CONSTRUCTION SKILLS TRAINING INSTITUTE

SKILL STANDARDS

PLUMBING & SANITARY

COMMITTEE

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ECC

CONSTRUCTION GROUP
LARSEN & TOUBRO LIMITED
CONSTRUCTION SKILLS STANDARDS

FOREWORD

Larsen & Toubro Limited (L&T) wish to regulate and promote Construction Vocational Training in India. To this end, L&T have established a Memorandum of Understanding with Henry Boot Training Limited and the Construction Industry Training Board of U.K. This is to assist in the development of a Unified Modular Training System for Construction related trades, which will supply the Industry with significant numbers of workers, trained to limited but recognised skill levels, in the shortest possible time. The system will be tried and tested by L&T and thereafter be offered to the Construction Industry Development Council of India as a model approach. The framework of the system will be designed to enable both new entrants to the Industry and skilled workers in the Industry to progressively improve their levels of skills and knowledge competency in their respective occupation and award them a skill certificate level, which is nationally recognised.

As a pre-requisite to the above, it is necessary to establish the Occupational Skill Standards, which the Industry requires from its employees. An Occupational Skill Standard is defined as written specification setting out the requirements of knowledge and skills in respect of a particular occupation or trade. To develop Construction skill standards, different committees were constituted, consisting of Senior executives of L&T ECC Group. They worked in collaboration with M/s. Henry Boot Training Limited, U.K. and Construction Industry Training Board, U.K.

The committee has brought out this book, which defines the skill standards and gradation in the skill level. Stratification of skills into three different levels (starting from level III and progressing to level I) has been done. There is a clear definition of Knowledge & Skills at each level. This is to encourage a progressive career growth for the individual and also a climate for continuous improvement of Knowledge & Skills in the Industry.

These Standards are used as a basis in the development of training programmes and in the implementation of Trade Testing and Certification. Employers in the construction Industry can confirm that employees, who achieve these Skill Standards, will meet the needs of the Industry and this will result in:

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Larsen & Toubro Ltd. ECC Construction Group  Skill Standard  Feb. 1999
1. Improved productivity of each person
2. Increased job satisfaction
3. An opportunity for progressive career growth for the individual
4. Reduced labour turnover
5. Improved industrial relations
6. Improved safety practice leading to fewer accidents
7. Improved workmanship resulting in timely and effective completion of the project
8. Improved performance of the firms

Skill standards are a dynamic means of improving the quality in Industry. Such standards may be modified and improved as necessary to meet the changing needs of the Industry. I am sure this will usher in a sea of change in the industry and fulfil a long felt need for recognition of Construction trades, as an organized industrial sector in the nation building process.

Larsen & Toubro Limited wishes to acknowledge the support given by

Mr. David Hammond, Director  
M/s. Henry Boot Training Limited, U.K.

and

Mr. Terry Kivlin, Training Manager  
M/s. Construction Industry Training Board, U.K.

for co-ordinating the efforts of the committee in drawing up these Construction Skill Standards.

I, on behalf of Larsen & Toubro Limited, wish to place on record my thanks to the committee, for their untiring efforts, in bringing about these excellent Skill Standards in the shortest time available at their disposal.

A. Ramakrishna
MEMBER OF THE BOARD AND PRESIDENT (OPERATIONS)  
LARSEN & TOUBRO LIMITED

Chennai  
Feb. 1999
GENERAL DESCRIPTION

A plumber assembles, installs and maintains pump sets, piping, fittings and fixtures of sanitary systems, heating systems, water supply and drainage systems. The plumber also carries out testing and commissioning of these systems. Work is carried out based on the prevailing codes and standards to a dimensional accuracy and an angular tolerance.

SPECIFIC DESCRIPTION

1. Understands sketches, drawings and specifications.

2. Carries out simple system design and estimates installation costs and repair costs.

3. Assembles, installs, tests, commissions and repairs pipes, fittings and fixtures of heating, water supply, sanitary and drainage systems according to specifications and codes of practice.

4. Co-ordinates with structural works to ensure all builder’s works can accommodate sanitary and plumbing works; such as provision of openings in walls/floors and locating insert plates during construction stage.

