MASON
(BUILDING CONSTRUCTOR)

NSQF LEVEL - 3

TRADE PRACTICAL

SECTOR : CONSTRUCTION

(As per revised syllabus July 2022 - 1200 Hrs)

Directorate General of Training

DIRECTORATE GENERAL OF TRAINING
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
GOVERNMENT OF INDIA

NATIONAL INSTRUCTIONAL MEDIA INSTITUTE, CHENNAI

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

Sector : Construction

Duration : 1 Year

Trade : Mason (Building Constructor) - Trade Practical - NSQF Level - 3 (Revised 2022)

Developed & Published by

National Instructional Media Institute
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Guindy, Chennai - 600032
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First Edition : July 2022 Copies : 500

Rs.230/-

FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of comprising various stakeholders viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Mason (Building Constructor) - Trade Practical NSQF Level - 3 (Revised 2022) in Construction Sector under** under Annual pattern. The NSQF Level - 3 (Revised 2022) Trade Practical will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF Level - 3 (Revised 2022) trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 3 (Revised 2022) the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these Instructional Media Packages IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

SHRI. ATUL KUMAR TIWARI., I.A.S.,
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New Delhi - 110 001

PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Directorate General of Training, Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of Federal Republic of Germany. The prime objective of this Institute is to develop and provide instructional materials for various trades as per the prescribed syllabi under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

In order to perform the skills in a productive manner instructional videos are embedded in QR code of the exercise in this instructional material so as to integrate the skill learning with the procedural practical steps given in the exercise. The instructional videos will improve the quality of standard on practical training and will motivate the trainees to focus and perform the skill seamlessly.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

Chennai - 600 032 **EXECUTIVE DIRECTOR**

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 (Building Constructor)** under the **Construction** Sector for ITIs.

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Shri. G. Michael Johny	-	Manager NIMI, Chennai - 32.

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 intented to be used in workshop . It consists of a series of practical exercises to be completed by the trainees during the course of the **Mason (Building constructor)** trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in compliance with NSQF LEVEL - 3

This manual is divided into ten modules. The ten modules are given below

Module 1	**Safety**
Module 2	**Carpenter Works**
Module 3	**Brick Masonry**
Module 4	**R.C.C. Construction**
Module 5	**Layout Marking and Levelling**
Module 6	**Plastering and flooring**
Module 7	**Drainage**
Module 8	**Sanitary Fittings**
Module 9	**Masonry Work**
Module 10	**Finishing Work**

The skill training in the shop floor is planned through a series of practical exercises centred around some practical project. However, there are few instances where the individual exercise does not form a part of 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 course of the **Mason (Building constructor)** Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theortical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptional 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 atleast 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.

CONTENTS

CONTENTS

CONTENTS

LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

Sl.No.	Learning Outcome	Exercise No
1	Perform wood work with carpenter's tools following safety precautions.	1.1.01 - 1.2.16
2	Plan and organize the work to make masonry brick wall as per drawing and specification applying different types of tools, materials and check for dimensional accuracy.	1.3.17 - 1.3.28
3	Construct wall leaving space for door & window opening.	1.4.29 - 1.4.36
4	Perform R.C.C casting, rod cutting in different sizes, bending, binding & placing. Mixing & compaction of Concrete with different proportions.	
5	Perform Construction of cavity wall.	1.4.29 - 1.4.36
6	Perform Laying out of building plan, diagonal check-up, fixing up of excavation lines	1.5.37 & 1.5.38
7	Perform wall & ceiling plastering with application of mortar, smoothening the surface by using of screeds & floats.	1.6.39 - 1.6.43
8	Make different types of floor with determination and formation of Slope.	1.6.39 - 1.6.43
9	Lay drain pipe, jointing, fittings & fixing of W.C. pan, urinals, gully trap,construction of manhole etc.	1.7.44 - 1.7.50
10	Construct septic tank.	1.8.51 - 1.8.53
11	Perform fixing & fittings of wash basin, flushing cistern, sink, vent pipe, etc.	1.8.51 - 1.8.53
12	Lay marble on floor& stair with marking, cutting &complete setting.	1.9.54 - 1.9.57
13	Construct circular brick wall & hollow block walls.	1.10.58 - 1.10.64
14	Prepare & mix of concrete, formwork, cutting & bending of bar, casting of roof slab, beams, lintels, stair, column etc.	1.10.58 - 1.10.64
15	Cut & set glazed tiles to walls.	1.10.58 - 1.10.64
16	Lay mosaic, terrazzo & tile flooring.	1.10.58 - 1.10.64
17	Perform Construction of R.C.C. & Brick stairs.	1.10.58 - 1.10.64

SYLLABUS FOR MASON (BUILDING CONSTRUCTOR)

Duration: One Year

Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 76 Hrs; Professional Knowledge 14 Hrs	Perform wood work with carpenter's tools following safety precautions.	1. Familiarization with Institute, administrative setup of Institute. (3 hrs.) 2. Rules & resolutions of attendance with leave facility. (3 hrs.) 3. Importance of Trade training, instruments & equipment's used. (5 hrs.) 4. Importance of trade training, List of tools & Machinery used in the trade. (4 hrs.) 5. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (5 hrs.) 6. First Aid Method and basic training. (4 hrs.) 7. Safe disposal of waste materials like Pieces of wood, rod, stone, mud, etc. (2 hrs.) 8. Hazard identification and avoidance. (2 hrs.) 9. Safety signs for Danger, Warning, caution & personal safety message. (3hrs.) 10. Preventive measures for electrical accidents & steps to be taken in such accidents. (5 hrs.) 11. Use of Fire extinguishers. (9 hrs.) 12. Practice and understand precautions to be followed while working in mason jobs. (3 hrs.) 13. Safe use of tools and equipments used in the trade. (2 hrs.)	• Importance of safety and general precautions required for the trade. • Importance of the trade. • Types of work to be done by trainees in the institute. • Scope of a mason work. • Types of services has to plan. • Role of a mason, nature of job done by masons(7 hrs) • Video demo chapter -3
		Carpenter works :- 14. Demonstrate uses of Carpenter's hand tools. (10 hrs.) 15. Centering work. Uses of nails, screws, nuts & bolts, hinges etc. (7 hrs.) 16. Perform centering & form work. (9 hrs.)	• Common types of wood- their description and use. • Carpenter's hand tools, their names and uses. Grinding of tools &precautions to be taken • Carpentry joints and their uses. Use of nails, screws, dowels, etc.(7 hrs)
Professional Skill 150 Hrs;	Plan and organize the work to make masonry brick wall as per	17. Handling of brick, turning of brick for stretcher & header faces. (4 hrs.) 18. Cutting of brick with brick hammer as desire shape & size. (8 hrs.)	• Technical terms used in brick masonry. Necessity of bonding bricks. Types of bond Types of mortars, different grades of sand

Professional Knowledge 23Hrs.	drawing and specification applying different types of tools, materials and check for dimensional accuracy.	19. Shaping mortar, spreading on the bed joining bricks. (10 hrs.) 20. Preparation of various types of mortars according to the ratio of ingredients. (6 hrs.) 21. Building 4½ straight wall about 6 courses high with one end stepped and the other racked back. (24 hrs.) 22. Building 4½ quoin wall with one end stepped and the other racked back. Use of plumb rule. (26 hrs.) 23. Construct of 1 &1 ½ brick walljunctions in English & Flemish bonds. Racking out the joints &finishing it flush. (24 hrs.) 24. Construction of 1 brick thick walls inEnglish & Flemish garden bonds. (24 hrs.) 25. Construct of detached brick pillars with footings square & rectangular types. (24 hrs.)	for brick work & plastering. Grades of cement. • Brickwork-racking back & toothing. Differences between English & Flemish bonds. Details of English & Flemish bond for 1 and 1½ brick walls. Precautions at quoins. • Cross wall-method of construction. Grouting of mortar, jointing and finishing of brickwork. Types of pointing & tools used. Details of bonding & special precautions at 'T', 'L' and cross junctions. Types of copings-weathering & throating. • Pillars: Necessity, types, relation between cross section & height. Details of reinforcement for square &rectangular pillars. • Types of cement, sand & lime. English & Flemish garden wall bonds. PWD specification on brickwork. • Foundation: Definition, purpose, types,important terms, causes of failure of foundations. (23 hrs)
Professional Skill 25 Hrs; Professional Knowledge 06 Hrs	Construct wall leaving space for door & window opening.	26. Form a door opening in a wall of English bond. Bonding of jambs & reveals. (10 hrs.) 27. Form a window opening in a wall in English bond. (7 hrs.) 28. Construction of sill with over Sailingcourses. Use of gauge rod Fixing door & window frames. (8 hrs.)	• Purpose of arch centering & form work. Different types of bricks &their sizes.Characteristics of good bricks Sizes of mortar joints for different works. Stretcher & header (6 hrs)
Professional Skill 50 Hrs; Professional Knowledge 7 Hrs	Perform R.C.C casting, rod cutting in different sizes, bending, binding & placing. Mixing & compaction of Concrete with different proportions.	29. Demonstrate R.C.C, re-enforcement of different dia. With unit weight. Cutting, bending & binding of bar. (4 hrs.) 30. Perform Pre-casting a lintel-compacting, curing & setting the same in position. Check for equal bearing. (8 hrs.) 31. Spanning of opening by casting a lintel in site. (10 hrs.)	• RCC lintels: Materials required, • Method of construction, precast lintels, • Method of construction of formwork, details of reinforcement. • Arches: Purpose,technical terms & types. Setting out an arch. (7 hrs)

		32. Making of shuttering &supports with uprights and wedges. (7 hrs.) 33. Cutting, bending & placing ofreinforcement. (4 hrs.) 34. Mixing, placing & compacting concrete. (2 hrs.) 35. Spanning of opening with a semi-circular arch, making centering, cutting of templates for voussoirs & preparing voussoirs, setting uprights of arch. Construction of arch &removing centering. (15 hrs.)	
Professional Skill 25 Hrs; Professional Knowledge 04 Hrs	Perform Construction of cavity wall.	36. Construct cavity walls, setting out both leaves, provision of wall ties and use of cavity rods. (25 hrs.)	• Cavity wall: Technical terms, advantages,constructional details, precautions to be taken at the bottom of cavity.
Professional Skill 50 Hrs; Professional Knowledge 10 Hrs	Perform Laying out of building plan, diagonal check-up, fixing up of excavation lines.	37. Setting out a building: Obtaining first,second, third & fourth lines, marking diagonals,setting out cross walls & offsets. (30 hrs.) 38. Marking excavation lines & fixing of plinth & floor levels. (20 hrs.)	• Steps in setting out & marking centre line, excavation line & other lines-use of deadman-checking accuracy & precautions. Windows & ventilators: Including steel windows & ventilators, fixtures & fastenings used.(10hrs)
Professional Skill70 Hrs; Professional Knowledge 12 Hrs	Perform wall & ceiling plastering with application of mortar, smoothening the surface by using of screeds & floats.	39. Plastering of walls-setting of spots-applying mortar-use of screeds &floats. (25 hrs.) 40. Fixing of screeds to soffits of door & window openings-reversing the screeds & squaring. (20 hrs.) 41. Plastering of ceiling: Application of mortar, strengthening and finishing (Improvise a roof with stone or concrete slab for the purpose ofdemonstration). (25 hrs.)	• Plastering: Tools used, necessity of screeds & their fixing, • Steps in plastering. • Concrete: Ingredients, selection of materials, various ratios of mix, their uses, measuring of materials for mixing. (12 hrs) • Video demo chapter -5
Professional Skill 50 Hrs; Professional Knowledge 7 Hrs	Make different types of floor with determination and formation of Slope.	42. Flooring practice: Determination and formation of slope, application of slurry for finishing, setting out of skirting, formation of spots for skirting. (30 hrs.) 43. Use of screeds, formation of curve at the junction of skirting & floor. (20 hrs.)	" Floors: Types, constructional details such as consolidation of bed, sand filling, concrete base & finishing. Granolithic flooring. Local Municipal byelaws. (07 hrs)
Professional Skill 100 Hrs; Professional Knowledge 20 Hrs	Lay drain pipe, jointing, fittings& fixing of W.C. pan, urinals, gully trap. Construction of manhole etc.	44 Drainage: Set out a drainage line including position of manhole & gully trap. (22 hrs.) 45 Practice in setting up and reading of dumpy level. (16 hrs.) 46 Lay out drainage to required gradients with the help of dumpy level and/or boning rod and layingits surface with bricks. (26 hrs.) 47 Laying of concrete foundation fordrainage pipes and jointing. Check-	• Purpose of drainage, different systems, their advantages & disadvantages, method of collection, carriage & final disposal of wastage, various types of constructions required. Roofs: Classification, parts, trussed roof, covering materials. • House drainage system-normal layout of drainage. • Traps-gully, nahani, etc.-their description.

		ing of alignment. Cutting thepipe to the required length. (10 hrs.) 48 Covering of drain pipe with concrete as per PWD specification. (4hrs.) 49 Laying out foundation concrete andconstruction of manhole. (12hrs.) 50 Method of providing footrests, Formingofdrain and benching.(10 hrs.)	• Purpose & method of fixing sanitary fittings such as WC, urinal, washbasin, kitchen sink, etc. • Construction of surface drains and laying its surface with bricks. • Drainage pipes: Types, materials, sizes, gradient for different diameters, method of laying & jointing, importance of water tightness, concrete base and covering. (20 hrs)
Professional Skill 50 Hrs; Professional Knowledge 6Hrs	Construct septic tank. Perform fixing& fittings of wash basin, flushing cistern, sink, vent pipe, etc.	51 Construct Septic tank conforming PWD norms, Bonding &waterproofing of tank walls, lining field drains with bricks. Shoring for deep trenches following proper Safety precautions. (30 hrs.) 52 Fix brackets for washbasinand flushing cistern. (06 hrs.) 53 Fix WC pan, kitchen & bathroom traps, sinks, etc. Fixing of vent pipe to walls. (14hrs.)	• Septic tank: Purpose, parts and method ofconstruction. (6 hrs) • Video chapter -6
Professional Skill 30Hrs; Professional Knowledge 7 Hrs	Lay marble on floor& stair with marking, cutting &complete setting.	54. Marble work: Method of cutting and setting on stair, floor, wall &pillar. (30 hrs.)	" Marble floor: types, constructional details..(07hrs)
Professional Skill 25 Hrs; Professional Knowledge 12 Hrs	Construct circular brick wall & hollow block walls.	55 Construct a 4½" dia. x 9" thick circular brick wall 4 layers. (15 hrs.) 56 Construct circular gate pillars with Brick / stone/ tile/ concrete. (10 hrs.)	• Circular walls: Details of construction. Purpose-made bricks. • Setting out and construction of circular gate pillars with brick/stone/tile/concrete. • Hollow block masonry: Laying of hollow blocks for walls & columns. • Use of structural clay tile for partition. • Precast concrete partition, metal lathe partition and concrete block partition. (12hrs)
Professional Skill 64 Hrs; Professional Knowledge 15 Hrs	Prepare & mix of concrete, formwork, cutting & bending of bar, casting of roof slab, beams, lintels, stair, column etc.	57 Construct roof with R.C.C. slab and beam (64 hrs.)	• Introduction to RCC: Uses, materials, properties and formwork, bending of bars & construction. • Reference to ISI code. Reinforced brickwork. • Brief description of slabs, beams, lintels, stairs, columns, etc. • RCC work: Mixing of concrete.

			• Laying, compacting &Curing of concrete. • Thumb rule for percentage of reinforcement for lintels, slabs, beams & columns. • Necessity hook & cranking. Shear reinforcement.(15 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Cut & set glazed tiles to walls.	**Finishing works:** 58 External / internal wall finishing practice by plastering or Pointing. (10 hrs.) 59 Fixing cement concrete jelly.(2 hrs.) 60 Laying of glazed tiles.(8 hrs.) 61 Fixing the thread, filling betweenends,plumbing, setting out a jamb, bonding. (3 hrs.) 62 Marking & cutting tiles. (2 hrs.)	• Method of finishing-factors to be kept in mind, PWD specification on the above. • Use of glazed tiles for wall facing, steps in fixing, precautions. • Construction & expansion joints-method of filling-repair of cracks.(7 hrs)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Lay mosaic, terrazzo & tile flooring. Perform Construction of R.C.C. & Brick stairs	63 Flooring: Mosaic, terrazzo, and tileflooring. (30 hrs.) 64 Laying out a stair on the ground.(20 hrs.)	• Stairs: Technical terms, relation between tread & rise, • Types of stairs, construction details of brick, stone & RCC stairs. • Spiral stairs with precast concrete steps. • Formwork & shuttering-their removal-precautions-PWD specifications.(14 hrs)

In plant training / Project work

Broad areas:

a Install a W.C. pan.

b Construct of a circular brick wall.

c Construct a manhole.

d Set glazed tiles on wall.

Familiarization with institute, administration setup of institute

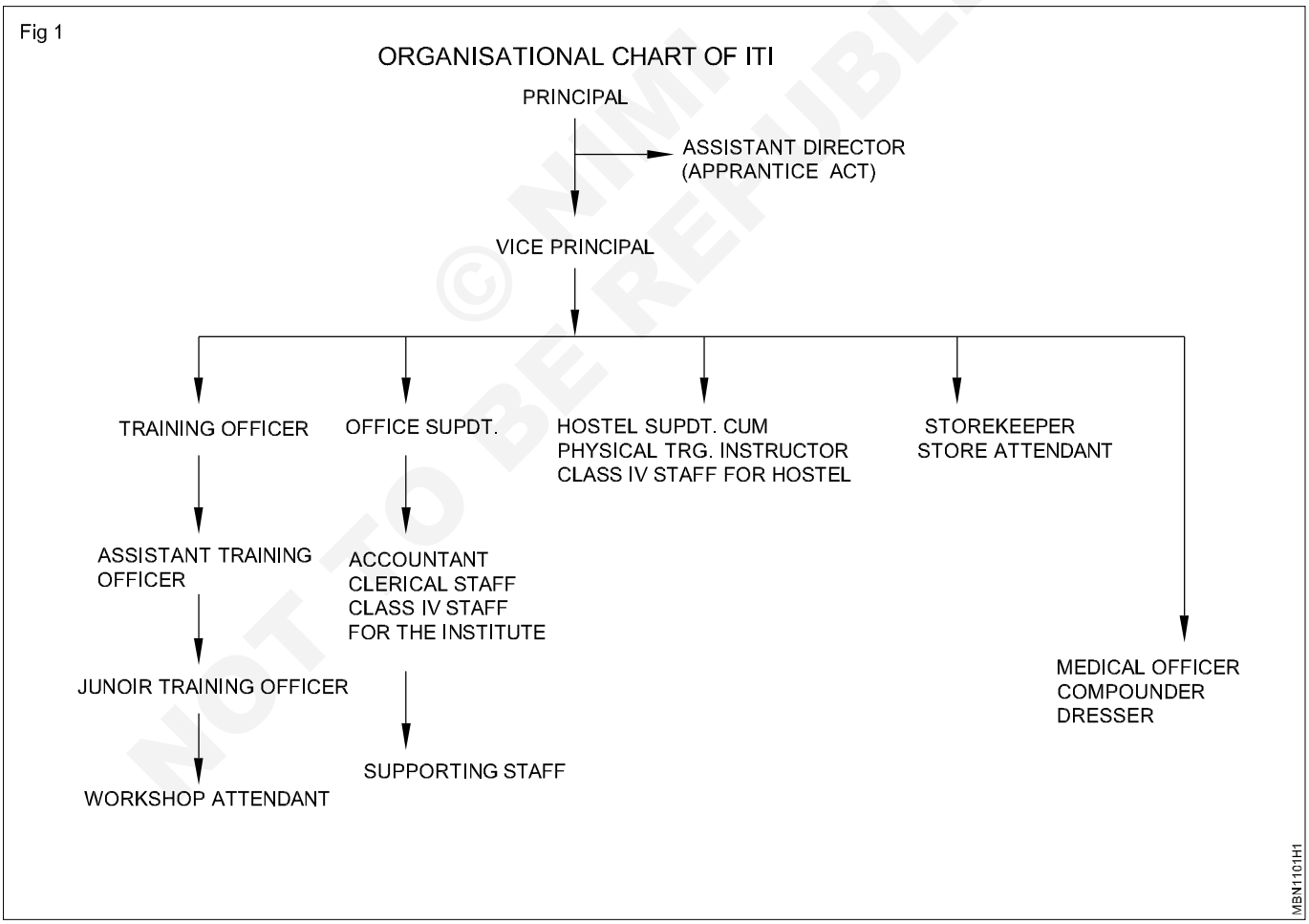
Objectives : At the end of this exercise you shall be able to
- **identify the staff structure of the institute**
- **identify the available trades in the institute and their functions**
- **explain the necessary of adopting the safety rules**
- **list the safety rules and follow them.**

The industrial training institutes throughout India follow the same syllabus pattern as given by the national Council for vocational Training (NCVT) Board. In India there are about 4000 Government. ITIs and 6000 private ITIs. The Government ITIs in each state work under the directorate of employment and training which is a department under the Labour ministry in most of the states.

The head of the industrial training institute is the principal, under whom there is one Vice-principal, Group instructor and a number of trade instructors as shown in the organization chart of ITI. (Fig 1)

Even though there are 132 trades selected for instructional training and identified for apprentice training, according to the requirement of industrial needs, area and finance a few selected trades are established under each ITI. The trainees are advised to make a list of the trades available in their ITI, the type of training and the scope of these trades in getting self or job employment in the rural and urban areas.

Fig 1



Rules and resolutions of attendance with leave facility

Objectives : At the end of this exercise you shall be able to
- **leave facility during training period**
- **rules and regulation of the institute and trade.**

Training system

General

The directorate general of training (DGT) under ministry of skill development & Entrepreneurship offers range of vocational training course catering to the need to different sectors of economy labour market. The vocational training programmes are delivered under the national council of vocational training (NCVT). Craftsman training scheme (CTS) and Apprenticeship training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Mason (Building Constructor) trade under CTS is one of the courses delivered nationwide. The course is of one year (02 semester) duration. It mainly consists of Domain area and core area. In the Domain area-trade theory and practical impart professional skills and knowledge: while core area imparts workshop calculation and science, engineering Drawing, and Employability skills impart requisite core skills & knowledge and life skills. After passing out the training programme , the trainee is being awarded national trade certificate (NTC) by NCVT which are recognized world wide.

Candidates broadly need to demonstrate that they are able to:

- Read & interpret technical parameters/ documentation, plan and organize work processes, identify necessary materials and tools.
- Perform work with due consideration to safety rules, GOVT. Bye laws and environmental protection stipulations.
- Apply professional knowledge, core skills & employability skills while performing the work
- Check the work as the per sketches and rectify errors
- Document the technical parameters related to the work undertaken

About the trade

What do mason

Construction site cleaning, marking the building as per plan. Excavation according to plan, mason can do handling bricks, preparation of mortar according to the ratio. Construction of brick and stone masonry. Foundation, pillars etc., R.C.C work and bar bending. Construction of cavity walls, laying of floor, plastering in walls and ceiling in construction, forming skirting at wall floor junction.

Fixing/positioning of/placing of floors, windows and ventilators, laying of DPC at various position and levels, checking form work, centering and shuttering for concrete work. Pre-casting the lintels and small beams. Construction of arches.

Setting out drainage line including position of manholes and gully trap giving various levels such as foundation bottom, sand filling, concrete basement as to drainage gradients with dumpy level.

Laying concrete foundation for drainage pipes & jointing, checking alignment , cutting the pipes to a required length, laying of foundation to manholes and providing foot rest in manhole. Forming drain & benching in manhole.

Construction of septic tank as per specification, water proofing for water tanks shoring for deep trenches as per safety instruction.

Fixing wash basins, flushing cisterns,fixing w/c, pan, traps, pipes, vent pipes.

Construction of circular brick walls marble work cutting and laying in foot & walls, pillars, construction of hollows block walls.

Fabricated hollow block construction. Construction gate walls with various shapes.

Construction such as internal, external finishing works.

Plastering or pointing

Fixing C.C jolly laying of glazed tiles, marking and cutting of tiles. Construction of stair case etc.,

Options for employment

Employment opportunities for trainees from this trade as mason in construction sector and also available in central and state government department.

Options for self employment

The trainees shall be able to independently undertake masonry work, sanitary work. Flooring and plastering work etc.,

Leave facility

The trainees should attend the institute 80% of attendance casual leave is eligible for 12 days per year and medical leave is eligible for 20 days per year.

Rules and regulation of the institute and trade

- The trainees who are all got admission in IT.I has to follow same general rules stipulated by the institution, and those are given below
- He should try to earn good room from the institution
- The trainees should attend the institution to the correction in punctuality should be maintained.
- He should be very sincere and faithful not only to this instructor but also other instructor and staff of the institute.
- He should attend wear proper formal dress as specified by the institute.
- He should not wear loose clothes and this may be the cause for accident while crossing in shops floor.
- He should have good attitude and behave with good manner to all the staff members his fellow students and to this senior students.
- He should take part in the activities of the institute.
- He should maintain discipline of class room and the institution.
- He should not spoil the environment of institute.

Note : The above rules and regulation are also compulsory for the Girl trainees to adhere.

Importance of trade training, instruments and equipments used

Objectives: At the end of this exercise you shall be able to
- **identify the name of the tools**
- **state the purpose of the tools.**

1 Instructor should demonstrate each tools name and their purposes as shown in figure.

Fig 1

TROWEL

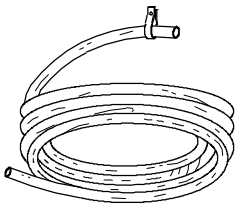
DCN1101H1

Fig 2

MORTAR PAN

MBN1103H2

Fig 3



CURING PIPE

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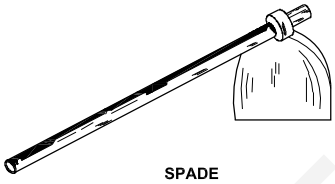
Fig 4



SPADE

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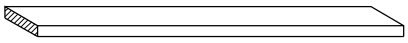
Fig 5

COMPACTING ROD

MBN1103H5

Fig 6



STRAIGHT-EDGE

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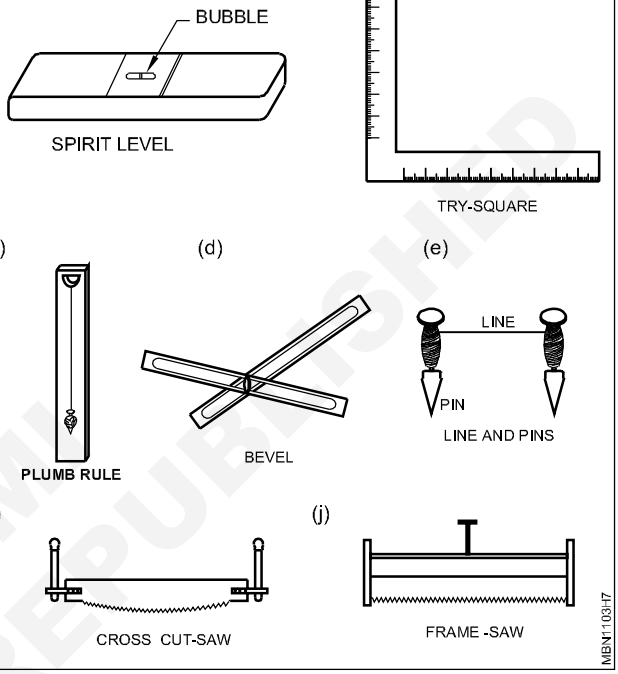
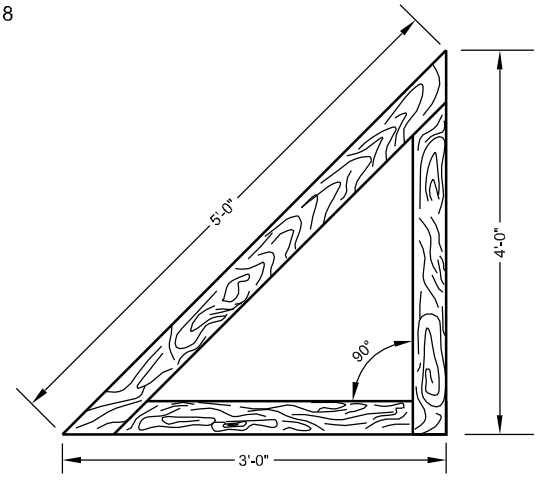
Fig 7 (a) (b)



MBN1103H7

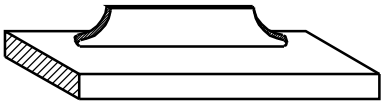
Fig 8



LARGE SQUARE OR MASON'S SQUARE

MBN1103H8

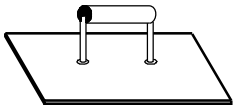
Fig 9



WOODEN FLOAT

MBN1103H9

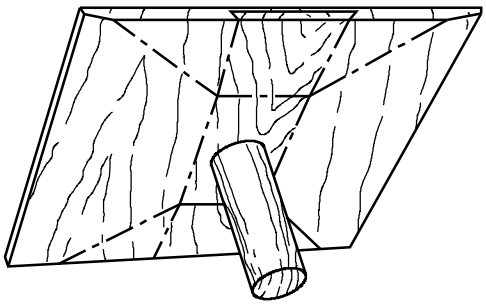
Fig 10



METAL FLOAT

MBN1103HA

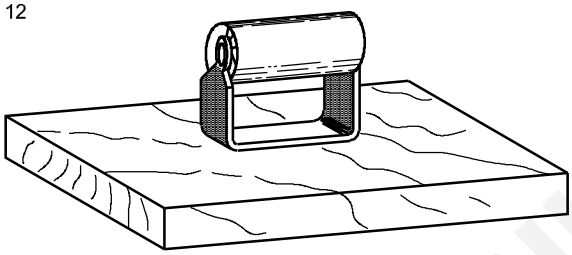
Fig 11



WOOD HAWK USED TO CARRY THE PLASTER MATERIAL TO THE WALL OR CEILING

MBN1103HB

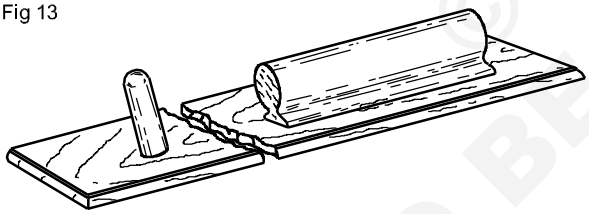
Fig 12



CORK CONSTRUCTION

MBN1103HC

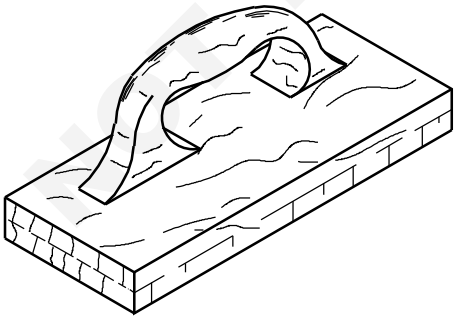
Fig 13



AN ORDINARY WOODEN DARBY USED TO LEVEL LARGE AREAS OF PLASTER

MBN1103HD

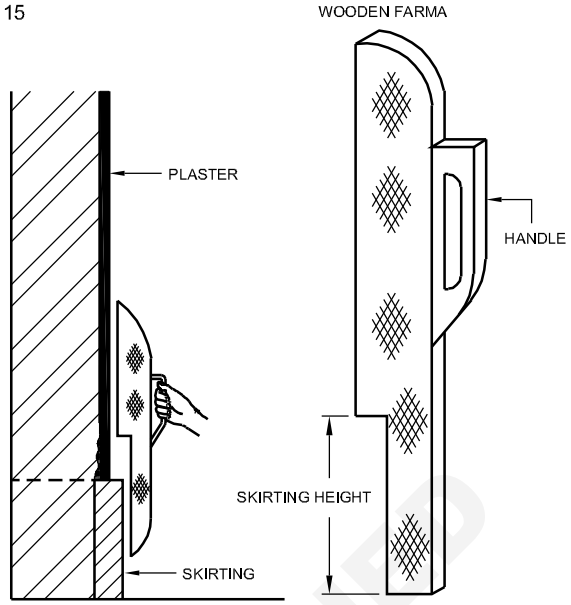
Fig 14



CORK-FACED FLOAT WITH HARD WOOD BACKING

MBN1103HE

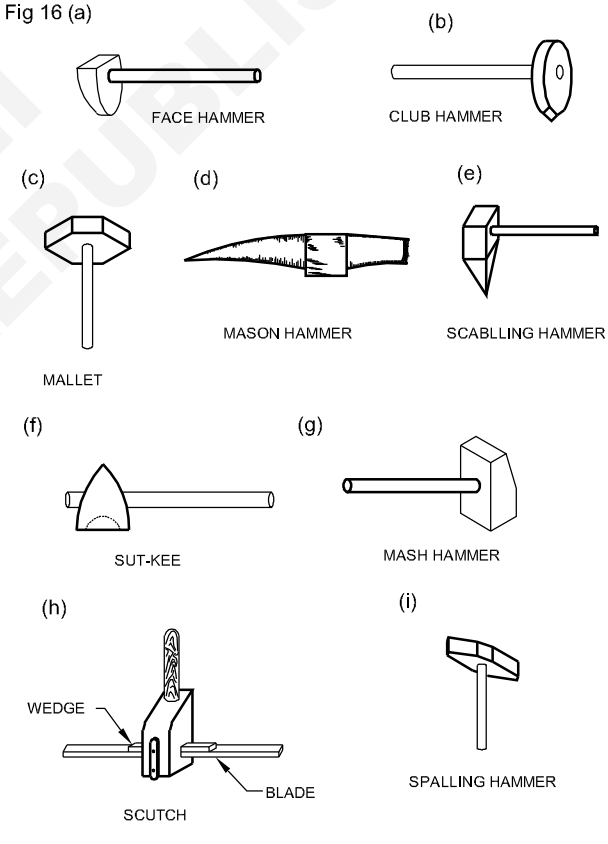
Fig 15



WOODEN FARMA (TEMPLATE) FOR SKIRTING

MBN1103HF

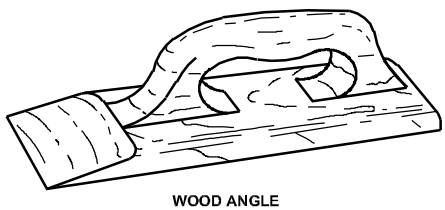
Fig 16 (a)



TOOLS FOR STONE MASONRY

MBN1103HG

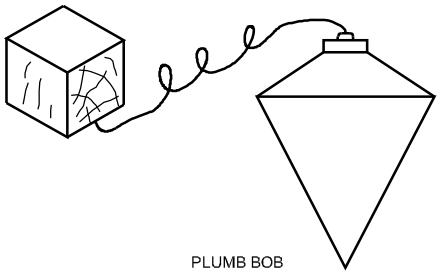
Fig 17



WOOD ANGLE

MBN1103HH

Fig 18



PLUMB BOB

MBN1103H

Trainees should identify the name of the tools and their purposes demonstrated by the instructor.

The trainees are asked fill the name of tools and their purposes in the Table 1.

Table 1

Sl. No	Name of the tools	Uses / Purposes
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Identification of equipment

Objectives: At the end of this exercise you shall be able to
- **identify the name of the equipment shown in figure**
- **identify the purpose for the uses shown in figure.**

1 The instructor should demonstrate each equipment and explain their purposes.

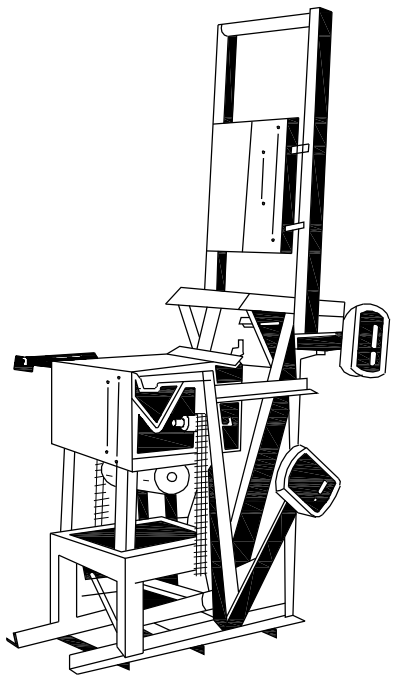
The trainee should identify the name of the equipment and their purposes, demonstrated by the instructor.

The trainees are asked to fill the name of the equipment and their purpose in the Table 2.

Table 2

Sl. No	Name of the equipments	Uses / Purposes
1		
2		
3		
4		
5		

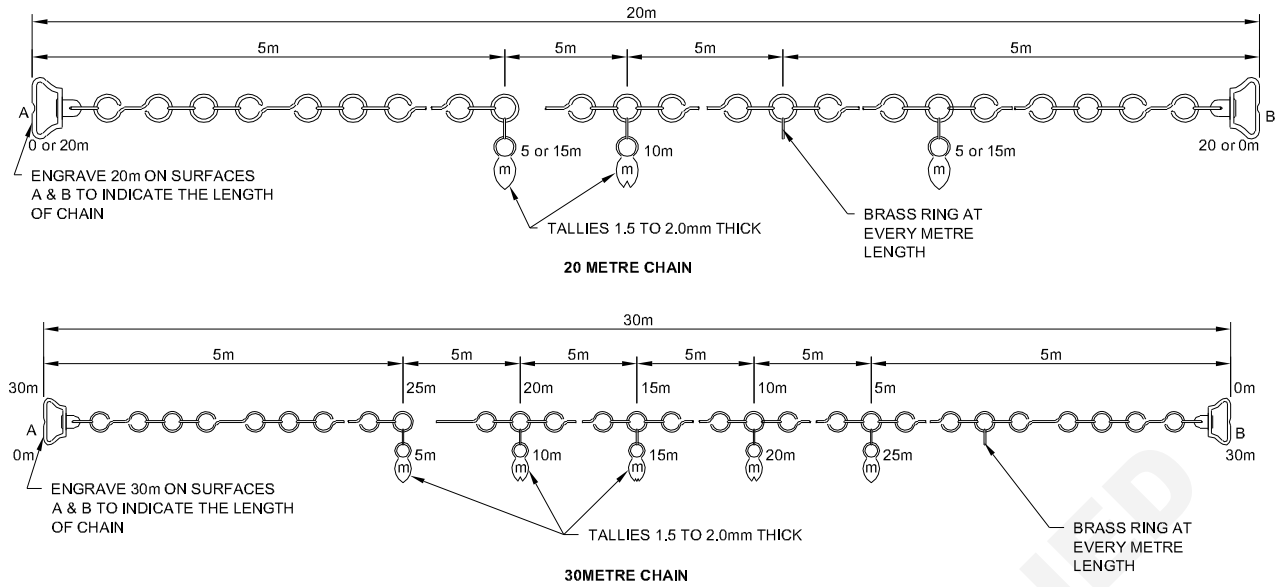
Fig 1



HAND OPERATED BLOCK MACHINE

MBN1103J1

Fig 2



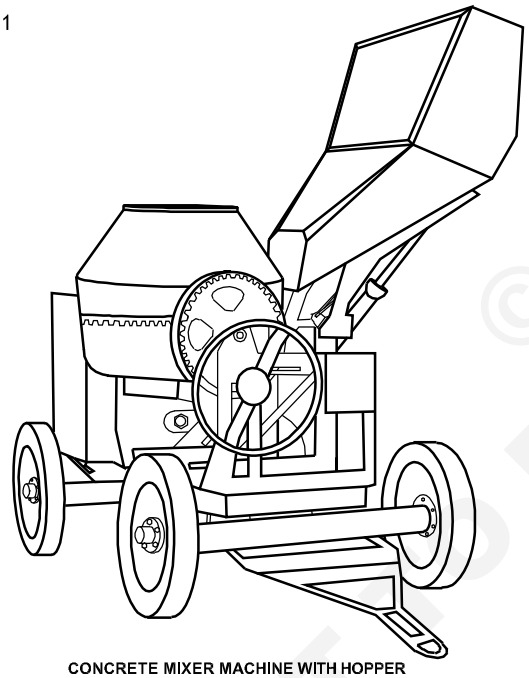
Importance of trade training, list of tools and machinery used in the trade

Objectives : At the end of this exercise you shall be able to
- **identify the machine used in trade**
- **identify the purpose of each machine.**

Mason (Building Constructor) trade under CTS is one of the courses delivered nationwide. The course is of one year (02 semester) duration. It mainly consists of Domain area and core area. In the Domain area-trade theory and practical impart professional skills and knowledge: while core area imparts workshop calculation and science, engineering Drawing, and Employability skills impart requisite core skills & knowledge and life skills. After passing out the training programme , the trainee is being awarded national trade certificate (NTC) by NCVT which are recognized world wide.

1 Instructor should demonstrate each machine name and their purposes as shown in figure.

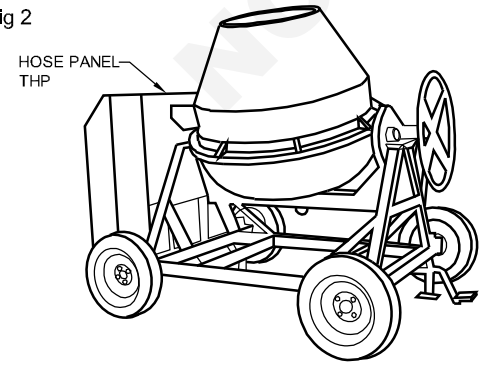
Fig 1



CONCRETE MIXER MACHINE WITH HOPPER

MBN1104H1

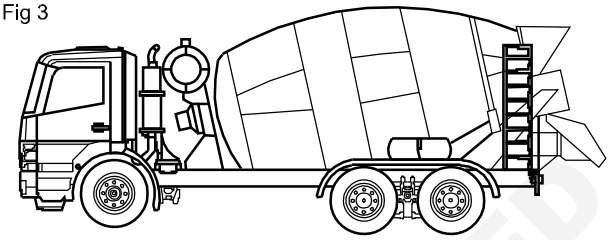
Fig 2



CONCRETE MIXER MACHINE WITH HOPPER

MBN1104H2

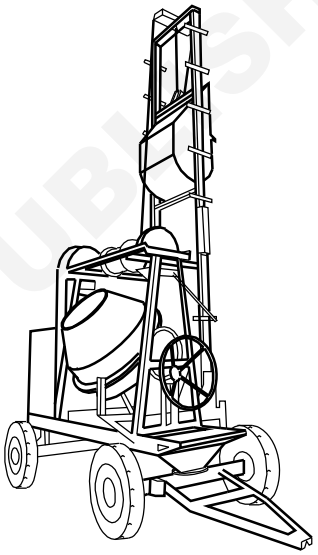
Fig 3



REDY MADE CONCRETE MIXER IN (MOBILE) LORRY

MBN1104H3

Fig 4



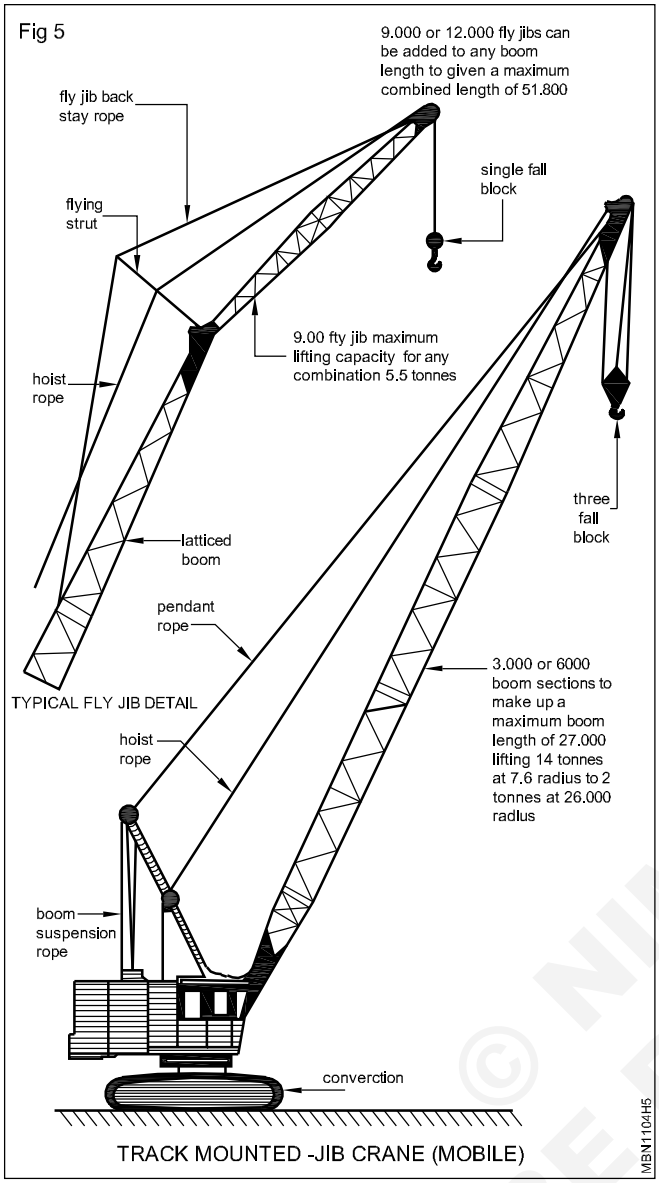
CONCRETE MIXER MACHINE WITH LIFT

MBN1104H4

Trainee should identify the name of the machine and their purpose demonstrated by the instructor.

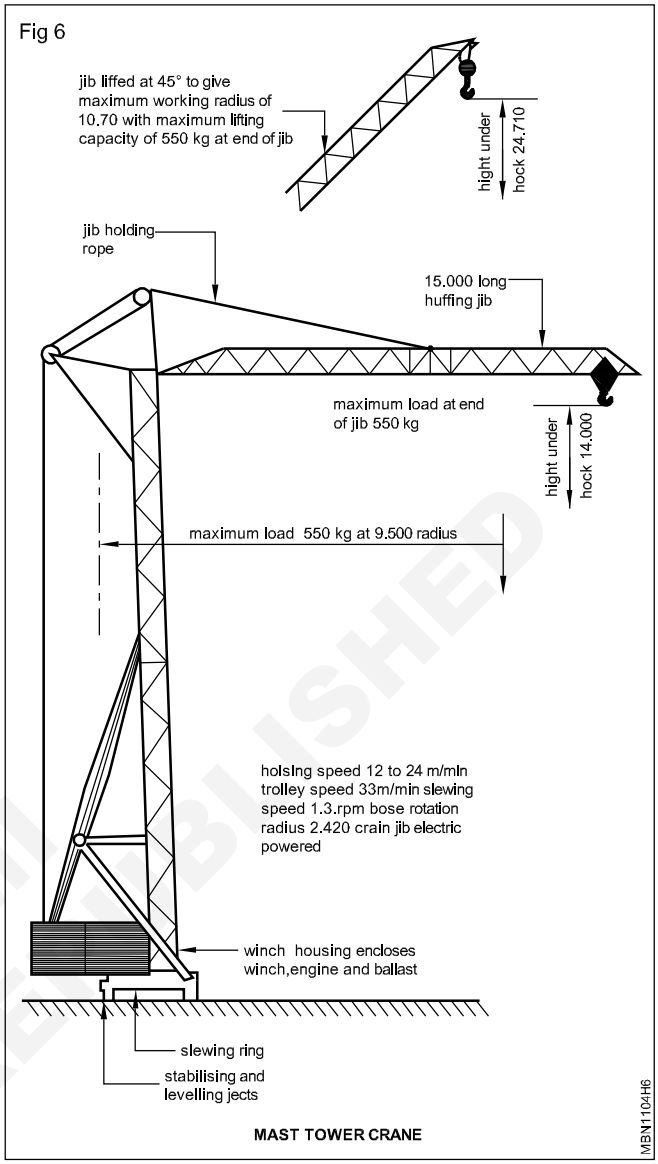
The trainees are asked fill the name of tools and their purpose in the Table 1.

Fig 5



TRACK MOUNTED -JIB CRANE (MOBILE)

Fig 6



MAST TOWER CRANE

Table 1

Sl. No	Name of the Machines	Uses / Purposes
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Safety attitude development of the trainee by educating them to use personal protective equipment

Objectives : At the end of this exercise you shall be able to
- **identify and name the PPEs**
- **state the wires of the PPEs.**

Requirements

Tools / Equipments

- Chart showing different types of PPEs - 1 No.
- Real PPEs (available in section) - as reqd.

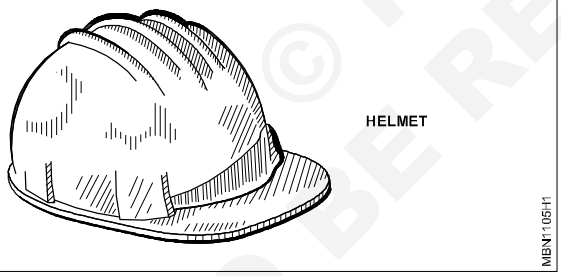
PROCEDURE

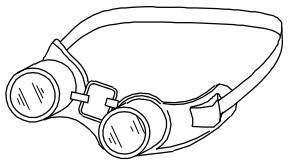
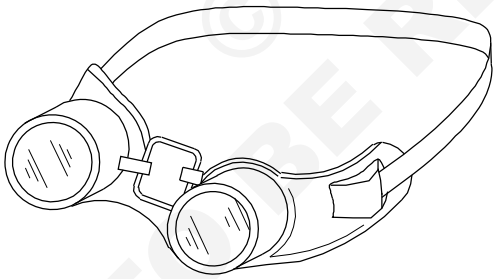
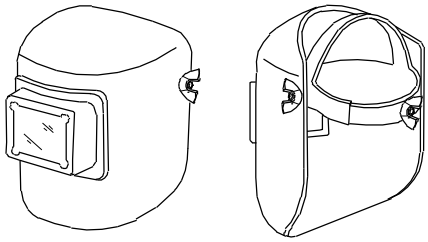
Instructor may arrange the available different types of PPEs in the table (or) provide the chart showing the PPEs. Explain the types of PPEs and their uses for corresponding hazards.

1 Identify the type of PPEs and write their names to the corresponding PPE, by referring from chart (or) read PPEs in Table 1.

2 Write their type of protection and uses in the blank space provided against each PPE in Table 1.

Table 1

Sl. No.	Sketches	Name of PPE	Type of protection	Uses
1	Fig 1 			
2	Fig 2 			

Sl. No.	Sketches	Name of PPE	Type of protection	Uses
3	Fig 3  SAFETY GOGGLE MBN1105H3			
4	Fig 4  HAND GLOVES MBN1105H4			
5	Fig 5  MBN1105H5			
6	Fig 6  MBN1105H6			

First Aid method and basic training

Objective : At the end of this exercise you shall be able to
- **carryout first aid method**

Requirements

Equipment/Materials

- No. of Persons (Instructor can divide the trainees in suitable No. of groups.) - 20 Nos.

PROCEDURE

Assumption - For easy manageability, Instructor may arrange the trainees in group and ask each group to perform one method of resuscitation.

TASK 1 : **Prepare the victim before giving first aid treatment**

1 Loosen the tight clothing which may interfere with the victim's breathing. (Fig 1)

Fig 1

MBN1106H1

2 Remove any foreign materials or false teeth from his mouth and keep the victim's mouth open. (Fig 2)

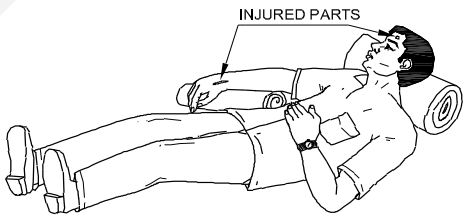
3 Bring the victim safely to the level ground, taking necessary safety measures. (Fig 3)

Do not waste too much time in loosening the clothes or trying to open the tightly closed mouth.

Fig 2

MBN1106H2Z

Fig 3



MBN1106H3

4 Avoid violent operations to prevent injury to the internal parts of the victim.

— — — — — — — —

TASK 2 : **Prepare the victim to receive artificial respiration**

1 If breathing has stopped, apply immediate artificial respiration.

2 Send word for professional assistance. (If no other person is available, you stay with the victim and render help as best as you can.)

3 Look for visible injury in the body and decide on the suitable method of artificial respiration.

4 Have you observed ? (In this case you are told by the instructor.)

5 In the case of injury/burns to chest and/or belly follow the mouth to mouth method.

6 In case the mouth is closed tightly, use Schafer's or Holden–Nelson method.

7 In the case of burn and injury in the back, follow Nelson's method.

8 Arrange the victim in the correct position for giving artificial respiration.

All action should be taken immediately.

Delay even by a few seconds may be dangerous.

Exercise extreme care to prevent injury to internal organs.

9 Place the mock victim in the recovery position.

10 Cover the victim with coat, sacks or improvise your own method. It helps to keep the victim's body warm.

11 Proceed to perform the suitable artificial respiration method.

Safe disposal of waste materials like pieces of wood, rod, stone, mud, etc.

Objectives: At the end of this exercise you shall be able to
- **identify the waste material in different category**
- **segregate and collect the waste materials in corresponding bins**
- **dispose non saleable and saleable material separately and maintain record.**

Requirements

Materials

- Shovel -1 No.
- Plastic/Metal bins - 4 Nos.
- Trolley with wheels - 3 Nos.
- Brush and gloves - 1 Pair

PROCEDURE

1 Collect all the waste materials in workshop.

2 Identify and segregate the different waste like cotton waste. metal chips, all chemical waste and electrical waste etc. (Fig 1) separately and label them.

3 Segregate saleable, non saleable, organic and inorganic materials also.

4 Record the segregated waste material and fill the Table 1.

Fig 1

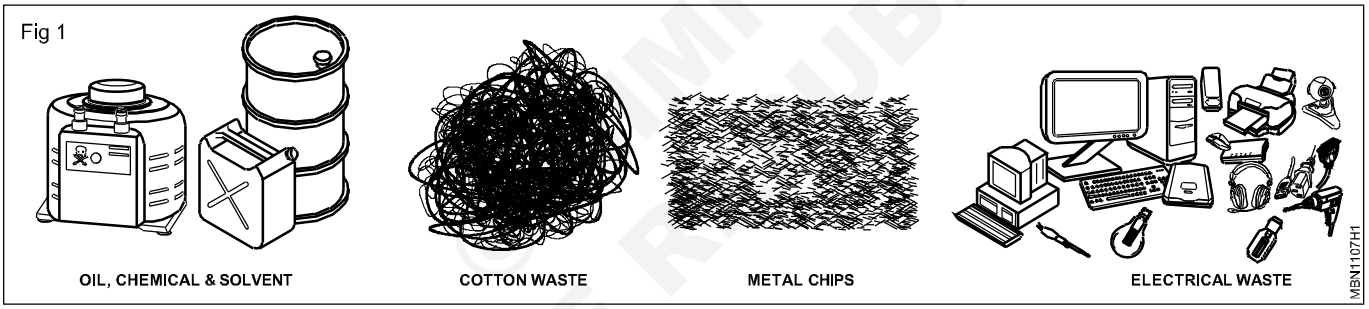


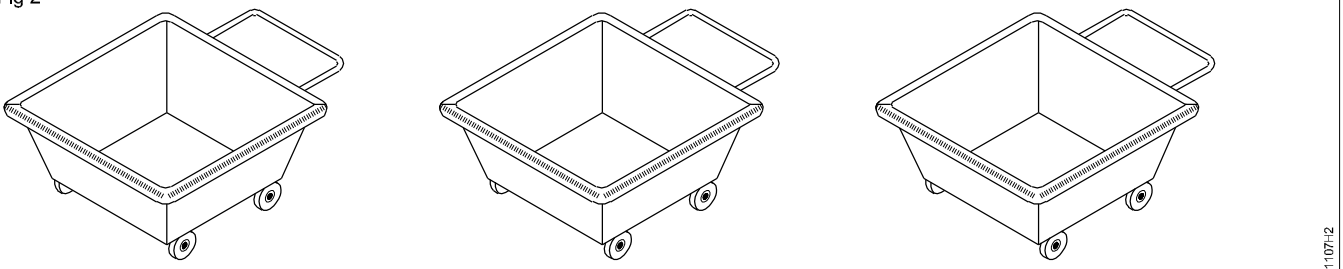
Table 1

Sl.No.	Name of the waste material	Quantity	Saleable or non Saleable
1			
2			
3			
4			
5			
6			

5 Arrange atleast 3 trolleys with wheel for disposal and stick the label an each trolley as "Cotton Waste", "Metal chips" and "others" (Fig 2)

6 Put the cotton waste in cotton trolley and similarly put the metal chips waste and others in corresponding trolleys.

Fig 2



7 Keep another 4 bins to collect saleable scarp. non saleable scrap, organic waste and in-organic waste and label them.

8 During construction the waste material is collected. (Fig 3)

Fig 3

CONSTRUCTION WASTE

9 After completion of work the material is collected and stored. (Fig 4)

Fig 4

SEGREGATION OF CONSTRUCTION WASTE

Do not handle the chip by bare hand there may be different metal chips. So separate the chip according to metal.

