MASON

1st Semester

TRADE PRACTICAL

SECTOR: Construction, Construction Material & Real Estate
Sector : Construction, Construction Material & Real Estate
Duration : 1 - Year
Trades : Mason 1st semester - Trade Practical

Copyright © 2014 National Instructional Media Institute, Chennai
First Edition : August 2014 Copies : 1,000
First Reprint : March 2016 Copies : 1,000

Rs. 110/-

All rights reserved.

No part of this publication can be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the National Instructional Media Institute, Chennai.

Published by:
NATIONAL INSTRUCTIONAL MEDIA INSTITUTE
P. B. No.3142, CTI Campus, Guindy Industrial Estate,
Guindy, Chennai - 600 032.
Phone: 044 - 2250 0248, 2250 0657
Fax : 91 - 44 - 2250 0791
email : nimichennai@vsnl.net , nimi_bsnl@dataone.in
Website: www.nimi.gov.in
FOREWORD

The National Instructional Media Institute (NIMI) is an autonomous body under the Directorate General of Employment and Training (DGE&T) Ministry of Labour and Employment has been developing, producing and disseminating Instructional Media Packages (IMPs) are extensively used in the Industrial Training Institutes/ Training centres in Industries to impart practical training and develop work-skills for the trainees and the trainers.

The Ministry of Labour & Employment constituted Mentor Councils (MCs) to revamp courses run / to be run under National Council of Vocational Training (NCVT) in 25 sectors. The MCs have representatives from thought leaders among various stakeholders viz. one of the top ten industries in the sector innovative entrepreneurs who have proved to be game-changers, academic/professional institutions (IITs etc.), experts from field institutes of DGE &T, champion ITIs for each of the sectors and experts in delivering education and training through modern methods like through use of IT, distance education etc. The technical support to the MCs is provided by Central Staff Training and Research Institute (CSTARI), Kolkata and National Instructional Media Institute (NIMI), Chennai. Some of the MCs are also supported by sector-wise Core Groups which were created internally in the Ministry (in 11 sectors).

A Steering Committee to provide overall coordination and guidance to Mentor Councils has also been constituted and has representation from the MCs, Chair positions to be endowed by the Ministry, trade unions, and experts on distance education and training. The MCs are mandated to work towards revamping/suggesting new courses, improving assessment systems, overall learning etc. for subjects under the purview of the NCVT.

Accordingly NIMI with the support and assistance of MC has developed Mason Trade Practical 1st Semester in Construction, Construction Material & Real Estate Sector to enhance the employability of ITI trainees across the country and also to meet the industry requirement.

I have no doubt that the trainees and trainers of ITIs & Training centres in industries will derive maximum benefit from these books and that NIMI's effort will go a long way in improvement of Vocational Training.

I complement Director, Mentor Council members, Media Development Committee (MDC) members and staff of NIMI for their dedicated and invaluable contribution in bringing out this publication.

ALOK KUMAR, I.A.S.,
Director General of Employment & Training/ Joint Secretary
Ministry of Labour and Employment
Government of India

New Delhi - 110 001
This National Instructional Media Institute (NIMI) was set up at Chennai by the Directorate General of Employment and Training (DGE&T) Ministry of Labour and Employment, Government of India with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and disseminate instructional materials for various trades as per the prescribed syllabi under the Craftsmen and Apprenticeship Training Schemes.

The instructional materials are developed and produced in the form of Instructional Media Packages (IMPs). An IMP consists of Trade Theory book, Trade Practical book, Test and Assignment book, Instructor guide, Wall Charts and Transparencies.

Hon'ble Union Minister of Finance during the budget speech 2014-2015 mentioned about developing Skill India and made the following announcement

"A national multi-skill programme called Skill India is proposed to be launched. It would skill the youth with an emphasis on employability and entrepreneur skills. It will also provide training and support for traditional professions like welders, carpenters, cobblers, masons, blacksmiths, weavers etc. Convergence of various schemes to attain this objective is also proposed."

The Ministry of Labour & Employment constituted Mentor Councils (MCs) to revamp courses run / to be run under National Council of Vocational Training (NCVT) in 25 sectors which will give a sustained skill based employability to the ITI trainees as the main objective of Vocational training. The ultimate approach of NIMI is to prepare the validated IMPs based on the exercises to be done during the course of study. As the skill development is progressive the theoretical content on a particular topic is limited to the requirement in every stage. Hence the reader will find a topic spread over a number of units. The test and assignment will enable the instructor to give assignments and evaluate the performance of a trainee. If a trainee possesses the same it helps the trainee to do assignment on his own and also to evaluate himself. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also helps the trainees to grasp the technical topic quickly. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirement,

Thus the availability of a complete Instructional Media Package in an institute helps the trainer and management to impart an effective training. Hence it is strongly recommended that the Training Institutes/Establishments should provide at least one IMP per unit. This will be small, one time investment but the benefits will be long lasting.

The Mason trade Practical 1st semester in Construction, Construction Material & Real Estate sector is one of the book develop by the core group members of the Mentor Councils (MCs). The 1st semester book includes Module 1- Wood Working, Module 2 - Layout marking and levelling, Module 3 - Masonry construction

The Mason trade Practical 1st semester is the outcome of the collective efforts of Members of Mentor Council which includes academic/professional institutions (IITs etc.), experts from field institutes of DGE&T, champion ITIs for each of the sectors, and also Media Development Committee (MDC) members and staff of NIMI.

NIMI wishes that the above material (Trade Practical & Trade Theory) will fulfil to satisfy the long needs of the Trainees and Instructor and helps the trainees for their employability in vocational training.

NIMI would like to take this opportunity to convey sincere thanks to all the Mentor Council members and Media Development Committee (MDC) members.

A. MAHENDIRAN
Director, NIMI.

Chennai - 600 032
ACKNOWLEDGEMENT

National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisation to bring out this IMP (Trade Practical) for the trade of Mason under the Construction, Construction Material & Real Estate Sector for Craftsman Training Scheme. This Book is prepared as per Revised Syllabus.

MEDIA DEVELOPMENT COMMITTEE

Dr. N. Dhang - Professor
D/O Civil Engineering,
Indian Institute of Technology, Kharagur,
Chairman, Mentor Council.

Shri. M.C. Sharma - Joint Director (TTC)
DGE & T, New Delhi,
Mentor, Mentor Council.

Smt. Arpana Singh - Training Officer
NVT (W), Noida,
Team leader, Mentor Council.

Shri. K.N. Babu - Training Officer
RVTI, Bangalore,
Member, Mentor Council.

Shri. G. Jayaraman - Retd. Assistant Training Officer
MDC Member, NIMI,
Member, Mentor Council.

Shri. M.N. Venkatraman - Retd. Assistant Director of Training
MDC Member, NIMI,
Member, Mentor Council.

Shri. R.N. Manna - Training Officer
CSTARI, Kolkatta,
Co-ordinator, Mentor Council.

Shri. V. Gopalakrishnan - Training Officer,
NIMI, Chennai-32,
Co-ordinator, NIMI, Chennai.

NIMI records its appreciation of the Data Entry, CAD, DTP Operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks, the invaluable efforts rendered by all other staff who have contributed for the development of this Instructional Material.

NIMI is grateful to all others who have directly or indirectly helped in developing this IMP.
INTRODUCTION

TRADE PRACTICAL

The trade practical manual is intended to be used in workshop. It consists of a series of practical exercises to be completed by the trainees during the First Semester course of the Mason trade supplemented and supported by instructions/informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered.

<table>
<thead>
<tr>
<th>Module</th>
<th>Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1 - Wood Working</td>
<td>13</td>
</tr>
<tr>
<td>Module 2 - Layout Marking and Levelling</td>
<td>07</td>
</tr>
<tr>
<td>Module 3 - Masonry Construction</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

The skill training in the shop floor is planned through a series of practical exercises centered around some practical project. However, there are few instances where the individual exercise does not form a part of the project.

While developing the practical manual, a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However, the development team accept that there is a scope for further improvement. NIMI looks forward to the suggestions from the experienced training faculty for improving the manual.

TRADE THEORY

The manual of trade theory consists of theoretical information for the First Semester course of the Mason Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptual capabilities for performing the skills.

The Trade theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indicating about the corresponding practical exercise are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise at least one class before performing the related skills in the shop floor. The trade theory is to be treated as an integrated part of each exercise.

The material is not the purpose of self learning and should be considered as supplementary to class room instruction.
<table>
<thead>
<tr>
<th>Exercise No.</th>
<th>Title of the Exercise</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.01</td>
<td>Visit various sections of the I.T.I</td>
<td>1</td>
</tr>
<tr>
<td>1.1.02</td>
<td>Sawing along the grain on carpenter's benchvice</td>
<td>2</td>
</tr>
<tr>
<td>1.1.03</td>
<td>Planning along the grain</td>
<td>6</td>
</tr>
<tr>
<td>1.1.04</td>
<td>Planning to size</td>
<td>8</td>
</tr>
<tr>
<td>1.1.05</td>
<td>Chiselling across the grain</td>
<td>11</td>
</tr>
<tr>
<td>1.1.06</td>
<td>Drilling, counter, sinking and tapping</td>
<td>15</td>
</tr>
<tr>
<td>1.1.07</td>
<td>Making of door frame</td>
<td>19</td>
</tr>
<tr>
<td>1.1.08</td>
<td>Making of door with panelled plank shutter</td>
<td>23</td>
</tr>
<tr>
<td>1.1.09</td>
<td>Making of king post truss (Model)</td>
<td>28</td>
</tr>
<tr>
<td>1.1.10</td>
<td>Wooden floor (Model)</td>
<td>32</td>
</tr>
<tr>
<td>1.1.11</td>
<td>Nailing practice</td>
<td>35</td>
</tr>
<tr>
<td>1.1.12</td>
<td>Screwing practice</td>
<td>39</td>
</tr>
<tr>
<td>1.1.13</td>
<td>Preparation of formwork for R.C.C columns</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td><strong>Module 2 : Layout marking and levelling</strong></td>
<td></td>
</tr>
<tr>
<td>1.2.01</td>
<td>Set out a building - marking first and second line</td>
<td>46</td>
</tr>
<tr>
<td>1.2.02</td>
<td>Set out a building - marking third and fourth line</td>
<td>51</td>
</tr>
<tr>
<td>1.2.03</td>
<td>Set out a building marking the centre line layout of the building</td>
<td>53</td>
</tr>
<tr>
<td>1.2.04</td>
<td>Set out a building - marking width of foundation on the ground for excavation</td>
<td>56</td>
</tr>
<tr>
<td>1.2.05</td>
<td>Set out a building obtaining plinth level mark</td>
<td>59</td>
</tr>
<tr>
<td>1.2.06</td>
<td>Measuring down from plinth level</td>
<td>61</td>
</tr>
<tr>
<td>1.2.07</td>
<td>Set out first peg for concrete foundation level</td>
<td>62</td>
</tr>
<tr>
<td>Exercise No.</td>
<td>Title of the Exercise</td>
<td>Page No.</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>1.3.01</td>
<td>Method to stack bricks at work place</td>
<td>63</td>
</tr>
<tr>
<td>1.3.02</td>
<td>Method of soak the brick</td>
<td>65</td>
</tr>
<tr>
<td>1.3.03</td>
<td>Method of cutting bricks</td>
<td>66</td>
</tr>
<tr>
<td>1.3.04</td>
<td>Mixing of mortar 1:5 mix</td>
<td>68</td>
</tr>
<tr>
<td>1.3.05</td>
<td>Half brick thick straight wall</td>
<td>71</td>
</tr>
<tr>
<td>1.3.06</td>
<td>Build half brick thick corner wall (stretcher)</td>
<td>75</td>
</tr>
<tr>
<td>1.3.07</td>
<td>Build one brick corner wall in english bond</td>
<td>78</td>
</tr>
<tr>
<td>1.3.08</td>
<td>Making of ‘L’ corner wall with 1 1/2 brick thick in english bond</td>
<td>80</td>
</tr>
<tr>
<td>1.3.09</td>
<td>Layout and build one brick or 23cm wall in flemish bond</td>
<td>82</td>
</tr>
<tr>
<td>1.3.10</td>
<td>Lay and build 1 1/2 brick thick wall ‘L’ corner in flemish bond’</td>
<td>84</td>
</tr>
<tr>
<td>1.3.11</td>
<td>Construction english garden wall bond 23cm thick</td>
<td>87</td>
</tr>
<tr>
<td>1.3.12</td>
<td>Construct flemish garden wall bond 23cm thick</td>
<td>89</td>
</tr>
<tr>
<td>1.3.13</td>
<td>Layout and build one brick right angle cross junction wall in english bond</td>
<td>90</td>
</tr>
<tr>
<td>1.3.14</td>
<td>Prepare cement concrete by hand mix</td>
<td>93</td>
</tr>
<tr>
<td>1.3.15</td>
<td>Lay R.C.C lintels with sun shade</td>
<td>95</td>
</tr>
<tr>
<td>1.3.16</td>
<td>Construction of detached square pillar with footing</td>
<td>97</td>
</tr>
<tr>
<td>1.3.17</td>
<td>Construction of detached rectangular pillar with footing</td>
<td>98</td>
</tr>
<tr>
<td>1.3.18</td>
<td>Construction of cavity wall</td>
<td>99</td>
</tr>
<tr>
<td>1.3.19</td>
<td>Fix door frames in masonry</td>
<td>101</td>
</tr>
<tr>
<td>1.3.20</td>
<td>Work spanning of door /window opening in one brick thick wall english bond semi circular arch</td>
<td>104</td>
</tr>
</tbody>
</table>
Visit various sections of the ITI

Objectives: At the end of this exercise you shall be able to
• identify the ITI staff their designation and their names
• list the trades available at your ITI
• draw the layout of the ITI mason section.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Set of scale</td>
<td>• Drawing sheet A3</td>
</tr>
<tr>
<td>• Measuring tape 20m</td>
<td>• Pencil HB</td>
</tr>
<tr>
<td>• Set square</td>
<td>• Eraser</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Visit various section of ITI and acquaint with the staff members

1. During the visit collect information like the designation of staff member, their name.
2. Identify the sections of the ITI and list the trade in which training is given.
3. Identify the location of ITI with respect to railway and bus stations and list of bus route numbers which place near the ITI.
4. Collect the telephone numbers of ITI office, nearest hospital, nearest police station and nearest fire station.

TASK 2: Draw the layout of mason (Building constructor) section of ITI

• Draw the plan of mason section to a suitable side in drawing sheet. (A3 size)
• Take the length and breadth measurement of doors, windows, furniture.
• Draw the layout of mason workshop and placement of doors and windows and furniture.
SAWING ALONG THE GRAIN ON CARPENTER’S BENCHVICE
Sawing along the grain on carpenter’s bench vice

Objectives: At the end of this exercise you shall be able to
• mark the job
• set and sharp the saw
• clamp the job in the carpenter’s vice
• saw along the grain.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Notched saw set (or) Pliers sawset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four fold wooden rule</td>
<td>Oil stone</td>
</tr>
<tr>
<td>Carpenter pencil</td>
<td>File holder</td>
</tr>
<tr>
<td>Try square 200mm</td>
<td>Warm saw (Rip saw)</td>
</tr>
<tr>
<td>Straight edge</td>
<td>Carpenter bench with vice</td>
</tr>
<tr>
<td>Hand saw 450mm</td>
<td>Saw vice</td>
</tr>
<tr>
<td>Flat file 300mm</td>
<td></td>
</tr>
<tr>
<td>Triangular file 150mm</td>
<td></td>
</tr>
<tr>
<td>Saw sets (slim-taper)</td>
<td></td>
</tr>
</tbody>
</table>

| Material                                    |                                   |
|---------------------------------------------|                                   |
| Hard wood 450 x 25 x 200mm (Kongu wood)     |                                   |

PROCEDURE

1 Mark the job as per drawing. Hold the job firmly in the carpenter’s vice vertically leaving 150mm above the vice and parallel to jaws.
2 Set and sharp the saw. Grip the saw handle with right hand index finger along the side. (Fig 1).
3 Place the saw on marked line at an angle of 65°.
4 Hold the handle to form an angle of 65° with job.
5 Move the saw forward and backward with even pressure to form a saw cut using left hand thumb as a guide.
6 Saw to a depth of 400mm on marked line of the job.
7 Repeat the sawing for the other marked lines.

