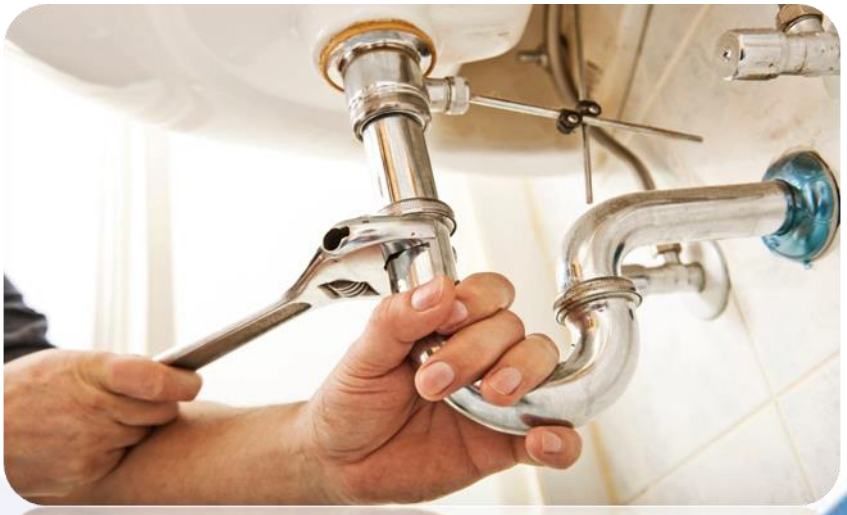
PLUMBER

NSQF LEVEL – 5



SECTOR- PLUMBING

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

GOVERNMENT OF INDIA
Ministry of Skill Development & Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City, Kolkata – 700091

PLUMBER (CITS)

(Engineering Trade)

SECTOR – PLUMBING

(Revised in 2023)

Version 2.0

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

NSQF LEVEL – 5

Developed By

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1. COURSE OVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructor Training Institute was established in 1948. Subsequently, 6 more institutes namely, Central Training Institute for Instructors (now called as National Skill Training Institute (NSTI), NSTI at Ludhiana, Kanpur, Howrah, Mumbai, Chennai and Hyderabad were established in 1960 by DGT. Since then the CITS course is successfully running in all the NSTIs across India as well as in DGT affiliated institutes viz. Institutes for Training of Trainers (IToT). This is a competency based course for instructors of one year duration. “Plumber” CITS trade is applicable for Instructors of Plumber CTS Trades.

The main objective of Craft Instructor training programme is to enable Instructors explore different aspects of the techniques in pedagogy and transferring of hands-on skills so as to develop a pool of skilled manpower for industries, also leading to their career growth & benefiting society at large. Thus promoting a holistic learning experience where trainee acquires specialized knowledge, skills & develops attitude towards learning & contributing in vocational training ecosystem.

This course also enables the instructors to develop instructional skills for mentoring the trainees, engaging all trainees in learning process and managing effective utilization of resources. It emphasizes on the importance of collaborative learning & innovative ways of doing things. All trainees will be able to understand and interpret the course content in right perspective, so that they are engaged in & empowered by their learning experiences and above all, ensure quality delivery.

2. TRAINING SYSTEM

2.1 GENERAL

CITS courses are delivered in National Skill Training Institutes (NSTIs) & DGT affiliated institutes viz., Institutes for Training of Trainers (IToT). For detailed guidelines regarding admission on CITS, instructions issued by DGT from time to time are to be observed. Further complete admission details are made available on NIMI web portal http://www.nimionlineadmission.in. The course is of one-year duration. It consists of Trade Technology (Professional skills and Professional knowledge), Training Methodology and Engineering Technology/ Soft skills. After successful completion of the training programme, the trainees appear in All India Trade Test for Craft Instructor. The successful trainee is awarded NCIC certificate by DGT.

2.2 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1.	**Trade Technology**	
	Professional Skill (Trade Practical)	480
	Professional Knowledge (Trade Theory)	270
2.	**Training Methodology**	
	TM Practical	270
	TM Theory	180
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

3	On the Job Training (OJT)/ Group Project	150
4	Optional Course	240

Trainees can also opt for optional courses of 240 hours duration.

2.3 PROGRESSION PATHWAYS

- Can join as an Instructor in a vocational training Institute/ technical Institute.
- Can join as a supervisor in Industries.

2.4 ASSESSMENT & CERTIFICATION

The CITS trainee will be assessed for his/her Instructional skills, knowledge and attitude towards learning throughout the course span and also at the end of the training program.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** to test competency of instructor with respect to assessment criteria set against each learning outcomes. The training institute has to maintain an individual trainee portfolio in line with assessment guidelines. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The **Final Assessment** will be in the form of **Summative Assessment Method**. The All India Trade Test for awarding National Craft Instructor Certificate will be conducted by DGT at the end of the year as per the guidelines of DGT. The learning outcome and assessment criteria will be the basis for setting question papers for final assessment**.** The external examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS CRITERIA

Allotment of Marks among the subjects for Examination:
The minimum pass percent for Trade Practical, TM practical Examinations and Formative assessment is 60% & for all other subjects is 40%.There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. While assessing, the major factors to be considered are approaches to generate solutions to specific problems by involving standard/non-standard practices.

Due consideration should also be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising of the following:

- Demonstration of Instructional Skills (Lesson Plan, Demonstration Plan)
- Record book/daily diary

- Assessment Sheet
- Progress chart
- Video Recording
- Attendance and punctuality
- Viva-voce
- Practical work done/Models
- Assignments
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming yearly examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of an ***acceptable standard*** of crafts instructorship with ***occasional*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***fairly good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A fairly good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Occasional support in imparting effective training.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***reasonable standard*** of crafts instructorship with ***little*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average in engagement of students for learning and achievement of goals while undertaking the training on specific topic. • Agood level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the

	entire lesson. • Little support in imparting effective training.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***high*** skill level to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Good engagement of students for learning and achievement of goals while undertaking the training on specific topic. • Ahigh level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Minimal or no support in imparting effective training.

3. GENERAL INFORMATION

Name of the Trade	**PLUMBER-CITS**
Trade code	**DGT/4013**
Reference NCO 2015	2356.01007126.0101, 7126.0102, 7126.0103, 7126.0104, 7126.0105, 7126.0106, 7126.0107, 7126.0201, 7126.0301, 7126.9900, 7212.0101, 7212.0102, 7233.1301.
NOS Covered	PSC/N9421, PSC/N9422, PSC/N9423, PSC/N9424, PSC/N9425, PSC/N9426, PSC/N9427, PSC/N9428, PSC/N9429, PSC/N9430, PSC/N9431, PSC/N9432, PSC/N9433, PSC/N9434, PSC/N9435, PSC/N9436, PSC/N9437, PSC/N9438, PSC/N9439, PSC/N9440, PSC/N9441, PSC/N9442, PSC/N9443, ASC/N9410, ASC/N9411
NSQF Level	Level-5
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in Mechanical/ Civil Engineering from AICTE/ UGC recognized Engineering College/ University OR 03 years Diploma in Mechanical/ Civil Industrial Engineering after class 10th from AICTE/ recognized board of technical education. OR Ex-serviceman from Indian Armed Forces with 15 years of service in related field as per equivalency through DGR. OR 10th Class with 01 year NTC in Plumber + 02 year of relevant experience. OR 10th Class with 02 years NAC in Plumber + 01 year of relevant experience.
Minimum Age	18 years as on first day of academic session.
Space Norms	120 Sq. m
Power Norms	16 KW
Instructors Qualification for	
1. Plumber -CITS Trade	B.Voc./Degree in appropriate branches of Mechanical / Civil Engineering from AICTE/UGC recognized University with two years experience in relevant field. OR 3 years Diploma in appropriate branches of Mechanical / Civil Engineering from AICTE/ recognized Board/ University or relevant Advanced Diploma (Vocational) from DGT with five years experience in

