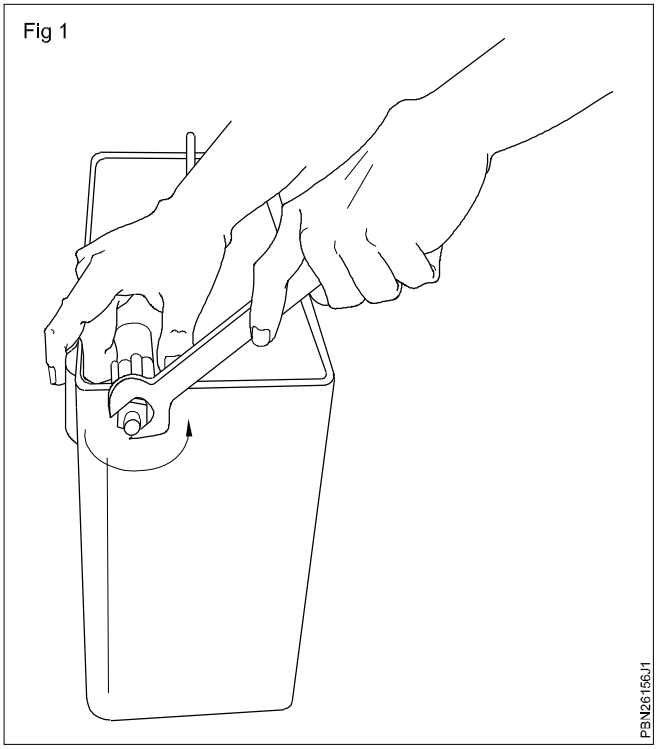
14 Bend the float arm down if water level is high, ie above from the required level. (25mm below overflow level) (Fig 4).

15 Bend the rod up if the water level is low. (Fig 4)

Safety

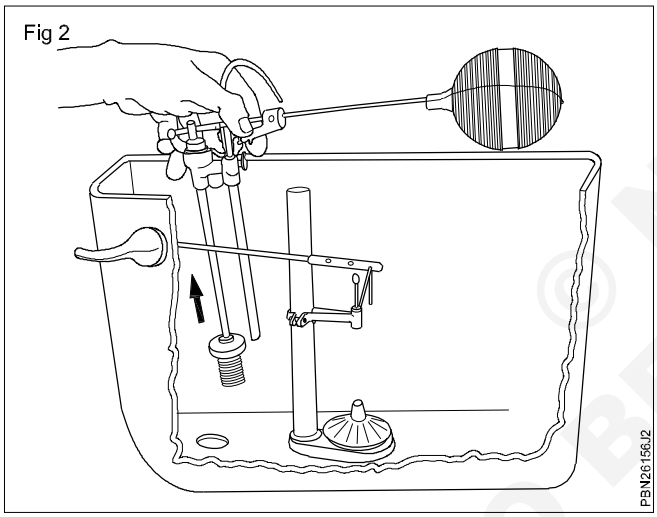
- Use proper tools
- Float valve removing only by spanner.

Fig 1



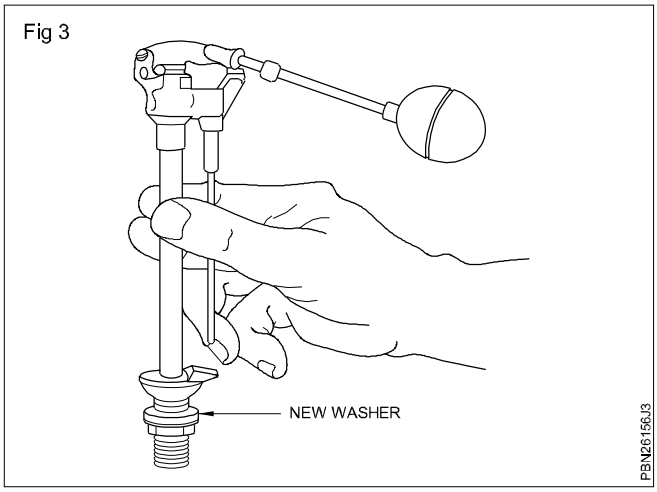
PBN26156J1

Fig 2



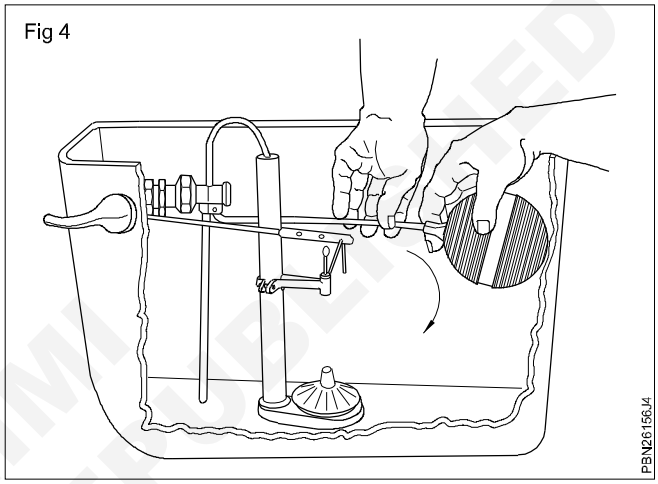
PBN26156J2

Fig 3



PBN26156J3

Fig 4



PBN26156J4

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TASK 4 : **Syphonic water**

If water leakage to closet.

1 Remove the flush tank handle lever.

2 Remove the syphonic unit with rubber washer.

If washer worn out, replace it.

— — — — — — —

TASK 5 : **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.

