

SYLLABUS FOR  
**PLUMBER**

UNDER

CRAFTS MEN TRAINING SCHEME  
As approved by  
GOVERNMENT OF INDIA

In consultation with  
THE NATIONAL COUNCIL FOR  
VOCATIONAL TRAINING

Issued by  
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## List of Trade Committee Members for the trade of “Plumber”

### Name and Designations

(S/ Shri)

1. T. Samule Thambu  
Supdtg. Engr. (Qty. Control)

2. V.S.D. Raja  
Asstt. Engineer

3. L.N. Janardhanan Potty  
Joint Director

4. P. Damodaranpillai  
Asstt. Training Officer

5. R. Manavalan  
Asstt. Training Officer

6. Gangadhara Rao  
Joint Director

7. R. Sambandam  
Joint Director Secretary:

V. Ananthanarayanan  
Director

### Organizations

Tamilnadu Housing Board  
Nandanam, Chennai – 600035

C.P.W.D., Mcsd 3/111  
K.K. Nagar, Madras- 600078

Directorate of Training,  
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Chennai -600098

Advanced Training Institute  
Guindy, Chennai – 600032

Advanced Training Institute  
Guindy, Chennai - 600032

Advanced Training Institute  
Guindy, Chennai - 600032

### General Information

1. Name of the Trade : PLUMBER
2. N.C.O. Code No. : 871.10
3. Entry Qualification : Passed in VIII class examination Under  
10 + 2 system of education Or its equivalent.
4. Duration of Craftsmen Training: One Year
5. Duration of Apprenticeship Training: Three Years including one year  
Basic Training
6. Rebate Ex-ITI Trainees : One year for Ex- ITI Plumber
7. Rebate of Apprentices : 1: 2 Workers

## DRAFT SYLLABUS FOR THE TRADE OF PLUMBER UNDER C.T.S.

| Week No. | Practical   | Theory  | Engineering Drawing  | Workshop Calculation & Science  |
|----------|---|---|--|---|
| 1        | 2   | 3   | 4  | 5   |
| 1        | Familiarization with the Institute importance of trade trg. Machinery used in the trade. Types of work done by trainees in the Instt. Types of job made by the trainees in the trade. | Importance of the trade in the development of industrial economy of the country. Importance of safety and general precautions observed in the Instt. And in the sections. Medical facilities, recreational, extra curricular activities of the Institute. What are related instruction subjects to be taught and achievement made? Necessary guidance to be provided to the new corners to become familiar with the working of industrial training institute. |  |   |
| 2        | Fitters hand tools: Use of steel rule, engineers square, scribe and dividers, hacksaw, centre punch, calipers and different files, bench vice and hand vice                           | Safety precautions and elementary first aid, fitters common hand tools, name s, description and materials from which they are made.   | Free hand sketching of straight lines, rectangles squares, circles, polygons etc. (IS : 696) | Applied workshop problems involving multiplication and division. Common fraction addition, subtraction, multiplication and division, application of fractions to shop problems. |
| 3        | Use of hacksaw, centre punch  | Description of simple fitting operations,   | Free hand sketching  | Proportions and uses of   |

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|       | filling to line drilling holes.   | hacksawing, punching and filling and types of files marking instruments and their use.   | with dimension to scale and proportionate sketching.                    | cast iron, wrought iron, plain carbon steel, high speed steel and alloy steel. Applied workshop problems as in week no 2                                   |
| 4     | Use of hammers-chipping and grinding of chisels, cold chisel, round noze chisel, drilling and tapping, making of studs and bolts. | Method of using drills, taps and dies. Description of simple drilling machine.   | Free hand sketching with dimension to scale and proportionate sketching | Applied workshop problems as in week no. 2.  |
| 5     | Filing a job flat and square various locking devices. Fastening devices such as fixing of check – nut locking pins.               | Description of different types of locking and fastening devices.   | Reading of simple Engg. Drawing   | Identification of elementary properties and uses of copper zinc lead, tin, aluminum, brass, bronze, solder, bearing metals timber.                         |
| 6     | Use of soldering iron, hand forge, soldering practice.  | Method of soldering fluxes in soft soldering – precautions to be observed while soldering. Soft solder and its composition properties and its use. Different preparation of plumber soldering, brazing of ferrous and non-ferrous metals, their merits and demerits. | Free hand sketching of nuts, bolts with dimensions                      | Asbestos, plastic materials, ceramic asphalt. Decimals addition, subtraction, multiplication, conversion of decimals to common fraction. Applied problems. |
| 7 & 8 | Brazing of pipes and various sizes in different angles  | Advantages of suing brazing. Different kinds of joints in  | Free hand sketching of rivets and                                       | Properties and uses of copper, zinc,   |

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|   | and tees.   | joining pipes, pipe description of PVC welding torch and filler rod.  | washers with dimensions from sample  | lead tin, aluminum, brass, bronze, solder, bearing metals, timber, rubber, leather, asbestos, plastic materials ceramic, asphalt etc. reduction of common fraction to decimal fractions, shop problems. |
| 9 | Use of Carpenter's hand tools involving sawing, planning, chiseling, making tap-joints in wood. | Carpenter's hand tools and their names materials from which they are made. Common types of wood: their description and use. | Sketching of views of simple bodies – when viewed perpendicular to their surfaces and axis. Use of drawing instruments, T- square and Board. | Reduction of common fraction to decimal fraction applied problems.  |

ACHIEVEMENTS: The Trainees should be able to do:

1. Use fitters hand tools.
2. Do hacksawing, chipping, filing, grinding of chisels, drilling and tapping.
3. Do soldering.
4. Use of Carpenter's hand tools.
5. Do wood drawing, planning and chiseling, making tap joints.