Skill sequence 1

Objectives: This shall help you to
• clamp the job in carpenter’s vice.
1 Clean the jaws of carpenter’s bench vice, by cleaning wire brush making it free from saw dust.
2 Open the jaws of the carpenter vice by turning the handle anti-clock-wise direction.
3 It should be wide enough to hold the job.
4 Hold the job vertically 150 mm above the vice, and parallel to jaws. Close the jaws to hold job firmly in the vice. (Fig 1)
   Do not over tighten the job.
Skill sequence 2

Objectives: This shall help you to
• mark the job.

Marking
1. Place the job horizontally on the work bench.
2. With carpenter’s pencil, wooden rule and straight edge mark 50mm from the left of the job.
3. Continue marking at intervals of 50mm to length of 400mm.
4. Repeat the procedure on end side and back side keeping the try squares on the edge of the end side. Mark the line with straight edge. (Fig 1)

Skill sequence 3

Objectives: This shall help you to
• set and sharpen the saw.

Topping (Fig 1)
Fix the saw in the saw vice.
Set the flat file in the wooden block to level all the teeth by running a fine flat file, along the length of the saw teeth.
The file must be kept flat and passed lightly, over the tops of the teeth and levelled.

Re-Shaping (Fig 2)
File all the teeth to their correct shape and size with triangular saw file.
Press the file firmly against each gullet, and held at right angles across the blade. Make all the teeth the same shape, the front edge being 70° to 80° to the line of the teeth.
Maintain the same grip throughout filing.
Each gullet is filed turn, until tooth of the finished side hits a point and half the flat on the next tooth is filed away.
When a saw is being set the blade should be fastened into the saw clamp.

When one row of the teeth has been set, the saw is reversed in the clamp and then the other row is bent.

**Setting**

**The notched saw setting** (Fig 4)

Notched saw setting operation consists of bending over the teeth alternately to one side and then to the other.

The notched saw set demands more practice than the pliers.

![Fig 4](image)

**Plier saw set** (Fig 5)

The pliers can be adjusted to the size of the teeth.

Bend every tooth about two-thirds of its length, and to the same degree side way.

Total thickness of saw set should be 1½ times the saw thickness.

![Fig 5](image)

**Sharpening** (Fig 7)

- Select a tapered triangular saw file with slightly round corner.
- Start sharpening at the point of the saw.
- Sharp the tooth of the saw at 30° to 45°.
- Hold the file at 90° both vertically and horizontally while filing the tooth of the saw.
- Remove the burr produced by the file by passing an oil stone lightly along the side of the teeth.

![Fig 7](image)
Planing along the grain

Objectives: At the end of this exercise you shall be able to
• grind and sharpen the cutting-iron
• set the plane for planing
• plane a wooden piece to obtain surface flatness
• check the flatness and squareness with try square.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Carpenter pencil</td>
<td>• Hard wood (Kongu wood)</td>
</tr>
<tr>
<td>• Four fold wooden rule</td>
<td>60 x 25 x 250mm</td>
</tr>
<tr>
<td>• Try square 150mm</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>• Jack plane 450mm</td>
<td></td>
</tr>
<tr>
<td>• Ball pein hammer - 1 Pound</td>
<td></td>
</tr>
<tr>
<td>• London pattern screw driver</td>
<td></td>
</tr>
<tr>
<td>• Work bench with vice</td>
<td></td>
</tr>
<tr>
<td>• Bench stops (Dogs)</td>
<td></td>
</tr>
<tr>
<td>• Pair of winding sticks</td>
<td></td>
</tr>
<tr>
<td>• Oil can</td>
<td></td>
</tr>
<tr>
<td>• Oil stone</td>
<td></td>
</tr>
<tr>
<td>• Wet grinder</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

Oblique sawing across the grain (Fig 1)

1 Place the job against bench stop.
2 Hold the plane with the right hand, keeping the index finger on the side.
3 Place the palm of left hand on the toe of the plane thumb and fingers on the side. (Fig 1)
4 Stand near the bench with left foot forward at 70° with the neck and the right foot at a convenient distance.
5 Place the plane straight on the job and give forward stokes (Fig 2)
6 At the begining of stroke exert more pressure with left hand as the stroke proceeds, gradually the pressure by the left hand is reduced, more pressure comes to the right hand. The main object is to keep the plane always horizontal. Fig (3) and Fig (4)
7 Release the pressure on the back stroke and merely draw the plane to the first position.
**Skill sequence 1**

**Objectives:** This shall help you to
- set the jack plane.

Remove cutting iron, cap iron and the wedge from the jack plane by slightly striking by hammer. (Fig 1)

Sharpen the cutting iron with oil stone at an angle of 25° to 30° (Fig 2)

Set the cap iron and cutting iron keeping a gap of 1mm. Reset the cap iron, cutting iron and the wedge. (Fig 3)

---

**Precautions**

1. Do not give pressure by right hand when you start the planing.
2. Do not put pressure by left hand at the end of the stroke.

11. Try to plane the wood uniformly.
12. Do not plane continuously without checking the surface.
13. Do not take a big cut for finishing.

*Keep the plane when not in use on its side and not on its cutting edge.*

8. Check the flatness of the surface occasionally with try square or straight edge
9. Repeat the procedure till the surface becomes flat.
10. Clean the job and clean the bench and tools.
### PLANING TO SIZE

<table>
<thead>
<tr>
<th>1</th>
<th>120 x 25 x 250</th>
<th>HARD WOOD</th>
<th>2 (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.OFF</td>
<td>STOCK SIZE</td>
<td>SEM-PRODUCT</td>
<td>PROJECT NO.</td>
</tr>
</tbody>
</table>

**SCALE NTS**

- TOLERANCE ±2.0 mm
- TIME 5h

CODE NO. MB1706E1
Planing to size

Objectives: At the end of this exercise you shall be able to
• plane the face side
• plane the face edge
• mark and plane the width of the job
• mark and plane the thickness of the job
• check the flatness and squareness of the job.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpenter pencil</td>
</tr>
<tr>
<td>Four fold wooden rule</td>
</tr>
<tr>
<td>Jack plane 450mm</td>
</tr>
<tr>
<td>Hammer - 1 pound</td>
</tr>
<tr>
<td>Marking gauge</td>
</tr>
<tr>
<td>Try square</td>
</tr>
<tr>
<td>Work bench with vice</td>
</tr>
<tr>
<td>Bench stop</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard wood (Kongu wood)</td>
</tr>
<tr>
<td>120 x 25 x 250mm</td>
</tr>
<tr>
<td>- 1 No.</td>
</tr>
</tbody>
</table>

PROCEDURE

1. Set the jack plane for planing.
2. Place the job on the work bench or hold the job on the carpenter’s vice with face side up.
3. Keep the packing piece between the job and the vice.
4. Keep the job horizontally flat in the vice.
5. Start planing the face side with jack plane.
6. Check its flatness with try square.
7. Mark the face side on the job using pencil.
8. Place the face edge up and hold it in the vice with packing piece.
9. Plane it along the face edge.
10. Check its squareness and flatness of the job.
11. Mark the face edge on the job using pencil.
12. Gauge to the required width of 100mm on both sides using the marking gauge from the face edge. Plane down the gauge lines. Test for straightness and squareness. (Fig 1)
13. Set the marking gauge 21mm for the required thickness.
14. Gauge to the required thickness of 21mm from the face side using marking gauge on both the edges. Plane down the gauge lines. Test for flatness. (Fig 2)

Note: While planing keep the left foot in forward position and parallel to the work bench. Right foot obliquely under the work bench. Right forearm should be in line with the plane. Left hand is held on the front part of the plane. Planing should be in the direction of grain.
Skill sequence 1

Objectives: This shall help you to

• mark the job using marking gauge.

1. Hold the gauge in left hand keeping the spur up.
2. Hold the foot rule in right hand and set the required
distance between stock and spur. Keep the graduation
of foot rule in front. (Fig 1)

3. Adjust the stock with the help of left hand thumb, and
index finger. Now the marking gauge is set. Tighten the
thumb screw.
4. Check the measurement of accuracy.
5. Hold the gauge stock in right hand thumb on top.
6. Place one end of the piece against the bench stop and
other end in left palm.
7. Place gauge stock in contact with the face edge of the
piece and spur touching the piece lightly in slanting
position.

8. Give forward stroke on the stock near the end (Fig 2)

9. Hold the piece in left hand and complete the gauge
mark.
10. Check the gauge mark with foot rule.

Precautions

Do not use a long spur for gauging.
Do not see the distance by keeping the rule flat.
Do not press spur while gauging.
Do not try to make a deep gauge.
Keep the stock face rubbing against the straight
dge.
Do not put the spur at right angles with the face.
PLANING ACROSS THE GRAIN

<table>
<thead>
<tr>
<th>NO.OFF</th>
<th>STOCK SIZE</th>
<th>SEMI-PRODUCT</th>
<th>MATERIAL</th>
<th>PROJECT NO.</th>
<th>PART NO.</th>
<th>EX. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 x 25 x 250</td>
<td>HARD WOOD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SCALE NTS

TOLERANCE ±2.0 mm
TIME 5h

CODE NO. MB1707E1
Chiselling across the grain

Objectives: At the end of this exercise you shall be able to
• grind and sharpen chisel blade
• mark the piece for chiselling
• chisel the wooden piece.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpenter pencil</td>
<td></td>
</tr>
<tr>
<td>Scribe</td>
<td></td>
</tr>
<tr>
<td>Jack plane</td>
<td></td>
</tr>
<tr>
<td>Try square</td>
<td></td>
</tr>
<tr>
<td>Hammer (Ball pein)</td>
<td></td>
</tr>
<tr>
<td>Mallet</td>
<td></td>
</tr>
<tr>
<td>Marking gauge</td>
<td></td>
</tr>
<tr>
<td>Four fold wooden rule</td>
<td></td>
</tr>
<tr>
<td>Firmer chisel bevelled edge 35mm, 25mm</td>
<td></td>
</tr>
<tr>
<td>Tenon saw</td>
<td></td>
</tr>
<tr>
<td>Work bench with vice</td>
<td></td>
</tr>
<tr>
<td>Grinding stone machine</td>
<td></td>
</tr>
<tr>
<td>Oil stone</td>
<td></td>
</tr>
<tr>
<td>Bench hook</td>
<td></td>
</tr>
<tr>
<td>Oil can</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Hard wood (Kongu wood)</td>
<td></td>
</tr>
<tr>
<td>150 x 50 x 20mm – 1 No.</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

1. Grind and sharpen the firmer chisel.
2. Plane the job to the required size of 150 x 50 x 20mm.
3. Hold the job on the vice and check it with try square for its flatness.
4. With scriber and try square mark out lines at a distance 50mm and 100mm from left side.
5. Set the marking gauge to 10mm and scribe on the middle of face edge and its opposite side.
6. Mark the 10mm dimension on the job as per the drawing.
7. Place the tenon saw on the line marked and saw it to a depth of 10mm.
8. Repeat the procedure for the other side saw it to a depth of 10mm.
9. Hold the firmer chisel in your right hand on the handle and guide the blade with left hand.
10. Control the movement of the chisel with thumb and fore finger.
11. Push it on the space to be cut.
12. Start chiselling away from you the bevel of the chisel turned upwards.
13. Chisel in an inclined direction up to middle of the portion (Fig. 1)

Safety precaution

Never hold your hand or finger before the cutting edge.
Never use a chisel without a proper handle.

14. Reverse the work piece so that the back side comes to front and hold in the vice.
15. Chisel the waste material away from you up to middle portion.
16. Repeat the chiselling as shown in (Fig 2).
17 Start chiselling slowly to make flat portion.
18 Repeat the procedure for the other side. Saw it to a depth of 10mm.
19 Smooth the bottom and side walls with firmer chisels. (Fig 3)

**Skill sequence 1**

**Marking job for chiselling**

**Objectives:** This shall help you to
- mark the job for chiselling across the grain.

**Marking sequence**

Hold the job 160 x 60 x 25 on the bench or vice.

Plane it to size 160 x 50 x 20.

With try square and steel rule mark 5mm, 55mm, 105mm and 155mm from one end of the job. Fig 1

Hold the stock of the try square closely in contact with face edge and mark lines with scribe and wooden rule at the distance of 5 mm, 55mm, 105mm & 155 mm on all four sides. Fig 2

Set the marking gauge to 10mm and scribe on the middle of face edge and its opposite side. (Fig 3)

For the end side, chisel 5mm width on all four sides slowly upto a depth of 3mm, then up to 5mm and chisel off the waste end with firmer chisel.
Skill sequence 2

Grinding and honing of chisel

Objectives: This shall help you to
- grind and sharpen the chisel.

Grinding

Remove the Nicks in the blade by slightly pushing the blade against grinding wheel. (Fig 1)

Adjust the tool rest of the grinder to the required angle of 25°.

Place the blade over the tool rest and move the chisel evenly across the wheel to get required sharpness. (Fig 2)

Honing a chisel

Wet the surface of the oil stone with oil. (Fig 3)

Lay the cutting bevel on the surface.

Place the blade until the cutting edge is parallel on the stone.

Hold the blade at an angle of 30° to the oil stone. (Fig 4)

Move the chisel backward and forward on full length and width of the stone until a burr is formed on the flat side of the blade.

The burr can be felt by rubbing lightly with a finger tip.

Turn the blade over and hold it perfectly flat on the stone. Rub from side to side until burr has disappeared.

Precaution

Never touch the wheel while rotating.

Avoid burning of the blade.

Cool the blade frequently in water.

Never allow the blade to become blue.

Wear safety goggles while grinding.
Ø5, Ø7, Ø8 DRILL HOLES
Ø5, Ø7, Ø8 C’SINK HOLES
M5, M6, M8 TAPPED HOLES

DRILLING, COUNTER-SINKING AND TAPPING
Drilling, tapping and countersinking

Objectives: At the end of this exercise you shall be able to
• file and surface parallel within \( \pm 0.2\text{mm} \)
• drill through holes
• countersinking holes to fit standard screw threads
• cut internal threads using hand taps.

JOB SEQUENCE

1. Check the size of the given raw material.
2. File and finish the plate to 60 x 11 x 60 within \( \pm 0.2\text{mm} \).
3. Locate centres for holes to be drilled, tapped and counter sunk.
4. Centre punch the located centres.
5. Drill two Ø 5mm holes one for counter sinking.
6. Drill two Ø 7mm holes, one for counter sinking.
7. Drill Ø 4.5mm hole for M5 tapping drill size.
8. Drill Ø 6.2mm hole for M8 tapping.
9. Drill Ø 7.2mm hole for M7 tapping drill size.
10. Cut internal threads of M5, M7 and M8 in the drilled holes of Ø4.5mm, Ø6.2mm and Ø7.2mm.
11. Counter sink the holes of Ø5mm, Ø 7mm and Ø 8mm with 90° countersinks as per standard. (Refer to table).
12. Check M5, M7 and M8 tapped holes with the supplied M5, M7 and M8 screws respectively.
Skill sequence 1  
Countersinking

**Objectives**: This shall help you to
• countersink holes of different sizes.

**Selection of countersinks**

Select the countersinking tool according to the angle of the taper head of the screw. Use the `table for countersink holes'.

**Procedure**

Fix the job in the machine vice (if necessary, use parallel blocks) and set it square.

Align the machine spindle with the drilled hole to be countersunk. (Fig 1)

![Figure 1](image1.png)

Remove the drill and fix the countersink tool on the machine without disturbing the alignment. (Fig 2)

![Figure 2](image2.png)

Set the spindle speed of the drilling machine to the nearest calculated r.p.m. Use the formula

\[ V = \frac{\lambda \times D \times N}{1000} \]

Substitute the recommended value of 'V' and diameter of countersink. (V=1/3rd of drilling cutting speed)

Countersink the hole to a depth equal to the head length of the screw. (Fig 3)

![Figure 3](image3.png)

Check the countersunk hole with a suitable countersink head screw for proper seating. (Fig 4)

![Figure 4](image4.png)

---

Counterboring

**Objectives**: This shall help you to
• counterbore holes of different sizes concentric to drilled holes

**Selection of counterbore sizes**

B.I.S. recommends different sizes of counterbores based on the sizes of clearance holes. (Fig 1)

Select the counterbore according to the screw size.

![Figure 1](image5.png)
Procedure

Fix the job in the machine vice, square to the axis of the machine spindle. Use parallel blocks. (Fig 2)

Set the location of the drilled hole position using the correct diameter drills.

Align the spindle axis with the drilled hole. For accurate work, drill and counterbore in one setting.