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.**

PROCEDURE

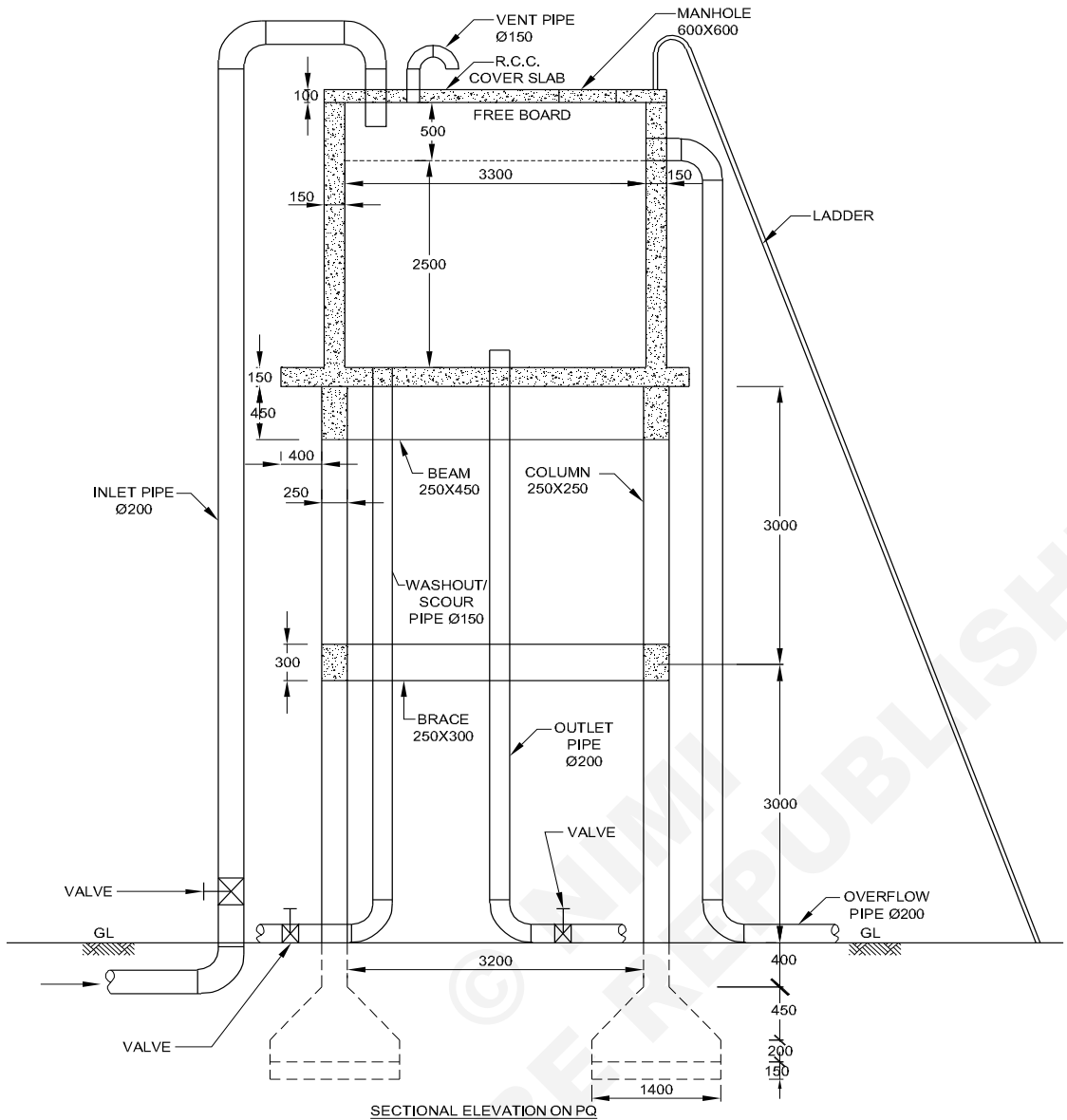
1 The instructor should demonstrate. over head tank name and construction are shown in Fig 1.

2 Instructor should arrange a chart.

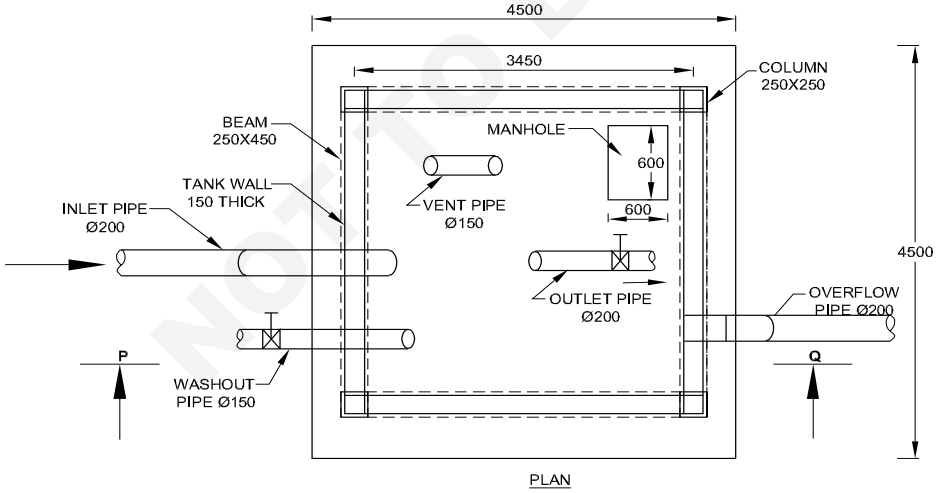
3 R.C.C square over head tank DATA (Fig 1).