Hazard - Identification and avoidance

Objectives: At the end of this exercise you shall be able to
- **explain various occupational hazard**
- **state occupational hygiene**
- **describe occupational disease and its prevention.**

Prevention is better than cure

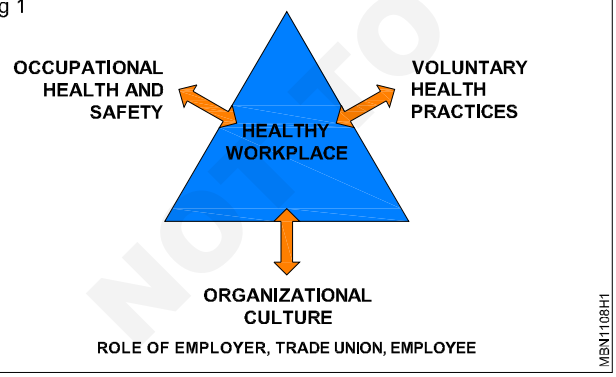
No place of work can always be completely safe all the time and whilst some work places present greater risks than others. Industry nowhere is immune to the possibility of an accident. Hence all industries should develop the ability to carry out risk assessment processes and to take all precautionary steps to ensure the safety of the workforce. It is a group collective effort that includes each and every member of the workforce. Employers should always ensure they do the following.

- Provide adequate control of the health and safety risks.
- Consult with employees on matters affecting their health and safety.
- Provide and maintain safe plant and equipment.
- Ensure safe handing and use of substances.
- Provide information, instruction, supervision and training so that employees are competent to carry out their role.
- Review and revise all these policies regularly.

Health and Safety programmes

For all of the reasons (Fig 1), it is crucial that employers, workers and unions are committed to health and safety, addressing the following areas.

Fig 1



- Workplace hazards are controlled - at the source whenever possible.
- Records of any exposure are maintained for many years.
- Both workers and employers are informed about health and safety risks in the workplace.
- Establish an active and effective health and safety committee that includes both workers and management.
- To observe that the workers' health and safety efforts are ongoing.

Effective workplace health and safety programmes can help to save the lives of workers by reducing hazards and their consequences. Health and safety programmes also have positive effects on both worker morale and productivity, which are important benefits. At the same time, effective programmes can save employers a great deal of money.

Healthy workplace, hazard free work environment, zero accident work-life can help to save the lives of workers by reducing hazards and diseases. Effective programmes can also have positive effects on both worker morale and productivity. All put together enhance the human values at work and prosperity of the nation.

1 Occupational health and safety encompasses the social, mental and physical well-being of workers in all occupations.

2 Poor working conditions have the potential to affect a worker's health and safety.

3 Unhealthy or unsafe working conditions can be found anywhere, whether the workplace is indoor or outdoor.

4 Poor working conditions can affect the environment workers live in. This means that workers, their families, other people in the community, and the physical environment around the workplace, can all be at risk from exposure to workplace hazards.

5 Employers have a moral and often legal responsibility to protect workers.

6 Work-related accidents and diseases are common in all parts of the world and often have many direct and indirect negative consequences for workers and their families. A single accident or illness can mean enormous financial loss to both worker and employers.

7 Effective workplace health and safety programmes can help to save the lives of workers by reducing hazards and their consequences.

8 Effective programmes can also have positive effects on both worker morale and productivity, and can save employers a great deal of money.

Occupational hazard

All jobs, primarily provides many economic and other benefits, But equally there are a wide varieties of workplace dangers and hazards, which are risky to the health and safety of people at work.

Basic hazards

Employers have a responsibility to protect workers against health and safety hazards at work. Workers have the right to know about potential hazards and to refuse work that they believe is dangerous. Workers also have a responsibility to work safely with hazardous materials. Health and Safety hazards exist in every workplace. Some are easily identified and corrected, while others create extremely dangerous situations that could be a threat to your life or long-term health. The best way to protect oneself is to learn to recognize and prevent hazards in the workplaces.

Physical hazards are the most common hazards and are present in most workplace at some point of time. Examples include; live electrical cords, unguarded machinery, exposed moving parts, constant load noise, vibrations, working from ladders, scaffolding or heights, spills, tripping hazards. Physical hazards are a common source of injuries in many industries. Noise and vibration, Electricity, Heat, Ventilation, Illumination, Pressure, Radiation etc.

- **Ventilation** and air circulation have major say on the health and working comfort of the worker. There must be good ventilation, a supply of fresh, clean air drawn from outside is required. It must be uncontaminated and circulated around the workspace. Closed of confined spaces also present a work hazard, which has limited openings for entry and exit and unfavourable natural ventilation, and which is not intended for continuous employee occupancy.

Spaces of this kind can include storage tanks, ship compartments, sewers, and pipelines. Asphyxiation is another potential work hazard in certain situations. Confined spaces can pose a hazard not just to workers, but also to people who try to rescue them.

- **Noise and Vibration :** Noise and vibration are both fluctuations in the pressure of air (or other media) which affect the human body. Vibrations that are detected by the human ear are classified as sound. We use the term 'noise to indicate unwanted sound. Noise and vibration can harm workers when they occur at high levels, or continue for a long time.(Fig 2)

Fig 2

- **Electricity** poses a danger to many workers. Electrical injuries caused by contact with electric energy can be divided into four types
  - fatal electrocution,
  - electric shock,
  - burns,
  - falls .

Wires and electrical equipment pose safety threats in the workspace. When employees mishandle electrical equipment and wires, they are taking risks. (Fig 3)

- **Temperature (Heat Stress) :** A reasonable working temperature, for strenuous work, local heating or cooling where a comfortable temperature is to be maintained which is safe and does not give off dangerous or offensive fumes, Thermal clothing and rest facilities where necessary (for example, for 'hot work' or work in cold storage areas). Sufficient space in workrooms etc. are under the legislation for implementation by the owner of the factories.
- **Illumination (lighting) :** Good light lighting is essential for productivity Natural light is preferred where possible. Glare and flickering should be avoided.

HEAT EXHAUSTION/HEAT STROKE & TREATMENT

- NORMAL BODY CORE TEMPERATURE - 37˚C
- HEAT EXHAUSTION - 38˚C - 40˚C
- HEAT STROKE 41˚C AND HIGHER

SIGNS AND SYMPTOMS

HEAT EXHAUSTION	HEAT STROKE
• RESTLESS	• REDUCED LEVEL OF CONCIOUSNESS
• WEAK	• IRRITABLE
• DIZZY	• MUSCULAR PAIN
• RAPID PULSE	• RAPID PULSE
• LOW BLOOD PRESSURE	• HIGH BLOOD PRESSURE
• NAUSEA	• NAUSEA
• VOMITTING	• VOMITTING
• MENTAL STATUS - NORMAL	• MENTAL STATUS - CONFUSED
• BEHAVIOR - NORMAL	• BEHAVIOUR - ERRATIC
	• HOT, DAY, RED SKIN
	• DEATH

TREATMENT

• LAY PERSON DOWN & ELEVATE LEGS	• MOVE PERSON TO COOL VENTILATED AREA
• ENSURE NORMAL BREATHING	• CHECK FOR BREATHING, PULSE & CIRCULATION
• IF THIRSTY GIVE WATER TO DRINK	• IF POSSIBLE COVER THE PERSON WITH ICE PACKS OR COLD WATER TO REDUCE THE BODY TEMPERATURE
• REPORT INCIDENT TO SUPERVISOR	• GIVE WATER TO DRINK
	• MONITOR VITAL SIGNS
	• GET PERSON TO HOSPITAL
	• REPORT INCIDENT TO SUPERVISOR

Fig 3

Chemical hazards are present when you are exposed to any chemical preparation (solid, liquid or gas) in the workplace. Examples include: cleaning products and solvents, vapours and fumes, carbon monoxide or other gases, gasoline or other flammable materials. Chemicals hazards are the major causes of concern. Many chemicals are used not on generic names but on brands. The chemicals have biological effects on the human body if digested, inhaled or if direct skin contact with the chemicals, injuries occurs.

Accidents involving chemical spills, exposure and inhalation can lead to burns, blindness, rashes and other ailments. Most of them cause acute poisoning when taken orally, eye-skin irritation, Respiratory injuries etc. Long term effects of chemicals on blood, nerve, bones, kidneys, livers etc., my lead to serious diseases/disorders. The only way is to understand their chemical nature and handle them very carefully.

CHEMICAL POISONING

Poison : An agent or substances which may cause structural damage or functional disorders when introduced into the body by:

- **Ingestion**
- **Inhalation**
- **Absorption or**
- **Injection**

Biological hazards (Fig 4) come for working with people, animals or infectious plant material. Examples include; blood or other bodily fluids, bacteria and viruses, insect bites, animal and bird droppings. Biological hazards are due agent like bacteria, virus, fungi, mold, blood-borne pathogens etc., are main agents to cause various illness. (Fig 5)

Ergonomic hazards (Fig 6): Ergonomic hazards occur when the type of work you do, your body position and/or your working conditions put a strain on your body. They are difficult to identify because you don't immediately recognize the harm they are doing to your health. Examples include : poor lighting, improperly adjusted workstations and chairs, frequent lifting, repetitive or awkward movements. Muscular Skeletal Disorders (MSDs) affect the muscles, nerves and tendons. Work related MSDs are one of the leading causes injury and illness.

Fig 4

Fig 5

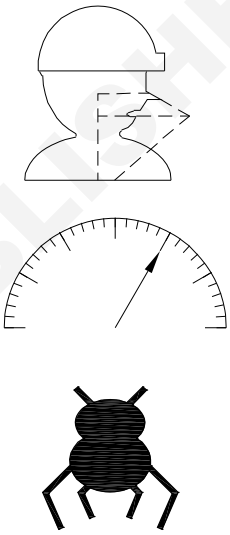
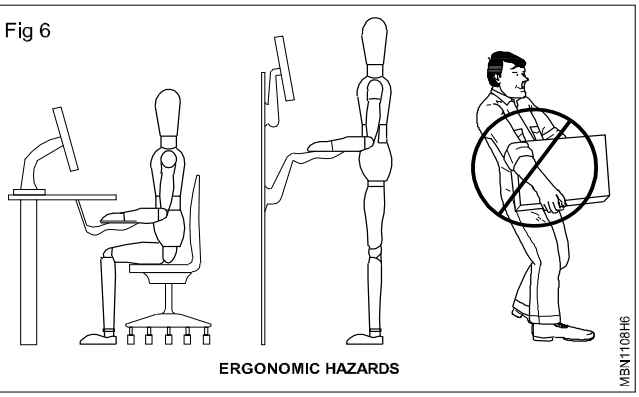


Fig 6



Workers in many different industries and occupations can be exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures and performing the same or similar tasks repetitively. Exposure to these known risk factors for MSDs increases a worker's risk of injury.

Mechanical hazards are factor arise out of varieties of machines in industries including manufacturing, mining, construction and agriculture. They are dangerous to the worker when operated without training and experience. Operating machines can be risky business, especially large, dangerous machines. When employees don't know how to properly use machinery or equipment, they risk such injuries as broken bones, amputated limbs and crushed fingers. Many machines involve moving parts, sharp edges, hot surfaces and other hazards with the potential to crush, burn, cut, shear, stab or otherwise strike or wound workers if used unsafely.

Various safety measures exists to minimize these hazards, lockout-tagout procedures for machine maintenance and roll over protection systems for vehicles. Machines are also often involved indirectly in worker deaths and injuries, such as in cases in which a worker slips and falls, possibly upon a sharp or pointed object. Safeguarding machinery decreases accidents and keeps employees who use the machine safer.

Falls (Fig 7) are a common cause of occupational injuries and fatalities, especially in construction, extraction, transportation, healthcare, and building cleaning and maintenance. Slips and falls to be the leading cause of workplace injuries and fatalities. From slippery surfaces to un-railed staircases, the possibility of slipping, tripping or falling on the job is a workplace safety hazard. Broken bones, fractures, sprained wrists and twisted ankles constitute some of the physical injuries caused by falling accidents.

Fig 7

Falls in the workplace is effectively prevented by putting caution signs around slippery surfaces (Fig 8), having rails on every staircase and making sure that wires on the floor are covered to avoid tripping. They are perhaps unavoidable in certain industries, such as construction and mining, but over time people have developed safety methods and procedures to manage the risks of physical danger in the workplace. Employment of children may pose special problems.

Fig 8

CAUTION BOARD

Psychosocial hazards : psychosocial hazards are related to the way work is designed, organized and managed, as well as the economic and social contexts of work and are associated with psychiatric, psychological and/or physical injury or illness. Linked to psychosocial risks are issues such as occupational stress and workplace violence which are becoming a major challenge to occupational health and safety.

Workplace inspections prevent hazards

Regular workplace inspections are another important factor in preventing injuries and illnesses. By critically examining all aspects of the workplace, inspections identify and record hazards that must be addressed and corrected.

A workplace inspection should include

- Listening to the concerns of workers and supervisors.
- Gaining further understanding of jobs and tasks.
- Identifying existing and potential hazards.
- Determining underlying causes of hazards.
- Monitoring hazard controls (Personal protective equipment, engineering controls, policies, procedures)
- Recommending corrective action.

Occupational hygiene

Occupational hygiene (Industrial hygiene) (Fig 9) is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objective of protecting worker health and well-being and safeguarding the community at large.

Occupational hygiene uses science and engineering to prevent ill health caused by the environment in which people work. It helps employers and employees to understand the risks and improve working conditions and working practices. (Fig 10)

Fig 9

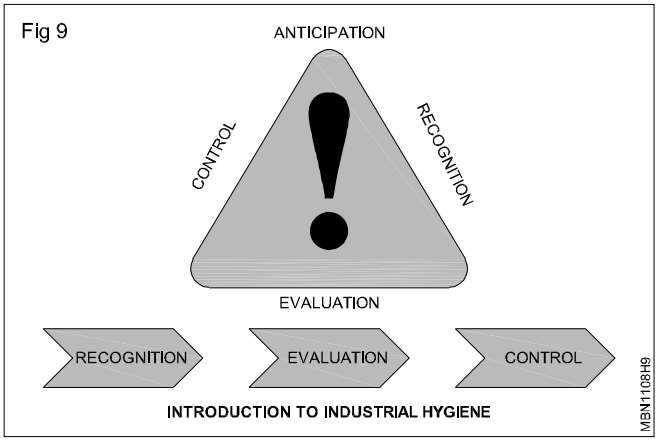
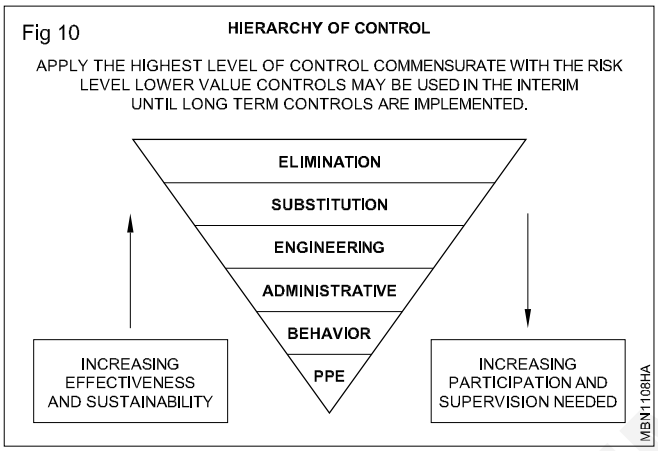


Fig 10



Occupational disease/Disorders & its prevention

Occupational disease, illness incurred because of the conditions or environment of employment. Unlike with accidents, some time usually elapses between exposure to the cause and development of symptoms. In some instances, symptoms may not become evident for may years and hence the relationship between work and disease is ignored.

Among the environmental causes of occupational disease are subjection to extremes of temperature leading to heatstroke, air contaminants of dust, gas, fumes causing diseases of the respiratory tract, skin, or muscles and joints or changes in atmospheric pressure causing decompression sickness, excessive noise causing hearing loss, exposure to infrared or ultraviolet radiation or to radioactive substances. The widespread use of X rays, radium and materials essential to the production of nuclear power has led to an special awareness of the dangers of radiation sickness. Hence careful checking of equipment and the proper protection of all personnel are now mandatory.

In addition there are industries in which metal dusts, chemical substances, and unusual exposure to infective substances constitute occupational hazards. The most common of the dust and fiber inspired disorders are the lung diseases caused by silica, beryllium, bauxite and iron ore to which miners, granite workers and many others are exposed causing pneumoconiosis and those caused by asbestos is cancer - mesothelioma, Fumes, Smoke and Toxic liquids from a great number of chemicals are other occupational dangers. Carbon monoxide, Carbon tetrachloride, Chlorine, Creosote, Cyanides, Dinitrobenzene, Mercury, Lead Phosphorus and nitrous chloride are but a few of the substances that on entering through the skin, respiratory tract or digestive tract cause serious and often fatal illness.

Occupational hazards also are presented by infective sources. Persons who come into contact with infected animals in a living or deceased state are in danger of acquiring such diseases as anthrax. Doctors, Nurses and other hospital personnel are prime targets for the tuberculosis bacillus and for many other infectious organisms.

Safety signs for danger warning caution and personal safety message

Objectives: At the end of this exercise you shall be able to
- **identify the safety symbols from the chart and their basic category**
- **identify the road safety sign with traffic signal from the chart**
- **read and interpret the different types of occupational hazards from the chart.**

Requirements

Materials

- Basic safety signs chart -1 No.
- Road safety signs and traffic signal chart - 1No.
- Occupational hazards chart - 1 No.

PROCEDURE

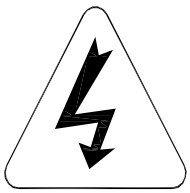
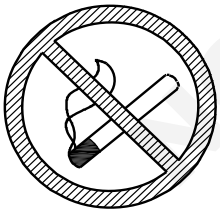
TASK 1 : **Identify the safety symbols and interpret their meaning and colour with shape**

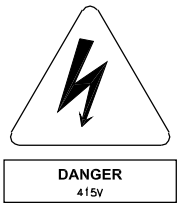
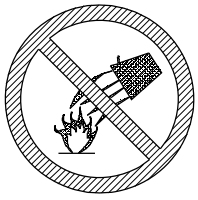
Instructor may provide various safety signs chart for basic categories and road safety with traffic signals. Then explain their categories meaning and colour. Ask the trainees to identify the sign and record in Table 1.

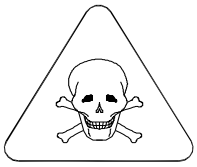
1 Identify the basic category of each sign from the chart.

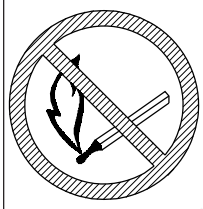
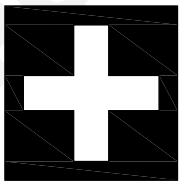
2 Write the categories name of the each sign meaning description and the place of use of that safety sign in Table 1.

Table 1

Sl. No.	Safety signs	Name of the basic category and sign	Place of use
1	 RISK OF ELECTRIC SHOCK		
2			
3	 WEAR HAND PROTECTION		

Sl. No.	Safety signs	Name of the basiccategory and sign	Place of use
4	 DANGER 415V		
5	 DO NOT EXTINGUISH WITH WATER		
6	 WEAR HEAD PROTECTION		

Sl. No.	Safety signs	Name of the basiccategory and sign	Place of use
7	 TOXIC HAZARD		
8	 WEAR EYE PROTECTION		
9	 RISK OF FIRE		
10	 PEDESTRIANS PROHIBITED		

Sl. No.	Safety signs	Name of the basiccategory and sign	Place of use
11	 WEAR HEARING PROTECTION		
12	 SMOKING AND NAKED FLAMES PROHIBITED		
13			

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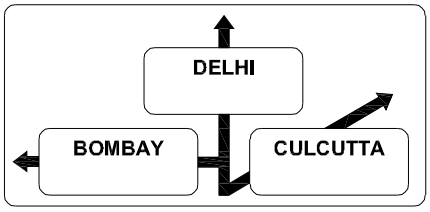
TASK 2 : **Identify the road safety sign and traffic signals**

Instructor will explain all the road safety sign and traffic police signals.

1 Read the sign given and mention their kinds and the meaning in the Table 2.

2 Get it checked by the instructor.

Table 2

Safety signs	Name of the basic category and sign	Place of use
 Fig. 1  Fig. 2  Fig. 3  Fig. 4  Fig. 5  Fig. 6  Fig. 7  Fig. 8		

— — — — — — — —

TASK 3 : **Read and interpret the different types of personal protective devices from the chart**

Instructor may brief the various types of occupational hazards and their causes.

1 Identify the occupational hazard to the corresponding situation with a potential harm given in Table 3.

2 Fill up and get it checked by your instructor.

Table 3

Sl.No.	Source or potential harm	Type of PPE to be word
1	Noise	
2	Explosive	
3	Virus	
4	Sickness	
5	Smoking	
6	Non control device	
7	No earthing	
8	Poor housekeeping	

— — — — — — — —

Safety preventive measure for electrical accidents and practice steps to be taken in such accidents

Objectives: At the end of this exercise you shall be able to
- **practice and follow the preventive safety rules to avoid electrical accidents**
- **perform the immediate steps to save the electric shock victim.**

Requirements

Materials

- Heavy insulated screw driver 200 mm -1 No.
- Electrical safety chart (or) display - 1 No.
- Gloves - 1 No.
- Rubber mat - 1 No.
- Wooden stool - 1 No.
- Ladder - 1 No.
- Safety belt - 1 No.

PROCEDURE

TASK 1 : **Practice and follow the preventive safety rules to avoid electrical accident**

1 Do not work on live circuits. If unavailable use rubber gloves or rubber mats, etc.

2 Do not touch bare conductors.

3 Stand on a wooden stool or an insulated ladder while repairing live electrical circuits/appliances or replacing fused bulbs.

4 Stand on rubber mats while working, operating switch panels, control gears, etc.

5 Use safety belts always, while working on poles or high rise points.

6 Use wooden or PVC insulated handle screw drivers when working on electrical circuits.

7 Replace (or) remove fuses only after switching off the circuit switches.

8 Open the main switch and make the circuit dead.

9 Do not stretch your hands on any moving part of rotating machine and around moving shafts.

10 Use always earth connection for all electrical appliances along with 3-pin sockets and plugs.

11 Do not connect earthing to the water pipe lines.

12 Do not use water on electrical equipment.

13 Discharge static voltage in HV lines/equipment and capacitors before working on them.

14 Keep the workshop floor clean and tools in good condition.

— — — — — — — —

TASK 2 : **Perform the immediate steps to be taken to save the electric shock victim**

1 Proceed with treatment at once without panic emotion.

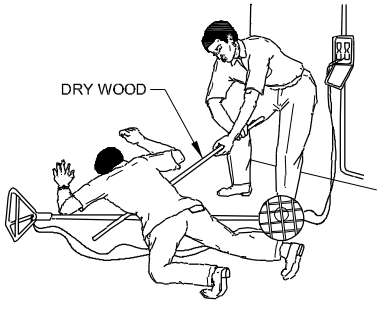
2 Break the contact either by switching off the power or removing the plug or wrenching the cable free.

3 Remove the victim from contact with the live conductor by using dry non-conducting materials such as wooden bar. (Fig 1 & 2)

Avoid direct contact with the victim. Wrap your hands in dry material if rubber gloves are not available. If you remain un-insulated, do not touch the victim with your bare hands.

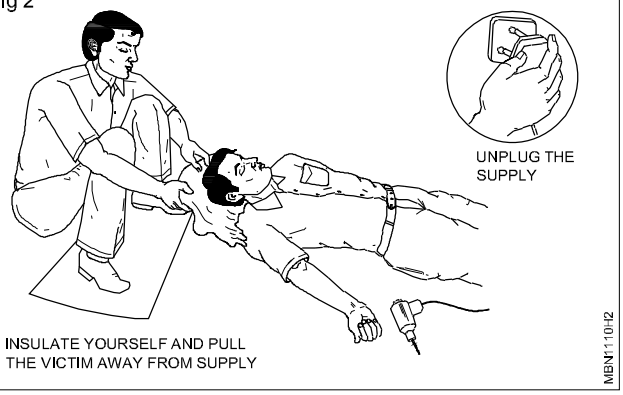
4 Keep the patient warm and at mental rest.

Fig 1



Ensure of good air circulation and comfort. Call for help to shift the patient to safer place. If the victim is alone action to be taken to prevent him from falling.

Fig 2



5 Loosen the clothing about the neck chest and waist and place in recovery position. If the victim is unconscious.

6 Keep the victim warm and comfortable. (Fig 3)

Fig 3

7 Send the person to call doctor, in case of electric burns.

If the victim gets electrical burns due to shock, burns are very painful and dangerous. If a large area of the body is burnt give no treatment. But do the first aid as given below.

8 Cover the burnt area with running pure water.

9 Clean the burnt area by using clean cloth/cotton.

10 Send the person to call the doctor immediately.

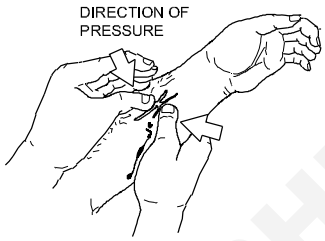
In case of severe bleeding

11 Lay the patient lie down and rest.

12 Raise the injured part above the level of the body. (If possible)

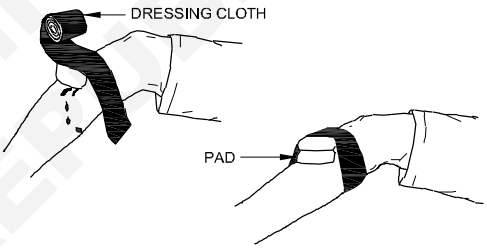
13 Apply pressure on the wound as long as necessary to stop the bleeding. (Fig 4)

Fig 4



14 Apply a clean pad and bandage firmly, if it is large wound. (Fig 5)

Fig 5



If bleeding is severe apply more than one dressing.

14 Proceed to perform the right methods of artificial respiration.

— — — — — — — —

Use of fire extinguishers

Objectives: At the end of this exercise you shall be able to
- **select the fire extinguisher according to the type of fire**
- **operate the fire extinguisher**
- **extinguish the fire.**

Requirements

Equipment/Machines

• Fire extinguishers	- 1 No.	• Scissor 100mm	- 1 No.
• CO_2 water, foam etc	- 1 No.each	• Cell phone	- 1 No.

PROCEDURE

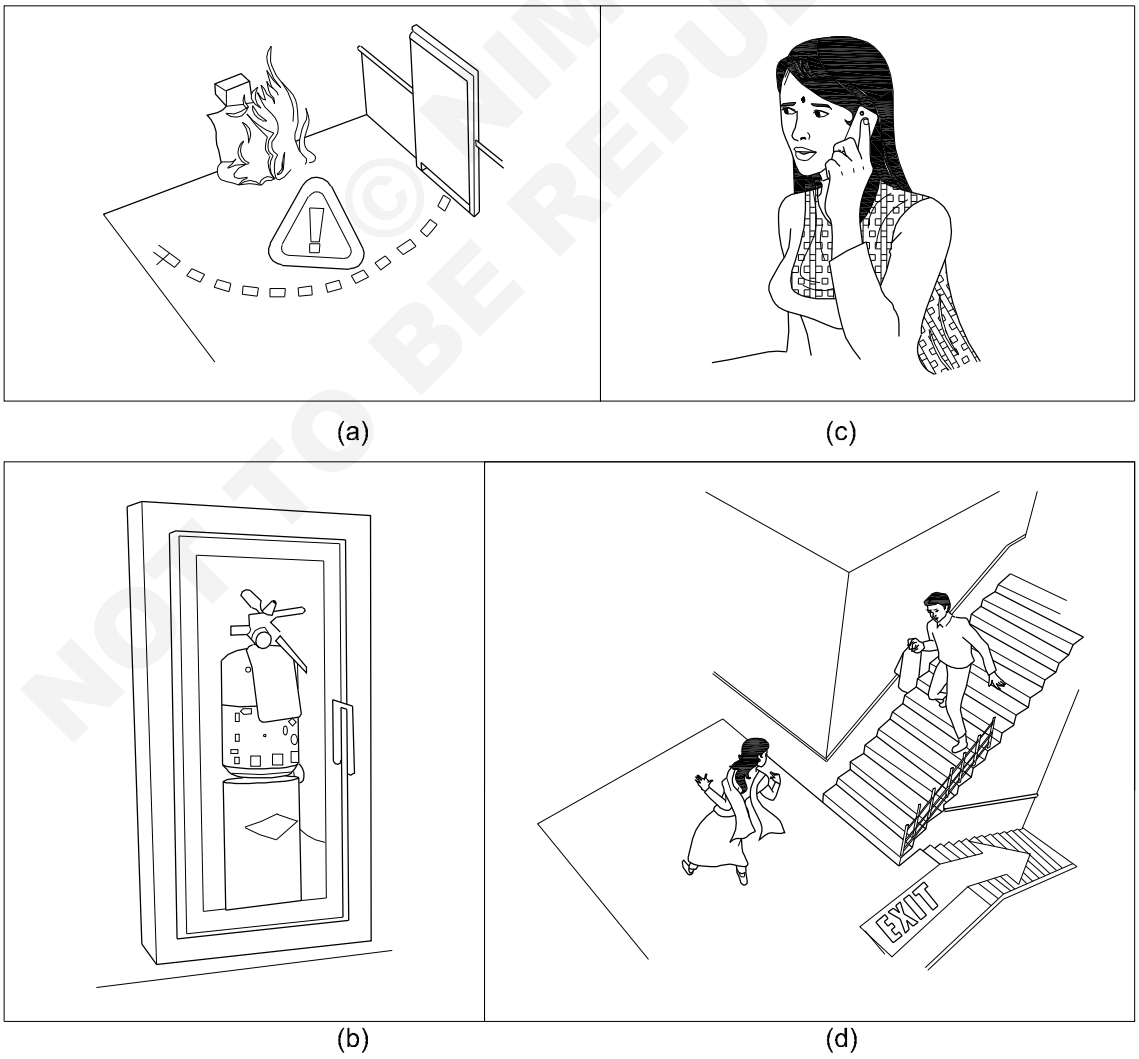
1 Alert people surrounding by shouting fire, fire, fire when observe fire (Fig 1a & b).

2 Inform fire service or arrange to inform immediately (Fig 1c).

3 Open emergency exist and ask them to go away (Fig 1d).

4 Put "Off" electrical power supply.

Fig 1



MBN1111H1

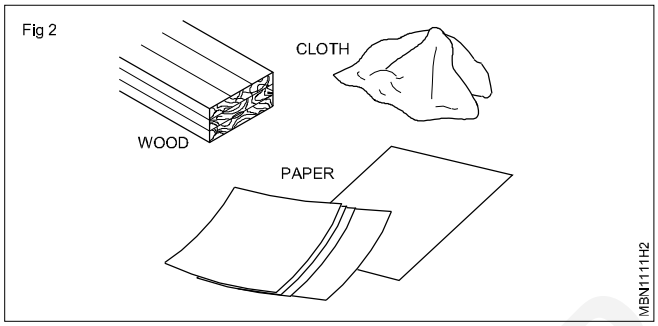
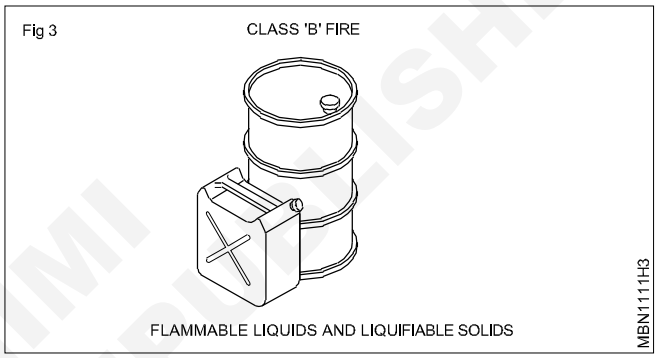
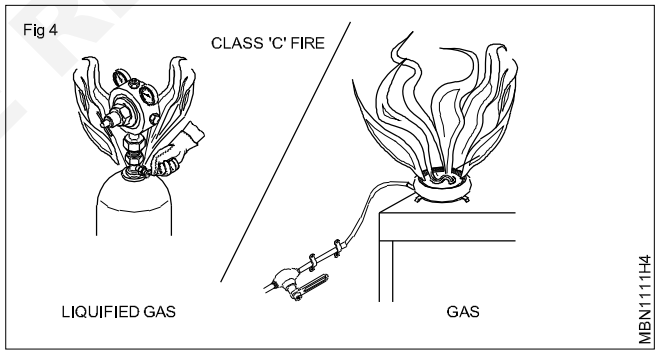
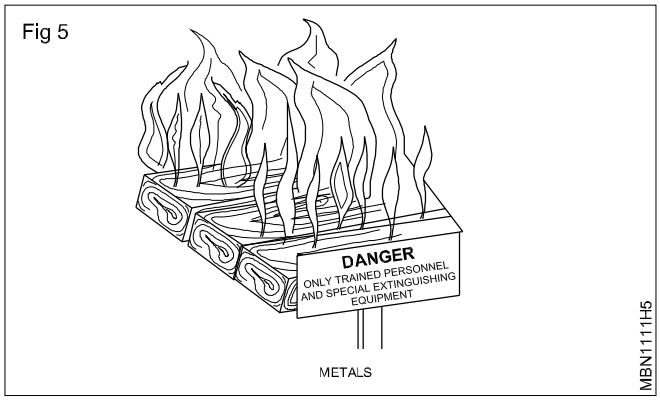
Do not allow people to go nearer to the fire.

5 Analyze and identify the type of fire. Refer Table1.

6 Assume the fire is D type (Electrical fire).

7 Select CO_2 (carbon dioxide) fire extinguisher.

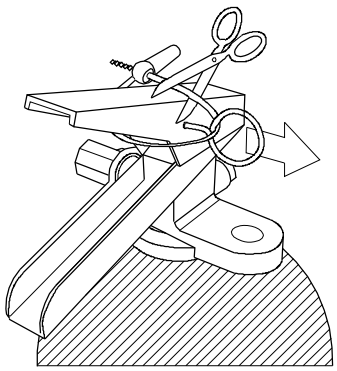
Table 1

Class 'A': Wood, paper, cloth, solid material	Fig 2 
Class 'B': Oil based fire (grease, gasoline,oil) & liquefiable solids	Fig 3 
Class 'C': Gas and liquefied gases	Fig 4 
Class 'D': Metals and electrical equipment	Fig 5 

8 Locate and pick up CO_2 fire extinguisher. Check for its expiry date.

9 Break the seal. (Fig 6)

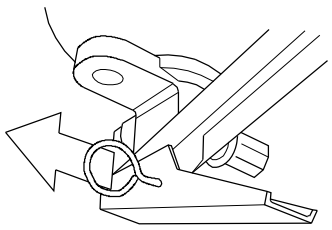
Fig 6



MBN1111H6

10 Pull the safety pin from the handle (Fig 7) (Pin located at the top of the fire extinguisher) (Fig 7)

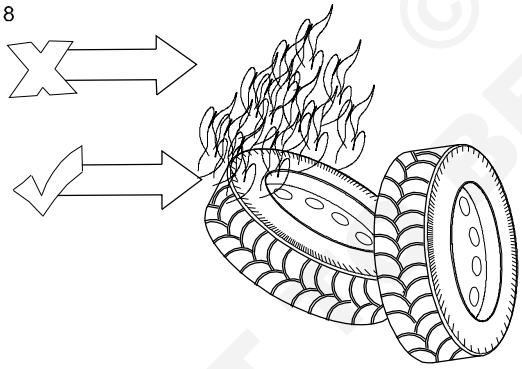
Fig 7



MBN1111H7

11 Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire) (Fig 8)

Fig 8

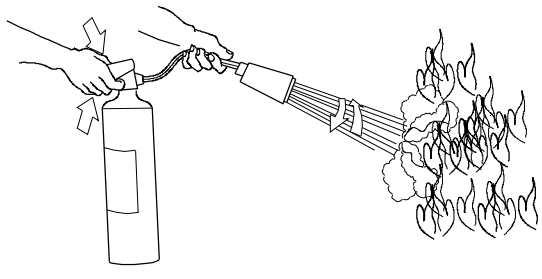


MBN1111H8

Keep your self low.

11 Squeeze the handle lever slowly to discharge the agent (Fig 8)

Fig 9



MBN1111H9

12 Sweep side to side approximately 15 cm over the fuel fire until the fire is put off. (Fig 9)

Fire extinguishers are manufactured for use from the distance.

Caution

- While putting off fire, the fire may flare up.
- Do not be panic so long as it put off promptly
- If the fire doesn't respond well after you have used up the fire extinguisher move away your self away from the fire point.
- Do not attempt to put out a fire where it is emitting toxic smoke, leave it to the professionals.
- Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of fire extinguisher

Remember

P.A.S.S. This will help to use fire extinguisher

P for pull

A for aim

S for squeeze

S for sweep

Practice and understand precaution to be followed while working in mason jobs

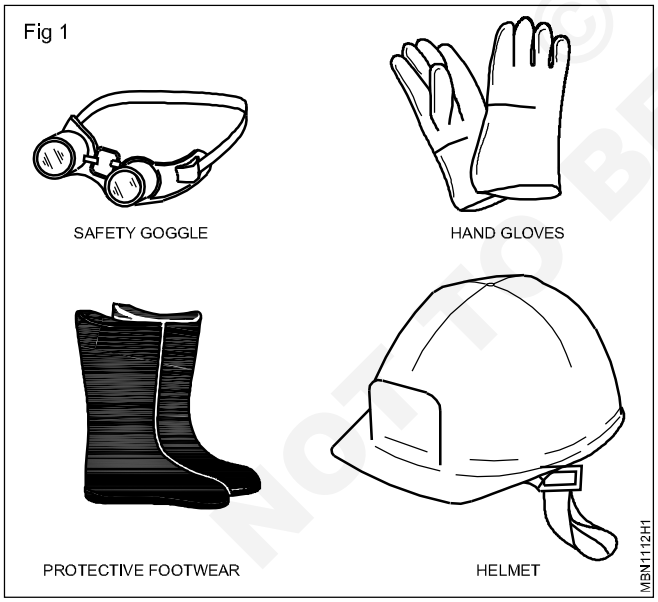
Objective: At the end of this exercise you shall be able to
- **practice the general precautions to be observed in mason job.**

- The general precautions to be observed in a masonry yard or workshop.
- Accidents are quite frequent in the building industry.
- These accidents often result in lost time or the job, partial or total disability or even loss of life.
- Accidents can be reduced if each person works safely and uses the precaution that the nature work requires.
- Safety precautions can be classified
- Safety for self
- Safely for colleague and others
- Safety for tools and equipments
- Safety for materials.

1 Safety for personal

- Always avoid loose clothing.
- Wear goggles while grinding the tools.
- Wear the safety shoes. (Fig 1)

Fig 1



- Do not through any sharp instruments.
- Do not through brick or brick bats from top.
- Check the scaffolding before you clamp up

2 Safety for colleague and others

- Give caution before lifting heavy units.
- Lifting heavy units by crow bar put some lever underneath the crow bar.
- Combined job is carried out give caution time to time and do safe work.

3 Safety for tools and equipment

- Use proper tools for proper work.
- Do not throw any tools either from top or at bottom
- All the tools should be washed and oiled after use.
- All the tools should be cleaned and washed and kept in a safe place.

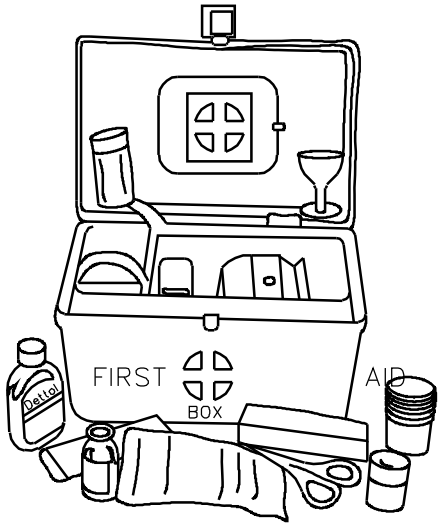
4 Safety for materials

- Bricks should be stacked properly and bricks should not be allowed to be scattered on the work place.
- Cement bags are staked properly on the wooden planks placed on the floor.
- Provide sufficient space say 0.5 meter away from wall and place cement bags.
- Cement godown should be free from air tight, otherwise cement may get spoiled.

5 General safety measures

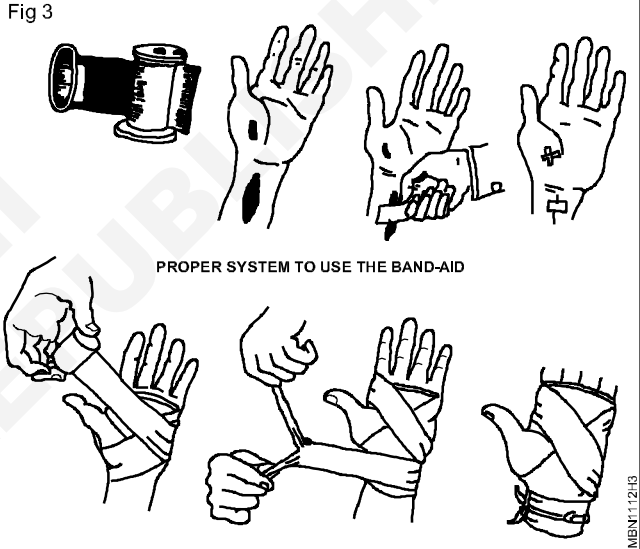
- Electric wire/cables
- High tension/low tension electric line passing near by the slab, care should be taken while placing reinforcement by working persons.
- While placing concrete it may affect working persons.
- Throwing of waste materials bricks bats, broken blocks may lead to injury to persons working below.
- Scaffolding should be erected firmly and properly braced.
- Walking on parapet wall may fall down due to in balance condition.
- Take more care while using the ladders because it may slip and fall down.
- The lift pit is left unguarded the children of workers may fall in the resulting in fatal accident.
- Bar bending work helpers of bar benders to follow short cut method throw surplus steel pieces form top floor to ground and may cause fatal injuries.
- Do not use faulty tools and equipment, repair or replace these tools.
- Keep the working area clean, many accidents are caused by litter underfoot.

Fig 2



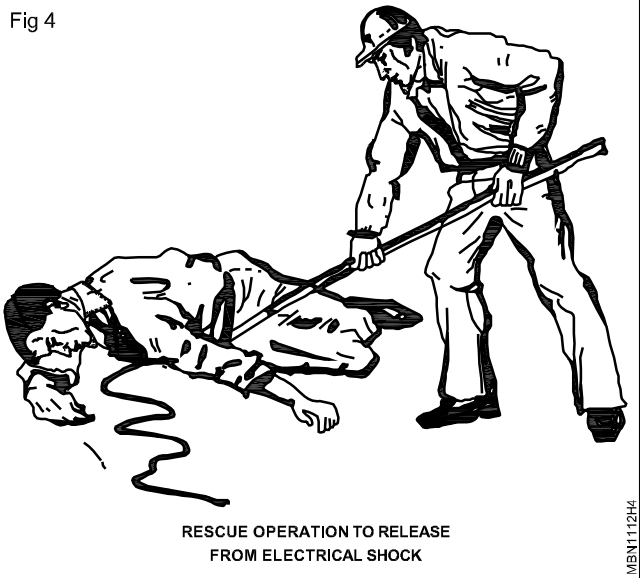
- Personal safety protective kit (Fig 2)
- Protecting workmen from injury during the execution job, safety precautions play a vital role.
- **Safety gloves:** Used for material handling welding machine, gas cutter etc. (Fig 1)
- **Safety helmets:** Use where site work is going on at different levels. (Fig 1)
- **Gumboots :** For cutting hard rock, concreting works, Asphalting etc. (Fig 1)
- **Safety belt :** used for workmen working on height, on outer sides of the building.
- **Safety goggles :** used for while grinding for gas welding, breaking or pavements etc as shown in figure.
- Site or work spot should have a list of following emergency telephone numbers.
- Fire 101
- Ambulance 108
- Police 100
- Nearest doctor
- First aid
- First aid is an immediate and temporary care given to the victim of an accident, or sudden illness till the treatment from the doctor is made available.
- First aid kit (Fig 2)
- Cotton dressing
- General medicine
- Triangular bandage
- Potassium permanganate
- Pocket of cotton wool
- Roller bandage 25mm
- Roller bandage 75mm
- Iodine bottle
- Dettol
- Safety pins
- Scissors
- Knife
- Blade.
- Major possible injuries at site
- In construction work injuries may causes in the following
- Bleeding
- Sudden stoppage of respiration
- Fracture
- Bleeding
- Usually bleeding can be controlled by direct pressure applied to the wound with a sterile dressing or any cloth, As shown in (Fig 3)

Fig 3



- Sudden respiratory blockage
- In the case of electric shock, gas poisoning, suffocation etc, where breathing is stopped immediate action is necessary. As shown in (Fig 4).

Fig 4

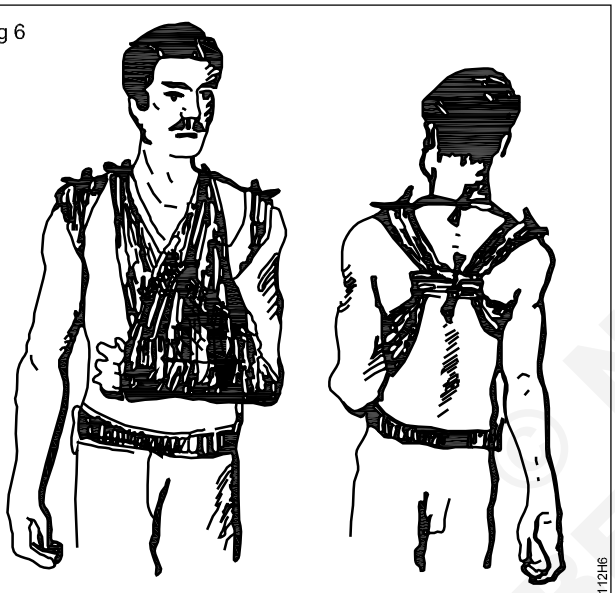


- Mouth to mouth respiration should be started as quick as possible without any time loss. As shown in (Fig 5)

Fig 5

- **Fractures**
- In the case of visible fractures and even a fracture suspected, the adjacent joints should be immobilize.
- If the fracture is with bleeding it should be controlled
- Care should be taken not to disturb the fractured born. As shown in (Fig 6).

Fig 6



TEMPORARY BANDAGE FOR FRACTURE

- Excavation of soil for column footing and for deep inches
- sliding of earth or soil from sides of column pits of deep trenches. As shown in (Fig 7)
- Snake bite precautions and First aid
- Snake bite is the most common accident observed on construction site
- One should know whether bitten snake was poisonous or non-poisonous. As shown in (Fig 8)
- Poisonous snake
- Only two prominent.
- Marks of the fangs can be seen after the bite.
- Non-Poisonous snake
- Two rows of marking of small teeth can be seen after biting. Shown in(Fig 9)
- First aid treatment on snake bite

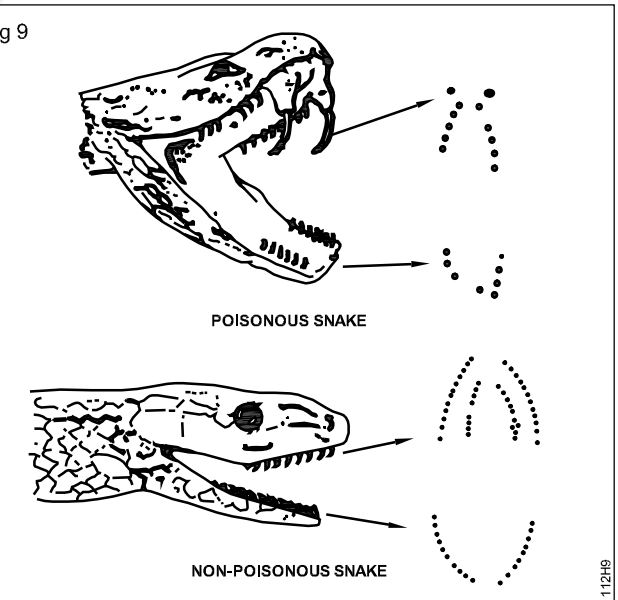
Fig 7

WE HAVE TAKEN ALL THE SAFETY PRECAUTIONS ON THIS SITE SIR !

Fig 8

DANGER OF SNAKES WHILE EXCAVATION

Fig 9



POISONOUS SNAKE

NON-POISONOUS SNAKE

IDENTIFICATION TEETH MARKS FOR POISONOUS SNAKES

- Tie a cloth immediately around the patient in resting position.
- Do not allow the affected portion of the body to move.
- Wash the wound with clear water.

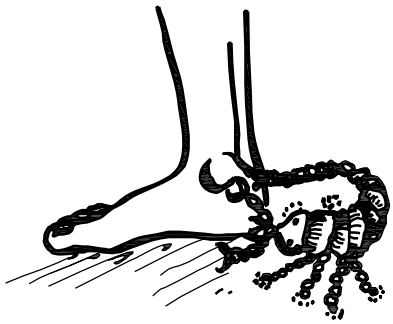
- Take for medical treatment. As shown in (Fig 10)

Fig 10

MBN1112HA

- Scorpion stings. (Fig 11)

Fig 11



MBN1112HB

- Usually two types of scorpions red and black.
- Tie the cloth immediately upper portion.
- Take for medical treatment nearest doctor.
- Accidents during slab concreting
- Column reinforcement cage may collapse.
- Lift scaffolding means vertical probes not fixed well may collapse while concreting.
- Wrong signal to lift operator and miss operation of lift may lead to accident. As shown in (Fig 12)

Fig 12

MBN1112HC

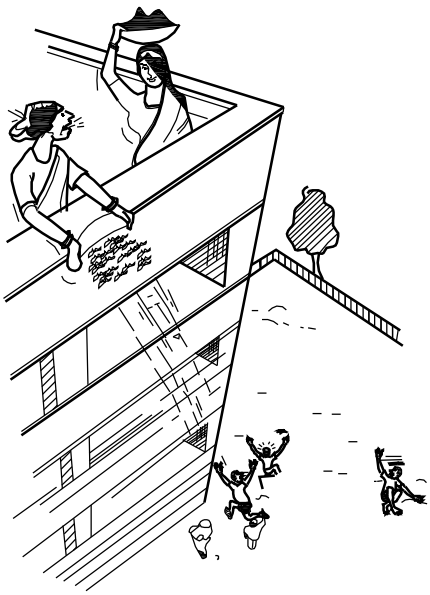
- Accidents due to electric cables.
- Careful working near cable area. All the necessary precaution to be taken. Otherwise accidents may happens as shown in (Fig 13)

Fig 13

MBN1112HD

- In construction site the waste materials such as broken brick bats, waste concrete or other debris should now be thrown from top to the bottom of the ground otherwise accidents may cause as shown in (Fig 14)

Fig 14



MBN1112HE

- Careless way of curing may cause accidents as shown in (Fig 15)
- Working on ladder may slip and painter may fall.
- Use safety belt anchored to hooks.
- Co-worker to hold the ladder firmly.

Fig 15

MBN1112HF

Fig 16

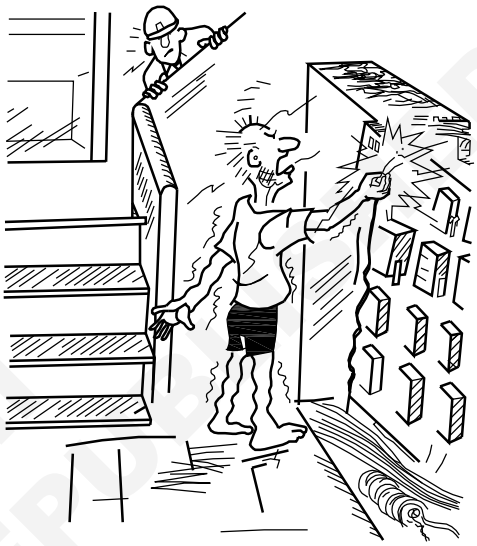
MBN1112HG

- Ladder should be anchored properly as shown. (Fig 16)

Electrical accidents (FIg 17)

- The common causes of electrical accidents at site.
- Insertion of the loose wires in sockets without a plug pin. This is the most common practice, and the cause of most of the electrical accidents at the construction site.
- Insertion of loose wires is mostly done by the unskilled workers, helpers, etc,. As shown in (Fig 17)

Fig 17



CAUSES OF ELECTRICAL ACCIDENTS

MBN1112HH

Safe use of tools and equipments used in the trade

Objectives: At the end of this exercise you shall be able to
- **state name and the used various tools and equipment used in the trade.**

Requirements

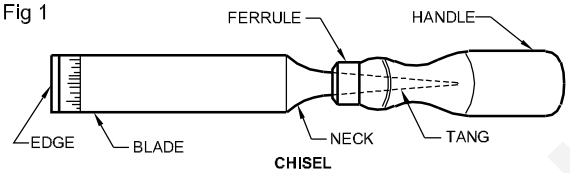
Equipment/Machines

• Chisel	- 1 No	• Hammer	- 1 No
• Jack plane	- 1 No	• Wooden peg	- 1 No
• Marking gauge	- 1 No	• Plumb bob	- 1 No
• Measuring tape	- 1 No	• Needle vibrator	- 1 No
• Grinder	- 1 No	• Tripod	- 1 No

Chisel (Fig 1)

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

Fig 1

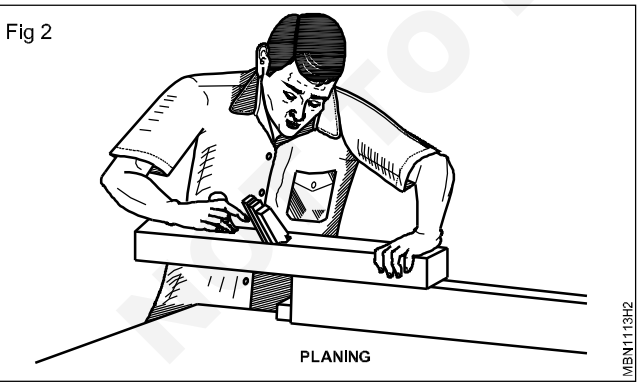


CHISEL

2 Planning (Fig 2)

While planning keep the left foot in forward position and parallel to the work bench. Right foot obliquely under the work branch. Right fore arm should be in line with the plane left hand is hold on the front part of the plane. Planning should be in the direction of grain.

Fig 2

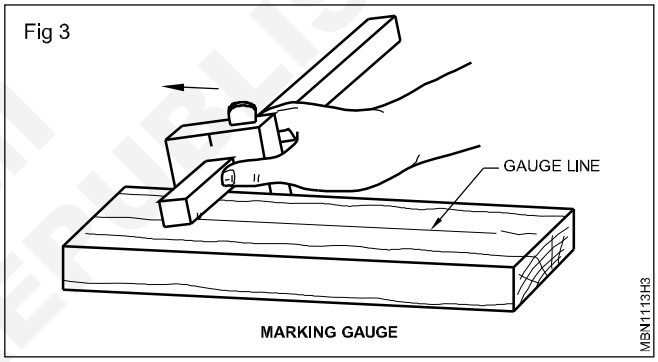


PLANING

3 Marking gauge (Fig 3)

- 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 edge.
- Do not put the spur at right angle with the face.

Fig 3

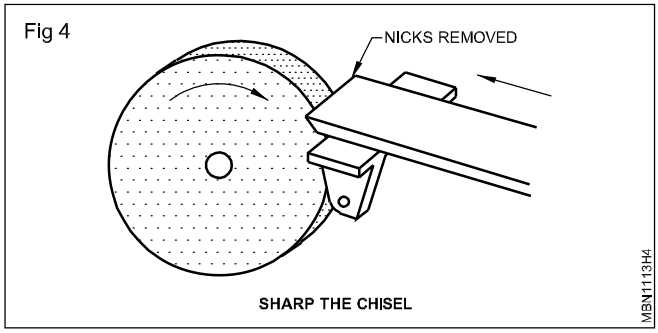


MARKING GAUGE

4 Grind and sharp the chisel (Fig 4)

- 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.

Fig 4



SHARP THE CHISEL

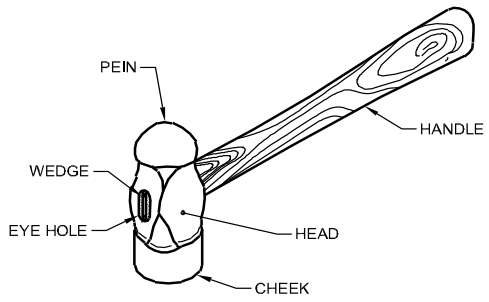
5 While measuring steel tape

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.

6 Hammer (Fig 5)

- Make sure the handle is properly fitted, select a hammer with correct weight suitable for the job.
- Check the head and handle for any cracks. Ensure the face of the hammer is free from oil and grease.

Fig 5



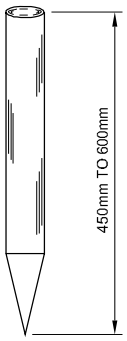
HAMMER

MBN1113H5

7 Wooden peg (Fig 6)

- If the peg thus driven is not vertical, tilt to the required side using the hammer.
- All the pegs to be driven up to the conical shape marking so that the peg top shall be at the uniform height from the ground level.