Mount and fix the counterbore tool on the drilling machine spindle. (Fig 3)
Set the spindle speed of the drilling machine to the nearest calculated r.p.m. Use the formula:

$$V = \frac{\lambda \times D \times N}{1000}$$
(Consider the value of "V" as 1/3rd of the drilling cutting speed.)

Counterbore the hole to a depth equal to the length of the screw head. (Fig 4)

Use the depth stop arrangement for controlling the depth of the counterbored hole.

Check the depth of the counterbored hole. (Use the correct screw for checking the depth and seating)

Internal threading of through holes using hand taps

Objectives: This shall help you to
• determine the tap drill sizes for internal threading
• cut internal threads using hand taps.

Determining the tap drill size

For cutting internal threads, it is necessary to determine the size of the hole (tap drill size). This can be calculated using the formula or can be chosen from the table of tap drill sizes.

Procedure

Drill the hole to the required tap drill size.

Do not forget to give the chamfer required for aligning and starting the tap. (Fig 1)

Hold the work firmly and horizontally in the vice. The top surface should be slightly above the level of the vice jaws. This will help in using a try square without any obstruction while aligning the tap.

Use soft jaws while holding the finished surface on a vice.

Fix the first tap (Taper tap) in the wrench.
MAKING OF DOOR FRAME (MODEL)

<table>
<thead>
<tr>
<th>NO.OFF</th>
<th>STOCK SIZE</th>
<th>SEMI-PRODUCT</th>
<th>MATERIAL</th>
<th>PROJECT NO.</th>
<th>PART NO.</th>
<th>EX. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8 x 8 x 75</td>
<td></td>
<td>TEAK WOOD</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>75 x 65 x 1080</td>
<td></td>
<td>TEAK WOOD</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>75 x 65 x 690</td>
<td></td>
<td>TEAK WOOD</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Making of Door frame (Model)

Objectives: At the end of this exercise you shall be able to
• make tenon and mortise joint
• make single dovetail joint
• make bridle joint
• make rebate on inside the frame
• assemble and finish the door frame.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wooden rule</td>
<td>• Teakwood</td>
</tr>
<tr>
<td>• Jack plane</td>
<td>75 x 65 x 1080 - 2 Nos.</td>
</tr>
<tr>
<td>• Try square</td>
<td>75 x 65 x 690 - 2 Nos.</td>
</tr>
<tr>
<td>• Smoothing plane</td>
<td>8 x 6 x 75 - Wooden peg - 8 Nos.</td>
</tr>
<tr>
<td>• Carpenter pencil</td>
<td>• Fevicol - 100gm.</td>
</tr>
<tr>
<td>• Smoothing plane</td>
<td></td>
</tr>
<tr>
<td>• Bevel square</td>
<td></td>
</tr>
<tr>
<td>• Scriber</td>
<td></td>
</tr>
<tr>
<td>• Mortise chisel 10mm</td>
<td></td>
</tr>
<tr>
<td>• Firmer chisel 25mm, 50mm</td>
<td></td>
</tr>
<tr>
<td>• Hand saw</td>
<td></td>
</tr>
<tr>
<td>• Tenon saw</td>
<td></td>
</tr>
<tr>
<td>• Mallet</td>
<td></td>
</tr>
<tr>
<td>• Work bench with vice</td>
<td></td>
</tr>
<tr>
<td>• Bar cramp</td>
<td></td>
</tr>
<tr>
<td>• Ball pein hammer 1lb</td>
<td></td>
</tr>
<tr>
<td>• Marking gauge</td>
<td>• Mortise gauge</td>
</tr>
<tr>
<td>• Mortise gauge</td>
<td></td>
</tr>
<tr>
<td>• Jointer plane</td>
<td>• Thickness planer</td>
</tr>
<tr>
<td>• Carpenter pencil</td>
<td>• Mortising machine</td>
</tr>
<tr>
<td>• Scriber</td>
<td>• Tenoning machine</td>
</tr>
<tr>
<td>• Mortising machine</td>
<td>• Drilling machine</td>
</tr>
<tr>
<td>• Tenoning machine</td>
<td></td>
</tr>
<tr>
<td>• Drilling machine</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

1. Check the size of the raw material. i.e.,
   - 75 x 65 x 1080 - 2 Nos.
   - 75 x 65 x 690 - 2 Nos.
   - 8 x 6 x 75 - 8 Nos.

2. Plane the raw material to the required size of ..
   - 66 x 50 x 1080 - 2 Nos.
   - 66 x 50 x 690 - 2 Nos.

3. Check the length and squareness of planed pieces using trysquare and wooden rule.

4. Mark the total length on A, B, C and D pieces as per drawing.

5. Mark and make the dovetail socket on left end of part A as per the drawing. (Fig 1).

6. Mark and make haunched mortise on right hand end of part A as per drawing. (Fig 2).

7. Mark and make dovetail pin on one end (left side) of part B as per drawing. (Fig 3).

8. Mark and make the pin portion of bridle joint on the other end of part B as per the drawing. (Fig 4).

9. Mark and make haunched tenon on top end of part C as per drawing. (Fig 5).
10. Mark and make dovetail pin on bottom end of part C as per drawing. (Fig 6).

11. Mark and make bridle socket on left end of part D as per drawing. (Fig 7).

12. Mark and make the single dovetail socket on right end of the part D as per drawing. (Fig 8).

Fig 3

Fig 6

Fig 4

Fig 7

Fig 5

Fig 8

Construction, Construction Material & Real Estate : Mason - Exercise: 1.1.07
13 Mark and make the rebate of 30mm deep and 10 mm wide on the face side and face edge of all four pieces A, B, C and D through out length. (Fig 9).

14 Check and assemble the joints, if any fault noticed rectify with firmer chisel.

15 Mark the drill hole position for wooden plug / pin.

16 Apply glue on all joint portions and fix the bar cramp with supporting piece at the ends of the frame near the joints and tighten it gently.

17 Check the squareness and dimensions using try square and wooden measuring rule. (Fig 10).

18 Adjust the bar cramp and set the frame using ball pein hammer.

19 Drill 6mm hole on the centre of the joints.

20 Prepare wooden peg (8 Nos.) of 6mm dia.

21 Apply glue on wooden peg of 6mm dia. and insert in the drill holes and strike with ball pein hammer.

22 Cut the projections of wooden peg using tenon saw.

23 Remove the bar cramp.

24 Allow the glue to dry. Finish the door frame using smoothing plane.
MAKING OF DOOR WITH PANELED PLANK SHUTTER

<table>
<thead>
<tr>
<th>NO.</th>
<th>OFF.</th>
<th>SIZE</th>
<th>MATERIAL</th>
<th>PROJECT NO.</th>
<th>PART NO.</th>
<th>EX. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>75 x 85 x 930</td>
<td>EX No. 3</td>
<td>TEAK WOOD</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SCALE: NTS

DEVIATIONS ± 2.0 mm
TIME: 20h

CODE NO. MB1711E1
Making of Door with panelled plank shutter

Objectives: At the end of this exercise you shall be able to
- make the double haunched mortise and tenon joint
- make the haunched mortise and tenon joint
- make the blind mortise and tenon joint
- make the grooved surface
- make the panel on plank
- assemble and finish the panelled door shutter.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel rule</td>
<td>• 60 x 35 x 960 - 2 Nos.</td>
</tr>
<tr>
<td>Jack plane</td>
<td>• 60 x 35 x 550 - 1 No.</td>
</tr>
<tr>
<td>Try square</td>
<td>• 165 x 35 x 510 - 1 No.</td>
</tr>
<tr>
<td>Scriber carpenter pencil</td>
<td>• 190 x 35 x 550 - 1 No.</td>
</tr>
<tr>
<td>Marking gauge</td>
<td>• 60 x 35 x 455 - 1 No.</td>
</tr>
<tr>
<td>Mortise gauge</td>
<td>• 60 x 35 x 380 - 1 No.</td>
</tr>
<tr>
<td>Firmer chisel</td>
<td>• 220 x 25 x 380 - 2 Nos.</td>
</tr>
<tr>
<td>Mortise chisel</td>
<td>• 220 x 25 x 255 - 2 Nos.</td>
</tr>
<tr>
<td>Mallet</td>
<td>• 8 x 8 x 76 (Wooden peg) - 16 Nos.</td>
</tr>
<tr>
<td>Work bench with vice</td>
<td></td>
</tr>
<tr>
<td>Bar cramp</td>
<td></td>
</tr>
<tr>
<td>Ball pein hammer</td>
<td></td>
</tr>
<tr>
<td>Smoothing plane</td>
<td></td>
</tr>
<tr>
<td>Grooving plane</td>
<td></td>
</tr>
<tr>
<td>Tenon saw</td>
<td></td>
</tr>
<tr>
<td>Jointer machine</td>
<td></td>
</tr>
<tr>
<td>Thickness planer</td>
<td></td>
</tr>
<tr>
<td>Mortising machine</td>
<td></td>
</tr>
<tr>
<td>Tenoning machine</td>
<td></td>
</tr>
<tr>
<td>Drilling machine</td>
<td></td>
</tr>
<tr>
<td>Circular saw machine</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

1. Plane the raw materials to the required sizes (i.e)
   a) Stiles 50 x 30 x 940 2 Nos.
   b) Top cross rail 50 x 30 x 530 1 No.
   c) Centre lock rails 155 x 30 x 490 1 No.
   d) Bottom cross rail 180 x 30 x 530 1 No.
   e) Mullion top vertical rail 50 x 30 x 360 1 No.
   f) Mullion bottom vertical rail 50 x 30 x 360 1 No.
   g) Top panelled plank 210 x 20 x 360 2 Nos.
   h) Bottom panelled plank 210 x 20 x 235 2 Nos.

2. Check the length and squareness of planed pieces with trysquare and steel rule.

3. Mark and make the total length on A-A1 pieces as per drawing.

4. Mark and make the through haunched mortise on top of the stiles as per drawing A-A1 (Fig 1).

5. Mark and make double through haunched mortise on the bottom end of the stiles as per drawing (A-A1).

6. Mark and make the total length on B, C and D pieces as per drawing.

7. Mark and make haunched tenon on both the ends of the top cross rail as per the drawing (B). (Fig 2).

8. Mark and make the blind double tenon on both the ends of the middle lock rail as per drawing (C). (Fig 3).

9. Mark and make the double through haunched tenon on both the ends of the bottom rail as per drawing (D). (Fig 4)

10. Mark and make the blind mortise on the middle of the top cross rail as per drawing (B). (Fig 2).

11. Mark and make through mortise on middle of the cross lock rail as per drawing (C). (Fig 3).
12 Mark and make the blind mortise on the middle of the bottom rail as per drawing (D). (Fig 4).

13 Mark and make the blind tenon on both the ends of the top mullion rail as per drawing (E). (Fig 5).
14. Mark and make the blind tenon on both the ends of the bottom mullion rail as per drawing (F). (Fig 6).

15. Mark and make the grooves on stiles, rails and mullion pieces as per drawing. (Fig 7).

16. Mark and make the bevels on panel pieces of the door as per drawing (G-H). (Fig 8 & 9).
17 Check the required dimension of mortise, tenon, groove and panels on respective pieces before assembling.

18 Prepare the wooden pegs.

19 Mark the drill hole position on stiles and rails.

20 Apply the glue on mortice and tenon surfaces and assemble the stiles, rails and panels with their respective pieces for correct assembling.

21 Clamp the pieces together using bar clamp on top cross rail and stiles of the frame.

22 Drill the holes at the centre of the mortise and tenon joint.

23 Insert the wooden peg in drilled hole of the frame.

24 Repeat the same procedure on other mortise and tenon joints also.

25 Cut off the projected wooden pegs using hand saw

26 Finish the door shutter using jack plane and smoothing plane.
### Making of King Post Truss (Model)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8 x 8 x 50</td>
<td></td>
<td>Teak Wood</td>
<td>Wooden Peg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>50 x 25 x 300</td>
<td></td>
<td>Teak Wood</td>
<td>King Post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>50 x 25 x 900</td>
<td></td>
<td>Teak Wood</td>
<td>Tie Beam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>50 x 25 x 450</td>
<td></td>
<td>Teak Wood</td>
<td>Rafter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>25 x 25 x 225</td>
<td></td>
<td>Teak Wood</td>
<td>Strut</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Code No:** MB1715E1

**Scale NTS**

**Deviations ± 0.5 mm**

**Time:** 25h
Making of King post truss (Model)

Objectives: At the end of this exercise you shall be able to
- make the mortise and tenon joint
- make the oblique mortise and tenon joint
- make the logged (brindle) joint
- assemble and finish the king post truss.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wooden rule</td>
<td>Teak wood</td>
</tr>
<tr>
<td>Jack plane</td>
<td>50 x 25 x 900 Tie beam</td>
</tr>
<tr>
<td>Try square</td>
<td>50 x 25 x 300 King post</td>
</tr>
<tr>
<td>Bevel square</td>
<td>50 x 25 x 450 Principle rafter</td>
</tr>
<tr>
<td>Carpenter pencil</td>
<td>25 x 25 x 450 strut</td>
</tr>
<tr>
<td>Scribe</td>
<td>Fevicol</td>
</tr>
<tr>
<td>Mortise chisel</td>
<td>Wooden peg 8 x 8 x 50</td>
</tr>
<tr>
<td>Firmer chisel</td>
<td>Layout board</td>
</tr>
<tr>
<td>Hand saw</td>
<td></td>
</tr>
<tr>
<td>Tenon Saw</td>
<td></td>
</tr>
<tr>
<td>Mallet</td>
<td></td>
</tr>
<tr>
<td>Work bench with vice</td>
<td></td>
</tr>
<tr>
<td>Bar cramp</td>
<td></td>
</tr>
<tr>
<td>Ball pein hammer</td>
<td></td>
</tr>
<tr>
<td>Hand drilling machine</td>
<td></td>
</tr>
<tr>
<td>Drill bit 4mm</td>
<td></td>
</tr>
</tbody>
</table>

Procedure

1. Check all the raw materials for the required size as per drawing.
2. Prepare the lay out on plywood as per the drawing to make the king post truss.
3. Mark and make the length of the tie beam as per drawing layout. (Fig 1).
4. Mark and make the mortise on middle of the tie beam as per the drawing to fix the king post tenon. (Fig 1).
5. Mark and make the bridle mortise (oblique mortice) on both the end of the tie beam to fix the principal rafter as per the drawing. (Fig 1).
6. Mark and make the length on king post as per the drawing. (Fig 2).
7. Mark and make the tenon on bottom end of the king post to fix on tie beam mortise portion as per the drawing. (Fig 2).
8. Mark and make the mortise on bottom part of the king post as per the drawing to fix the strut piece. (Fig 2).
9. Mark and make the mortise on top of the king post to join the common rafter as per the drawing. (Fig 2).
10. Mark and make the slot (ridge) on top end of the king post to fix the ridge piece as per the drawing. (Fig 2).
11. Mark and make the total length on both the strut piece as per drawing. (Fig 3).
12. Mark and make the oblique tenon on top end of the strut to fix principle rafter as per drawing. (Fig 3).
13. Mark and make the oblique tenon on bottom ends of the strut piece. (Fig. 3).
14 Mark and make the length on both the pieces of principal rafter as per drawing. (Fig 4).

15 Mark and make the oblique tenon (brindle pin) on bottom end of the principal rafter to fix on tie beam as per drawing. (Fig 4).

16 Mark and make the tenon (mortise) on top end of the principal rafter to fix on king post piece (mortise) as per drawing. (Fig 4).

17 Mark and make the oblique mortise on middle of the principal rafter as per the drawing. (Fig 4).

18 Check the squareness, and correct measurement of prepared work pieces with prepared layout of king post truss before assembling.
19 Apply glue on all the joined surfaces.