| 1   | 2   | 3   | 4   | 5   |
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| <b>BUILDING CONSTRUCTION FROM 10<sup>TH</sup> TO 15<sup>TH</sup> WEEK</b> |   |   |   |   |
| 10  | Use of masons hand tools straight edge spirit level, plumb bob, square etc. | Safety precautions and elementary first aid related description and use of mason's hand | Simple orthographic projection – first angle. | Metric system metric weights and measurement s units. |

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|  |   | tools  |  |  |
| 11   | Simple brick laying including setting out work with mason hand tools  | Specification and property of bricks, laying types of bricks such as T.M. bricks, country bricks and application.<br>Description of bonds. | ---do---   | ---do---   |
| 12   | Construction of a gully traps using bricks in cement mortar.  | Notes on cement lime. Preparation of cement mortar of varying proportion, construction of gully traps.                                     | Simple orthographic projection – 3 <sup>rd</sup> angle   | Square root – the square root of a perfect square, the square root of a whole number and a decimal |
| 13   | Construction of an inspection chamber of any convenient size. Forming benching and channeling and plastering the walls. | Method of inspection of chamber, septic tank.  | Simple orthographic projection 3 <sup>rd</sup> angle.  | The weight of a body-unit of weight shop problems.   |
| 14   | Do  | Do   | Do   | Percentage and its application shop problems   |
| 15   | Repairing damaged portion of the wall and flooring using cement mortar concrete   | Plain cement concrete, RCC and its proportion, grades of blue metal .brick jelly concrete with cement mortar and lime mortar.              | Views of simple hollow and solid bodies with dimension. Use of different types of lines and symbols for drawing. | CGS and FPS system of units of length, weight And their conversion.                                |
| <b>Plumber 16<sup>th</sup> to 51 week:</b> |   |  |  |  |
| 16   | Use and care of the plumber's hand tools and equipment. Identification demonstration and precautions to be observed.    | Safety precaution and elementary first aid. Description of plumber's tools and equipment.  | Views of simple hollow solid with dimensions. Use of different types of lines and symbols for drawings.          | Ratio and proportion. Applied problems.  |

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| 17& 18. | Cutting of pipes of different metals of different dimensions.   | Care and use of tools, materials used in plumbing. Ferrous metals, cast iron mild steel, steel and its properties and uses.                            | Plumbing symbols.  | Work, power, energy, unit-applied problems.  |
| 19      | Fixing of waste pipe cast iron and AC with suitable bends, with junction jointing with lead and cement. | Materials used in plumbing non-ferrous meta, brass, copper, zinc, lead, tin, solder, gun metal and its uses in plumbing work. White lead and red lead. | Simple isometric drawings isometric views of simple objects such as squares, rectangular, cubes, rectangular blocks etc.           | Do   |
| 20      | Fixing of rain water pipe with RW head shoe and its terminal(i.e., Draining store water).               | Description of soil and water pipe. Description of rain water pipe. Single and double pipe system, specials used in soil and water pipe line work.     | Simple isometric drawings. Isometric views of simple objects such as squares, rectangles cubes, rectangular blocks etc.            | Definition of friction- Related terms, different types with examples, problems on friction on plain and inclined surfaces. |
| 21      | Fixing of vent line pipe for soil and waste line anti-syphon pipes.                                     | Description of soil waste pipe. Description vents pipe and its importance. Description of anti siphon pipe and its importance.                         | Do   | Measuring of friction examples. Meaning of center of gravity example. Specify gravity.                                     |
| 22      | Fixing of floor traps, and in a bath of kitchen.  | Description of traps. Types of traps. Method of testing the soil and waste pipe.   | Conversion of orthographic view of solid objects like cubes, parallelopoids , prisms, cones, cylinders, etc. into isometric views. | Menstruation on areas of rectangle, square, triangle, circle, regular polygons, etc. calculation of area.                  |

ACHIEVEMENTS:-the trainees should be ables to:

1. Use masons hand tools.
2. Use plumbers hand tools.
3. Construct single brick wall.
4. Construct gully chamber.
5. Construct inspection chamber.
6. Do concreting and repairing of the damaged portions.
7. Cut pipes of different metals.
8. Plaster walls.
9. Fix soil pipe, waste pipe, RC pipe with accessories and jointing (using lead and cement).
10. Fix anti-syphon pipe connection and vent pipes.
11. Fix floor traps.
12. Test soil and waste pipes.

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| 23 | Threading of G.I. pipes, using pipe die of various sizes up to 50mm.     | Sources of waste-composition hard and soft water. Temporary hardness and permanent hardness.   | Water supply Construction of simple figures and solids such as cubes rectangular block cylinders etc.   | Menstruation-areas rectangle, square, triangles, circle, regular polygons etc.   |
| 24 | Steps simple pipe connection using G.I. pipes.                           | Impurities in water, suspended and dissolved impurities, purification of water, sedimentation slow sand filtering and mechanical filters. Congulation. | Construction of simple figures and solids, such as cubes, rectangular blocks, cylinders etc. with dimensions and tiles. Use of different types of scales in inches and millimeters. | Calculation of area. Calculation of volume and weight of solid bodies such as cubes squares and hexagonal prisms, shop problems. |
| 25 | Installing water meter(drilling C.I. Main and taping and fixing ferrule) | Storage tank, distribution of water intermittent and constant water supply system. Gravity system, pumping storing and distribution of water.          | Lettering numbers and alphabets. Free hand isometric sketching of simple objects with   | Heat and temperature their metric scale Fahrenheit and centigrade scales and   |

