

**CONSTRUCTION SKILLS TRAINING INSTITUTE**

**SKILL STANDARDS**

**MASONRY**



**CONSTRUCTION GROUP  
LARSEN & TOUBRO LIMITED**

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**MASONRY**

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# 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 :

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.

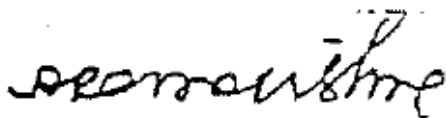
and

**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

# OCCUPATIONAL JOB DESCRIPTION

## MASON

### **GENERAL DESCRIPTION**

A mason sets bricks, concrete blocks, grills and paving slabs, plasters walls and soffits, lays concrete floors, brick paved floors, lays concrete in foundations and drains; including bonding of brickwork, casting and building in concrete lintels. A mason also assists in the construction and maintenance of various types of structures, working to specific, predetermined standards of dimensional accuracy, to gauge, level, plumb and range within given tolerances.

### **SPECIFIC DESCRIPTION**

1. Interprets working drawings, sketches, specifications and instructions.
2. Estimates amount of materials required to complete a specific job.
3. Sets out work, measuring accurate linear distances from given points. (Accuracy + or - 5mm in 3 to 3.5 m)
4. Sets out 90° corners using builders square or 3-4-5 method. Checks for square using diagonal measurement (accuracy + or - 5mm in 5m)
5. Transfers level points using spirit level or Tube-Water level. (Accuracy + or -3mm per floor to floor transfer)
6. Works at heights; use ladders and scaffolds.

7. Sets out glazed stoneware drainpipes to correct alignment and falls.
8. Fixes timbering to trenches less than 1.5m deep.
9. Sets rubble walling.
10. Organises work area and materials to maximise productivity
11. Determines quantity of mortar required to set predetermined number of bricks.
12. Spreads mortar using trowel to required thickness of bed joint to required level.
13. Taps bricks with trowel to required line and level. Place mortar to bond joints.
14. Uses line dori and pins to keep each course of brickwork level.
15. Uses wooden/Aluminium straight edge sections to maintain line and level of each course of brickwork. Ensure uniform 10mm joint thickness.
16. Rakes joints and removes excess mortar from face of wall with hard-broom keeping face of wall clean.
17. Uses plumb bob and spirit level to determine vertical and horizontal alignment. Faces plane evenness by ranging and gauges overall height.
18. Breaks brick to required size using brick hammer, trowel, lump hammer and chisel.

19. Mixes mortars and concrete to specified parts by volume or mix design.
20. Lays concrete and uses trowel to finish surface.
21. Fixes into position window and doorframes.
22. Plasters and renders ceilings and walls.
23. Lays screed floors including use of pigments and surface additives.
24. Works responsibly and safely without endangering self or others.
25. Uses and maintains appropriate tools, equipment and materials.
26. Maintains clean and safe working conditions.
27. Lays into position brick paving.
28. Uses pointed trowel to create decorative finish to joints on walls.
29. Uses jointer to create decorative finish to joints on wall.
30. Builds into position pipe and other fixing brackets
31. Erects shoring and strutting during alteration work.
32. Lays glazed stoneware drainpipes to correct alignment and gradient.
33. Tests and repairs faulty drains.
34. Carries out repairs and maintenance work on various types of structures.

## SKILL STANDARDS - MASON LEVEL III

### **1. KNOWLEDGE**

#### **A. Level III Mason must**

- 1.1 Know and name all mason's tools and materials
- 1.2 Appreciate care and use of mason's tools.
- 1.3 Understand the importance of being able to produce correct mix of mortar including setting times, properties and curing.
- 1.4 Understand how to determine quantity of mortar for predetermined number of bricks.
- 1.5 Be aware of the importance and ability to joint bricks and spread bed correctly.
- 1.6 Understand uses of various types of jointing and pointing.
- 1.7 Be aware of the techniques / procedure for cutting different types of bricks to sizes.
- 1.8 Understand the basic principles of measurement.
- 1.9 Understand the use of checking tools such as plumb bob, spirit level and builder's square.
- 1.10 Be able to understand the reasons why dry materials are placed at a certain distance from the place where work is in progress.
- 1.11 Know why materials should be stacked safely.

- 1.12 Know why concrete is mixed to specification.
- 1.13 Understand the need to bond brickwork.
- 1.14 Be aware of different kinds of bond.
- 1.15 Have basic knowledge of drainage systems.
- 1.16 Know why plastering rendering is carried out.
- 1.17 Appreciate safe working methods including working on scaffolding, basic human kinetics and general site tidiness.

## **2. SKILL**

- 2.1 Use all mason's tools to their best advantage including correct handling and maintenance of same.
- 2.2 Mix mortars concretes to given specification, and use patent additives correctly.
- 2.3 Manipulate mortar on trowel to spread bed equally and level for set number of bricks.
- 2.4 Join and point face of brickwork using weather and struck jointing and weather pointing.
- 2.5 Gauge special requirement, and cut bricks using, brick hammer and trowel to cut sizes correctly.
- 2.6 Measure accurately linear distance between two given points.