20 Mark the drill hole points on centre of the joints.

21 Prepare the bar cramp to assemble the king post truss pieces.

22 Place the assembled pieces on bar cramp and tighten it.

23 Make the drill hole on centre of the joints.

24 Insert the wooden peg on drilled hole and tighten it.

25 Allow the king post truss to dry and cut off the projected wooden pegs using tenon saw.

26 Finish the king post truss using smoothing plane.

27 Check the prepared king post truss by placing on layout.
### Wooden Floor (Model)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>12 x 12 x 60</td>
<td>HARD WOOD</td>
<td>WEDGE</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>60 x 20 x 150</td>
<td>HARD WOOD</td>
<td>FLOORING BOARDS</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>60 x 20 x 300</td>
<td>HARD WOOD</td>
<td>FLOORING BOARDS</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>40 x 20 x 150</td>
<td>HARD WOOD</td>
<td>HERRING BONE STRUT</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>50 x 20 x 150</td>
<td>HARD WOOD</td>
<td>SOLID STRUT</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>75 x 25 x 450</td>
<td>HARD WOOD</td>
<td>BRIDGING JOIST</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>75 x 25 x 450</td>
<td>HARD WOOD</td>
<td>TRIMMER JOIST</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Scale Notes**: NTS

**Deviations**: ± 2.0 mm

**Time**: 20h

**Code No.**: CA1608E1
Wooden floors

Objectives: At the end of this exercise you shall be able to
• make the tusk tenon and mortice joint
• assemble the trimmer joist and bridging joist pieces
• nail the strut pieces and flooring boards
• finish the wooden floor.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Claws hammer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work bench with vice</td>
<td></td>
</tr>
<tr>
<td>Wooden rule</td>
<td></td>
</tr>
<tr>
<td>Jack plane</td>
<td></td>
</tr>
<tr>
<td>Try square</td>
<td></td>
</tr>
<tr>
<td>Bevel square</td>
<td></td>
</tr>
<tr>
<td>Carpenter pencil / scriber</td>
<td></td>
</tr>
<tr>
<td>Marking gauge</td>
<td></td>
</tr>
<tr>
<td>Firmer chisel</td>
<td></td>
</tr>
<tr>
<td>Mallet</td>
<td></td>
</tr>
<tr>
<td>Mortise chisel</td>
<td></td>
</tr>
<tr>
<td>Hand saw</td>
<td></td>
</tr>
<tr>
<td>Tenon saw</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smoothing plane</td>
</tr>
</tbody>
</table>

Materials

<table>
<thead>
<tr>
<th>Trimmer joist 75 x 25 x 450</th>
<th>3 Nos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging joist 75 x 25 x 450</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>Solid strut 50 x 20 x 150</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>Herring bone strut 40 x 20x 150</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>Flooring boards 60 x 20 x 300</td>
<td>6 Nos.</td>
</tr>
<tr>
<td>Wire nail 50mm</td>
<td>100g</td>
</tr>
<tr>
<td>Wedge 12 mm x 12 mm 50mm</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>Fevicol glue</td>
<td>150gm.</td>
</tr>
</tbody>
</table>

JOB SEQUENCE

1. Check all the raw materials of the wooden floor for the required size as per the drawing.
2. Plane all the work pieces of wooden floor to the required width and thickness as per the measurements given in the drawing.
3. Mark the make the length of the trimmer joist pieces as per the dimension given in the drawing. (Fig.1).
4. Mark and make the tusk mortise of the trimmer joist pieces as per the measurements given in the drawing.
5. Mark and make the tusk tenon on both the ends of the trimmer joist as per the measurements given in the drawing.
6. Mark and make the mortise on the tenon surface of the trimmer joist as per the dimensions given in the drawing.
7. Mark and make the length of the bridging joist as per the dimensions given in the drawing. (Fig 2).
8. Mark and make the tusk tenon on both the ends of the bridging joist piece as per the measurements given in the drawing.
9. Mark and make the tusk mortise on bridging joist piece as per the dimension given in the drawing.
10. Mark and make the length of the floor boards as per the dimensions given in the drawing.
11. Mark and make the length of the solid strut piece as per the measurements given in the drawing.
12 Mark and make the length of the herring bone strut pieces as per the measurements given in the drawing.

13 Mark and make the wedge pieces as per the measurements given in the drawing.

14 Apply the glue on tusk tenon and mortise surfaces of the wooden floor pieces for assembling.

15 Assemble the trimmer and bridging joist pieces together in their respective joints.

16 Tighten the assembled wooden floor frame using bar cramp.

17 Gently insert the prepared wedge pieces on mortise of the trimmer joist pieces.

18 Nail the strut pieces with bridging joist properly and carefully.

19 Arrange the prepared flooring boards on assembled wooden floor frame.

20 Strike the nails through the flooring boards on bridging joist and trimmer joist.

21 The nail head should be just below the wooden surface (1mm in deep).

Note: Use nail punch to strike the head of the nail inside the surface of the wood.

22 Finish the wooden floor using smoothing plane.
### NAILING PRACTICE

<table>
<thead>
<tr>
<th>NO.</th>
<th>STOCK SIZE</th>
<th>SEMI-PRODUCT</th>
<th>MATERIAL</th>
<th>PROJECT NO.</th>
<th>PART NO.</th>
<th>EX. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>45 x 2.4</td>
<td></td>
<td>WIRE NAIL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>50 x 2.4</td>
<td></td>
<td>WIRE NAIL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>75 x 38 x 250</td>
<td></td>
<td>HARD WOOD</td>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

**SCALE NTS**

**TOLERANCE ± 2 mm**

**TIME 5h**

**CODE NO.: CA1115E1**
Nailing practice

Objectives: At the end of this exercise you shall be able to
• drive the nails in the wood.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pencil</td>
<td>• Soft wood (Silver wood) 75 x 35 x 250mm - 1 No.</td>
</tr>
<tr>
<td>• Four fold wooden rule</td>
<td>Wire Nails 50mm - 9 Nos.</td>
</tr>
<tr>
<td>• Marking gauge</td>
<td>Wire Nails 45mm - 7 Nos.</td>
</tr>
<tr>
<td>• Try square</td>
<td></td>
</tr>
<tr>
<td>• Jack plane</td>
<td></td>
</tr>
<tr>
<td>• Marking awl</td>
<td></td>
</tr>
<tr>
<td>• Claw hammer 1 1/2 lb</td>
<td></td>
</tr>
<tr>
<td>• Nail punch</td>
<td></td>
</tr>
<tr>
<td>• Scrap wood</td>
<td></td>
</tr>
<tr>
<td>• Work bench with vice</td>
<td></td>
</tr>
</tbody>
</table>

JOB SEQUENCE

1. Check the raw material for its size.
2. Plane it to size 70 x 30 x 250 and check the planed wood for its level and squareness with a try square. (Fig 1)
3. On the width side, mark out divisions of 30, 30, 30, 30, 30, 30, and 40mm as shown in the figure. (Fig 2)
4. Mark out on one edge divisions of 30mm. (Fig 2)
5. Set the marking gauge at 20mm.
6. Gauge two lines on the width side at 20mm from the edges.
7. Gauge in the directions as shown. (Fig 3)
8. Set the marking gauge at 10mm.
9  Gauge two lines on the edge from the sides and in the
directions shown.

10 Draw diagonals with the aid of a try square. (Fig 3)

11 Mark the locations for the nails with marking awl. (Fig
4)

12 Place the work piece on a piece of scrap wood

13 Drive the nails through the wood as deep as possible,
leaving the heads of the nails about one mm projection.
(Fig 5)

14 Hold the hammer as shown near the end of the handle.  
(Fig 6)

15 Use the nail punch and drive the nails hitting the heads
square. (Fig 6)

16 The nail heads should be just below the wood surface
±1 mm deep. (Fig 7)

17 Remove the work piece from the scrap piece. (Fig 8)

18 Reverse it and place it on the scrap piece.

19 Hold the work piece down with the left hand.

20 Drive with hammer on the nail point so that it bends
sideways with the grains. (Fig 9)
21 Use the nail punch to drive the point below the surface.

22 Drive the 2” nails in the edge. Start with the row which should remain projecting for 10 mm above the wood surface. (Fig 10)

23 Check with try square for 90°. (Fig 10)

24 After lowest row the nails for the middle row are driven and after that last row.

25 Check if all nails are in their proper position clenched in the prescribed direction and are in straight rows.

26 Check, with a ruler, the projection of the nails lengthwise and diagonally. (Fig 11).
Construction, Construction Material & Real estate
Mason-Wood Working

Exercise 1.1.12

<table>
<thead>
<tr>
<th>NO.</th>
<th>STOCK SIZE</th>
<th>MATERIAL</th>
<th>PROJECT NO.</th>
<th>PART NO.</th>
<th>EX. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75 x 22 x 140</td>
<td>SOFT (SILVER) WOOD</td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>50 x 38 x 150</td>
<td>SOFT (SILVER) WOOD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WOOD SCREWS

SCREWING PRACTICE
Screwing practice

Objectives: At the end of this exercise you shall be able to
• develop skills in driving screws in wood.

Requirements

<table>
<thead>
<tr>
<th>Tools / Equipments</th>
<th></th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pencil</td>
<td></td>
<td>• Silver wood (Soft)</td>
</tr>
<tr>
<td>• Four fold wooden rule</td>
<td>• Marking gauge</td>
<td>75 x 22 x 140mm - 1 No.</td>
</tr>
<tr>
<td>• Try square</td>
<td>• Jack plane</td>
<td>50 x 38 x 150mm - 2 Nos.</td>
</tr>
<tr>
<td>• Firmer chisel 35mm</td>
<td>• Mallet</td>
<td>Screw 50 x No.8 - 8 Nos.</td>
</tr>
<tr>
<td>• Marking awl</td>
<td>• Hand drill</td>
<td>Sticking tape</td>
</tr>
<tr>
<td>• Hammer 1 lb</td>
<td>• Drill bits 2.4mm and 1.2mm each</td>
<td></td>
</tr>
<tr>
<td>• Counter sink bit</td>
<td>• 1 No.</td>
<td></td>
</tr>
<tr>
<td>• Screw driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Work bench with vice</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

JOB SEQUENCE

1. Check the raw material for its size.

2. Plane it to size of 45 x 30 x 150 - 2 Nos. and 70 x 18 x 140 - 1 No. and check its squareness and trueness.

3. Mark letter A on 1st piece, B on 2nd piece and AB on 3rd piece as shown in figure 1.

4. Keep the pieces A and B together and mark out 50 x 70 x 30mm as per drawing. (Fig 2).

5. Square the lines simultaneously as shown in Fig 2.

6. On the piece AB, mark the lines 13, 45, 24, 45 and 13mm. (Fig 3)

7. Square these join lines across the top broad side and two edges as shown. (Fig 3)

8. Mark out the locations for the screw holes. (Fig 4)
9 The holes are positioned in the shape of a cross near A.

10 The holes are situated in the corners of a rectangle with an offset of 5mm in clockwise direction near ‘B’. (Fig 5)

11 Mark the position of each hole with marking awl. (Fig 5)

![Fig 5](image1)

12 The marking awl should have sharp point.

13 Hold the work piece in the vice as shown in Fig 6.

![Fig 6](image2)

14 Select a proper drill bit. The size should be same as the shank of the screws. (Fig 7)

![Fig 7](image3)

15 Make use of a scrap wood for the backing up.

16 The procedure consists of

1  Making with marking awl

2  Dent made by marking awl

3  Supporting by a scrap wood

4  Drilling of shank hole

5  Countersinking so that the screw head will be flush.

17 Place the broad piece AB on the piece A so that the marks coincide. (Fig 8)

18 Use piece B as support.

19 Insert four screws.

20 Tap the screws carefully with hammer so that the screw points the dent piece A. (Fig 8)

![Fig 8](image4)

**Take care not to damage the screw heads.**

21 For drilling a pilot hole in piece use a drill bit of one half the thickness of the shank hole. (Fig 9)

![Fig 9](image5)

22 To control the depth of a pilot hole stick a piece of sticking tape round the bit.

23 Repeat the whole drilling procedure for piece B. (Fig 10)

24 Insert the 8 screws and drive these into the wood. Use the proper screw driver.
Using the screw driver

25 Grasp the handle firmly in your right hand with your palm resting on the end of the handle. The thumb and forefinger extend along the handle. (Fig 11)

26 While the right hand changed grips to turn the handle the left hand steadies the tool and keeps it in the slot. The method of using a screw driver is shown in Fig 12.
Preparation of Formwork for R.C.C Columns

Objectives: At the end of this exercise you shall be able to
• collect formwork materials
• check the material should be water proof
• erect formwork sufficient in vertical and horizontal directions.

Requirements

Tools / Equipments
• Measuring steel tape
• Line and thread
• Plumb bob
• Plumb level
• Firmer chisel
• Hammer
• Hand saw

• Steel try square
• PVC level tube

Materials
• 9/10 mm shuttering ply
• 75 x 50mm Reepers
• 75 x 100 column yokes
• 16mm bolt and nuts
• 12mm bolt and nuts.

PROCEDURE

• Check the planks as required dimensions.
• The planks should be uniform and plain surface
• The planks should not have any warps or the joints.

• Check dimensions of column and height
• Fix planks with reepers and nail with planks.
• Fix and erect the column shuttering as shown in (Fig 1).

![Fig 1](image-url)
- Support is given by using bracing.
- Check plumb for vertical by using plumb bob or plumb level. (Fig 3)
- Take care that all fours sides covers as per the drawing
- Check the shuttering ply dimensions and ensure that it should be exactly square or rectangular (Fig 2)

![Fig 2]

- care should be taken all time that bracings fixed for supporting of column box should not be disturbed, until concreting work.
- The bolt and nuts used should be properly tightened as shown in Fig 1

![Fig 3]

- Checking of column size and diagonals and cover
- Checking of column for plumb by using plumb bob (Fig 3)

![Fig 4]

- Checking of column shuttering for diagonals and plumb and also its support provided (bracings) (Fig 4).
Skill Sequence

- This exercise shall help you to
- Prepare form work for R.C.C tooling.
- Check wooden planks and its sizes.
- Check planks are uniform thickness.
- Join reepers 75x50mm with planks as shown in (Fig.1)

- Use nails to join reepers and wooden plank. (Fig. 2)
- Make hole for fixing Bolts and Nuts.
- Fix with 150mm thick planks on sides.
- Cut the planks to required length and fix with bolt and nuts (Fig. 3)
Set out a Building - Marking First and Second line

Objectives: At the end of this exercise you shall be able to
• drive wooden pegs
• stretch thread line
• obtain first, second line of the building.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Builders square</td>
<td>Wooden pegs (about 80 to 100mm diameter and</td>
</tr>
<tr>
<td>Nylon marking thread</td>
<td>450 to 600mm casurina poles), 35mm long wire</td>
</tr>
<tr>
<td>Hammer</td>
<td>nails and lime powder</td>
</tr>
<tr>
<td>Measuring tape</td>
<td>Spade</td>
</tr>
<tr>
<td></td>
<td>Plumb bob</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Study and inspect the plot and drawing

• Inspect the plot where setting out is to be done.

• Study plot layout drawing (Fig 1) Plot 14

• Study Building drawing (Fig 2)

• Locate boundary points A, B, C, D of the plot
  (Set back layout) (Fig 3)

• Clear vegetation, and debris

• Level the ground to required gradient.

• Study orientation of the building.

• Calculate and note the overall length and breadth of the building Measure width of the road.

• Mark center of the Road at several points and produce line RM (see Fig 3)

  Note road widening measurements.

  Note local authority frontage (minimum three meter) and side set back (minimum one and half meter) rules.

• Calculate building frontage ie half road width including widening plus three meter

• Have left side back as one and half meter.

• Prepare layout sketch showing set back dimensions (Fig 3)

TASK 2: Marking first line of building

Marking Firstline (base line) (See Fig 3)

Calculate half of road width including future widening (four meter) and add three meter to get the measurement of Frontage (ie Seven meter)

Locate points Y1 and Y2 on line RM so as to cover the overall dimensions of the front side of buildings and also foundation excavation width plus safe distance.

Locate points Y1 and Y2 on line RM so as to cover the overall dimensions of the front side of the building and also foundation excavation width plus safe distance.

Measure an arbitrary distance of five meter at point Y1 at right angle to line RM and mark piont P1 and drive wooden peg firmly into the ground.
- Measure an equal distance of five meter at point Y2 at right angle to line RM and mark point P2 and drive wooden peg firmly into the ground.
- Plumb at point Y1 and measure five meter and mark on the top of peg at point P1 and drive nail.
- Tie line thread on the nail at peg P1 and stretch thread to appear on the peg at P2.
- Plumb at point Y2 and measure five meter and mark on the top of peg at point P2 and drive nail so as to be at center of line thread.

Caution:

Verify correctness of measurement and adjust thread line and nail point only at peg P2

Tie the line thread on the nail in peg P2 and obtain the first line (Base line) P1 P2 parallel to road center line RM.

NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. ALL WALLS ARE 230 mm THICK

Construction, Construction Material & Real Estate: Mason - Exercise: 1.2.01
NOTE:
1. WIDTH OF ROAD INCLUDING WIDENING = 6.0 m
2. ALL DIMENSIONS ARE IN METER

SET BACK LAYOUT
**Skill Sequence 1**

**Objective**: This exercise shall help you to
• drive wooden pegs in the ground.

**Steps**

1. Cut one end of the wooden pegs flat (see Fig 1) using a hand saw.
2. Measure the total length of the peg and mark one third length from the opposite end.
3. Sharpen the one third length to a conical shaped edge (see Fig 1) using a knife.
4. Mark the center points on the ground where the pegs have to be driven.
5. Hold the prepared peg on one hand with the sharpened edge kept on the center mark (see Fig 1).
6. Use hammer and gently strike the first few blows on the flat edge (see Fig 1) to drive the sharpened edge little into the ground.
7. Use plumb bob and check the verticality of the driven peg (see Fig 1).

If the peg thus driven is not vertical, tilt to the required side using the hammer.

8. When the peg is vertical, strike a few hard blows with hammer on the flat surface followed by few gentle final blows to fix the peg to the required depth.

**Caution:**

All the pegs to be driven up to the conical shape marking so that the peg top shall be at the uniform height from ground level (see Fig 1).

---

**TASK 3: Marking second line of the building** (See Fig 3)

- Measure an arbitrary distance of half metre from boundary AD and locate points p3 and p4 so as to cover the overall dimensions of the left side of the building and also foundation excavation width and safe distance.

**Caution:**

While measuring stretch and hold the steel tape without sag, and as low as possible, clear above the ground and truly horizontal to the ground

- Drive pegs at points P3 and P4
- Drive nail on center of peg P3 and tie line thread

**Skill Sequence 1**

**Objective**: This exercise shall help you to
• drive wooden pegs in the ground.

**Steps**

1. Cut one end of the wooden pegs flat (see Fig 1) using a hand saw.
2. Measure the total length of the peg and mark one third length from the opposite end.
3. Sharpen the one third length to a conical shaped edge (see Fig 1) using a knife.
4. Mark the center points on the ground where the pegs have to be driven.
5. Hold the prepared peg on one hand with the sharpened edge kept on the center mark (see Fig 1).
6. Use hammer and gently strike the first few blows on the flat edge (see Fig 1) to drive the sharpened edge little into the ground.
7. Use plumb bob and check the verticality of the driven peg (see Fig 1).

If the peg thus driven is not vertical, tilt to the required side using the hammer.

8. When the peg is vertical, strike a few hard blows with hammer on the flat surface followed by few gentle final blows to fix the peg to the required depth.

**Caution:**

All the pegs to be driven up to the conical shape marking so that the peg top shall be at the uniform height from ground level (see Fig 1).
Skill sequence 2

Objectives: This exercise shall help you to
• use builders square
• obtain right angle
• check back for square.

Steps

1. Hold builders square on both hands firmly (see Fig)
2. Place side a,b parallel and abutting the first line (See Fig 1)
3. Keep corner “a” at the point where right angle turn is required.
4. Keep side a,c pointing in the direction of right angle turn is required.
5. Stretch second line parallel and abutting builders square side a,c (see Fig 1)
6. When second line is parallel to side a,c keeping the first line parallel side a,b the right angle turn has been obtained.
7. Turn builders square and keep side a,b on second line, and verify whether side a,c is parallel to first line (see Fig 2) and if it is parallel check back for square has been done.

Caution

Adjust only second line to achieve true alignment parallel to builders square side a,c hold builders square without much shake.
Setout a Building - Marking third and fourth line

**Objectives:** At the end of this exercise you shall be able to

- Mark third line of the building.
- Mark fourth line of the building.

**Requirements**

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Builders square steel 75 cm X 50 cm 1 No.</td>
<td>Wooden pegs (about 80 to 100mm diameter and 450 to 600mm casurina poles), 35mm long and wire nails</td>
</tr>
<tr>
<td>Nylon marking thread</td>
<td></td>
</tr>
<tr>
<td>Hammer Mason (club) 11/2 / 1 lbs 1 No.</td>
<td></td>
</tr>
<tr>
<td>Measuring tape 30 m 1 No.</td>
<td></td>
</tr>
<tr>
<td>Plumb bob 1 No.</td>
<td></td>
</tr>
</tbody>
</table>

**PROCEDURE**

**TASK 1: Mark third line of the building (see Fig 1)**

- Measure an arbitrary distance of one meter from boundary DC and locate points P5 and P6 so as to cover the overall dimensions of the rear side of the building and also foundation excavation width and safe distance.

Caution:

While measuring, stretch and hold the steel tape without sag, and as low as possible clear above the ground and truly horizontal to the ground.

- Drive pegs at points P5 and P6
- Drive nail on center of peg P5 and tie line thread
- Stretch the line thread at right angles using the builders square (see Fig 1) to line P3, P4 and to appear on peg at P6
- Locate nail point on peg P6 and drive nail so as to be at center of line thread.

**TASK 2: Mark fourth line of the building (see Fig 1)**

- Measure an arbitrary distance of one meter from boundary CB and locate points P7 and P8 to as to cover the overall dimensions of the right side of the building and also foundation excavation width and safe distance.

Caution:

While measuring, stretch and hold the steel tape without sag, and as low as possible clear above the ground and truly horizontal to the ground.

- Drive pegs at points P7 and P8
- Drive nail on center of Peg P7 and tie line thread
- Stretch the line thread at right angles using the builders square (see Fig 1) to line P5, P6 and to appear on peg at P8
- Locate nail point on Peg P8 and drive nail so as to be center of line thread.

**Note**

- Measure diagonal distance between intersection points e, and h (see Fig 3 in Ex. No.1.01)
- Measure diagonal distance between intersection, points g and f (See Fig.3 in Ex.No.1.01)
Skill sequence 1

Objective: This exercise shall help you to
• drive nails on the pegs.

Steps
• Mark with a pencil the approximate center point of the flat surface of the driven peg.
• Hold the nail vertical with the sharp point on the center mark.
• Strike gently with a claw hammer the nail head and fix. (Fig 1)

Skill sequence 2

Objectives: This exercise shall help you to
• verify diagonal distance between profile markings.

Steps
• Tie thread lines between profiles to run on the center line mark.
• Obtain intersection points on the line thus stretched.
• Measure the distance between diagonally opposite intersection points.
• The distance between two such pairs should be equal

Caution
If the two diagonal distance’s are not equal, verify all right angles obtained at the intersection points and correct where necessary keeping any one line between two intersecting points as base not to be altered.
Set out a Building - Marking the center line layout of the building

Objectives: At the end of this exercise you shall be able to
• produce center lines of the building on the profiles
• transfer center line mark, on the ground.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Builders square</td>
<td>Wooden profiles</td>
</tr>
<tr>
<td>Nylon line thread</td>
<td>Wire Nails</td>
</tr>
<tr>
<td>Hammer</td>
<td>Lime powder</td>
</tr>
<tr>
<td>Measuring tape</td>
<td></td>
</tr>
<tr>
<td>Steel tri square</td>
<td></td>
</tr>
<tr>
<td>Plumb bob</td>
<td></td>
</tr>
<tr>
<td>Spirit level</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Mark centre line in layout of the building

• Trace center line plan of the building (Fig 1) and orientation of the building.
• Tie all line threads at almost same level (Levels separated only by thread thickness) between pegs P1 P2, P3 P4, P5 P6 and P7 P8 (Ref Fig 3 of ex.1.01)
• Calculate half wall width ie 115mm plus the balance two meter = 2115mm for locating the center line pegs for the front wall of the building.
• Measure this distance of 2115 mm on the line thread P3 P4 from the intersection point e (see Fig 3) and locate and drive peg P9
• Measure once again the distance 2115 mm from the inspection point e and locate the nail point on peg P9 and drive nail
• Repeat the process from intersection point f and locate peg P10 and drive nail.
• Now tie line thread between P9 P10
• Mark a safe distance (say half a meter) in front of peg P9 towards the building and drive a profile.
• Repeat the same procedure in front of peg P10 and drive another profile.
• Mark the center line on these profiles.
• Remove line thread P9 P10 and tie between these two profiles and obtain center line of the building front wall.
• Repeat process to obtain all other center lines as per the center line drawing.

Skill sequence 1

Objective: This exercise shall help you to
• tie line thread to nails.

Steps

• Form a loop in the line thread as shown in step 1 of (Fig 2)
• Hold the loop apart over the thumb and forefinger of the left hand and the bottom with the right hand and form a triangular shape step 2
• Turn the left hand downward, holding the thumb and forefinger together and this forms a loop around these two fingers Step 3
• Pull downward firmly with the right thumb and forefinger until the two loops have almost reached each other step 4
• Push the loops on the nail and draw the loops tightly against the nail to form the tie. step 5
Skill sequence 2

Objectives: This exercise shall help you to
• form profiles
• drive profiles.

Steps

• Use a hand saw, cut one end of the two vertical battens flat.
• Measure the total length of the vertical battens and mark the one third length from the opposite end.
• Use a hand saw, sharpen the one third length to a conical shaped edge.
• Nail the horizontal batten to the vertical batten keeping them apart.
• Mark the points on the ground where the vertical batten have to be driven.
• Position the prepared profile with the sharpened edge kept on the mark.
• Use hammer and gently strike the first few blows on the flat edge of the vertical batten (see fig) to drive the sharpened edge little into the ground.
• Use plumb bob and check the verticality of the driven profile.
• Tilt to the required side using the hammer if the profile thus driven is not vertical.
• When the profile is vertical, strike a few hard blows with hammer on the flat surface followed by few gentle final blows to fix the profile to the required uniform horizontal level (use spirit level to check horizontal level)

Caution:

All the profiles to be driven only up to the conical shape marking so that the profiles top shall be at the uniform height from ground level.
Skill sequence 3

Objectives: This exercise shall help you to
• mark the center lines on Profiles.

Steps
• Tie the center line thread between pegs.
• Allow thread lines to just pass over a flat horizontal batten top (see fig 1)
• Plumb from the center line and make a vertical pencil mark on the horizontal batten side (see fig) using plumb bob and tri square.
• Use tri square on this vertical pencil mark (see fig), square it across the top surface of the horizontal batten and draw a pencil mark.
• Slightly move the tread line by your hand, and using a hand saw make a dent say about 1mm thick on horizontal pencil line mark thus made
• This dent thus formed constitutes the center line mark on the profile.
• Allow the thread line to pass in the groove.(Fig 2)

Caution
• Center line thread should be traveling free without any obstruction, twist and knot when tied between pegs.
• All horizontal battens of profiles to be truly horizontal and at same levels.
• All profiles should be located so that it will not be disturbed when foundation works in progress.
Objectives: At the end of this exercise you shall be able to
• mark the edge of foundation and excavation on the ground

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nylon line thread</td>
<td>• Plumb bob</td>
</tr>
<tr>
<td>• Hammer Mason (club) 1 1/2 lbs</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>• Measuring tape 30 m</td>
<td>• Spirit level 15 cm</td>
</tr>
<tr>
<td>• Steel tri square 75 cm X 50 cm</td>
<td>- 1 No</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Mark the edge of foundation and excavation on the ground

• Study center line sketch (Fig 1) of exercise no : 1.03
• Study foundation cross section and foundation layout drawing and note excavation width (Fig 4)
• Tie and stretch thread line on the existing center mark between two opposite profiles (Fig 4)
• Plumb for vertical at threadline intersecting points.
• Drop plumb bob slowly and mark the point.(Fig 3)

Caution

When transferring the intersecting point the plumb bob must be held without shake and not disturbing the center line threads.

• Repeat this process at the opposite intersecting point.
• Stretch a thread line between these two opposite points on the ground.
• Pour lime powder on this line gently by using two fingers only.
• Remove thread line.
• The center line has been now marked on the ground.

• Measure one half of required width of excavation at right angles to this lime powder line at three or more point along the length and put lime powder dots.

Caution

Width of foundation excavation to be calculated considering angle of respose for the type of soil, and also labour workability.

• Stretch a thread line to run on all these lime powder dots.
• Pour lime powder on this stretched line gently by using two fingers only.

Caution

Pouring lime powder on the thread must be done carefully, without shake

• Remove thread line (Fig.2)
• The foundation excavation edge line on one side has been now marked on the ground.
• Repeat this procedure on the other side of ground center line for marking the other edge line.
• The width obtained between these two lines is the width of foundation excavation. (Fig. 1)
• Repeat process on all foundation locations to be obtained such edge lines. (Fig 3)
Set out a Building - obtaining plinth level mark

Objectives: At the end of this exercise you shall be able to
• mark plinth level and height

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nylon line thread</td>
<td>• pegs</td>
</tr>
<tr>
<td>• Hammer Mason (Club) 1 1/2 /1 lbs</td>
<td>• water</td>
</tr>
<tr>
<td>• Measuring tape 30 m</td>
<td>• lime powder</td>
</tr>
<tr>
<td>• Steel tri square 75 cm X 50 cm</td>
<td></td>
</tr>
<tr>
<td>• Plumb bob</td>
<td></td>
</tr>
<tr>
<td>• Spirit level 15 cm</td>
<td></td>
</tr>
<tr>
<td>• tube level</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Mark the plinth level and height

• Trace plot a layout sketch and note bench mark level. (Fig 1 of ex 1.01)
• Trace foundation layout and note excavation depth
• Drive at a convenient location, a local permanent bench mark level peg
• Transfer the required bench mark level and drive this peg so that the top of the peg is equal to the required level and treated as permanent bench mark.
• Transfer this level to all four corner profiles and a have a reference level mark
• Hold a straight edge to tally with this level and also to appear on the trench
• Measure down from this straight edge to get the required excavation depth/plinth level
• Tie and stretch thread line between two opposite level pegs if length of straight edge is not enough.

Caution

When transferring levels the water tube should be free from air bubbles, not twisted clear and readable and correct markings done.

• Repeat this process at all four corners, and at intermediate points where required to get uniform plinth level.

Skill sequence 1

Objective: This exercise shall help you to
• transfer levels between two points using water tube levels.

Steps

• Fill water in the water tube

Note: (this is usually done by having a bucket of water and allowing water to pass by gravity into the water tube after putting one edge in the water and the other edge to siphon by lowering it down)

• Hold water level mark of one edge of the tube totally with the permanent bench mark level
• Stretch the tube to reach maximum length and turn the opposite edge vertically up.
• Read the level when the other end mark is steadily tallying with the bench mark without any variation.

• Drive a peg and mark this level. (Fig.1)
• Now this is the transferred bench mark level
• Repeat this process from this peg and proceed to transfer the level to reach the desired peg.

Caution

Every time when levels are transferred make sure that there is not even a minute variation since each transfer is a potential source of a carry over error. Repeat process of transferring more than once and make sure that the correct levels are transferred.
Measuring down from plinth level

Objectives: At the end of this exercise you shall be able to
• determine the height of courses upto plinth level.

<table>
<thead>
<tr>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tools</strong></td>
</tr>
<tr>
<td>• Spirit level 15 cm 1 no</td>
</tr>
<tr>
<td>• Pocket steel tape 2m long 1 no</td>
</tr>
<tr>
<td>• Straight edge 1.5m 1 no</td>
</tr>
<tr>
<td>• Plumb rule 1 no</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Determine the height of course not plinth level

• First check the reference point
• Verify the top surface of the pillar.
• Place the straight edge on the top of the plinth level peg and Reference point.
• Extend the straight edge to reach over the excavated portion as shown in (Fig 1)
• Level the straight edge by using spirit level or plumb level.
• Measure down from the under edge of the straight edge with steel rule (or) with foot rule, as the required distance (or) height.
• Check the level by recessing the straight edge and level.
Set out first peg for concrete foundation level

Objectives: At the end of this exercise you shall be able to
• lay the concrete in uniform thickness

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>- 1 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammer mason 11/2 / 1lbs</td>
<td>1 No.</td>
</tr>
<tr>
<td>Straight edge 1.5m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Spirit level 15 cm</td>
<td>1 No.</td>
</tr>
<tr>
<td>Pocket steel tape 20 m long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel square 75 cm X 50 cm</td>
<td>1 No.</td>
</tr>
<tr>
<td>Spade</td>
<td>1 No.</td>
</tr>
<tr>
<td>Bucket</td>
<td>1 No.</td>
</tr>
<tr>
<td>Mug</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

Materials

Ratio 1: 5:10

• Cement 14 kg (or ) 0.23m³
• Sand 0.045m³
• Stone aggregate 0.09m³

PROCEDURE

TASK 1: Lay the concrete in uniform thickness

• Lay the foundation concrete 15 cm thickness and one metre length
• Setout the position of the main corners
• Fix the ranging lines by using line or thread
• Tie to the wall marks on the profile.
• Check for perpendicular with plumb rule and plumb lines are taken down on the foundation concrete as shown in (Fig 1).