	relevant field. OR Ex-serviceman from Indian Armed Forces with 15 years of service in related field as per equivalency through DGR. Candidate should have undergone methods of Instruction of course or minimum 02 years of experience in technical training institute of Indian Armed Forces. OR NTC/ NAC passed in Plumber trade with seven years experience in relevant field. **Essential Qualification:** Relevant National Craft Instructor Certificate (NCIC) in Plumber trade, in any of the variants under DGT.
2. Workshop Calculation &Science	B.Voc/Degree in any Engineering from AICTE/ UGC recognized Engineering College/ university with two years experience in relevant field. **OR** 3 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years experience in relevant field. **OR** NTC/ NAC in any Engineering trade with seven years experience in relevant field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade. **OR** NCIC in RoDA or any of its variants under DGT.
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering College/ university with two years experience in relevant field. OR 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years' experience in the relevant field. OR NTC/ NAC in any one of the 'Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with seven years experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade. **OR** NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
4. Training Methodology	B.Voc./Degree in any discipline from AICTE/ UGC recognized College/ university with two years experience in training/ teaching field. OR Diploma in any discipline from recognized board / University with five years experience in training/teaching field.

	OR NTC/ NAC passed in any trade with seven years experience in training/ teaching field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in any of the variants under DGT / B.Ed /ToT from NITTTR or equivalent.
5. Minimum Age for Instructor	21 years

4. JOB ROLE

Brief description of job roles:

Manual Training Teacher/Craft Instructor: Instructs students in ITIs/Vocational Training Institutes in respective trades. Imparts theoretical instructions for the use of tools, mechanical drawings, blueprint reading and related subjects. Demonstrates processes and operations in the workshop; supervises, assesses and evaluates students in their practical work. Ensures availability & proper functioning of equipment & tools in stores.

Plumber, General; laysout, assembles, installs and maintains sanitary fittings and fixtures, sewage and drainage systems, heating and sanitary systems, gas and water pipe lines etc. Receives instructions from Sanitary Engineer or Civil Engineer regarding lay out of pipes, gas or water mains, position of fixtures and fittings, etc. Examines drawings or other specifications regarding size and dimensions of area where sanitary fittings or pipe are to be fitted or laid. Marks points at places to indicate position for fixing brackets and laying pipes. Drills passage holes in walls or floor of premises and fixes necessary brackets, stands, holders etc. to keep or hold fittings and fixtures in position, using nuts, bolts, clamps etc. and tightens them with hand tools. Cuts reams, threads and bends pipes as appropriate. Ensures that pipe lines are laid properly by Pipe Fitter. Joins pipes with sockets, Tees, elbow etc. or with molten lead or lead wool. Caulks joints (operation of making joint seam tight to withstand pressure) and tests them for leaks with pneumatic or hydraulic pressure. May repair and maintain sewerage and pipe lines by replacing washers on leaky faucets, mending burst pipes, opening clogged drains, etc. May do lead burning, dressing and bossing of lead pipe and sheet lead, inlaying of wooden tanks, construction of septic tanks etc.

Plumber, Operations; is responsible for operation of plumbing system used in housing, commercial and institutional setups.

Plumber, General-Installation and Repair; Plumber (General)-II is responsible for installation and repair plumbing systems including those of advanced sanitary fixtures as per manufacturer's specifications in housing, commercial and institutional setups.

Plumber, General Helper; is responsible for helping Plumber (General) by carrying and handling of tools and materials required in installation, minor repair and maintenance of plumbing systems.

Plumber, General Assistant; is responsible for assistance in, preliminary installation and minor repair work of basic plumbing systems in domestic, commercial and institutional setups.

Plumber, Maintenance and Servicing Assistant; is responsible for assistance in maintenance and servicing of pipes and sanitary fixtures in housing, commercial and institutional setups.

Plumber, Maintenance and Servicing; is responsible for assistance in maintenance and servicing of pipes and sanitary fixtures in housing, commercial and institutional setups.

Pipe Layer/Plumber Pipeline; Sewer Pipe Layer lays concrete, stone ware or clay pipes to form sanitary drains and sewers. Receives instructions regarding size and type of concrete, stone ware or clay pipe to be laid. Digs or gets earth dug along marked lines using spade, picks etc. to make trenches for laying pipes. Levels and smoothens bottom of trenches to proper gradient by scooping with shovels. Receives pipes of required size lowered into trench manually or by pulley and adjusts their position by hand or crow-bar for correct levelling and vertical and horizontal alignment. Joints pipes together using appropriate couplings, joints, rings etc. and closes joints by caulking with fibre and cement to prevent leakage. Tests joints by hydraulic or pneumatic pressure after sealing. Fills trench with earth to cover laid pipe and rams earth to avoid sinking. Is designated as PIPE LAYER WATERMAINS or WATER MAINS FITTER if engaged in laying cast iron or galvanized iron water pipe mains and in caulking their joints with lead to prevent leakage. May lay pipe lines to provide water connection to houses, sanitary sewers etc. May fix meters to stopcocks, remove defects from pipe lines and replace defective ones.

Pipe Fitter; lays, repairs and maintains, pipes for supply of water, gas, oil or steam in buildings, gardens, workshops, stores, ships etc., according to drawings or instructions. Examines drawings and other specifications or receives relevant instructions. Cuts passage holes for laying pipes in walls and floors. Cuts reams, threads and bends pipes according to specifications. Lays pipes in cut passage and assembles pipe sections with couplings, sockets, Tee's elbows etc. Levels position of pipes using sprit level for gravitational flow. Caulks joints, tests them for leakage with pneumatic or hydraulic pressure and secures pipe line to structure with clamps, brackets, and hangers. Fits water meters, taps etc. to pipe where necessary. Repairs and replaces leaky pipe lines, taps and joints and provides connections to overhead water tanks. Helps Plumber, General in fittings sanitary fittings to buildings. May join pipe sections and fittings.

Plumbers and Pipe Fitters, Other; perform number of routine and low skilled tasks such as assisting in laying pipes, making water tight joints, fitting sockets and reducers, threading pipes with taps and dies, removing leakages, etc., and are designated as Plumber Mate or Pipe Fitter Helper according to type of work done.

Plumber (Welder)/Plumbing (Sanitary Fixtures) Fitter Assistant; is responsible for welding activities related to plumbing works in housing, commercial and institutional setups.

Plumber (Welder) Assistant; is responsible for assistance in welding activities related to plumbing works in housing, commercial and institutional setups.

Plumber (Pumps and E/M Mechanic); is responsible for installation and repair of Pumps and E/M equipment used for different plumbing applications of housing, commercial and institutional Set ups.