Fig 6



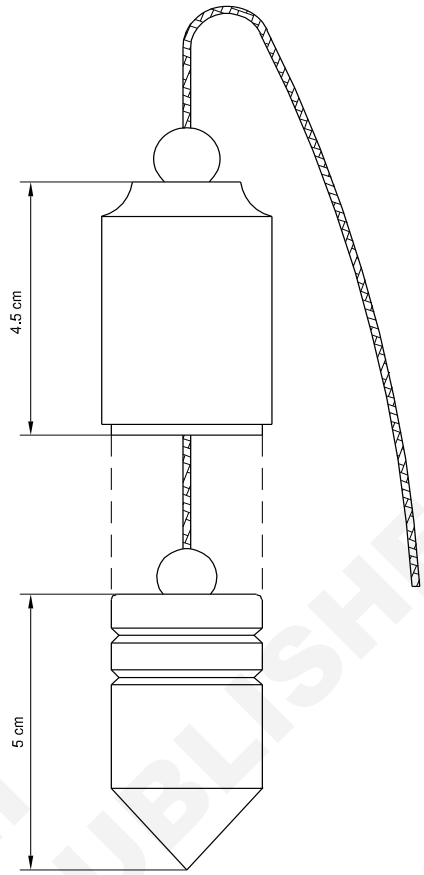
WOODEN PEG

MBN1113H6

8 Plumb bob (Fig 7)

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

Fig 7



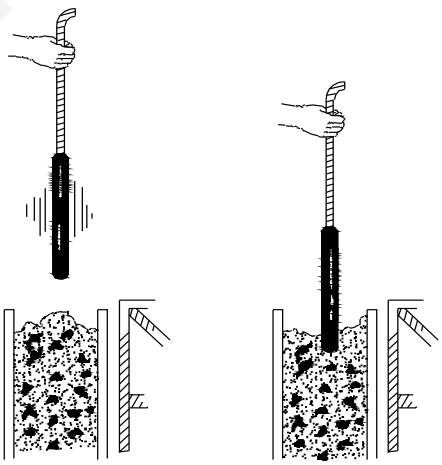
PLUMB BOB

MBN1113-H7

9 Needle vibrator (Fig 8)

- Do not stop the vibrator when needle in concrete
- Avoid over vibrating otherwise form work centering and shuttering may damages.
- Stop the vibrator it cement slurry flows out from shuttering.

Fig 8



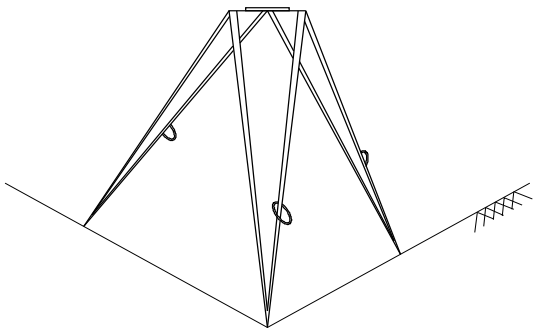
NEEDLE VIBRATOR

MBN1113H8

10 Tripod (Fig 9)

- Give the support such as stone, bricks etc., to all three legs in case of slippery ground
- Keep the two legs on the lower side of the hill and one leg on the higher side of the hill in case of hilly areas.

Fig 9



TRIPOD STAND

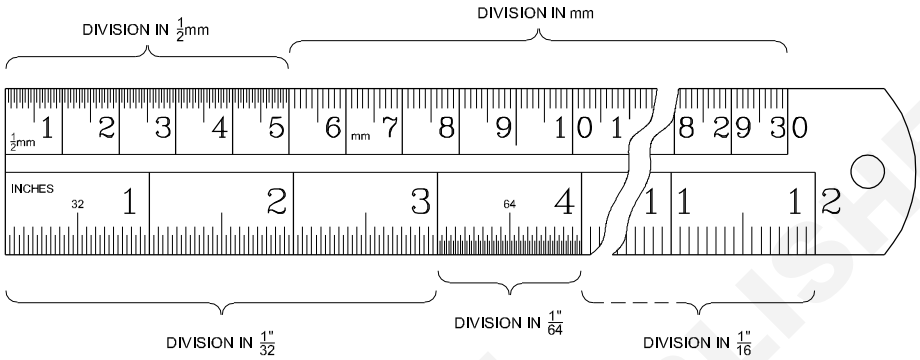
MBN1113H9

Demonstrate uses of carpenters hand tools

Objectives: At the end of this exercise you shall be able to
- **identify the name of the carpenters hand tools**
- **identify the purpose of each tools.**

1 The instructor should demonstrate each hand tools name and their purposes are shown in (Fig 1,19).

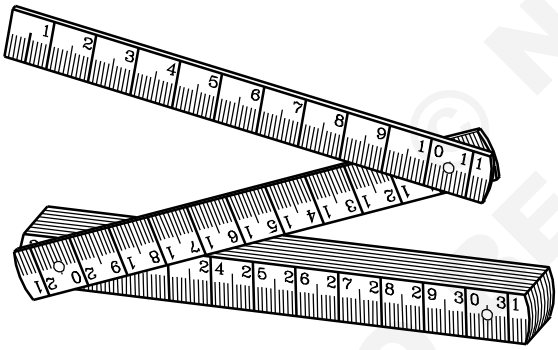
Fig 1



METAL (STEEL) BENCH RULE

MBN1214H1

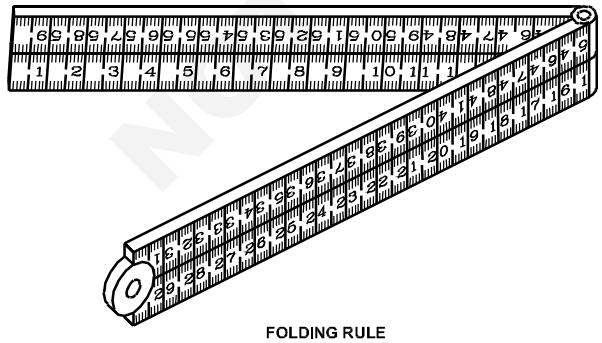
Fig 2



COLLAPSIBLE CARPENTERS RULE (ZIG-ZAG)

MBN1214H2

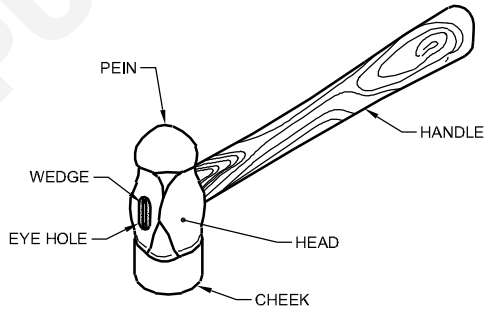
Fig 3



FOLDING RULE

MBN1214H3

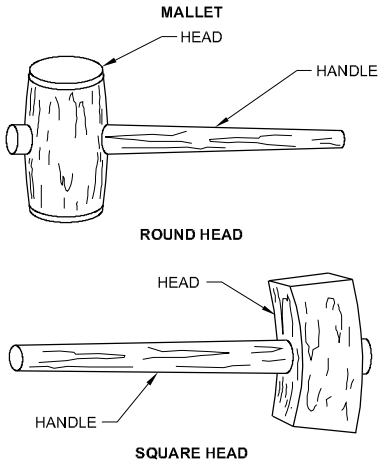
Fig 4



HAMMER

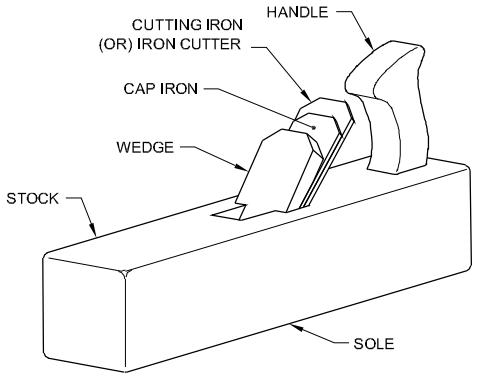
MBN1214H4

Fig 5



MBN1214H5

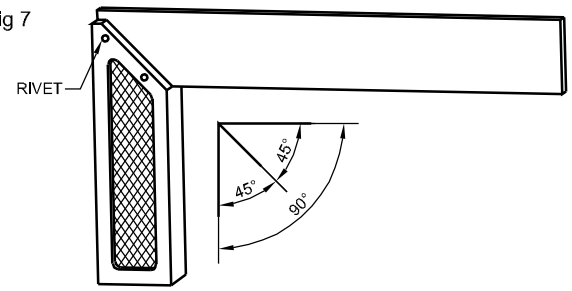
Fig 6



WOODEN JACK PLANE

MBN1214H6

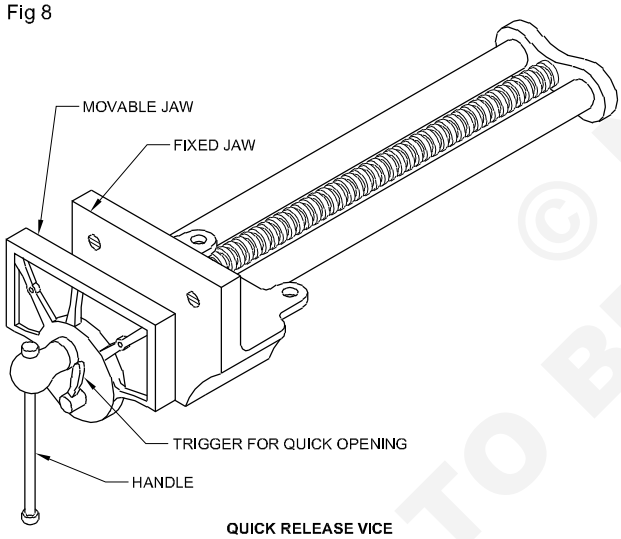
Fig 7



MITRE SQUARE

MBN1214H7

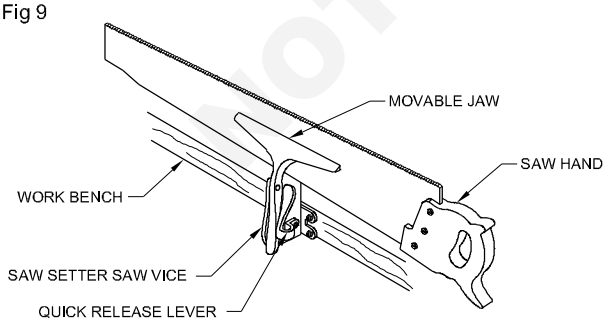
Fig 8



QUICK RELEASE VICE

MBN1214H8

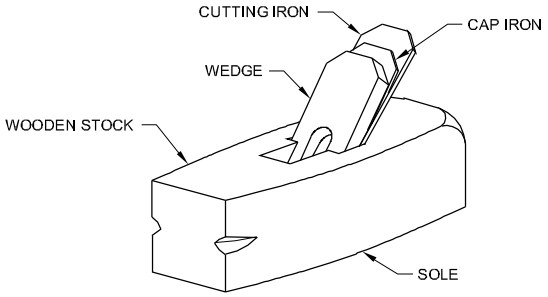
Fig 9



SAW VICE

MBN1214H9

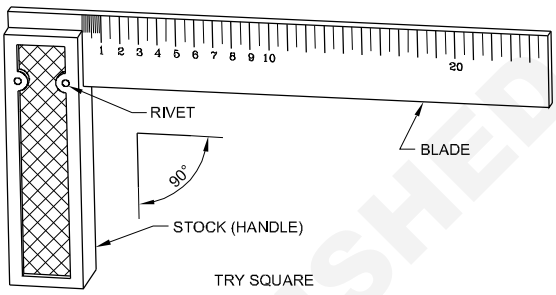
Fig 10



SMOOTHING PLANE

MBN1214HA

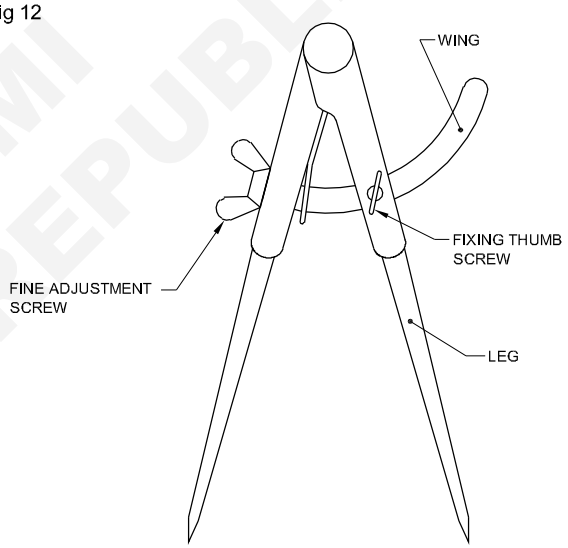
Fig 11



TRY SQUARE

MBN1214HB

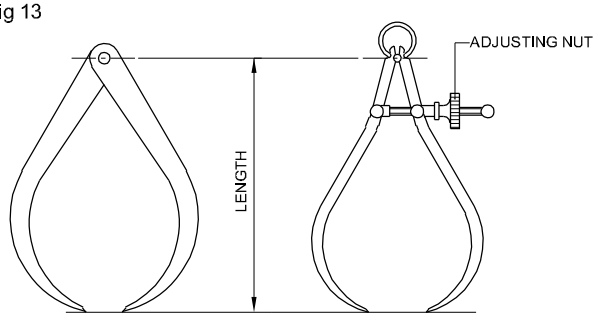
Fig 12



WING COMPASSES

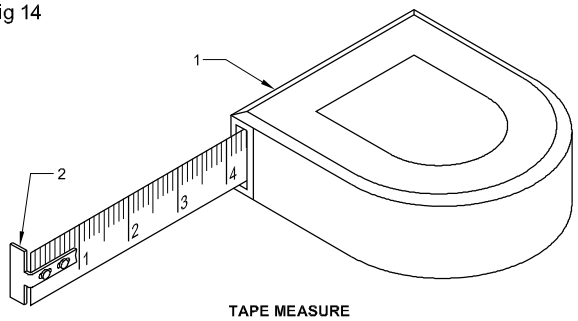
MBN1214HC

Fig 13



MBN1214HD

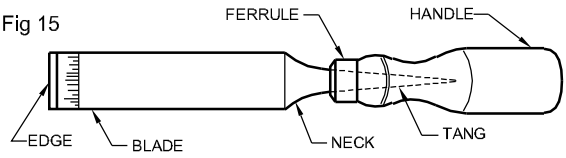
Fig 14



TAPE MEASURE

MBN1214HE

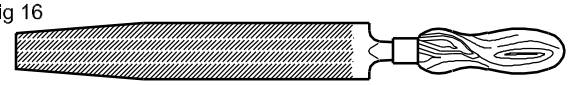
Fig 15



BENCH FIRMER CHISEL

MBN1214HF

Fig 16

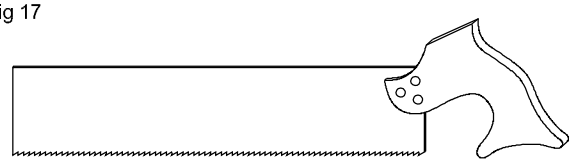


WOOD FILE

MBN1214HG

2 Trainer should identify the name of the carpenter tools and their purposes demonstrated by the instructor. The trainers are asked fill to name of tools and their purpose in the Table 1.

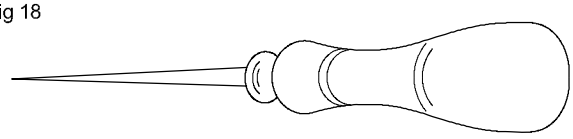
Fig 17



DOVETAIL SAW

MBN1214HH

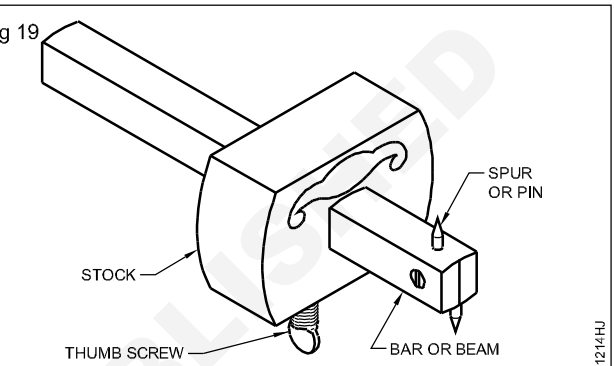
Fig 18



STEEL SCRIBER

MBN1214HI

Fig 19



MARKING GAUGE

MBN1214HJ

Table 1

Sl. No	Name of the tools	Uses / Purposes
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		

Centering work uses of nails, screws, nuts, bolts, hinges etc.

Objective: At the end of this exercise you shall be able to
- **drive the nails in the wood.**

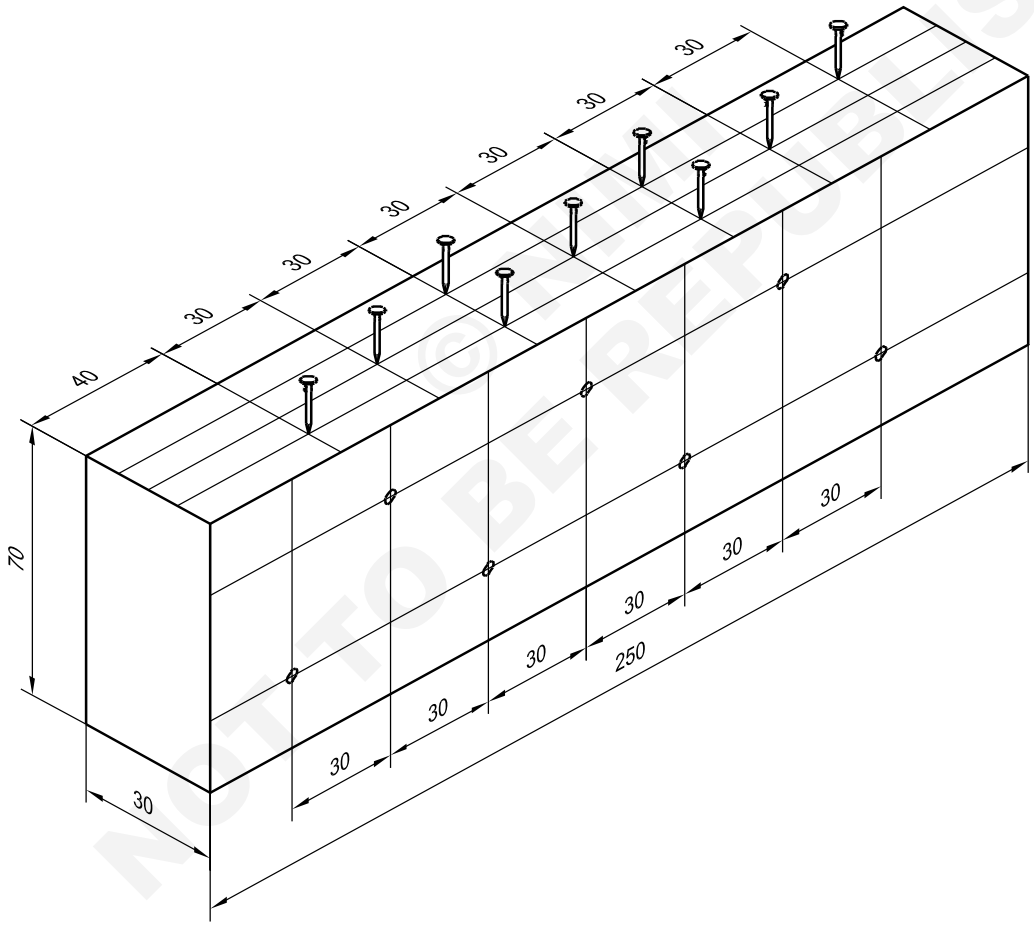
Requirements

Tools / Equipments

- Pencil - 1 No.
- Four fold wooden rule, - 1 No.
- Marking gauge, - 1 No.
- Try square, Mallet - 1 No.
- Jack plane, Marking awl - 1 No. each
- Claw hammer 1 1/2 lb - 1 No.
- Nail punch, - 1 No.
- Scrap wood - 1 No.
- Work bench with vice - 1 No.

Material

- Soft wood (Silver wood) 75 x 35 x 250mm - 1 No.
  Wire Nails 50mm - 9 Nos.
  Wire Nails 45mm - 7 Nos.
- T-hinges



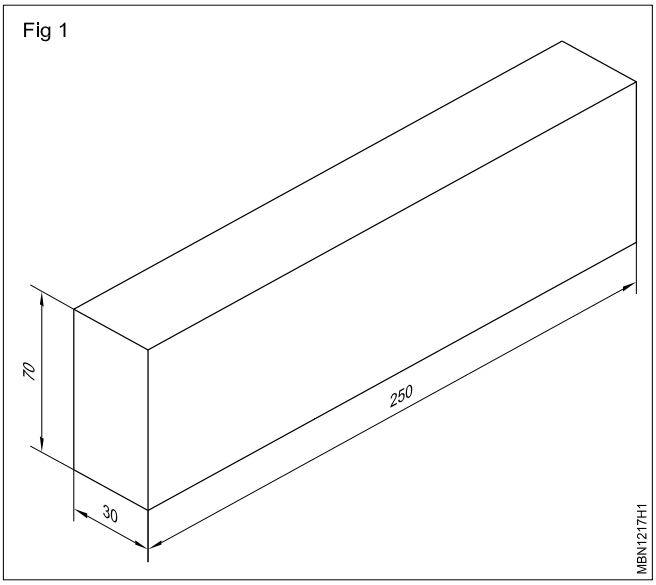
7	45 x 2.4		WIRE NAIL			
9	50 x 2.4		WIRE NAIL			
1	75 x 38 x 250		HARD WOOD			1.2.17
NO.OFF	STOCK SIZE	SEMI-PRODUCT	MATERIAL	PROJECT NO.	PART NO.	EX. NO.

SCALE NTS	NAILING PRACTICE	TOLERANCE ± 2 mm	TIME 5h
		CODE NO. MBN1217E1	

Job sequence

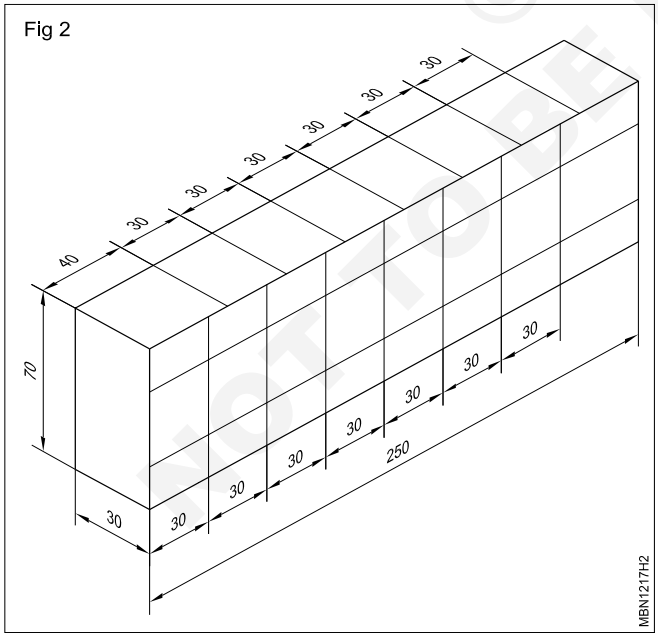
- Check the raw material for its size.
- Plane it to size 70 × 30 × 250 and check the planed wood for its level and squareness with a try square. (Fig 1)

Fig 1



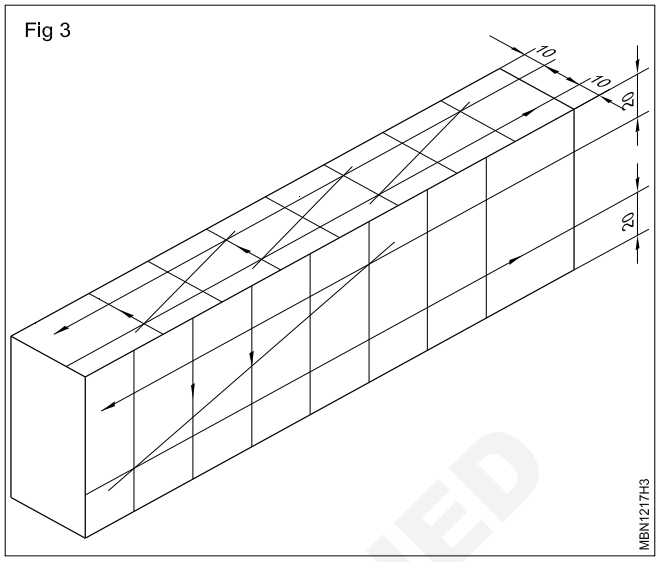
- On the width side, mark out divisions of 30, 30, 30, 30, 30, 30, and 40mm as shown in the figure. (Fig 2)
- Mark out on one edge divisions of 30mm. (Fig 2)
- Set the marking gauge at 20mm.
- Gauge two lines on the width side at 20mm from the edges.

Fig 2



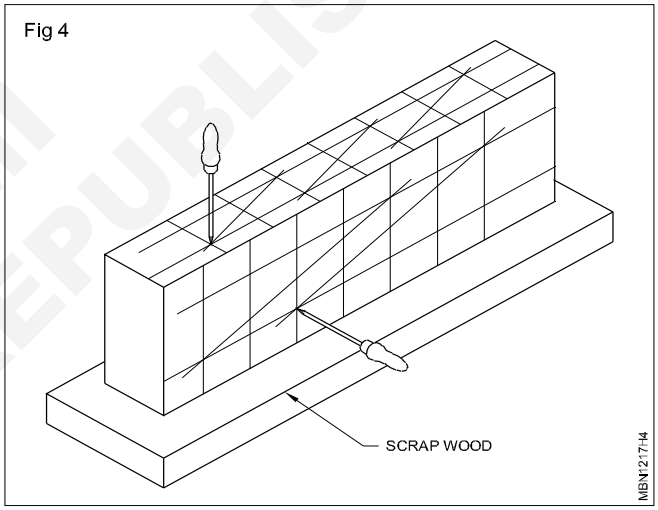
- Gauge in the directions as shown. (Fig 3)
- Set the marking gauge at 10mm.
- Gauge two lines on the edge from the sides and in the directions shown.
- Draw diagonals with the aid of a try square. (Fig 3)

Fig 3



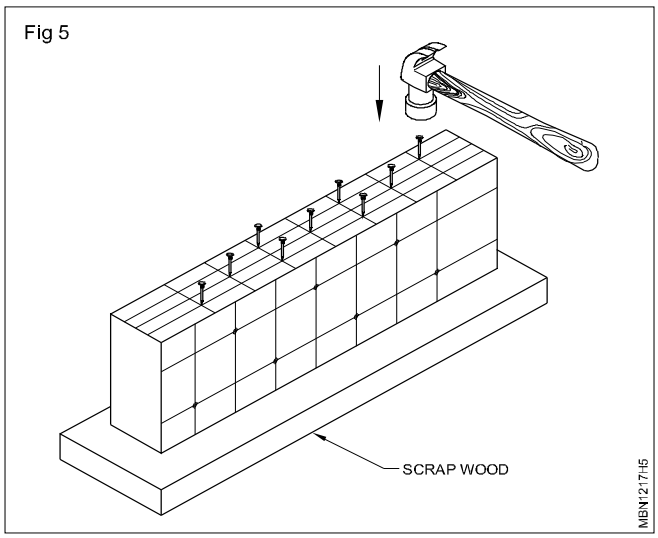
- Mark the locations for the nails with marking awl. (Fig 4)

Fig 4



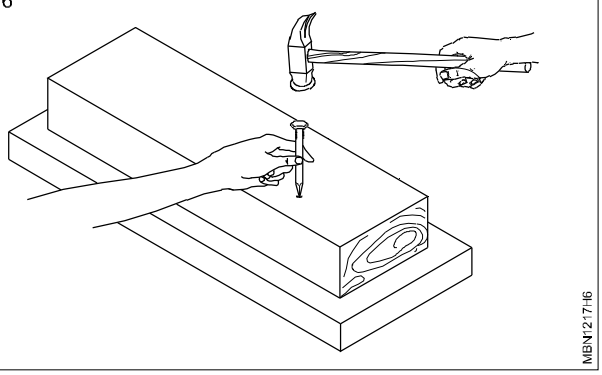
- Place the work piece on a piece of scrap wood
- Drive the nails through the wood as deep as possible, leaving the heads of the nails about one mm projection. (Fig 5)

Fig 5



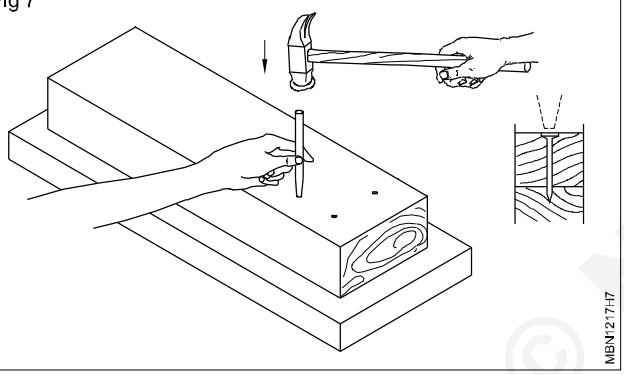
- Hold the hammer as shown near the end of the handle. (Fig 6)
- Use the nail punch and drive the nails hitting the heads square. (Fig 6)

Fig 6



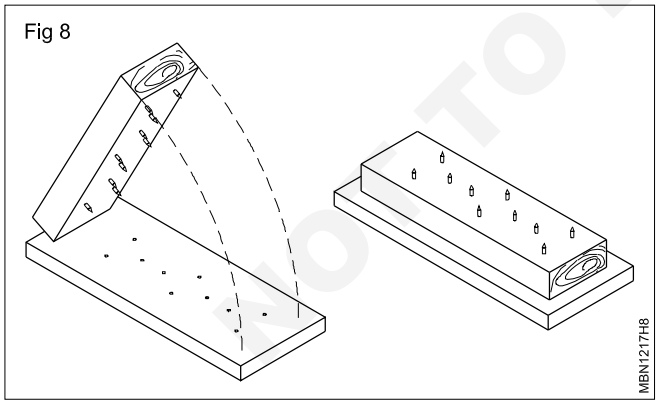
- The nail heads should be just below the wood surface ±1 mm deep. (Fig 7)

Fig 7



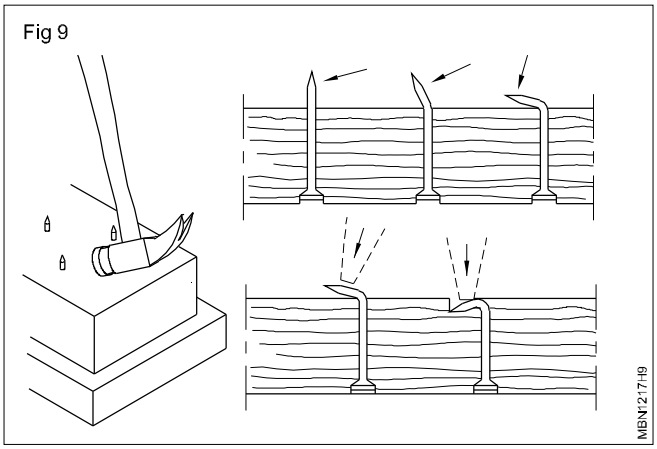
- Remove the work piece from the scrap piece. (Fig 8)
- Reverse it and place it on the scrap piece.
- Hold the work piece down with the left hand.

Fig 8



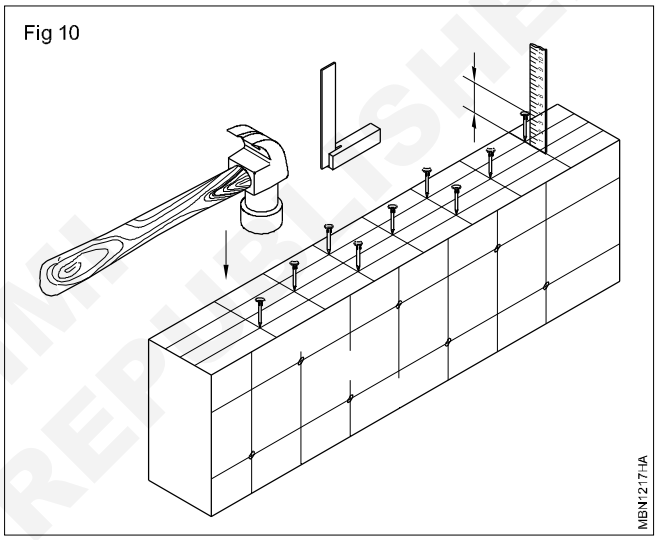
- Drive with hammer on the nail point so that it bends sideways with the grains. (Fig 9)
- Use the nail punch to drive the point below the surface.
- Drive the 2" nails in the edge. Start with the row which should remain projecting for 10 mm above the wood surface. (Fig 10)

Fig 9



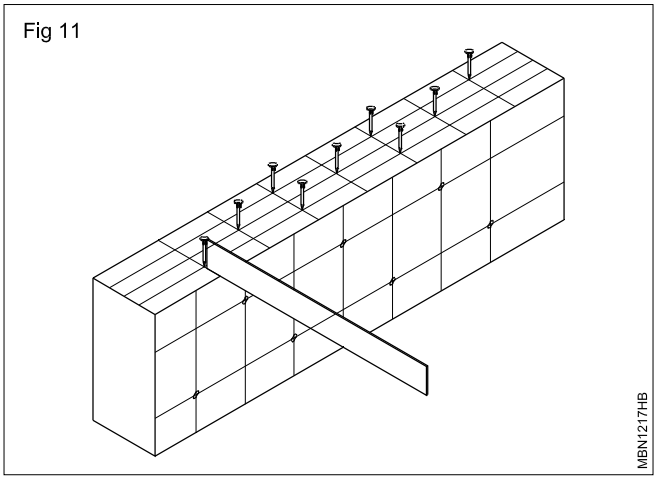
- Check with try square for 90°. (Fig 10)
- After lowest row the nails for the middle row are driven and after that last row.

Fig 10



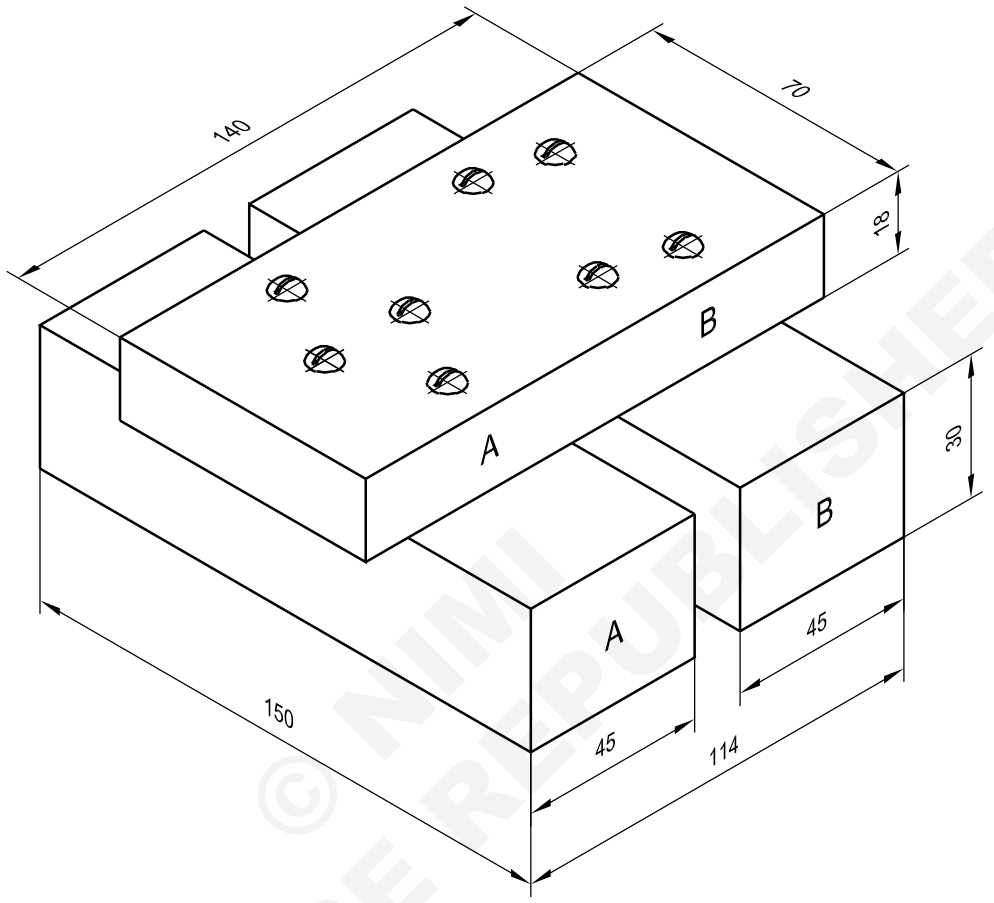
- Check if all nails are in their proper position clenched in the prescribed direction and are in straight rows.
- Check, with a ruler, the projection of the nails lengthwise and diagonally. (Fig 11)

Fig 11



Screwing practice

Objective: At the end of this exercise you shall be able to
- **develop skills in driving screws in wood.**

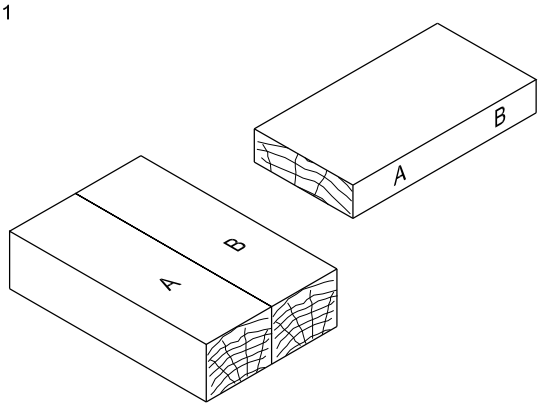


8	50 x 8		WOOD SCREWS			
1	75 x 22 x 140		SOFT (SILVER) WOOD			
2	50 x 38 x 150		SOFT (SILVER) WOOD			1.2.17
NO.OFF	STOCK SIZE	SEMI-PRODUCT	MATERIAL	PROJECT NO.	PART NO.	EX. NO.
SCALE NTS	**SCREWING PRACTICE**				TOLERANCE ± 2 mm	TIME 10h
					CODE NO. MBN1217E2	

Job sequence

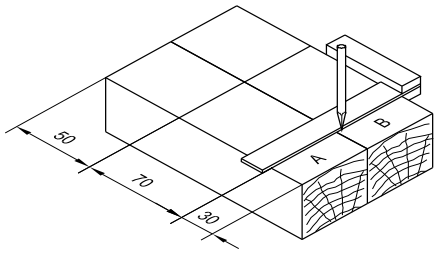
- Check the raw material for its size.
- Plane it to size of 45 × 30 × 150 - 2 Nos. and 70 × 18 × 140 - 1 No. and check its squareness and trueness.
- Mark letter A on 1st piece, B on 2nd piece and AB on 3rd piece as shown in (Fig 1).
- Keep the pieces A and B together and mark out 50 × 70 × 30mm as per drawing. (Fig 2).
- Square the lines simultaneously as shown in (Fig 2).
- On the piece AB, mark the lines 13, 45, 24, 45 and 13mm. (Fig 3)
- Square these join lines across the top broad side and two edges as shown. (Fig 3)
- Mark out the locations for the screw holes.(Fig 4)

Fig 1



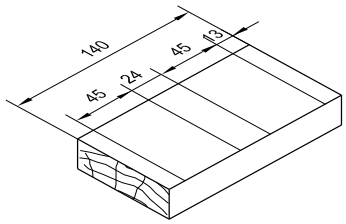
MBN1217J1

Fig 2



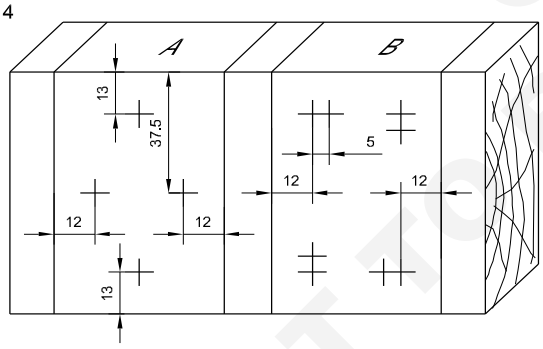
MBN1217J2

Fig 3



MBN1217J3

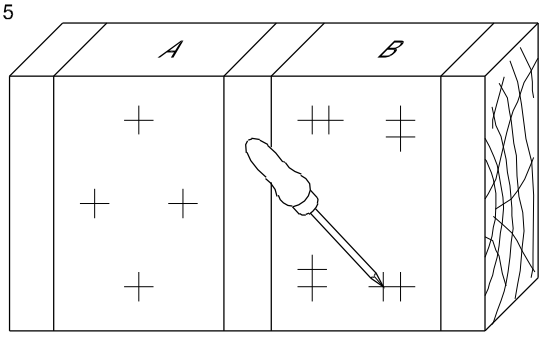
Fig 4



MBN1217J4

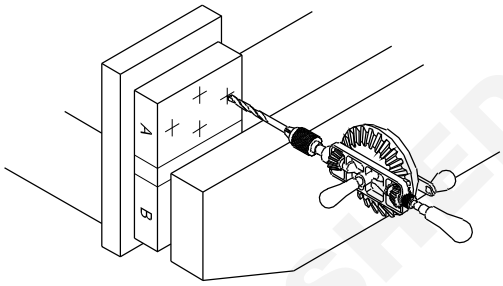
- The holes are positioned in the shape of a cross near A.
- The holes are situated in the corners of a rectangle with an offset of 5mm in clockwise direction near `B'. (Fig 5)
- Mark the position of each hole with marking awl. (Fig 5)
- The marking awl should have sharp point.
- Hold the work piece in the vice as shown in Fig 6.
- Select a proper drill bit. The size should be same as the shank of the screws. (Fig 7)
- Make use of a scrap wood for the backing up.

Fig 5



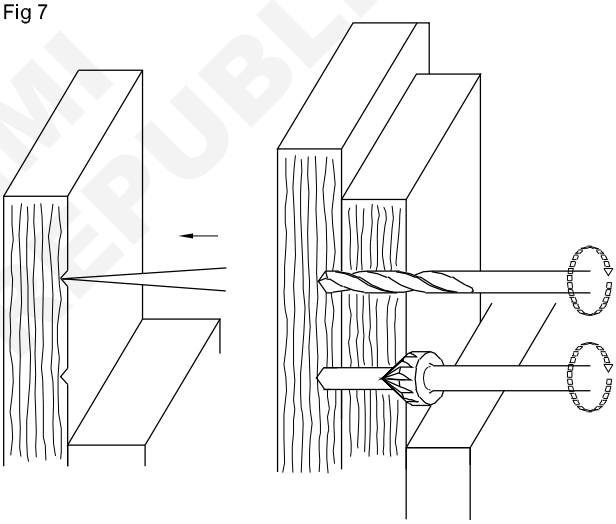
MBN1217J5

Fig 6



MBN1217J6

Fig 7

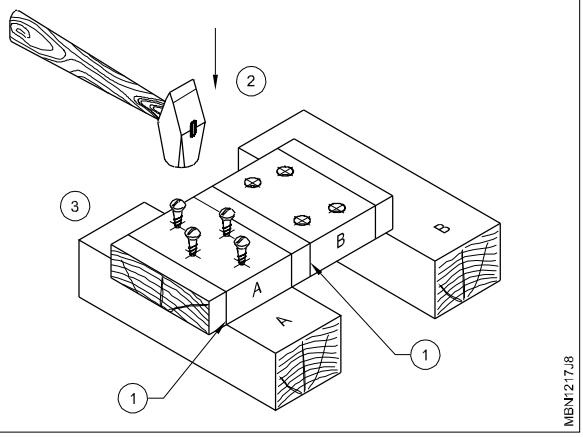


MBN1217J7

- 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.
- Place the broad piece AB on the piece A so that the marks coincide. (Fig 8)
- Use piece B as support.
- Insert four screws.
- Tap the screws carefully with hammer so that the screw points the dent piece A. (Fig 8)

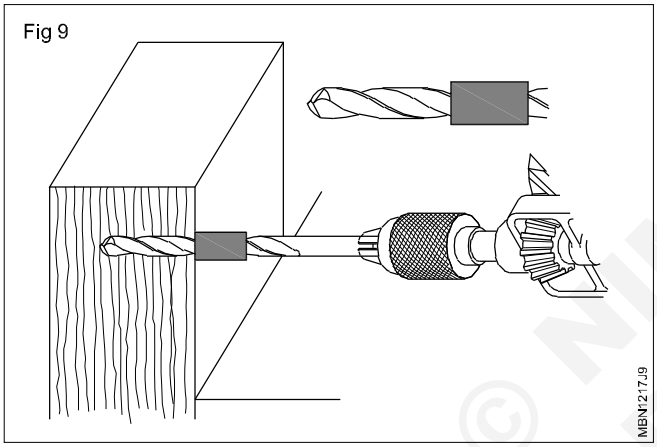
Take care not to damage the screw heads.

Fig 8



- For drilling a pilot hole in piece use a drill bit of one half the thickness of the shank hole. (Fig 9)
- To control the depth of a pilot hole stick a piece of sticking tape round the bit.

Fig 9



- Repeat the whole drilling procedure for piece B. (Fig 10)
- Insert the 8 screws and drive these into the wood. Use the proper screw driver.

Using the screw driver

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

Fig 10

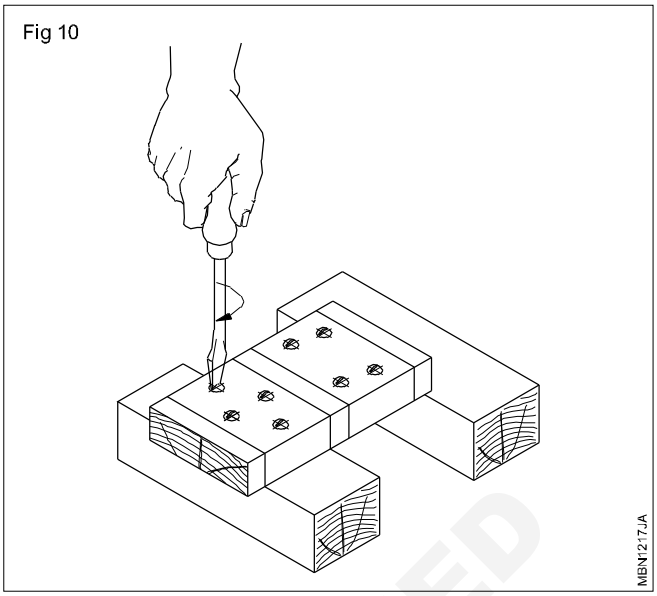


Fig 11

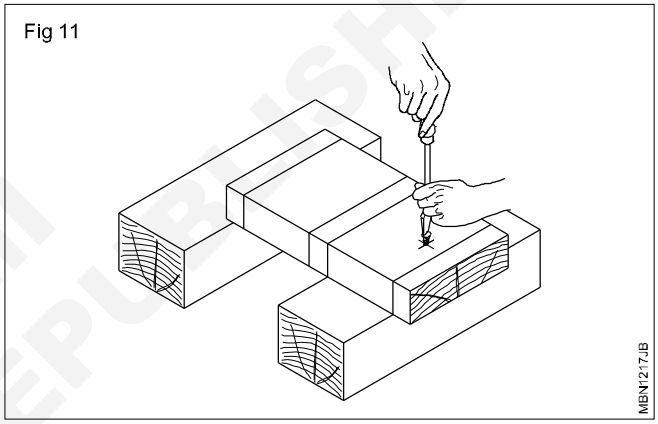
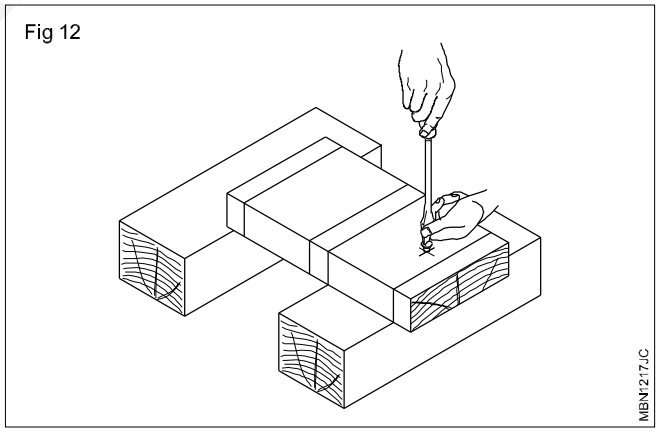


Fig 12



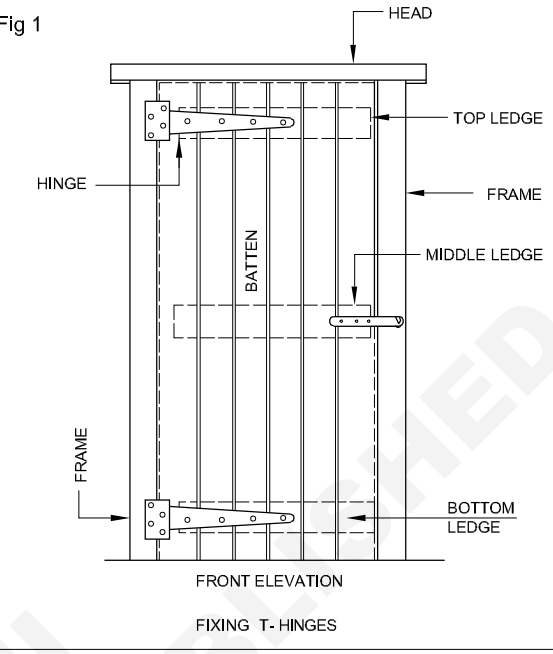
Fixing hinges in doors

Objectives: At the end of this exercise you shall be able to
- **develop the skill fixing hinges in doors.**

TASK 1 : **Fix the hinges in door (Fig 1)**

- Check the door frame and shutter of sizes.
- Mark the position of 'T' hinges of bottom and top of frame and shutter.
- Mark out the location for the screw holes.
- Mark the position of each hole with marking awl.
- The marking awl should have sharp point.
- Select a proper drill bit, the size should be same as the shank of the screws.
- Insert of screws in each 'T' hinges.
- Tap the screws carefully with hammer so that the screw points are piers into 'T' hinges.
- For drilling a pilot hole in piece use a drill bit of one half the thickness of the shark hole.
- To control the depth of a pilot hole stick a piece of sticking tape round the bit.
- Insert the 8 screws in each 'T' hinges and drive these into frame and shutter.
- Use the proper screw driver.

Fig 1



FIXING T- HINGES

Perform centering and form work

Objectives : At the end of this exercise you shall be able to
- **form work for beams and slabs**
- **form work for square column**
- **centering for arches.**

Requirements

Tools / Equipments

- Measuring tape - 1 No.
- Line and thread - 1 No.
- Plumb bob, Plumb level - 1 No. each
- Firmer chisel, Hammer, Hand saw - 1 No. each
- Steel try square, PVC level tube - 1 No. each

Materials

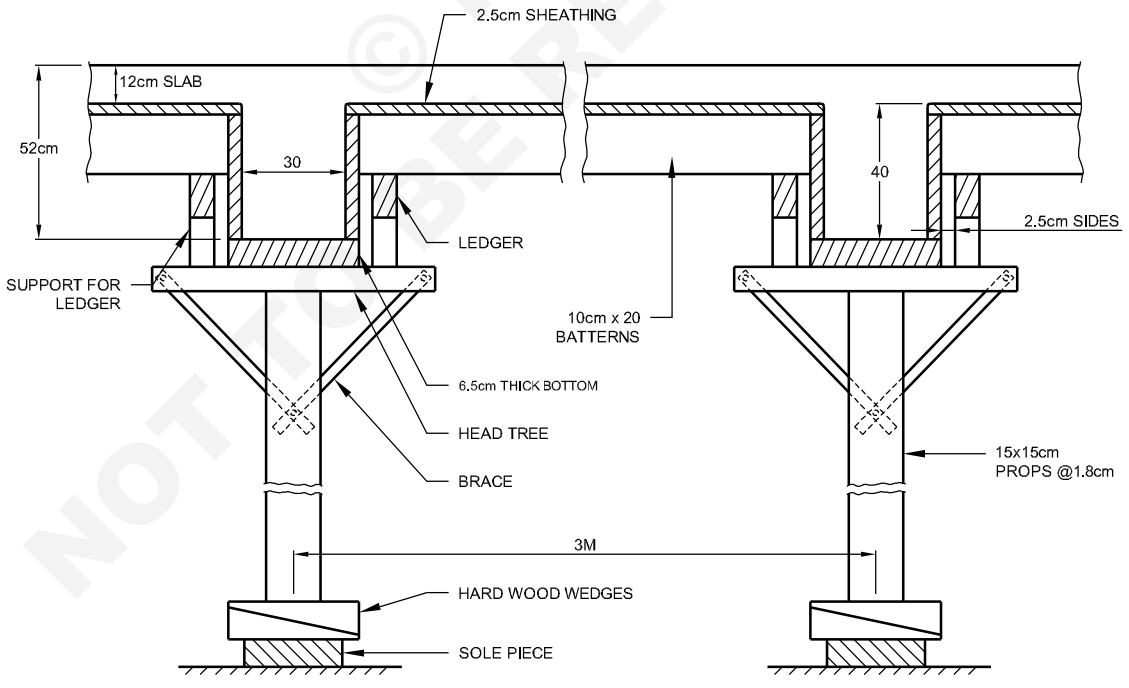
- Prob 15x15cm, Batten 10 x 20cm
- Side slab 2.5cm thick, Bottom board 6.5cm thick
- Hand wooden wedges,Sole piece
- Sheating 2.5cm thick, Boarding 35mm thick
- Yokes 100 x 100mm, Batten 50x 100mm
- Bolt 20mmø, prob100 x 50mm
- Turning piece 75 x 50 x 115mm
- Folding wedges

PROCEDURE

TASK 1 : **Prepare a form work for beams and slabs**

- 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 the dimensions of beam and slabs.
- Fix planks with reapers and nail with planks.
- Check the shuttering and probing (Fig 1).

Fig 1



SECTION ACROSS BEAMS AND SLABS

TASK 2 : **Prepare a form work for square column**

1 Check the vertical planks as required sizes.

2 The plants should be and should not have any warps and joints.

3 Check the dimension of square column

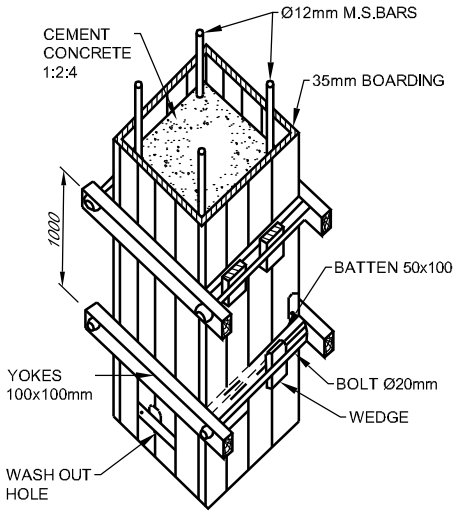
4 Fix the wooden board vertically

5 Fix the yokes horizontally and connect by 20mm bolt

6 Use wedges wherever necessary to strengthen form work

7 Check the form work. (Fig 2)

Fig 2



ISOMETRIC VIEW

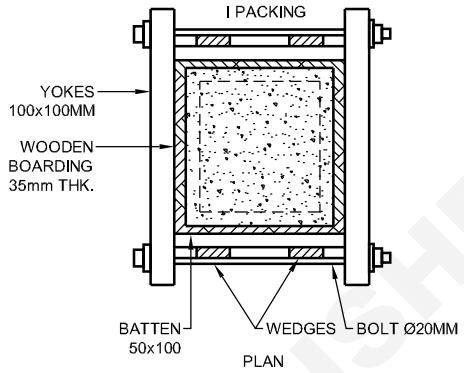


Fig 1(a)

DETAILS OF TIMBER FORM WORK FOR A SQUARE OR RECTANGULAR R.C.C. COLUMN

MBN1218H2

TASK 3 : **Prepare centering for arches**

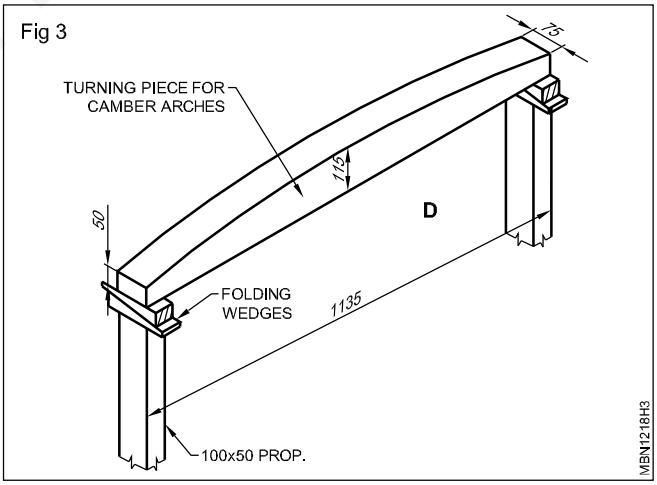
1 Fix the prop on both end

2 Kept the turning piece on the of prop

3 Fix folding wedges on both end of supports

4 Check the centering piece. (Fig 3)

Fig 3



MBN1218H3

Skill Sequence

Form work for R - C - C column

Objective : This shall help you to

- fix the form work for R - C - C column.