Skill sequence

Building corners to datum

If concrete or Brick foundation has been laid correctly the depth Fig 1 will be a multiple of Brick courses.
Method to stack bricks at work place

Objectives: At the end of this exercise you shall be able to
• lay the first course of brick
• lay the second course of brick.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nil</td>
<td>• Bricks 9&quot; x 4 ½&quot; x 3&quot;</td>
</tr>
<tr>
<td></td>
<td>- 40 Nos</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Lay the first course of brick
• Store the brick in levelled ground
• Unload the bricks from the lorry gently without broken
• lay first brick as header (fig. 1) then two bricks are laid as stretcher 2,3 (two and half brick in length)
• Lay the bricks 4, 5 and 6 opposite side.
• Fill other bricks 7,8, 9 and 10 and complete the odd course.
• Lay second course of brick over first course of brick.

TASK 2: Lay the second course of brick
• Lay the first brick as stretcher. (Fig. 2)
• Complete the second course (Even course) as shown in Fig. 2.
• Similarly laid the bricks alternate coruse as required height. (Fig. 3)
Fig 1

Fig 2

Fig 3

METHOD OF STACK THE BRICK

EVEN COURSE
22 3/8 (57 cm)

1 2 3

4 5 6

8 9 7

10

ODD COURSE
Method of soak the brick

Objective: At the end of this exercise you shall be able to
• method of soak the brick in water and transport the brick.

<table>
<thead>
<tr>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools</td>
</tr>
<tr>
<td>• Drum - 1 No.</td>
</tr>
<tr>
<td>• Water</td>
</tr>
<tr>
<td>• Brick - 5 Nos</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Method of soak the bricks in water

• keep the drum and fill pure water.
• Remove the top bricks
• Keep the bricks fully immersed in water for a period half an hour. (Fig. 1)

Note

When mud mortar or lime mortar is used, the brick should not be soaked in water before use.

• After soaking, take out the bricks and put then near work place for skin dry. (Figs. 2 & 3)
Method of cutting bricks

Objective: At the end of this exercise you shall be able to
• cut the brick in two equal pipes in cross wise
• cut a queen closer brick (in longitudinal direction).

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chisel or bolster 100mm wide</td>
<td>Brick 9” x 4½ x 3”</td>
</tr>
<tr>
<td>Hammer 1kg</td>
<td>or 20cm x 10cm x 10cm</td>
</tr>
<tr>
<td>Marking scale</td>
<td>- 2 Nos.</td>
</tr>
<tr>
<td>Marking pencil</td>
<td></td>
</tr>
<tr>
<td>Fibre board or timber</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Cut the brick in two equal pieces in cross wise

• Lay timber board or fibre board on the floor.
• Keep the brick on fiber board as flat.
• Mark the face of the brick for cutting using the width another brick as a guide as shown in Fig. 1.
• Place the bolster along the cutting line.
• Place the bolster along the cutting line.
• Keep the botster firmly in left hand.
• Strike a medium blow with a hammer.
• Turn the brick to the other header face.
• Repeat until to cut into two pieces. (Fig. 2)

Caution

• Keep away finger from the chisel head.
• Care should be taken while blow with hammer, otherwise may spoil the finger.
• Brick should be rest on a fibre of soft wood pad to reduce unnecessary fractures.

TASK 2: Cut a queen closer brick (in longitudinal direction)

• Lay the fibre board or pad on the floor.
• Keep the brick vertically on fibre board. (Fig. 3)
• Mark the face of the brick in longitudinal direction by using marking scale.
• Place the bolster along the cutting line. (Fig. 4)
• Strike a medium blow with hammer.
• Turn the brick to the other longitudinal face.
• Repeat until to cut into two pieces as queen closer.
Mixing of Mortar 1: 5 Mix

Objectives: At the end of this exercise you shall be able to
• proportion of mortar ingredients for specific mix
• mix mortar manually
• follow correct safety precautions.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tools/Equipments</strong></td>
<td><strong>Cement - 1 box</strong></td>
</tr>
<tr>
<td>Spade</td>
<td>(0.034 m³ or 1 bag)</td>
</tr>
<tr>
<td>Bucket</td>
<td>Sand - 5 box (0.17 m³)</td>
</tr>
<tr>
<td>Mug</td>
<td>Add 20% for bulking</td>
</tr>
<tr>
<td>Mortarpan</td>
<td>Water as required.</td>
</tr>
<tr>
<td>Measuring Box (Figs 5 and 6)</td>
<td>Mason Trowel</td>
</tr>
<tr>
<td>G.I. Sheets (For Platform)</td>
<td>G.I. Sheets (For Platform)</td>
</tr>
</tbody>
</table>

Job Sequence

• Level the area where mixing is to be done.
• Place adequate numbers of G.I. sheets on the levelled ground.
• Bring the required quantity of sand and water near the mixing area.
• Measure sand using measuring box, and spread it into a heap. (Figs 5 & 6)
• Transport cement bag (Fig.1) and place on the heap of sand.
• Cut open the cement bag (Fig 2) pour and spread slowly the cement evenly on the sand.

Caution:
• Wear dust mask
• Cut cement bags without spoiling the bag.
• Use spade to dry mix the contents uniformly. (Fig 3) Mix of all the ingredients well, until uniform colour is achieved.
• Add the sufficient quantity of water (As per water cement ratio) to get consistency of mortar. (Fig 4)
• Mix quickly without allowing the water to keep out of the heap.

Caution:
• When mixing is done in poorly ventilated area wear a dust mask.
• Again pour the balance quantity of water using mug slowly mug by mug fig 7 and same time continue mixing.
• Don’t add water with a curing pipe as shown in Fig.7
• Keep mixing until uniform colour and consistency of mortar is obtained.

• Do not pour excess water since mix will become lean.
• After mixing use the mortar with in 30 minutes.
Skill Sequence: 1

Objective: At this end of exercise you shall be able to

- measure ingredients using measuring box.

- Keep the measuring box near the sand.
- Fill the measuring box in layers by using mortar pan.
- When the box is full remove the excess of sand with trowel.

Caution:
- Slightly shake the measurement box when full to enable ingredients to full without voids.
- Two persons can hold the handles on both sides of the measuring box and lift it and pour the sand.

Skill Sequence: 2

Objectives: At this end of exercise you shall be able to

- mixing the cement mortar
- pour water and mix for consistency.

- Mix the mortar using the water tight platform.
- (M.S. Tray for smaller quantity or G.I. sheet for large quantity).(Fig 1)
- Required quantity of sand and cement mixed in dry condition (Fig.2). By turning them over, from one end to another end and cutting with a shovel until the mix appears uniform colour.

- Mix until the uniform colour and required consistency is achieved.

Caution:
- Add Water according to water cement ratio.

Fig 1

Fig 2

Fig 3
LAYOUT AND BUILD 1/2 BRICK THICK STRAIGHT WALL IN STRETCHER BOND IN THE ONE END STOPPED AND OTHER RACKED BACK

STOPPED END

RACK BACK END

8 BRICKS

10 mm JOINTS

ELEVATION

CONCRETE BLOCK (SOLID)

FIRST COURSE PLAN

8 BRICKS

10 mm JOINTS

120 mm

220 mm

SECOND COURSE PLAN

NOTE:
* ALL JOINTS ARE 10mm THICKNESS
* ALL DIMENSIONS ARE IN mm

<table>
<thead>
<tr>
<th>PORTABLE</th>
<th>WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>LIME MORTAR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NO.</th>
<th>STOCK SIZE</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>400 x 200 x 100</td>
<td>SOLID CONCRETE BLOCKS</td>
</tr>
<tr>
<td>06</td>
<td>115 x 110 x 70</td>
<td>CONVENTIONAL BRICKS (HALF SIZE)</td>
</tr>
<tr>
<td>30</td>
<td>230 x 110 x 70</td>
<td>CONVENTIONAL BRICKS (FULL SIZE)</td>
</tr>
</tbody>
</table>

SCALE: HALF BRICK THICK STRAIGHT WALL (ONE END STOPPED AND OTHER END RACKED BACK)

TOLERANCE ± 5  TIME:

CODE NO. MB1301E1
Half brick thick straight

Objectives: At the end of this exercise you shall be able to
• build a 1/2 brick thick wall in stretcher bond one end stopped and the other end racked back six courses height.

| Requirements |
|-----------------|-----------------|
| **Tools** | **Materials** |
| • Mason Pan - 1 No. | • Conventional bricks 230 x 110 x 70mm -30 nos |
| • Mason Trowel 25 cm long - 1 No. | • Water |
| • Brick hammer, brush, straight edge each one | • Wooden batten 1500 x 100 x 70mm - 1 No. |
| • Plumb bob - 1 No. | • Lime mortar or cement mortar 0.064m³ |
| • Spirit level, pointing tool each one | • Solid concrete blocks 400 X 200 X 100 - 3 no |
| • Line thread each one | • Cement - 20kg |
| • Measuring Steel tape 5m - 1 No. | • Sand - 2 box |

**PROCEDURE**

**TASK 1:** Build a 1/2 brick thick wall in stretcher bond one end stopped and the other end racked back six courses height

• Place required quantity of mortar in mortar pan
• Lay the wooden batten on breath side supported on three numbers solid concrete block
• Spread enough mortar on the batten top
• Lay the first course
• Check the height of the first brick laid
• Level and plumb the course using the first brick as guide
• Lay the bricks in the next top courses leaving half the length of bricks on one end only in the lower course
• Continue laying bricks in the balance four courses leaving half the length of bricks on one end only in the lower course
• Strike the joints with jointer as needed
• Brush the wall in completion of the job
• Recheck the entire work with plumb bob/spirit level for verticality before completion

**Caution**

• Tap and check each course for alignment with straight edge
• Level, plumb and alignment the racked back end of the lead
Skill sequence 1

Cutting mortar and lifting by Trowel

Hold the trowel with the fingers under the handle and the thumb on top of the ferrule as shown.

The mortar into a pile in the center of the mortar board.

Smooth the place with a back hand stroke

Cut a small amount from the larger pile with a pulling action.

Pile scoop up the small with a quick movement of the trowel

Skill sequence 2

Buttering bricks

- Take a scoop of mortar on the Trowel blade direct from the mortar pile on the mortar spot as shown in (Fig 1)
- Flex the wrist of the Trowel hand firmly to cause the mortar to spread across the adhere to the trowel blade
- Pick up the brick across its width with the bedding plane toward the trowel hand hold the brick and the trowel in front of the body and just apart
- Draw the trowel blade down across the width of the brick of its end so that a portion of the mortar on the blade is struck on to the brick
- Lift the trowel again and turn it through 90°
- Draw the blade down across the face of the edge of the brick and its end
- Again the portion of mortar should be struck on to the brick
- Move the trowel hand away from the body over the top of the bricks

Skill sequence 3

Placing the brick on the wall

- Assemble materials in the work area
- Set the mortar pan back from the wall approximately 0.5m to provide sufficient working space
- Strick a chalkline a little longer than 1.5m on the base as a reference point
- Lay dry bond and project
- Lay a brick in mortar on each end of the project level and plumb (Fig 1,2)
- Lay the Course level and plumb with the spotted bricks.
- Lay second course of bricks as shown in (Fig 3).

- Rise the wall until the six courses in height
- Recheck the work for accuracy according to the plan given.

**Caution:**
Check mortar joints constantly keep the work area clean and free from hazards.
**Objective**: At the end of this exercise you shall be able to

- layout and build half brick thick corner wall (stretcher).

### Requirements

<table>
<thead>
<tr>
<th>Tools/Equipments</th>
<th>- 1 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar pan</td>
<td></td>
</tr>
<tr>
<td>Mason trowel</td>
<td></td>
</tr>
<tr>
<td>Brick hammer</td>
<td></td>
</tr>
<tr>
<td>Brush</td>
<td></td>
</tr>
<tr>
<td>Straight edge</td>
<td></td>
</tr>
<tr>
<td>Plumb bob</td>
<td></td>
</tr>
<tr>
<td>Sprit level</td>
<td></td>
</tr>
</tbody>
</table>

| Line and thread                |                   |
| Measuring steel tape           |                   |
| Try square                     |                   |

**Materials**

- Brick 230 x 110 x 70mm - 45 Nos
- Cement one bag
- Sand 4 boxes
- Water

### PROCEDURE

**TASK 1**: Layout and build half brick thick corner wall (stretcher)

- Assemble the materials in the work area
- Set the mortar pan back from the wall approximately one metre to provide sufficient working space.
- Layout the ‘L’ corner on the floor using the steel square and pencil or chalk (Fig. 1)

  ![Fig 1](image1.png)

- Extend the line a little longer than the actual corner measures with chalk.
- Layout the first course ‘Dry bond’ keeping head joint uniform (10mm using the fore finger)
- Remove the corner brick (brick number 1) spread the mortar and re-lay without moving the bricks in between. (Fig. 2)

  ![Fig 2](image2.png)

- Remove the end brick (Brick No. 2) spread the mortar.
- Level and plumb brick No. 1 with brick No. 2 and straighten the edge and plumb rule or with straight edge.

- Lay the brick No. 3 level plumb and straighten the edge with brick No. 1 as shown in Figs. 3 and 4.

  ![Fig 3](image3.png)

- Remove excess mortar Fig. 5 in each course in laid.
- All the joints should be uniform thickness.
- Check the corner of squarness after laying the first course of brick. (Fig. 6)
- Check the second course for level. (Fig. 7)
- Take mortar sufficiently to form a bed and lay three or four bricks and spread in (Figs 8 & 9).

  ![Fig 4](image4.png)
• Turn the trowel and moved along the bed the deposit the mortar. (Fig. 10)
• Lay the mortar in centre of the bed area.

• Proceed this method till all the nine courses and complete the work.
• Remove the excess cement mortar in the external and internal surface of wall.
• Lay the corner brick exact corner.
• Use the trowel to tap it into position 11.
• Lay the corner brick exact corner.
Objective: At the end of this exercise you shall be able to
• lay 23 cm thick corner wall in English bond.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Trowel 25 cm long</td>
<td>• Bricks 230 x 110 x 70 mm</td>
</tr>
<tr>
<td>• Spirit level 15 cm</td>
<td>• Cement</td>
</tr>
<tr>
<td>• Steel tape 5m long</td>
<td>• Sand</td>
</tr>
<tr>
<td>• Straight edge 1.5 m</td>
<td>• Water</td>
</tr>
<tr>
<td>• Plumb level or Plumb bob</td>
<td>• Hose pipe 30m long.</td>
</tr>
<tr>
<td>• Bucket with mugs</td>
<td></td>
</tr>
<tr>
<td>• Mortar pan</td>
<td></td>
</tr>
<tr>
<td>• Line and pins</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Lay 23 cm thick corner wall in English bond
• Mark line with chalk and set out the position of the job.
• Use accurately dry bricks mark the overall dimensions of the model job ensure that the thickness of the wall is not more or less the length of one brick.
• Lay first stretcher of the first course at one end of the front elevation of the model job and lay queen closer next to the corner brick of first course (Fig 1).
• Check width of the first course of front end rear. (Fig.2)
• Lay the second stretcher at the opposite end of the front elevation of the job and check the level from the first stretcher of the job and check the level from the first stretcher layed. (Fig 3)
• Lay the bed for the rear elevation of the first course of stretchers.
• Draw the trowel point along the front elevation stretchers to form an additional furrow.
• Check for alignment level and width
• Build up one end of the job with a header closer and header on the second course
• Check for gauge, level, plumb ranging in width as the work proceeds repeat at the other end of the job using line and pins
• As the lack of the stretcher course is layed make sure that the mortar led is furrowed clear of the lack of the bricks already laid on the course.
• As the headers are layed make sure that they are level across the width of the wall
• This job needs accurate setting out and squaring of the ends on the first course (Fig. 5)

• Check stepped end of wall Fig. 6.
• The closers must be cut to the correct size
• The headers and the back course of stretchers must be level across the width of the wall
• The headers must be central over the across joints or stretchers below.
• The cross joints should be of uniform width
• Use full bricks except closers.
• Isometric view of coner wall (Figs 7, 8 & 9)
Objective: At the end of this exercise you shall be able to
• layout marking of 1½ brick thick in English bond with one end stopped and other end racked back.