Reference NCO Code:

a) 2356.0100 – Manual Training Teacher/Craft Instructor
b) 7126.0101 – Plumber, General
c) 7126.0102 – Plumber, Operations
d) 7126.0103 – Plumber, General-Installation and Repair
e) 7126.0104– Plumber, General Helper
f) 7126.0105– Plumber, General Assistant
g) 7126.0106– Plumber, Maintenance and Servicing Assistant
h) 7126.0107– Plumber, Maintenance and Servicing
i) 7126.0201– Pipe Layer/Plumber Pipeline
j) 7126.0301– Pipe Fitter
k) 7126.9900– Plumbers and Pipe Fitters, Other/ NA
l) 7212.0101– Plumber (Welder)/Plumbing (Sanitary Fixtures) Fitter Assistant/
m) 7212.0102– Plumber (Welder) Assistant
n) 7233.1301– Plumber (Pumps and E/M Mechanic)

Reference NOS:

(i) PSC/N9421
(ii) PSC/N9422
(iii) PSC/N9423
(iv) PSC/N9424
(v) PSC/N9425
(vi) PSC/N9426
(vii) PSC/N9427
(viii) PSC/N9428
(ix) PSC/N9429
(x) PSC/N9430
(xi) PSC/N9431
(xii) PSC/N9432
(xiii) PSC/N9433
(xiv) PSC/N9434
(xv) PSC/N9435
(xvi) PSC/N9436
(xvii) PSC/N9437
(xviii) PSC/N9438
(xix) PSC/N9439
(xx) PSC/N9440
(xxi) PSC/N9441
(xxii) PSC/N9442
(xxiii) PSC/N9443
(xxiv) ASC/N9410
(xxv) ASC/N9411

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1TRADE TECHNOLOGY

1. Follow workshop safety measures and monitor job as per specification applying different types of basic fitting operation and check for dimensional accuracy by using steel rule, calliper etc.[Basic Fitting operation- marking, hack sawing, chiselling, filing,, drilling, reaming, taping, off-hand grinding etc. accuracy±0.25mm]. (NOS: PSC/N9421)
2. Demonstrate the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy. [Basic fitting operation – marking, Hack sawing, Chiselling, Filing, Drilling, Taping and grinding etc. Accuracy: ± 0.25mm]. (NOS: PSC/N9422)
3. Demonstrate Inner & Outer Thread cutting on Metal & Studs and thread cutting on different types of pipes & fittings accessories. (NOS: PSC/N9423)
4. Review various wood jointing with carpenter's tools. (NOS: PSC/N9424)
5. Demonstrate the Cutting of Pipes of different dia. in different angle and Joining of pipes by Gas & Arc welding. Soldering and Brazing. (NOS: PSC/N9425)
6. Construct a Masonry brick wall and RCC casting. Demonstrate Brick wall cutting for concealing pipe line. (NOS: PSC/N9426)
7. Monitor Cutting and Bending of Pipes using Plumber's tools and equipments. (NOS: PSC/N9427)
8. Check &Evaluate various types of PVC pipe joint by different methods and heat process or Welding. (NOS: PSC/N9428)
9. Review Installation and maintenance of different Electric pump. (NOS: PSC/N9429)
10. Construct complete pipe line circuit with different types of Joints and demonstrate fixing of cocks & valve on Pipe line. (NOS: PSC/N9430)
11. Perform water analysis test, Water Pressure test and demonstrate Water distribution system by using Pipe line. (NOS: PSC/N9431)
12. Plan & execute fitting, fixing & laying installation of hot & cold water pipe line and symboling. (NOS: PSC/N9432)
13. Demonstrate & assess installation of Kitchen, Sanitary Fittings and Testing of Drainage line. (NOS: PSC/N9433)
14. Examine and remove Leakage of pipe line as per site Water supply pipe line and Drainage Pipe line layout. (NOS: PSC/N9434)
15. Construct inspection chamber, manhole, gutter, septic tank, sock pit etc. & Layout of soil pipe. (NOS: PSC/N9435)
16. Analyze & install Rain Water Harvesting. (NOS: PSC/N9436)

17. Monitor repairing & reconditioning, scraping & painting of sanitary fittings, Pipe line. (NOS: PSC/N9437)
18. Perform Fittings of Water heater and arrange supply of hot & cold water. (NOS: PSC/N9438)
19. Assemble and Repair different types of Pump. (NOS: PSC/N9439)
20. Evaluate Maintenance & Repair of Tank, waste fittings and Fixing of the Sensor system. (NOS: PSC/N9440)
21. Assess & test the Pressure of pipe and repair leakage. (NOS: PSC/N9441)
22. Monitor Fitting of Hydrants & Sprinklers. (NOS: PSC/N9442)
23. Draw, Estimate and Execute of Plumbing system. (NOS: PSC/N9443)
24. Read and apply engineering drawing for different application in the field of work. (NOS: ASC/N9410)
25. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)

6. COURSE CONTENT

SYLLABUS FOR PLUMBER - CITS TRADE			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 10 Hrs Theory 06 Hrs	Follow workshop safety measures and monitor job as per specification applying different types of basic fitting operation and check for dimensional accuracy by using steel rule, calliper etc.[Basic Fitting operation- marking, hack sawing, chiselling, filing,, drilling, reaming, taping, off-hand grinding etc. accuracy±0.25mm]	**INTRODUCTION OF TRAINING:** 1. Familiarize with the institute. 2. Explain importance of trade training. 3. Identify & select machinery used in the type of work done by trainees in the institute. 4. Describe type of jobs made by the trainees in the trade. **Introduction to safety:** 5. Select & use equipment including safety& fire fighting and their uses.	Importance of safety and general precautions required for the trade. Importance of the trade. Types of work to be done by trainees in the institute. Scope of a plumbing work. Types of services have to plan. Basic Bench fitting
Practical 10 Hrs Theory 06 Hrs	Demonstrate the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy. [Basic fitting operation – marking, Hacksawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm]	6. Use steel rules, try Square, Scriber and dividers for marking out from drawing. 7. Use hacksaw, centre punch, Marking, filing, drilling holes and sawing. 8. Make studs and bolts. 9. Select different types of Files & filing to line. 10. Filing a job flat and square. 11. Use various locking devices. Fastening devices. 12. Practice chipping operation, Grinding of chisels, Cold chisel, round nose chisel.	Fitter's common hand tools - names, description and Material from which they are made. Description, types and uses of holding device , hammers & cold chisels, cutting tools Description of simple fitting operations hack sawing, punching and filing. Types of files used commonly. Marking instruments and their use. Description of different types of Locking and fastening devices.

Practical 10Hrs Theory 06 Hrs	Demonstrate Inner & Outer Thread cutting on Metal & Studs and thread cutting on different types of pipes & fittings accessories.	13. Perform Threading pipe of various sizes. 14. Fix different fittings. 15. Mark drilling holes, drill, tap and thread pipes.	Standard pipe threads. Description of simple drilling machine. Method of using drills taps and dies. Description of simple bench drilling Machine.
Practical 10 Hrs Theory 06 Hrs	Review various wood jointing with carpenter's tools.	16. Demonstrate and use of Carpenter's hand tools involving sawing, planning, chiseling and making simple joints.	Description and uses of Carpenter's hand tools used for simple operations such as marking, sawing, planning and making simple joints. Common types of wood- their description and use.
Practical 25 Hrs Theory 08 Hrs	Demonstrate the Cutting of Pipes of different dia. in different angle and Joining of pipes by Gas & Arc welding. Soldering and Brazing.	**Practice of Gas & Arc welding:** 17. Cut pipes of different metals of different dimensions and sizes. 18. Join pipes of different diameters and thickness by GAS & ARC welding. 19. Simple repair work by welding. 20. Practice soldering and brazing of simple jobs.	**Gas & Arc welding :** Purpose of gas and Arc welding Method of gas & arc welding, Equipments and tools for hot gas welding. Safety precautions to be observed Methods of soldering and brazing - & Types of fluxes uses Description of Plumber's materials Lead, tin, Zinc, solder, copper, red lead etc. and their uses. Hard & soft solders -their properties, composition and uses.
Practical 25 Hrs Theory 08 Hrs	Construct a Masonry brick wall and RCC casting. Demonstrate Brick wall cutting for concealing pipe line.	**Use of mason hand tools :** 21. Construct Straight edge spirit level, plumb bob, square, etc	**Masons hand tools:** Identify plumbing services required for each type of building according to usage. Description of plumber tools and Equipments-ratchet, brace, threading die, pipe wrench, sliding wrench, spanner set, chain Wrench etc. and their safety. Care & use of tools.
		22. Set out work with tape, rule, square, line pin, and level. 23. Cut bricks and stones to given size and template. 24. Prepare lime & cement	Names, description and their uses. -Method of making holes in walls and Floors. Types of tools used and various Processes. Concept of bricks, lime and