- 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 - 250x250mm.
- 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.
- 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



SECTIONAL ELEVATION ON PQ



PLAN

PBN26148H1

R.C.C. SQUARE OVER HEAD TANK SUPPORTED BY FOUR COLUMNS

Maintenance and recondition pipe line

Objectives: At the end of the exercise you shall be able to
- **prepare the material for repairing the connection to leakage**
- **detect leakage in water supply system, bath tub, wash basin and sink**
- **decide the joint in water supply pipe lines**
- **repair the joints in water supply system bath tub, wash basin and sink.**

Requirements

Tools/Instruments

- Hacksaw frame with blade - 1 No.
- Frame with blade - 1 No.
- Chisel and hammer - 1 No.
- Adjustable wrench - 1 No.
- Water pump plier - 1 No.
- Spanner set - 1 No.
- Measuring tape - 1 No.
- Screw drivers - 1 No.
- Pipe wrenches - 1 No.

Equipment/Materials/Components

- Wash basin and sink - as reqd.
- Pipe & pipe fittings - as reqd.
- Thread seal materials - as reqd.
- Existing bath tub - as reqd.

PROCEDURE

TASK 1 : **Recondition pipe line**

1 Clear the pipe by removing the soil on the pipe line.

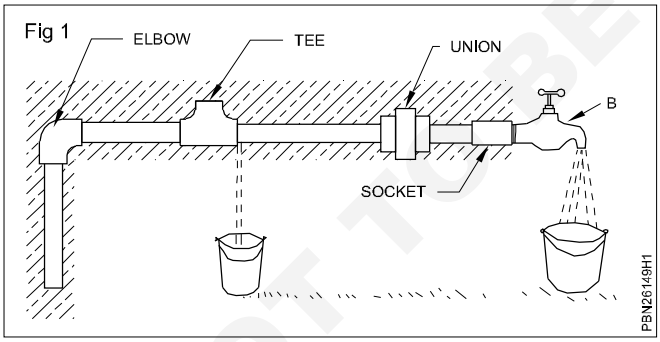
2 Detect the reason of leak.

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. (Fig 1)

Fig 1



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**

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 in fitting tight them.

4 If any C - lock nut, spindle (or) check nut loose (or) worn out replace it.

In bath tub

5 Clean the over flow line and remove the blockage.

6 If unable to remove the blockage replace the over flow line to drain line.

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

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 of wash basin.

11 Over flow the drain water into wash basin.

12 Remove the blockage of wash basin.

13 fix 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 in the wash basin.

16 Check the outlet line towards nahani trap.

In sink

17 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.

— — — — — — — —

Plumbing — Exercise 1.12.116

Plumber - Tank Installation, Tests and Maintenance

Perform smoke test for waste pipe line

Refer Exercise No. 1.9.80

— — — — — — — —

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 cleaning tools name and maintenance.

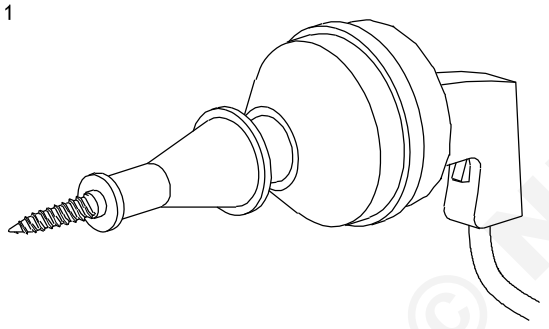
2 Record it in Table 1.

3 Get it checked by the instructor.

Table 1

Fig No	Name of the tools	Uses
1		
2		
3		
4		

Fig 1



ELECTRIC DRAIN CLEANER

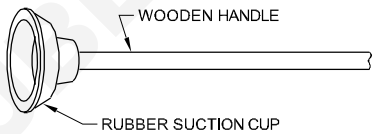
PBN26151H1

Fig 2

CLOSET AUGER

PBN26151H2

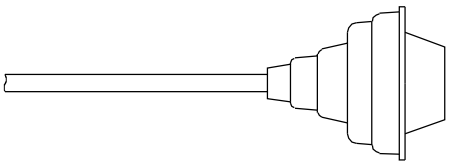
Fig 3



FORCE CUP

PBN26151H3

Fig 4



BALL-TYPE PLUNGER

PBN26151H4

Perform cleaning of sanitary pipe line

Objectives: This shall help you to
- **clean the sanitary pipe line rectifying the leakage**
- **find the blockage (or) leakage in waste outlet**
- **repair the waste outlet lines.**

Requirements

Tools/Instruments

- Plumber tool kit - 1 No.

Machinery Equipment

- Ball type plunger (or) Force cup - as reqd.

Materials

- Pipe - as reqd.
- Pipe fittings - as reqd.
- Thread seal material - as reqd.
- white cement - as reqd.

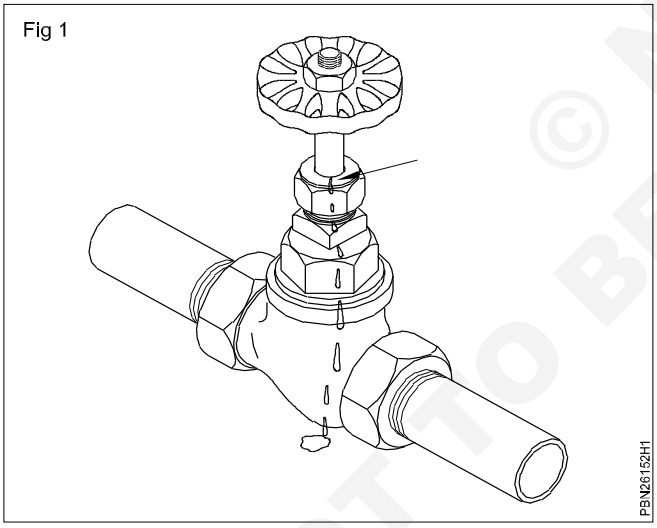
PROCEDURE

TASK 1: **Rectifying the leakage**

1 Close the gate-valve by turning the hand wheel clockwise (Fig 1) to arrest water flow.

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

Fig 1



2 Remove the lock 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 white rope to make a new packing.

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).