**Requirements**

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trowel 25 cm long</td>
<td>Bricks 230 x 110 x 70mm</td>
</tr>
<tr>
<td>Pointing Trowel 15 cm long</td>
<td>Mortar</td>
</tr>
<tr>
<td>Steel tape 5m long</td>
<td>Cement</td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td>Sand</td>
</tr>
<tr>
<td>Plumb level or bob</td>
<td>Water</td>
</tr>
<tr>
<td>Line and pins</td>
<td></td>
</tr>
<tr>
<td>Mortar pan</td>
<td></td>
</tr>
</tbody>
</table>

**PROCEDURE**

**TASK 1: Layout marking of 1 1/2 brick thick corner in English bond**

- Clean the work area
- Collect the materials about 1m near the work place
- Mark line with chalk and setout the position of job (Fig.1-3)

- Mark the corner by using the steel square
- Extend the line a little beyond the required length
- Lay the corner Brick and plumb and level
- Place the end brick in the same row and level, plumb and align for straightness as shown in (Fig 4)
- Place the queen closer next to the brick already placed
- Complete the front row of the front elevation
- Lay bricks rear wythe and align, level and plumb
- Repeat the same over the other side and plumb level and align for straightness (Fig 4,6)
- (Fig 1) Hold a brick layer’s line at a convenient height above and between these marks, keeping the line tight, chalk it thoroughly by running the chalk two or three times along its length
• (Fig 2) Lower the line to the two end marks and hold under the tension
• (Fig 3) Raise the line vertically 300mm at its center and release, making sure the line strikes the ground direct.

• Lay the corner brick at the exact corner. Use the trowel to tap it in to position.
• Make the corner brick exactly verticle.
• Make the first five brick are straightened with the plumb rule
• Level the first five bricks with the mason’s level (plumb rule)
• Plumb the tail end brick. Note how mason braces his arm against his knee to steady the plumb rule. Brick is tapped with the trowel to adjust it to proper position.
• The first course to the line. The closer brick is being placed. Note that both ends have been buttered. It must be fully pressed into position.
• Lay the second course from both ends toward the middle. Above mason line in position Below Next to last brick being placed. Note how the fingers extend out over the line without touching it.
• Repeat the same procedure in second lead corner as for the first corner
Objective: At the end of this exercise you shall be able to
• lay bricks alternate headers and stretchers
• lay the queen closer.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason’s Trowel 25 cm long - 1 No.</td>
<td>Bricks 230 X 110 X 70 - 325 nos</td>
</tr>
<tr>
<td>Spirit level 15 cm long - 1 No.</td>
<td>Cement - 50 Kg</td>
</tr>
<tr>
<td>Steel square 75 X 50 cm - 1 No.</td>
<td>Sand - 5 Box</td>
</tr>
<tr>
<td>Straight edge 1.5 m - 1 No.</td>
<td>Water</td>
</tr>
<tr>
<td>Steel tape 5m long - 1 No.</td>
<td>Bucket - 1 No.</td>
</tr>
<tr>
<td>Brush - 1 No.</td>
<td>Mug - 1 No.</td>
</tr>
<tr>
<td>Pointing trowel 15 cm long - 1 No.</td>
<td>Line and threads</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Lay bricks alternate headers and stretchers

• Assemble the bricks in the work area
• Mix the mortar and load the mortar pan
• Snap a chalk line longer than the required length
• Mark a line for 90° angle at one end of the straight line already marked (Fig 1&2)

• Lay the corner with a stretcher
• Lay one header and one stretcher alternate in each course
• Provide over lap should 1/4 brick to avoid continuous vertical joints
• Provide uniform bed joints and vertical joints

TASK 2: Lay the queen closer

• Plumb and level after laying the first course check the align
• Lay queen closer next to the quoin header, to avoid the vertical joints
• Attach the line by pushing a nail to which the line is attached under the end of the brick on the left end of the wall
• Pull the line up over the top of the brick and push the line to the face of the bricks as shown in (Fig 3)
• Set the line correctly 2mm out from the edge of the brick and the top surface even with the top of the brick as shown in (Fig 4).

• Fill the space between the leads, using line as guide after fixing line.

• Resume building leads up to the specified height and fill the wall to the line.

• The correct bonding arrangement with proper bond followed.

• Check the work for the correct height.

• Check again square, level, plumb and Alignment of straightness.

• Brush the work at completion and pointing.

• Complete the work as shown in (Fig 5).

---

Construction, Construction Material & Real Estate : Mason - Exercise: 1.3.09
Lay and build 1 1/2 brick thick wall ‘L’ corner in Flemish bond

Objective: At the end of this exercise you shall be able to
• lay bricks in position
• lay alternate header and stretcher bricks in same course
• follow the principle of Flemish bond.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason's Trowel 2.5 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Straight edge 1.5</td>
<td>1 No.</td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel tape 5m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Line and pins</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel square 75 cm X 50cm</td>
<td>1 No.</td>
</tr>
<tr>
<td>Chalk or pencil</td>
<td>1 No.</td>
</tr>
<tr>
<td>Plumb level</td>
<td>1 No.</td>
</tr>
<tr>
<td>Plumb bob</td>
<td>1 No.</td>
</tr>
<tr>
<td>Bucket and mug</td>
<td>-each one</td>
</tr>
<tr>
<td>Brush</td>
<td>-1 No.</td>
</tr>
<tr>
<td>Brick hammer</td>
<td>-1 No.</td>
</tr>
</tbody>
</table>

Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricks 230 X 110 X 70mm</td>
<td>-850 bricks</td>
</tr>
<tr>
<td>Mortar</td>
<td>-3 bags</td>
</tr>
<tr>
<td>Cement</td>
<td>-15 box</td>
</tr>
<tr>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Lay and build 1 1/2 brick thick wall ‘L’ corner wall in Flemish bond

• Stock the bricks and place the mortar pan approximately 0.75m from the work area
• Mix mortar and place into mortar pan.
• Layout the ‘L’ corner on the floor using the steel square and pencil or chalk (Fig 1 & 2)
• Extend the line a little longer than the actual corner measures with chalk
• Layout out the first course dry keeping head joints uniform
• Lay brick No.1 and brick No.2 in mortar without moving the bricks in between.
• Level and plumb brick No.1 with brick No.2 and straighten the edge with plumb rule or with straight edge.
• Lay the brick No.3 level plumb and straighten the edge with Brick No.1 as shown in Fig 3
• Lay the remaining bricks to complete the course
• Level, plumb and straighten the edge of the each corner (Fig 4 & 5)
• Lay the corner brick no.1 first in each succeeding course and work towards the end of the lead.
• Check the outer most corner of every course laid
• While laying bricks care must be taken headers and stretchers are placed alternately in same course
• All the joints should be uniform thickness, and in perpends
• Remove excess mortar in each course in laid
• Sight down the corner as each brick is laid

• Recheck the corner for squareness after laying the first course of bricks

• Observe good safety practices at all times.

• (Fig 6, 7, 8) The mortar should be enough to form a bed sufficient to lay three or four bricks

Note: To align the front faces of the remaining bricks (Fig 9)
**Fig 8**

SPREAD THE MORTAR WITH A SMOOTH SWING OF THE ARM WITH FINGERS RELAXED

**Fig 9**

ALIGN THE FRONT FACES
Construction English Garden wall bond 23 cm Thick

Objective: At the end of this exercise you shall be able to
• prepare English garden wall bond 23 thick.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason’s Trowel 25 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Brick hammer 1 1/2 lbs</td>
<td>1 No.</td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel square 75 cm x 50 cm</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel tape 3m long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Straight edge 1.5 m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Line and pins</td>
<td>1 No.</td>
</tr>
<tr>
<td>Plumb rule or level</td>
<td>1 No.</td>
</tr>
<tr>
<td>Plumb bob</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

| Mortar pan | 1 No. |
| Bucket and mug | each one |
| Brush | 1 No. |

<table>
<thead>
<tr>
<th>Materials</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricks 230 x 110 x 70</td>
<td>115 nos</td>
</tr>
<tr>
<td>Mortar</td>
<td>1 bag</td>
</tr>
<tr>
<td>Cement</td>
<td>3 box</td>
</tr>
<tr>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Prepare English Garden wall bond 23 cm thick

• Clean the surface area and lay out the wall location as with 23cm in wall
• Layout dry bond to eliminate excessive cutting of bricks.
• Lay bricks with mortar header course as shown in Fig.1 as first course
• Level plumb and line up of the course perfectly
• Lay successive courses of stretchers 3 or 5 courses height until reaching the next header course level plumb and line up with the help of straight edge for accuracy each course as it is laid.
• Lay sixth course as header course breaking the bond in the usual manner
• Finish the laying the first corner and complete the second in the same manner
• Construct the first stretcher course of the wall by laying the outside first and then the inside.

Note: These should be laid from the lead to the center. Level, plumb and line up each course before beginning the header course. A line should be used on all backing courses to insure the good face.

• Lay the header course from each load toward the center, Level Plumb and line up the header course
• Lay the outside tier up the next header course keeping it straight level and plumb
• Lay the inside tier up the same height

**Note:** Careful to keep it level with the outside tier as it is laid up
This is important as you must have a level surface for the header course

• Continue, until the desired height is required.
• Strike the joints and brush the wall at the proper time.

**Correct method of using trowel for spreading mortar. Bed as shown in Fig. 2**
Objective: At the end of this exercise you shall be able to
• prepare flemish garden wall bond 23 cm thick

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason’s Trowel 25 cm long</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Mason’s Brick hammer 1 1/2 lbs</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Steel square 75 cm x 50 cm</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Straight edge 1.5m</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Plumb rule or bob.</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Plumb level</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>Bucket and mug</td>
<td>- each one</td>
</tr>
<tr>
<td>Wire Brush</td>
<td>- 1 no</td>
</tr>
</tbody>
</table>

Materials

• Bricks 230 x 110 x 70mm - 135 nos
• Cement - 1 Bag
• Sand - 3 Box
• Water

PROCEDURE

TASK 1: Prepare flemish garden wall bond 23 cm thick

• Lay the wall location as 23cm thick wall
• Place the header centrally over the stretcher in the preceding course as shown in (Fig 3)
• Level, plumb and lineup with the help of spirit level, plumb level or plumb bob and with straight edge respectively.
• Lay each alternate course will contain a 3/4 brick placed next to the quion as shown in (Fig 2) as second course
• Check plumb, level and its straightness
• Place the header centrally over the stretcher in the preceding course as shown in (Fig 3)
• Flemish garden is not as strong as the English bond.
• Place the stretcher in the middle portion of the bottom and top headers as shown in (Fig 4)

Note: This bond is only suitable for walls having a thickness of one brick (23 cm)
Layout and build one brick right angle cross junction wall in English bond

**Objective**: At the end of this exercise you shall be able to
- lay and mark dimension of right angle cross junction
- mark square at corners.

### Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason’s Trowel 25 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Mortar pan</td>
<td>1 No.</td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel tape 5m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Straight edge 1.5 m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Plumb bob or rule</td>
<td>1 No.</td>
</tr>
<tr>
<td>Bucket</td>
<td>1 No.</td>
</tr>
<tr>
<td>Mug</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel square 75 cm x 50 cm</td>
<td>1 No.</td>
</tr>
<tr>
<td>Line and pins</td>
<td>1 No.</td>
</tr>
<tr>
<td>Chisel</td>
<td>1 No.</td>
</tr>
<tr>
<td>Bolster</td>
<td>1 No.</td>
</tr>
<tr>
<td>Lump hammer</td>
<td>1 No.</td>
</tr>
<tr>
<td>Pencil</td>
<td>1 No.</td>
</tr>
<tr>
<td>Chalk</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

**Materials**

- Bricks 230 x 110 x 70 - 400nos
- Bricks 230 x 110 x 70 - 2 nos
- Mortar (cement, sand)
- Water
- Cement - 20 kg
- Sand - 3 box

### PROCEDURE

**TASK 1**: Lay and mark dimensions of right angle cross junction

- Locate the face of the wall on the floor. Mark a chalk line.
- Prepare layout the first course with dry bricks to identify and correct any problems by using line thread and straight edge also using the steel square as shown in (Fig 1 & 2)
- Spread mortar bed and lay bricks as already shown in (Fig 3) and align, level and plumb the course of brick
- Lay intersecting brick wall and running the course to the outside wall. Align, level, plumb and check thickness of brick wall
Skill Sequence 1

Method of Cutting bricks by using of Bolster and Hammer

- Set one brick face up on an off cut of timber or fibre board.
- Mark the face of the brick for cutting. Using the width another brick as a guide
- Hold the blade of the bolster on the face of the brick and vertical to it
- Strick the bolster with a firm hard blow with the lump hammer.
- Use the bolster and Lump hammer to trim any excess remaining on the half brick
- Mark the line of cut for the closer on each header face an the brick to be cut
- Stand the brick an one header face on a fobre board pad and Place the bolster along the cutting line.
- Strike a medium blow with a lump hammer, turn the brick to the other header face and repeat the cut with are medium blow.
- Continue alternating between each header face untility the brick is cut.

Caution

- Keep away fingers from the chisel head.
- Care should be taken while blow with hammer. Other wise may spoil the fingers.(Fig.1)
Lump hammer

- 1 kg hammer used in conjunction with a bolster for cutting (Fig 1)

Bolster (Fig.2)

- 100 mm wide chisel, when cutting or trimming the bricks
  The brick should rest on a fibre of soft wood Pad to reduce unnecessary fractures. For final cutting the bolster should be given a sharp heavy blow with lump hammer or club hammer.

Skill Sequence

Method of lifting mortar from mortar Board.

- Cut away a quantity of mortar
- Using a curved sawing stroke draw the trowel of mortar across the spot to form a roll.
- Move the trowel back from the roll of mortar and turn it . So that the blade is horizontal, 1 mm above spot board and 50 mm diagonally away from the roll.
- With a sharp movement Rick up the roll of mortar.
- In a sweeping movement draw the trowel parallel to and along the edge of the spot simultaneously turning .
- With the trowel point, furrow the spread mortar along its length with series of undulating trowel movements.
- Cut off the surplus mortar along the edge of the spot board to produce clean edge to the spread mortar.
- Trowel blade and spreading . The mortar along the edge of the spot board.
Prepare cement concrete by hand mix

Objective: At the end of this exercise you shall be able to
• check the platform and materials
• measure the required ingredients
• mix the ingredients.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spade - 1 No.</td>
<td>Cement one bag (0.034m³)</td>
</tr>
<tr>
<td>Bucket - 1 No.</td>
<td>Sand : 5 Box</td>
</tr>
<tr>
<td>Mug - 1 No.</td>
<td>(Add 20% for bucking)</td>
</tr>
<tr>
<td>Mortar pan - 1 No.</td>
<td>Aggregate</td>
</tr>
<tr>
<td>Measuring box - 1 No.</td>
<td>Water</td>
</tr>
<tr>
<td>Mason trowel - 1 No.</td>
<td></td>
</tr>
<tr>
<td>G.I Sheet (for plat form) - 1 No.</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Check the platform before mixing

• Check the quality of materials such as cement, sand, aggregate and water.

TASK 2: Measure the requirement of ingredients

• The measurement is taken by using form as shown in Fig. 1.
• Take 5 box of sand and spread over the platform.
  Note: The sand should be in dry condition
• Take one bag of cement and spread over the sand or fine aggregate.

TASK 3: Mix the ingredients

• This sand and cement mix are well mixed by turning over from one end to another end in dry as shown in (Figs. 2 & 3)
This turning is done three or four times of dry mix material for proper mixing.

Add the well mixed cement sand material over the coarse aggregate as per the specification as shown in (Fig 4) and mixed well by using spade or showel in dry mixing as shown in (Fig 5)

Make required size of pond in dry material for water as shown in (Fig 6)

After adding water in required quantity then mix all material until it appears uniform in colour and consistency for work as shown in Fig. 7.

Mix the wet concrete throughly.