		mortars in different proportions to suit various purposes. 25. Make elementary brick wall work such as construction of gully trap, inspection chamber & manhole of any convenient size. 26. Demonstrate Forming, benching and channeling the plastering of walls. 27. Cut wall with electric cutting tools.	cement. Preparation of mortars with various materials of varying composition. Common brick joints. Description of bonds. Scaffolding & plastering. Method of construction of manhole etc. Plain cement concrete, RCC and its proportion, grades of coarse aggregate and fine aggregate, Define-concrete with cement mortar and lime mortar. Knowledge of waterproofing compound
Practical 25 Hrs Theory 08 Hrs	Monitor Cutting and Bending of Pipes using Plumber's tools and equipments.	28. Practice cutting of pipe at different angles in different materials and diameters by using various fittings. 29. Fix different pipe accessories such as bends, flanges, tees, elbows, sockets, cocks and valves. 30. Make simple joints for Different purposes of using above. 31. Make Socket joint of cast iron pipes with lead.	Different types of pipes- GI, C.I, PVC/CPVC, PPR, AC and HDPE etc. Describe the pipe fittings GI, C.I, PVC/CPVC, PPR, AC and HDPE etc. Methods of joining and their uses. Precautions to be taken while fixing.
Practical 25 Hrs Theory 08 Hrs	Check &Evaluate various types of PVC pipe joint by different methods and heat process or Welding.	32. Plan & check Layout of P.V.C. pipe according to drawing. 33. Practice cutting & shaping of P.V.C. pipes as per lay out. 34. Use & fix P.V.C. pipe fittings. 35. Select Method of laying out PVC pipe. Perform PVC welding. 36. Perform PPR pipe welding joint.	Importance of Layout in domestic. Plumbing Symbols and coding practice. Describe the pipe dies, their uses, care and precaution. P.V.C. Description, Properties & use in plumbing work, PVC Pipe fitting -bends, elbows, sockets, tees, unions etc. Their description, specification and use Metric specification of various pipes. Standard pipe threads. Method of Joining and fixing

			PVC pipe. Joining material for water and gas piping system Electric hot plate for PPR pipe joints
Practical 25 Hrs Theory 10 Hrs	Review Installation and maintenance of different Electric pump.	37. Install electric pumps (Centrifugal, reciprocating, submersible pumps, etc.)	Description, identify the parts of pumps types, and their uses (Centrifugal pump, reciprocating, submersible pumps, etc.) Application -care & maintenance of pumps
Practical 25 Hrs Theory 08 Hrs	Construct complete pipe line circuit with different types of Joints and demonstrate fixing of cocks & valve on Pipe line.	38. Plan & prepare branching of pipes. 39. Install and test simple water supply system including water meter. 40. Practice fixing of different water, gas and steam cocks and valves. 41. Practice repairing of cocks and valves including renewal of packing, washer, gasket, spindle etc.	Describe water meter -types, working principle-application, merit, specification. Laying of Branches of piping system Inspection and testing of water supply system. General points to be observed when choosing water supply system. Description of cocks & valves-their types, Application, working principle, materials & advantages, specification as per IS.
Practical 12 Hrs Theory 06 Hrs	Perform water analysis test, Water Pressure test and demonstrate Water distribution system by using Pipe line.	42. Test water by ph meter.	Sources of water **Composition of water:** Hard & Soft water, temporary hardness & permanent hardness. Action of water on lead-water softness -tests for water. Water purification stages and methods Impurities of water - organic and inorganic impurities Static water pressures and measurement of pressures. Bursting pressure, Expansion of water on freezing and heating Bernoulli's principles Pascal's law Pressure of water on the sides of cistern or tank. Water hammer in pipes.

Practical 120Hrs Theory 06 Hrs	Plan & execute fitting, fixing & laying installation of hot & cold water pipe line and symboling.	43. Explain Water distribution system. 44. Measure, prepare and fix up rising mains. 45. Prepare and fix hot and cold services to the bath and wash basin as per layout. 46. Installhot water system (Electric water heating system).	Water supply system of a small town. Storage tanks for general water supply purpose, Water distribution system, method of distribution Electric water heating system.
Practical 35 Hrs Theory 12 Hrs	Demonstrate & assess installation of Kitchen, Sanitary Fittings and Testing of Drainage line.	47. Fix floor traps in kitchen and bath. 48. Fix Bath tub, wash basin, sink etc.	Description of sanitary fittings (bath tub, floor traps , kitchen sink , wash basin etc.
		49. Trouble shoot sanitary system, test drainage lines, perform smoke test, water test, smell test, ball test, mirror test.	Trouble shooting of sanitary system Testing of drainage lines smoke test, water test, smell test, ball test, mirror test.
		50. Erect rain water and drainage piping system. 51. Install sanitary fittings like water closets & urinals.	Erecting rain water and drainage pipe system, Description of sanitary fittings, types application, specification of water closets & urinals General points to be observed when selection of sanitary fittings.
Practical 35 Hrs Theory 12 Hrs	Examine and remove Leakage of pipe line as per site Water supply pipe line and Drainage Pipe line layout.	52. Trace different pipe line system, find leakages and repair water supply system.	Methods of tracing out the leakages in water supply system (hydraulic gradient lines, sounding rod, Direct observation etc) Leaks in pipes and noises in plumbing.
		53. Remove air locks.	Causes and remedies of Air locks in pipe and pipe fittings
		54. Perform Laying out of hummed and asbestos pipes-according to drawing alignment of pipes and joining them Repair of leaks in joints.	Use of hummed and asbestos pipes of different sizes. Method of laying out pipes alignment and joining.
Practical 35 Hrs Theory 12 Hrs	Construct inspection chamber, manhole, gutter, septic tank, sock pit etc. & Layout of soil pipe.	55. Construct inspection chamber.	Inspection chamber and septic tank, Layout of drainage system , types application, specification ,IS Code

		56. Construct manholes, gully traps.	Description of drains, chess pools, soaks pits etc. Traps-types and their uses ,applications, specification , IS Code
		57. Fix external soil pipe with sand branch fitted to take soil pipe from W.C.	Describe the soil pipe, types, materials, Fittings, joints, specification, Application, Testing. Uses of Air vent, etc.
Practical 25 Hrs Theory 10 Hrs	Analyze & Install Rain Water Harvesting.	58. Install Rain water harvesting system.	Describe the Rain water harvesting system, types, methods, application, Care and maintenance.
		59. Fix rain water gutter, outlet and grounding pipe.	Describe rain water gutter, outlet and grounding pipe, Accessories Care and maintenance.
Practical 12 Hrs Theory 06 Hrs	Monitor repairing & reconditioning, scraping & painting of sanitary fittings, Pipe line.	60. Recondition taps and valves,(Practice including renewal of packing, washer, gasket etc.) Recondition flushing tank. 61. Scrape and paint pipes.	Method of dismantling and renewal of the taps and valves Spares for particular work. Describe,types, parts and function, constructional features of flushing tank. Plumbing symbols and plumbing colour codes. Corrosion - causes and remedies, Prevention, Corrosion due to electrolytic action.
Practical 12 Hrs Theory 06 Hrs	Perform Fittings of Water heater and arrange supply of hot & cold water.	62. Install solar water heater Prepare and fix hot and cold services to the bath and wash basin as per layout.	Concept of heat and temperature. Method of transmission of heat. Heating system by different thermal units. Description of Domestic solar water heater and cooker General layout, specification of materials required for Domestic boilers and Geysers.
Practical 25 Hrs Theory 10 Hrs	Assemble and Repair different types of Pump.	63. Assemble and disassemble different types of pumps. (Centrifugal, reciprocating, submersible pumps, etc.)	Preventive maintenance of all types of pumps. Calculation of head of pumps.
		64. Repair different types of	Suction limitation of pumps ,