Fig 2

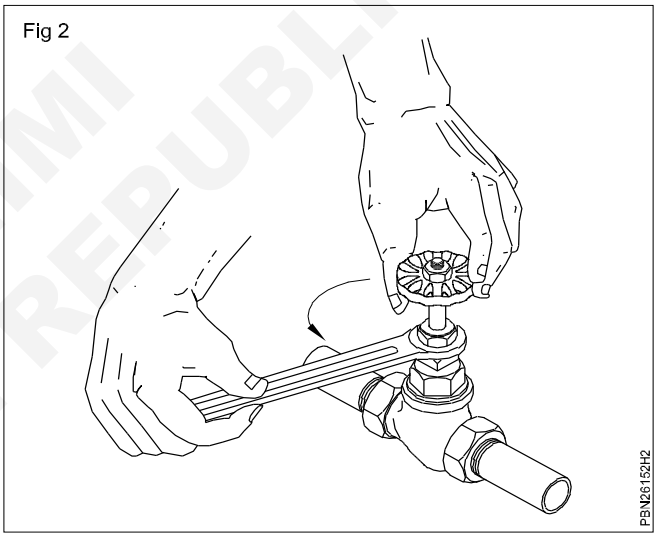
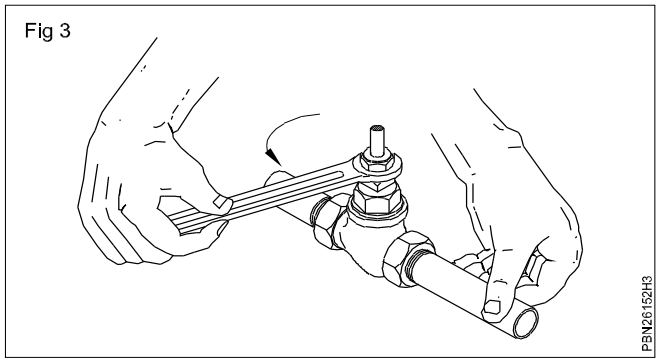


Fig 3

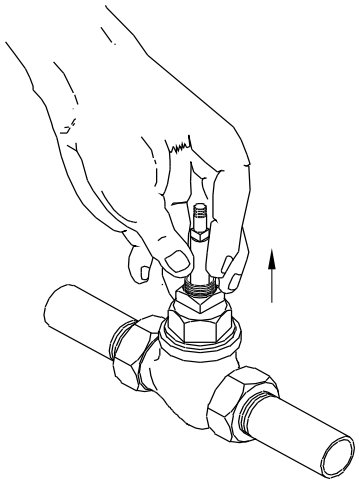


9 Reassemble and leave the gland nut hand tight.

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 0escaping from the gland nut.

Fig 4



PBN26152H4

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TASK 2: Repairing of waste outlet (Fig1)

Check the waste outlet line.

1 If any fitting are damage or worn out replace it.

2 Check the line for waste water leakage

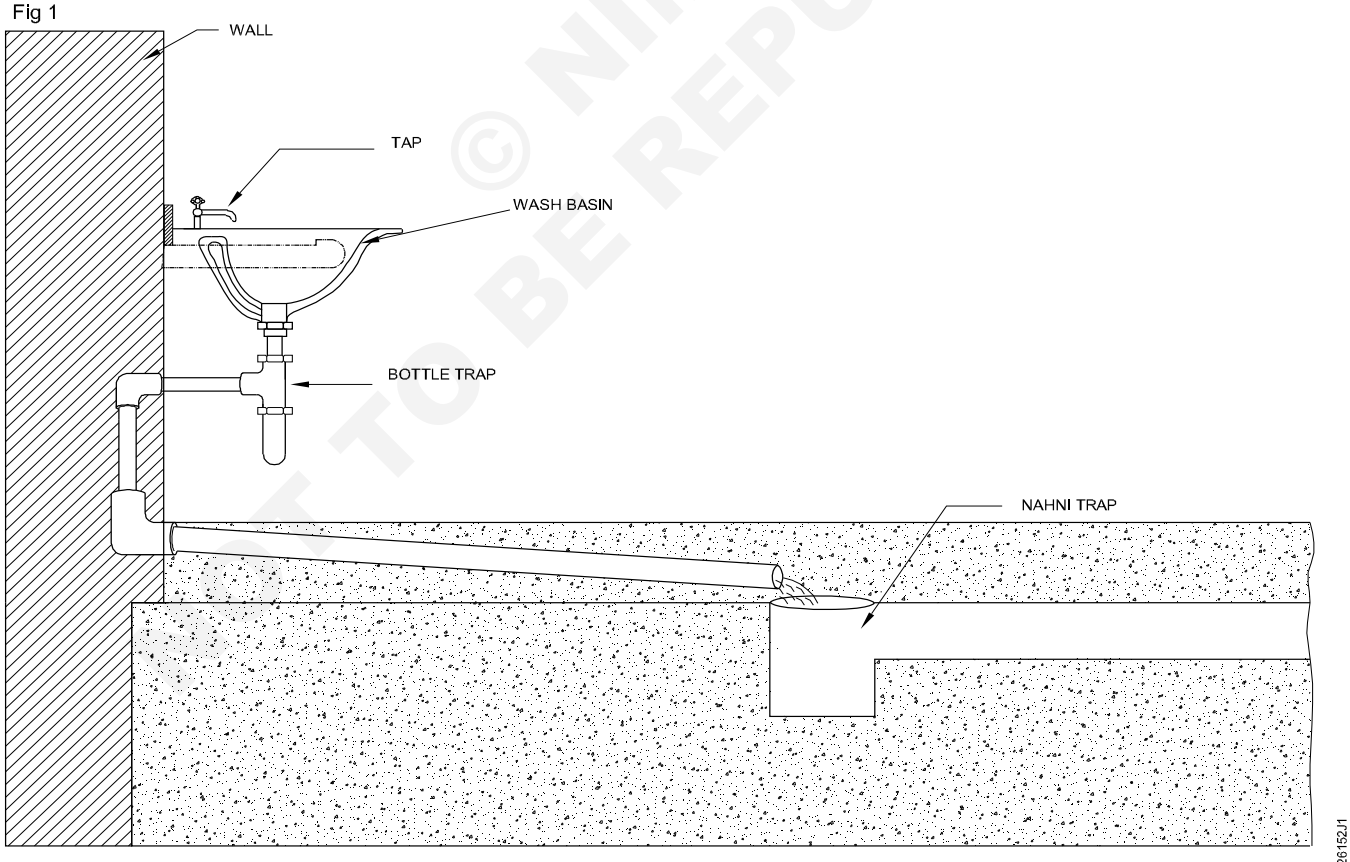
3 Select and use proper fittings on proper place.

