

## GENERAL INFORMATION

1	Name of the Trade	<b>Plumber</b>
2	Entry Qualification	Passed 8 <sup>th</sup> class examination under 10 +2 system of education or its equivalent.
3	Duration of Crafts Man Training	1 Year
4	Duration of Apprenticeship Training	3 Years including 1 Year Basic Training

# PLUMBER

## SYLLABUS FOR THE TRADE OF PLUMBER

UNDER

CRAFTSMEN TRAINING SCHEME

WEEK NO.	PRACTICAL	THEORY	ENGG. DRAWING	W/CAL. & SCIENCE
1	Familiarisation with the institute. Importance of trade training, machinery used in the trade. Types of work done by trainees in the institute . 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 Institute and in the sections. Medical facilities , recreational, extra curricular activities of the Institute. What is related instruction subjects to be taught and achievement made. Necessary guidance to be provided to the new comers to become familiar with the working of Industrial training Institute		
2	Fitters hand tools : Use of steel rule , engineers , square, scriber and dividers, hacksaw ,centre punch, calipers and different files, bench vice and hand vice	Safety precautions and elementary first aid , fitters common hand tools,, names , description and materials from which they are made	Free hand sketching of straight lines, rectangles, squares, circles, polygons etc. (IS 696-1960)	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 filing to the line drilling holes	Description of simple fitting operations, hacksawing , punching and filling and types of files, marking instruments and their uses	Free hand sketching with dimension to scale and proportionate sketching	Proportions and uses of cast iron, wrought iron, plain carbon steel, high speed steel and alloy steel . applied workshop problems as in the week No. 2

4	Use of hammers-chipping and grinding of chisels, cold chisel round nose chisel, drilling and taper 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, aluminium, 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 and tees	Advantages of using brazing . Different kinds of joints in joining pipes , pipe description of PVC welding torch and filler rod	Free hand sketching of rivets and washers with dimensions from samples	Properties and uses of copper, zinc , lead, tin aluminium , brass, bronze , solder , bearing metal, timber, rubber, leather, asbestos, plastic material ceramic, asphalt etc. Reduction of common fraction to decimal fractions, shop problems
9	Use of carpenter's hand tools involving sawing, planing, 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 Drg. 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 filling , grinding of chisels, drilling and tapping,
- 3 Do soldering
- 4 Use of carpenter's hand tools
- 5 Do wood drawing, planing and chiseling making tap joints

<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 & use of mason's hand tools.	Simple orthographic projection- first angle	Metric system metric weights and measurement units.
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. Description of bonds	-----do-----  Third angle-	-----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..	-----do-----	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 , R.C.C. & its proportion, grades of blue metal, Brick jelly concrete with cement mortar and lime mortar.	Views of simple hollow and solid bodies with dimensions. Use of different types of lines and symbols for drawing .	CGS and FPS system of units of length , weight , their conversion
<b>PLUMBER 16<sup>TH</sup> TO 51<sup>ST</sup> WEEK</b>				
16	Use and care of the plumbers hand tools and equipment. Identification , demonstration and precautions to be observed	Safety precautions & elementary first aid,. Description of plumbers tools and equipment	Views of simple hollow solid bodies with dimensions Use of different types of lines & symbols for drawings	Ratio and proportion applied problems.
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 & its properties and uses	Plumbing symbols	Work, power, energy, unit –applied problems
19	Fixing of waste pipe	Materials used in	Simple isometric drawings,	

	cast iron & AC with suitable bends, with junction jointing with lead and cement	plumbing , non ferrous metal, brass, copper., zinc, lead, tin , solder, gun metal and its uses in plumbing work. White lead and red lead	isometric views of simple objects such as squares , rectangles cubes, rectangular blocks etc.	-----do-----
20	Fixing of rain water pipe with RW head, shoe and its terminal (i.e. store water drain )	Description of soil and waste pipe , descriptions of rain water water pipe. Single & double pipe system, special used in soil and waste pipe line work	Simple isometric drawings, isometric views of simple objects such as squares, rectangles cubes, rectangular blocks	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 vent pipe & its importance . Description of anti -syphon pipe and its importance	-----do-----	Measuring of friction examples, meaning of centre of gravity – example specific gravity
22	Fixing of floor traps, nanhi trap and in a bath or kitchen,	Description of traps. Types of traps , method of testing the soil and waste pipe	Conversion of orthographic views of solid objects like cubes,parallelopoids,prisms,cones ,cylinders,etc. into isometric views.	Mensuration –Areas of rectangle , square, triangle , circle, regular Polygons etc. Calculation of areas.