Place the concrete in place by using mortar pans.
Lay R.C.C LINTELS with sunshade

Objectives: At the end of this exercise you shall be able to

- erect the form work shuttering for Lintel and sunshade
- fix the reinforcement and lay the concrete.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammer</td>
<td>Vertical probs</td>
</tr>
<tr>
<td>Steel tape 5m long</td>
<td>Bracing</td>
</tr>
<tr>
<td>Straight edge.</td>
<td>Wooden planks</td>
</tr>
<tr>
<td>Mason’s Trowel</td>
<td>M.S plates</td>
</tr>
<tr>
<td>Mortar pan.</td>
<td>Wooden wedges</td>
</tr>
<tr>
<td>Spade</td>
<td>Steel rods for reinforcement</td>
</tr>
<tr>
<td>Shovel</td>
<td>Oil</td>
</tr>
<tr>
<td>Nail</td>
<td></td>
</tr>
<tr>
<td>chisel</td>
<td></td>
</tr>
<tr>
<td>Lever</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

**TASK 1**: Erect the form work shuttering for lintel and sunshade

- Fix the bottom of lintel with the help of wooden planks on the masons walls
- Check the line and level of the Lintel bottom proper supports are given to it.
- Mark the width of the sunshade projected out on the face of the wall M.S plates are fixed in the lower of the Lintel bottom with vertical supports, as shown in the (Fig 1)
- Tie cross bracings, with vertical supports.
- Provide wooden wedges at the bottom of the vertical supports to prevent from sliding.

**TASK 1**: Fix reinforcement and lay the concrete

- Place the reinforcement bars in its position and tie properly by using binding wire.
- The sides of sunshade provided are fixed along with sides of Lintel.
- The sides of planks are fixed vertically and fixed firmly.
- Spacing of the main rod reinforcement and distribution rod should be properly placed at 15cm centre to centre and tied well with binding wire.
- Mix concrete in proper proportion 1:2:4 cone part of cement 2 parts of sand and four parts coarse aggregate) in dry condition.
- Add water and proper mixing is done until good workability
- Pour the concrete gently. Care should be taken, in any case do not through concrete
- Level the concrete and compact either by Hand or vibrator.
- Provide sloping outside the face of wall to divert the rain water outside as shownin (Fig 2).
Fig 2

CROSS SECTION OF LINTEL

DETAILS OF REINFORCEMENT

LINTEL
DISTRIBUTOR
MAIN BARS

BRICK WALL
WIDTH OF PROJECTION

DISTRIBUTOR ROD

MAIN REINFORCEMENT
### Construction of detached square pillar with footing

**Objectives:** At the end of this exercise you shall be able to
- layout and construct detached square pillar with footing.

#### Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar pan or board</td>
<td>Brick 230 x 110 x 70mm - 35 Nos</td>
</tr>
<tr>
<td>Spade</td>
<td>Cement concrete = 0.0098m³</td>
</tr>
<tr>
<td>Mason’s trowel 25cm long</td>
<td>Mortar = 0.0132m³</td>
</tr>
<tr>
<td>Brick hammer 1½/1 lbs</td>
<td>Cement</td>
</tr>
<tr>
<td>1.5m plumb rule</td>
<td>Sand</td>
</tr>
<tr>
<td>Sprit level 15cm long</td>
<td>Water</td>
</tr>
<tr>
<td>Plumb bob</td>
<td></td>
</tr>
<tr>
<td>Plumb level</td>
<td></td>
</tr>
<tr>
<td>Wire brush</td>
<td></td>
</tr>
<tr>
<td>Chalk or Pencil</td>
<td></td>
</tr>
</tbody>
</table>

#### PROCEDURE

**TASK 1: Layout and construct a detached square pillar with footings**

- Clean the work spot
- Strike a chalk line on one side only.
- Mark the layout course with pencil according to the plan.
- Arrange required tools and materials.
- Excavate the foundation 70 x 70 x 90cm.
- Level the earth at bed level.
- Lay the cement concrete 1:5:10 - 20cm thick. (Fig. 1)
- Consolidate the concrete and cured.
- Mark 15cm offset around the concrete bed.
- Layout the 1st footing in dry course and square it as per given drawing. (Fig. 3)
- Check the bed of the corner brick and height with the gauge rod. Level and plumb.
- Spread the mortar 1:6cm the surface of the 1st footing.
- Lay the second footing as per Fig. 2.
- Lay the square pillar of size 20cm x 20cm in eleven courses.
- Plumb the course on its corner point and align the pier with straight edge on all four sides.
- Don't remove mortar that has been squeezed from under the bricks at this time as they may as settle unevenly.
- Remove the mortar after 3 courses have been laid.
- Check the pillar with the steel square and make any necessary corrections.
- Repeat the operations involved in laying each course of bricks until the pier has been suit the specified number of courses.
- Strike the mortar joint as needed with a convex joints.
- Recheck the pier in level, plumb, square and the proper size as per the drawing.

**Caution**

Don't beat on the pier excessively as this may cause the brick work to set out of alignment.

Keep the work area free from materials

Brush the work on all the four sides of the pier and do neat painting as required.
Construction of detached square pillar with footing

Objectives: At the end of this exercise you shall be able to
• layout and construct detached square pillar with footing.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mortar pan or board - 1 No.</td>
<td>• Brick 230 x 110 x 70mm - 110 Nos</td>
</tr>
<tr>
<td>• Spade - 1 No.</td>
<td>• Cement concrete = 0.81m³</td>
</tr>
<tr>
<td>• Mason’s trowel 25cm long - 1 No.</td>
<td>• Mortar = 0.40m³</td>
</tr>
<tr>
<td>• Brick hammer 11/2/1 lbs - 1 No.</td>
<td>• Cement</td>
</tr>
<tr>
<td>• 1.5m plumb rule - 1 No.</td>
<td>• Sand</td>
</tr>
<tr>
<td>• Sprit level 15cm long - 1 No.</td>
<td>• Water</td>
</tr>
<tr>
<td>• Plumb bob - 1 No.</td>
<td></td>
</tr>
<tr>
<td>• Plumb level - 1 No.</td>
<td></td>
</tr>
<tr>
<td>• Wire brush - 1 No.</td>
<td></td>
</tr>
<tr>
<td>• Chalk or Pencil - 1 No.</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Layout and construct detached rectangular pillar with footings

• Clean the work spot.
• Mark the layout with pencil according to the plan.
• Excavate the foundation 90 x 100 x 90cm.
• Level the earth at bed level.
• Lay the cement concrete 1:5:10 - 25cm thick.
• Consolidate the concrete and cured.
• Mark 15cm offset around the concrete bed.
• Layout the first footing in dry course as per given drawing (Fig. 4)
• Check the bed of the corner brick and height with gauge rod, level and plumb.
• Spread the mortar 1:6 on the surface of the 1st footing.
• Lay second footing and 3rd footing as per given drawing (Fig. 3, 2).
• Lay rectangular pillar of size, 40 x 30mm in ten courses.
• Plumb the course on its corner point and align the pier with straight edge on all four sides.
• Recheck the pier in level, plumb square and the proper size as per given drawing. (Fig. 1)
Construction of cavity wall

Objective: At the end of this exercise you shall be able to
• lay a cavity wall

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason’s Trowel 25 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td>1 No.</td>
</tr>
<tr>
<td>Steel tape 3m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Straight edge 1.5 m</td>
<td>1 No.</td>
</tr>
<tr>
<td>Plumb level</td>
<td>1 No.</td>
</tr>
<tr>
<td>Line and pins</td>
<td></td>
</tr>
<tr>
<td>Steel square 75 cm x 50 cm</td>
<td>1 No.</td>
</tr>
<tr>
<td>Wooden strips drip 5cm x 5cm - 100 long</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricks 230 x 110 x 70</td>
<td>400 nos</td>
</tr>
<tr>
<td>Cement mortar</td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>1 bag</td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>5 box</td>
</tr>
<tr>
<td>Binding wire</td>
<td>2 m</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Lay a cavity wall

• Locate outside wall edges and snap chalk guidelines.
• Do a dry layout with the bricks to identify any problems. Fig 1 bottom shows the first course plan.
• Measure over 25cm from the outside line to locate the inside line for the backing leaf. 5cm cavity is used.
• Lay inside bed course running from bed brick 1 to bed brick 2 (Fig 1)
• Work from both ends toward the middle.
• Lay mortar slightly thick for the bed joint, check plumb to be sure brick are vertically true.
• Take care to lay brick to the marked line.
• Align and check horizontal level after laying
• Lay bed brick 6 and the closure between brick 6 and 1. Align plumb and level (Fig 1)
• Measure to make sure corner is square (ie) at a 90° angle as shown in Fig 1
• Cut three quarter brick number 3, 4 and 5 as shown in 1st course plan Fig 1
• Lay bed brick 3, 4 and 5 in mortar bed.
• Level and plumb brick
• Measure distance to bed brick 3 and 4 to be sure the outside edge is located 25cm from the inside face.
• Check corner by brick 2 and 5 to see that it is square
• Lay brick between bed brick 4 and 5 and finish the legoff of bed brick 3
• Level, plumb and align
• Check corners for square and also see that 25cm width of wall throughout.
• Three weep holes in the joints as shown in elevation view (Fig 3)
• Cut three, three quarter brick for second course
• Lay mortar bed as Bevel mortar bed to avoid dropping mortar in cavity as shown in (Fig 4)

Fig 4

BEVELING THE BED JOINT WITH THE BLADE OF THE TROWEL

• Lay three quarter brick number 7 over right end of wall
• Lay second course brick number 8 at other end of wall as shown in the Fig 2
• Complete both face wythe and backing wythe following the procedure established for the first course.
• Lay mortar for the four metal ‘Z’ shaped ties.(Fig 5)
• Embed ties in the mortar and locate as shown on the second course Fig 2
• Be sure that if a tie with a drip is used, the drip on the metal tie points downward
• Build corner leads six courses heigh on each end of the wall
• Finish wall to eighth course Then embed metal ‘Z’ shaped ties as noted on elevation view Fig 3
• Use one metre long 5cm x 5cm wood piece and attach wires at each end. This is used to catch any mortar inside the cavity and to finish the mortar flat as shown in (Fig 5)

Fig 5

• A wood strip insert on the wall ties prevents mortar from dropping into the cavity
• Complete the cavity wall, use the wood piece inside the cavity to catch any mortar
• Continue, however to bevel the inside of the mortar bed before laying the brick.
• Square, and align the wall
• Remove any mortar splatter on the outside wall
• Brush wall with brush and finish the joints
• Make sure weep holes are clear as shown in (Fig 6)

Fig 6

LOCATION OF WEEP HOLES IN MASONRY WALL
Fix door frames in masonry work

Objectives: At the end of this exercise you shall be able to
• check the line-out for brickmasonry
• fix the hold fast with the frame
• check the door frame
• fix the door frame.

Requirements

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Doorframe</td>
<td>• Screws</td>
</tr>
<tr>
<td>• Iron hold fast 300 x 30 x 5m</td>
<td>- 1 No.</td>
</tr>
<tr>
<td>• Plumb bob</td>
<td>• Coal tar</td>
</tr>
<tr>
<td>• Level tube</td>
<td>• Bamboo</td>
</tr>
<tr>
<td>• Thread</td>
<td>• Cement</td>
</tr>
<tr>
<td></td>
<td>• Sand</td>
</tr>
<tr>
<td></td>
<td>• Aggregate</td>
</tr>
<tr>
<td></td>
<td>- 24 Nos</td>
</tr>
<tr>
<td></td>
<td>- 1/2 lit.</td>
</tr>
<tr>
<td></td>
<td>- 2 Nos</td>
</tr>
<tr>
<td></td>
<td>- as reqd.</td>
</tr>
<tr>
<td></td>
<td>- as reqd.</td>
</tr>
<tr>
<td></td>
<td>- as reqd.</td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: State check the lineout for brick masonry
• Check the face of block by plumb.
• Check diagonals of the room. (Fig. 1)
• Check the top of block are in one level.
• Keep the door opening 50mm more than the actual size of opening. (Fig. 2)

TASK 2: Fix the hold fast with the frame
• Fix the hold fast with screws (Fig. 3)
• Fix the hold fast 3 Nos on each side of frame.
TASK 3: Check the door frame (Figs 5 & 6)

- Check the quality of wood.
- Check dry defects in the frame.
- Check temporary supports provided bottom, middle and top two corners to keep the frame in fact.
- Bottom support is check in mild steel angle of size 25 x 25 x 5mm to keep the bottom ends of the frame in position very effectively.
- To check the vertically use in plumb bob.
- Check whether coal tar is applied or not on all sides of the frame and primer coat on rest of the exposed portion.
TASK 4: Fix the door frame (Figs 7 to 9)

- Check the door frame is properly
- Fix it temporarily at the place.
- Check from working drawing, the opening side of the frame before fixing it.
- Check the level of the frame with reference to main door level.
- Check the plumb from the outer and inner face.
- Check the top of the door frame with level tube.
- Check the line of door frame with the help of line thread.
- Fix the hold fast in concrete to avoid buckling of frame from bottom.
- Fix M.S. plate instead of hold fast, incase of column and wall on one side of the door frame.
- Check all these points, then the mason to fix the door frame permanently by connecting the hold fasts.
Spanning of door/window opening in one brick thick wall English bond “Semi circular arch”

Objective: At the end of this exercise you shall be able to
- layout arch masonry opening dimensions
- prepare voussoirs
- form required semicircular arch curvature.

Requirements

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason’s Trowel 25 cm long</td>
<td></td>
<td>Bricks 230 x 110 x 70mm</td>
<td>260 Nos</td>
</tr>
<tr>
<td>Pointing Trowel</td>
<td></td>
<td>Voussoirs</td>
<td>50 Nos</td>
</tr>
<tr>
<td>Line and thread</td>
<td></td>
<td>Cement mortar</td>
<td></td>
</tr>
<tr>
<td>Spirit level 15 cm long</td>
<td></td>
<td>Cement or lime</td>
<td>1.5 bags</td>
</tr>
<tr>
<td>Steel tape 3m long</td>
<td></td>
<td>Sand</td>
<td>8 box</td>
</tr>
<tr>
<td>Foot rule 60 cm</td>
<td></td>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>Straight edge 15 cm long</td>
<td></td>
<td>Plywood</td>
<td></td>
</tr>
<tr>
<td>Plumb bob</td>
<td></td>
<td>Ballies</td>
<td></td>
</tr>
<tr>
<td>Nail</td>
<td></td>
<td>Wooden wedges</td>
<td></td>
</tr>
<tr>
<td>Brick hammer 1 1/2 lbs</td>
<td></td>
<td>Wooden reepers</td>
<td></td>
</tr>
<tr>
<td>Hammer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

TASK 1: Layout arch masonry opening dimensions
- Draw the lines of the opening size on the floor (Fig 1)
- Draw the springing line and mark centre
- Drive the nail into the centremark and a double up the string to the length of the radius (Fig 2).
- Insert the pencil at the end of the loop

- Describe the semi circular for introdos line
- Extend the string to the depth of arch ring and describe the lines of extrados
- Divide the extrados line into odd number of voussoirs and allowing for joints
TASK 2: Prepare voussoirs

- Mark the common size of voussoirs are determined complete the shape by drawing the joints lines between introdos and extrodos as shown in (Fig 4)

- Check the accuracy of the template shape
- Check the joints can be determined by laying straight edge along one of the bed joint
- Mark on each side by the template the cutting mark of the bricks as shown in (Fig 5)

- Mark bricks by placing the template on the face of the bricks as shown in (Fig 6)

- Mark the soffit with the aid of a steel square and cut the bricks with cutting tool (Fig 7)

- Cut the voussoirs in wedge shaped
- Cut a joggle in the beds and allow for grouting as shown in (Fig 8)

- Fix the framework /centering carefully in position making adjustment as required with the aid of bottom supports as shown in (Fig 9)

TASK 3 - Procedure required semi circular arch Centering

- Mark accurately along the framework the position of voussoirs on the introdos and the width of joints
- Drive a nail at the centre and attach a length of line so that the radiation of the bricks to the centre may be checked for accuracy and to ensure that the voussoirs are normal to the curve as shown in (Fig 9)
• Check the arch for straightness along its face
• Build brick work each side of the arch and stretching a line in between to lineup arch
• Stretch a line between two temporary one brick piers erected each side of the opening.
• Build the arch evenly on each side meeting it at the middle or key brick
• Check each voussoirs for its correct position on the form work and correct alignment by means of the line from the centre as shown in (Fig 10)

**Note**

After the arch has been allowed to set, first case the bottom ballies except the centre ones allowing arch to take load gently

Then remove altogether and finally take out the centre ballies and remove the ribs carefully

• Clean the surface with the aid of brush and do neat pointing
• Complete and finish the semi circular arch as shown (Fig 11)