		pumps.	defects in pumping, causes and remedies of pumping
Practical 25 Hrs Theory 10 Hrs	Evaluate Maintenance & Repair of Tank, waste fittings and Fixing of the Sensor system.	65. Clean and maintain over head tanks and sumps.	Precautions to be taken before entering the tanks and sumps.
		66. Repair waste, outlet of wash basin, sink, tub with putty and washer. 67. Fix sensor system.	Causes and remedies of blockages. Sensor system for urinals and was basin, describe, types, specifications and materials required for the sensor system.
Practical 25 Hrs Theory 10 Hrs	Assess &test the Pressure of pipe and repair leakage.	68. Perform Pressure test using hydraulic pressure testing machine.	Describe pressure test, equipments, types, method, calculation of pressure, application.
		69. Repair leakages of sanitary system.	Trouble shooting of leakage testing of sanitary systems.
Practical 12 Hrs Theory 06 Hrs	Monitor Fitting of Hydrants & Sprinklers.	70. Install Fire main systems, Hydrants & Sprinklers.	Describe, types, functioning, Specification, of Fire main systems, Hydrants & Sprinklers.
Practical 25 Hrs Theory 10 Hrs	Draw, Estimate and Execute of Plumbing system.	71. Practice 2D CAD Commands and prepare drawing of pipe line systems. 72. Estimate and work out abstract cost of plumbing work as per drawing/layout.	Introduction of Auto CAD for Plumbing. •Features of Auto CAD •2D CAD Commands. •Applications for Creating Drawing. Methods of Developing the CAD drawings. **Bill of Quantity and Estimation :** •Preparation of bill of quantity •Preparation of Estimation
ENGINEERING DRAWING (40 Hrs.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work.	**CIRCLES, TANGENTS AND ELLIPSE:** Practical applications procedure for constructing tangent to given circle-lines- loop pattern-- tangential circles- external tangents- internal tangents ellipse **PARABOLIC CURVES, HYPERBOLA:** Involutes - Properties and their application. Procedure for constructing parabolic curve-	

		hyperbolic curve-in volute curve. epicycloids, hypocycloid, Involutes, spiral & Archimedes spiral **TECHNICAL DRAWING/ SKETCHING OF COMPONENTS' PARTS:** Views of object Importance of technical sketching-types of sketches-Isometric drawing sketching- Oblique drawing sketching. **PROJECTIONS**: Theory of projections (Elaborate theoretical instructions), Reference planes, orthographic projections concept 1st Angle and 3rd Angle, Projections of points, Projections of Lines–determination of true lengths & inclinations. Projections of plane, determination of true shape. Exercises on missing surfaces and views. Orthographic drawing or interpretation of views. Introduction to first angle projections of solids. **ISOMETRIC VIEWS**: Fundamentals of isometric projections (Theoretical Projections) Isometric views from 2 to 3 given orthographic views. Preparation of simple working drawing of Furniture items like table, stool and any job prepared in the workshop. **SECTIONAL VIEWS:** Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventional in sectioning. Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, Rectangular, square angle, channel, rolled sections. Exercises on sectional views of different objects. - **DEVELOPMENT AND INTERSECTIONS:** Development of surfaces-Types of surface- Methods of development-Intersection- Methods of drawing intersection lines-critical point or key point. **FASTENERS**: Sketches of elements of screw threads, Sketches of studs, cap screws machine screws, set screws, Locking devices, bolts, Hexagonal & square nuts & nut bolt & washer assembly. Sketches of plain spring lock, toothed lock, washers, cap nut, check nut, slotted nut, cassel nut, sawn nut, wing nut, eye blot, tee bolt & foundation bolt. Sketches of various types

		of rivet heads (snap–pan–conical– countersunk) Sketches of keys (sunk, flat, saddle, gib head, woodruff) Sketches of hole & shaft assembly. **DETAIL DRAWING AND ASSEMBLY DRAWING:** Details of machine drawing- Assembly drawing- surface quality-surface finish standard- Method of indicating surface roughness for general engineering drawing-symbols used for indication of surface roughness-symbols for direction of lay. Geometrical tolerance. Detail drawing of the following with complete dimensioning, tolerances, material and Surface finish specifications 1. Universal couplings 2. Ball bearing and roller bearing. 3. Fast and loose pulley. 4. Stepped and V belt pulley. 5. Flanged Pipe joints, right angle bend. 6. Tool Post of Lathe Machine. 7. Tail Stock of Lathe Machine 8. Stepped and V belt pulley. 9. Flanged Pipe joints, right angle bend. 10. Tool Post of Lathe Machine. 11. Tail Stock of Lathe Machine Practice of blue print reading on limit, size, fits, tolerance, machining symbols, and reading out of assembly drawing etc., ISO Standards. **READING OF ENGINEERING DRAWING:** Blue print and machine drawing reading exercises. **GRAPHS & CHARTS**: Types (Bar, Pie, Percentage bar, Logarithmic), Preparation & interpretation of the graphs and charts. **AUTO CAD:** Familiarization with AutoCAD application in

		engineering drawing. Practice on AutoCAD using Draw & Modify commands. Practice on AutoCAD with Rectangular snap using Draw, Modify, Inquiry commands. Practice on AutoCAD using text dimensioning& dimensioning styles Practice on AutoCAD to draw nuts, bolts & washers. Isometric views-isometric views with square, taper and radial surface-simple & complex views. Perspective views. Practice on AutoCAD using isometric snap to make isometric drawings Practice on AutoCAD using Hatch command and application. Practice on AutoCAD using 3D primitives with UCS (User Co-ordinate system).
WORKSHOP CALCULATION & SCIENCE (40 Hrs.)		
Professional Knowledge WCS- 40 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION:** **Fraction:** Concept of Fraction, Numbers, Variable, Constant, **Ratio & Proportion**: - Trade related problems **Percentage:** Definition, changing percentage to decimal and fraction and vice versa. Applied problems related to trade. Estimation and cost of product. **Algebra:** Fundamental Algebraic formulae for multiplication and factorization. Algebraic equations, simple & simultaneous equations, quadratic equations and their applications. **Mensuration 2D:** Concept on basic geometrical definitions, basic geometrical theorems. Determination of areas, perimeters of triangles, quadrilaterals, polygons, circle, sector etc. **Mensuration 3D:** Determination of volumes, surface areas of cube, cuboids cylinders, hollow cylinder, sphere prisms, pyramids cone spheres, frustums etc. Mass, Weight, Volume, Density, Viscosity, Specific gravity and related problems. **Trigonometry:** Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Trigonometrical ratios and their relations. Review of ratios of some standard angles (0, 30,45,60,90 degrees), Height & Distances, Simple problems. **Graphs:** basic concept, importance. Plotting of graphs of simple linear equation. Related problems on ohm's law, series-parallel combination. **Statistics:** Frequency tables, normal distribution, measure of central tendency – Mean, Median & Mode. Concept of probability. Charts like pie chart, bar chart, line diagram, Histogram and frequency polygon.