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|    |   |  | dimensions.  | their conversion. Name and use of temperature measuring instruments used in workshops.   |
| 26 | Layout of water pipe connection to the sanitary fitting using different types of valves/fittings.                                     | Valves used in plumbing system (sluice valve, reflux valve, scour valve, air valve, pressure relief valve (safety valve water supply through pipes).                         | Line diagram of the water service line.                          | Heat and temperature their metric scale Fahrenheit centigrade scales and their Heat and Temperature conversions.                           |
| 27 | Laying and jointing of Cast iron pipe (lead pouring and lead caulking).   | Free system, grid iron system and radial system. Description of C.I. pipes, method of jointing C.I. pipes and G.I. pipes, specials and fittings used in C.I. and G.I. pipes. | Free hand isometric sketching of simple objects with dimensions. | Shop problems on determination of volume and weight of simple solid bodies.  |
| 28 | Cast iron socket pipe-heavy, light, duty, joining, molten lead, lead wool Bossing lead sheet corner to corner practice on soldering . | Water main, street line in water supply as well as soil pipe and drainage system.  | Free head isometric sketching of simple objects with dimensions. | Shop problems in determination of volumes and weight of simple solid bodies.   |
| 29 | Practicing on cutting and shaping PVC pipes to sizes, use and fixing of PVC pipes fittings preparation of PVC pipe joints.            | PVC description of ISI specification of pipe, properties and use in plumbing work. Method of cutting and preparing joints.   | -- do --   | Workshop problems on determination of volume and weight of volume and weight of simple solid bodies. Geometry properties of lines, angles, |

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|     |   |  |  | triangles, and circles.   |
| 30. | Laying of PVC pipe according to drawing.  | PVC fitting-their description and use. Method of laying out of PVC pipes. Saddle connection for house service.   | Free hand sketching plan and elevation, simple objects hexagonal bar, square bar, circular bar tapered bar, hollow bar.          | --- do ---  |
| 31. | Saddle connection form PVC pipe according to drawing.   | Drawl of from river bed, infiltration, wells and infiltration, well and infiltration galleries.  | Free hand sketching plan and elevation of simple objects like hexagonal bar square bar, circular bar, tapered bar, hollow bar.   | Simple problems on lines angles, triangles and circles.   |
| 32. | Laying out of asbestos cements Pressure pipes with detachable color joint with rubber rings-taking service connection from the pipes(saddle connection) for | Description and use of AC pressure pipes, standard sizes lengths, specials used. Precaution to be pipes and protection of pipes.   | ---- do - --   | Simple estimation on requirement of material for different jobs.  |
| 33. | Installing hand pump, finding out the defects and rectifying the same. Fixing of shower connection in a Toilet Room.  | Method applied for lifting of water from well, deep and shallow. Lift semi-rotary pump and deep well barrel pumps and wind mill, description and working principles of the above mentioned pumps and the materials they are made of and parts consisted in it. | Views of simple's solid and hollow bodies cut by section plane. Free hand isometric sketching of simple objects with dimensions. | Simple estimation on requirements of material for different jobs. Shop problems in determination of volume and weight of simple solid bodies. |

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|     |   | Valves and taps used in service connection, air lock in the pipes and its removal, water hammer noises in plumbing.   |   |  |
| 34. | Installation of Electrical pump.  | Water supply system of small towns, description of pumps of various types. Centrifugal, piston type, electro type, mono type booster pump, submergible pump.  | Views of simple solid and hollow bodies cut by section plane.   | Simple estimation on requirement of material for different jobs.   |
| 35. | Erecting simple water supply system as per lay out branding of pipes introducing valves wherever necessary and connecting to the storage tanks delivery line and testing the line under pressure. | Storage tanks for general water supply purpose. Tests and water supply pipes. Different types of storage tanks :<br>1. R.C.C.<br>2. Steel tank, masonry tanks, water level indication. Automatic float switch underground tanks vertical type's ball valve. | Lay out plan of a small village or town and mark the water line with valves of all types and the position of the reservoir, | Calculation of volume and weight of pipes of different dia and thickness. Determination of pipe length.  |
| 36. | Bending of C.I. and M.S. pipe up to 50 mm as per the template(plain bends and offset bends)   | Advantages of template and their preparation , bending machine and method of bending their advantages and disadvantages (Cold bending and hot bending)  | Exercises on Engg. Drawing.   | Calculation of volume, and weight of pipes of different dia and thickness, Determination of pipe length. |
| 37. | Reconditioning of Taps Valves, Flushing tank Testing for correct functioning.   | Causes for damage in Taps valves, and water meter and Tank etc; Method of rectification and modification.   | Exercises on Engg. Drawing.   | --- do ---   |

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| 38. | Demonstration by various methods, protecting the pipes. | Description to be given while laying pipes of different materials for protecting the same from corrosion , earth pressure due to vibration, due to load of the building , sinking due to loose soil etc. | --- do --- | Simple estimation of pipe requirements etc. for different types of jobs. Calculation of water in container of different sizes. |
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ACHIEVEMENTS: The Trainees should be able to do:

1. External threading of pipes of various sizes.
2. Joining of pipes of different metals-C.I., G.I., M.S. etc.
3. Lay out of PVC pipes as per drawing.
4. Installing water meter.
5. Taking service connection form PVC and AC pressure pipes.
6. Installing hand pumps and repair of had pumps.
7. Installing electrical pumps.
8. Bending of pipes G.I. and M.S.
9. Repairs of valves, cocks.
10. Removal of air lock.
11. Tracing out leakages and rectifying the defects.
12. Protection of pipes due to various reasons.