This exercise shall help you to

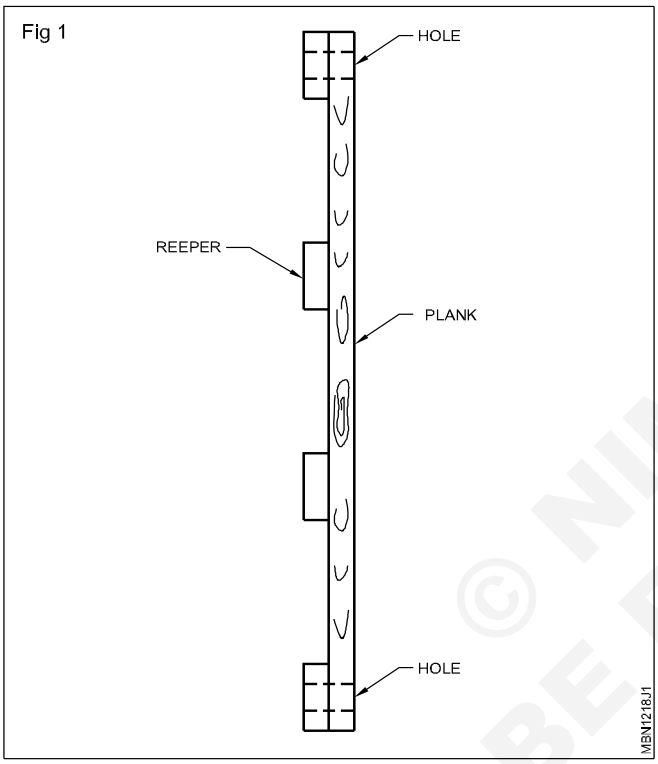
Prepare form work for R.C.C tooling.

Check wooden planks and its sizes.

Check planks are uniform thickness.

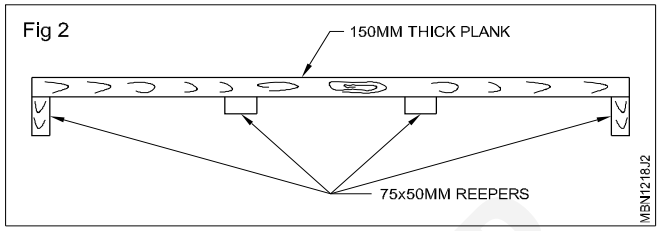
Join reapers 75x50mm with planks as shown in (Fig1)

Fig 1



Use nails to join reapers and wooden plank.(Fig 2)

Fig 2

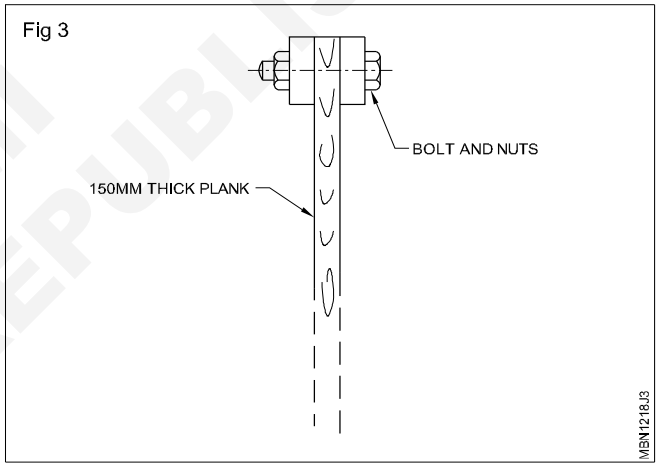


Make hole for fixing Bolts and Nuts.

Fix with 150mm thick planks on sides.

Cut the planks to required length and fix with bolt and nuts (Fig 3)

Fig 3



Handling of bricks, turning of bricks for structure and header faces

Objectives: At the end of this exercise you shall be able to
- **handling of the brick for turning as a structure face**
- **handling of the brick for turning as header face.**

Requirements

Tools/ equipments

- Trowel - 1No
- Plumb bob - 1No
- Spirit level - 1No
- Try square - 1No

Materials

- Bricks
- Mortar

PROCEDURE

TASK 1: **Handling of bricks for turning as structure face**

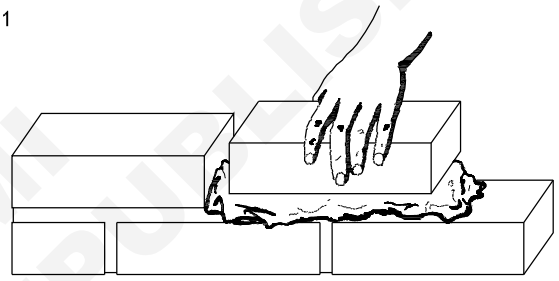
1 From the stack of the wetted bricks, lift a brick by your left hand from middle of the brick

2 Turn it conveniently structure face laying on the construction of wall as shown in Fig1.

3 Check the level using plumb and spirit level

4 Adjust the level using back end of the handle of trowel.

Fig 1



PLACING THE BRICK ON THE WALL

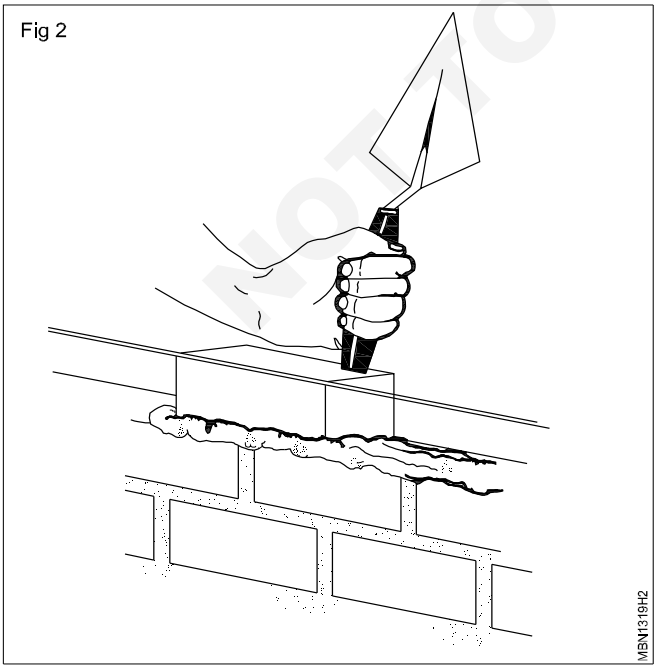
MBN1319H1

TASK 2**: Handling of bricks for turning as header face**

1 Lift the brick in your left hand on structure length

2 Turn the brick by twisting the wrist to header face and place it on the construction wall.

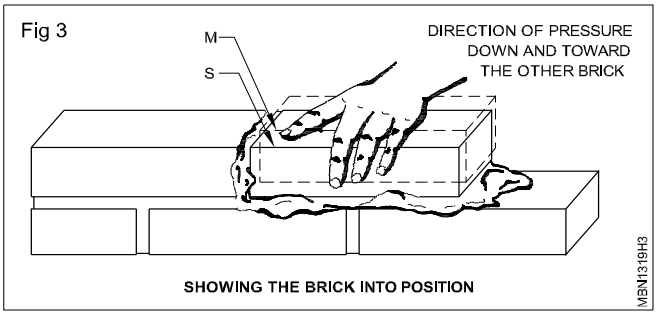
Fig 2



MBN1319H2

3 Push and tap the brick with trowel hand (Fig 2,3).

Fig 3

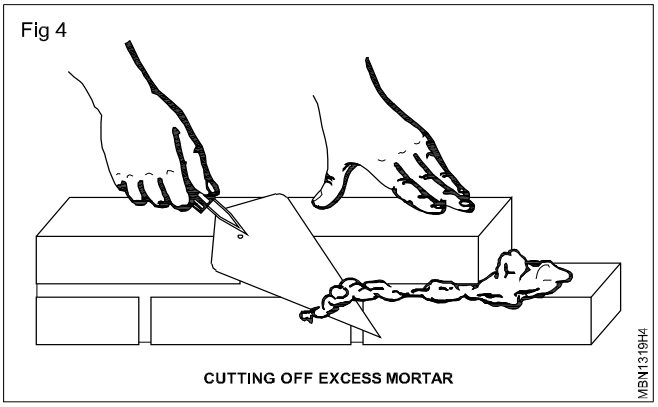


SHOWING THE BRICK INTO POSITION

MBN1319H3

4 Remove the excess of mortar by trowel (Fig 4).

Fig 4

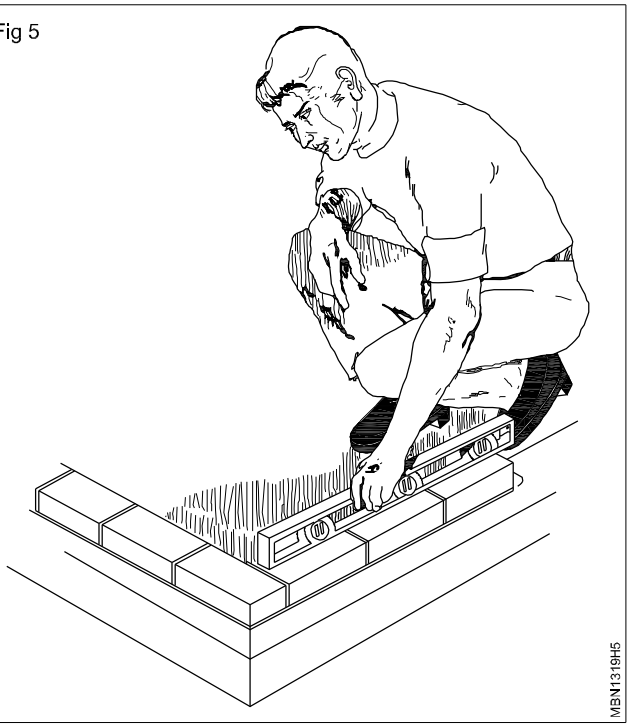


CUTTING OFF EXCESS MORTAR

MBN1319H4

5 Check first course of level (Fig 5).

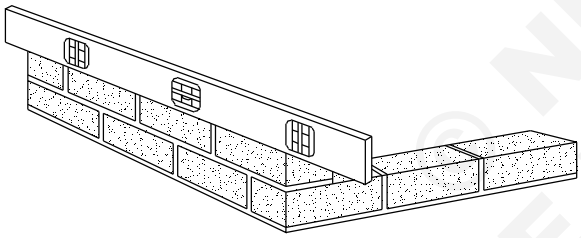
Fig 5



MBN1319H5

6 Check the second course of level by sprit level (Fig 6).

Fig 6



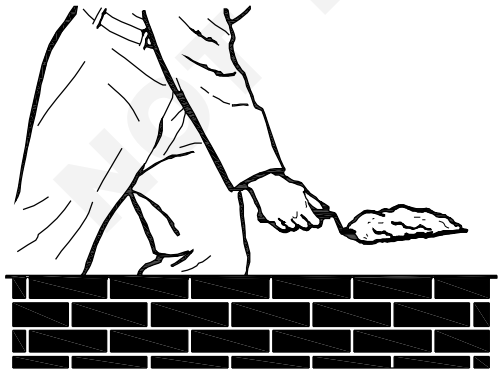
CHECKING THE SECOND COURSE FOR LEVEL

MBN1319H6

7 Take the mortar by trowel (Fig 7).

8 Check the level using plumb bob and spirit level adjust the level using brick end of the handle of trowel.

Fig 7



A FULL TROWEL-LOAD OF MORTAR

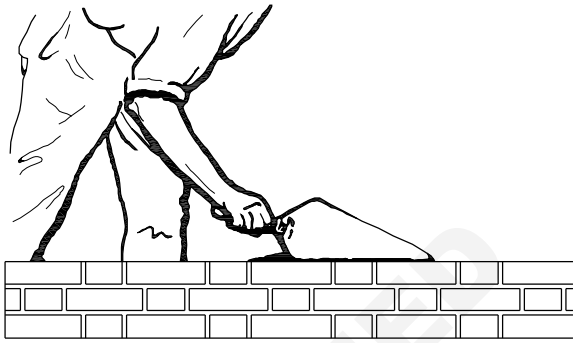
MBN1319H7

9 Following the same procedure of laying structure face to lay the header face in the construction.

10 Turn the trowel and moved along the bed the deposit the mortar.

11 Lay the mortar in centre of the bed area.(Fig 8)

Fig 8



STARTING TO SPREAD MORTAR

MBN1319H8

12 Proceed this method till all the nine courses and complete the work.(Fig 9)

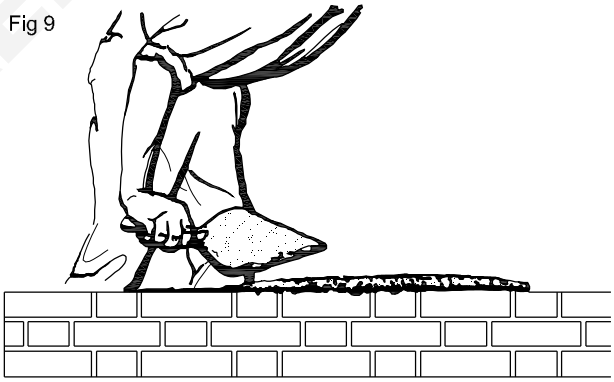
13 Remove the excess cement mortar in the external and internal surface of wall.

14 Lay the corner brick exact corner.

15 Use the trowel to tap it into position.

16 Lay the corner brick exact corner.

Fig 9



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

MBN1319H9

Cutting of bricks with brick hammer as desired shape and size

Objectives : 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

Tools/ equipments

- Chisel or bolster 100mm wide - 1 No.
- Hammer brick - 1 No.
- Marking scale - 1 No.
- Marking pencil - 1 No.
- Fibre board or timber - 1 No.

Materials

- Brick 9" x 4½ x 3"
  (or)
  20cm x 10cm x 10cm - 2 Nos

PROCEDURE

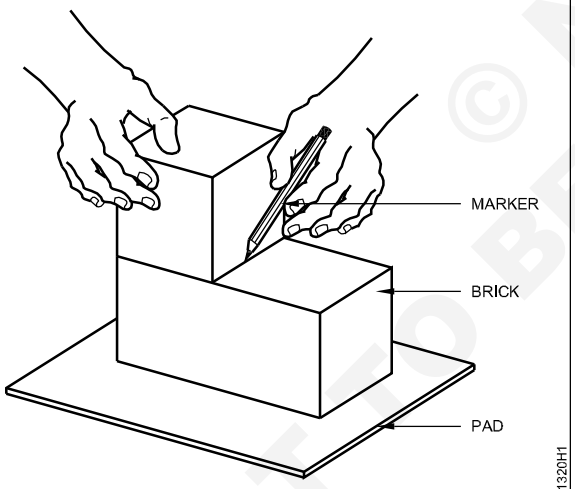
TASK 1 **: Cut the brick in two equal pieces in cross wise**

1 Lay timber board or fibre board on the floor.

2 keep the brick on fiber board as flat.

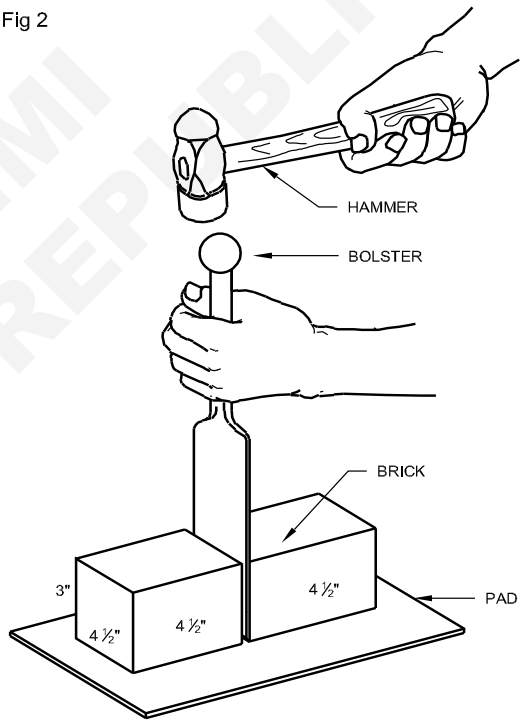
3 Mark the face of the brick for cutting using the width another brick as a guide as shown in (Fig 1).

Fig 1



HALF BAT

Fig 2



4 Place the bolster along the cutting line.

5 Keep the bolster firmly in left hand.

5 Strike with medium blow with a hammer.

6 Turn the brick to the other header face.

7 Repeat until to cut into two pieces. (Fig 2)

Caution

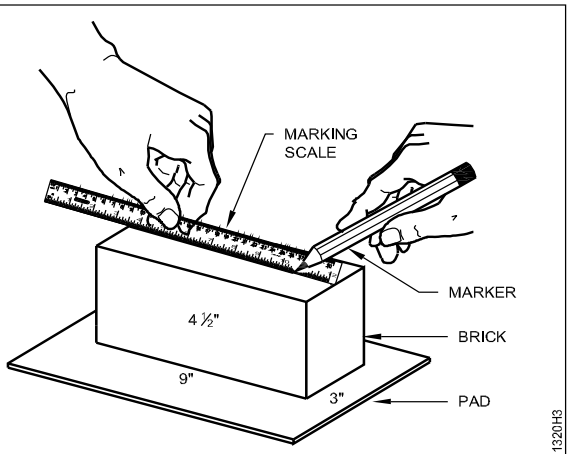
- **Keep away finger from the chisel head.**
- **Care should be taken while blow with hammer, otherwise may spoil the finger.**
- **Brick should be rest on a fibre of soft wood pad to reduce unnecessary fractures.**

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

1 lay the fibre board or pad on the floor.

2 Keep the brick vertically on fibre board. (Fig 3)

Fig 3



QUEEN CLOSER

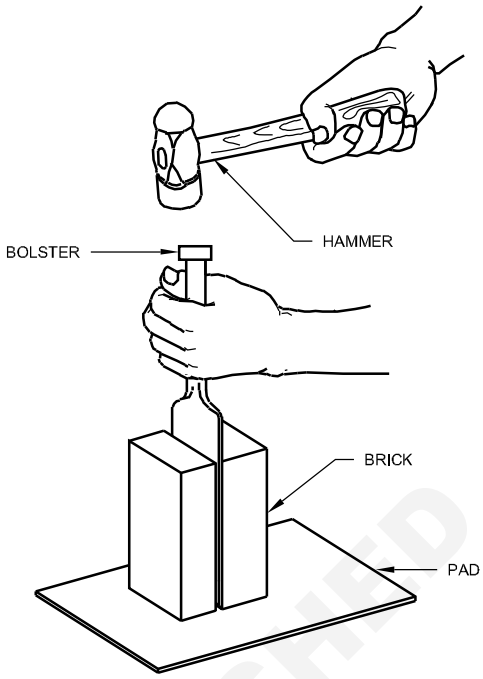
3 Mark the face of the brick in longitudinal direction by using marking scale.

4 Place the bolster along the cutting line. (Fig 4)

5 Strike a medium blow with hammer. Turn the brick to the other longitudinal face.

6 Repeat until to cut into two pieces as queen closer.

Fig 4



Skill Sequence

Method of cutting bricks by using of bolster and hammer

Objectives : This shall help you to
- **cutting bricks by bolster**
- **cutting bricks by hammer.**

1 Set one brick face up on an off cut of timber or fibre board.

2 Mark the face of the brick for cutting. Using the width another brick as a guide

3 Hold the blade of the bolster on the face of the brick and vertical to it

4 Strike the bolster with a firm hard blow with the lump hammer.

5 Use the bolster and Lump hammer to trim any excess remaining on the half brick.

6 Mark the line of cut for the closer on each header face an the brick to be cut

7 Stand the brick an one header face on a fibre board pad and Place the bolster along the cutting line.

8 Strike a medium blow with a lump hammer, turn the brick to the other header face and repeat the cut with are medium blow.

9 Continue alternating between each header face untill the brick is cut.

Caution

1 Keep away fingers from the chisel head.

2 Care should be taken while blow with hammer. Other wise may spoil the fingers.(Fig 1a)

Lump hammer

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

Bolster (Fig 1b)

1 100 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.

Fig 1(a)

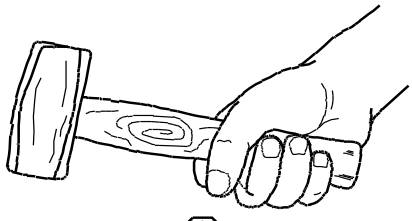
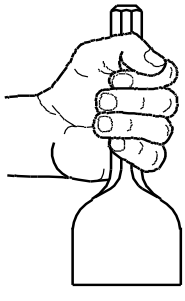


Fig 1(b)



Shaping mortar, spreading on the bed joint bricks

Objective : At the end of this exercise you shall be able to
• layout and build half brick thick corner wall (stretcher).

Requirements

Tools/Equipments

- Mortar pan - 1 No.
- Mason trowel - 1 No.
- Brick hammer - 1 No.
- Brush - 1 No.
- Straight edge - 1 No.
- Plumb bob - 1 No.
- Sprit level - 1 No.
- Line and thread - 1 No.
- Measuring steel tape - 1 No.
- Try square - 1 No.

Materials

- Brick 230 x 110 x 70mm - 45 Nos
- Cement one bag - 1 No.
- Sand 4 boxes - 4 No.
- Water - as reqd.

PROCEDURE

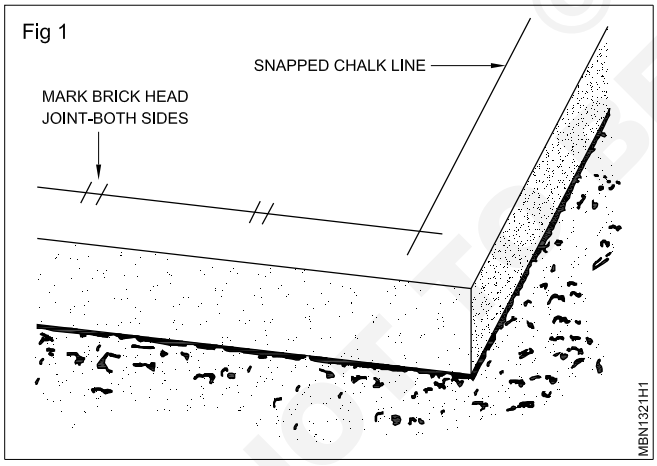
TASK 1 **: Layout and build half brick thick corner wall (stretcher)**

1 Assemble the materials in the work area

2 Set the mortar pan back from the wall approximately one metre to provide sufficient working space.

3 Layout the 'L' corner on the floor using the steel square and pencil or chalk (Fig 1)

Fig 1



4 Extend the line a little longer than the actual corner measures with chalk.

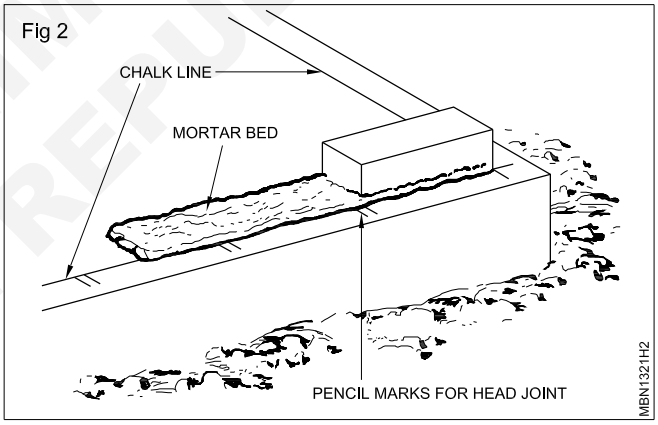
5 Layout the first course 'Dry bond' keeping head joint uniform (10mm using the fore finger)

6 Remove the corner brick (brick number 1) spread the mortar and re-lay without moving the bricks in between. (Fig 2)

7 Remove the end brick (Brick No. 2) spread the mortar.

8 Level and plumb brick No. 1 with brick No. 2 and straighten the edge and plumb rule or with straight edge.

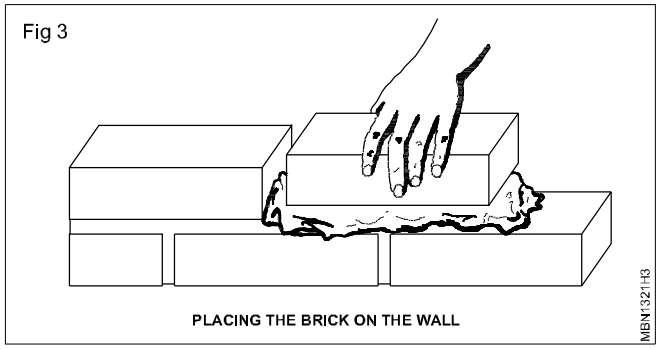
Fig 2



9 Lay the brick No. 3 level plumb and straighten the edge with brick No. 1 as shown in (Figs 3 & 4)

10 Remove excess mortar Fig 5 in each course in laid.

Fig 3

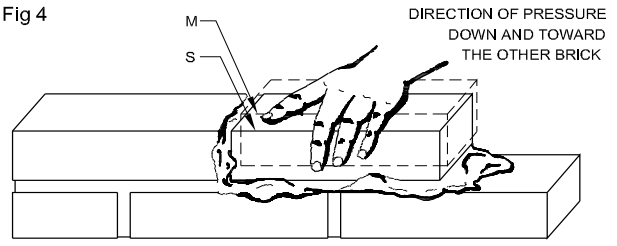


11 All the joints should be uniform thickness.

12 Check the corner of squareness after laying the first course of brick. (Fig. 6)

13 Check the second course for level. (Fig 7)

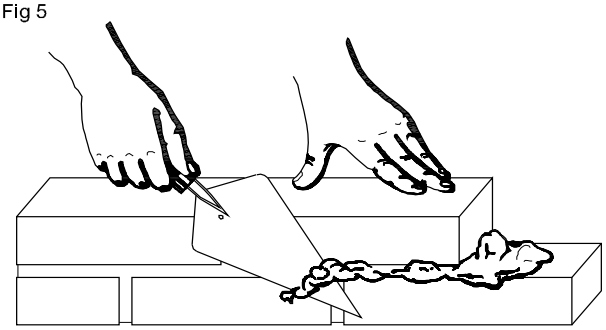
Fig 4



SHOWING THE BRICK INTO POSITION

MBN1321H4

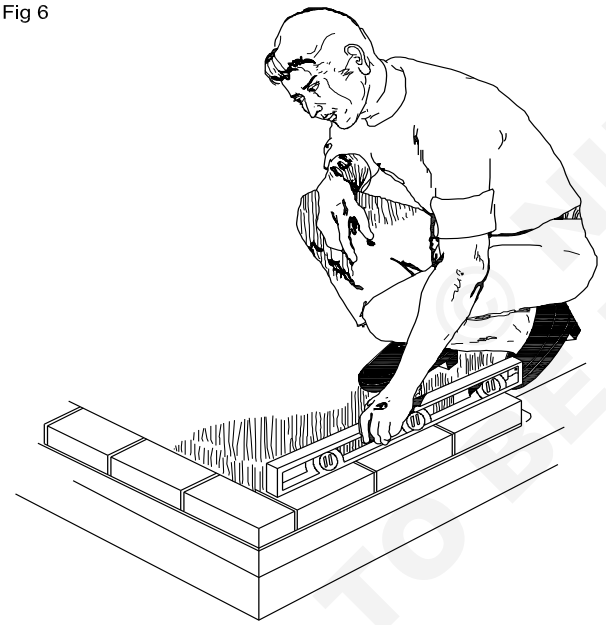
Fig 5



CUTTING OFF EXCESS MORTAR

MBN1321H5

Fig 6



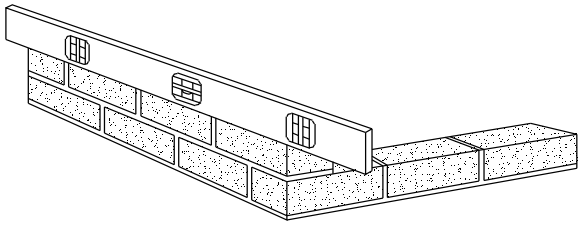
MBN1321H6

14 Take mortar sufficiently to form a bed and lay three or four bricks and spread in (Figs 8 & 9).

15 Turn the trowel and moved along the bed the deposit the mortar. (Fig 10)

16 Lay the mortar in centre of the bed area.

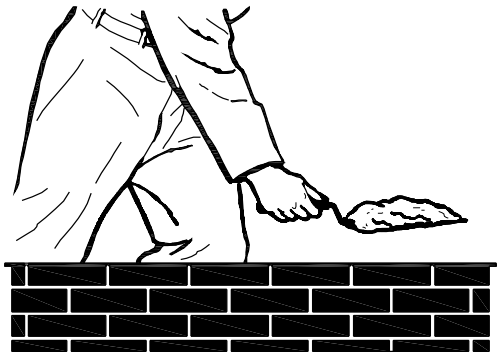
Fig 7



CHECKING THE SECOND COURSE FOR LEVEL

MBN1321H7

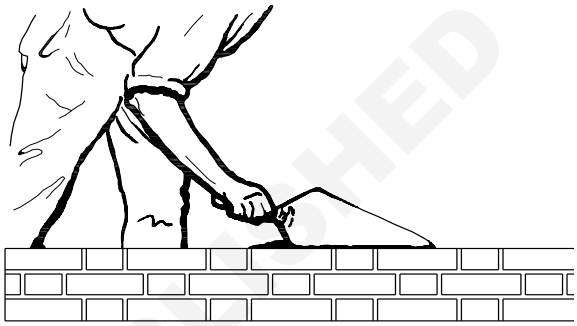
Fig 8



A FULL TROWEL-LOAD OF MORTAR

MBN1321H8

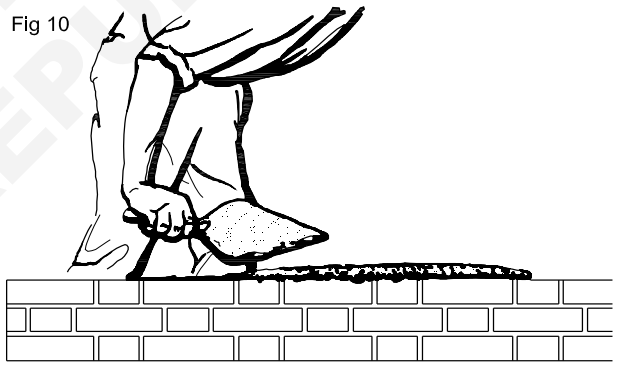
Fig 9



STARTING TO SPREAD MORTAR

MBN1321H9

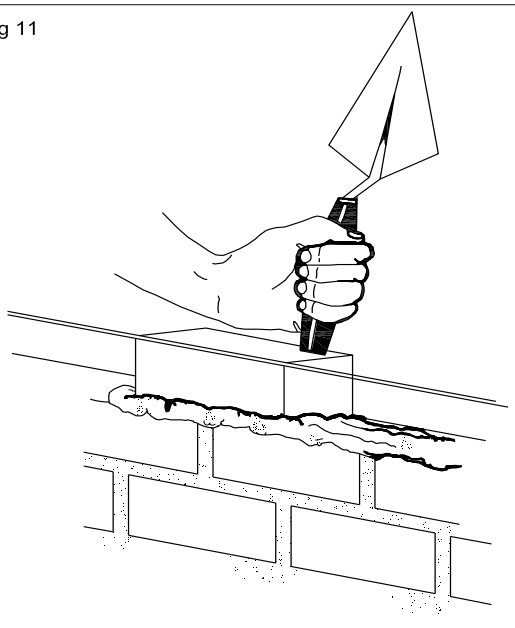
Fig 10



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

MB1311HA

Fig 11



MB1311HB

17 Proceed this method till all the nine courses and complete the work.

18 Remove the excess cement mortar in the external and internal surface of wall.

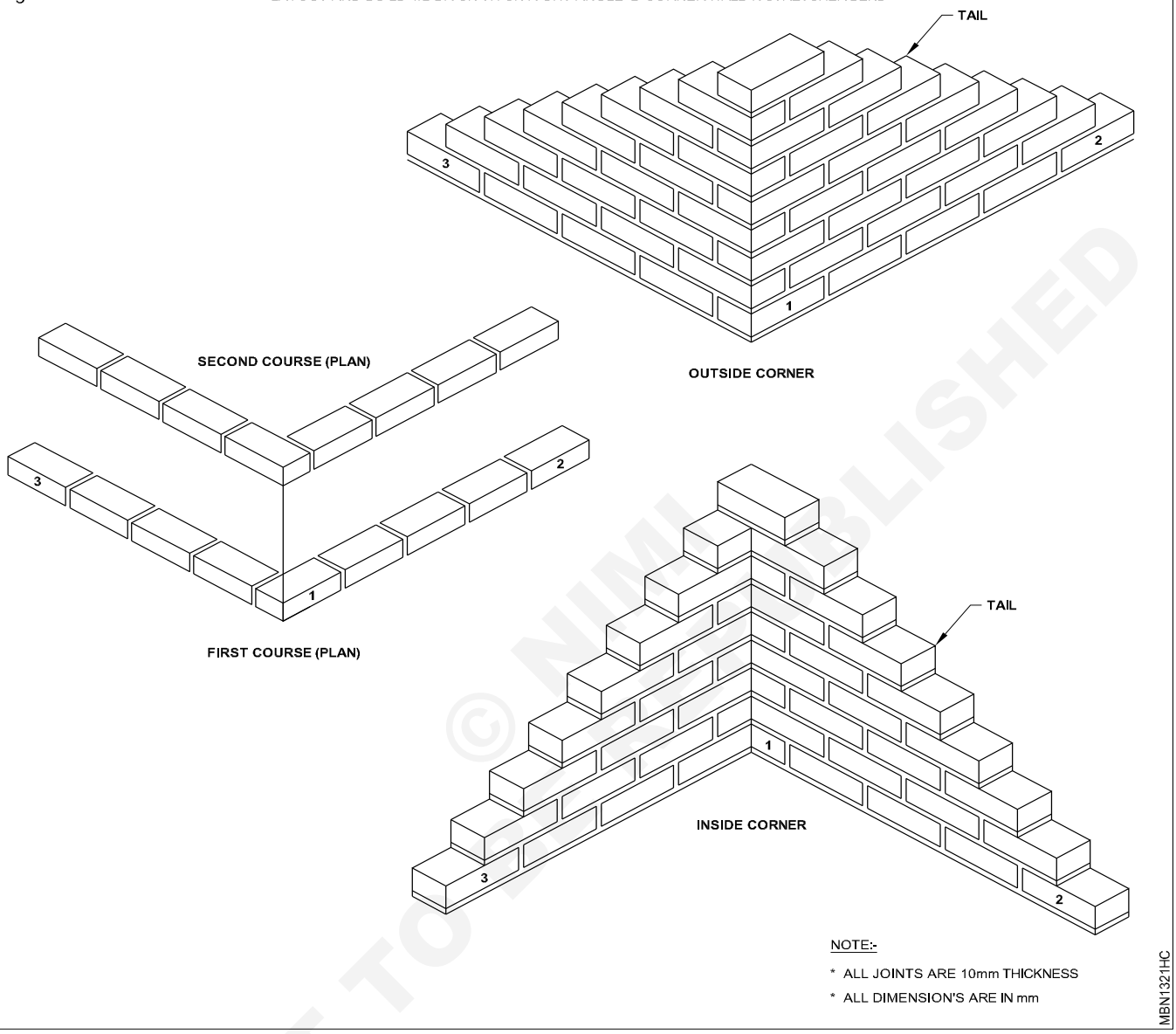
19 Lay the corner brick exact corner.

20 Use the trowel to tap it into position (Fig 11).

21 Lay the corner brick exact corner.

22 Lay and complete to the corner wall of half brick thick strertcher bond. (Fig 12)

Fig 12 LAYOUT AND BUILD 1/2 BRICK THICK RIGHT ANGLE 'L' CORNER WALL IN STRETCHER BEND



Skill Sequence

Method of lifting mortar from mortar Board

Objective: This shall help you to
- **lifting motar 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, 1mm above spot board and 50mm 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.

Preparation of various types of mortars according to the ratio of ingredients

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

- **prepare of mortar ingredients for specific mix**
- **mix mortar manually**
- **follow correct safety precautions.**

Requirements

Tools/Equipments

- Spade - 1 No.
- Bucket - 1 No.
- Mug - 1 No.
- Mortar pan - 1 No.
- Measuring Box (Figs 5 and 6) - 1 No.
- Mason Trowel - 1 No.
- G.I. Sheets (For Platform) - 1 No.

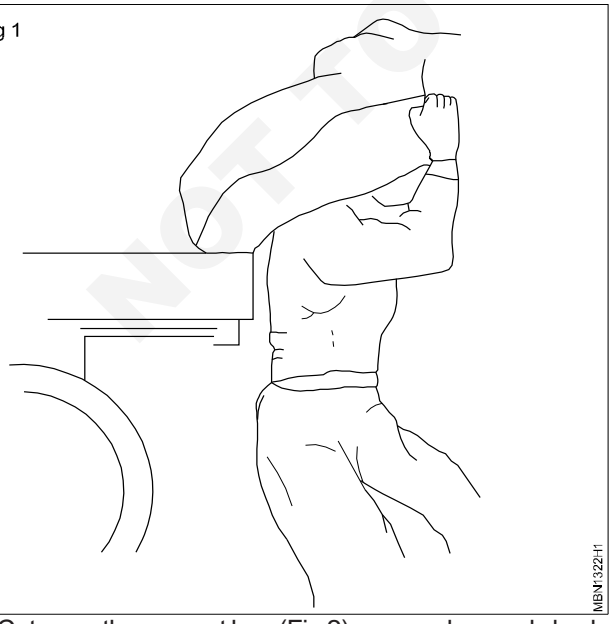
Materials

- Cement - 1 box
- (0.034 m3 or 1 bag)
- Sand - 5 box (0.17 m3)
- Add 20% for bulking
- Water - as required.

Job Sequence

- Level the area where mixing is to be done.
- Place adequate numbers of G.I. sheets on the levelled ground.
- Consider preparation of cm 1:5
- 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.

Fig 1



- Cut open the cement bag (Fig 2) pour and spread slowly the cement evenly on the sand.

Fig 2

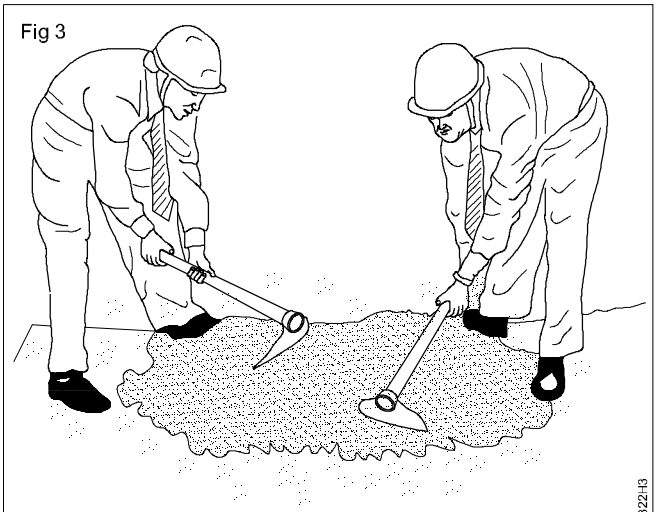
EMPTYING CEMENT BAG

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 radio) to get consistency of mortar. (Fig 4)
- Mix quickly without allowing the water to keep out of the heap.

Fig 3



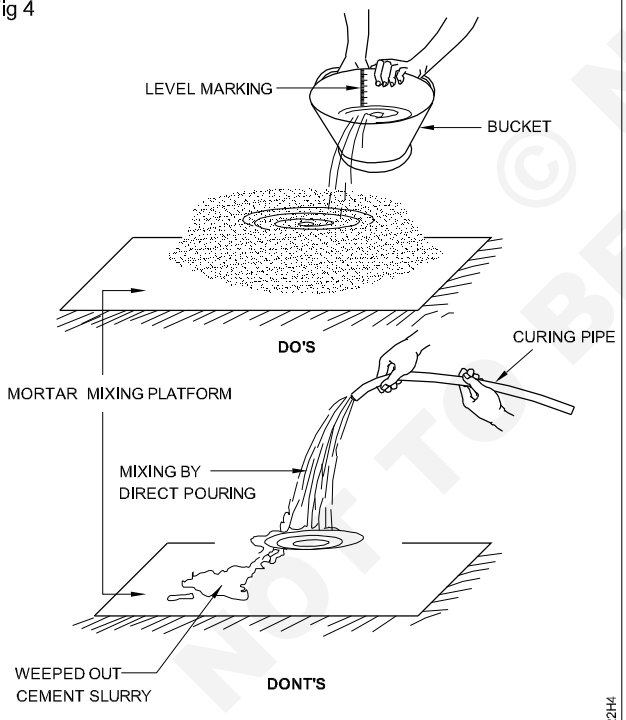
DRY MIXING OF CEMENT AND SAND

MBN1322H3

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 and same time continue mixing. (Fig 4)
- Don't add water with a curing pipe as shown in (Fig 4).

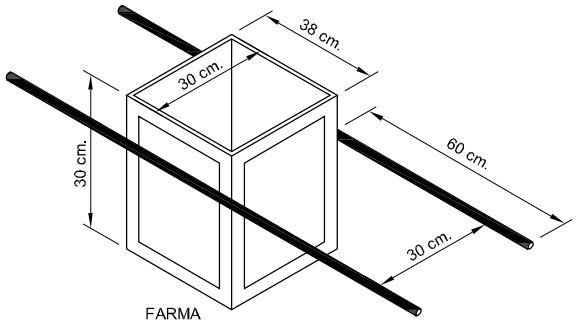
Fig 4



MIXING WATER (DO'S & DONT'S)

MBN1322H4

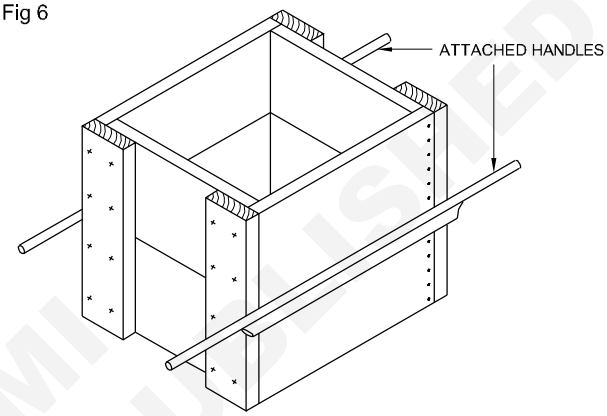
Fig 5



STEEL MEASURING BOX

MBN1322H5

Fig 6



WOODEN MEASURING BOX

MBN1322H6

- Keep mixing until uniform colour and consistency of mortar is obtained.

Caution

- Do not pour excess water since mix will become lean.
- After mixing use the mortar with in 30 minutes.

Skill Sequence

Method of measuring ingredients

Objective : This shall help you 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.

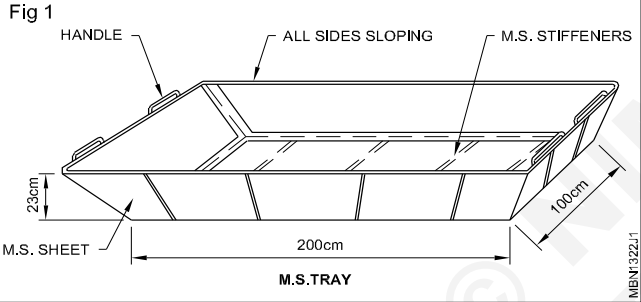
Mixing cement in dry and wet

Objectives: This shall help you to
- **mixing the cement mortar**
- **pour water and mix for consistency.**

Mix the mortar using the water tight platform.

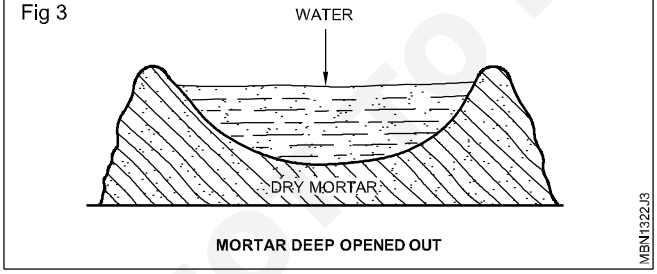
(M.S. Tray for smaller quantity or G.I. sheet for large quantity).(Fig 1)

Fig 1



Required quantity of sand and cement mixed in dry conation (Fig 2). By turning them over, from one end to another end and cutting with a shovel until the mix appears uniform colour.

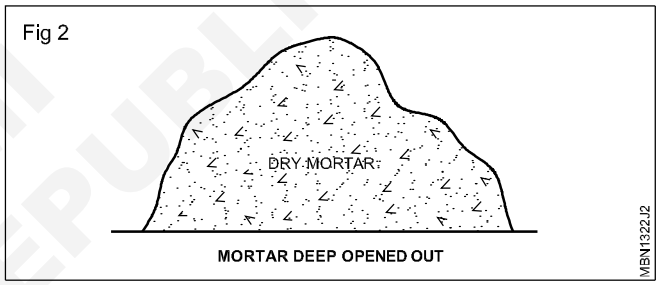
Fig 3



Turning is done three times for dry mixing in opposite directions and make heap.

Make a pond in the middle of heap (Fig 3).

Fig 2



Add required quantity of water by pouring mug by mug into pond in the heap slowly, while keeping the mixing in progress.

Mix until the uniform colour and required consistency is achieved.

Caution

Add Water according to water cement ratio.

Selection of mortar

Depending upon the nature of civil engineering work, suitable type of mortar should be selected.

Building 4½ Straight wall about 6 courses high with one end stepped and the other racked back.

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

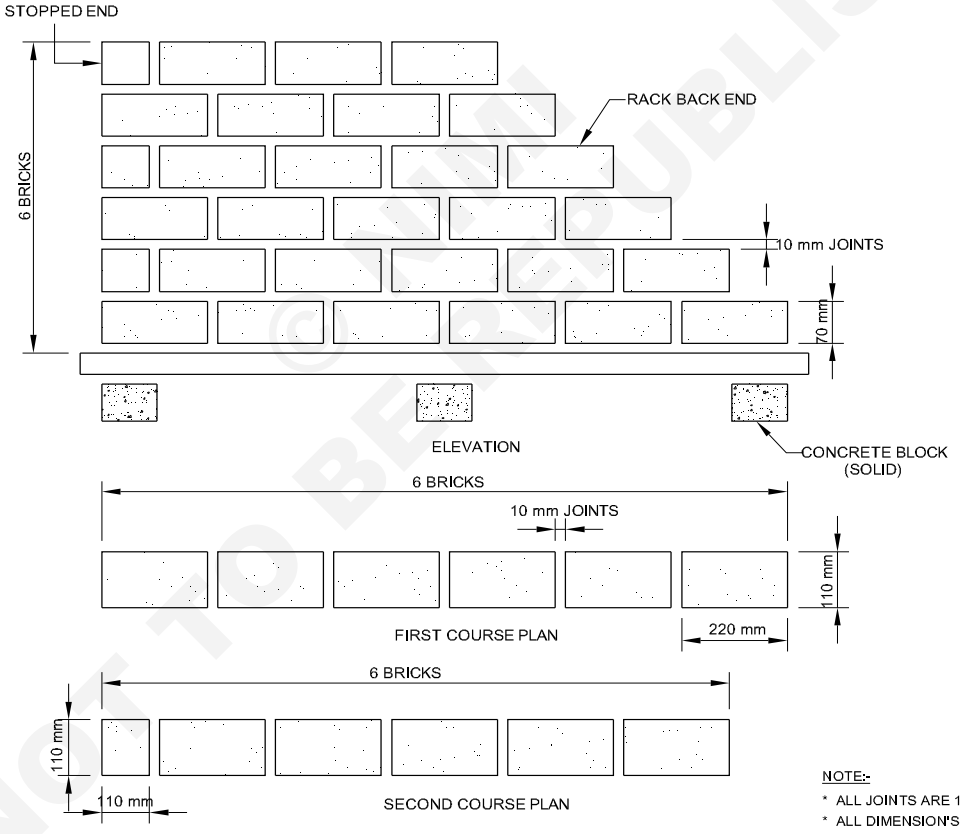
Tools/Equipments

- Mason Pan - 1 No.
- Mason Trowel 25 cm long - 1 No.
- Brick hammer, brush, straight edge each one
- Plumb bob - 1 No.
- Spirit level, pointing tool each one
- Line thread
- Measuring Steel tape 5m - 1 No.

Materials

- Conventional bricks 230 x 110 x 70mm - 30 Nos
- Water
- Wooden batten 1500 x 100 x 70mm - 1 No.
- Lime mortar or cement mortar 0.064m^3
- Solid concrete blocks 400 X 200 X 100 - 3 No
- Cement - 20kg
- Sand - 2 box

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



NOTE:-
* ALL JOINTS ARE 10mm THICKNESS
* ALL DIMENSION'S ARE IN mm

	PORTABLE		WATER		
	1 : 5		LIME MORTAR		
03	400 x 200 x 100		SOLID CONCRETE BLOCKS		
05	115 x 110 x 70		CONVENTIONAL BRICKS (HALF SIZE)		
30	230 x 110 x 70		CONVENTIONAL BRICKS (FULL SIZE)		1.3.23
NO.OFF	STOCK SIZE		MATERIAL		EX. NO.

SCALE :	**HALF BRICK THICK STRAIGHT WALL**	TOLERANCE ± 5	TIME :
	(ONE END STOPPED AND OTHER END RACKED BACK)	CODE NO. MBN1323E1	

PROCEDURE

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

1 Place required quantity of mortar in mortar pan

2 Lay the wooden batten on breath side supported on three numbers solid concrete block

3 Spread enough mortar on the batten top

4 Lay the first course

5 Check the height of the first brick laid

6 Level and plumb the course using the first brick as guide

7 Lay the bricks in the next top courses leaving half the length of bricks on one end only in the lower course

8 Continue laying bricks in the balance four courses leaving half the length of bricks on one end only in the lower course

9 Strike the joints with jointer as needed

10 Brush the wall in completion of the job

11 Recheck the entire work with plumb bob/spirit level for verticality before completion

Caution

1 Tap and check each course for alignment with straight edge

2 Level, plumb and alignment the racked back end of the lead

Skill sequence

Method of cutting mortar and lifting by trowel

Objective : This shall help you to

• 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 centre 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

Method of buttering bricks

Objective : This shall help you to

• 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)

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 90^0

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

Push the trowel blade across the back edge of the brick

Struck the mortar on the brick

Laying the bricks on the wall

Objective : This shall help you to
• 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

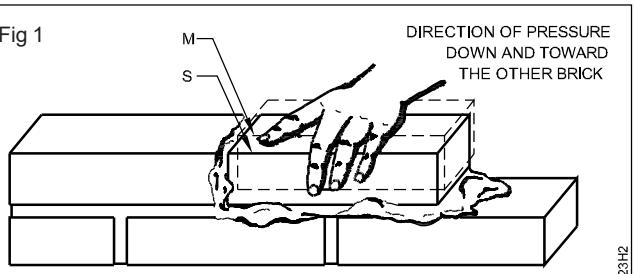
Strike a chalk line a little longer than 1.5m on the base as a reference point

Lay dry bond and project

Lay a brick in mortar on each end of the project level and plumb (Fig 1)

Lay the Course level and plumb with the spotted bricks.

Fig 1



SHOWING THE BRICK INTO POSITION

Lay second course of bricks as shown in (Fig 2).

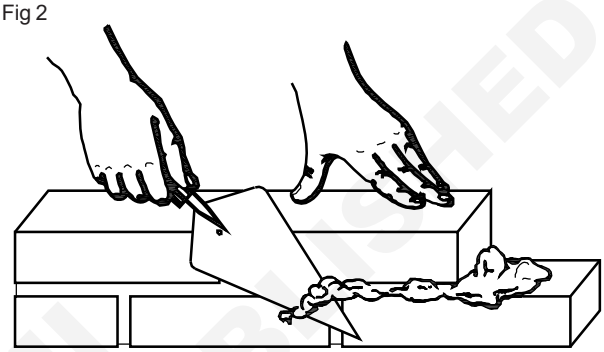
Rise the wall until the six courses in height

Recheck the work for accuracy according to the plan given.

Caution

Check mortar joints constantly keep the work area clean and free from hazards.

Fig 2



CUTTING OFF EXCESS MORTAR

Building 4½ quoin wall with one end stepped and the other racked back use plumb rule

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

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

Refer the Exercise No. 1.3.19

Construct 1 and 1½ brick junction wall in English bond and flemish bond

Objective : At the end of this exercise you shall be able to
• lay and mark dimensions of right angle junction (English bond)
• mark square at corners.

Requirements

Tools/Equipments

- Masons trowel - 1No
- Mortar pan - 1No
- Spirit level 15cm long - 1No
- Steel tape 5m - 1No
- Straight edge 1.5m - 1No
- Plumb bob or rule - 1No
- Bucket and Mug - 1No
- Steel square 75cm x 50cm - 1No
- Chisel - 1No
- Hammer - 1No
- Pencil - 1No
- Chalk - 1No
- Wire brush - 1No

Materials

- Bricks 230 x 110 x 70 - 220 nos
- Mortar (cement and sand)
- Water
- Cement - 20kg
- Sand - 3box

PROCEDURE

TASK 1: **Lay and mark dimensions of right angle junction (English bond)**

1 Locate the face of the wall on the floor. Mark a chalk line.

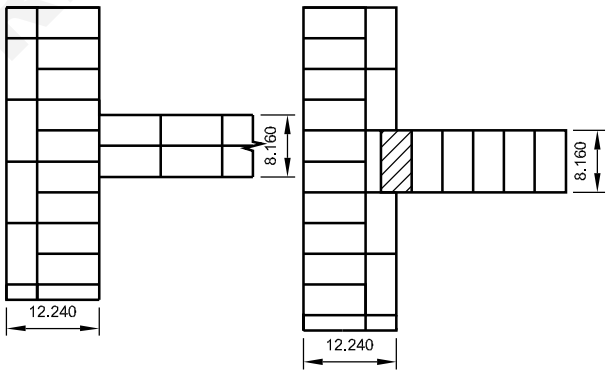
2 Prepare layout the first course with dry bricks to identify and correct any problems by using line thread and straight edge also using.

3 Use the steel square.

4 Spread the mortar bed and lay the bricks and align, level and plumb the course of brick.

5 Lay intersecting brick wall and running the course to outside wall. Align, level, plumb and check the thickness of brick wall.(Fig 1)

Fig 1



PLANS FOR ONE -AND -A HALF BRICK TEE-JUNCTION.
TEE-JUNCTION IN ENGLISH BOND.

— — — — — — — —

TASK 2: **Mark square of corners**

1 Square the corners for its right angle (90°)

Note: The main wall and junction wall which are meeting each other should be properly bonded

Care should be taken that all the courses shall be followed by laying in English bond.

2 Complete the intersecting walls continuing alternate layout pattern in ten courses.

3 Level and check plumb of the completed wall.

4 Clean off any mortar splatter.

5 Scrape off any mortar left after finishing the joints, clean wall by brushing with a brick layers brush.

6 The corner is completed it should be checked for plumb; with a level.

Construct 1 and 1½ brick junction wall in flemish bond

Objective : At the end of this exercise you shall be able to
• lay and mark dimensions of right angle junction (Flemish bond).

TASK 1: **Lay and mark dimensions of right angle junction (Flemish bond)**

1 Locate the face of the wall on the floor, mark a chalk line

2 Prepare layout the first course with bricks and check.

3 Lay the bricks on the mortar bed and align the level.

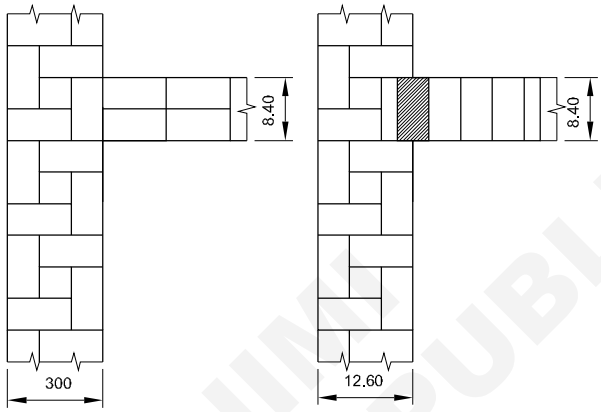
4 Lay the second course over the first course

5 Complete the intersecting walls continuing alternate layout pattern in ten courses

6 Level and check, plumb the wall (Fig 1)

7 Clean the wall by brushing with a brick layers brush.

Fig 1



TEE-JUNCTION IN FLEMISH BOND

MBN1325J1

Construction of English and Flemish garden wall bond 23cm thick

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

Requirements

Tools

- Mason's Trowel 25 cm long - 1 No.
- Brick hammer 1 1/2 lbs - 1 No.
- Spirit level 15 cm long - 1 No.
- Steel square 75 cm x 50 cm - 1 No.
- Steel tape 3m long - 1 No.
- Straight edge 1.5 m - 1 No.
- Line and pins
- Plumb rule or level - 1 No.
- Plumb bob - 1 No.
- Mortar pan - 1 No.
- Bucket and mug each one
- Brush - 1 No.

Materials

- Bricks 230 x 110 x 70 - 115 Nos
- Mortar
- Cement - 1 bag
- Sand - 3 boxes
- Water

PROCEDURE

TASK 1: **Prepare English Garden wall bond 23 cm thick**

1 Clean the surface area and lay out the wall location as with 23cm in wall

2 Layout dry bond to eliminate excessive cutting of bricks.

3 Lay bricks with mortar header course as shown in Fig.1 as first course

4 Level plumb and line up of the course perfectly

5 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.