		WORKSHOP SCIENCE: **Units and Dimensions:** Conversions between British & Metric system of Units. Fundamental and derived units in SI System, Dimensions of Physical Quantities (MLT)-Fundamental & Derived. **Engineering Materials:** Classification properties and uses of ferrous metals, non-ferrous metals, alloys etc. Properties and uses of non-metals such as wood, plastic, rubber, ceramics industrial adhesives. **Heat & Temperature:** Concepts, differences, effects of heat, different units, relation, specific heat, thermal capacity, latent heat, water equivalent, mechanical equivalent of heat. Different Temperature measuring scales and their relation. Transference of heat, conduction, convection and radiation. Thermal Expansion related calculations. **Force and Motion**: Newton's laws of motion, displacement, velocity, acceleration, retardation, rest & motion such as linear, angular. Force – units, different laws for composition and resolution of forces. Concept on centre of gravity and equilibrium of forces in plane. Concept of moment of inertia and torque. **Work, power & energy**: Definitions, units, calculation & application. Concept of HP, IHP, BHP and FHP – related calculations with mechanical efficiency. S.I. unit of power and their relations. **Friction:** Concept of friction, laws of friction, limiting friction, coefficient of friction and angle of friction. Rolling friction & sliding friction with examples. Friction on inclined surfaces **Stress & Strain:** Concepts of stress, strain, modulus of elasticity. Stress- strain curve. Hook's law, different module of elasticity like Young's modulus, modulus of rigidity, bulk modulus and their relations. Poisson's ratio. **Simple machines:** Concept of Mechanical Advantage, Velocity Ratio, Efficiency and their relations. Working principles of inclined plane, lever, screw jack, wheel and axle, differential wheel and axle, worm and worm wheel, rack and pinion. Gear train. **Electricity:** Basic definitions like emf, current, resistance, potential difference, etc. Uses of electricity. Difference between ac and

		dc. Safety devices. Difference between conductors and semiconductors and resistors, Materials used for conductors, semiconductors and resistors. Ohm's Law. Series, parallel and series-parallel combination of resistances. Concept, definitions and units of electrical work, power and energy with related problems. **Fluid Mechanics:** Properties of fluid (density, viscosity, specific weight, specific volume, specific gravity) with their units. Concept of atmospheric pressure, gauge pressure, absolute pressure, vacuum and differential pressure.

SYLLABUS FOR CORE SKILLS
1. Training Methodology (Common for all CITS trades) (270Hrs + 180 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for all the CITS trades, provided separately in[www.bharatskills.gov.in.](http://www.bharatskills.gov.in)/ dgt.gov.in

7. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
TRADE TECHNOLOGY	
1. Follow workshop safety measures and monitor job as per specification applying different types of basic fitting operation and check for dimensional accuracy by using steel rule, calliper etc.[Basic Fitting operation- marking, hack sawing, chiselling, filing,, drilling, reaming, taping, off-hand grinding etc. accuracy±0.25mm]. (NOS: PSC/N9421)	Plan & identify tools, instruments and equipment for marking and make this available for use in a timely manner.
	Demonstrate raw material and visual inspection for defects.
	Illustrate as per specification applying desired mathematical calculation and observing standard procedure.
	Demonstrate all dimensions in accordance with standard specifications and tolerances.
	Identify hand tools for different fitting operations and make these available for use in a timely manner.
	Demonstrate the job for Hacksawing, chiselling, filing, drilling, tapping, grinding.
	Demonstrate basic fitting operations viz., Hacksawing, filing, drilling, tapping and grinding to close tolerance as per specification to make the job.
	Demonstrate safety procedure during above operation as per standard norms and company guidelines.
	Check for dimensional accuracy as per standard procedure.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
2. Demonstrate the work to make job as per specification applying different types of basic fitting operation and Check for dimensional accuracy. [Basic fitting operation – marking, Hacksawing, Chiseling, Filing, Drilling, Taping and Grinding etc. Accuracy: ± 0.25mm] (NOS: PSC/N9422)	Demonstrate Identification of tools, instruments and equipments for marking and make this available for use in a timely manner.
	Select different raw material and inspect visually for defects.
	Demonstrate the appropriate mark as per specification applying desired mathematical calculation and observing standard procedure.
	Demonstrate all dimensions in accordance with standard specifications and tolerances.
	Operate Hand Tools for different fitting operations and make these available for use in a timely manner.
	Operate the job for Hack sawing, chiselling, filing, drilling, tapping, grinding.
	Perform basic fitting operations viz., Hack sawing, filing, drilling, tapping and grinding to close tolerance as per specification to make the job.
	Observe& follow safety procedure during above operation as per

	standard norms and company guidelines.
	Check for dimensional accuracy as per standard procedure.
	Plan & demonstrate avoidance of waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
3. Demonstrate Inner&Outer Thread cutting on Metal & Studs and thread cutting on different types of pipes & fittings accessories. (NOS:PSC/N9423)	Explain Hand Tools for Plumber work.
	Select Hand Tools for Cutting Inner thread and Outer thread.
	Use the pipe fittings accessories.
	Perform Inner thread cutting as per drawing.
	Perform Outer thread cutting as per drawing.
	Demonstrate preparation of Pipe line circuit with fittings as per drawing.
	Observe safety procedure during thread cutting as per standard norms and company guidelines.
	Check and verify the job as per drawing.
4. Review various wood jointing with carpenter's tools. (NOS: PSC/N9424)	Identify & select the woods and describe their characters.
	Demonstrate use of Carpenter's hand Tools.
	Prepare the job as per drawing.
	Observe safety procedure during wood cutting, sawing, chiseling. Plan as per standard norms and company guidelines.
	Check and verify the job as per drawing.
5. Demonstrate the Cutting of Pipes of different Dia in different angle and Joining of pipes by Gas & Arc welding. Soldering and Brazing. (NOS: PSC/N9425)	Demonstrate different components/parts of Gas (oxy-acetylene) machine, collect desired information and set each components/parts as per standard procedure.
	Observe safety/ precaution during operation.
	Demonstrate selection of appropriate material & plan for gas cutting & joining operation.
	Demonstrate Cutting& joining of metal parts / mechanical components as per specification observing standard procedure.
	Check cut portion/ joined part to ascertain proper welding.
	Demonstrate use of hand tools for Soldering and Brazing.
	Demonstrate marking and develop various forms as per drawing using sheet metals.
	Demonstrate making of simple items with sheet metal as per drawing.
	Perform Soldering and Brazing.
	Observe & follow safety procedure during operation
	Check and verify the job as per drawing.

6. Construct a Masonry brick wall and RCC casting. Demonstrate Brick wall cutting for concealing pipe line. (NOS: PSC/N9426)	Demonstrate use of different types of Mason's hand tools.
	Analyze & select the Construction materials.
	Make a simple construction of different type of Brick joints with mortar.
	Demonstrate preparation of a job related to masonry work and RCC casting as per drawing.
	Check & verify the job as per drawing.
7. Monitor Cutting and Bending of Pipes using Plumber's tools and equipments. (NOS: PSC/N9427)	Demonstrate use of different types of Plumber's hand tools.
	Demonstrate care & maintenance of hand tools.
	Demonstrate cutting of pipe with Pipe cutter.
	Demonstrate working of Bending Machine and accessories.
	Assess the desired bend on pipe as per drawing.
	Check the job as per Drawing.
8. Check & Evaluate various types of PVC pipe joint by different methods and heat process or Welding. (NOS: PSC/N9428)	Demonstrate use of different types of PVC Pipe.
	Demonstrate working of Electric Welding Machine and accessories for PVC pipes
	Demonstrate Simple joint of PVC pipe by Welding Machine.
	Evaluate making of job with PVC fittings and pipe as per drawing.
	Observe safety procedure during operation.
9. Review installation and maintenance of different Electric pump. (NOS: PSC/N9429)	Demonstrate selection of the pump and inspect for defects.
	Select the tools, instrument and equipment for the pump installation and repairing.
	Check and calculate output of the pumps.
	Install pump observing standard procedure and method as per specification using appropriate tools and raw material.
	Check performance of the pump.
10. Construct complete pipe line circuit with different types of Joints and demonstrate fixing of cocks & valve on Pipe line. (NOS: PSC/N9430)	Demonstrate Identification of different types of Joints.
	Demonstrate Identification & selection of different types of tools /Joints.
	Demonstrate making of a Flange joint as per drawing.
	Demonstrate making of a Detachable joint as per drawing.
	Demonstrate making of a Spigot & Socket joint as per drawing.
	Demonstrate making of a Socket joint as per drawing.
	Demonstrate use of GI fittings.