**ACHIEVEMENTS :** the trainees should be able to do :-

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

23	Threading of G.I. pipes , using pipe die of various sizes upto 50mm	Sources of water – composition hard & soft water. Temporary	<b>Water supply</b> Construction of simple figures and solids such as cubes,	Mensuration –areas of rectangle, square, triangles, circle, regular polygons etc.
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		hardness & permanent hardness	rectangular block cylinders 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	<b>Construction of simple figures and solids, such as cubes, rectangular blocks, cylinders etc. With dimension and files. Use of different types of scales in inches and millimeters</b>	Calculation of areas, 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 & taping and fixing Ferrule )	Storage tank, Distribution of water, intermittent and constant water supply system. Gravity system pumping storing & distribution of water	<b>Lettering numbers &amp; alphabets. Free hand isometric sketching of simple objects with dimensions</b>	Heat & temperature their metric scale- Fahrenheit and centigrade scales and 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	<b>Line diagram of the water service line</b>	Heat and temperature their metric scale Fahrenheit and centigrade scale and their conversion. Name and use of temperature measuring instruments used in workshop.
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 fitting used in C.I. & G.I. pipes	<b>Free hand isometric sketching of simple objects with dimensions</b>	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.	<b>Free hand isometric sketching of simple objects with dimensions.</b>	Shop problems in determination of volume and weight of simple solid bodies.
29	Practicing on cutting and shapping PVC pipes to sizes, use and fixing of PVC pipe fittings preparation of PVC pipe joints.	PVC description of ISI specification of pipe, properties and use in plumbing work. Method of cutting preparing joints.	<b>---do--</b>	Workshop problems on determination of volume and weight of simple solid bodies. Geometry- properties of lines angles, 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.	<b>Free hand sketching plan and elevation, simple objects hexagonal bar, square bar, circular bar, tapered bar hollow bar.</b>	<b>---do--</b>
31	Saddle connection from PVC main line for house services.	Drawal of water from river bed, infiltration, wells and infiltration galleries.	<b>Free hand sketching plan and elevation of simple objects like hexagonal bar, square bar, circular bar tapered</b>	Simple problems on lines, angles triangles and circles.

			<b>bar, hollow bar.</b>	
32	Laying out of asbestos cement. Pressure pipes with detachable collar joints with rubber rings-taking servicing connection from the pipes (saddle connection) for house services.	Description and use of AC pressure pipes standard sizes, lengths, specials used. Precautions to be observed while laying the pipes and protection of pipes.	<b>---do---</b>	Simple estimation on requirement of material for different jobs.
33	Installing hand pump, finding out the defects & rectifying the same. Fixing of shower connection in a toilet room.	Method applied for lifting of water from well, deep and shallow. Lift pumps, lift and force pumps, 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. Valves and taps used in service connection, air lock in the pipe and its removal, water hammer noises in plumbing.	<b>Views of simple solid and hollow bodies cut by section plane. Free hand isometric sketching of simple objects with dimensions.</b>	Simple estimation on requirements of material for different jobs. Shop problems in determination of volume and weight of simple solid bodies.
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, submersible pump.	<b>Views of simple solid and hollow bodies cut by section plane.</b>	Simple estimation on requirement material for different jobs.
35	Erecting simple water supply system as per lay out, branching of pipes introduction 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 1. R.C.C., 2. Steel tank, masonry tanks, and water level indication. Automatic float switch under ground tanks, vertical types ball valve.	<b>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.</b>	Calculation of volume, and weight of pipes of different dia and thickness. Determination of pipe length.
36	Bending of CI. & 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	<b>Exercises on engineering drawing.</b>	Calculation of volume, and weight of pipes of different dia and thickness. Determination of pipe length.

		advantages and disadvantages (cold bending and hot bending).		
37	Re conditioning 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.	<b>Exercises on engineering Drawing.</b>	---do---
38	Demonstration by various methods, protecting the pipes.  (a) Below ground level.  (b) Over the ridge.  (c) Crossing the canal.  (d) Crossing the roads.  (e) Below the foundation of a building.  (f) Loose soils.	Description to be given while laying pipes of different materials for protecting the same from corrosion, earth pressure, pressure due to vibration due to load of building, sinking due to loose soil etc.	---do---	Simple estimation of pipe requirements etc. for different types of jobs. Calculation of volume and weight of water on container of different sizes.