6 Lay sixth course as header course breaking the bond in the usual manner

7 Finish the laying the first corner and complete the second in the same manner

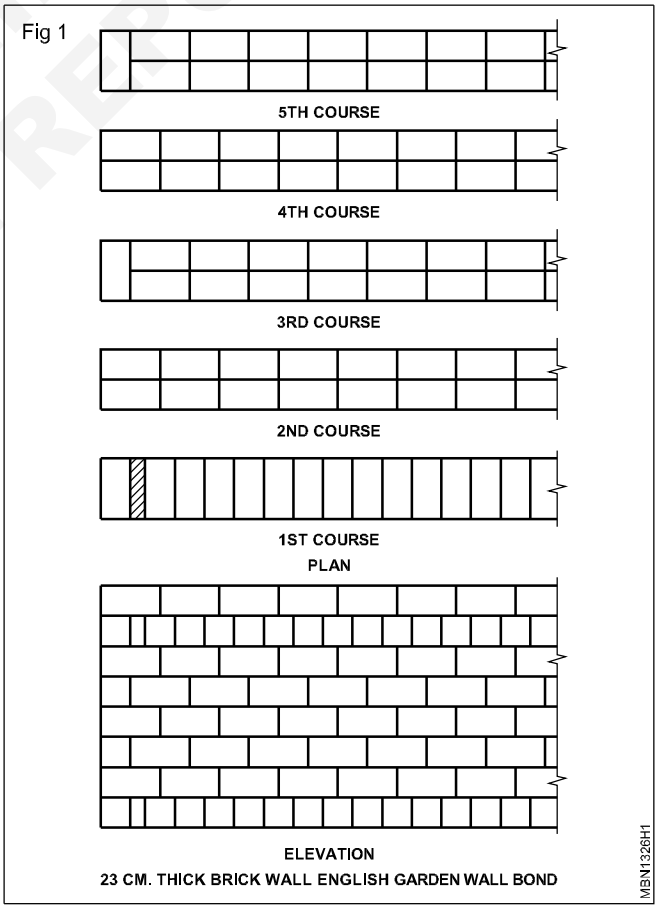
8 Construct the first stretcher course of the wall by laying the outside first and then the inside.

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.

9 Lay the header course from each load toward the centre, Level Plumb and line up the header course

Fig 1



10 Lay the outside tier up the next header course keeping it straight level and plumb

11 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

12 Continue, until the desired height is required.

13 Strike the joints and brush the wall at the proper time.

Construction of flemish garden wall bond 23 cm thick

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

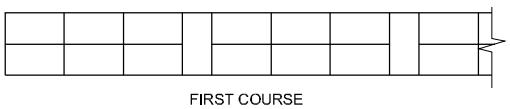
TASK 1: **Prepare flemish garden wall bond 23 cm thick**

1 Lay the wall location as 23cm thick wall

2 Place dry bricks to eliminate excessive cutting.

3 Lay and setup three stretchers followed by one header is introduced in every course as shown in (Fig 1)

Fig 1



FIRST COURSE

PLAN

MBN1326J1

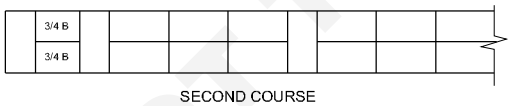
4 Level, plumb and lineup with the help of spirit level, plumb level or plumb bob and with straight edge respectively.

5 Lay each alternate course will contain a 3/4 brick placed next to the quion as shown in (Fig 2) as second course

6 Check plumb, level and its straightness

7 Place the header centrally over the stretcher in the preceding course as shown in (Fig 3)

Fig 2

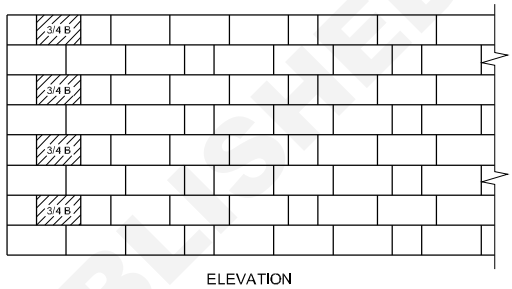


SECOND COURSE

PLAN

MBN1326J2

Fig 3



ELEVATION

23 CM. THICK FLEMISH GARDEN WALL BOND

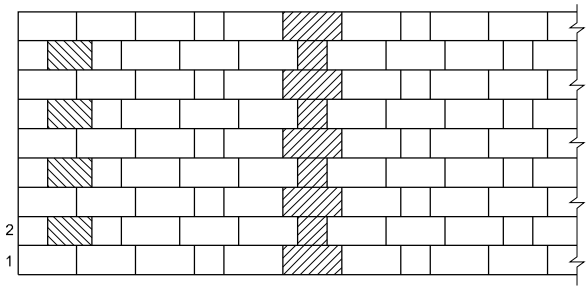
MBN1326J3

Note : This bond is only suitable for walls having a thickness of one brick (23 cm)

8 Flemish garden is not as strong as the English bond.

9 Place the stretcher in the middle portion of the bottom and top headers as shown in (Fig 4)

Fig 4



FLEMISH GARDEN BOND

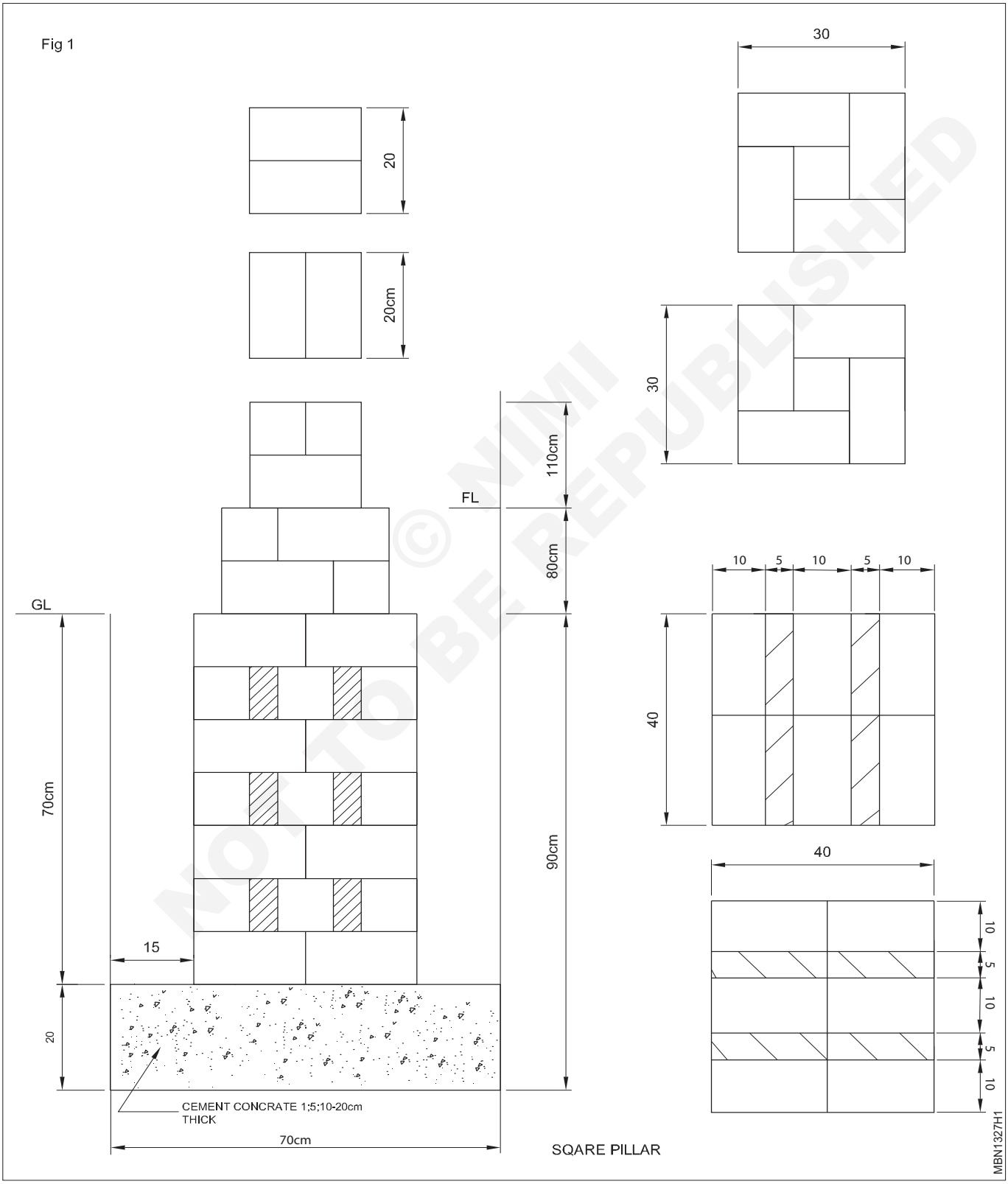
MBN1326J3

Construct of detached brick pillars with footing square and rectangular types

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

- **layout and construct detached square and pillar rectangular with footing.**

Fig 1



Requirements

Tools

- Mortar pan or board - 1 No.
- Spade - 1 No.
- Mason's trowel 25cm long - 1 No.
- Brick hammer 1 1/2/1 lbs - 1 No.
- 1.5m plumb rule - 1 No.
- Sprit level 15cm long - 1 No.
- Plumb bob - 1 No.
- Plumb level - 1 No.
- Wire brush - 1 No.
- Chalk or Pencil - 1 No.

Materials

- Brick 230 x 110 x 70mm - 120 Nos
- Cement concrete = 0.0098m^3
- Mortar = 0.4m^3
- Cement
- Sand
- Water

PROCEDURE

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

1 Clean the work spot

2 Strike a chalk line on one side only.

3 Mark the layout course with pencil according to the plan.

4 Arrange required tools and materials.

5 Excavate the foundation 70 x 70 x 90cm.

6 Level the earth at bed level.

7 Lay the cement concrete 1:5:10 - 20cm thick. (Fig 1)

8 Consolidate the concrete and cured.

9 Mark 15cm offset around the concrete bed.

10 Layout the 1st footing in dry course and square it as per given drawing.

11 Check the bed of the corner brick and height with the gauge rod. Level and plumb.

12 Spread the mortar 1:6cm the surface of the 1st footing.

13 Lay the second footing as per drawing.

14 Lay the square pillar of size 20cmx20cm in eleven courses.

15 Plumb the course on its corner point and align the pier with straight edge on all four sides.

16 Don't remove mortar that has been squeezed from under the bricks at this time as they may as settle unevenly.

17 Remove the mortar after 3 courses have been laid.

18 Check the pillar with the steel square and make any necessary corrections.

19 Repeat the operations involved in laying each course of bricks until the pier has been suit the specified number of courses.

20 Strike the mortar joint as needed with a convex joints.

21 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 rectangular pillar with footing

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

TASK 1: **Layout and construct detached rectangular pillar with footings**

1 Clean the work spot.

2 Mark the layout with pencil according to the plan.

3 Excavate the foundation 90 x 100x 90cm. (Fig 9)

4 Level the earth at bed level.

5 Lay the cement concrete 1:5:10 - 25cm thick (Fig 9)

6 Consolidate the concrete and cured

7 Mark 15cm offset around the concrete bed.

8 Layout the first footing in dry course as per given drawing (Fig 1,2)

9 Check the bed of the corner brick and height with gauge rod, level and plumb.

10 Spread the mortar 1:6 on the surface of the 1st footing.

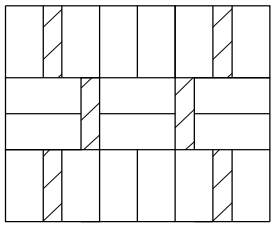
11 Lay second footing and 3rd footing as per given drawing (Fig 3, 4, 5, 6)

12 Lay rectangular pillar of size, 40 x 30mm in ten courses. (Fig 7,8)

13 Plumb the course on its corner point and align the pier with straight edge on all four sides.

14 Recheck the pier in level, plumb square and the proper size as per given drawing. (Fig 1)

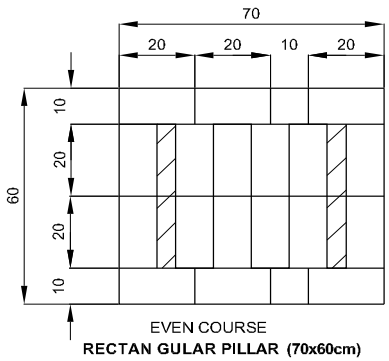
Fig1



ODD COURSE

MBN1327.J1

Fig 2

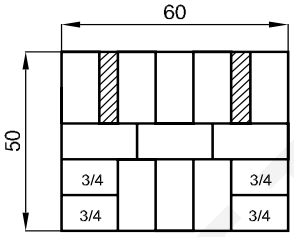


EVEN COURSE

RECTAN GULAR PILLAR (70x60cm)

MB20N1327.J2

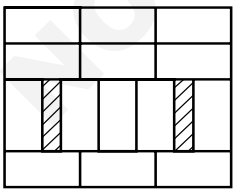
Fig 3



EVEN COURSE

MBN1327.J3

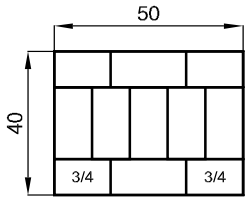
Fig 4



ODD COURSE

MBN1327.J4

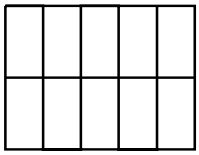
Fig 5



EVEN COURSE

MBN1327.J5

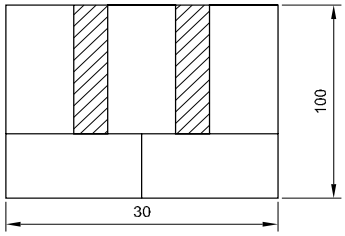
Fig 6



ODD COURSE

MBN1327.J6

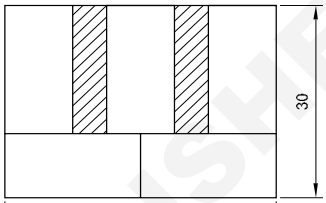
Fig 7



ODD COURSE

MBN1327.J7

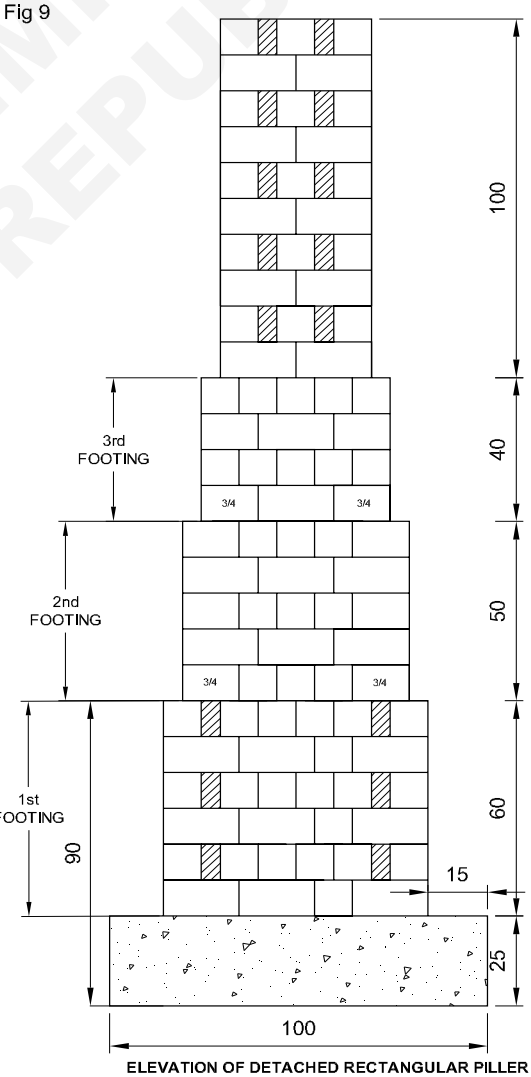
Fig 8



EVEN COURSE

MBN1327.J8

Fig 9



ELEVATION OF DETACHED RECTANGULAR PILLER

MBN1327.J9

Form a door opening in a wall of english bond

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

Requirements

Tools

• Door frame	- 1 No.
• Iron hole fast 300 x 30 x 5m	- 6 No.
• plumb bob	- 1 No.
• Level tube	- 1 No.
• Thread	- 1 No.

Materials

• Screws	- 24 No.
• Coal tar	- 1/2.lit
• Bamboo	- 2 Nos.
• Cement	- as reqd.
• Sand	- as reqd.
• Aggregate	- as reqd.

PROCEDURE

TASK 1: **State check the lineout for brick masonry**

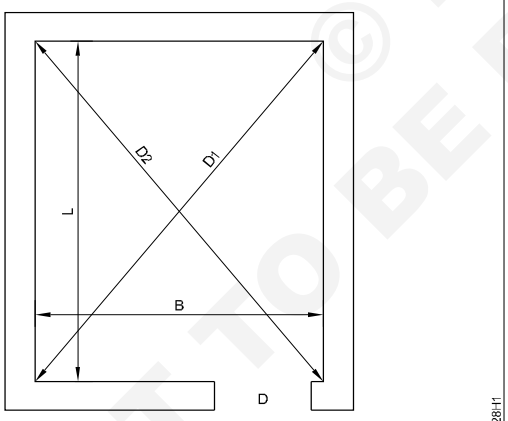
1 Check the face of block by plumb.

2 Check diagonals of the room. (Fig 1)

3 Check the top of block are in one level.

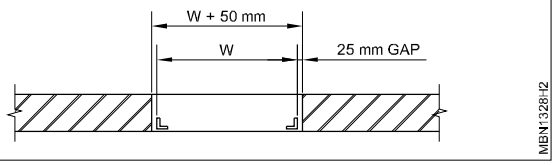
4 Keep the door opening 50mm more than the actual size of opening. (Fig 2)

Fig 1



CHECK FOR DIAGONALS ($L^2 + B^2 = D_1^2$)

Fig 2



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TASK 2: **Fix the hold fast with the frame**

1 Fix the hold fast with screws (Fig 3,4)

2 Fix the hold fast 3 Nos on each side of frame.

— — — — — — — —

TASK 3: **Check the door frame (Figs 5 & 6)**

1 Check the quality of wood.

2 Check dry defects in the frame.

3 Check temporary supports provided bottom, middle and top two corners to keep the frame in fact.

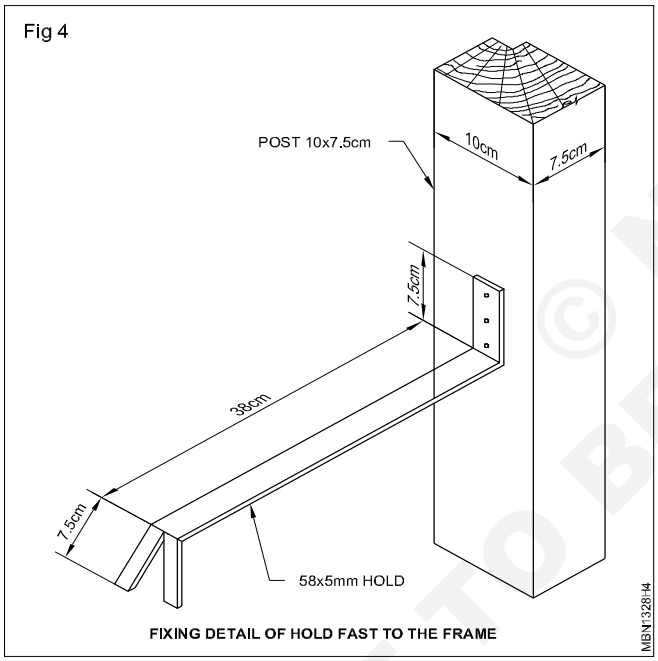
4 Bottom support is check in mild steel angle of size 25 x 25 x 5mm to keep the bottom ends of the frame in position very effectively.

5 To check the vertically use in plumb bob.

6 Check whether coal tar is applied or not on all sides of the frame and primer coat on rest of the exposed portion.

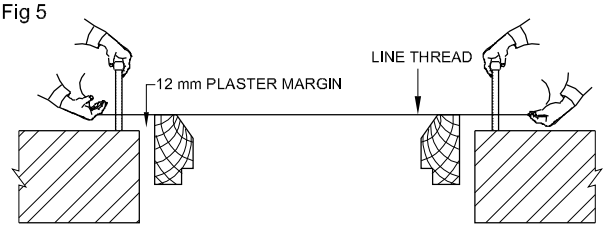
Fig 3

Fig 4



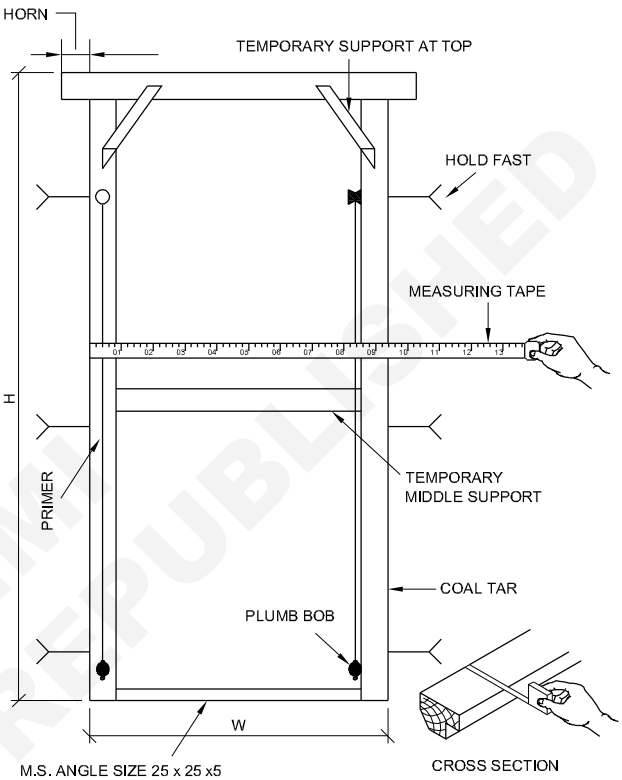
FIXING DETAIL OF HOLD FAST TO THE FRAME

Fig 5



CHECKING OF DOOR FRAME

Fig 6



CHECKING OF DOOR FRAME AT SITE

TASK 4: **Fix the door frame (Figs 7 to 9)**

1 Check the door frame is properly

2 Fix it temporarily at the place.

3 Check from working drawing, the opening side of the frame before fixing it.

4 Check the level of the frame with reference to main door level.

5 Check the plumb from the outer and inner face.

6 Check the top of the door frame with level tube.

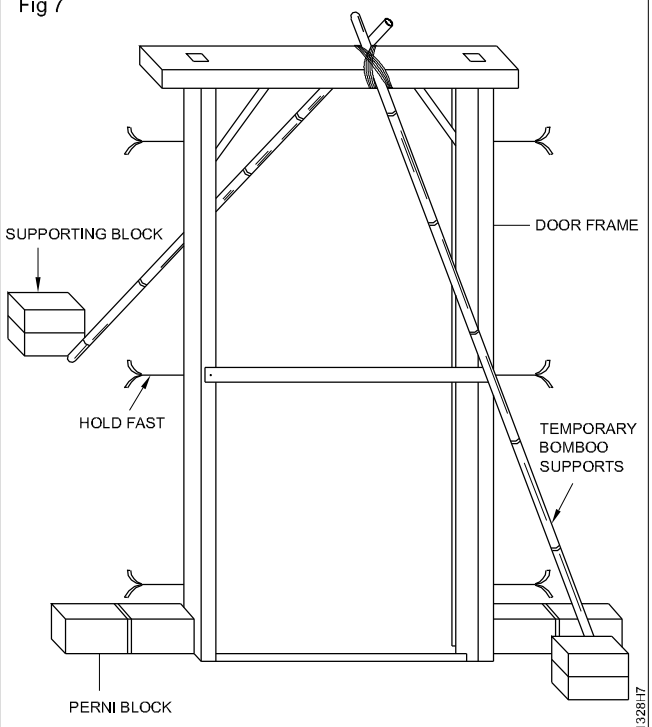
7 Check the line of door frame with the help of line thread.

8 Fix the hold fast in concrete to avoid buckling of frame from bottom.

9 Fix M.S. plate instead of hold fast, incase of column and wall on one side of the door frame.

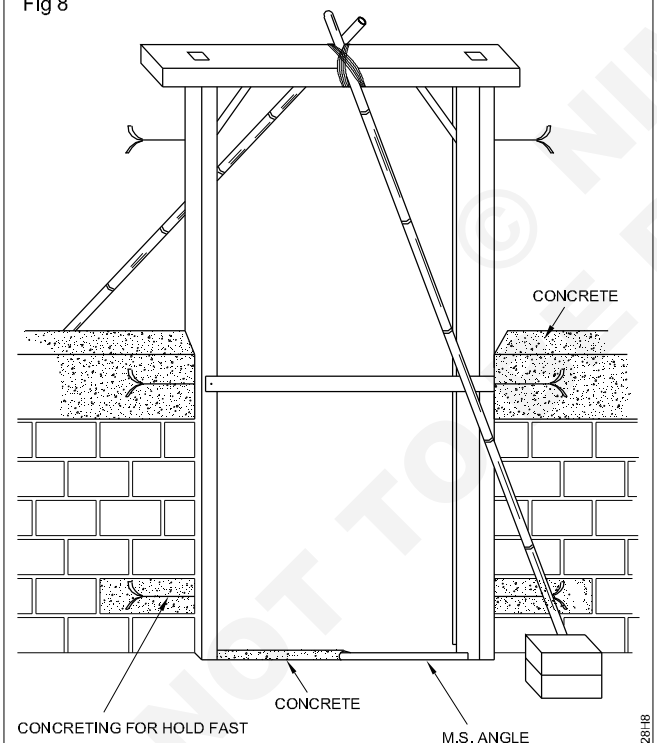
10 Check all these points, then the mason to fix the door frame permanently by connecting the hold fasts.

Fig 7



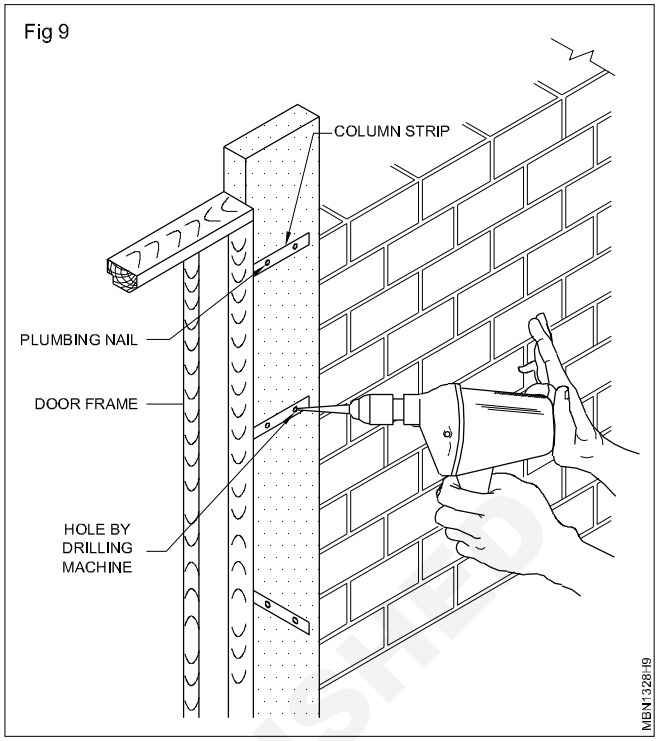
DOOR FRAME FIXING WITH SUPPORTS

Fig 8



CONCRETING FOR HOLD FAST & BOTTOM M.S. ANGLE

Fig 9



Form a window opening in a wall in english bond

Objectives : At the end of this exercise you shall be able to
• check room measurement
• form the window opening in a wall.

Requirements

Tools

• Mason trowel	- 1 No.
• Brick hammer	- 1 No.
• Sprit level	- 1 No.
• Steel tape	- 1 No.
• Straight edge	- 1 No.
• Line & pins	- 1 No.
• Plumb bob	- 1 No.
• Mortar pan	- 1 No.
• Bucket & mug	- 1 No. each
• Brush	- 1 No.
• Wooden/iron	- 1 No.
• 'L' (Tri square) wooden / iron	- 1 No.

Materials

• Bricks	- as reqd.
• Mortar	- as reqd.
• Cement	- as reqd.
• Sand	- as reqd.
• Water	- as reqd.

PROCEDURE

TASK 1: **Form window opening brick work. After completion of sill level brick work. (Fig 1)**

1 Mark the window portion in brick masonry (Window opening + 2.5cm extra)

2 Lay the brick in CM at both ends of window opening.

3 Check the dimension again & keep the brick in correct position.

4 Further construct the brick work on the existing brick masonry on both sides of opening.

5 While construction is going on the line and pin are simultaneously shifted each layer and fixed in brick work to form level layer follow the bond. Check the jamp portion both for verticality perpendicular to the face work and straight these are checked by means of wooden try square, straight edge & plumb bob.

6 Construction and opening thus carried out to required window height.

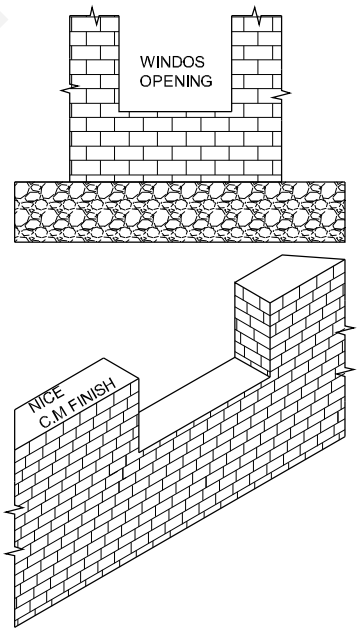
7 Then the top is rough finish with cement mortar, check the in and out faces of wall with straight edge.

8 The top level is checked with again straight edge & plumb bob,tape.

9 Over on the opening it is ready to receive lintel.

10 Thus each and every window opening in formed.

Fig 1



MBN1329H1

Construction of sill with over sailing course

Objectives: At the end of this exercise you shall be able to
- **identify materials used for sill slab**
- **construct a sill (R.C.C) slab.**

Requirements

Tools

• Trowel	- 1 No.
• Sprit level	- 1 No.
• Steel tape	- 1 No.
• Mortar pan	- 1 No.
• PVC tube level	- 1 No.
• Spade	- 1 No.

Materials

• 8 mm bar	- 3 nos each 1.4m
• 8 mm bar	- 8 nos each 22cm.
• Concrete	- 1: 4 : 8, .cm 1: 6
• Water	
• Cement	
• Sand	
• Aggregate	

PROCEDURE

TASK 1 : **Laying R.C.C precast sill slab on sill**

1 After completion of masonry work just below the sill, level after one or two days.

2 Locate the window position & mark.

3 The length of sill slab window breadth+ 30cm width just 5cm extra than wall thick.

4 On each window the length of sill slab is 30cm extra when comparing to window width.

5 Keep all concrete mixtures & tools, water etc ready.

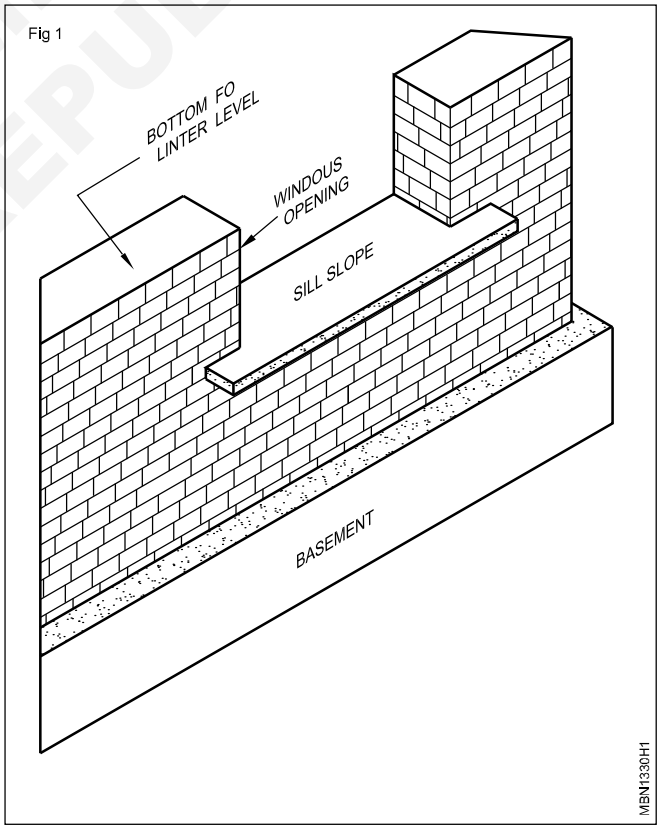
6 Water the sill (Slab) area.

7 Spread the C.M. over the area with 12mm thick in window portion.

8 According to the window portion keep or lay the sill slab over the brick masonry so that the sill slab is flush with inside wall surface and 5cm projected outside of the wall. Shown in (Fig 1)

9 After correctly positioned the sill slab leave the window opening and proceed for the masonry work & curing work

Fig 1



Demonstrate R.C.C Reinforcement, different dia-unit weight,cutting, bending, binding of bar

Objectives: At the end of this exercise you shall be able to
- **Identify different dia of beam and unit weight**
- **Identify the hooks, bonds and crank details**
- **Identify the junction**
- **Identify the name of the reinforcement bore.**

1 The instructor should demonstrate each hooks, bonds, cranks, junctions and name of the bars and their purposes (Fig 1 & 2)

- Trainee should identify the name of the bars, junctions and bar bending, and their purpose, demonstrated by the instructed.
- The trainees are asked fill the name of R.C.C bars and their purpose in the Table1.

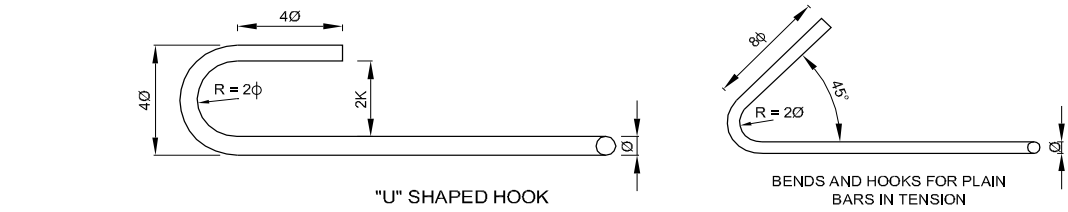
Weight/m of round bar

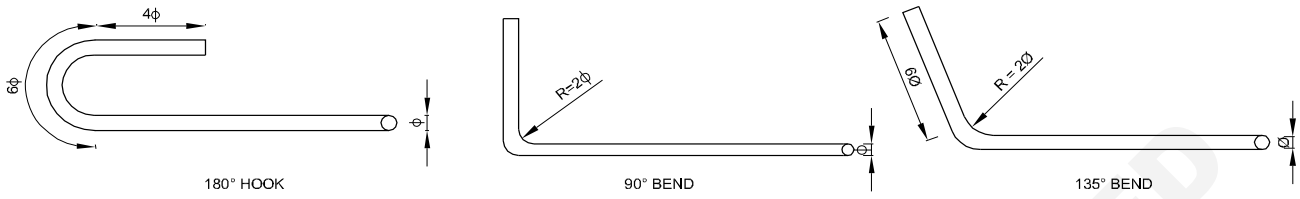
Diameter	Weight/m
6 mm	0.22 kg/m
8 mm	0.39 kg/m
10 mm	0.62 kg/m
12 mm	0.89 kg/m
16 mm	1.58 kg/m
18 mm	2.00 kg/m
20 mm	2.45 kg/m

Table 1

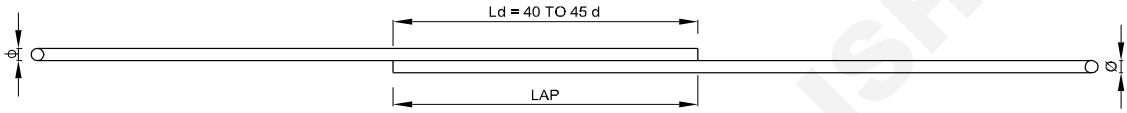
Sl .No	Name of R.C.C Reinforcement	Uses / purposes
1		
2		
3		
4		
5		
6		
7		
8		

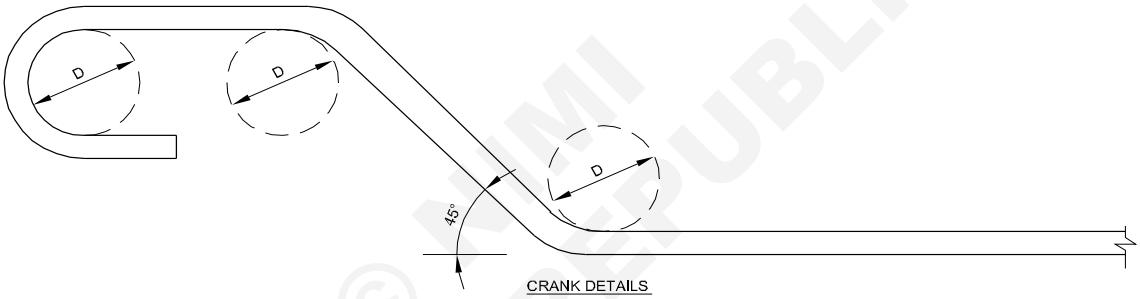
Fig 1



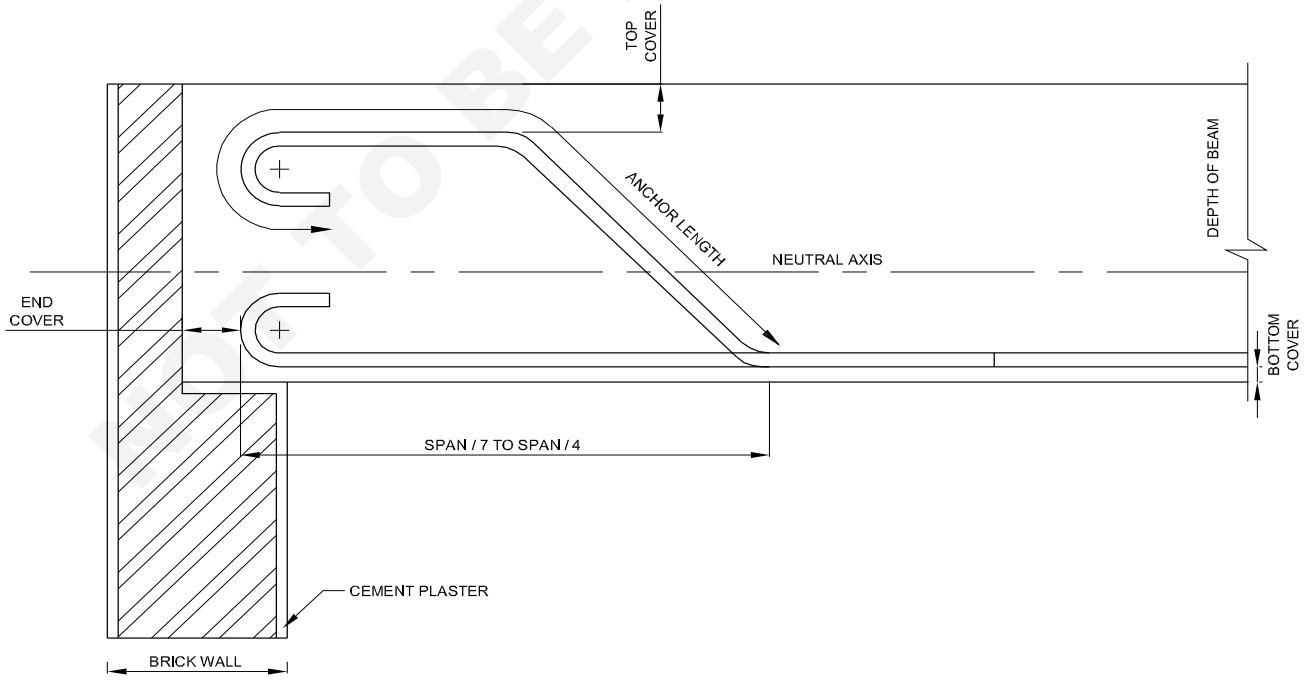


HOOKS AND BENDS FOR STIRRUPS





CRANK DETAILS



HOOKS, BENDS AND CRANK DETAILS

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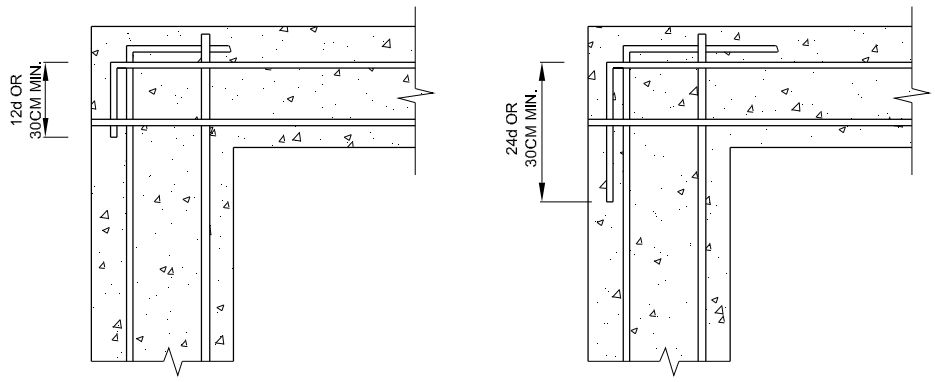
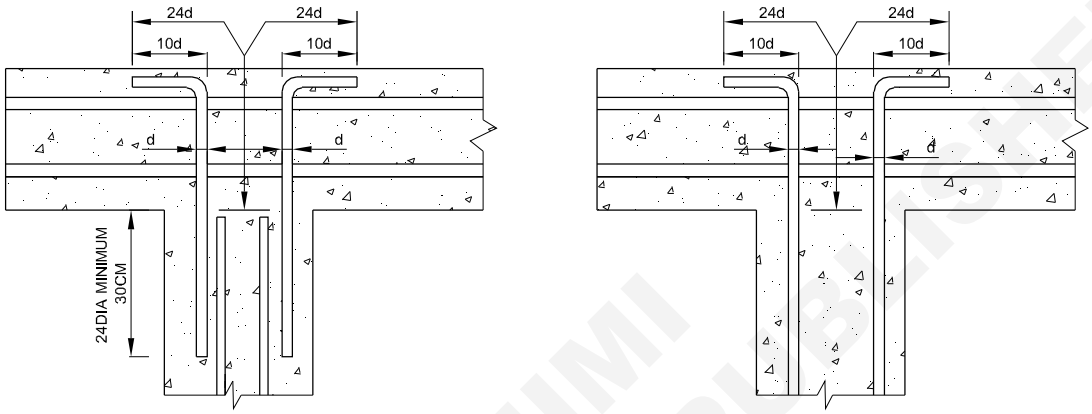
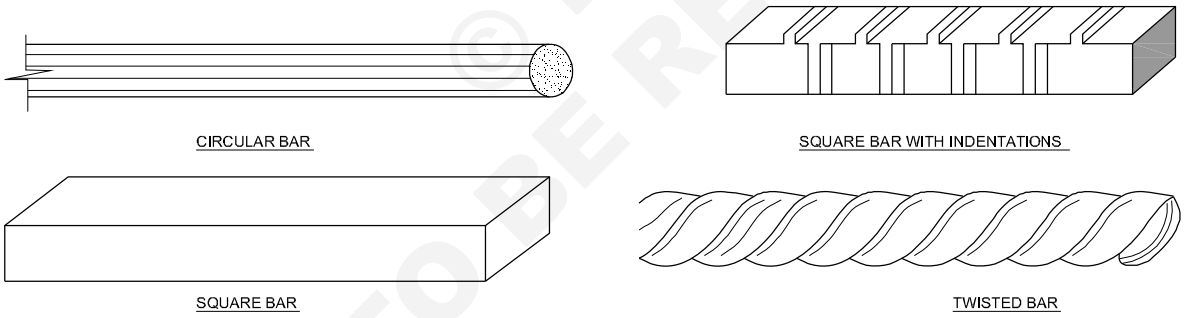
Fig 2



TYPICAL DETAILS OF L-JUNCTIONS



TYPICAL DETAILS OF T - JUNCTIONS



CIRCULAR BAR

SQUARE BAR WITH INDENTATIONS

SQUARE BAR

TWISTED BAR

MBN1431H2

DETAILS OF JUNCTIONS

Perform pre-casting a lintel-compacting curing and setting

Objectives: At the end of this exercise you shall be able to
- **erect form work for pre cast lintel**
- **fix the reinforcement and lay the concrete**
- **curing the precast lintel.**

Requirements

Tools

• Steel tope 5m length	-1No
• Straight edge	-1No
• Mason's trowel	-1No
• Mortar pan	-1No
• Spade	-1No
• Showel	-1No

Materials

• Wooden planks	- as reqd.
• Wooden wedges	- as reqd.
• Nails,Oil	- as reqd.
• Steel rods for reinforcement	- as reqd.
• Cement concrete	- as reqd.

PROCEDURE

TASK 1: **Erect the form work shuttering for lintel (pre cast lintel) (Fig 1, 2 & 3)**

1 Clean the site and level

• Mark the width of the lintel

3 Fix wooden planks as on four sides as per given size

TASK 2: **Fix the reinforcement and lay the concrete**

1 Place the reinforcement bars in its position and tie properly by using binding wire.

2 The sides of planks are fixed vertically and fixed firmly.

3 Spacing of main rod reinforcement and distribution bar should be properly laid and tied well with binding wire

4 Mix the concrete in proper preparation 1:2:4 in dry condition.

5 Add sufficient water and mixing is done until good workability

6 Pour the concrete gently in the lintel mould

Care should be taken in any case do not through the concrete

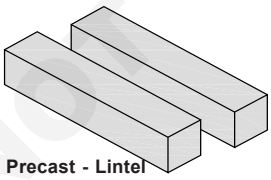
7 Compact either by hand or vibrator and level to concrete

TASK 3: **Curing the lintel**

1 Make a small pond with full of water.

2 Kept the precast lintel in the pond until curing.

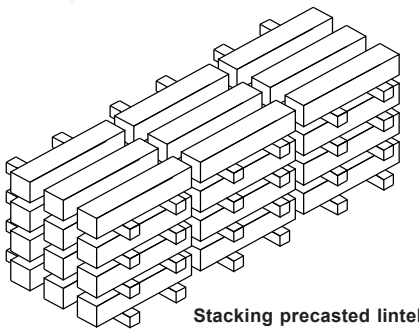
Fig 1



Precast - Lintel

MBN1431H1

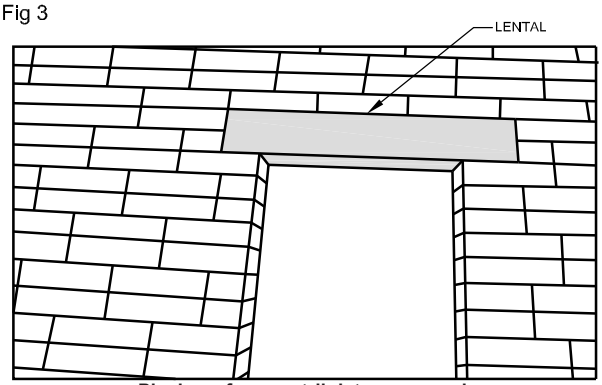
Fig 2



Stacking precasted lintel at site

MBN1432H2

Fig 3



Placing of precast linlet over opening

MBN1432H3

Spanning of opening by casting a lintel in site

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

Tools

- Hammer, Steel tape 5m long - each 1 no
- Straight edge, Mason's Trowel - each 1 no
- Mortar pan, Spade - each 1 no
- Showel - 1 No.
- Chisel, Lever - each 1 no
- Nail - as reqd

Materials

- Vertical probs, Bracing, Oil - as reqd
- Wooden planks, M.S plates - as reqd
- Wooden wedges, Steel rods for reinforcement - as reqd

PROCEDURE

TASK 1 : **Erect the form work shuttering for lintel.**

1 Fix the bottom of lintel with the help of wooden planks on the masons walls

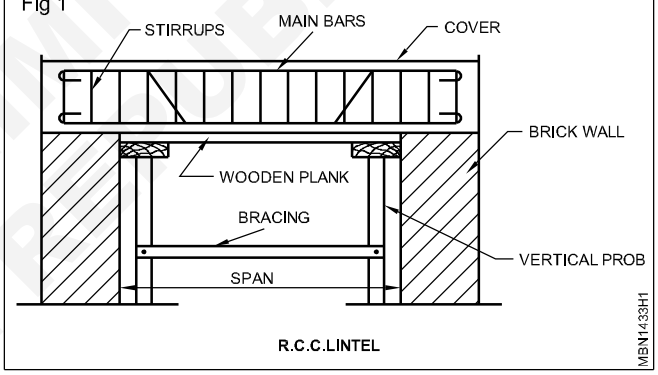
2 Check the line and level of the Lintel bottom proper supports are given to it.

3 Mark the width of 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).

4 Tie cross bracings, with vertical supports.

5 Provide wooden wedges at the bottom of the vertical supports to prevent from sliding.

Fig 1



TASK 2 : **Fix reinforcement and lay the concrete**

1 Place the reinforcement bars in its position and tie properly by using binding wire.

2 The sides of planks are fixed vertically and fixed firmly.

3 Spacing of the main rod reinforcement and distribution rod should be properly placed at 15cm centre to centre and tied well with binding wire.

4 Mix concrete in proper proportion 1:2:4 one part of cement 2 parts of sand and four parts coarse aggregate) in dry condition.

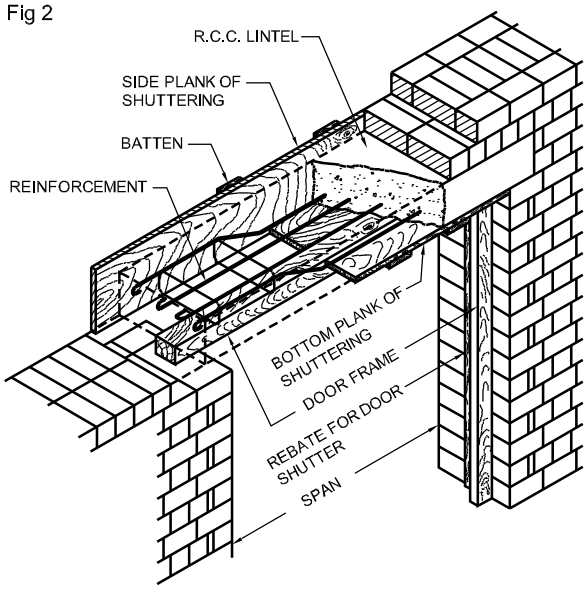
5 Add water and proper mixing is done until good workability

6 Pour the concrete gently. Care should be taken, in any case do not through concrete

7 Level the concrete and compact either by Hand or vibrator. (Fig 2).

8 Casting lintel shown in (Fig 3).

Fig 2



ISOMETRIC-VIEW OF R.C.C. LINTEL SHOWING VARIOUS DETAILS

Flg 3

Casting lintel in site

Making of shuttering and supports with uprights and wedges

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

Requirements

Tools

• Measuring steel tape	- 1 No
• Line and thread	- 1 No
• Plumb bob	- 1 No
• Plumb level	- 1 No
• Firmer chisel	- 1 No
• Hammer, Hand saw	- each 1 no
• Steel try square	- 1 No
• PVC level tube	- 1 No

Materials

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

PROCEDURE

1 Check the planks as required dimensions.

2 The planks should be uniform and plain surface

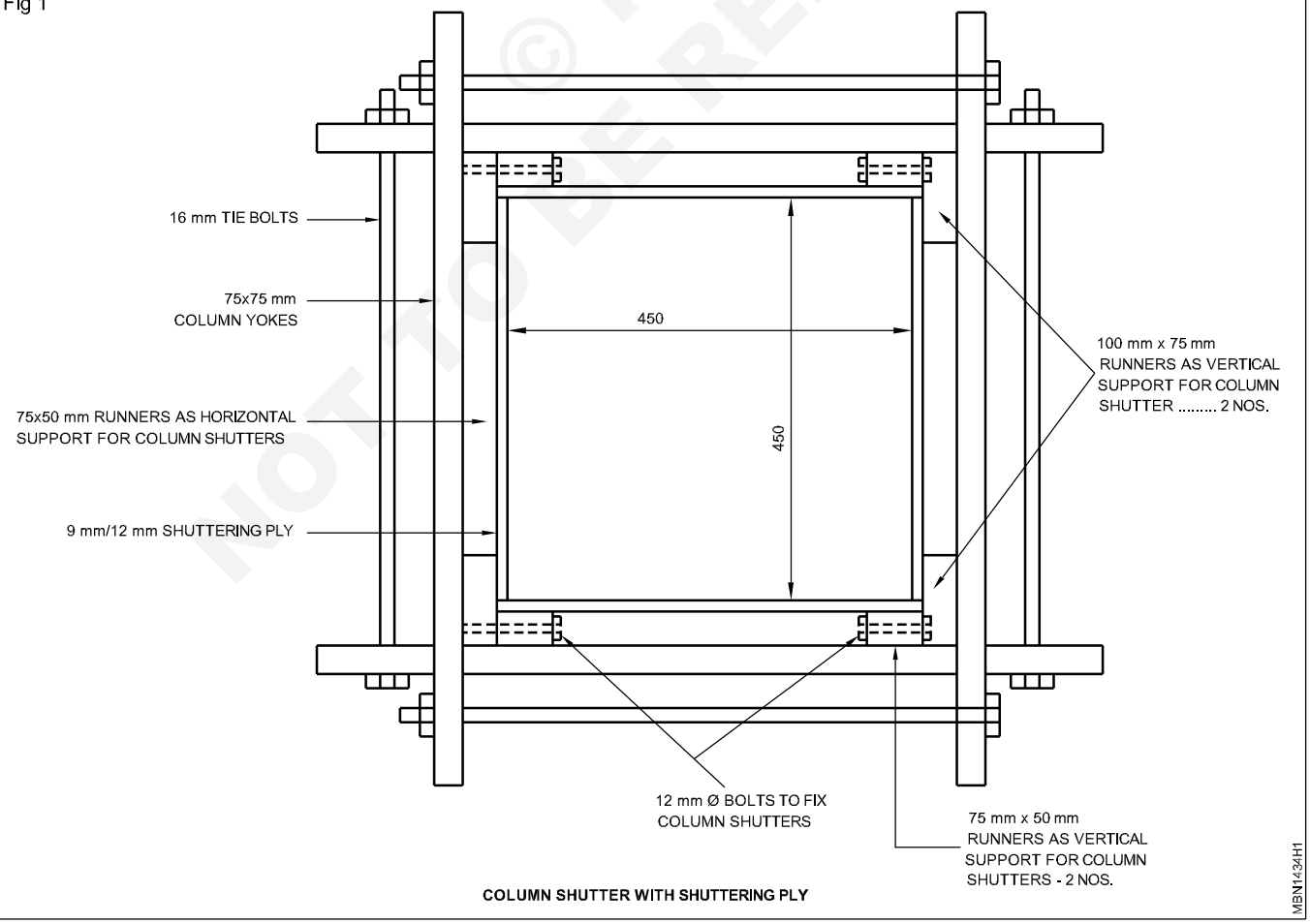
3 The planks should not have any warps or the joints.

4 Check dimensions of column and height

5 Fix planks with reepers and nail with planks.

6 Fix and erect the column shuttering as shown in (Fig 1).

Fig 1



COLUMN SHUTTER WITH SHUTTERING PLY

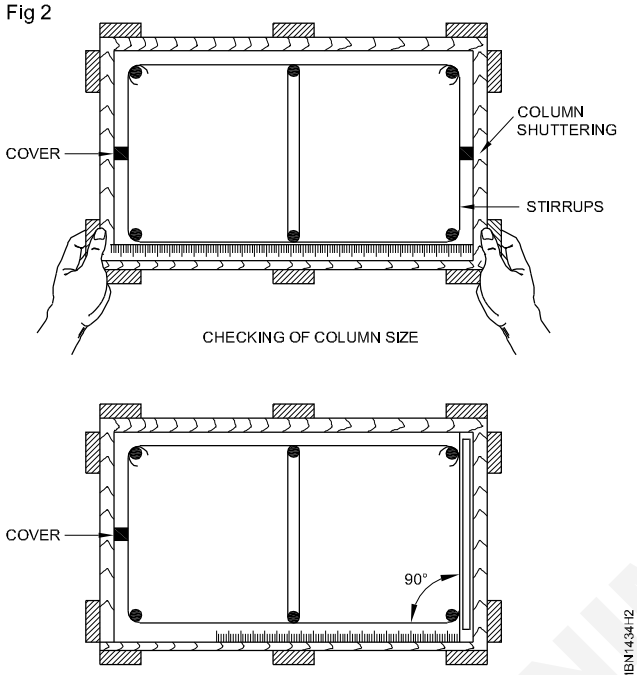
7 Support is given by using bracing.

8 Check plumb for vertical by using plumb bob or plumb level.(Fig 3)

9 Take care that all fours sides covers as per the drawing

10 Check the shuttering ply dimensions and ensure that it should be exactly square or rectangular (Fig 2)

Fig 2



11 Care should be taken all time that bracings fixed for supporting of column box should not be disturbed, untill concreting work.