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| 39. | Installing Indian Style water closet with high level cistern, including fixing flush pipe connection, water connections etc. and connecting the outlet to the drainage line or inspection chamber. | Description of sanitary fitting. General points to be observed when choosing sanitary fittings.                | Building plan and mark the position of the sanitary fitting water supply line drainage line connection to sewage line. | Simple estimation of pipe requirement etc. for different types of jobs. Calculation of volume and weight of water in container different levels. |
| 40. | Installing European style water closet with low level flushing cistern with flush pipe connecting,   | Description of Indian style W.C. and R.W.C. difference between the same. Standard sizes, types, precautions to | --- do ---<br>-  | ---- do ---  |

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|     | fixing of double flap seat toilet paper holder and connecting the outlet to the drainage line of C.I. Inspection chamber.   | the observed while installing.  |  |  |
| 41. | Installing a urinal with automatic flushing, cistern fixing lead waste or PVC waste for the outlet and connect the same to the inspection chamber.  | Types of urinal, description of flushing, devices, tipper automatic tank, symphonic ball, symphonic tank of high level and low level, flush valves and its working principles. Principle of siphon ball valves in a flushing cistern. | Building and mark the position of the sanitary fittings, water supply line drainage line and connection to sewage line.      | Simple estimation of pipe requirement etc. for different types of jobs. Calculation and volume and weight of water in container of different size. |
| 42. | Installing a wash basin with lead waste or PVC waste pipe, connecting of the pillar tap to service connection-fixing or mirror plate glass shelf towel rail, soap dish, hot and cold taps with popup waste connection, connect the waste to the gully trap or floor trap. | Description of wash basin its standard sizes, types and accessories required for installing wash basin sizes of mirror towel rail, glass shelf, precautions to be observed while installing.  | Building plan and mark the position of the sanitary fitting water supply line drainage line and connection to sewage line.   | Electricity and its uses, Electric current positive and negative terminals. Use of switches and fuses, conductors and insulators.                  |
| 43. | Installing a sink with drain board, waste outlet connecting the waste outlet with all fittings. Water service connection to the sink.   | Description sink, types of sink, size of kitchen sink, pantry sink, bed pan sink, laundry sink, slop sink, sizes of waste outlet, fixing of sink according to their suitability.  | Building plan and mark the position of the sanitary fittings, water supply line drainage line and connection to sewage line. | Reading of simple graphs.  |
| 44. | Installing a bath tub with hot and  | Description of bath tub, accessories  | Free hand sketching of   | Reading of simple  |

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|     | cold water connection with shower , over flow and waste connection, soap dish etc.   | required for installing a bath tub.  | simple objects related to the trade and preparation of simple working drawings form the sketches.                       | graphs.   |
| 45. | Demonstrating the working principle of the bidet washing through range W.C. range, urinals flushing arrangements and methods of arranging the waste outlet.  | Importance of introducing the trap of the sanitary fittings. Deep seal traps and low seal traps crown vent, left side and right side vent, different materials out of which they are made and size available.  | Free hand sketching of simple objects related to the trade and preparation of simple working drawing form the sketches. | Reading of simple graphs.   |
| 46. | Laying and jointing of stoneware pipe with the help of sight rail and boning rod, jointing of stone ware popes.  | Drains-Drainage Conservancy system and water carriage system. Combined system of drain and separate system of drain and separate system of drain and Types of drain.   | Longitudinal section of the house drain.  | Estimation on requirements of materials for pipe. Lay out and installation. |
| 47. | Laying and jointing of stoneware pipe with the help of sight rail and boning rod, jointing of stoneware pipes, according to soil conditions and water level. | Method of setting this sight rail and boning rod and radiant to be allowed to be S.W. pipe according to the sizes. Standard length of S.W. (Stone ware) pipe sizes. Self cleanings velocity sewage system. Special problems in different soils and water level conditions. | Longitudinal section of the house drain. Drainage arrangements of workshop of an institution.                           | Estimation on requirements of materials for pipe. Lay out and installation. |
| 48. | Fixing of a gully trap and connecting the same to a chamber.   | Earth work excavation laying drain pipes, precautions to be observed Full shoring/partial of the   | Longitudinal section of the house drain, Drainage arrangements of workshop  | Estimation on requirement of materials for pipe. Lay out and installation.  |

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|    |  | trench in respect of corresponding depth of drain , refilling of trench, testing of drain pipes(Pressure smoke and light test)  | of an institution.  |           |
| 49 | Providing vent pipe from a starting chamber.   | Description of vent pipe its necessity. Traps used in drainage line, Greece trap, gully trap, interceptor, types of manholes, cesspool, soak pits, septic tanks, size of septic tank, according to the users dispersion trench.                         | Revision  | ----do--- |
| 50 | Preparation and fixing up of hot water supply as per layout. Installation of hot water system.   | Heat and temperature Transmission of heat, heating system. Domestic boilers and geysers, method of ventilating return pipes.  | Live diagram- showing the hot water line from boiler, return, and vent pipes. | Revisions |
| 51 | Cleaning of sanitary fittings, scraping and painting of pipes. Tracing out leakages and repairing of valves, taps and pumps, air locks in pipe lines and removal. Use of epoxy resin. Demonstration of renewal of the packing of the valves taps and electrical pumps. | Corrosion – its causes and remedies prevention of corrosion. Corrosion due to electrolytic action. The effect of water and frost on materials. Reasons for packing rope for gland. Important points to check the proper working conditions of the pump. | ---do---<br>Exercises on Engg. Drug.  | ---do---  |
| 52 | -----TEST-----   |   |   |           |

ACHIEVEMENTS: The Trainees should be able to do the following:

1. Install Indian Water Closet.
2. Install European Water Closet.
3. Install high level flushing cistern.
4. Install low level flushing cistern.

5. Install wall urinals.
6. Install an automatic tank.
7. Install flush valve.
8. Install a wash basin.
9. Install a sink.
10. Install a bath tub.
11. Method of installing a bidet, working trough range urinals.
12. Lying a jointing of drainage pipes.
13. Fixing of a gully trap.
14. Fixing of vent pipe in drainage system.
15. Install a water heater.
16. Clean sanitary fitting.
17. Estimating material requirement for pipe layout for a building making from a pipe layout.

N.B. Social Studies: The syllabus has already been approved and is same for all the trades.