ACHIEVEMENTS: The trainees should be able to do :-

1. External threading of pipes of various sizes.
2. Joints 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 from PVC and AC pressure pipes.
6. Installing hand pumps and repair of hand pumps.
7. Installing electrical pumps.
8. Bending of pipes G.I. and M.S.
9. Repair of valves, cocks.
10. Removal of air lock.
11. Tracking out leakage and rectifying the defects.
12. Protection of pipes due to various reasons.



39	Installing Indian style water closet with high level cistern, including fixing flush pipe connection, water connection 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.	<b>Building plan &amp; mark the position of the sanitary fittings, water supply line, drainage line connection to sewage line.</b>	Simple estimation of pipe requirement etc. for different types of jobs. Calculation of volume and weight of water in container of different sizes.
40	Installing European style water closet with low level flushing cistern with flush pipe connecting, fixing of double flap seat toilet paper holder and connecting the outlet to the drainage line of C.I. inspection chamber.	Description of Indian style W.C. and R.W.C. difference between the same. Standard sizes, types, precautions to be observed while installing.	---do---	---do---
41	Installing a urinal with automatic flushing, cistern fixing lead waste of PVC waste for the outlet and connect the same to the inspection chambers.	Types of urinal, description of flashing, devices, tipper, automatic tank, syphonic ball, syphonic tank of high level and low level flush valves and its working principles. Principles of syphon ball valve in a flushing cistern.	<b>Building plan and mark the position of the sanitary fitting, water supply line drainage line and connection to sewage line.</b>	Simple estimation of pipe requirements etc. For different types of jobs. Calculation volume and weight of water in container of different sizes.
42	Installing a wash basin with lead waste or PVC waste pipe, connecting of the pillar tap to service connection- fixing of mirror plate, glass shelf towel rail, soap dish, hot and cold taps with popup waste connection, connect the waste to 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.	<b>Building plan and mark the position of the sanitary fitting, water supply line drainage line and connection to sewage line.</b>	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 the sink.	Description of sink. types of sink, sizes of kitchen sink, pantry sink, bed pan sink, laundry sink, slop sink, sizes of waste outlet. Fixing of sink according to their suitability.	<b>Building plan &amp; mark the position of the sanitary fitting, water supply line drainage line and connection to sewage line.</b>	Reading of simple graphs.
44	Installing a bath tub with hot and cold water connection with shower, over flow and waste connection, soap dish etc.	Description of bath tub, accessories required for installing a bath tub. .  Method of connecting the over flow.	<b>Free hand sketching of simple objects related to the trade &amp; preparation of simple working drawings from the sketches.</b>	Meaning of work and energy, explanation of H.P. Shop problems.
45	Demonstrating the working principle of the bidet washing through range W.C. range,	Importance or introducing the trap to the sanitary fitting. Deep seal traps and low	<b>Free hand sketching of simple objects related to the</b>	Reading of simple graphs.

	urinals flushing arrangements & methods of arranging the waste outlet.	seal traps, crown vent, left side and right side vent, different materials out of which they are made and size available.	<b>trade and preparation of simple working drawings from the sketches.</b>	
46	Laying and jointing of stone ware pipe with the help of sight rail and boning rod, jointing of stone ware pipes.	<b>Drains- drainageConse rvancy system and water carriage system. Combined system of drain and separate system of drain. Types of drain.</b>	<b>Logitudinal section of the house drain.</b>	Estimation on requirements of materials for pipe. Lay out and installation.
47	Laying and jointing of stone ware pipe with the help of sight rail and boning rod, jointing of stone ware pipes. According to soil conditions and water level.	<b>Methods of setting this sight rail and boning rod and radients to be allowed to be S.W. pipe according to the sizes. Standard length of S.W. (Stone ware) pipe sizes. Self cleaning, velocity sewage system. Special problems in different soils and water level conditions.</b>	<b>Longitudinal section of the house drain. Drainage arrangements of workshop of an institution.</b>	Estimation on requirements of materials for pipe. Lay out and installation.
48	Fixing of a gully trap and connecting the same to a chamber.	<b>Earth work excavation laying drain pipes, precautions to be observed. Full shoring/partial shoring for the trench in respect of corresponding depth of drain, refilling of trench, testing of drain pipes (pressure smoke and light test).</b>	<b>Longitudinal section of the house drain. Drainage arrangements of workshop of an institution.</b>	Estimation on requirements of materials for pipe. Lay out and installation
49	Providing vent pipe from a starting chamber.	<b>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 taken,</b>	<b>Revision</b>	---do--