5. Marks pipe routes in co-ordination with other services to avoid obstructions.
6. Cuts opening in walls and floors, and chases walls wherever required to accommodate pipes and pipe fittings using hand or power tools.

7. Provides pipe sleeves at wall / floor crossing.

8. Co-ordinates with the interior finishing works for exact location of pipes, pipe fittings and fixtures.

9. Uses hand tools, power tools and gas cutting equipment to cut, bend, shape and thread pipes.

10. Joins pipes by use of threaded fittings, flanged fittings, couplings and methods of flared, wiped slip, sleeve or clamp joints, using solder, plastic solvent, caulks joints and gaskets.

11. Joins MS pipes of different sizes by welding.

12. Assembles and installs valves, pipe fittings and pipes composed of materials such as cast iron, steel, brass, copper, lead and non-metals such as glazed stoneware, concrete, HDPE, plastic or PVC using hand tools and power tools.

13. Tests systems by water, air and smoke, reads pressure gauges to determine whether system meets specifications or to identify faults.


15. Disinfects and purges pipelines prior to commissioning.
16. Installs and repairs plumbing fixtures, such as sinks, W.C. suites, bath tubs, water heaters, water tanks, bidets, showers, urinals, water drainage systems, gutters, fall pipes, soil pipes.

17. Works at heights, uses ladder and scaffolds.

18. Fixes pipe supports and brackets.

19. Installs, aligns, tests and commissions pumps, motors and accessories.

20. Insulates cold and hot water piping in line with the codes of practice.

21. Locates and installs flexible joints in piping across expansion joints at seismic zones.

22. Locates and installs air vents and scour valves as per site conditions.
SKILL STANDARD – PLUMBER LEVEL III

1.0 KNOWLEDGE

A Plumber level III must:

1.1 Know and name plumber’s tools and materials

1.2 Appreciate care and use of Plumber’s tools.

1.3 Know and name types of pipes, materials and fittings used in domestic installation systems.

1.4 Read simple sketches and identify symbols

1.5 Appreciate safe working practice including material storage, condition and inspection of tools, manual lifting, methods of artificial resuscitation, simple first aid, site tidiness and safety precautions related to fire and electricity.

2.0 SKILLS

A plumber level III must be able to:

2.1 Use and maintain plumbing tools such as a file, hacksaw, spirit level, plumb bob, hammer, and chisel, rawlplug chisel, stocks and dies, pipe cutter, pipe wrench, pipe bending machine.

2.2 Files to remove burr or sharp edges

2.3 Adjust hacksaw, fit blades and saw pipe to a given measurement to a tolerance of ±1.5 mm
2.4 Use a spirit level or plumb bob to check or find horizontal and vertical lines to within a tolerance of ± 2.5mm over one linear meter.

2.5 Chase out and cut holes in building fabrics using hammer and chisel without causing damage.

2.6 Use rawl plug chisel to make holes for fixing installations to brickwork, concrete and tiling.

2.7 Use stocks and dies, pipe cutter, pipe bending machine and Stillson wrench, for simple pipe assembly installations to a given specification.

2.8 Install P.V.C. pipe work including selection of pipes, measuring pipes and fittings, bending of pipes to given specification, making joints by using solvents or couplings.

2.9 Assemble and install sanitary fixtures including installation of sinks, bath tubs, water closets with cistern and adjusting of ball valves and overflow, make connection to soil pipes.

2.10 Install, maintain and repair of individual or mixer taps.
1.0 KNOWLEDGE

In addition to knowledge items outlined above, a level II plumber must:

1.1 Know methods of laying pipes in or pass through building structural members such as floors, beams and columns.

1.2 Know methods of avoiding air locks in pipes.

1.3 Know methods of connecting pipes of different materials.

1.4 Understand installation methods of commonly used domestic water and drainage pumps.

1.5 Know simple calculations concerned with plumbing. Appreciate conversion of units between metric and imperial systems.

1.6 Understand significance of ventilation of fresh water pipes and soil pipes.

1.7 Know methods of cutting, connecting & fixing cast iron pipes including fixing of pipes on slopes.

1.8 Make simple calculations to find area, volume and weight of water storage tanks.

1.9 Read simple installation drawings, signs and symbols.

1.10 Know municipal rules, regulations, procedures and standards of products concerned with plumbing.
1.11 Appreciate safe working practice including working off stepladders, scaffold towers, ladders, bamboo scaffold.