4 Joints are made water tight with sealing materials.

Blockage of the line

6 Clean the drain (or) trap with help of force cup (plunger)

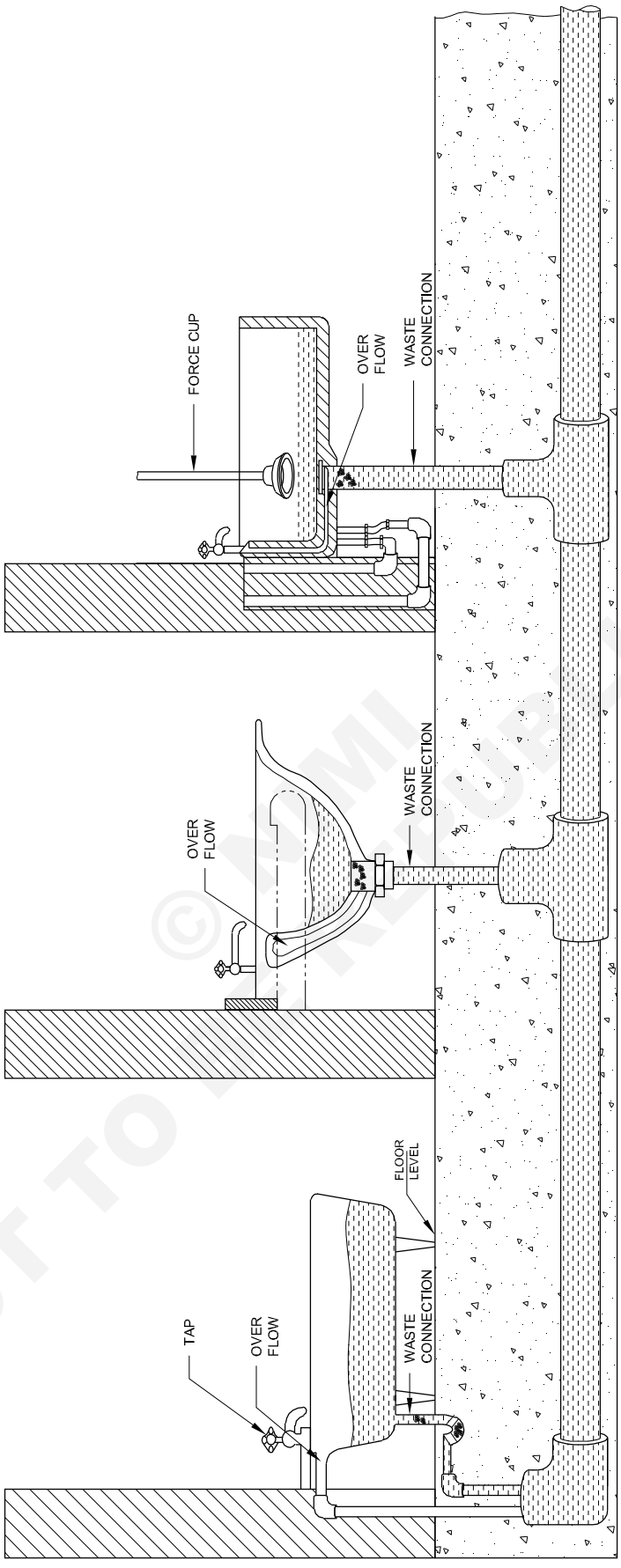
Fig 1



OUTLET OF WASHBASIN

PBN26152J1

Fig 2



REPARING OF WASTE OUT LET WITH FORCE CUP

PBN26152J2

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

- Plumber tool kit - 1 No.

Machinery Equipment/Materials

- Cleaning acids - as reqd.
- GI plug - as reqd.
- GI cap - as reqd.