	Demonstrate application of Cocks & Valves.
	Select Tools for fixing of fittings with GI pipe, Cocks & Valves.
	Observe making of a simple job on GI Pipe with fittings, Cocks, and Valves as per drawing.
	Check & verify the job as per drawing.
11. Perform water analysis test, Water Pressure test and demonstrate Water distribution system by using Pipe line. (NOS: PSC/N9431)	Demonstrate preparation of water for test.
	Prepare water analysis kits.
	Demonstrate testing procedure of water for pH, TDS, temperature as per requirements.
	Prepare Hydraulic Pressure Test Machine.
	Demonstrate Pressure test on Cistern and Tank.
	Check and verify test result.
12. Plan &execute fitting, fixing & laying installation of hot & cold water pipe line and symboling. (NOS: PSC/N9432)	Demonstrate identification of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Demonstrate installation of pipe line for distribution of hot & cold water according to drawing.
	Demonstrate installation of hot water system & solar water heating system in accordance with standard specification and drawing.
	Observe & follow safety procedure during desired operation as per standard norms and schedule drawing.
	Check different parameters and functionality of the system.
13. Demonstrate & assess installation of Kitchen, Sanitary Fittings and Testing of Drainage line. (NOS: PSC/N9433)	Demonstrate identification of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Demonstrate fixing of Kitchen Sink, Hand Wash Basin in wall.
	Demonstrate fitting of Urinal, Pan, Commode.
	Demonstrate fitting of waste Pipe and Drainage Pipe.
	Demonstrate identification of tools and equipment for testing pipe line.
	Test pipe line observing standard procedure.
	Observe & comply safety precaution during operation.
14. Examine and remove Leakage of pipe line as per site Water supply pipe line and Drainage Pipe line layout. (NOS: PSC/N9434)	Demonstrate identification of tools and equipment for testing pipe line.
	Demonstrate preparation of the job for different testing for pipe line.
	Test pipe line observing standard procedure.
	Observe& comply safety precaution during operation.
	Identify the leakage pipe& repair the same.

	Remove pipe leakages as per standard procedure.
	Observe safety procedure during desired operation as per standard norms.
	Check performance after removal of leakages.
15. Construct inspection chamber, manhole, gutter, septic tank, sock pit etc.& Layout of soil pipe. (NOS: PSC/N9435)	Demonstrate use of tools and equipment for desired purpose and make this available for use in a timely manner.
	Select raw materials and inspect for defect.
	Demonstrate marking as per drawing applying desired mathematical calculation and observing standard procedure.
	Demonstrate construction of inspection chamber, manhole, gutter, septic tank, socket etc. as per drawing.
	Measure all dimensions in accordance with standard specification and tolerance.
	Observe & comply safety procedure during desired operation as per standard norms.
	Check for dimensional accuracy as per standard procedure.
16. Analyze & install Rain Water Harvesting. (NOS: PSC/N9436)	Explain Rain Water Harvesting.
	Demonstrate use of tools and equipment for desired purpose and make this available for use in a timely manner.
	Demonstrate rain water Gutter.
	Demonstrate Outlet and grounding of the Pipe line.
	Demonstrate Supply of water using various types Pipe Fittings.
	Test pipe line observing standard procedure.
	Observe safety precaution during operation.
17. Monitor repairing & reconditioning, scraping & painting of sanitary fittings, Pipe line. (NOS: PSC/N9437)	Demonstrate use of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Demonstrate cleaning of sanitary pipe line and remove corrosion from pipe line.
	Explain corrosion from pipe line and perform scraping & painting of pipe line in accordance with standard guidelines.
	Plan & execute replacement of broken or cracked sanitary fitting.
	Observe safety procedure during desired operation as per standard norms and schedule drawing.
	Check different parameters and functionality of the system.
18. Perform Fittings of Water heater and arrange supply of hot & cold water. (NOS:	Demonstrate use of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Plan for Installation of pipe line for distribution of hot & cold water

PSC/N9438)	according to drawing.
	Demonstrate installation of hot water system & solar water heating system in accordance with standard specification and drawing.
	Observe safety procedure during desired operation as per standard norms and schedule drawing.
	Check different parameters and functionality of the system.
19. Assemble and Repair different types of Pump. (NOS: PSC/N9439)	Select the pump and inspect for defects.
	Select the tools, instrument and equipment for the pump installment and repairing.
	Check and identify default parts of the pumps.
	Demonstrate installation of pump Observing standard procedure and method as per specification using appropriate tools and raw material.
	Check performance of the pump.
20. Evaluate Maintenance & Repair of Tank, waste fittings and Fixing of the Sensor system. (NOS: PSC/N9440)	Demonstrate use of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Demonstrate cleaning and maintenance of the Tank or Sump.
	Demonstrate fixing of the sensor system in Sanitary fittings.
	Observe safety procedure during desired operation as per standard norms.
	Check for dimensional accuracy as per standard procedure.
21. Assess & test the Pressure of pipe and repair leakage. (NOS: PSC/N9441)	Demonstrate use of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Explain calculation of pressure test in pipe line.
	Explain about Hydraulic pressure test machine.
	Demonstrate preparation of the job for testing for pipe line by Hydraulic pressure test machine .
	Observe safety precaution during operation.
	Identify the leakage in pipe& repair.
	Remove pipe leakages as per standard procedure.
	Observe safety procedure during desired operation as per standard norms.
	Check performance after removal of leakages.
22. Monitor Fitting of Hydrants & Sprinklers. (NOS: PSC/N9442)	Demonstrate use of tools, instrument &equipments for desired work and make this available for use in a timely manner.
	Explain about Hydrant.
	Demonstrate fitting of Hydrant.

	Observe safety precaution during operation.
	Explain about Sprinkler.
	Demonstrate fitting of Sprinkler.
	Observe safety precaution during operation.
	Check performance for dimensional accuracy as per standard procedure.
23. Draw, Estimate and Execute of Plumbing system. (NOS: PSC/N9443)	Explain plumbing drawing.
	Explain about 2D CAD.
	Explain Features and application for creating a drawing by 2D CAD.
	Check performance for dimensional accuracy as per drawing.
	Explain about Estimating in plumbing system as per drawing.
	Check Estimate as per drawing.
24. Read and apply engineering drawing for different application in the field of work. (NOS: ASC/N9410)	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
25. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