**TRADE: PLUMBER**  
**List of Tools and Equipment for a batch of or Unit of 16 trainees**

| SI No.                   | Items                                       | For Instructor | For Trainees |
|--------------------------|---|----------------|--------------|
| 1                        | 2   | 3              | 4            |
| <b>TRAINEES TOOL KIT</b> |   |                |              |
| 1.                       | Rule steel 300 mm both in inch and mm.      | 1 No.          | 16 Nos.      |
| 2.                       | Rule wooden 4 fold 600 mm.                  | 1 No.          | 16 Nos.      |
| 3.                       | Hacksaw frame adjustable for 250 to 300 mm. | 1 No.          | 16 Nos.      |
| 4.                       | Scriber 200 mm.                             | 1 No.          | 16 Nos.      |
| 5.                       | Centre punch 100 mm.                        | 1 No.          | 16 Nos.      |
| 6.                       | Chisel cold flat 20 x 250 mm.               | 1 No.          | 16 Nos.      |
| 7.                       | Hammer ball pein 800 gms.                   | 1 No.          | 16 Nos.      |
| 8.                       | Hammer ball pein 300 gms.                   | 1 No.          | 16 Nos.      |
| 9.                       | File flat rough 300 mm.                     | 1 No.          | 16 Nos.      |
| 10.                      | Level spirit wooden 300 mm.                 | 1 No.          | 16 Nos.      |
| 11.                      | Plumb bob 50 gms.                           | 1 No.          | 16 Nos.      |
| 12.                      | Trowel 125 IS: 6013.                        | 1 No.          | 16 Nos.      |
| 13.                      | Stillson wrench 200 & 350 mm.               | 1 each         | 16 each      |
| 14.                      | Screw driver 250 mm.                        | 1 No.          | 16 Nos.      |
| 15.                      | Wooden mallet small IS:2022                 | 1 No.          | 16 Nos.      |

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| 16   | Cutting pliers 200 IS:3650  | 1 No.  | 16 Nos. |
| 17   | Steel tape.   | 1 No.  | 16 Nos. |
| <b>TOOLS, MEASURING INSTRUMENTS, SHOP OUTFIT &amp; GENERAL INSTALLATIONS</b> |   |        |         |
| 18   | Surface plate 400 x 400 mm grade 1                                  | 1 No.  |         |
| 19   | Scribing block universal 300 mm.                                    | 2 Nos. |         |
| 20   | Hand vice jaw 50 mm.  | 2 Nos. |         |
| 21   | File flat smooth 200 mm.  | 2 Nos. |         |
| 22   | File half round rough 300 mm.                                       | 2 Nos. |         |
| 23   | File square rough 250 mm.   | 2 Nos. |         |
| 24   | File square smooth 200 mm.  | 2 Nos. |         |
| 25   | File triangular rough 250 mm.                                       | 2 Nos. |         |
| 26   | File flat rasp 250 mm.  | 2 Nos. |         |
| 27   | File triangular smooth 200 mm.                                      | 2 Nos. |         |
| 28   | Chisel cold flat 20 mm x 300 mm.                                    | 2 Nos. |         |
| 29   | Chisel cross cut 6 x 150 mm IS:402                                  | 2 Nos. |         |
| 30   | Chisel round nose 3 x 150 mm IS:402                                 | 2 Nos. |         |
| 31   | Chisel diamond point 6 x 150 mm.                                    | 2 Nos. |         |
| 32   | Tap and die set to cut BSP Thread.                                  | 1 set  |         |
| 33   | Punch letter set.   | 1 set  |         |
| 34   | Punch number set.   | 1 set  |         |
| 35   | Chase wedge 50 mm.  | 3 Nos. |         |
| 36   | Dresser lead 350 x 50 mm.   | 4 Nos. |         |
| 37   | Stick setting in 350 x 50 mm.                                       | 4 Nos. |         |
| 38   | Saw plumber 300 mm.   | 4 Nos. |         |
| 39   | Spanner monkey up to 50 mm.   | 2 Nos. |         |
| 40   | Cutter, pipe wheel type 6 mm to 25 mm                               | 1 No.  |         |
| 41   | Pipe jointer, lead, universal                                       | 1 No.  |         |
| 42   | Oil stone 150 mm x 50 mm x 25 mm                                    | 3 Nos. |         |
| 43   | Soldering iron, copper fit, fire heated, hatched, straight 500 gms. | 4 Nos. |         |
| 44   | Snip straight 250 mm  | 4 Nos. |         |
| 45   | Try square 200 mm   | 4 Nos. |         |
| 46   | Inside caliper 150 mm   | 4 Nos. |         |

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| 47 | Caliper outside 150 mm.   | 4 Nos. |  |
| 48 | Odd leg caliper 200 mm.   | 4 Nos. |  |
| 49 | Tenon saw.  | 2 Nos. |  |
| 50 | Handsaw   | 2 Nos. |  |
| 51 | Mortice chisel  | 2 Set  |  |
| 52 | Firmer chisel   | 2 Set  |  |
| 53 | Mallet medium IS: 2922  | 2 Set  |  |
| 54 | Jack plane  | 2 Set  |  |
| 55 | Pliers combination 200 mm.  | 2 Nos. |  |
| 56 | Blow lamp 500 milliliter  | 4 Nos. |  |
| 57 | Pipe opener.  | 1 No.  |  |
| 58 | Washer cutter   | 1 No.  |  |
| 59 | Pressing stick.   | 1 No.  |  |
| 60 | Mandrel.  | 2 Nos. |  |
| 61 | Plumber kit containing tampin bent pin, plumbers hammers dressers, mallets, chase wedges, draw knife and step turner. | 2 sets |  |
| 62 | Bobbin and follower.  | 2 sets |  |
| 63 | Bend bolt   | 2 Nos. |  |
| 64 | Sheet lead knife.   | 2 Nos. |  |
| 65 | Chipping knife.   | 2 Nos. |  |
| 66 | Mirror 100 x 150 mm.  | 2 Nos. |  |
| 67 | Splash stick  | 1 No.  |  |
| 68 | Soil pot with brush.  | 1 No.  |  |
| 69 | Pot hook.   | 1 No.  |  |
| 70 | Turn pin.   | 1 No.  |  |
| 71 | D.E. spanners 7 x 8, 10 x 11, 13 x 17, 19 x 22, 24 x 27, IS:2028  | 2 sets |  |
| 72 | Branch gimlets  | 2 Nos. |  |
| 73 | Bending spring.   | 1 set  |  |
| 74 | Long dummy.   | 2 Nos. |  |
| 75 | Short dummy.  | 2 Nos. |  |