PROCEDURE

1 Hold the job in pipe vice.

2 Unscrew the pipe A using pipe wrench. If the joint is very tight hammer at joint slightly. (Fig 1 & 2)

3 Remove elbow using pipe wrench (Fig 3)

4 Remove plug using spanner.

5 Clean the Inner of GI pipes by pouring cleaning acids.

6 Gently stroke the pipe blends with hammer.

7 Allow water to flow through the opening.

8 Descale using necessary materials like rod, spring etc.

9 Inspect the scaling removed thoroughly.

10 Refit the fittings and check the water flow.

Fig 2

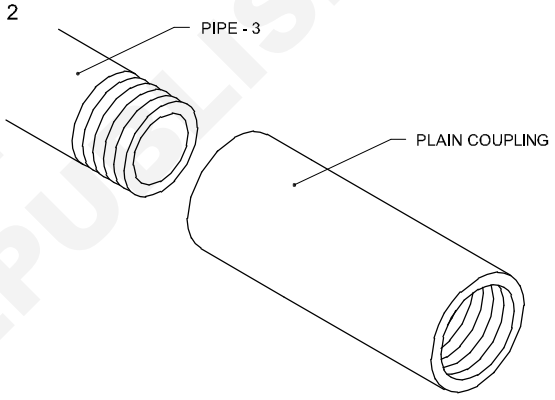


Fig 1

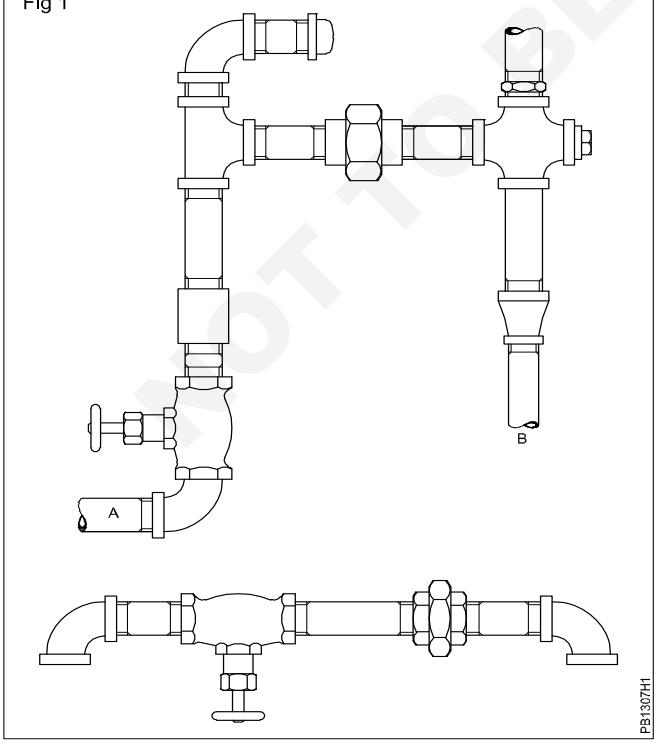
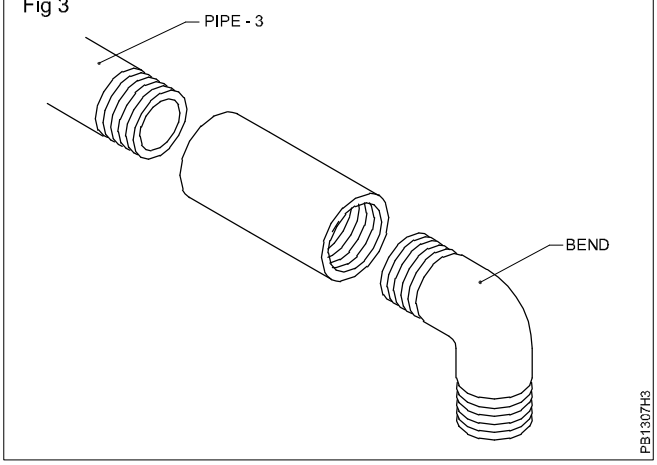


Fig 3



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.**

Requirements

Tools/Instruments

• Scraping knife	- 1 No.	• painting brush 1” 2” 3”	- 1 No.
• Sand paper rough and smooth	- 1 No.	• synthetic enamel	- 1 No.
• Emery paper rough and medium	- 1 No.	• Thinner	- 1 No.
• Metal primer (Red oxide)	- 1 No.	• Bucket 5 lines	- 1 No.

PROCEDURE

Instructor shall display and demonstrate to the trainees 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	