8. INFRASTRUCTURE

LIST OF TOOLS AND EQUIPMENT FOR PLUMBER (CITS) TRADE			
For batch of 25 candidates			
S No.	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Rule Steel	300 mm both in inch and mm	26 Nos.
2.	Rule Wooden 4 fold	600 mm	26 Nos.
3.	Hacksaw Frame	adjustable for 250 to 300 mm	26 Nos.
4.	Scriber	200 mm	26 Nos.
5.	Centre punch	100 mm	26 Nos.
6.	Chisel Cold, flat	20 mm	26 Nos.
7.	Hammer ball peen	800 grams	26 Nos.
8.	Hammer ball peen	50 grams	26 Nos.
9.	File flat rough	300 mm	26 Nos.
10.	Level spirit wooden	300 mm	26 Nos.
11.	Plumb bob	50 grams	26 Nos.
12.	Trowel C-125-I S: 6013		26 Nos.
13.	Still son wrench 200 & 350 mm		26 Nos.
14.	Screw Driver	250 mm	26 Nos.
15.	Wooden Mallet small I S: 2022		26 Nos.
16.	Cutting pliers I S : 3650	200mm	26 Nos.
17.	Steel tape	5m	26 Nos.
B. TOOLS, MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT			
18.	Surface plate	400 X400 mm Grade I	1 No.
19.	Marking Table	900X600X900mm high	1 No.
20.	'V' Blocks with clamps 80/7-63A IS 2949		2 Nos.
21.	Combination set	200 mm	1 No.
22.	Universal Scribing Block	300 mm	5 Nos.
23.	Hand Vice Jaw	50 mm	5 Nos.
24.	File Flat Smooth	200 mm	13 Nos.
25.	File Half Round Rough	300 mm	13 Nos.
26.	File Square rough	250 mm	13 Nos.
27.	File Square Smooth	200 mm	13 Nos.
28.	File Triangular Rough	250 mm	13 Nos.
29.	File Flat Rasp	250 mm	13 Nos.
30.	File Triangular Smooth	200 mm	13 Nos.
31.	Chisel Cold Flat	20 mmX300mm	13 Nos.
32.	Chisel Cross Cut I S-402	6X150 mm	13 Nos.
33.	Chisel Round Nose I S -402	3X150 mm	13 Nos.

34.	Chisel Diamond Point	6X150mm	13 Nos.
35.	Tap and tap wrench to cut B.S.F. , B.S.W.	Metric threads of sizes No.M6 to M-12 and British thread to 1/"	5 set each
36.	Screw Pitch gauge to cover above threads		5set
37.	Letter Punch	8mm	1 No.
38.	Number Punch	8mm	1 No.
39.	Hand hacksaw frame	300mm	13 Nos.
40.	Spanner monkey	up to 50mm	5Nos.
41.	Stove melting (solder Iron and bit)		5Nos
42.	Pipe Cutter wheel type	6mm to 25mm	5 Nos.
43.	Oil stone	150X50X25mm	2 Nos.
44.	Soldering Iron , Copper , Bit , Fire heated , Hatched , Straight	500 grams	4 Nos.
45.	Snip Straight	250mm	5 Nos.
46.	Snip bend	250mm	5 Nos.
47.	Try square	200mm	5 Nos.
48.	Inside Calliper	150mm	13 Nos.
49.	Caliper outside	150mm	13 Nos.
50.	Odd leg calliper	200mm	13 Nos.
51.	Tenon saw		5 Nos.
52.	Hand Saw		5 Nos.
53.	Mortise Chisel	6mm, 8mm, 10mm, 12mm ,15mm, 25mm	Each 5 Sets
54.	Firmer Chisel		5 Sets.
55.	Mallet Medium IS: 2922		13 Nos.
56.	Jack plane		13 Nos.
57.	Gas Welding set with oxygen acetylene cylinder		1 No.
58.	Table welding	1200X 750 mm with fire bricks top and stand	1 No.
59.	Combination Pliers	200 mm	13 Nos.
60.	Blow lamp	500 millilitre	5Nos.
61.	Washer cutter	Hollow punch 6mm to 30mm	Each 2set.
62.	Scribing gauge		5 No.
63.	Soil pot with brush		1 No.
64.	Pot- Hook		3 No.
65.	D. E. Spanners IS:2028	6mm to 32mm	Each 2 Sets
66.	Branch Gimlets		2 Nos.
67.	Bending Spring		2 Set
68.	Plumbers Ladle		2 Nos.
69.	Caulking Tool	set of 5nos.	2 Set
70.	Plumbers' metal melting pot 10 kg		1 No.
71.	Pipe Die and Die stock with complete set	up to 2/"	4 sets
72.	Pipe vice IS -2587	up to 75 mm	8 Nos.

73.	Still son pattern pipe wrenches IS - 4003	450 mm	13 sets
74.	Still son pattern pipe wrenches 300mm		13 sets
75.	Chain pipe wrench	90mm-650 is 4123	2sets
76.	Adjustable spannerIS- 6149	12"	13 Nos.
77.	Anvil IS- 510	50 or 63 kg.	1 No
78.	Pipe bender manually operated		2 Nos.
79.	Leg vice IS -2588	75mm jaw with Stand	1 No
80.	Hand drill machine	up to 13mm capacity with drill chuck (Electric)	1 No
81.	Drill Twist (straight shank)	1.5mm to 13mm	Each 3set
82.	Portable forge	450mmwith hand blower	1 No
83.	Smithy tong different shapes		Each 2 Nos.
84.	working bench	2400x1200x750mm with 4 voice 125 mm jaws	5 Nos.
85.	Bath tub small size		2 No.
86.	Wash Basin Equivalent metric	16"X14"X10"	5 Nos.
87.	Water Heater	10litres	5 Nos.
88.	Water closet (European type p) complete with over head cistern		2set
89.	Water closet (Indian type) complete with over head cistern		2set
90.	Urinal wall type complete with automatic system		1set
91.	Water meter		5 Nos.
92.	Black Board with glass		2 Nos.
93.	Fire Extinguisher (CO2and DCP)		Each1No
94.	Fire Buckets with stand		2 Nos.
95.	Hammering drilling machine with drill bit	6mm to 32mm	Each 2 Nos.
96.	Electric PPR pipe welding machine		1 No
97.	Electric pump, 1 HP ((Centrifugal, reciprocating, submersible pumps, etc.)		1 No.
98.	Pedestal grinder machine		1 No.
99.	Hydraulic pressure machine for testing leakage in pipe fittings etc.		1No.
100.	Sight rail and boning rod		1 No.
101.	Ratchet pipe die set	15 mm to 32 mm	1 No.
102.	Bench drilling machine with chuck	up to 25mm capacity	1 No.
103.	Double face hammers		2 No.
104.	Dormant, Pickaxe, Spade, Grimace		1 each
105.	Pipe bender(Hydraulic type)		1 No.
106.	Ring spanner set m	6mm to 32m	2 set

107.	Solar water heater system		1No
108.	Solar cooker		1No
C. CLASS ROOM FURNITURE			
109.	Class Room Chairs (armless) / Dual desk may also be allowed		25 /13Nos.
110.	Class Room Tables (3ft X 2ft) / Dual desk may also be allowed		25 /13Nos.
111.	Chair for Trainer (armed) movable		01No.
112.	Table for Trainer (4 $^1/_2$ft X 2 $^1/_2$ft) with Drawer and cupboard		01 No.
113.	LCD / LED Projector		01 No.
114.	Desktop computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. Cache Memory: - Minimum 3 MB or better. RAM:-8 GB DDR-III or Higher. Hard Disk Drive: 500GB or Higher, 7200 rpm (minimum) or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet (10/100/1000) - Wi-Fi, USB Mouse, USB Keyboard and Monitor (Min. 17 Inch), Standard Ports and connectors. DVD Writer, Speakers And Mic. Licensed Windows Operating System / OEM Pack(Preloaded), Antivirus / Total Security	01 set
115.	UPS		As required
116.	Computer Table		01 No.
117.	White Board	6ft X 4 ft.	01 No.
118.	LCD Projector Screen		
119.	Air Conditioner (OPTIONAL)		As required
120.	Wall Clock		01 No.
121.	Wall charts, Transparencies and DVDs related to the trade		As required

NOTE:

1. *No additional items are required to be provided for the batch working in The second shift except the item under trainee's tool kit and lockers.*
2. *Items such as sockets, elbow, u-1rap, w-Trap, pipes etc. required for day to day Plumbing work should be purchased.*
3. *The specification of the items in the above list has been given in Metric Unit and is based on the ISI Standards wherever available. While procuring the I.S.I Specifications should be strictly followed Measuring instrument such as steel rule Which are graduated both in English and Metric unit may be procured, if available*


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