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| 76  | Plumbers ladle.   | 2 Nos. |  |
| 77  | Joining cramp.  | 2 Nos. |  |
| 78  | Plumbers metal melting pot 10 kg.   | 1 No.  |  |
| 79  | Pipe stocks and dies complete with stocks brushing, bushing holders taps and tap wrenches sizes covered to suit pipes of bore dia 6, 8, 10, 20, 25, 32, 40 and 50 mm. | 6 sets |  |
| 80  | Pipe vice to grip pipes up to 77 mm. IS:2587  | 8 Nos. |  |
| 81  | Tool caulking set of 2.   | 2 set  |  |
| 82  | Stillson pattern pipe wrenches 450 mm to take pipe up to 52 mm dia IS: 4003.  | 2 set  |  |
| 83  | Stillson pattern pipe wrenches 300 mm to take pipe 20 mm to 32 mm.  | 2 set  |  |
| 84  | Chain pipe wrench 90 mm -650 mm IS: 4223.   | 1 No.  |  |
| 85  | Adjustable spanner A 375 IS:1649  | 2 Nos. |  |
| 86  | Anvil 50 or 63 kg. IS:510   | 1 No.  |  |
| 87  | Pipe bender manually operated.  | 1 No.  |  |
| 88  | Vice leg 75 mm, jaw on stand IS:2588  | 1 No.  |  |
| 89  | Hand drills 6 mm capacity with drill chuck.   | 1 No.  |  |
| 90  | Drill twist (Straight shank) 3 mm to 6 mm.  | 1 Set  |  |
| 91  | Portable forge 450 mm with hand blower.   | 1 No.  |  |
| 92  | Flat smithy tong.   | 2 Nos. |  |
| 93  | Working bench 2400 x 1200 x 750 mm with 4 vices 125 mm jaws.  | 2 Nos. |  |
| 94  | Bath tub small size.  | 1 No.  |  |
| 95  | Stop tab water 20 mm IS: 781  | 4 Nos. |  |
| 96  | Wash basin (16" x 14" x 10") equivalent metric.   | 2 Nos. |  |
| 97  | Water heater 22 liters  | 1 No.  |  |
| 98  | Water closet (European type with down type cistern)   | 1 set  |  |
| 99  | Water closet Indian type complete with over head cistern  | 1 set  |  |
| 100 | Urinal wall type complete with automatic  | 1 set  |  |

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|     | system.  |        |  |
| 101 | Water meter.   | 2 Nos. |  |
| 102 | Steel lockers with 8 drawers.  | 2 Nos. |  |
| 103 | Metal rack 1800 x 1500 x 450 mm  | 1 No.  |  |
| 104 | Desk   | 1 No.  |  |
| 105 | Stool  | 1 No.  |  |
| 106 | Black board with easel.  | 1 No.  |  |
| 107 | Fire extinguisher  | 1 No.  |  |
| 108 | Fire buckets with stud.  | 1 No.  |  |
| 109 | Steel almirah.   | 1 No.  |  |
| 110 | Ratchet brick with post and clamp flat drill 6 to 35 mm by 0.2 mm        | 1 set  |  |
| 111 | PVC welding plant.   | 1 No.  |  |
| 112 | Electric pump 1 HP.  | 1 No.  |  |
| 113 | D. E. pedestal grinder with two wheels 175 rough and smooth              | 1 No.  |  |
| 114 | Hydraulic pressure machines for testing leakage in GI pipe fittings etc. | 1 No.  |  |
| 115 | Sight rail and banning rod.  | 1 each |  |
| 116 | Ratchet pipe die 15 mm to 32 mm.   | 1 No.  |  |
| 117 | Bench drilling machine with chuck and key up to 15 mm cap.               | 1 set  |  |
| 118 | Double face hammers.   | 4 Nos. |  |
| 119 | Dormat, Pickle, spade, Girmale.  | 1 each |  |
| 120 | Pipe bender (Hydraulic type)   | 1 No.  |  |
| 121 | Monkey plier (Gas pliers)  | 4 Nos. |  |

Note:

1. No additional items are required to be provided for the batch working in the second shift except the items under trainees Tool Kit and lockers.
2. No additional number of item marked (\*) are required to be provided for additional number of batches. /units.
3. Items such as sockets elbow U-trap, W-trap pipes etc. required for day to day plumbing work should be purchased from training grant.
4. The specification of the items in the above list have been given in Metric Units and are based of the ISI standards wherever available, while procuring thee ISI specifications should be strictly followed. Measuring instrument such as

steel rule which are graduated both in English and Metric units may be procured, if available.