Fig 1

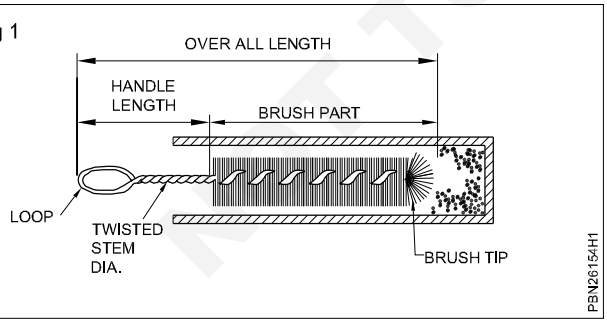
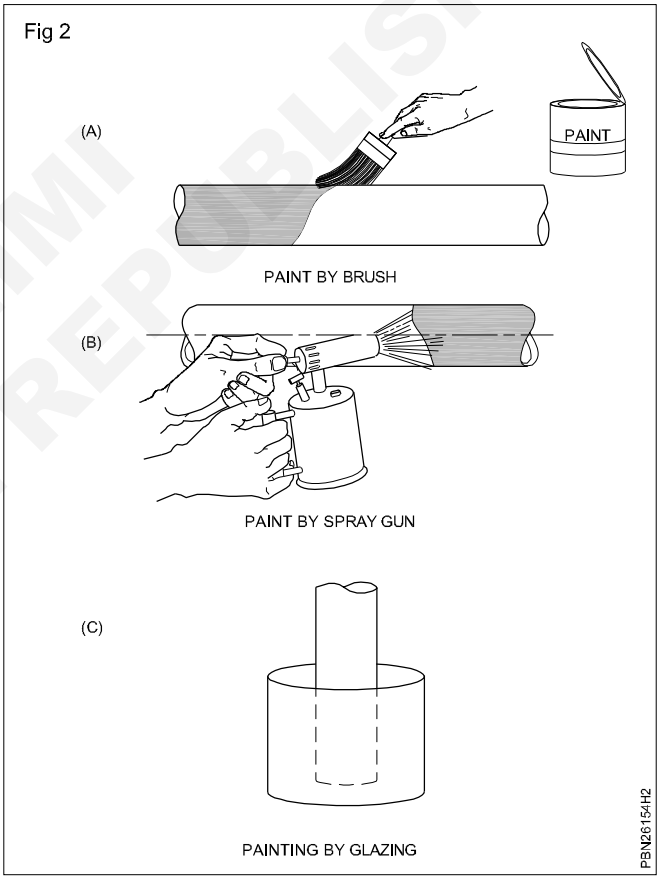


Fig 2



Perform scraping and painting of pipe line

Objective: At the end of the exercise you shall be able to
- **do scraping and painting the pipe.**

Requirements

Tools/Instruments

• Putty blade	- 1 No.
• paint brush	- 1 No.
• long scraper	- 1 No.
• spray gun	- 1 No.
• wire brush	- 1 No.

Equipment

• Power operated buffing wheel	- as reqd.

Materials

• Emery paper	- as reqd.
• Cotton waste	- as reqd.
• Exterior primer	- as reqd.
• Exterior paint	- as reqd.
• Broken hacksaw blade	- as reqd.

PROCEDURE

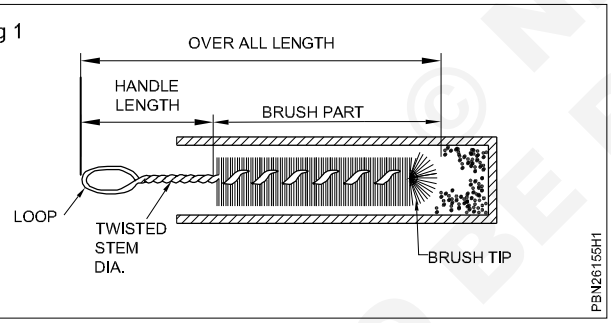
TASK1 : **Scraping the pipes (Fig 1)**

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.

Fig 1



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 scratcher 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 clean the surface with wire wool.

3 Reply two coats of oil-based glass paint.

4 Make sure you apply the second coat on the day after the first.

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TASK2 : **Painting the pipe (Fig 1)**

1 Clean off old paint or rust.

2 Wash off pipes.

3 Prime the metal pipe with primer.

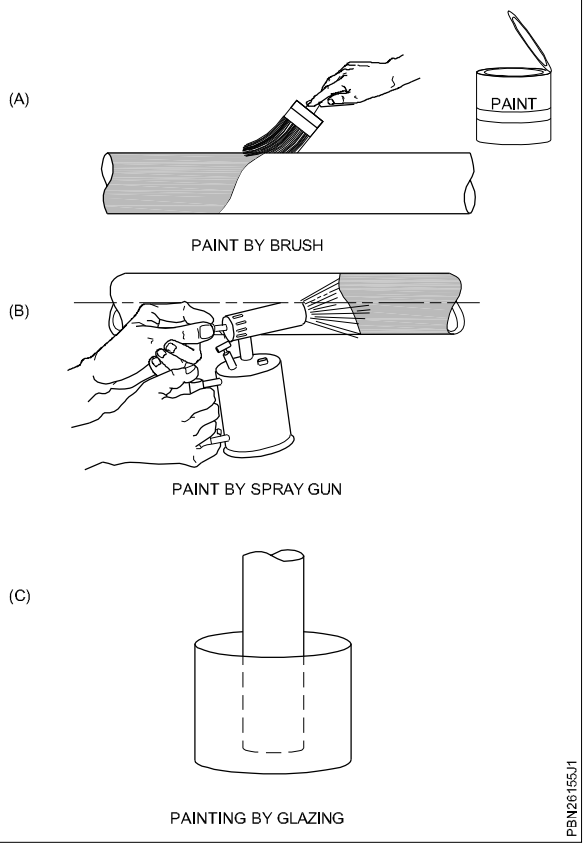
4 Paint the pipe with exterior paint.

5 Then leave it for 6 hours to dry

6 Use the pipes.

Service and background colour (colour coding of pipe lines)

Fig 1



Potable water	-	Green
Non potable water	-	Blue
Cold water supply	-	Green
Hot water supply	-	Red
Sanitary drain	-	Orange
Plumbing vent	-	Orange
Waste	-	Orange
Waste (corrosive)	-	Orange
Storm drain	-	Green
Roof drain	-	Blue
Fire protection	-	Red

Maintenance of broken or cracked sanitary fitting

Objectives: At the end of the exercise you shall be able to
- **prepare the materials list**
- **join 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.