12 The bolt and nuts used should be properly tightened as shown in Fig 3

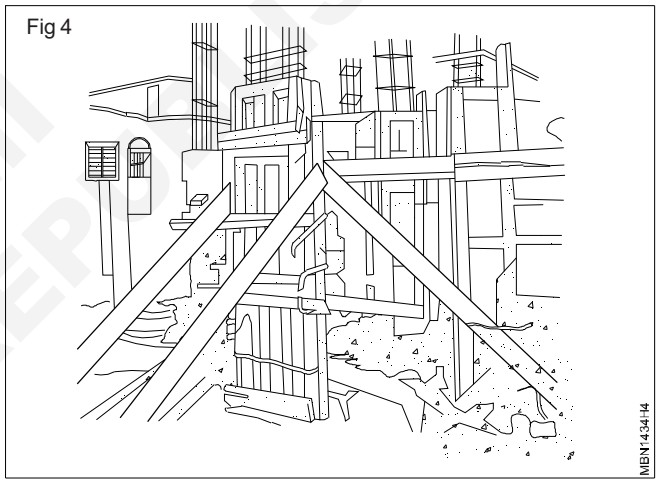
13 Checking of column size and diagonals and cover

14 Checking of column for plumb by using plumb bob (Fig 3)

Fig 3

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

Fig 4



Cutting, bending and placing of reinforcement

Objectives : At the end of this exercise you shall be able to
- **prepare straight bar, cranked bar and stirrup bar**
- **lay the steel reinforcement**
- **prepare cement concrete**
- **lay the cement concrete and consolidate.**

Requirements

Tools

- Mason's trowel 25cm long - 1 No
- Mortar pan - 1 No
- Plumb bob - 1 No
- Line and thread
- Straight edge - 1 No
- Try square - 1 No
- Measuring type 5m long - 1 No
- Spade - 1 No
- Wooden float - 1 No

Materials

- Scaffolding materials - as reqd
- Wooden plans - as reqd
- Rope - as reqd
- Cement - as reqd
- sand - as reqd
- Water - as reqd
- Bucket and mug - 1 No. each
- Steel reinforcement bars - as reqd

PROCEDURE

TASK 1: **Prepare straight bar, cranked bar, and stirrup bar (Barbending Schedule)**

1 Cut 12 mm ø bar, of length 2.436 m. In two numbers

2 Bend a hook at bond ends.

3 Cut 12mm ø bar of length 2.515 mm in two pieces.

4 Bend a hook and crank of 45° angle.

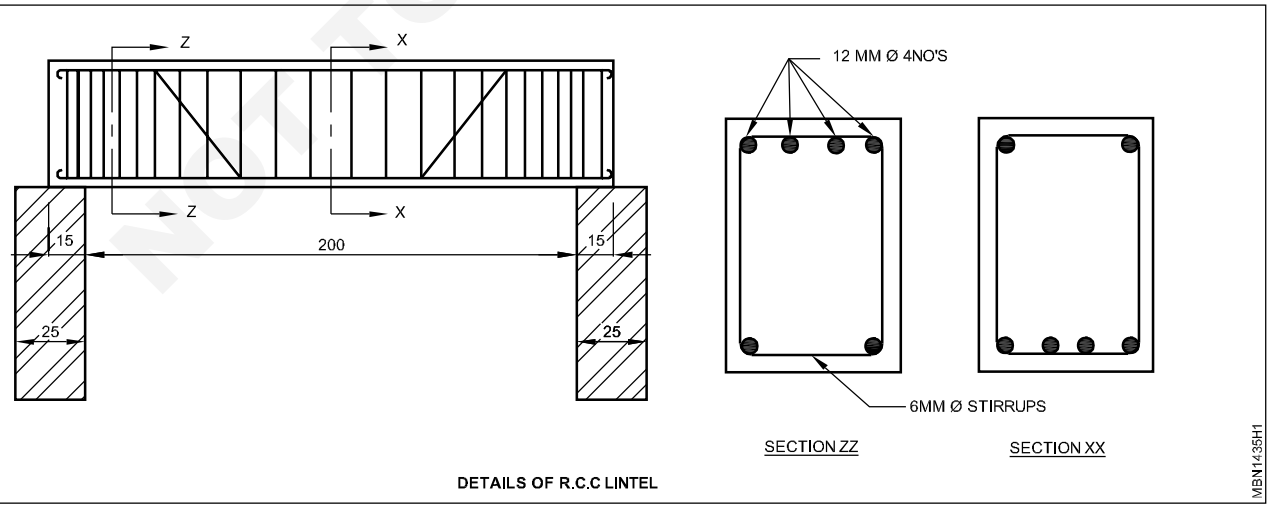
5 Cut a 6mm ø stirrup bar of length 0.784m about 19 numbers.

6 Make bend in rectangular shape as shown in schedule.

7 Cut 8mm ø stirrup holder of length 2.364mm two pieces.

TASK 2: **Lay the steel reinforcement (Fig 1)**

Fig 1



DETAILS OF R.C.C LINTEL

1 Mark the clear span of 200cm.

2 Mark the bearing 15 cm on both ends

3 Mark concrete depth 15cm

4 Lay the main straight bar - 2Nos

5 Lay the main crank bar - 2Nos
6 Lay the stirrup holder - 2 Nos
7 Lay the stirrup around the lintel - 19 Nos
8 Tie the rod with binding wire
9 Keep the tube of bottom of steel rod to avoid sag of steel

— — — — — — — —

TASK 3: **Prepare cement concrete**

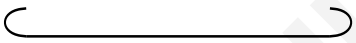
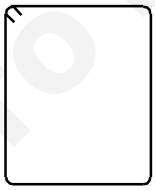
1 Spread dry aggregate a uniform layer on a platform
2 Lay over this cement mortar spread uniform layer and mix thoroughly.
3 Add required water and well mix with consistency.

— — — — — — — —

TASK 4: **lay the cement concerts and consolidate**

1 Lay the concrete over the reinforcement from one corner and complete all surface.
2 Use vibrating machine or rammed for consolidation of concrete.
3 Use straight edge and level the surface of concrete.
4 Complete the work.

Barbending schedule

Sl. No	Description particular	Shape of bars with sketch	No. of bar	length of each bar in m	Total length in m
1	Main bar stratight bar 12mm		2	2.436	4.872
2	Main bar cranked bar 12mm ø		2	2.515	5.03
3	Stirrup 6mmø		19	0.784	14.896
4	Stirrup holder 8 mm ø	 SHAPE OF BARS	2	2.364	4.728

— — — — — — — —

Mixing, placing and compacting concrete

Objective : At the end of this exercise you shall be able to
- **check the plat form and materials**
- **measure the required ingredients**
- **mix the ingredients.**

Requirements

Tools

• Spade	- 1 No.
• Bucket	- 1 No.
• Mug	- 1 No.
• Mortar pan	- 1 No.
• Measuring box	- 1 No.
• Mason trowel	- 1 No.
• G.I Sheet (for plat form)	- 1 No.

Materials

• Cement one bag (0.034m^3)	- as reqd.
• Sand : 5 Box	- 5 Nos.
• (Add 20% for bulking)	
• Aggregate	- 10 box
• Water	- as reqd.

PROCEDURE

TASK 1: **Check the platform before mixing**

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

— — — — — — — —

TASK 2 : **Measure the requirement of ingredients**

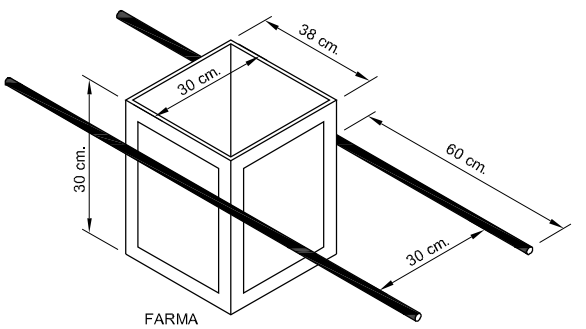
1 The measurement is taken by using form as shown in (Fig 1).

2 Take 5 box of sand and spread over the platform.

Note: The sand should be in dry condition

3 Take one bag of cement and spread over the sand or fine aggregate.

Fig 1



STEEL MEASURING BOX

— — — — — — — —

TASK 3: **Mix the ingredients**

1 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)

2 This turning is done three or four times of dry mix material for proper mixing.

3 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)

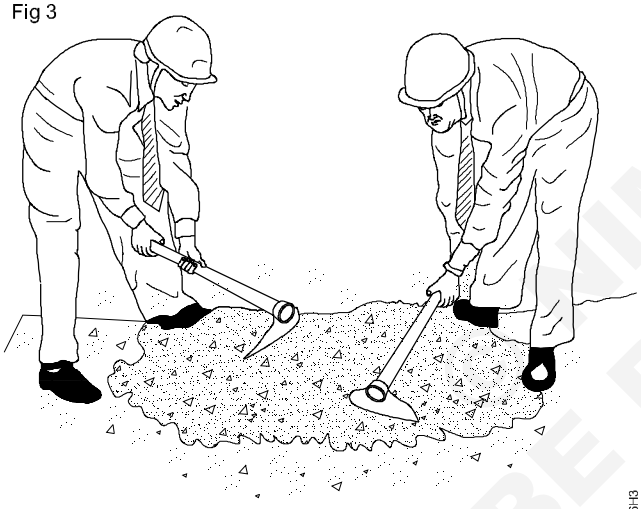
4 Make required size of pond in dry material for water as shown in (Fig 6)

Fig 2

EMPTING CEMENT BAG

MBN1436-I2

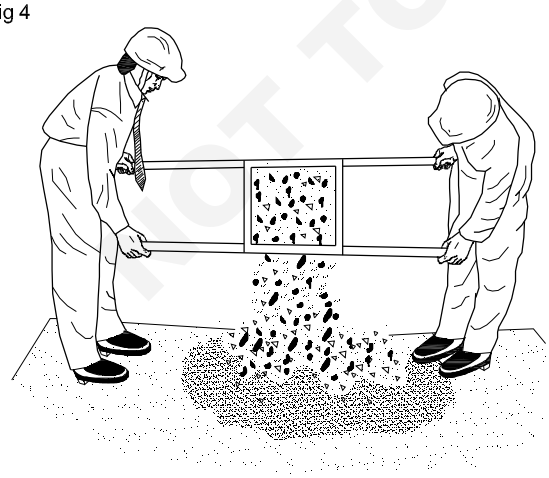
Fig 3



DRY MIXING OF CEMENT, SAND & AGGREGATE

MBN1436-I3

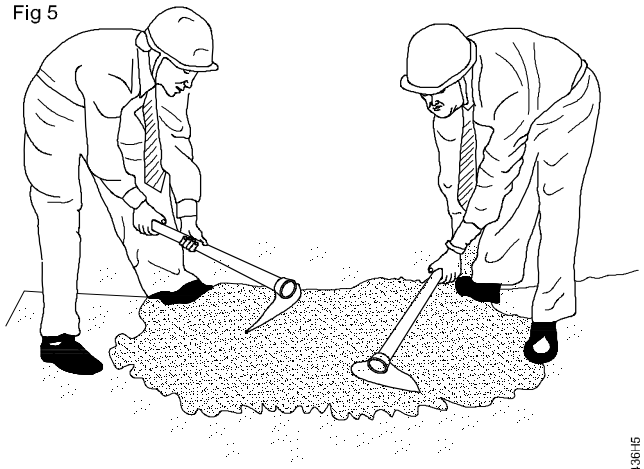
Fig 4



ADDING COARSE AGGREGATES

MBN1436-I4

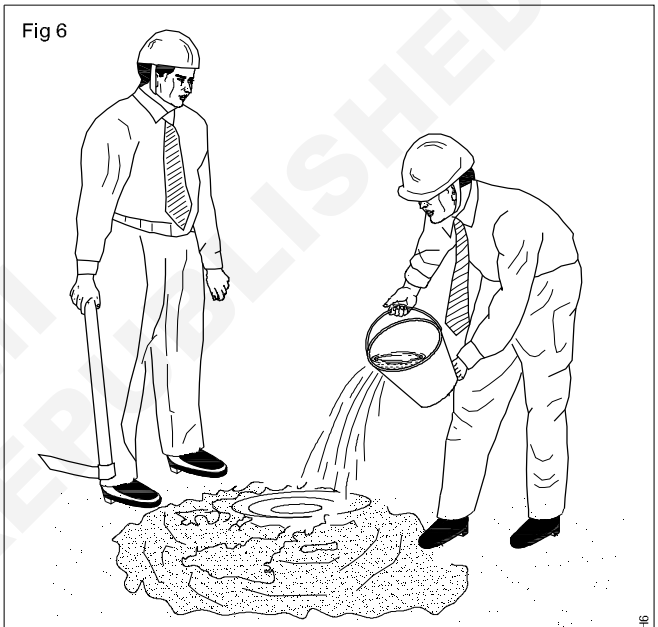
Fig 5



DRY MIXING OF CEMENT AND SAND

MBN1436-I5

Fig 6



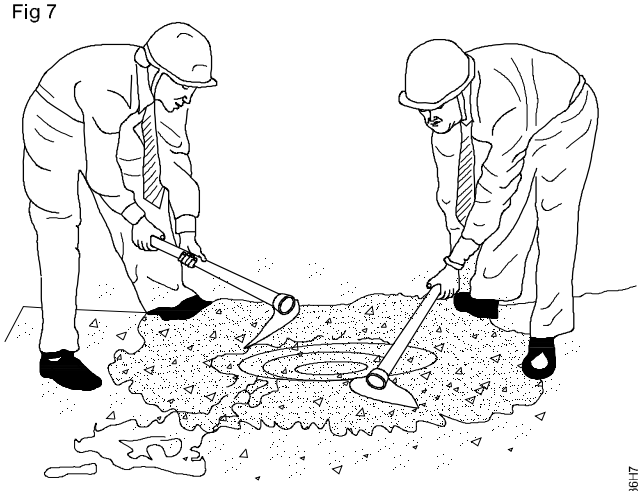
ADDING WATER IN DRY MIX

MBN1436-I6

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

6 Mix the wet concrete thoroughly.

Fig 7



WET MIXING

MBN1436-I7

TASK 4: **Placing the concrete**

1 Form a ladder, for ordinary building works.

2 Conveyed the concrete in baskets or pans form hand to hand

3 Conveyed the concrete for tall building wheel barrows, concrete carts, vertical hoists are arranged.

4 Concrete should be transported, from the point of its mixing to the point of placement, before the initial set of concrete. (Fig 8,9)

Fig 8

Placing the concrete (By Mechanicla) and Compaction

5 Place the concrete in place by using mortar pans.

Fig 9

Placing the concrete (By Hand)

TASK 5: **Compaction of concrete**

1 Start compaction immediately after placing it in position

The purpose of consolidation is to expel or eliminate the air bubbles from the concrete mass.

2 Compaction may be carried out by hand or by mechanical vibrators.

3 Hand compaction carried out by either rodding, tamping or hammering or ramming.

TASK 6: **Curing of concrete**

1 Water is either applied directly to the concrete of by means continuously saturated covering of moist earth, sand, gunny bags, straw etc.

2 This method is used for curing both horizontal and vertical concrete surfaces.

Construction of semi - circular arch - centering and removing

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

Requirements

Tools

- Mason's Trowel 25 cm long - 1 No.
- Pointing Trowel - 1 No.
- Line and thread
- Spirit level 15 cm long - 1 No.
- Steel tape 3m long - 1 No.
- Foot rule 60 cm - 1 No.
- Straight edge 15 m long - 1 No.
- Plumb bob - 1 No.
- Nail
- Brick hammer 1 1/2 lbs - 1 No.
- Hammer - 1 No.
- Divider - 1 No.
- Pencil - 1 No.

Materials

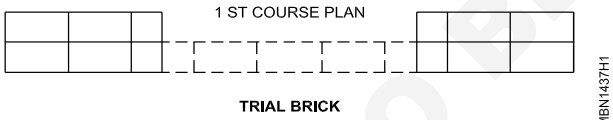
- Bricks 230 x 110 x 70mm - 260 Nos
- Voussoirs - 50 Nos
- Cement mortar
- Cement or lime - 1.5 bags
- Sand - 8 box
- Water
- Plywood
- Ballies
- Wooden wedges
- Wooden reepers

PROCEDURE

TASK 1: **Layout arch masonry opening dimensions**

1 Draw the lines of the opening size on the floor (Fig 1)

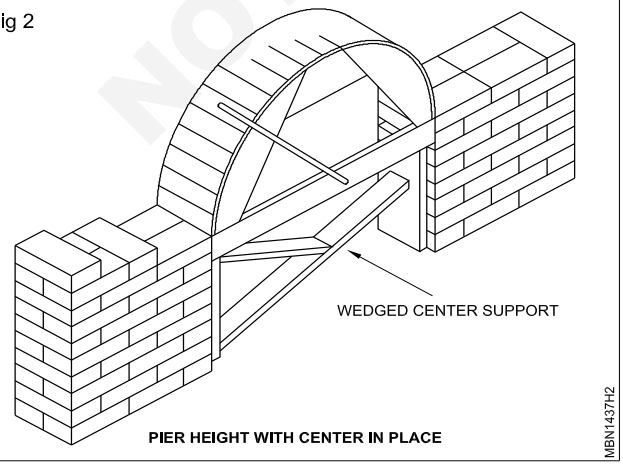
Fig 1



2 Draw the springing line and mark centre

3 Drive the nail into the centremark and a double up the string to the length of the radius (Fig 2,3).

Fig 2



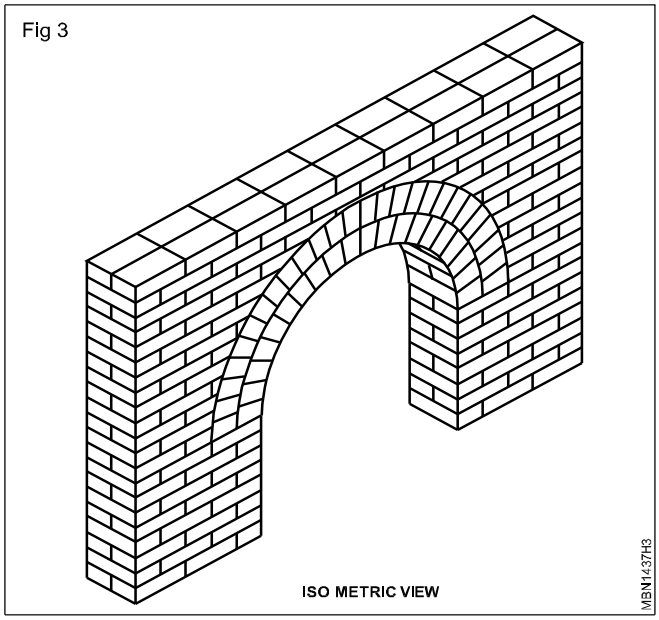
4 Insert the pencil at the end of the loop

5 Describe the semi circular for intrados line

6 Extend the string to the depth of arch ring and describe the lines of extrados

7 Divide the extrados line into odd number of voussoirs and allowing for joints.

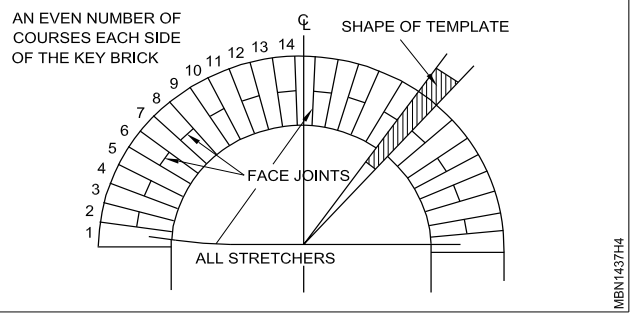
Fig 3



TASK 2: **Prepare voussoirs**

1 Mark the common size of voussoirs are determined complete the shape by drawing the joints lines between intrados and extrados as shown in (Fig 4)

Fig 4

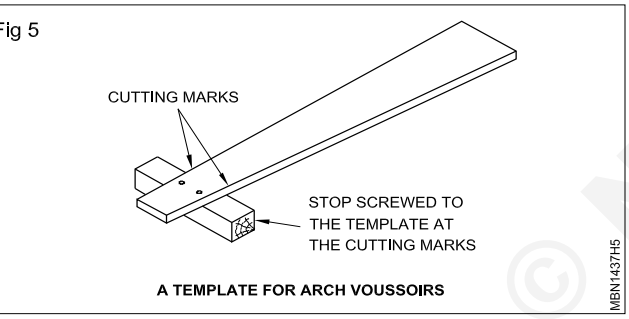


2 Check the accuracy of the template shape

3 Check the joints can be determined by laying straight edge along one of the bed joint

4 Mark on each side by the template the cutting mark of the bricks as shown in (Fig 5)

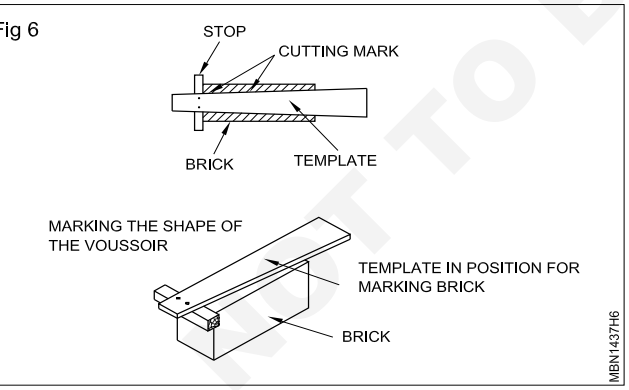
Fig 5



A TEMPLATE FOR ARCH VOUSSOIRS

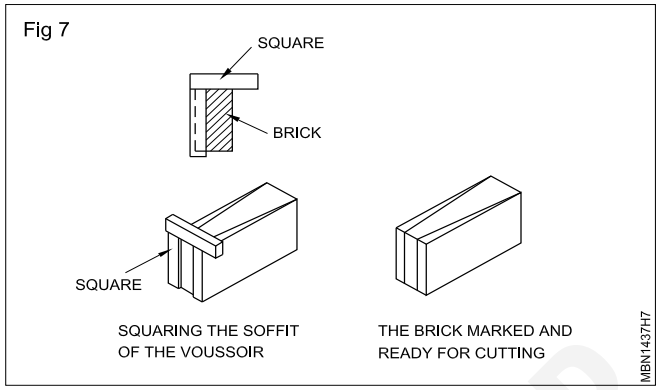
5 Mark bricks by placing the template on the face of the bricks as shown in (Fig 6)

Fig 6



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

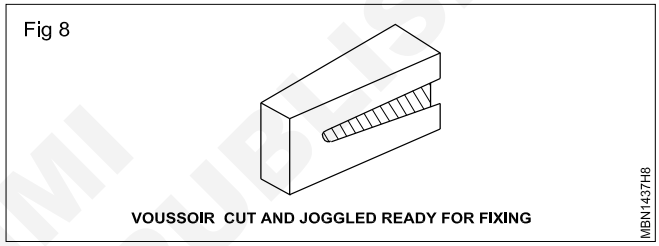
Fig 7



7 Cut the voussoirs in wedge shaped

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

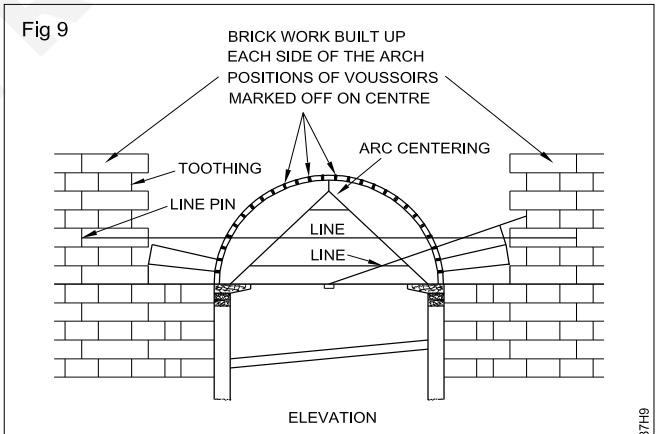
Fig 8



VOUSSOIR CUT AND JOGGLED READY FOR FIXING

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

Fig 9



METHOD OF BUILDING AN ARCH BY BUILDING BRICK WORK ON SIDES

TASK 3 - **Procedure required semi circular arch centering**

1 Mark accurately along the framework the position of voussoirs on the introdos and the width of joints

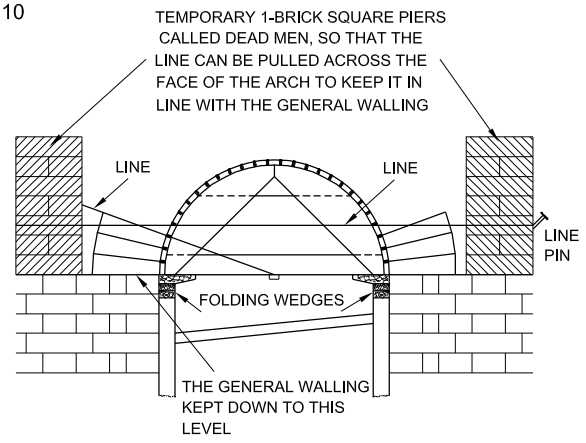
2 Drive a nail at the centre and attach a length of line so that the radiation of the bricks to the centre may be checked for accuracy and to ensure that the voussoirs are normal to the curve as shown in (Fig 10)

3 Check the arch for straightness along its face

4 Build brick work each side of the arch and stretching a line in between to lineup arch.

5 Stretch a line between two temporary one brick piers erected each side of the opening.

Fig 10



METHOD OF BUILDING IN AN ARCH WITH THE AID OF 'DEAD MEN'

MBN1437HA

6 Build the arch evenly on each side meeting it at the middle or key brick

7 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)

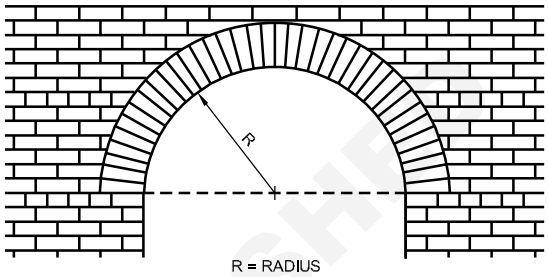
Note: After the arch has been allowed to set, first case the bottom ballies except the centre ones allowing arch to take load gently

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

8 Clean the surface with the aid of brush and do neat pointing

9 Complete and finish the semi circular arch as shown (Fig 11)

Fig 11



SEMICIRCULAR ARCH

MBN1437HB

Construction of cavity wall

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

Requirements

Tools

- Mason's Trowel 25 cm long - 1 No.
- Spirit level 15 cm long - 1 No.
- Steel tape 3m - 1 No.
- Straight edge 1.5 m - 1 No.
- Plumb level - 1 No.
- Line and pins - 1 No.
- Steel square 75 cm x 50 cm - 1 No.
- Wooden strips drip 5cm x 5cm - 100 long - 1 No.
- Brush - 1 No.
- Wall ties - 4 Nos

Materials

- Bricks 230 x 110 x 70 400 nos
- Cement mortar
- Cement - 1 bag
- Water
- Sand - 5 box
- Binding wirel - 2 m

PROCEDURE

TASK 1: **Lay a cavity wall**

1 Locate outside wall edges and snap chalk guidelines.

2 Do a dry layout with the bricks to identify any problems. Fig 1 bottom shows the first course plan.

3 Measure over 25cm from the outside line to locate the inside line for the backing leaf. 5cm cavity is used.

4 Lay inside bed course running from bed brick 1 to bed brick 2 (Fig 1)

5 Work from both ends toward the middle.

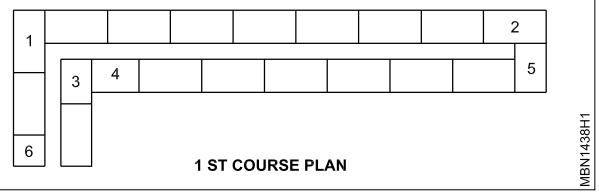
6 Lay mortar slightly thick for the bed joint, check plumb to be sure brick are vertically true.

7 Take care to lay brick to the marked line.

8 Align and check horizontal level after laying

9 Lay bed brick 6 and the closure between brick 6 and 1. Align plumb and level (Fig 1)

Fig 1



10 Measure to make sure corner is square (ie) at a 90^0 angle as shown in Fig 1

11 Cut three quarter brick number 3,4 and 5 as shown in 1st course plan Fig 1

12 Lay bed brick 3,4 and 5 in mortar bed.

13 Level and plumb brick

14 Measure distance to bed brick 3 and 4 to be sure the outside edge is located 25cm from the inside face.

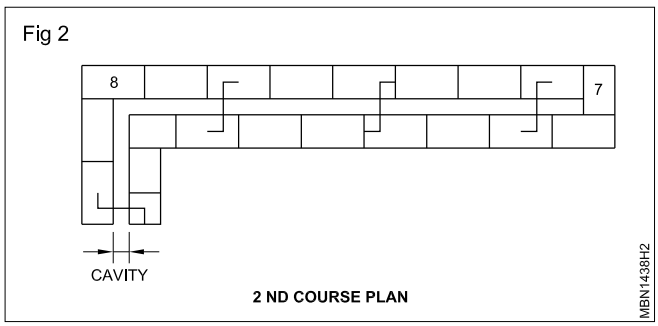
15 Check corner by brick 2 and 5 to see that it is square

16 Lay brick between bed brick 4 and 5 and finish the legoff of bed brick 3

17 Level, plumb and align

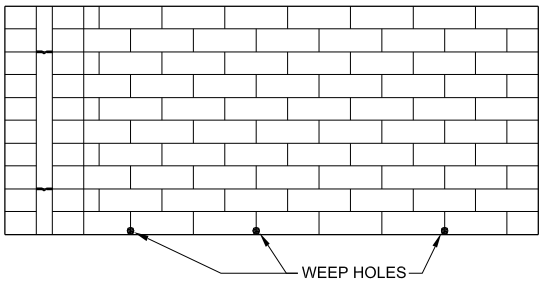
18 Check corners for square and also see that 25cm width of wall throughout. (Fig 2)

Fig 2



19 Three weep holes in the joints as shown in elevation view (Fig 3)

Fig 3



ELEVATION

20 Cut three, three quarter brick for second course

21 Lay mortar bed as Bevel mortar bed to avoid dropping mortar in cavity as shown in (Fig 4)

22 Lay three quarter brick number 7 over right end of wall

23 Lay second course brick number 8 at other end of wall as shown in the Fig 2

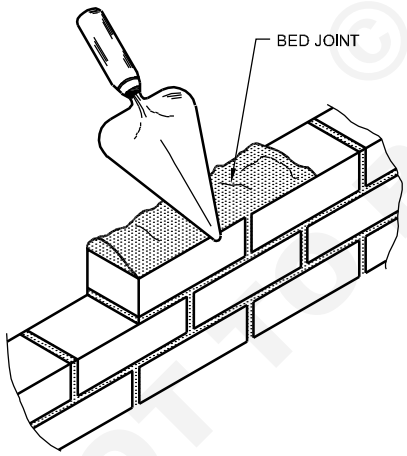
24 Complete both face wythe and backing wythe following the procedure established for the first course.

25 Lay mortar for the four metal 'Z' shaped ties.(Fig 5)

26 Embed ties in the mortar and locate as shown on the second course Fig 2

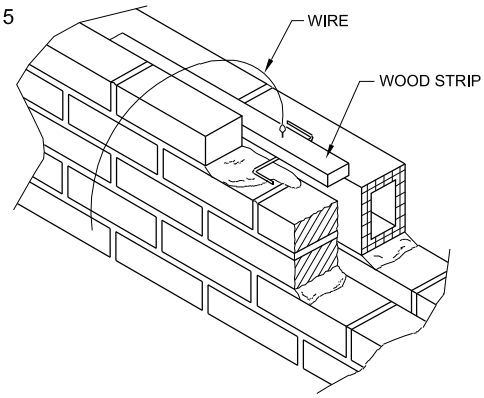
27 Be sure that if a tie with a drip is used, the drip on the metal tie points downward

Fig 4



BEVELING THE BED JOINT WITH THE BLADE OF THE TROWEL

Fig 5



28 Build corner leads six courses heigh on each end of the wall

29 Finish wall to eighth course Then embed metal 'Z' shaped ties as noted on elevation view Fig 3

30 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)

31 A wood strip insert on the wall ties prevents mortar from dropping into the cavity

32 Complete the cavity wall, use the wood piece inside the cavity to catch any mortar

33 Continue, however to bevel the inside of the mortar bed before laying the brick.

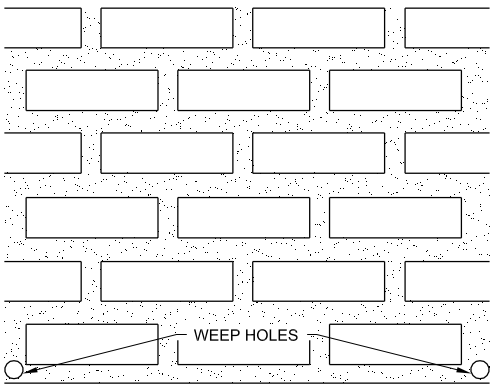
34 Square, and align the wall

35 Remove any mortar splatter on the outside wall

36 Brush wall with brush and finish the joints

37 Make sure weep holes are clear as shown in (Fig 6)

Fig 6



LOCATION OF WEEP HOLES IN MASONRY WALL

Setting out a building obtaining first, second, third and fourth lines, marking diagonals, setting out cross walls and offsets

Objective : 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

Tools

- Builders square - 1 No.
- Nylon marking thread - as reqd
- Hammer - 1 No.
- Measuring tape - 1 No.
- Spade - 1 No.
- Plumb bob

Materials

- Wooden pegs (about 80 to 100mm diameter and 450 to 600mm casurina poles), 35mm long wire nails and lime powder

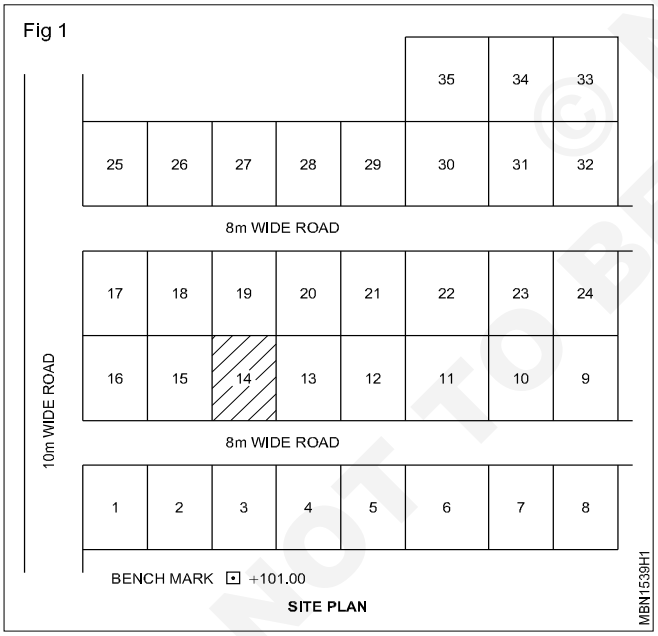
PROCEDURE

TASK 1: **Study and inspect the plot and drawing**

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

2 Study plot layout drawing.(Fig 1) Plot 14

Fig 1



3 Study Building drawing (Fig 2)

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

5 Clear vegetation, and debris

6 Level the ground to required gradient.

7 Study orientation of the building.

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

9 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.

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

11 Have left side back as one and half meter.

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

— — — — — — — —

TASK 2 : **Marking first line of building**

Marking Firstline (base line) (Fig 3)

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

2 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.

3 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.

4 Measure an arbitary distance of five meter at point Y1 at right angle to line RM and mark point P1 and drive wooden peg firmly into the ground.

5 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.

6 Plumb at point Y1 and measure five meter and mark on the top of peg at point P1 and drive nail.

7 Tie line thread on the nail at peg P1 and stretch thread to appear on the peg at P2.

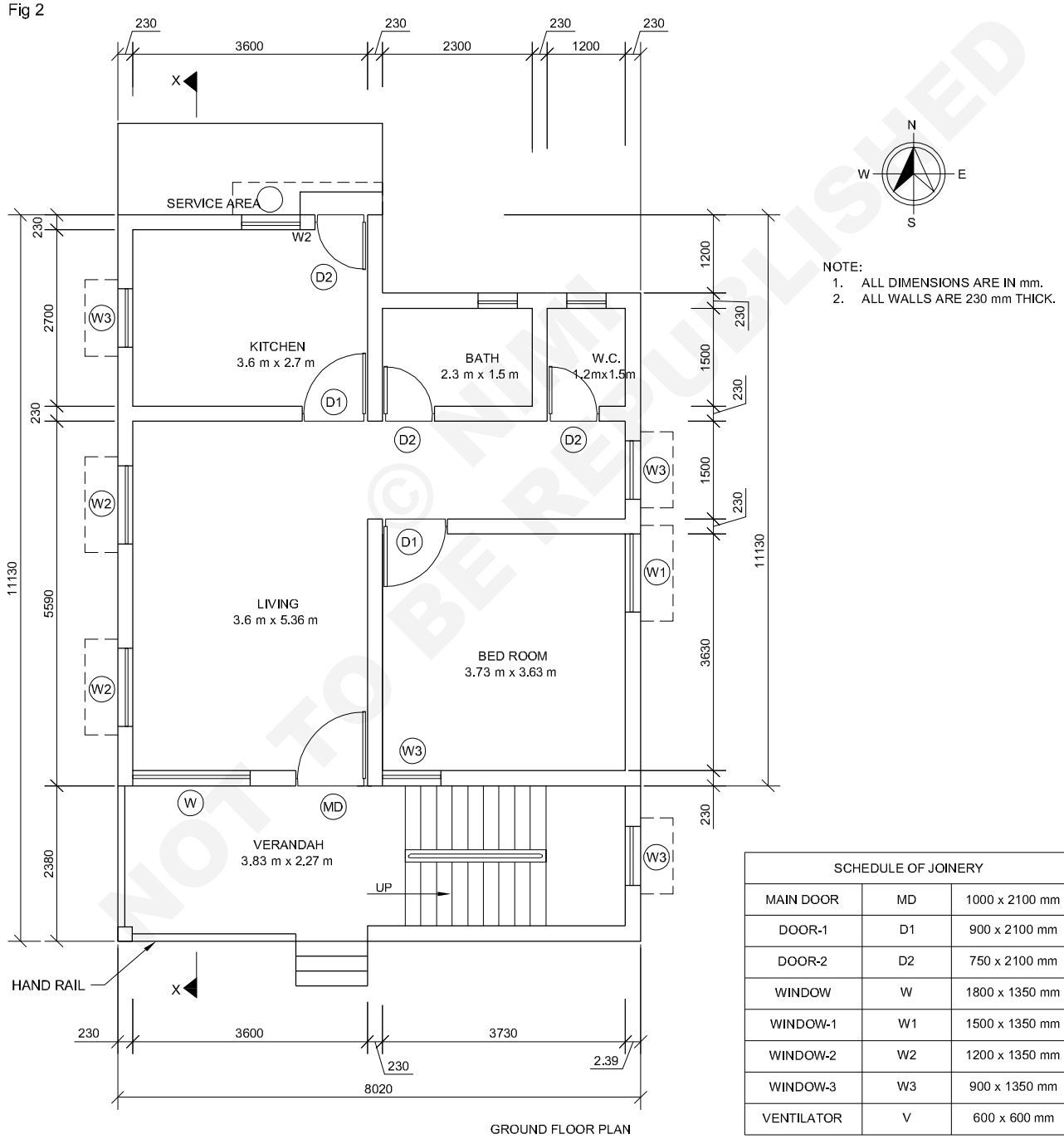
8 Plumb at point Y2 and measure five meter and mark on the top of peg at point P2 and drive nail so as to be at centre of line thread

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 centre line RM

Fig 2



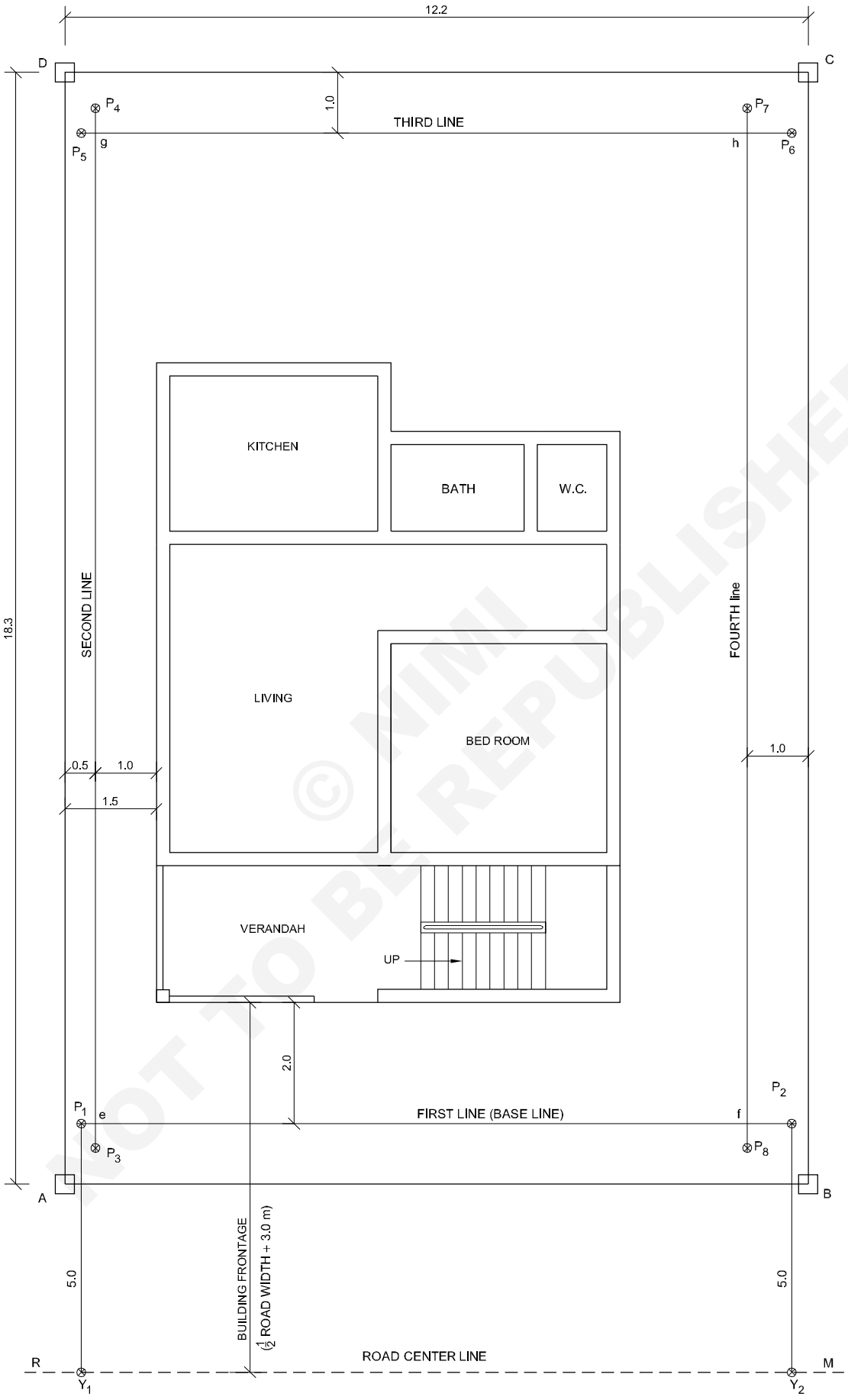
SCHEDULE OF JOINERY		
MAIN DOOR	MD	1000 x 2100 mm
DOOR-1	D1	900 x 2100 mm
DOOR-2	D2	750 x 2100 mm
WINDOW	W	1800 x 1350 mm
WINDOW-1	W1	1500 x 1350 mm
WINDOW-2	W2	1200 x 1350 mm
WINDOW-3	W3	900 x 1350 mm
VENTILATOR	V	600 x 600 mm

GROUND FLOOR PLAN
SCALE 1:100

BUILDING DRAWING

MBN1539H2

Fig 3



NOTE:
1. WIDTH OF ROAD INCLUDING WIDENING = 8.0 m
2. ALL DIMENSIONS ARE IN METER

SET BACK LAYOUT

MBN1539H3

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

1 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

2 Drive pegs at points P3 and P4

3 Drive nail on centre of peg P3 and tie line thread

4 Stretch the line thread at right angles using the builders square (see Fig 3) to line P1,P2 and to appear on peg at P4

5 Locate nail point on peg P4 and drive nail so as to be at centre of line thread.

Caution : Verify correctness of measurement and adjust the line thread and nail point only at peg P4

6 Tie the line thread on the nail in peg P4 and obtain the second line P3 P4 at right angles to line P1 P2

— — — — — — — —

Skill Sequence

Method of driving wooden pegs in the ground

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

Steps

1 Cut one end of the wooden pegs flat (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 (Fig 1)using a knife.

4 Mark the centre 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 (Fig 1) to drive the sharpened edge little into the ground.

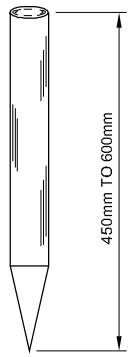
7 Use plumb bob and check the verticality of the driven peg (Fig 1)

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)

Fig 1



WOODEN PEG

MBNT539.1

Uses of builders square

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

Steps

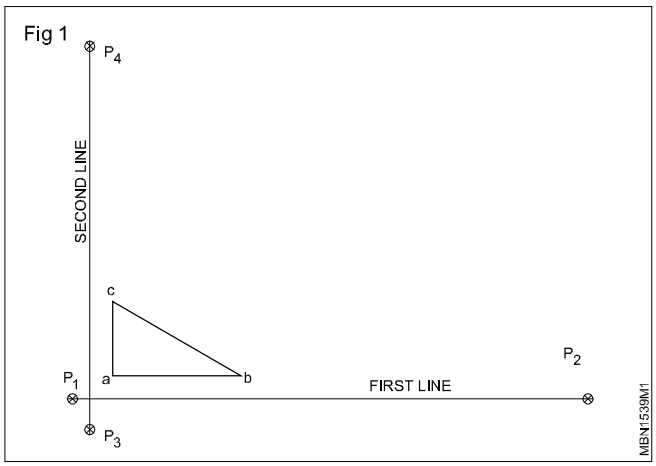
1 Hold builders square on both hands firmly (see Fig)

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.

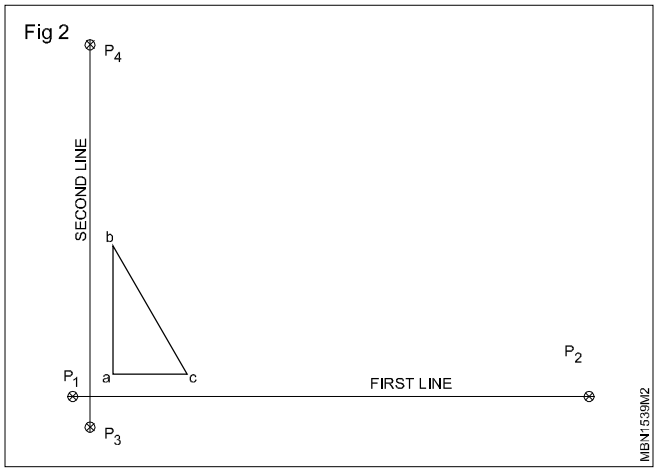
4 Keep side a,c pointing in the direction of right angle turn is required.

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 (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.

Set out a Building - Marking third and fourth line

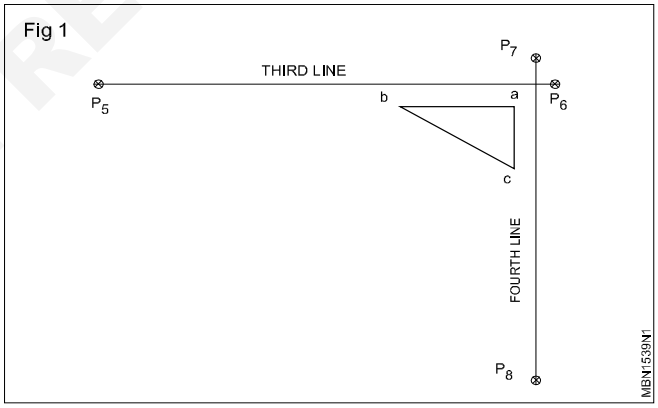
Objective : This shall help you to
- **mark third line of the building**
- **mark fourth line of the building.**

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

- Measure an arbitary 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 centre of peg P5 and tie line thread
- Stretch the line thread at right angles using the builders square (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 centre of line thread.



Caution : Verify correctness of measurement and adjust the line thread and nail point only at peg P6

Tie the line thread on the nail in peg P 6 and obtain the Third line P5 P6 at right angles to line P3 P4 and parallel to line P1 P2

— — — — — — — —

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

- Measure an arbitrary distance of one meter from boundary C B 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 P 7 and P 8

- Drive nail on center of Peg P 7 and tie line thread
- Stretch the line thread at right angles using the builders square (Fig 1) to line P5 P6 and to appear on peg at P 8
- Locate nail point on Peg P8 and drive nail so as to be center of line thread.

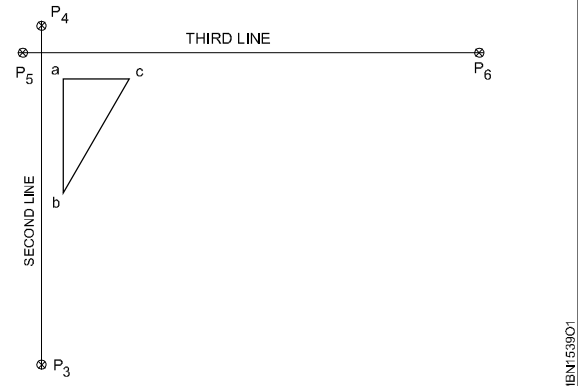
Caution : Verify correctness of measurement and adjust the line thread and nail point only at peg P 8

Tie the line thread on the nail in Peg P 8 and obtain the Fourth line P7 P8 at right angles to line P5 P6 and parallel to the line P3P4

Note

- Measure diagonal distance between intersection points e,and h (Fig 3 in Ex.No:1.5.39)
- Measure diagonal distance between intersection, points g and f (Fig.3 in Ex.No:1.5.39)

Fig 1



Caution : The diagonal distances thus verified must be equal, if not correct right angle turnings and arrive at equality between diagonals.

- All the line threads must travel at same level and separated only by thickness of threads.
- Use Builders square to turn and check the back right angle of thread line as shown in Fig (a,b,c and d)

Skill sequence

Method of nails on wooden pegs

Objective : This shall help you to

• drive nails on the pegs.

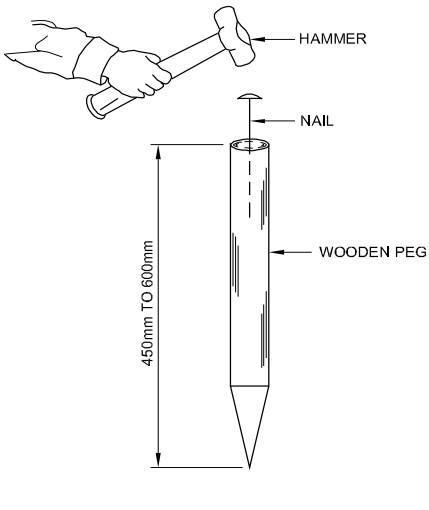
Steps

Mark with a pencil the approximate centre point of the flat surface of the driven peg.

Hold the nail vertical with the sharp point on the centre mark.

Strike gently with a claw hammer the nail head and fix. (Fig 1)

Fig 1



DRIVING NAIL USING HAMMER

Check the diagonal of square or rectangle

Objective : This 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.

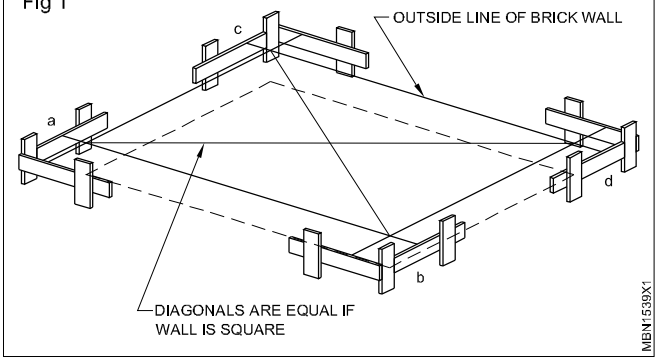
Measure the distance between diagonally opposite intersection points. (Fig 1)

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.

Fig 1



Set out a Building - Marking the center line layout of the building

Objectives : This shall help you to
- **produce center lines of the building on the profiles**
- **transfer center line mark, on the ground.**

Mark centre line in layout of the building

Trace center line plan of the building (Fig1) of Ex.1.5.37 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.1.5. 37)

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 (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.

Fixing tie line thread to nails

Objective: This shall help you to
- **tie line thread to nails.**

Steps

Form a loop in the line thread as shown in (Fig 1)

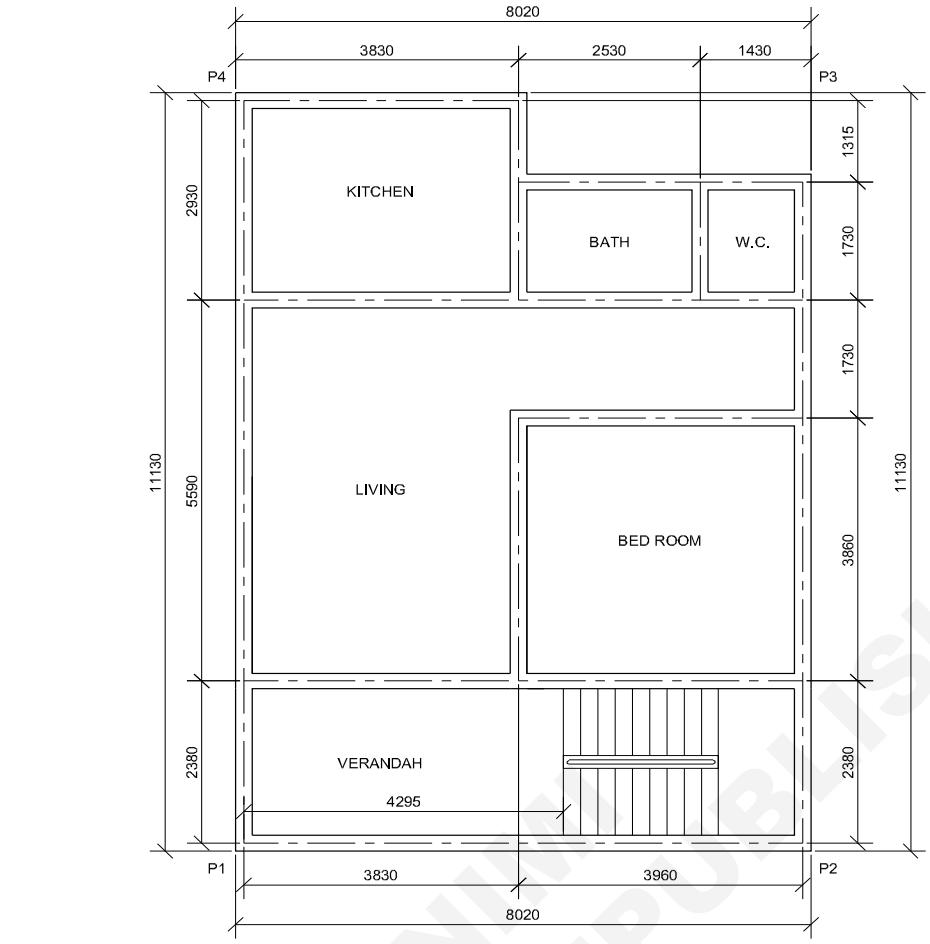
Hold the loop apart over the thumb and forefinger of the left hand and the bottom with the right hand and form a triangular shape

Turn the left hand downward, holding the thumb and forefinger together and this forms a loop around these two fingers.

Pull downward firmly with the right thumb and forefinger until the two loops have almost reached each other.

Push the loops on the nail and draw the loops tightly against the nail to form the tie.

Fig 1



Fixing the profiles

Objectives: This 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 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.

Marking the center lines on profiles

Objective: This 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 (Fig 1)
- Plumb from the center line and make a vertical pencil mark on the horizontal batten side using plumb bob and tri square.
- Use tri square on this vertical pencil mark, 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.