		<b>according to the users- dispersion trench.</b>		
50	Preparation and fixing up of hot water supply as per layout. Installation of hot water system.	<b>Heat and temperature. Transmission of heat, heating system. Domestic boilers and geyser, method of ventilating return pipes.</b>	<b>Live diagram – showing the hot water line from boiler, return, vent pipes.</b>	Revision
51	Cleaning of sanitary fitting, scrapping and painting of pipes. Tracing of leakage and repairing of valves taps and pumps air locks in pipe line and remover. Use of epoxy resin . Demonstration of renewal of the packing of the valves taps and electrical pumps.	<b>Corrosion its causes &amp; remedies prevention of corrosion. Corrosion due to electrolytic action. The effect of water and frost on materials .Reasons for packing row for the gland. Important points to check the proper working conditions of the pumps.</b>	<b>---do--- Exercises on Engg. Drawings.</b>	<b>---do--</b>

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	Methods of installing a bidet, working through range urinals.
12	Laying 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 requirements for pipe layout for a building making from a pipe layout.

**TRADE: PLUMBER**

**List of tools & equipment for a batch of or unit of 16 trainees**

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

16	Cutting pliers 200 IS:3650	1 No	16 No
17	Steel tape	1 No	16 No

TOOLS MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT :AND GENERAL INSTLATIONS:

18	Surface plate 400x400 mm grade 1.	1 No.	
19	Scribing block universal 300mm.	2 No	
20	Hand vice jaw 50 mm	2 No.	
21	File flat smooth 200 mm.	2No	
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 250mm.	2 Nos.	
27	File triangular smooth 200 mm	2 Nos.	
28	Chisel cold flat 20 mm x300mm	2 Nos.	
29	Chisel cross cut 6 x 150 mm IS:402	2 Nos.	
30	Chisel round nose 3 x150 mm IS:402	2 Nos.	
31	Chisel diamond point 6 x 150 mm	2 Nos.	
32	Tap and die set to cut BSP, threads	1 set each	
33	Pipe bender (Hydraulic type)	1 No.	
34	Punch letter set.	1 set	
35	Punch number set	1 set	
36	Chase wedge 50 mm:	3 Nos.	
37	Dresser lead 350 x 50 mm.	4 Nos.	
38	Stick setting in 350 x 50 mm.	4 Nos.	
39	Saw plumber 300 mm.	4 Nos.	
40	Spanner monkry up to 50 mm	2 Nos.	
41	Monkey plier(Gas plier)	4 Nos.	
42	Cutter, pipe wheel type 6 mm to 25 mm	1 No	
43	Pipe jointer, lead, and universal.	1 No	
44	Oil stone 150 x50 mm x25 mm	3 Nos.	
45	Soldering iron, copper fit, fire heated, hatched, straight 500 gms.	4 Nos.	
46	Snip straight 250 mm.	1 No.	
47	try square 200 mm	4 Nos.	
48	Inside caliper 150 mm	4 Nos.	
49	Caliper outside 150 mm	4 Nos.	
50	Odd leg caliper 200 mm	4 Nos.	
51	Tennon saw	2 Nos.	
52	Handsaw	2 Nos.	
53	Mortice chisel	2 sets	
54	Firmer chisel	2 sets	
55	Mallet medium IS :2922	2 sets	
56	Jack plane	2 sets	
57	Pliers combination 200 mm	1 No	
58	Blow lamp 500 milliliter	2 pairs	
59	Pipe opener	1 No	