- 2.7 Determine vertical and horizontal alignment and correct height of brickwork using plumb bob, spirit level and gauge staff to within a tolerance of 5 mm within 3 - 3.5 Mts. in vertical range.
- 2.8 Place materials in correct position to wall to ensure ease of manipulation during construction of same.
- 2.9 Mix concrete to specified mix using mix design or parts by volume, including dry mix and machine mix.
- 2.10 Set bricks using English Bond, Flemish Bond and English Garden Wall Bond.
- 2.11 Join together SWG pipes in single runs and check alignment, carry out jointing.
- 2.12 Mix plastering materials to given specification and apply correctly to vertical walls within a face plane tolerance of + or - 2 mm within 1 m range.
- 2.13 Erect scaffolding up to a height of 3.6m safely.
- 2.14 Adhere to personal safety and the safety of others in all aspects of work.

## SKILL STANDARD - MASON LEVEL II

### **1. KNOWLEDGE**

In addition to all the knowledge and the skill items outlined in Level III, a Level II Mason must also:

- 1.1 Interpret and understand working drawings.
- 1.2 Appreciate modern techniques of masonry, including use of a corner method of wall construction, corner block and trig bricks.
- 1.3 Understand simple calculations.
- 1.4 Be aware of all basic setting out techniques.
- 1.5 Appreciate simple mix design of mortars and concrete.
- 1.6 Understand methods of brickwork finishes, including steps and paving cills, arches, copings and the reasons they are utilised.
- 1.7 Understand the necessity for different types of trench timbering.
- 1.8 Be aware of the effects of loading on walls and lintels and reasons why various widths of walls are used for different structures.
- 1.9 Understand basic principles involved in all aspects of scaffolding.
- 1.10 Know types of sanitary fixtures.

- 1.11 Understand simple geometry of arches and setting out.
- 1.12 Have comprehensive knowledge of all brickwork bonds.
- 1.13 Appreciate safe working practice and utilisation of safety appliances, including working at height, storage of materials.
- 1.14 Be aware of different types of cement, lime and other additives.

## **2. SKILLS**

- 2.1 Transfer information taken from plans and working drawings to practical performance on site.
- 2.2 Build walls using corner method, with blocks, pins, lines, trigs and dead man to various wall widths.
- 2.3 Estimate material required for structural completion.
- 2.4 Set out from building line, interpreting site drawings to a tolerance within + or - 5 mm including setting out 90° angle work using 3-4-5 method and diagonal check.
- 2.5 Mix concrete and mortar to given specification including ability to supervise others to carry out said tasks.
- 2.6 Build up, plumb and square, door and window frames using the pad and bracket methods of fixing, within a tolerance of + or - 3 mm.
- 2.7 Set out and build steps and cills including horizontal, transverse and vertical alignment within a tolerance of + or - 3mm, cast lintels with steel reinforcement in correct position and build in over reveals.

- 2.8 Set out and build simple arches.
- 2.9 Select, erect and / or supervise trench timbering for given conditions of strata.
- 2.10 Select, erect and / or supervise scaffolding over the height of 3.6m upto to a height of 6.5m.
- 2.11 Set bricks using all known bonds.
- 2.12 Work safely with consideration to self and others, including head and eye protection, using ladder at safe angle of erection, storage and overall site cleanliness.
- 2.14 Set out and build rubble walling and foundation work.
- 2.15 Join and point the face of rubble work using different methods.

## SKILL STANDARD - MASON LEVEL I

### 1. KNOWLEDGE

In addition to all the knowledge and skill items outlined in Level III and Level II, a Level I Mason must also:

- 1.1 Understand simple Technical Drawing principles, relating to buildings and other types of structures.
- 1.2 Appreciate properties and basic manufacture processes of materials used by a Mason.
- 1.3 Know standard sizes of equipment, materials and fittings.
- 1.4 Appreciate working with other trades.
- 1.5 Understand geometry and relevant uses of various types of arches.
- 1.6 Know different types of shoring techniques for addition/alteration work.
- 1.7 Be aware of methods and reasons for using different types of internal and external wall and floor finishes.
- 1.8 Have knowledge of decorative brickwork and construction of same to give pleasing aesthetic value.
- 1.9 Appreciate different techniques used in plasterwork.

## 2. SKILLS

- 2.1 Prepare simple working drawings.
- 2.2 Plan work in co-ordination with other trades and site management.
- 2.3 Suggest methods of work and specify types of material to be used for given situations.
- 2.4 Set out and build all types of commonly used arches.
- 2.5 Erect simple shoring for repairs and maintenance, including cutting out and replacement of damaged portion, toothing and cutting existing brickwork, cutting openings and making good, cutting and making good plasterwork.
- 2.7 Set out and construct incorporating levels and gradients, all types of drain work, including pipe foundations, manhole bases, pipe laying straight runs and junctions, manholes, gullies, traps and rainwater outlets.
- 2.8 Plaster, render, including two coat application to vertical walling, internal and external corners, soffits, sand and cement screed floors and skirting, ceramic tiling to vertical walls and floor tiling.

## 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)
Mr. K.P. Raghavan	Jt. Genl. Manager (Buildings & System Housing)
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