Fig 1

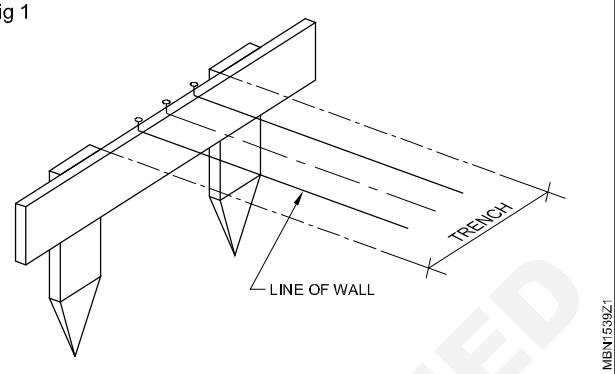
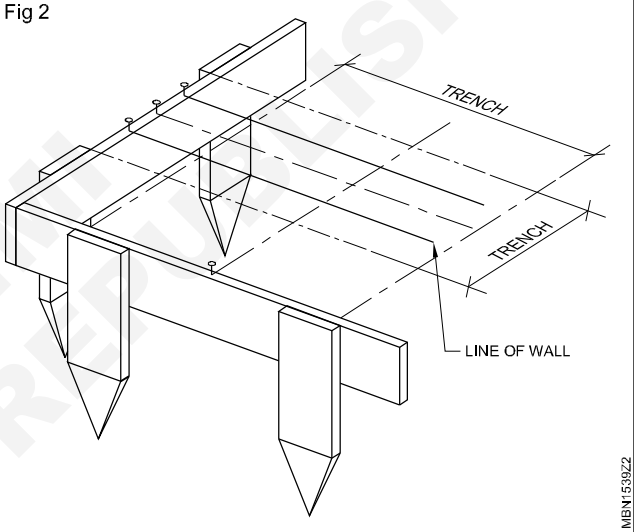


Fig 2



Marking excavation lines and fixing of plinth and floor levels

Objective : At the end of this exercise you shall be able to
- **mark the edge of foundation and excavation on the ground**

Requirements

Tools

- Nylon line thread - as reqd
- Hammer Mason (club) 1 1/2/ lbs - 1 No
- Measuring tape 30 m - 1 No
- Steel tri square 75 cm X 50 cm - 1 No
- Plumb bob, Plumb rule - 1 No
- Spirit level 15 cm - 1 No
- Tube level - 1 No

Materials

- Lime powder - as reqd
- Pegs - 10 No
- Water

PROCEDURE

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

1 Study center line sketch Fig 1of (Ex.no : 1.5.37)

2 Study foundation cross section and foundation layout drawing and note excavation width.

3 Tie and stretch thread line on the existing center mark between two opposite profiles.

4 Plumb for vertical at thread line intersecting points.

5 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.

6 Repeat this process at the opposite intersecting point.

7 Stretch a thread line between these two opposite points on the ground.

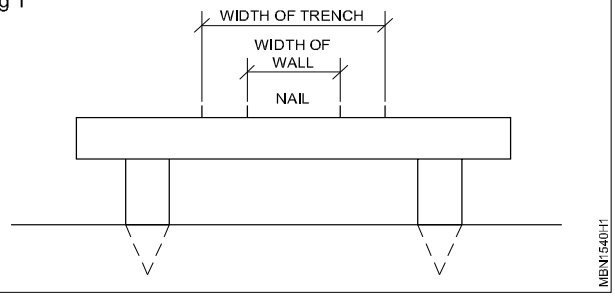
8 Pour lime powder on this line gently by using two fingers only.

9 Remove thread line.

10 The center line has been now marked on the ground.

11 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.

Fig 1



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

12 Stretch a thread line to run on all these lime powder dots.

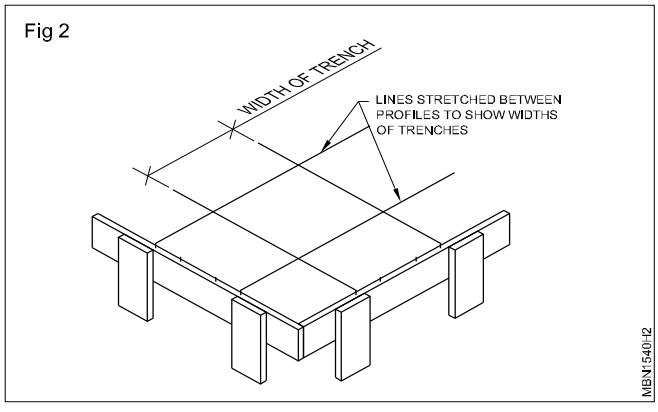
13 Pour lime powder on this stretched line gently by using two fingers only.

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

14 Remove thread line (Fig 2)

15 The foundation excavation edge line on one side has been now marked on the ground.

Fig 2

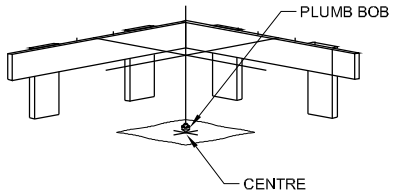


16 Repeat this procedure on the other side of ground center line for marking the other edge line.

17 The width obtained between these two lines is the width of foundation excavation. (Fig.1)

18 Repeat process on all foundation locations to be obtained such edge lines.(Fig 3)

Fig 3



Marking excavation line and fixing of plinth and Floor level

Objective : At the end of this exercise you shall be able to
- **mark plinth level and height**

TASK 1 **: Mark the plinth level and height**

1 Trace plot a layout sketch and note bench mark level. (Fig 1 of Ex.No : 1.5.37)

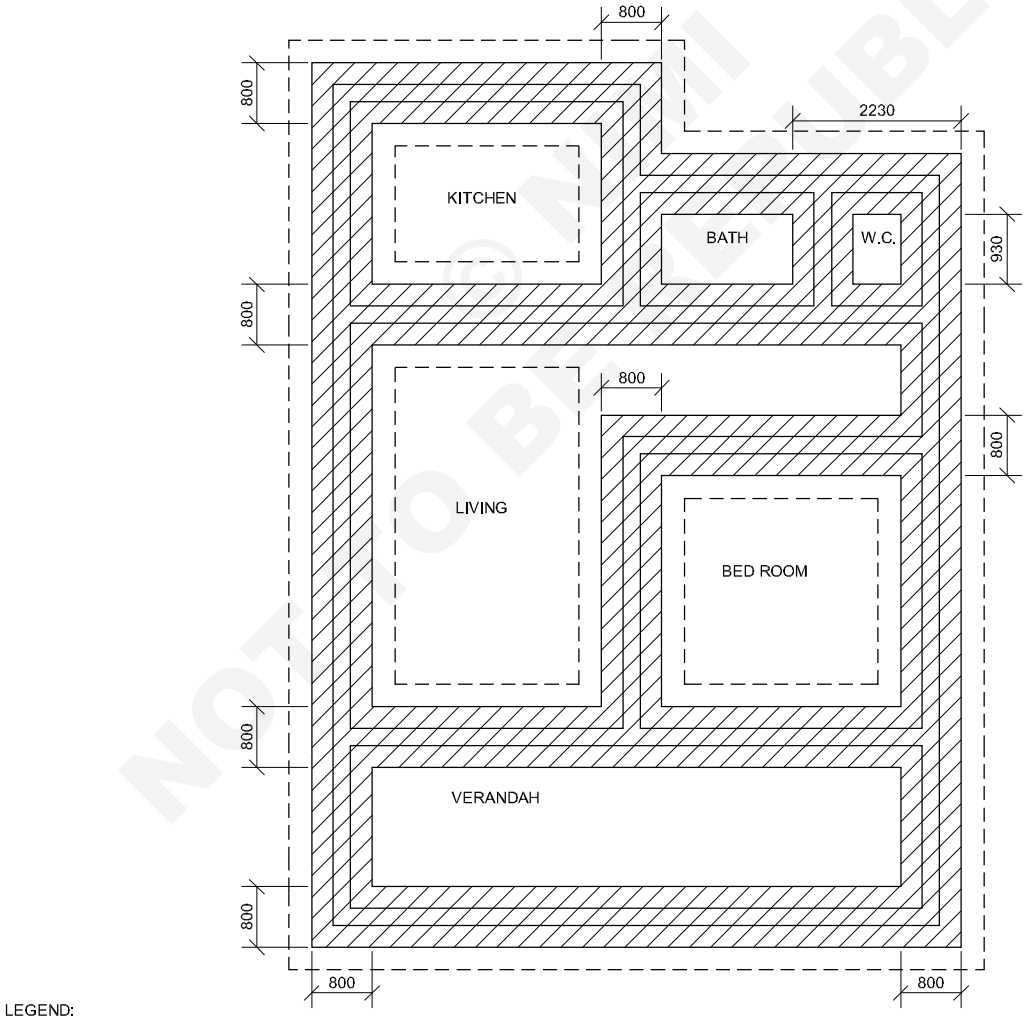
2 Trace foundation layout and note excavation depth

3 Drive at a convenient location, a local permanent bench mark level peg

4 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.

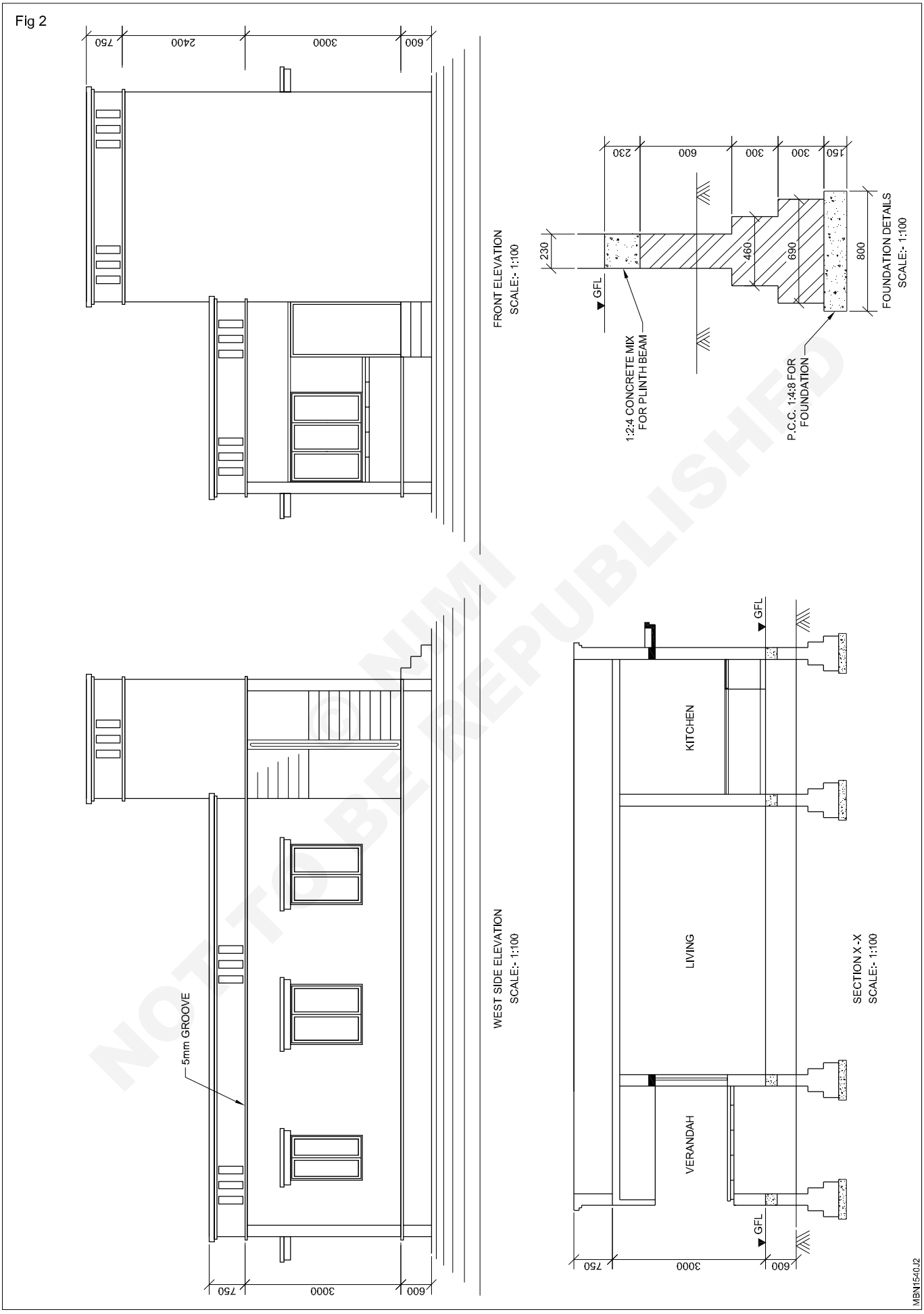
5 Transfer this level to all four corner profiles and have a reference level mark

Fig 1



FOUNDATION LAYOUT

Fig 2



6 Hold a straight edge to tally with this level and also to appear on the trench

7 Measure down from this straight edge to get the required excavation depth/plinth level

8 Tie and stretch thread line between two opposite level pegs if length of straight edge is not enough.

Caution

Plumb for vertical measurements.

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

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

Skill sequence

Using water tube levels

Objective: This 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.
- 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.

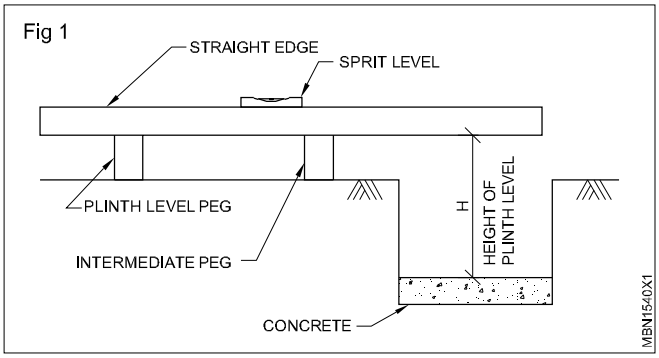
Measuring down from plinth level

Objective: This you shall be able to
- determine the height of courses upto plinth level.

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.

Fig 1



Plastering of walls setting of spots-applying mortar use of screeds and floats

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

- **plastering the walls (two coats of 12mm thickness).**

Requirements

Tools

- Mason's trowel 25cm long - 1No
- Pointing trowel 15cm long - 1No
- Mortar pan - 1No
- Plumb bob - 1No
- Line and thread - 1No
- Straight edge 1.8m long - 1No
- Try square 0.75 x 0.5 m - 1No
- Measuring taps 5m long - 1No
- Wire brush - 1No
- Spade - 1No
- Straight edge 1m long - 1No
- Wooden float - 1No
- Steel float - 1No

Materials for 10m x 10m = 100m^2 wall

- Scaffolding material
- Wooden planks
- Coconut coir or rope
- M.S chair - 1No
- Cement 0.280cm^3 or 8.5bag
- Sand 1.152 cm^3 42-boxes
- Water
- Bucket and mug - each one

PROCEDURE

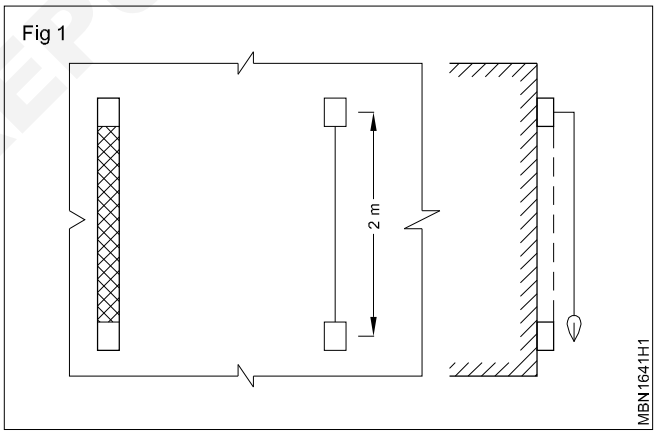
TASK 1: **Plastering the wall of two coats**

- Keep the cement mortar 1:4 ration in the area of plastering.

Note: Cement mortar should be used/ consumed within 30minutes of mixing

- Arrange the scaffolding according to requirement.
- Remove the projecting burrs of mortar by using pointing in order to form uniform surface.
- Clean the surface with white brush.
- The surface of the wall should be well settled so to remove the dust deposited before the application of plaster.
- Make even thickness and a true surface " level dots" are prepared (15mm x 150mm square)
- Place the level dots at 105 intervals in both directions, to act as guide for the plastering.
- First coat plaster 9mm to 10min to be plastered and to arrive the uniform thickness Fig 1 place the dots 150mm x 150mm.
- With the help of pump bob 2 meter below Fig 1. Place two dots.
- Place as many dots as required.
- Complete the first coat plastering.

Fig 1



- The second coat has to carried after 6 hours interval of first coat and to be 2mm to 3mm thickness form smooth surface using proper travel.

Note : Then cement mortar is applied or dashed in a uniform surface to a thickness slightly more than the specified thickness.

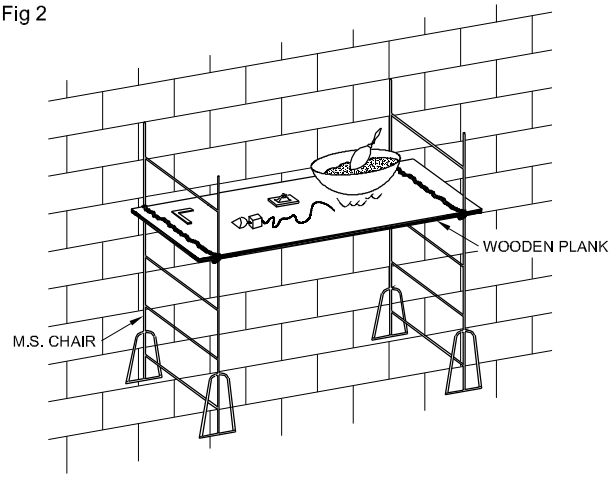
The surfaces of mortar applied is screened to brought true and even surface by using wooden straight edge or aluminium hollow section 1.8m long reaching across the gauges of level dots.

Finally the surface should be finished true with a trowel or with wooden float to give a smooth or sandy granular texture as required.

After 24 hours of completion of plastering it the curing has to done for 7days.

Figs 2 to 7 is shown some of the plaster tools

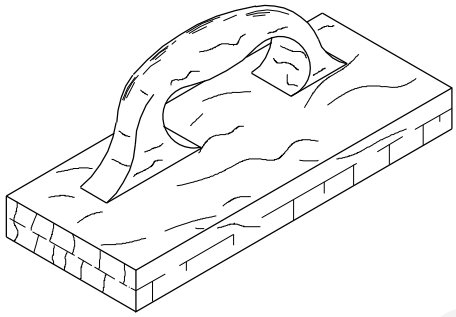
Fig 2



M.S. CHAIRS FOR INTERNAL PLASTERING

MBN1641H2

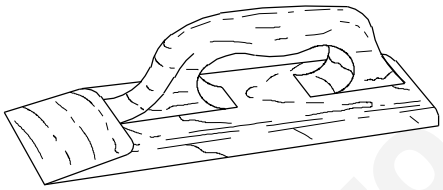
Fig 3



CORK-FACED FLOAT WITH HARD WOOD BACKING

MBN1641H3

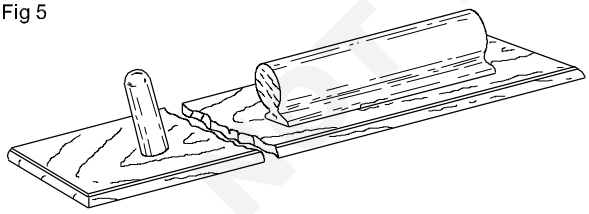
Fig 4



WOOD ANGLE

MBN1641H4

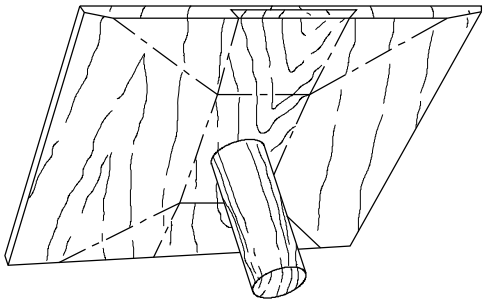
Fig 5



AN ORDINARY WOODEN DARBY USED TO LEVEL LARGE AREAS OF PLASTER

MBN1641H5

Fig 6



WOOD HAWK USED TO CARRY THE PLASTER MATERIAL TO THE WALL OR CEILING

MBN1641H6

Fig 7

HOW PLASTER IS APPLIED TO THE WALL SHOWING THE USE OF THE HAWK AND THE TROWEL

MBN1641H7

Fixing of screeds to soffits of doors and window opening - reversing the screeds and squaring

Objectives : At the end of this exercise you shall be able to
- **check the door frame**
- **fix the door frame**
- **casting screeds in ground at site.**

Requirements

Tools

- Trowel 25 cm long - 1No
- Pointing trowel 15cm long - 1No
- Spirit level 15cm - 1No
- Straight edge 1.5m long - 1No
- Measuring steel tape 15m - 1No
- Mortar pan - 1No
- Spade - 1No
- Template - 1No

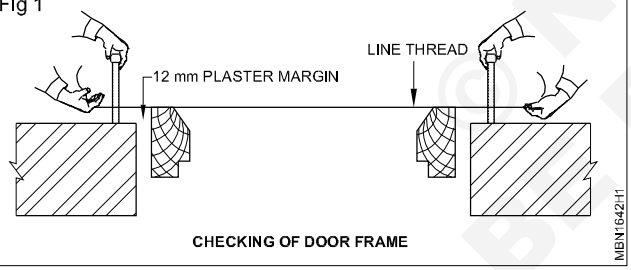
Materials

- Cement
- Sand
- Water
- Bucket and mug

PROCEDURE

TASK 1: **Check the door frame (Fig 1)**

Fig 1

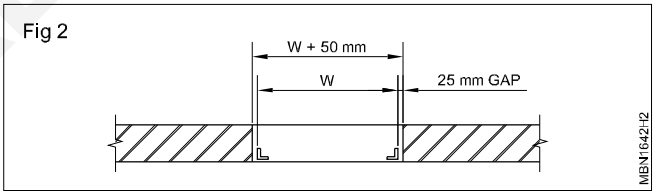


CHECKING OF DOOR FRAME

- Check the quality of wood
- Check the defects in the frame

- Keep the door and window opening 50mm more than the actual size of opening (Fig 2).

Fig 2



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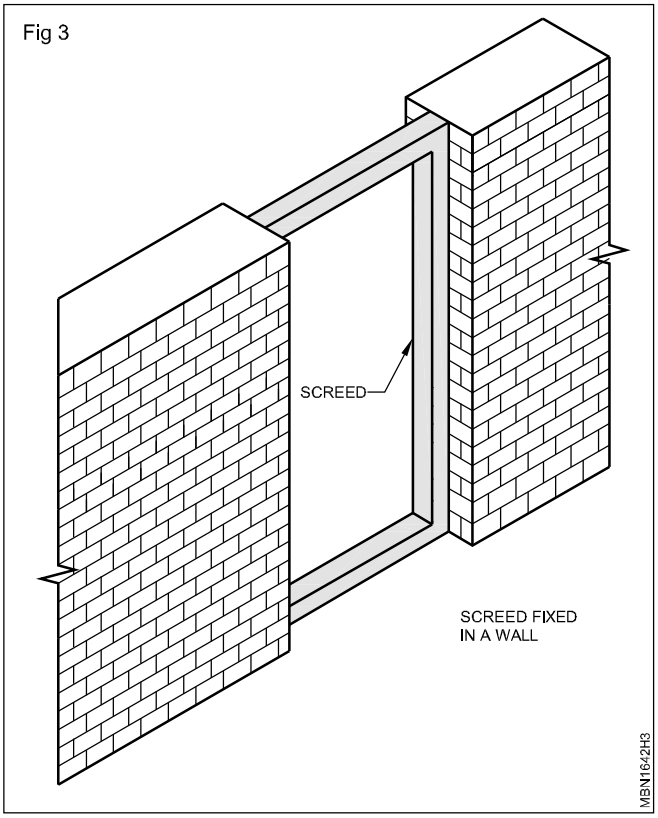
TASK 2: **Fix the door frame (Fig 3)**

- Check the door frame 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
- Check all points, then the mason to fix the door frame permanently by connecting the hold fasts.

Fig 3



TASK 3: **Casting screeds in ground at site (Fig 4)**

- Clean and level the surface
- Fix the wooden planks in all side.
- Inner and outer planks are connected by bolt and nut.
- Place the reinforcement bars in its position and tie properly by using binding wire.
- Mix the concrete in proper proposition 1:2:4 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
- Casting the screeds as shown in Fig 4.

Fig 4

Casting screeds in ground of site

Cement plaster 6mm thick on R.C.C slab ceiling

Objective : At the end of this exercise you shall be able to
- **make ceiling plastering.**

Requirements

Tools

- Mason's trowel 25cm long - 1 No
- Pointing trowel 15cm long - 1 No
- Mortar pan - 1 No
- Plumb bob - 1 No
- Line and thread
- Straight edge 1.8m long - 1 No
- Measuring steel tape 5m long - 1 No
- Try square 0.75 x 0.5m - 1 No
- Spade - 1 No
- Straight edge 1m long - 1 No
- Wooden float - 1 No
- Steel float - 1 No
- Wire brush - 1 No

Materials

- Scaffolding material
- wooden planks
- Coconut coir or rope
- M.S Chair - 1 No
- Cement - 1 Bag
- Sand - 3 Boxes
- Water
- Bucket and mug - each one

PROCEDURE

TASK 1: **Make ceiling plastering (Fig 1)**

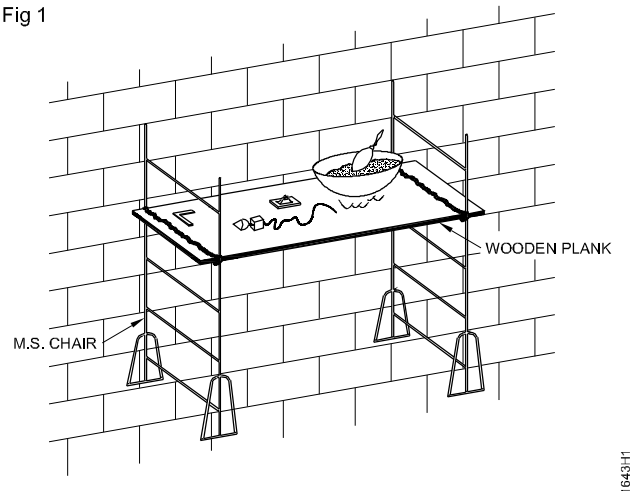
- Stage scaffolding is provide for the ceiling plaster work
- Remove projecting burrs of mortar formed due to the gaps at joints in shuttering.
- The surface clean with wire brush.
- Concrete surfaces to be plastered should be pock marked with a pointing tool, of spacing of not more than 5cm centres.
- The pock not less than 3mm deep, for a proper key for the plaster.
- The surface of wall should be well wetted before the plaster is applied.
- The mortar for ceiling plastering is 1:3 or 1:4 i.e., one part cement and three or four parts of sand as specified in drawing or otherwise as directed.
- Make even thickness and a true surface "Level dots" are prepared (15cm x 15cm square)
- Make level dots are 1.5m intervals in both directions to serve as a guides for the plastering.
- Make level dots are truly in the plane of the finished plaster surface.

Note: Then cement mortar is applied or dashed in a uniform surface to a thickness slightly more than the specified thickness.

The surfaces of mortar applied is screened to brought to true and even surface by using wooden straight edge or Aluminium hollow section 1.8m long reaching across the gauges of level dots.

Finally the surface should be finished true with a trowel or with wooden float to give a smooth or sandy granular texture as required.

Fig 1



M.S. CHAIRS FOR INTERNAL PLASTERING

Flooring practice determination and formation of slope, application of slurry for finishing, setting out of skirting, formation of spots for skirting

Objectives : At the end of this exercise you shall be able to
- **determine the formation of a slope of floor in building**
- **make the top edges of skirting in perfect straight line**
- **apply mortar and lay tiles/floor.**

Requirements

Tools

- Trowel (25 cm), Pointing trowel (15 cm) - as reqd
- Sprit level (30 cm), Straight level (1.5 m) - as reqd
- Steel tape, Mortar pan, PVC tube level - as reqd
- Spade - as reqd

Materials

- Cement, Sand, Water, Bucket and Mug - as reqd

PROCEDURE

TASK 1: **Determination and formation of final slope of floor level**

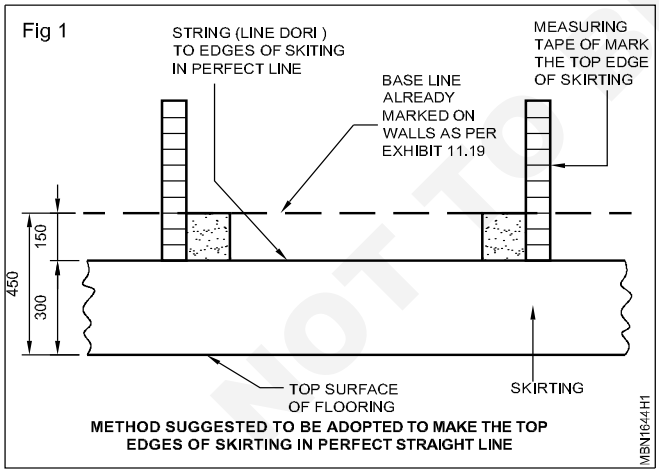
- Check the sub grade surface level of room.
- It the level in not correct make it correct by cutting & filling and level it (or) compact it.
- Mark the base line alround the room, just 30cm above the sub grade of floor level by using level.
- By using tube level mark the floor (Finished) level from the base line with a slope of 1: 200 to required corner/ side of the room.
- With respect to the final/ finished floor level proceed for floor work after completion.

— — — — — — —

TASK 2: **Make top edges of skirting in perfect straight line**

- Mark the position of the top of the skirting by measuring the distance between the base line and the top of skirting with measuring tape as shown in (Fig 1).

Fig 1

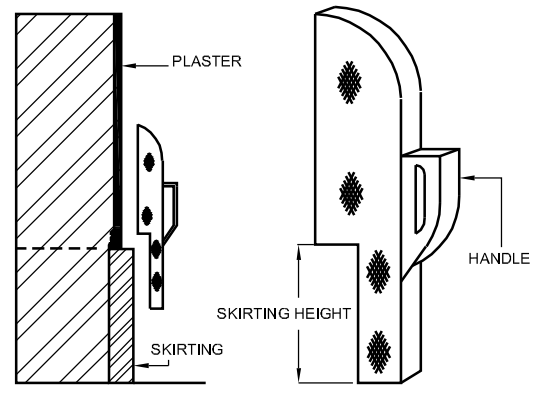


METHOD SUGGESTED TO BE ADOPTED TO MAKE THE TOP EDGES OF SKIRTING IN PERFECT STRAIGHT LINE

Note : A template should be prepared by using wooden batten shown in (Fig 2).

- Fix the skirting tiles with the base line mark and also with the help of using wooden template projecting 10mm to 12mm only from wall plaster as shown in (Fig 2).
- Fix skirting tiles at two ends of wall with wooden template projecting only 10mm to 12mm outside of the wall plaster as shown in (Fig 1).

Fig 2



WOODEN FARMA (TEMPLATE) FOR SKIRTING

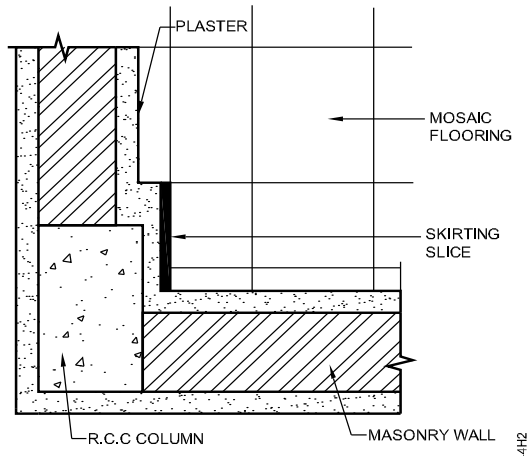
- Fix the skirting tiles in between the reference tiles already fixed above.
- Check the skirting tiles always that they should be projecting only 10mm to 12mm from wall plaster
- Keep the skirting top line should be in one line, straight and uniform level.
- Fix the string line at two corners and again fix string line as guideline for all other skirting tiles.

TASK 3: **Apply mortar and lay tiles**

- Lay and fix accordingly to the reference line fixed as shown in (Fig 3).

Note : At the column positions skirting needs cutting/slicing in vertical direction. This will carefully worked for keeping 10mm projections from the wall plaster as shown in (Fig 3).

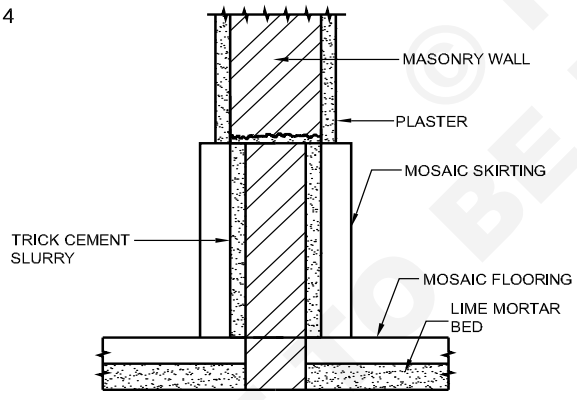
Fig 3



FIXING OF SKIRTING SLICES

- Mark the both sides of internal masonry walls provide and stretch clear margin to accommodate skirting as shown in (Fig 4).

Fig 4



INTERNAL WALL SKIRTING DETAILS

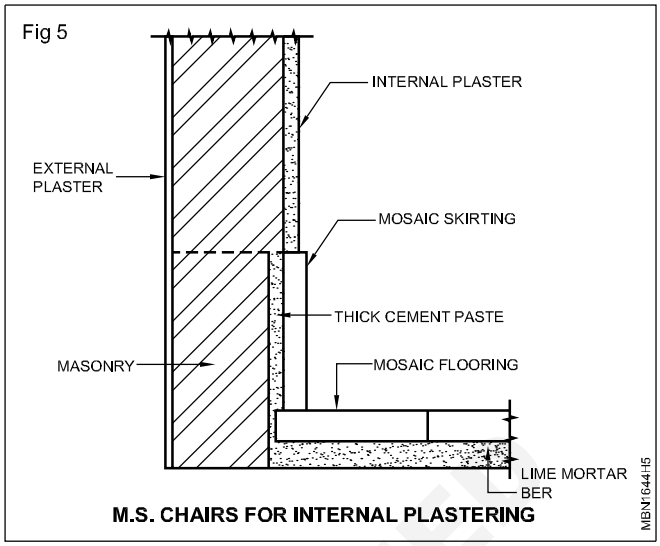
- For skirting of outer wall pieces of skirting should be adjusted in the corners where furniture work it expected as shown in (Fig 5)
- Check top edges of skirting should be kept in perfect alignment

Note: The width of offset of the skirting from the plaster surface of masonry wall should be perfectly uniform and in straight line.

The setting of skirting tiles should be in perfect plain.

The surface of the skirting should be made in perfect plain.

Fig 5



M.S. CHAIRS FOR INTERNAL PLASTERING

After curing of skirting the surface is polished.

The skirting tiles polishing should be done manually along with polishing of floors with same carborundum stones.

For 1st coat with 60No stone 2nd coat is done as grouting with cement slurry grey or white cement mixed with pigments to suit colour of the tiles.

3rd coat is done with 120 No. Stones, these stones are finer than 60No. Stones.

4th coat is done with 320 No or 220 No. Stone purpose being smooth polish as shown in Fig 6.

After polishing is completed the surface of skirting washed with oxalic acid or powder form

Finally wash with water should be cleaned with wooden rage or smooth white brush.

Fig 6

HAND POLISHING TO SKIRTING

Use of screeds, formation of curve at junction of skirting and floor

Objective : At the end of this exercise you shall be able to
- **form skirting in floor.**

Requirements

Tools

- Trowel - 1 No
- Pointing trowel - 1 No
- Curved trowel - 1 No
  - Sprit level 15cm long - 1 No
  - Straight levels 1.5m, - 1 No
- Steel tape - 1 No
- Line and thread

Materials

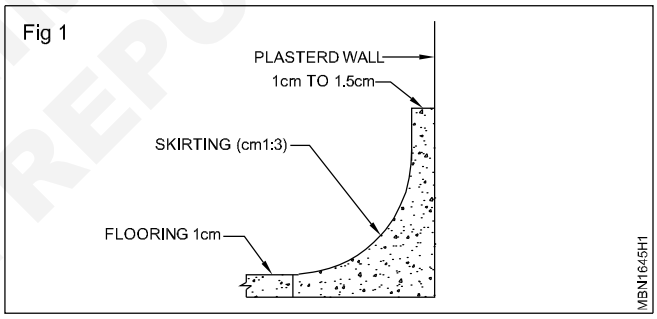
- Cement - as reqd.
- Sand - as reqd.
- Water - as reqd.
- Bucket and Mug - as reqd.

PROCEDURE

TASK 1: **Form skirting in floor**

- Mark the skirting top level line in wall just above 10cm from floor level alround the room, as stated in previous Ex.No: 1.6.44, by using line and pins.
- Mark the bottom skirting line in floor just 5cm away from wall.
- Clean the skirting area between the top and bottom level marking line.
- Apply cement mortar (sieved sand should be used) 1:3 in skirting area as shown in (Fig 1).
- Use the curved trowel to turn the curve.
- The skirting surface area finally with a brush finished with cement powder sprinkled with water for fine finishing.

Fig 1



Set out a drainage line including position of manhole and gully trap

Objective: At the end of this exercise you shall be able to
- **set out a drain with the help of sight rail traveller and offset sight rail.**

Requirements

Tools

- Pocket Steel tape 2m - 1 No.
- Line thread - as reqd.
- Plumb bob - 1 No.
- Steel square - as reqd.
- Spirit Level 15 cm - 1 No.
- Steel tape 30 m - 1 No.
- Measuring tape 30 m - 1 No.
- Straight edge 1.5 m - 1 No.
- Hammer mason 1 1/2 / 1 lbs - 1 No.
- Spade - 1 No.
- Crow bar - 1 No.
- Mortar pan - 1 No.

Materials

- Rectangular 100 x 40mm - 1 No.
- Wooden battens - as reqd.
- Nails 35 mm long - as reqd.
- Lime (Powder for Marking the Position) - 1 Kg
- 20mm metal - as reqd.
- sand - as reqd.
- PVC pipe - as reqd.

PROCEDURE

TASK 1**: Set out a drain with the help of sight rail traveller and offset sight rail**

1 Drain layout drawing

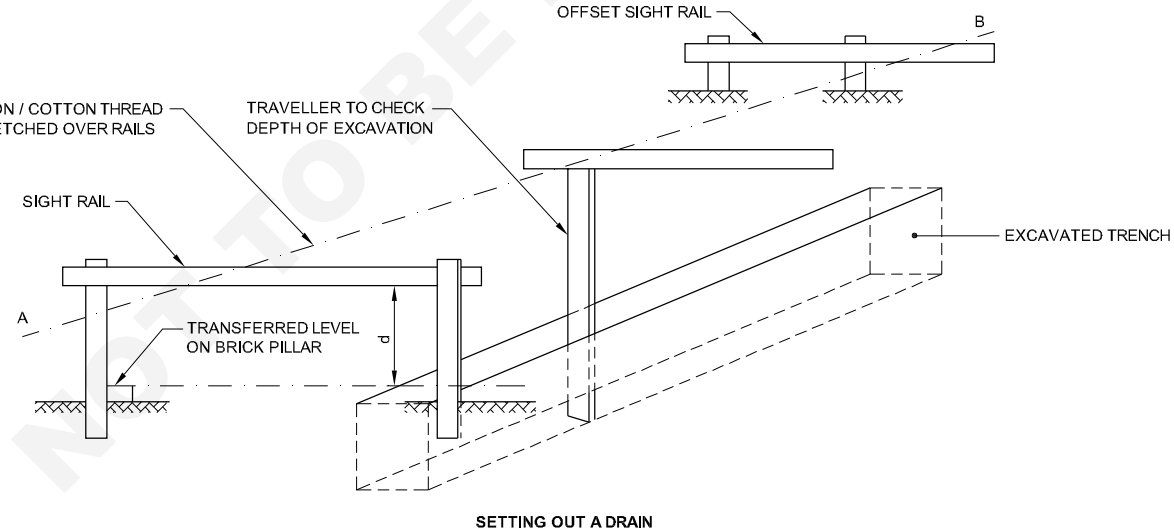
2 (Note: Gradient, alignment manhole position)

3 Check existing gradient of the ground on the drainage alignment.

4 Erect sight rail on a safe distance on either end of the drain (Fig 1)

5 Erect offset rail at manhole, inspection chamber, change of direction or gradient not having a manhole.

Fig 1



SETTING OUT A DRAIN

6 Erect offset rail at a distance once in every 30m

Caution: Care should be taken that the rails vertical post should not be placed on the path of excavation.

7 Mark the center points of drain line on sight rails, and intermediate offset rails

8 Drive nail at these marks

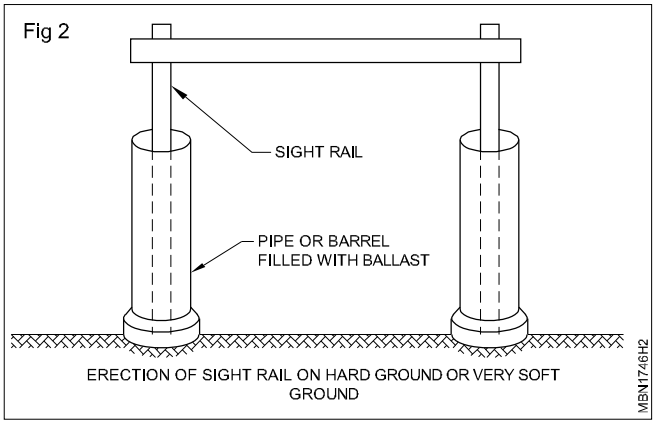
9 Tie line thread and produce line section wise.

10 Transfer line on ground using plumb bob and mark on ground using the thread and lime powder

11 Measure center points of manhole to manhole and plumb down points on line marked earlier.

Fix all rails firmly on ground (Fig 2)

Fig 2



12 Transfer bench mark level on the supports of sight rail and intermediate rails.

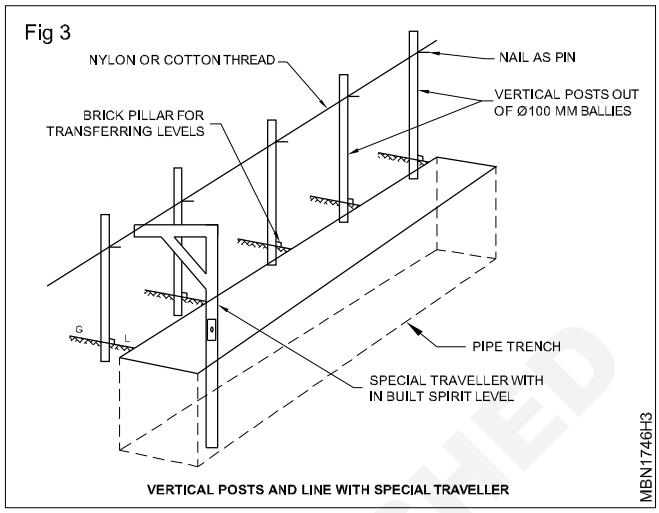
The height of rails is determined from the bench mark level transferred

13 mark on ground from center line on either side half the width of excavation of drain.

14 Levels of drain is to be measured down from line thread

15 Tied at same level between rails (Fig 3)

Fig 3



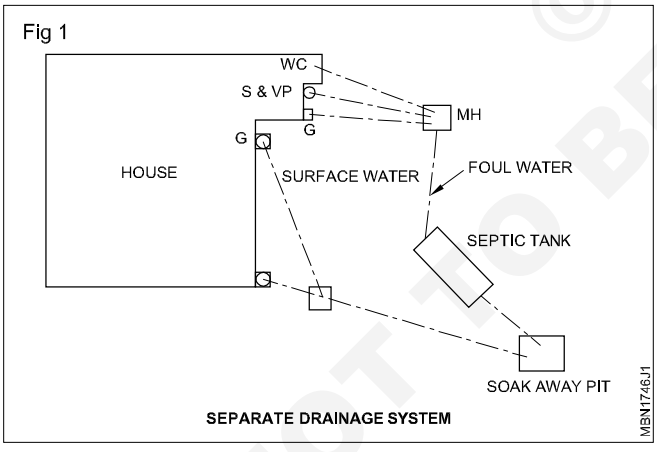
Mark the line of excavation and position of manhole

Objective : At the end of this exercise you shall be able to
- **mark the position of man hole and excavation.**

TASK 1: **Mark the position of man hole and excavation**

1 Trace drawing given (Fig 1)

Fig 1



2 Determine direction of main line sewer (Fig 2)

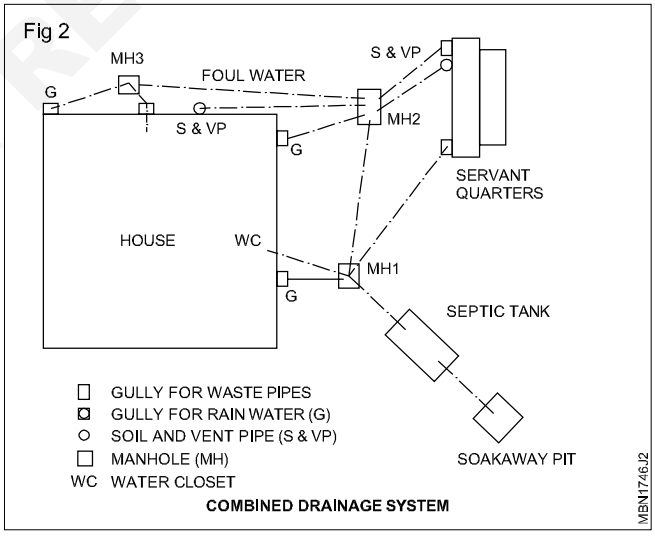
3 Drive wooden pegs firmly into the ground

4 Tie nylon thread in between two pegs

5 Mark proposed alignment on the ground by locating different points along the alignment.

6 Locate the position where manholes/chambers are required as per the drawing.

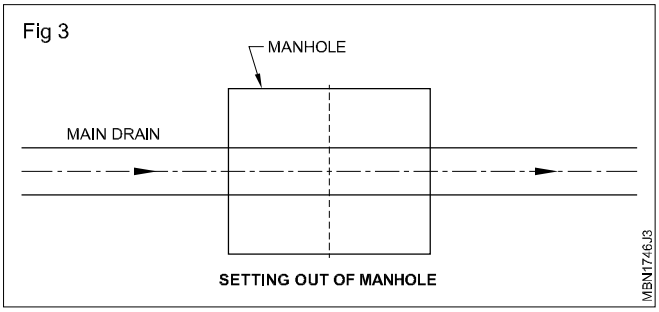
Fig 2



7 Slopes in excavation should be provided by use of side rail or boning rods as shown in (Fig 3)

8 Mark posit on of man hole with lime powder gently into the ground.

9 Take care while marking longer side of manhole should be parallel with flow of main sewer.



10 Avoid the branches pipe lines entering manhole at corner.

11 Mark the position of manhole parallel to the adjacent building.

— — — — — — — —

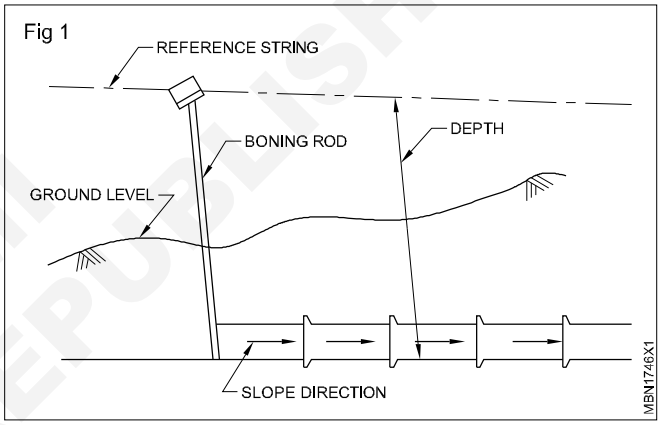
Skill sequence

Use of boning rod

Objective: This shall help you to
- **state the use of boning rod.**

Boning rod is made wooden strips in the form letter 'T' and used for gradient

Starting pipe (inlet) and ending pipe (outlet) should be provided some gradient so that drain water flow will be free from any sullage. (Fig.1)



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Practice in setting up and reading of dumpy level

Objective: At the end of this exercise you shall be able to
- **determine the level difference for the given two points A and B.**

Requirements

Tools/Equipments/Instruments

- Dumpy level with tripod - 1 No.
- Telescopic staff - 1 No.

Materials

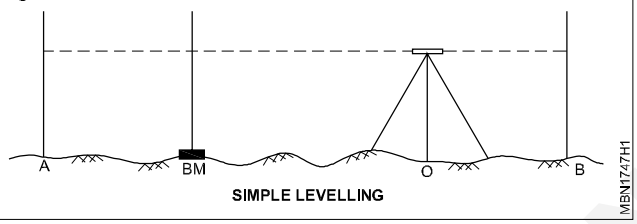
- Levelling Field Book - 1 No.

PROCEDURE

TASK 1: **Determine the level difference for the given two points A and B**

1 Select Instrument position 'O' approximately centre to the stations A and B are visible. (Fig 1)

Fig 1



SIMPLE LEVELLING

2 Setup and level at the instrument at position '0'.

3 Direct the telescope towards the staff to held vertically on BM and focus it carefully to obtain clear graduation.

4 Observe the reading of the central horizontal cross hair of the diaphragm as it appears to cut the staff, ensuring that the bubble is in central.

5 Enter the reading in a field book.

6 Send the staff man to the station A.

7 Direct the telescope towards station A and focus it again.

8 Check-up the bubble is in central. If not, bring it to the central position by adjusting by the foot screw nearest to the telescope or the micrometre screw.

9 Observe the readings of the central horizontal cross hairs and enter it in field book.

10 Send the staff man to B, and hold it.

11 Direct the telescope towards B and observe the readings and enter it.

12 Reduce the levels and calculate the Reduced levels of stations A and B.

13 Apply arithmetical check.

— — — — — — — —

Skill sequence

Temporary adjustments of a level

Objective: This shall help you to
- **practice the temporary adjustments of the level.**

Temporary adjustments of a level consists of the following skills:

a Setting up the tripod on the ground.

b Fixing the Instrument on the tripod and leg adjustment.

c Levelling up the Instrument

d Eleminating parallax

i Focussing the Eye piece

ii Focussing the object glass.

a To set up the tripod on the ground.

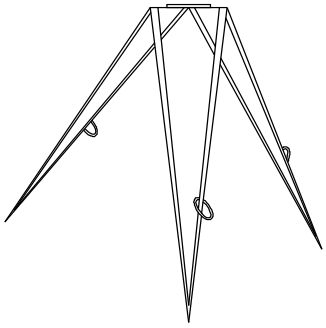
1 Loosen the strap of the Tripod.

2 Spread the legs of the tripod so that the instrument is at the convenient height. (Fig 1)

3 Keep the two legs firmly on a non slippery ground.

4 Adjust the third leg so that the top of Tripod approximately horizontal to earth surface by eye Judgement

Fig 1



TRIPOD

MBN1747J1

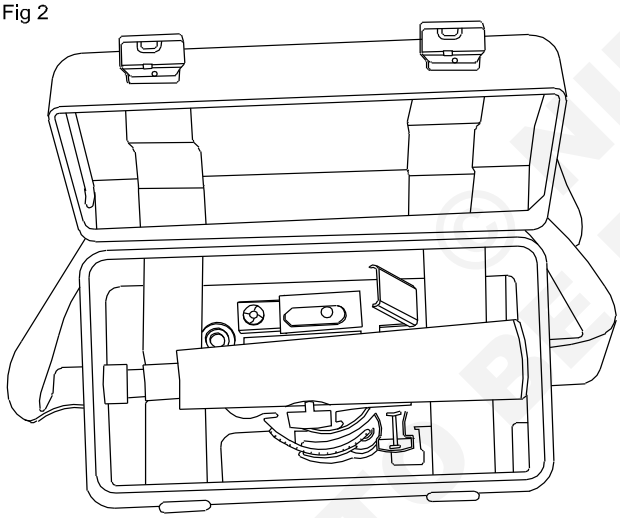
Give supports such as stones, bricks etc to all three legs incase of slippery ground.

Keep the two legs on the lower side of the hill and one leg on the higher side of the hill in case of hilly areas.

b To fix the Instrument on the tripod and leg adjustment

1 Mark the Positions of the object glass, the eye piece, clamp screw and tangent screw, before taking out the Instrument from the box. (Fig 2)

Fig 2



INSTRUMENT IN THE BOX

MBN1747J2

This is to be done for placing the Instrument in the box in its proper position without any difficulty after the completion of the work.

2 Take the Instrument from the box by holding telescope using right hand. (Fig 3)

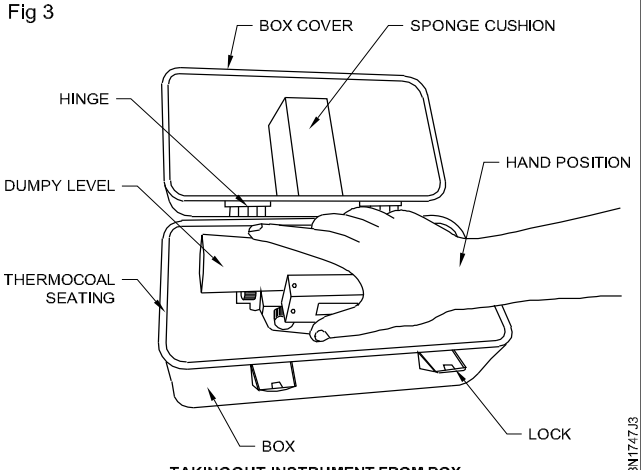
3 Release the clamp screw of the Instrument if it is tightened.

4 Hold the Instrument in right hand.

5 Support the tribranch plate of the Instrument with left hand.

6 Fix the instrument on the tripod by turning round the lower part with the left hand, by screwing (Fig 4).

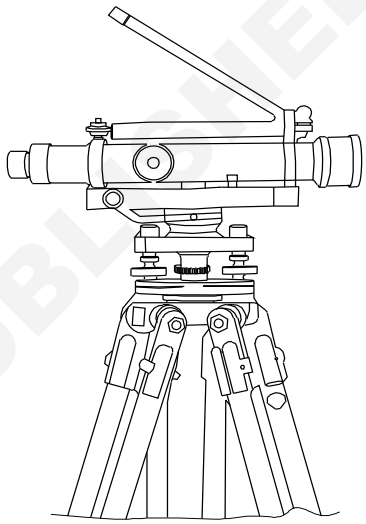
Fig 3



TAKINGOUT INSTRUMENT FROM BOX

MBN1747J3

Fig 4



FIXING OF INSTRUMENT TO STAND

MBN1747J4

The tripod is so adjusted that the tribranch is approximately horizontal position.

7 Bring all the foot screws in the centre of their run.

8 Fix any two legs firmly into ground by pressing them in the same direction of the legs (Fig 5).

9 Keep telescope nearly parallel to the above two legs.

10 Move the third leg to right or left to bring the long bubble to its centre.

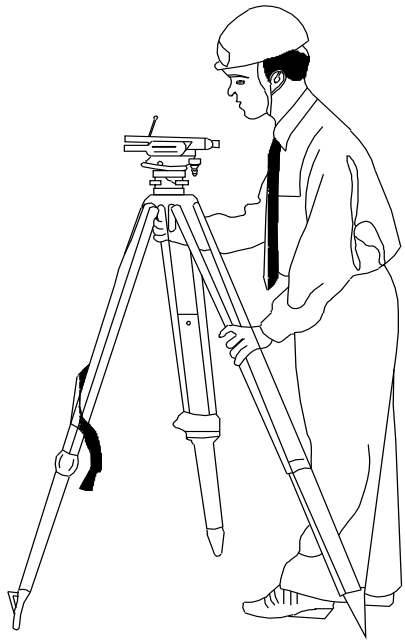
11 Now move the third leg to in or out and bring the cross bubble to its centre.

C Levelling up

1 Loose the clamp

2 Keep the telescope to the longitudinal axis of the plate level is approximately parallel to the line joining any two of the levelling screws (A and B in Fig 6a).

Fig 5



LEG ADJUSTMENT

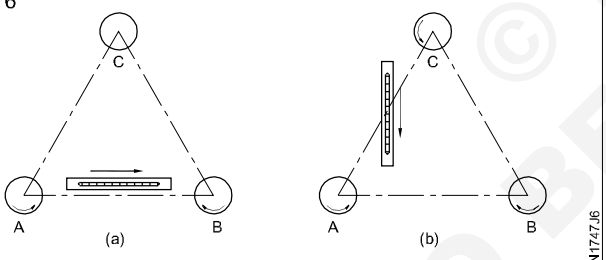
MBN1747J5

3 Hold these two levelling screws between the thumb and first finger of each hand.

4 Turn the screws uniformly so that the thumbs move either both inward or outward until the bubble comes to its centre.

5 Turn the telescope through 90° ie until the axis of the level passes over the third foot screw C,b (Fig 6)

Fig 6



LEVELLING-UP WITH THREE FOOT SCREWS

MBN1747J6

6 Turn the third levelling screw to right or left till the bubble comes to its centre.

7 Bring the telescope back to its original position without reversing the eye piece and object glass ends.

8 Again turn the foot screws uniformly so that the thumbs move either both inwards or outwards until the bubble comes to its centre.