60	Washer cutter	1 No	
61	Pressing stick	2 Nos.	
62	Mandrel	4 Nos.	
63	Plumber kit containing tampin, bent pin, plumbers hammers dressers, mallets, chase wedges, draw knife and step turner	1No	
64	Bobbin and follower	1 No	
65	Bend bolt	1 No	
66	Sheet lead knife	2 Nos.	
67	Chipping knife		
68	Mirror 100 x 150 mm	2 Each	
69	Splash stick	2 Nos.	
70	Soil pot with brush	2 Nos.	
71	Pot hook	2 Nos.	
72	Turn pin	2 Nos.	
73	D.E. spanners 7 x 8, 10 x 11, 13 x 1.7, 19x 2.2, 24 x 27 IS:2028	1 No	
74	Branch gimlets	1 No	
75	Bending spring	1 No.	
76	Long dummy	1 No	
77	Short dummy	1 No	
78	Plumber laddle	2 Sets	
79	Joining cramp	2 Nos.	
80	Plumbers metal melting pot 10 kg.	1 set	
81	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.	2 Nos.	
82	Pipe vice to grip pipes up to 77 mm IS: 2587.	2 Nos.	
83	Tool caulking set of 2.	2 Nos.	
84	Stilton pattern pipe wrenches 450 mm. to take pipe up to 52 mm dia IS 4003	2 Nos.	
85	Stilton pattern pipe wrenched 300 mm to take pipe 20 mm to 32 mm	1 No	
86	Chain pipe wrench 90 mm 650 mm IS: 4223	3 sets	
87	Adjustable spanner A 375 IS: 6149.	3 Nos.	
88	Anvil 50 or 63 kg IS510	2 Sets	
89	Pipe bender manually operated	2 Sets	
90	Vice leg 75 mm. jaw on stand IS:2588	2 Sets	
91	Hand drill 6 mm capacity with drill chuck.	1 No.	
92	Drill twist (straight shank) 3 mm to 6 mm.	2 Nos.	
93	Portable forges 450 mm with hand blower.	1 No	
94	Flat smithy tong	1 No	
95	Bath tub small size	1 No.	
96	Stop tap water 20 mm IS: 781	1 Set	
97	Wash basin (16" x 14" x 10 ") equivalent metric	1 No.	
98	Water heater 22 liters	2 Nos.	
99	Steel almira	1 No	

100	Ratchet brack with post and clamp flat drill 6 to 25 mm by 0.2 mm.	1 No	
101	PVC welding plant	1 No	
102	Electric pump 1HP	1 No	
103	D.E. Pedestal grinder with 2 wheels 175 rough and smooth	1 No	
104	Hydraulic pressure machine for testing leakage inGI pipe fittings etc.	1 No	
105	Sight rail and banning rod.	1set	
106	Rachet pipe die 15mm-32mm	1 No	
107	Bench drilling machine with chuck and key upto 15mm cap.	1 set	
108	Double face hammers.	4 nos	
109	Dormat,pickle, spade, girmale	1 no	
110	BSP Pisit Die Machine ½'',1/4'',1/2'',2'',2.5'',3'',4''	1 each	

GENERAL INSTALLATIONS:

Electric pump 1 HP

D.E. pedestal grinder with two wheels 175 rough and sirooth.

NOTE

1. No additional items are required to be provided for the batch working in the IIInd shift except the items under trainees tool kit and lockers.
2. No additional number of items 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 on the ISI standards wherever available. While procuring the ISI specifications should be strictly followed. Measuring instruments such as steel rule which are graduated both in English and metric units may be procured, if available.

## TRADE - PLUMBER

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### LIST OF I.S.I. PUBLICATIONS FOR USE OF INSTRUCTORS

SL. NO.	ITEMS	ISI CODE NO.
1.	Pipe wrenches	IS: 4003-1967
2.	Pipe vices	IS: 2587-1964
3.	Pipe threads for fastening purposes dimensions for.	IS: 2643-1964
4.	Horizontal centrifugal pumps for clear, cold and fresh water	IS: 1520-1960
5.	Gland packing asbestos.	IS: 4687-1968
6.	Cork composition sheets (part-I & II)	IS:4253-1967
7.	Selection installation and maintenance of sanitary appliances, code of practices for	IS: 2064-1962
8.	Water meters (domestic type) code of practice for selection installation & maintenance.	IS:2401-1963
9.	Water supply in buildings, code of practice for	IS:2065-1963
10.	Caulking lead	IS: 782-1966
11.	Enameled steel bath tubs	IS: 3489-1966
12.	Formulaes for water services.	IS: 3489-1966
13.	Flashing cistern for water closet and urinals.	IS: 774-1964
14.	Glazed earthen ware sanitary appliances.	IS: 771-1963
15.	Pillar taps	IS: 1795-1961
16.	Plug cockes for water supply purposes.	IS: 3004-1964
17.	Sanitary appliances enameled C.I. general requirements.	IS: 772-1962
18.	Wastes fitting for wash basins & sinks non-ferrous.	IS: 2963-1964
19.	Water closets, enameled & C.I.	IS: 773-1964
20.	Vitreous sanitary appliances (Part-I) general requirements.	IS: 2556-1967
21.	Lead pipes	IS: 404-1962
22.	Zinc	IS: 209-1966
23.	Soft solder	IS: 198-1966
24.	Pipes and fittings C.I. & rain water.	IS: 1230-1968
25.	Pressure pipes for water gas and sewage C.I. fittings for	IS:1538-1960
26.	Pipe lines, color code for the identification of.	IS: 2379-1963
27.	Lead and its compounds, code of safety for.	IS: 4312-1967
28.	Excavation work, safety code for	IS:3764-1966
29.	Scaffolds & carders (Part I & II) safety code for	IS:3696-1966
30.	Manhole covers and frames intended for use in drainage work C.I.	IS:1726-1967
31.	Laying C.I. pipes code of practice for.	IS:3114-1965
32.	Laying of concrete pipes code practice for	IS:783-1959
33.	Asbestos cement pressure pipes	IS:1592-1960
34.	Glossary of terms relating to corrosion of metals	IS;3531-1966