**Trade: Plumber**

**List of I.S.I. Publications for use of Instructors.**

| <b>Sl. No.</b> | <b>Items</b>  | <b>ISI Code No.</b> |
|----------------|---|---------------------|
| 1              | Pipe wrenches   | IS:4003             |
| 2              | Pipe vices  | IS:2587             |
| 3              | Pipe threads for fastening purposes dimensions for.                                       | IS:2643             |
| 4              | Horizontal centrifugal pumps for clear, cold and fresh water.                             | IS:1520             |
| 5              | Gland packing asbestos.   | IS:4687             |
| 6              | Cork composition sheets (Part I and II)   | IS:4253             |
| 7              | Selection installation and maintenance of sanitary appliances, code of practices for.     | IS:2064             |
| 8              | Water meters (domestic type) code of practice for selection installation and maintenance. | IS:2401             |
| 9              | Water supply in buildings, code of practice for.  | IS:2065             |
| 10             | Caulking lead.  | IS:782              |
| 11             | Enameled steel bath tubs.   | IS:3489             |
| 12             | Formulas for water services.  | IS:3489             |
| 13             | Flashing cisterns for water closets and urinals.  | IS:774              |
| 14             | Glazed earthenware sanitary appliances.   | IS:771              |
| 15             | Pillar taps.  | IS:1795             |
| 16             | Plug cocks for water supply purposes.   | IS:3004             |
| 17             | Sanitary appliances, enameled C.I. general requirements                                   | IS:772              |
| 18             | Waste fittings for wash basins and sinks non-ferrous.                                     | IS:2963             |
| 19             | Water closets, enameled and C.I.  | IS:773              |
| 20             | Vitreous sanitary appliances (Part- I) general requirements.                              | IS:2556             |

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|----|--|---------|
| 21 | Lead pipes.  | IS:404  |
| 22 | Zinc.  | IS:209  |
| 23 | Soft solder  | IS:198  |
| 24 | Pipes and fittings C.I. and Rain water                           | IS:1230 |
| 25 | Pressure pipes for water gas and sewage C.I. fittings for.       | IS:1538 |
| 26 | Pipe lines, color code for the identification of.                | IS:2379 |
| 27 | Lead and its compounds, code of safety for.                      | IS:4312 |
| 28 | Excavation work, safety code for.                                | IS:3764 |
| 29 | Scaffolds and carders (Part I and II) safety code for.           | IS:3696 |
| 30 | Manhole covers and frames intended for use in drainage work C.I. | IS:1726 |
| 31 | Laying C.I. Pipes code of practice for.                          | IS:3114 |
| 32 | Lying of concrete pipes code of practice for.                    | IS:783  |
| 33 | Asbestos cement pressure pipes.                                  | IS:1592 |
| 34 | Glossary of terms relating to corrosion of metals.               | IS:3531 |
| 35 | Engineering drawing general code of practice for.                | IS:696  |

## **SYLLABUS FOR THE TRADE OF PLUMBER UNDER APPRENTICESHIP TRAINING SCHEME**

**Period of Apprenticeship Training: 3 Years**

The period of training for this trade is three years consisting of Basic Training for a period of one year and Shop Floor training for the remaining period.

For 1<sup>st</sup> year Training (Basic Training)

Note:

1. The content of the syllabus for the apprentices during 1<sup>st</sup> year training (Basic Training) should be same as that of the syllabus and tools, equipment, machineries etc. of Craftsmen Training Scheme in the trade of 'Plumber'
2. Related instruction should be imparted to all apprentices during the entire period of training including Basic Training.

The subject to be taught to the apprentices in Related Instruction is:

- (a) Trade Theory
  - (b) Engineering Drawing
  - (c) Workshop Science and Calculation
  - (d) Social Studies
3. The content of the syllabus for Related Instruction during 1<sup>st</sup> year training should be same as that of the syllabus for I.T.I. Trainees in the Trade of Plumber.

#### Shop Floor Training for 2<sup>nd</sup> and 3<sup>rd</sup> year

Note:

1. The apprentices should have more practice on the Shop Floor in those operations/skills which have been already learnt during the Basic Training and additional operations/skills during the shop floor training and develop method of work, speed, accuracy and finish in jobs.
2. The operations/skills which an apprentice will be required to carry out to cover the approved syllabus for practical training during the period of 2<sup>nd</sup> and 3<sup>rd</sup> year are as listed below. It is not necessary that the operations/skills should be performed in the order in which they are listed.

| SI No. | List of operations/skills to be learnt during Apprenticeship Training  |
|--------|--|
| 1      | 2  |
| 1      | Instruction to Safety precautions on the Shop Floor.   |
| 2      | Hardening and tempering of chisels.  |
| 3      | Measurement – wire gauge and sheet gauge.  |
| 4      | Cutting of sheet metal to size.  |
| 5      | Preparation of sheet metal articles involving developments.  |
| 6      | Forming of rolls, welts, and corners and slashing in sheet.  |
| 7      | Jointing of Copper and Zinc on solids, hollow and conical roll.  |
| 8      | Erection of simple scaffolding.  |
| 9      | Marking for excavation   |
| 10     | Cement jointing of pipes.  |
| 11     | Jointing of copper of pipes.<br>(a) Using can type compression fittings.<br>(b) Using ring type compression fittings.<br>(c) Using capillary fittings. |
| 12     | Butt and branch welds on M.S. pipes.   |
| 13     | Bronze welding:<br>(a) Copper sheet  |

|    |   |
|----|---|
|    | (b) Copper tubes<br>(c) Brass tubes to copper   |
| 14 | Installation meters:<br>(a) Gas meter<br>(b) Compound meter<br>(c) Hot water meter  |
| 15 | Jointing practice on zinc and copper pipes.   |
| 16 | Installation of gas piping.   |
| 17 | Connection of gas meter.  |
| 18 | Installation of gas appliances.   |
| 19 | Use, care and maintenance of lifting tackle.  |
| 20 | Use of synthetic pipes e.g. polythene etc. and preparation of joints.   |
| 21 | Use of water supply and bathroom fittings.  |
| 22 | Installation of domestic water supply system.<br>Installation of water supply and sanitary lines in multistoried Flats,<br>Hospitals, Hotels and Chemical Plants. |
| 23 | Installation of bidet.  |
| 24 | Trouble shooting.   |

Note:

The operations/skills marked (\*) are optional. They must be carried out where facilities are available in the establishments.