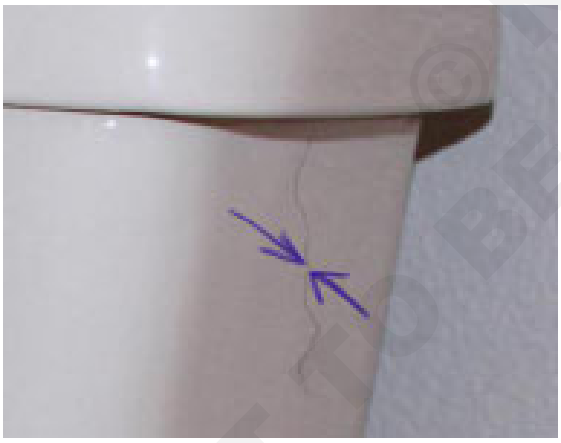
PROCEDURE

TASK 1 : **Repairing of cracked sanitary fittings**

1 Inspect and find out the crack. (Fig 1)

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.

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Estimate and work out abstract cost of plumbing work as per drawing / 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 (Fig 1)**

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.

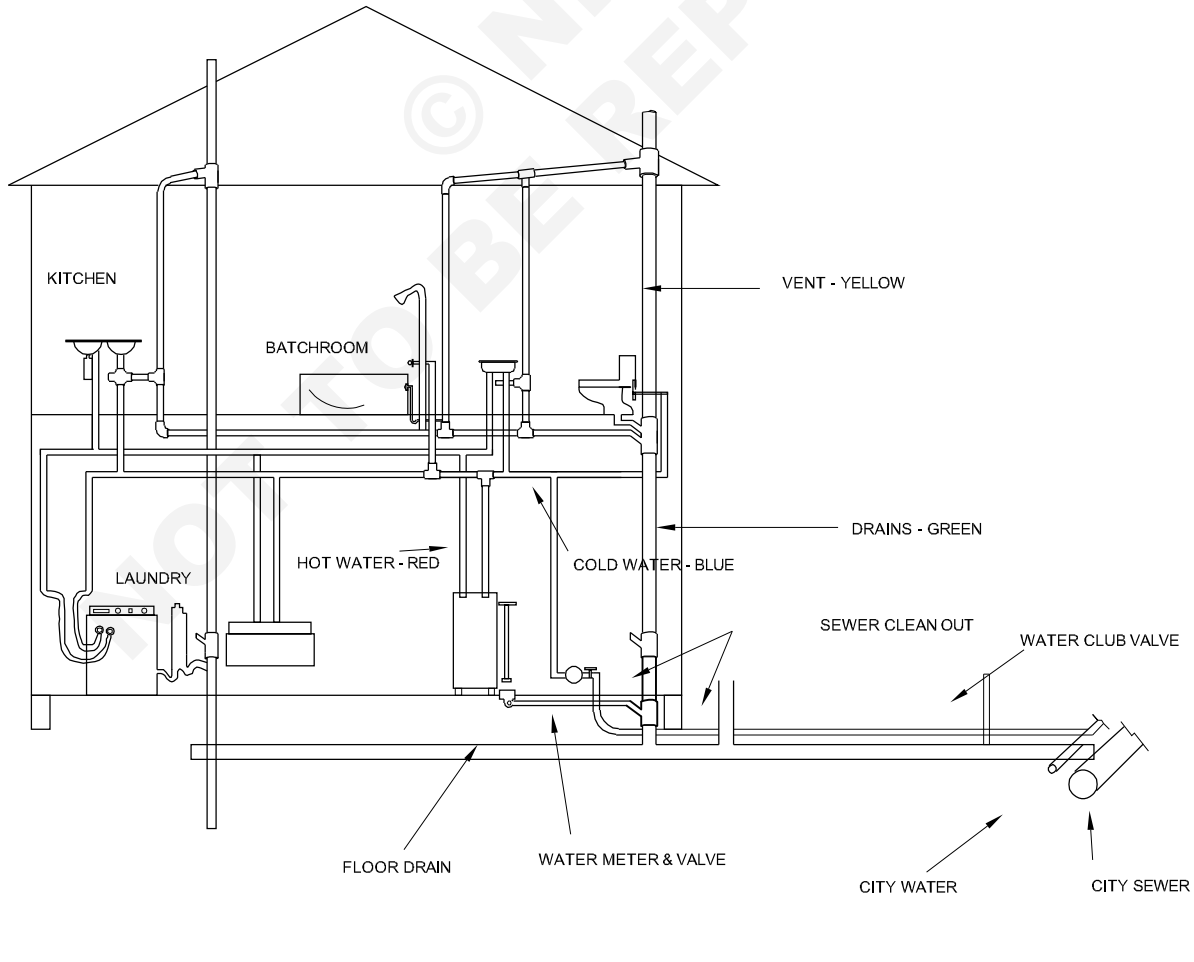
6 Check the factors affecting pricing of plumbing job.

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



- Inspect the unfore seen challengers 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.

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TASK 2 : **Arriving abstract cost of plumbing work as per layout**

1 Check the size of bathroom the material required.

2 List the sanitary and plumbing fixtures required.

3 Prepare market rate for skilled labour pricing.

4 Labour and material Rs100 to 120/- per square feet based on economic specification.

5 In general bathroom size 2.1 meter x 1.2 meter and height would be 2.5 to 3 meters.

Material

Brick work = 1.32 Cu.m x 80 = 105.6

Plumbing pipe = Approx. x 25 running meters

Plaster = 39.6 sq.m x 80 Rs = 3168

Water proofing = 0.756 Cu.M x 108 = 81.64

Cement sheet = 3.22 sq.m x 37 = 119.14

Tiling 19.8 sq.m x 15.5 Rs/sqm = 6.9

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)

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