1.12 Know colour codes of various service pipes as per codes of practice.

2.0 SKILLS

In addition to skilled items outlined above, a level II plumber must:

2.1 Use and maintain hand tools, electric power tools and machines used in plumbing works.

2.2 Read installation drawings and take off quantities required.

2.3 Plan simple pipe installations and plumbing fixtures

2.4 Diagnose problems, locate and repair as necessary.

2.5 Locate and install water pumps according to manufacturer's specification.

2.6 Install and maintain various types of pipes for drainage including glazed stoneware, concrete asbestos cement, cast iron, PVC and HDPE.

2.7 Install cast iron pipe work including selecting pipe for various jobs, measuring and cutting pipes, yarning and caulking, fixing and supporting pipes, connecting soil pipes, setting and connecting pipes between manholes.
2.8 Install galvanized steel pipe works including selection of pipes, fittings and types of joints, measuring pipes and fittings. Cutting, reaming, threading different size pipes within tolerance limits as per specifications. Make and fix supports. Install valves on pipelines.

2.9 Determine size of storage water tanks required, connect water supply, fit ball valve and connect over flow and drainpipes.

2.10 Make simple equipment such as hangers, caulking and yearning tools.

2.11 Sketch layout of systems such as bathroom installations and advise customers of work content and limitations.

2.12 Install water meter, drill CI main, tap and fix ferrule.

LEVEL I

1.0 Knowledge

In addition to knowledge items for level III and level II, a level I plumber must:

1.1 Know properties of materials and appropriate equipment to be used in plumbing works as per relevant codes of practice.

1.2 Know methods of testing cold water installations and soil pipe installations.

1.3 Know types, standard sizes and usage of sanitary fixtures.
1.4 Appreciate techniques of hot and cold bending thick wall steel pipes.

1.5 Know water pressures and related atmospheric pressures.

1.6 Know methods of installing domestic hot water systems.

1.7 Know techniques of installing copper pipe work and alternate methods of joining and assembling.

1.8 Appreciate techniques of joining steel pipes by welding

1.9 Appreciate safe working practice including working with welding equipment and simple lifting gear.

1.10 Know simple estimating and costing techniques.

1.11 Alteration of pipe supports to suit site conditions.

2.0 SKILLS

In addition to Skills items for level III and level II, a level I plumber must be able to:

2.1 Estimate cost of plumbing installation from given drawing/specification.

2.2 Prepare bill of materials and material specification for procurement.

2.3 Plan work to link with other trades or technicians.
2.4 Suggest types and sizes of pipes to be used for a building such as soil pipes, waste pipes, water pipes and vent pipes.

2.5 Suggest types of hot water systems to be installed.

2.6 Carry out welding of low-pressure mild steel pipes.

2.7 Prepare as built drawings.
ACKNOWLEDGEMENTS

The Committee wishes to acknowledge the total support given by the following executives of L&T:

Mr. A. Ramakrishna  
Member of the Board and President (Operations) L&T and Vice-Chairman-CIDC

Mr. K.V. Rangaswami  
Vice President - Buildings & Infrastructure Projects

Mr. S. Chandrasekar  
General Manager - Plant & HRD

Mr. V.B. Gadgil  
Jt. Genl. Manager (Buildings & Factories)

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Mr. S.R. Kumar  
Jt. Genl. Manager (Development - Buildings & Infrastructure)

Mr. M. Kalyanasundaram  
Sr. Manager (Buildings & Factories)

Mr. M.G. Vasudevan  
Manager (Buildings & Factories)

The publications of the following organisations have been used for reference:

- Henry Boot Training Limited, U.K. (Training Standards)
- Construction Industry Training Board, U.K. (Training Manuals & Training Specifications)
- The Directorate General of Employment and Training of Ministry of Labour & Employment, Govt. of India
- Bureau of Indian Standards
- CIDC
- NICMAR

The following in-house documents of L&T ECC Construction Group have been used for reference:

- Construction Group Work Procedures
- Construction Quality Assurance Manuals
- Construction Project Quality Plan Manuals