### **SYLLABUS FOR RELATED INSTRUCTION**

(2<sup>ND</sup> year 3<sup>rd</sup> year)

Related instruction should be imparted to all the apprentices during the entire period of training including basic training. The syllabus given for Related Instructions should be considered as a guide.

The syllabus to be taught to the apprentices in Related Instructions:

1. Trade Theory
2. Workshop Calculation and Science
3. Engineering Drawing
4. Social Studies

### **SECOND AND THIRD YEAR**

## Trade Theory

1. Safety at work accidents do not happen, they are caused.
2. Revision of previous year's work.
3. Sheet metal worker's common hand tools-their names and uses, description and uses of simple hand tools used for masonry work. Care and maintenance of tools.
4. Method of jointing sheet metal by folding, riveting and soldering.
5. Domestic hot and cold water supply system – geysers layout –specifications of materials required and connection of pipes to main Tracing leakages. Repairs to service mains. Domestic boilers and geysers. Domestic gas supply system – general layout, specifications of materials required. Methods of testing leakage. Repairs to service and main gas supply systems. Water and gas meter their description and use.
6. Domestic drainage system. General layout and specification of materials required. Inspection chambers, air vents, anti symphonize system, flap valves. Protection of pipe and fitting from atmospheric action. Sanitary fittings. Various types of urinals, spittoons, basins single and double tap basins, baths, showers, laboratory basins over flow pipes, water closets, bidets, brackets, frame, kitchen and laboratory sinks, drains etc. their description and use.
7. Knowledge of carpentry work related to plumbing.
8. Fire hydrants-description and installation.
9. Leak proofing of roof and the junction with chimney by laying lead sheets etc. Names and parts of roof general principles and metal used for pitched roofs. Roofs drainage – description of gutters – rain water gutters and pipes.
10. Different types of plumbing system- description and principles of working. Advantages and dis-advantages of each system. Regulations, standard specifications and local by laws covering plumbing work.
11. Corrosion and incrustation-prevention of corrosion. Corrosion due to electrolytic action. The effects of water and frost on materials.
12. Principles of municipal water supply and distribution system. Principles of municipal sewerage system and its disposal.
13. Application of plastic and synthetic materials in plumbing.

14. Principles of different types of pumps and siphons and their use in plumbing work.
15. Use of reference tables and manufacturer's hand books.
16. Modern development in the trade-new techniques, new plumbing materials etc.
17. Quality and finish of work importance of quality and finish of job at all stages.
18. Introduction to work simplification job study, job analysis including planning of sequences of operations. Critical approach and method of working. Estimation of time and materials.
19. Water supply theory :
  - (a) Calculating the capacity of an overhead reservoir for: (i) Workshop, (ii) Institution, (iii) a small town.
  - (b) Contamination of water in a drinking water well storage reservoir etc.
  - (c) Method adopted for the drawl of water from river bed, a dam, for drinking water purposes.
20. Soil Pipe :
  - (a) Duct plumbing.
  - (b) Removing the blockage in the soil pipe, waste pipes traps, method adopted tools used.
21. Drainage :
  - (a) Elevated septic tank (collection well, septic tank, sprinklers homes tank)
  - (b) Imhoff tanks.
  - (c) Sewage disposal, plants,
  - (d) Treatment of sewage.
22. Gas Supply System :
  - (a) Gas storage tanks.
  - (b) Gas supply pipes.
  - (c) Valves used in Gas supply system tracing out leakage and sequence.
23. Trouble shooting sequence.
24. Revision and test.

## **WORKSHOP CALCULATION AND SCIENCE**

1. Revision of previous year's work.
2. Algebra: Addition subtraction, multiplication and division of expressions involving algebraic symbols. Simple equations and transposition problems, Standard algebraic formulae e.g.  $(a+b)^2$   $(a-b)^2$  etc. Simple simultaneous equation with two unknown quantities.
3. Menstruation : Areas of rectangles, squares, triangles, circle and regular polygons, calculation of area, volume and weight of simple solid bodies, such as cube, spheres hexagonal prisms etc., problems.
4. Trigonometry: Trigonometric functions. Use of trigonometric tables, applies problems, Calculation of areas of triangles, polygons etc.
5. Further problems as applicable to the trade.
6. Advance problems of menstruation, work, power and energy
7. Estimation, preparation of estimates.
8. Meaning of tenacity, elasticity, malleability, brittleness, hardness, compressibility and ductility.
9. Meaning of stress, strain, modulus of elasticity, ultimate tensile strength, factor of safety and different types of stresses.
10. Velocity and acceleration.
11. Definition of mechanical advantage of simple machines pulleys and cranes.
12. Simple problems on straight and bell crank levers.
13. Mass-unit of mass, force, absolute unit of force, the weight of a body-unit of weight C.G.S., M.K.S. & F.P.S. system of units, S.I. Units.
14. Determination of diameters, length and weight of pipes. Calculation of requirement of materials for the preparation of estimates. Head of water, water pressure per unit area, rate of flow and volume of water discharged.
15. Descriptive explanation of expansion of solids, liquids and gases due to heat, coefficient of expansion. Brief description of transference of heat-conduction, convection and radiation.
16. Heat and temperature. Thermometric scales, Fahrenheit and Celsius/centigrade scales, conversion of Fahrenheit to centigrade/Celsius scale and vice-versa. Measurement of temperature. Name and brief description of temperature measuring instruments used in the workshop.

## **ENGINEERING DRAWING**

1. Revision of previous year's work.
2. Advance blue print reading.
3. Code of practice for general engineering drawing according to ISI (IS: 696).
4. Development of surfaces of simple objects related to the trade.
5. Construction of Isometric scale.
6. Free hand sketching and production of working drawing of simple parts such as pipe joints, taps valves etc.
7. Free hand sketching and preparation of layout drawings of various plumbing details of buildings.

## **SOCIAL STUDIES**

The syllabus has already been approved and is same for all the trades.