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SYLLABUS FOR THE TRADE OF PLUMBER UNDER APPRENTICESHIP  
TRAINING SCHEME

**PERIOD OF TRAINING: 3 YEARS**

**The period of training for this trade is three years consisting of basic training for a period of one year. Shop training for the remaining period.**

For 1st year Training (Basic Training)

Note :

1. The content of the syllabus for the apprentices during 1st 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 subjects to be taught to the apprentices in Related Instruction are :

(a)Trade Theory

(b)Engineering Drawing

(c)Workshop Science and Calculation

(d)Social Studies

3.The content of the syllabus for Related Instruction during 1st year training should be same as that of the syllabus for I.,T.I. Trainees in the Trade of Plumber.

Shop Floor Training for 2nd and 3rd 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 2nd and 3rd year are as listed below. It is not necessary that the operations/ skills should be performed in the order in which they are listed.

S.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. Measurements - 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, corners and slashing in sheet.
7. Jointring of Copper and Zinc on solids, hollow and conical roll.
8. Erection of simple scaffolding.
9. Marking of excavation.
10. Cement joining of pipes.
11. Jointing of copper tubes :

(a) Using can type compression fittings.

- (b) Using ring type compression fittings.
- (c) Using capillary fittings.
- 12. Butt and branch welds on M.S. pipes.
- 13. Bronze welding:
  - (a) Copper sheet
  - (b) Copper tubes
  - (c) Brass tubes to copper
- \*14. Installation meters :
  - (a) Gas meter
  - (b) Compound meter
  - (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.  
  
Installation of water supply and sanitary lines in multistoried Flats, 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

(2nd year and 3rd 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 cause.
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 , rivetting 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 syphonage system, flap valves. Protection of pipe and fittings from atmospheric action. Sanitary fittings. Various types of urinals, spittons, 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 workrelated 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. Roof 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 syphons and their uses 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 a overhead reservoir for : (i) Workshop, (ii) Institution, (iii) A small village, (iv) a small town.
  - (b) Contamination of water in a drinking water well storage reservoir etc.
  - (c) Method adopted for the drawal 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 humes tank)
  - (b) Immoff 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.  $(a+b)$   $(a-b)$  etc. Simple simultaneous equation with two unknown quantities.

3. Mensuration : 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, applied problems. Calculation of areas of triangles, polygons etc.

5. Further problems as applicable to the trade.

6. Advance problems on mensuration, 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 Celcius/ centigrade scales, conversion of fahrenheit to centigrade/ celsius scale and vice-versa. Measurement of temperature. Name and brief description 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.

(The syllabus for this trade should be considered as a guide for imparting Apprenticeship Training according to the facilities available in industry).

List of operations/skills to be learnt during practical training including Basic Training.

### NOTE:

1. All fresher should undergo one year Basic Training following by two years training on the shop floor. The apprenticeship should have more practice 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 content of one year training in the I.T.I. in this trade is exactly the same as mentioned in (1) above. The trainees of I.T.I. who may be engaged for two years for Shop Floor training after one year training in I.T.I. Is should follow the same course for apprenticeship as in (1) above.
3. The operations/skills which an apprentice will be required to carry out to cover the approved syllabus for practical training during the period of 3 years are as listed below. It is not necessary that the operations/skills should be performed in which they are listed.

Sl. No.	List of operation/skills to be learnt during Apprenticeship
1.	Instructions in safety precautions as applicable to the trade.
2.	Marking out from drawing in mm/inch.
3.	Filing.
4.	Chipping.
5.	Grinding of chisels.
6.	Hacksawing.
7.	Drilling.
8.	Threading with dies.
9.	Tapping.
10.	Use of locking devices
11.	Soldering.
12.	Simple brazing.
13.	Use of carpenter's basic hand tools involving sawing, planing, chiselling etc.
14.	Making simple joints on wood.
15.	Use of Manson's basic hand tools.
16.	Preparation of cement mortars.
17.	Elementary brickwork: construction of gulley trap, chamber, manhole etc.
18.	Use & care of plumber's hand tools and equipment.
19.	Cutting, threading and fitting of pipes.
20.	Bending of pipes: <ul style="list-style-type: none"> <li>(a) Light gauge copper tubes using bending machine or sand loading process.</li> <li>(b) Heavy weight mild steel tubes and pipes.</li> <li>(c) Galvanized pipes loaded with dry sand by heating</li> <li>(d) Steam pipe loaded with dry sand by hearing.</li> </ul>
21.	Fixing of pipe accessories.
22.	Making of joints on pipes.
23.	Installation of soil and vent pipes connecting to drain.
24.	Connection of drains to sewers.
25.	Laying out asbestos pipes according to drawing.
26.	Jointing of asbestos pipe.
27.	Jointing cast iron socket pipes with lead.
28.	Jointing pipes of different materials.
29.	Running with lead and chaulking.
30.	Cutting, shaping & jointing PVC pipes.
31.	Laying out of PVC popes according to drawing.
32.	Repairing of band water pumps.
33.	Installation of electric pumps.
34.	Fixing and repairing of water. gas and steam cocks and values.
35.	Tracing and repairing of leakage in water pipe line.
36.	Removal of air locks.
37.	Erections of simple water supply system.
38.	Installation of water meter.
39.	Fixing, testing & repairing of bath wash basins.
40.	Erection of rainwater and drainage piping system.
41.	Installation of sanitary fitting.
42.	Fixing of C.I. external water pipes, external soil pipe, rain water gutter, outlet, down pipe etc.
43.	Preparation and fixing up of hot and cold services to bath and wash basins as per layout.



44.	Preparation and fixing up of lead wastes, rising mains, distributions pipes as per layout.
45.	Connections of hot water supply systems per layout.
46.	Insulation of hot water supply system.
47.	Erection of geysers.
48.	Repairing of waste outlets.
49.	Reconditioning and testing of taps, valve, overhead tanks flushing cistern etc.
50.	Testing plumbing installations.
51.	Cleaning of sanitary installation including long pipes.
52.	Scraping and painting of pipes.
53.	Renewing of broken and cracked sanitary fittings.

**SHOP TRAINING:2 YEARS**

54.	Instructions on safety precautions on the Shop Floor.
55.	Hardening and tempering of chisels.
56.	Measuring-wire gauge and sheet gauge.
57.	Cutting of sheet metal to size.
58.	Preparation of heat metal articles involving developments.
59.	Forming of rolls, welts, corners & slashing in sheet metal.
60.	Jointing of copper & zinc on solid, hollow & conical roll
61.	Erection of simple scaffolding.
62.	Marking for excavation.
63.	Cement jointing of pipes.
64.	Jointing of copper tubes:  (a) Using cam type compression fittings.  (b) Using ring type compression fittings.  (c) Using capillary fittings.
65.	Butt and branch welds on M.S. pipes.
66.	Bronze welding  (a) Copper sheet.  (b) Copper tube.  (c) Brass tubes to copper.
*67	Installation meters:  (a) gas meter.  (b) Compound meter.  (c) Hot water meter.
*68	Jointing practice on zinc and copper pipes:
*69	Installation of gas piping.
*70	Connection of gasmeter.
36.	Installation of gas appliances.

72	Use care and maintenance of lifting tackles.
*73	Use of synthetic pipes e.g. polythene etc. and preparation of joints.
74	Use of water supply and bathroom fittings.
75	Installation of domestic water supply system.
76	Installation of bidet.
77	Trouble shooting.

**NOTE:**

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

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