9 Again bring the telescope perpendicular to the third foot screw.

10 Turn the third foot screw till the bubble comes to its centre.

11 Repeat the above process till the bubble remains centre to its run in both positions.

12 Rotate the telescope through 180°

13 Check whether the bubble remains in the centre of its run.

If the bubble remains central in all positions, then the instrument is in adjustment . If not the Instruments needs permanent adjustment.

d To eliminate the parallax

i To focus the eye piece

1 Remove the lid from the telescope

2 Focus the telescope towards the sky or hold piece of white paper in front of the telescope

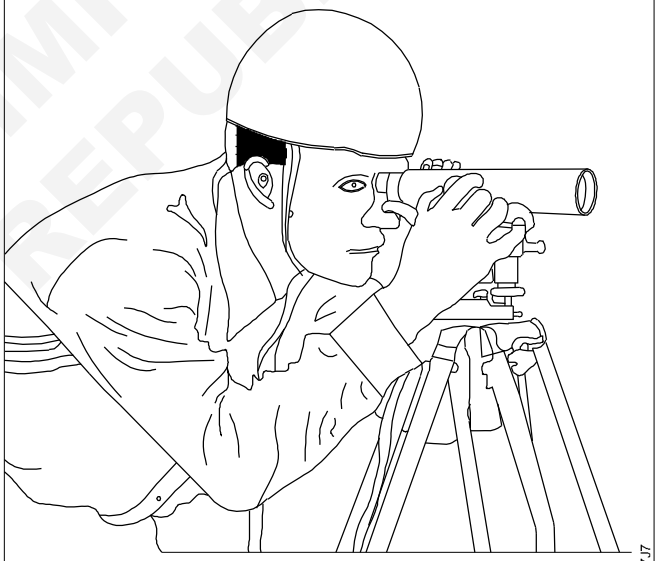
3 Move the eyepiece by turning in or out until the cross hairs are seen sharp and clean.

The cross hairs are seen sharp and clear according to the observer's eye sight.

The focusing of the eye piece when once made need not be changed if only one observer is using the instrument.

ii To focus the object glass (Fig 7)

Fig 7



FOCUSSING THE OBJECT

MBN1747J7

4 Hold the levelling staff at a station.

5 Direct the telescope towards the levelling staff

6 Look through the eye piece and bring the image of the levelling staff.

7 Slightly tap the telescope and bring the image in between the two vertical hairs of the diaphragm.

8 Tighten the clamping screw if provided.

9 Use the focusing screw by turning it and adjust until a clear and sharp image to be obtained.

10 Check the elimination of parallax by moving the eye up and down.

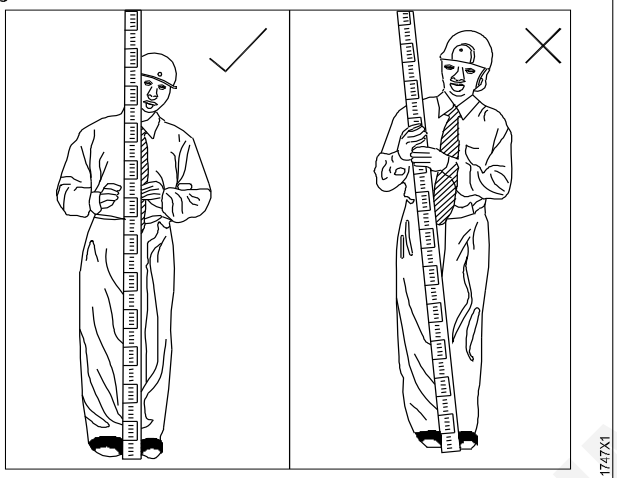
The parallax is completely eliminated only when there is no change in the image of the staff reading while moving the eye up and down when sighting through the eye piece end.

Holding the staff

Objective: This shall help you to
- **hold the staff in a true vertical position.**

Holding the staff (By staffman)

Fig 1



HOLDING OF STAFF

1 Hold the staff at the station truly vertical and upright

2 To do this.

3 Rest the staff in a stable ground

4 Stand behind the staff. (Fig 1)

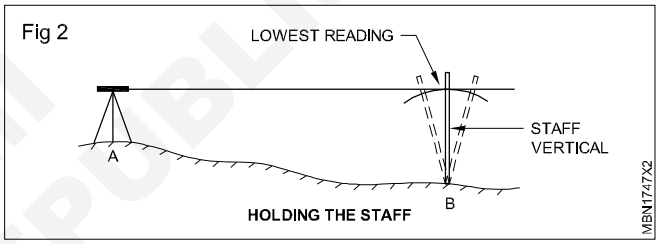
5 Keep the heels together

6 Keep the bottom of the staff in between the toes.

7 Hold the staff between the palms of the hands at the height of the face.

8 Move the staff (B) to the right or left direction to keep it in vertical position with the guidance of the observer.(A) (Fig 2)

Fig 2



HOLDING THE STAFF

Extending the telescopic staff

Objective: This shall help you to
- **extend the staff properly.**

Extending the Telescopic staff

a For extending second length staff

1 Extend the second length of staff until the brass spring catch, rests over the first length of the staff.

2 Check whether the second length exactly held over the first length.

3 Read the staff through the telescope.

b For extending third length staff

1 Extend the third length of the staff, until the brass spring catch rests on the second length and check it.

2 Extend now the second length of the staff until the brass spring catch rests on the first staff and check it.

3 Read the staff through the telescope.

Reading the staff

Objective: This shall help you to
- **observe the graduation of the staff in three digits and hand signals.**

1 Setup and level the instrument

2 Hold the staff vertically on the staff station.

3 Direct the telescope towards the staff.

4 Bring the vertical hair of the diaphragm in the middle of the staff

5 Clamp the tangent screw

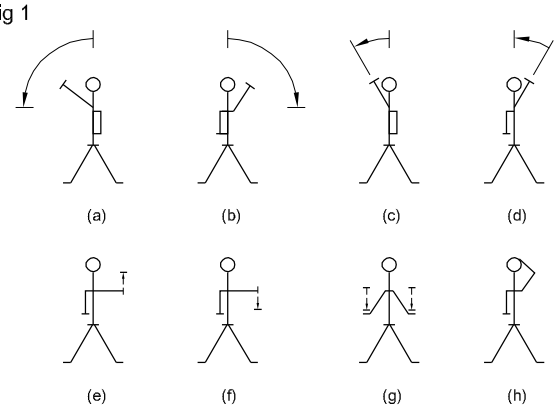
6 sight through the telescope check whether the staff sloping forward or inward and adjust the staff upright in vertical position by using signals.

Hand signals (Fig 1)

	Signal	Message
(a)	Movement of left arm over 90°	Move to my left
(b)	Movement of right arm over 90°	Move to my right
(c)	Movement of left arm over 30°	Move top of staff to my left
(d)	Movement of right arm over 30°	Move top of staff to my right
(e)	Extension of arm horizontally and moving hand upwards	Raise height peg or staff
(f)	Extension of arm horizontally and moving hand downwards	Lower height peg or staff
(g)	Extension of both arms and slightly thrusting downwards	Establish the position
(h)	Extension of arms and placement of hand on top of head.	Return to me

7 Check the bubble is in central. If not centre the bubble using the foot screw nearby in line with the telescope.

Fig 1



HAND SIGNALS

8 Note the reading against horizontal cross hair appears to cut the staff.

9 First note down the red figure denoting metre numerals the left of the staff.

10 Secondly note down black figure denoting the minimum decimetre reading.

11 Finally count the spaces from minimum to maximum graduated as centimetres and millimetres as the horizontal cross haircuts the staff.

The graduations are marked erect in the staff. While looking through the telescope the staff should be seen in inverted position. Hence the staff should be read from above to downwards.

Booking and reduction of levels

Objective: This shall help you to
- **book the readings in two different methods.**

Book the readings in field book

1 For five stations including bench mark say A,B,C and D from a single instrument position.

2 Observer should setup and level the instrument.

3 Hold the staff vertically on the known bench mark.

4 Take the first staff reading known as backs right.

5 Enter the above reading in the first horizontal line under the Back sight column (x)

6 Enter the reduced level of the known B.M in the same horizontal column under the Reduced Level column

7 Staff man should move and hold the staff in the next station at A.

8 Take the reading on the staff as inter sight.

9 Enter the above reading in the second horizontal line under the Inter sight column (x1)

10 Again staff man should move and hold the staff at B.

11 Take the reading as inter right.

12 Enter the above reading in the third horizontal line under I.S column (x2)

13 Again staffman should move and hold the staff at 'C'

14 Take the reading as another I.S

15 Enter the above reading in the fourth horizontal line under I.S column (x3)

16`Finally staffman should move and hold the staff at station 'D'

17`Take the reading as fore sight.

18 Enter the above reading in the fifth horizontal line under the fore sight column(x4)

(a) Height of collimation method

B.S	I.S	F.S	H.C	R.L	Remarks
X					B.M
	x1				Station A
	x2				Station B
	x3				Station C
		x4			Station D

Arithmetical check

The difference between the back sight reading and fore sight reading must be equal to the difference in elevation between the last reduced level and first reduced level.

i.e. B.S - F.S = L.R.L - F.R.L

(b) Rise and fall method

B.S	I.S	F.S	Rise	Fall	R.L	Remarks
x						B.M
	x1					Station A
	x2					Station B
	x3					Station C
		x4				Station D

Arithmetical check

The difference between the backsight and fore sight reading must be equal to the difference between the sum of rise and sum of fall and also equal to the difference between last Reduced level and First Reduced Level.

i.e. B.S - F.S = ∑ Rise - ∑ Fall = L.R.L - F.R.L

A Reduction of level: By height of collimation method (for having single instrument position)

Objectives: This shall help you to
- **record readings in field book**
- **find the height of instrument**
- **find the reduced level of station points.**

Sl.No.	B.S	I.S	F.S	H.C	R.L	Remarks
1	1.260			101.260	100.000	B.M
2		0.965			100.295	Station A
3		1.555			99.705	Station B
4		2.030			99.230	Station C
5			2.270		98.990	Station D
	1.260				2.270	

The reduction of levels in the height of collimation method is explained with an example of the above readings given below:

Add back sight reading (1.260) with the R.L of B.M 100.000 to find the height of instrument. (H.I)

Example

Height of instrument = R.L of B.M + B.S

= 100.000 + 1.260 = 101.260

- Enter the H.I (101.260) under the height of collimation (H.C) column in the same line against B.S.
- Subtract the first inter sight reading (0.965) from the H.I (101.260) to find the R.L of station A.

Step 1

R.L of station 'A' = H.I - I.S

= 101.260 - 0.965 = 100.295

- Enter the R.L of station A 100.295 under the R.L column in the same line against the first inter sight reading.
- Find the R.Ls of the subsequent stations B,C and D, by subtracting the inter sight readings of 'B' (1.555), 'C' (2.030) and fore sight reading (2.270) from the same H.I.

Step 2

R.L of station B = 101.260 - 1.555 = 99.705

R.L is station C = 101.260 - 2.030 = 99.230

R.L of station D = 101.260 - 2.270 = 98.990

- Enter all the above calculated R.L of stations B,C and D under the R.L column in the respective lines against stations B,C and D.

Arithmetical check

- Find the difference between B.S reading and F.S reading.

- Find the difference between last reduced level (L.R.L) and first reduced level. (F.R.L)

Step 3

B.S - F.S = 1.260 - 2.270 = -1.010

L.R.L - F.R.L = 98.990 - 100.000 = (-)1.010

i.e. B.S - F.S = L.R.L - F.R.L = -1.010

- Check whether the difference between B.S and F.S must be equal to the difference between L.R.L and F.R.L.

B Reduction of level : (By Rise and Fall system)

Objectives : This shall help you to
- **compare each point with the preceding point to find rise or fall**
- **check the inter sight readings also.**

	Back sight	Inter sight	Fore sight	Rise	Fall	Reduced level	Remarks
1	1.260					100.000	B.M
2		0.965		0.295		100.295	Station 'A'
3		1.555			0.590	99.705	Station 'B'
4		2.030			0.475	99.230	Station 'C'
5			2.270		0.240	98.990	Station 'D'
	1.260		2.270		0.295	1.305	

The reduction of levels in the rise and fall system is explained with an example of the above readings given below;

- Compare and find the difference between the reading of bench mark (B.M) (1.260) and the successive inter sight (I.S) reading 0.965.

Step 1

B.S reading on B.M - Inter sight reading = 1.260 - 0.965
= 0.295

- Enter the above calculated value (0.295) under the rise column because it comes as a positive value in the horizontal line against station 'A'.
- Compare and find the difference between the successive stations A(0.965) and B(1.555).

Step 2

Reading on station 'A' - Reading on station 'B'

= 0.965 - 1.555 = -0.590

- Enter the above calculated value (-0.590) under the fall column as it comes as a negative value in the line against station 'B'.
- Compare and find the differences between the successive stations 'B' and 'C' and 'C' and 'D'.

Step 3

Reading on station 'B' - Reading on station 'C'

= 1.555 - 2.030 = (-)0.475

Reading on station 'C' - Reading on station 'D'

= 2.030 - 2.270 = (-)0.240

- Enter the above values under fall column as both comes in negative values in the respective horizontal lines against station 'C' and 'D'.
- Add the value of rise (0.295) of the station 'A' with the R.L of B.M (100.000) to find the R.L of station 'A'.

Step 4

R.L of B.M + Rise in station 'A'

= 100.000 + 0.295 = 100.295

- Enter the above calculated value under the R.L column in the line against station 'A'.
- Subtract the value of fall (0.590) at the station 'B' from the previous R.L of station 'A' (100.295).

Step 5

R.L of station 'A' - Value of fall at station 'B'

= 100.295 - 0.590 = 99.705

- Enter the above calculated value under the R.L column in the line against station 'B'.
- Continue the above process to find the R.L of stations 'C' and 'D' by subtracting the fall values at 'C' and 'D' from the R.Ls of station 'B' and 'C'.
- Enter the values in the respective column.

Arithmetical check

- Find the difference between B.S and F.S.
- Find the sum of Rise and sum of Fall and find the difference between them.
- Find the difference between the L.R.L and F.R.L.

Example

B.S reading - F.S reading = 1.260 - 2.270 = (-)1.010

Sum of Rise - Sum of Fall = 0.295 - 1.305 = (-)1.010

Last R.L - First R.L = 98.990 - 100.000 = (-)1.010

Check whether difference between B.S and F.S must be equal to the difference between sum of Rise and sum of Fall and also equal to the difference between Last Reduced Level and First Reduced Level.

Check

B.S - F.S = $\sum$ Rise - $\sum$ Fall = L.R.L - F.R.L

(-)1.010 = (-)1.010 = (-)1.010

— — — — — — — —

Layout drainage to required gradients with the help of dumpy level and / or boning rod and laying its surface with bricks

Objectives : At the end of this exercise you shall be able to
- **setout drainage gradients falls by dumpy level**
- **setout fall in drainage pipe**
- **setout invert level**
- **sewer on a sloping site.**

Requirements

Tools

- Dumpy level with Tripod - 1 No.
- Telescopic staff - 1 No.

Equipments

- Levelling field Book - 1 No.

PROCEDURE

TASK1: **Setout drainage gradients falls by dumpy level**

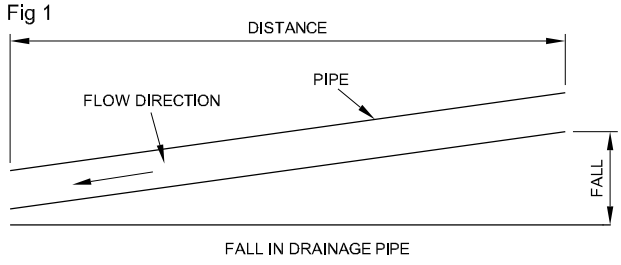
1 Select the instrument position between two station
2 Setup the instrument .
3 Observe the readings.
4 Enter the reading in a field Book.
5 Direct the telescope towards previous station and focus it again.
6 Send the staffman to another station and observe the readings.
7 Reduce the levels and calculate the reduced level of the all stations.
8 Apply arithmetical check.

— — — — — — —

TASK 2: **Setout fall in drainage pipe**

1 Fix the normal gradient from 1 in 40 to 1 in 110.
2 Gradient = Fall / Distance.
3 Take the slope of distance between sections of pipe (Fig 1).

Fig 1



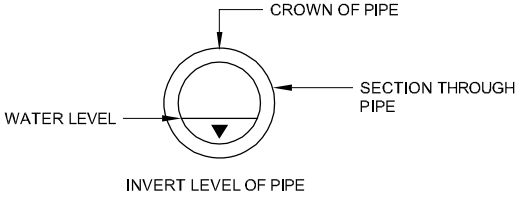
FALL IN DRAINAGE PIPE

— — — — — — — —

TASK 3: **Setout invert level**

1 Take the level from the bottom of the inside of the pipe (Fig 2).
2 Take the level from the crown of a pipe.

Fig 2



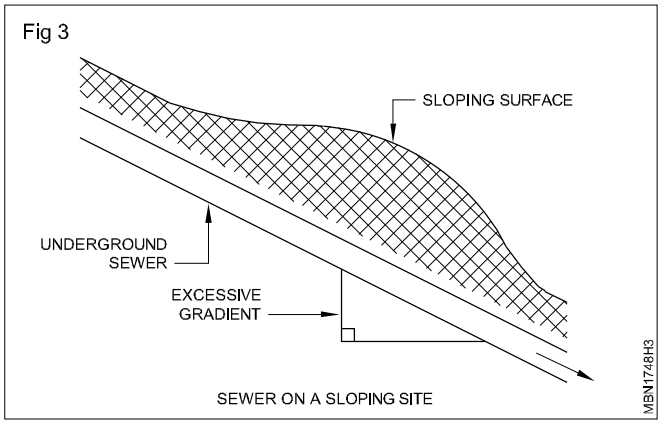
INVERT LEVEL OF PIPE

TASK 4: **Sewer on a sloping sit**

1 Take the level from different paints on the sloping site (Fig 3).

2 Mark the excessive gradient.

Fig 3



Practice to lay concrete foundation for drainage pipes and joint check the alignment

Objective: At the end of this exercise you shall be able to
- **lay underground pipes sewage, water pipe.**

Requirements

Tools

- Crow bar1.5 m - 1 No.
- Spade - 1 No.
- Measuring tape 15 m - 1 No.
- Mortar pan - 1 No.
- Trowel 25 cm long - 1 No.
- Die-set - as reqd.
- Pipe cutter - as reqd.
- Scriber - as reqd.
- Hacksaw frame with blade - as reqd.
- Steel rule - as reqd.
- Steel tape - as reqd.
- Hammer - as reqd.
- Bench vice - as reqd.
- Pipe wrench - as reqd.
- Try square - 2 Nos.

Materials

- Concrete - as reqd.
- Pipe - 6 Nos.
- Rails - 2 Nos.
- Boning rod - 2 Nos.
- Peg - 4 Nos.
- Bracing - 4 Nos.
- Cement mortar - as reqd.
- Bend - as reqd.
- Water - as reqd.
- Vertical pipe - as reqd.
- Gasket - 2 Nos.
- Cement - as reqd.
- Sand - as reqd.
- Aggregate - as reqd.
- G.I pipe - as reqd.
- Chalk - as reqd.
- Paper - as reqd.
- oil - as reqd.
- P.V.C pipe - as reqd.

PROCEDURE

TASK 1: **Lay under ground pipe (sewage, water pipe)**

1 Excavate the trench after marking the centre line of pipe layout - The depth and width are to be as per standard.

2 Lay the bed concrete.

3 Lay the pipe after checking for visible defects.

4 Joint the pipe - close the end after days work.

5 Test the joints.

6 Lay the concrete as per standard.

7 Refill the trench.

— — — — — — — —

Skill sequence

Excavation of trench for sewer line

Objective: This shall help you to
- **excavate trench for sewer lines.**

Mark the width of the trench on ground with chalk powder.

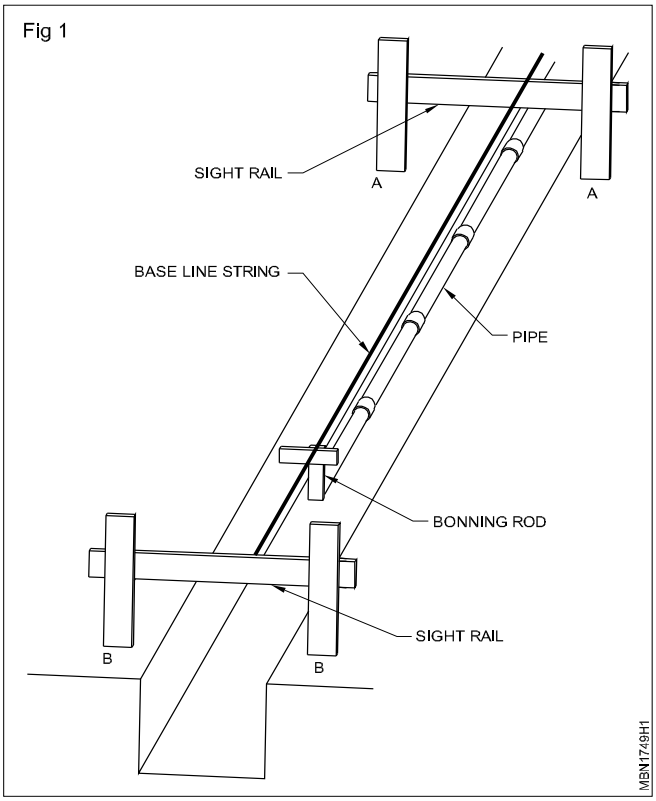
Drive two pegs on the side of trench starting point at a distance of 600mm from trench mark at A.

Mark level on both pegs using water level. Fix a sight rail at mark. Fig.1.

Calculate the required slope at the end of trench.

Fix two more pegs at end as per earlier procedure at B.

Mark the level required considering the slope.

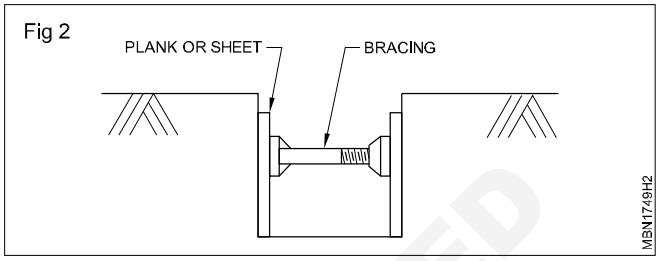


Fix a straight rail at mark.

Tie a string from sight rail A to B tightly.

Check the bottom level of trench using a boning rod (level of trench to be exactly equal from string)

Precautions: In case of loose soil trenches are to be shored Fig.2. Necessary barricades and red light indication to be provided.



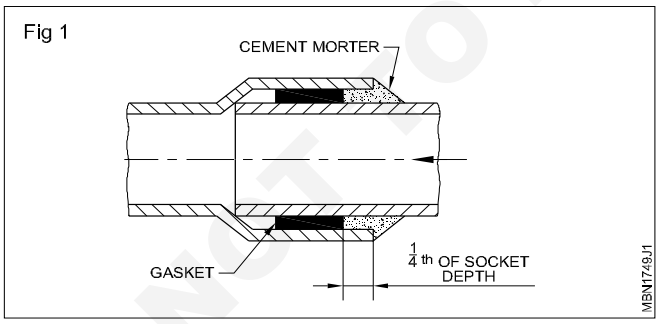
Joints in stone ware pipe

Objective: This shall help you to
- **joint stone ware pipe.**

1 Clean the out side of spigot end and inside of socket.

2 Place tarred gasket of hemp yarn soaked in thick cement slurry around the spigot end.Fig.1.

3 Slip the spigot end well into socket end of pipe previously laid.



Socket end to face up stream.

4 Adjust the pipe alignment.

5 Check the gasket tightly hemp so as to fill not more than 1/4th of the total depth of the socket.

6 Fill the reminder of socket with stiff mixture of cement mortar 1:1 (1 cement : 1 fine sand).

7 Form a fillet round the joint with a trowel at 45° angle.

8 Remove foreign materials from inside pipe.

9 Cure the joint for 7 days.

Test the pipe joints

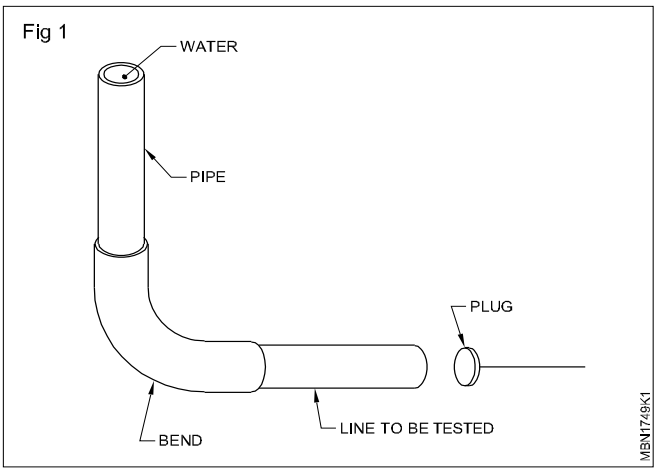
Objective: This shall help you to
- **test the joints.**

1 Plug the lower end of the drain and ends of connections if any.

2 Fill the system with water.Fig.1.

3 Join a knuckle bend temporary at top end.

4 Join a vertical pipe so as to provide required test height i.e 2.5m head at highest point of section under test.



5 Fill this pipe also with water.

6 Check for leakage.

7 Rectify the leakage or sweating if any.

8 Re-test.

Refill the trench

Objective: This shall help you to
- **refill the trench if not bedded in concrete.**

1 Pack refill material by hand under and around the pipe.

2 Ram with a shovel and light tamper.

3 Continue upto 600mm above top of pipe.
(Dont tamp with in 150mm of top of pipe.)

4 Refill the balance area.

Lay the cement concrete

Objective: This shall help you to
- **lay concrete to stoneware pipe.**

1 Ram the bottom of trench.

2 Water the rамed area.

3 Mark the height of bedding.Fig.1.

4 Lay concrete.

5 Lay the pipe and joint.

6 Lay the concrete upto the haunch of pipe.

7 Finish with mortar.

8 Prepare two template of the required shape as per drawing.

9 Fix the template at two ends.

10 Put concrete in line with template shape.

11 Finish the surface neatly.

12 Cure it.

W = D + X

Where

D - is the external diameter of the pipe.

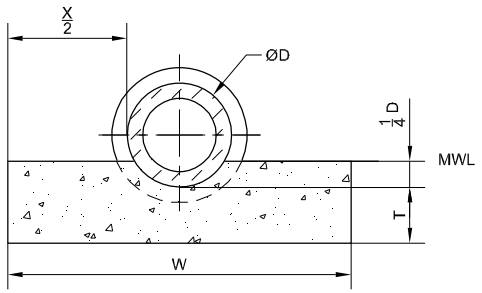
X - 300mm for trench depth of 1200mm,

400mm for trench depth more than 1200mm

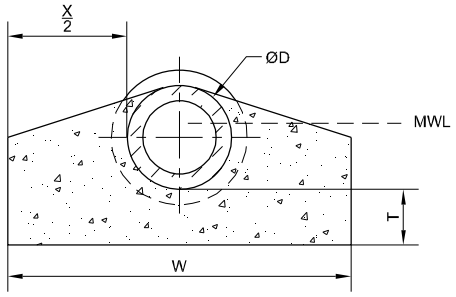
T - 100mm for pipes under 150mm, 1/4th internal diameter subject to a minimum of 150mm and maximum of 300mm for pipes more than 150mm

MWL - Maximum water level

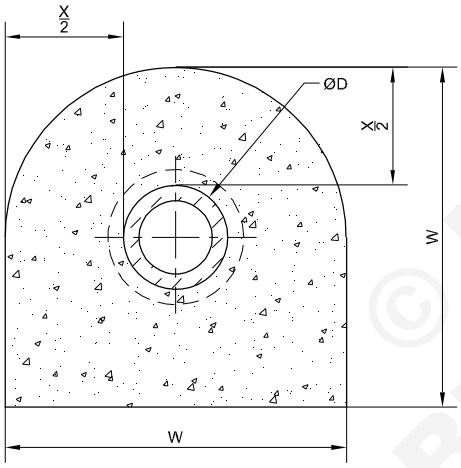
Fig 1



CONCRETE BEDDING



CONCRETE UPTO HAUNCHES



CONCRETE ALROUND

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GI pipe cutting

Objectives : At the end of the exercise you shall be able to
- **measure the G.I pipe**
- **mark the G.I pipe**
- **cut the G.I pipe**

Measure the required length of pipe with scriber and try square.(Fig 1)

Roll the paper on pipe scribed area.

Shade with rolled paper by Marker (or) Chalk.

Hold the pipe in a pipe vice.

Cut the required length of pipe.

Remove the burrs from inside the pipe by file.

Chamber out side.

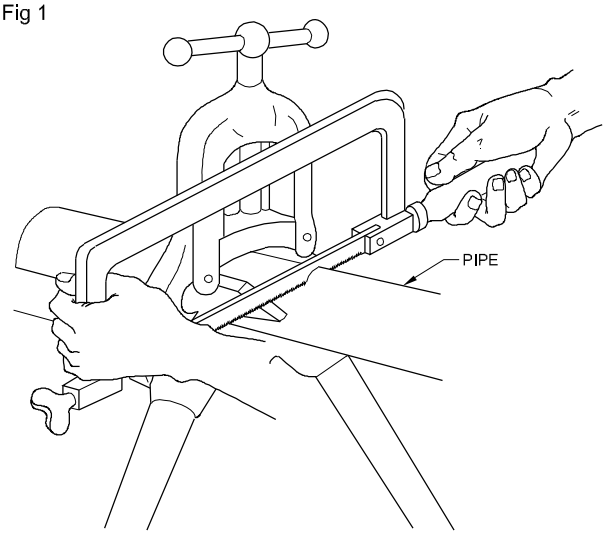
Safety

Use proper tools

Hold the pipe in a pipe vice firmly

Use water coolant on hacks awing.

Fig 1



Cutting PVC pipe

Objectives : At the end of this exercise you shall be able to
- **hold PVC pipe in pipe vice**
- **mark the required length in PVC pipe with paper, tape and pencil**
- **step cut PVC pipe for depth of 10, 15, 20, 25, 30, 35, 40, 45mm with hacksaw**
- **cut the PVC pipe at 45° with the hacksaw.**

TASK 1: **Cutting PVC pipe. (Fig 1)**

Hold PVC pipe in pipe vice tightly.

Mark the required lengths as per drawing shown in figure.

Step cut PVC pipe for depth of 5, 10, 15, 20, 25, 30, 35 40, 45, 50 mm.

Cut the PVC pipe with hacksaw.

Holding PVC pipe in a pipe vice (S.S.1)

Marking the required length (S.S. 2)

Cutting of PVC pipe

Mark the place of cutting. (S.S.2)

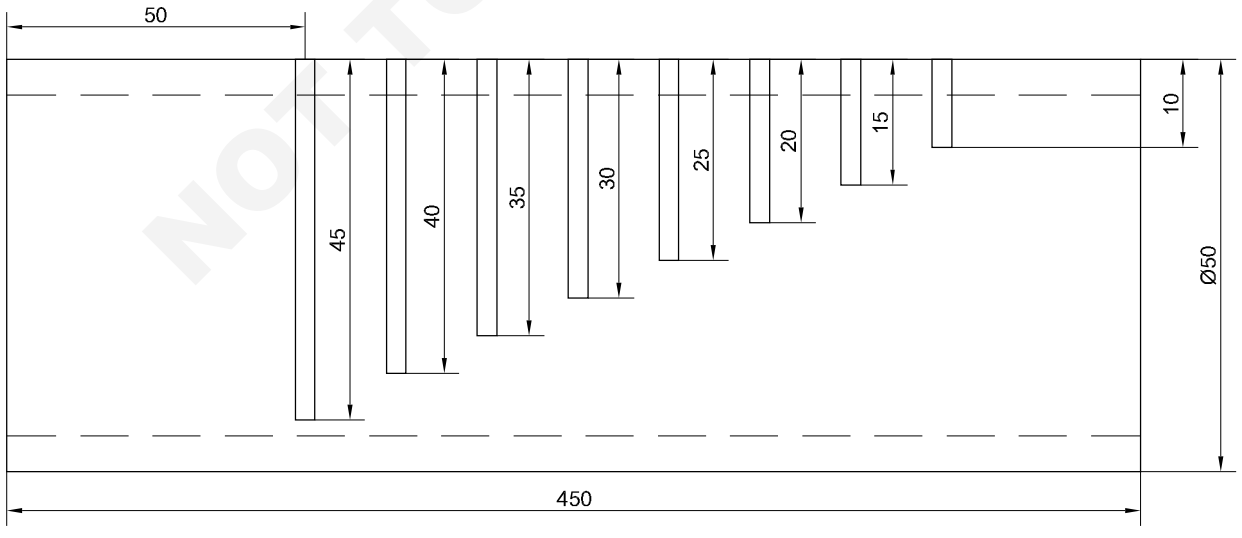
Fix fine tools blade in hacksaw.

Hold hacksaw handle in right hand.

Hold hacksaw frame in left hand.

Move the blade to and fro on the mark @ 40 strokes per minutes for full length of blade.

Fig 1



P.V.C.PIPE CUTTING

Covering of drain pipe with concrete as per P.W.D specification

Objectives: At the end of the exercise you shall be able to
- **prepare material for laying of drainage pipes**
- **specify the lay area**
- **dig the trench and line the trench**
- **install the pipe and connect drainage lines**
- **refilling the trench.**

Requirements

Tools/Instruments

• Plumber tool kit	- 1 No.
• Masonary tool kit	- 1 No.
• Crow bar	- 1 No.

Machines/Equipment

• Trench rail	- as reqd.
• Bonning rod	- as reqd.

Materials

• Drainage pipe PVC (or) cast iron	- as reqd.
• Fittings	- as reqd.
• Cement mortar	- as reqd.
• Cement solvent	- as reqd.

PROCEDURE

TASK 1: **Decide the Route**

The route of the pipe should be as direct as possible if draining a particular point or can meander widely if a general area needs to be drained.

— — — — — — — —

TASK 2: **Decide on the Pipe**

For draining a particular point you might need a closed pipe so that water goes in at one end and comes out at the other. Closed pipe can come in flexible rolls several yards long with all the fittings required to join as many lengths as necessary. For draining a general area you will need pipes that are open. These pipes usually have a row of holes down the length of the pipe and do not usually come except as individual short pipe sections.

— — — — — — — —

TASK 3: **Dig the Trench**

The drainage pipe needs to be set in a trench. Dig the trench along the route you have already decided upon. The trench needs to be 20cm to 25 cm wide and about 45 cm deep. When you cut the sod to start the trench, retain it to use to cover the finished job. It is important that the bottom of the trench be firm and always sloping down in the direction of the required drainage. The contours of the land might take the trench deeper or shallower at points along its length but the bottom must be evenly down graded.

— — — — — — — —

TASK 4: **Line the Trench**

Line the trench with a couple of inches of gravel and level it off. If you are using open pipes line the trench over the gravel with filter fabric.

— — — — — — — —

TASK 5: **Install the Pipes**

Reels of closed pipe can be simply unrolled into the trench. If there is a drain that it needs to be connected to at the beginning of the trench, it should be connected.

Open pipes need to be laid along the bottom of the trench. The holes in the pipe should be facing downwards and the filter fabric should be wrapped round the pipe as it progresses. The filter fabric will ensure that the pipe does not get blocked by too many large pieces of debris being washed into it.

— — — — — — — —

TASK 6: **Re-fill the Trench**

Once all of the pipe has been laid and you have confirmed that there is a steady down grade for the whole length of the pipe, you should fill the trench. Try not to disturb the pipes, especially take care not to disturb the filter fabric.

— — — — — — — —

TASK 7: **Replace the Sod**

To give a neat finish, replace the sod that you cut when you started digging the trench.

If you have doubts about being able to maintain a down grade it is sensible to call in a specialist to dig your trench.

— — — — — — — —

Laying out foundation concrete and construction of man hole

Objectives: At the end of this exercise you shall be able to
- **set out the man hole**
- **lay brick courses with bonding.**

Requirements

Tools

- Mortar pan - 1 No.
- Mason's Trowel (25 cm) - 1 No.
- Mixing tools - 1 No.
- Steel square (75 cm X 50cm) - 1 No.
- Steel tape 3m - 1 No.
- Spirit level (15 cm) - 1 No.
- Straight edge (1.5m) - 1 No.
- Line and pins - as reqd.
- Brick hammer 1½ lbs - 1 No.
- Man hole ϕ 50cm - 1 No.
- Ball of nylon thread - as reqd.

Materials

- Bricks 20 x 10 x 10 cm - 280 Nos.
- Cement concrete 1.5 x 1.5 x 0.15m - 0.34m^3
- Cement mortar - as reqd.
- RCC Slab 1.2 x 1.2 x 0.1 - 0.14m^3
- Cement - as reqd.
- 8 mm bar - 10 m
- Sand - as reqd.
- Water - as reqd.

PROCEDURE

TASK 1: **Set out the man hole**

1 Draw AB straight line and mark point Q on the line AB

2 From the point Q Draw a line CD as shown in Fig 1

3 Mark 4 bricks length on the line CD and draw line EF perpendicular to the line CD and parallel to AB

4 Draw perpendicular line GH and parallel to the CD

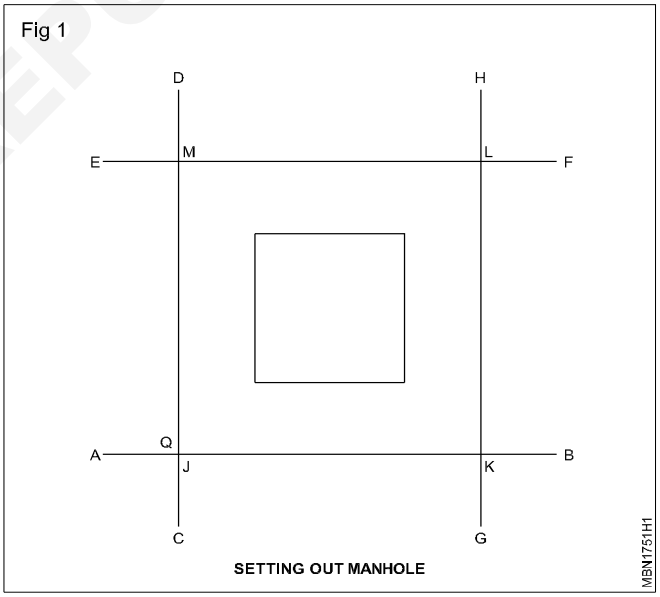
5 Join "jklm" i s the required man hole square

6 Excavate the square man hole as shown in Fig 1 at a depth of 1 metre.

7 Place the base concrete 1:5:10 for the thickness of 15cm and rammed well.

8 Level top surface of the concrete bed with the aid of straight edge.

Fig 1



SETTING OUT MANHOLE

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TASK 2: **Lay brick courses with bonding**

1 Lay dry bricks to suit the benching and dimensions square man hole.

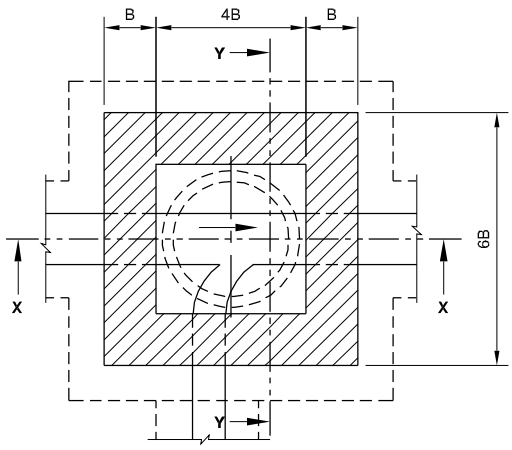
2 Place pipes in the centre of man hole as shown in Fig 2

3 Flush the pipe inside the face of the man hole.

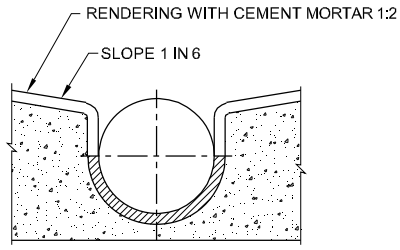
4 Continue brick work with cement mortar until required as shown in(Fig 2)

5 Fill up all the joints inside as well as outside wall.

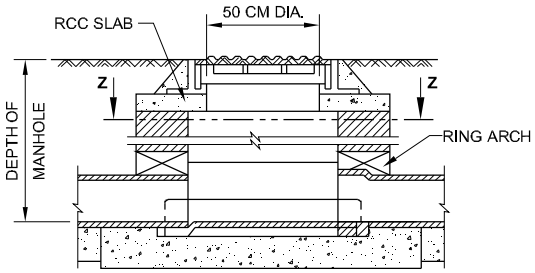
Fig 2



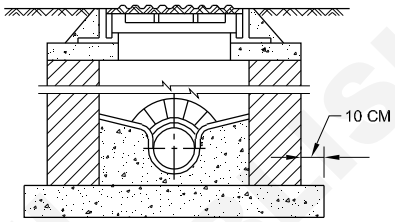
SECTIONAL PLAN AT ZZ



DETAIL OF BENCHING



SECTION XX



SECTION YY

DETAILS OF MANHOLE (DEPTHS 1 M AND BELOW)

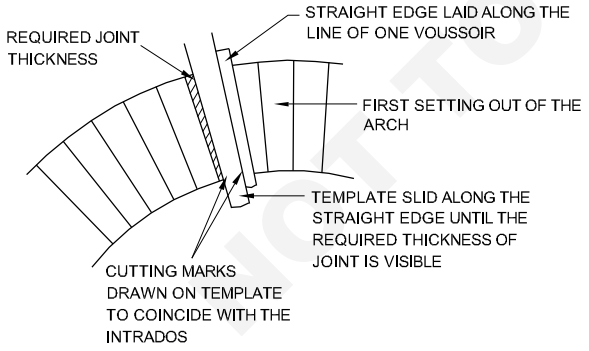
MBN1751H2

Take care no load shall be provided on the pipes placed in the manhole.

All brick work in manhole chambers and shafts shall be carefully laid with bricks in English bond

6 Cut the bricks according to the template (Fig 3)

Fig 3



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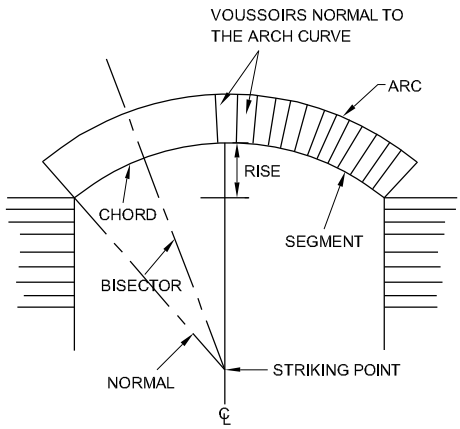
7 Check all the voussoirs joints

The method of construction procedure are similar to the semi circular arch

The skewback should be constructed in bricks by forming an angle of 60^0 as shown in (Fig 4)

Fig 4



MBN1751H4

8 Lay the jointing faces of each brick being well buttered with cement mortar.

The walls of manholes shall be plastered both inside and outside with cement mortar 1:3

Method of providing foot rest and forming of drain and benching

Objectives: At the end of the exercise you shall be able to
- **read drawing according to work spot**
- **excavate laying of cement concrete**
- **laying of wall, laying of benching & concrete**
- **fix of foot rest**
- **plastering of wall.**

Requirements

Tools/Instruments

- Measuring tape - 1 No.
- Spade - 1 No.
- Pick axe - 1 No.
- Mortar pan - 1 No.
- Trowel - 1 No.
- Sprit level - 1 No.
- Mason axe - 1 No.
- Plumb bob - 1 No.
- Thread with nails - 1 No.
- Straight edge - 1 No.
- Water level tube - 1 No.
- Wooden smoother - 1 No.

Equipment/Materials/Components

- Chalk powder - as reqd.
- Cement - as reqd.
- Brick - as reqd.
- Brick gravels - as reqd.
- Aggregate - as reqd.
- River fine grain sand - as reqd.
- C.I.Frame with cover - as reqd.

PROCEDURE

TASK 1: **Providing foot rest and benching in drain**

1 Excavate for the inspection chamber as per drawing true to dimension and level. Read drawing carefully to prepare required size of materials.

2 Lay the concrete as per drawing Fig 1. Prepare cement concrete for base of free chamber proper ratio.(1:5:10)

3 Construct brick work with first class 30cm brick in cement mortar 1:4. Internal wall it must fine smoothness is need.

4 Finish the external joints smooth.

5 Make the joint of pipe and brick work for leak proof.

6 Block the pipe to prevent entry to foreing material.

7 Plaster the inside walls with 12mm thick cement plaster(Cement 1:Coarse sand 3).

8 Provide channel and benching with cement concrete 1:2:4(1 cement : 2 course sand : 4 stone aggregate 20 mm normal size).

9 Render smooth with neat coment(the depth of channel as benching is shall be as per drawing). In the chamber must be provide proper benching.

10 Embed the M.S. foot rests in cement concrete block of 20 x 20 x 10cm of cement concrete 1:3:6.

11 Fix the foot rest 40cm apart projecting 10cm beyond the surface of wall. (only for deep chamber)

12 Paint the foot rest with coal tar.

13 Provide centering for top cover.

14 Fabricate and fix the reinforcement for cover.

15 Fix the cast Iron cover frame.

16 Concrete the top cover.

17 Cure the work.

18 Remove centering and render remove block.

19 Fix man hole cover.

20 Seal the man hole cover with grease.

Safety

1 Don't use damaged tools

2 The inspection chamber and construction for use the good bricks.

3 The inspection chamber and manhole construction of use the mortar accurate ratio.

4 Don’t use more quantity water in the mortar.

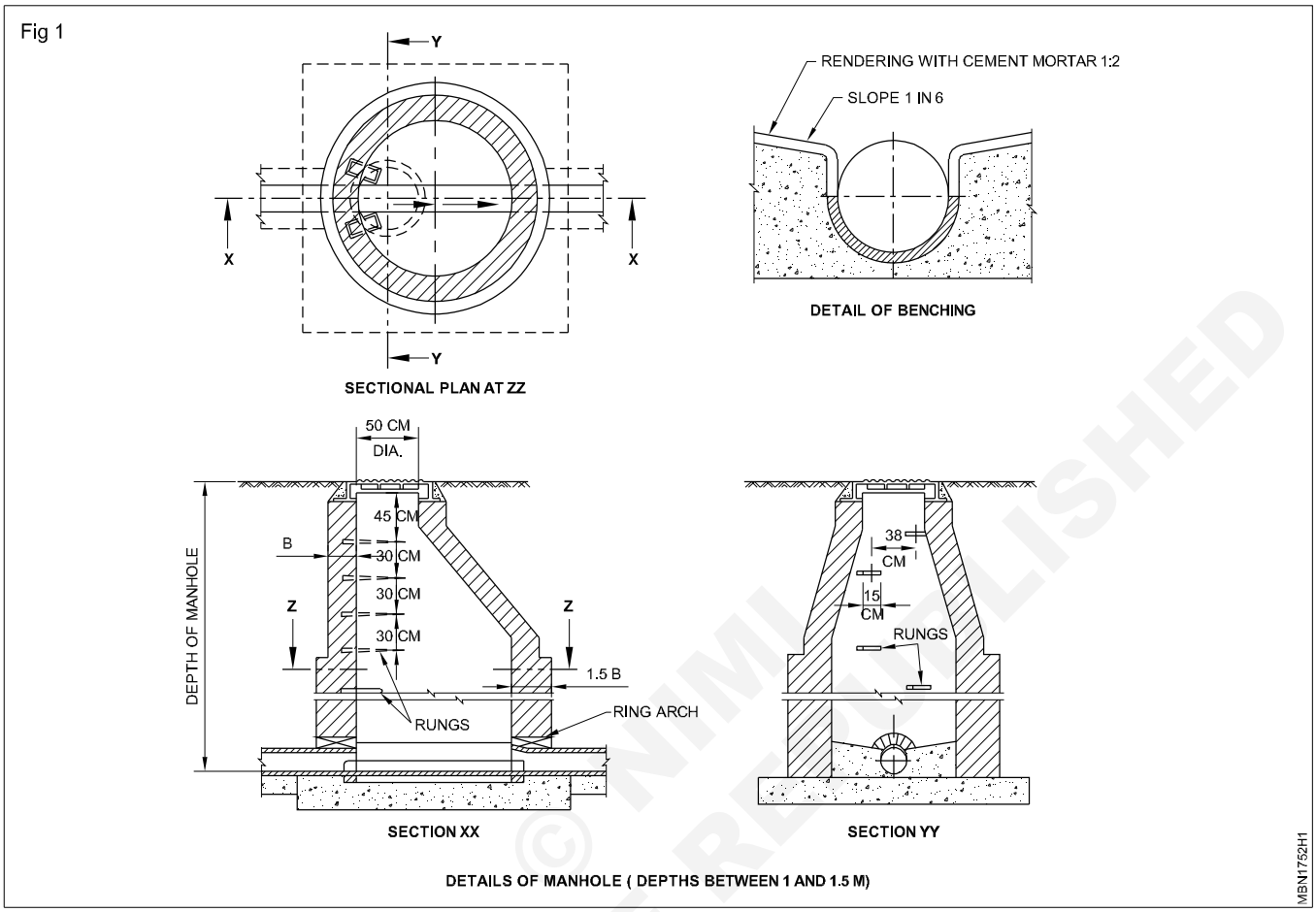
5 The inspection chamber depth/height according to the thickness of wall.

6 Check the slope channel.

7 Use the plumb-bob for vertical straightness

8 The inspection chamber and manhole complete of the dry wall in the plaster.

Fig 1



Construct septic tank conforming PWD norms bonding and water proofing of tank walls, lining field drains with bricks shoring for deep trenches following proper safety precautions

Objectives: At the end of this exercise you shall be able to
- **Set out the septic tank**
- **Lay the cement concrete**
- **Lay brick courses with bonding.**

Requirements

Tools

- Mortar pan - 1 No.
- Mason's trowel (25 cm) - 1 No.
- Mixing tools - 1 No.
- Steel square (75 cm x 50 cm) - 1 No.
- Steel tape 3m - 1 No.
- Spirit level (15 cm) - 1 No
- Straight edge 1.5m - 1 No.
- Line and pins - 1 No.
- Brick hammer 1½ lbs - 1 No.
- Ball of nylon thread - 1 No.
- Plumb bob - 1 No
- Measuring tape 30m - 1 No
- Spade - 1 No
- Crow bar - 1 No

Materials

- Bricks 20x10x10 cm - 3000 Nos
- Cement concret - 3.2m^3
- Cement mortar - 1.8m^3
- R.C.C Slab - 0.93m^3
- Cement - as reqd.
- 8mm bar - as reqd.
- Sand - 1 No.
- Water - as reqd.
- Wooden board 200x40mm - 2 to 4 - as reqd.
- Strut 100x100mm - as reqd.
- Poling boards 200x40 mm

PROCEDURE

TASK 1: **Set out the septic tank**

1 Mark AB straight line and mark point Q on the line AB. From the point Q set a line CD as shown in figure 1.

2 Mark Qm equal to 2.10m.

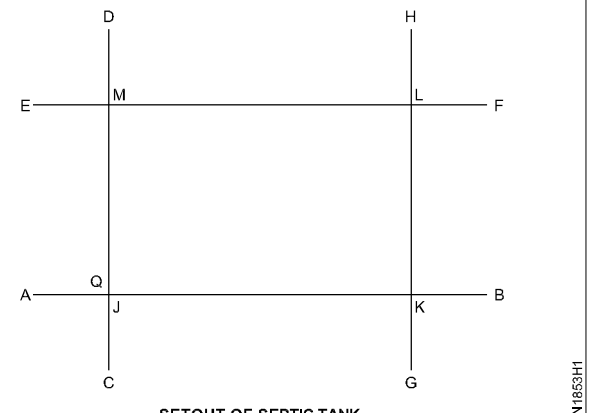
3 Mark JK equal to 5.10m.

4 Mark perpendicular line GH and parallel to CD.

5 Join JKLM is the required septic tank.

6 Excavate the rectangular septic tank as shown in Fig 1 at a depth of 2.75m.

Fig 1



SETOUT OF SEPTIC TANK

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TASK 2: **Lay the cement concrete**.

1 Place the base concrete 1:2:4 for the thickness of 25cm and rammed well. (Fig 2)

2 Level top surface of the concrete bed with slope of 1 in 10.

— — — — — — — —

TASK3: **Lay the brick courses with bonding**

1 Lay the bricks alround wall in english bond in one brick thick with cement mortar 1:4

2 Lay 40mm thick R.C.C Baffle wall, 90cm from inlet end.

3 Kept the inlet stone ware pipe 100mmÆ, above water level

4 Kept the outlet pipe 100mmÆ bottom level of sewage level.

5 Fill 210 all the joints inside of septic tank.

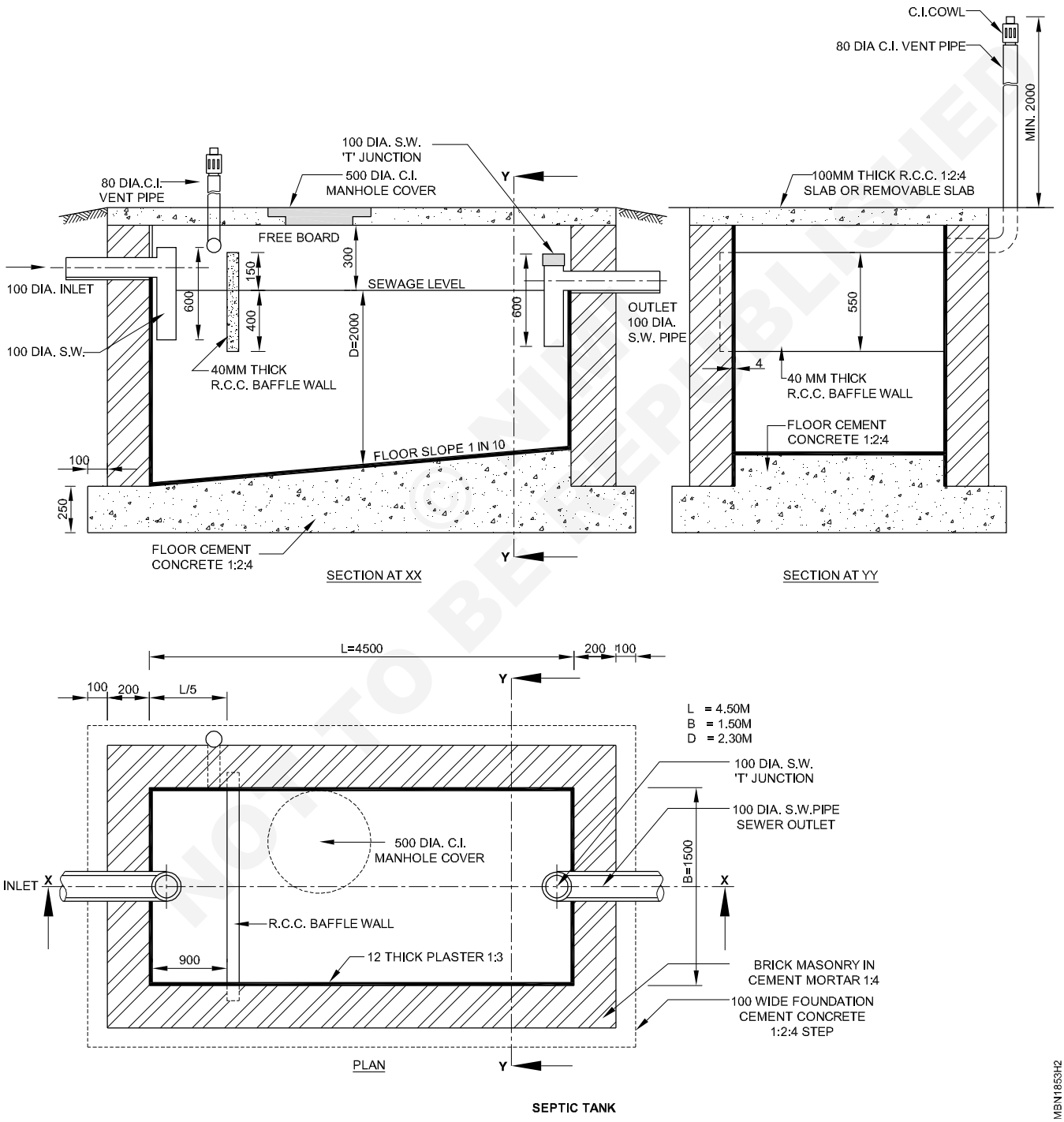
6 Fix 80mm Æ C.I. vent pipe.

7 Kept the vent pipe 200cm above the ground level.

8 Fix the C.I cowl at the top of vent pipe.

9 Lay 10 cm thick R.C.C 1:2:4 slab or removable slab over the septic tank.

Fig 2



Shoring for trenches

Objectives: At the end of this exercise you shall be able to
- **to set out a trenches in firm ground**
- **to set out a trenches Moderately firm ground**
- **to set out a trenches in loose and water logged ground**
- **to set out a deep trench in very loose soil.**

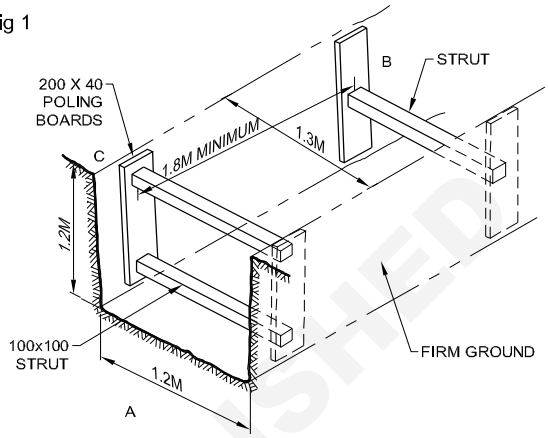
TASK1: **To set out a trenches in firm ground**

1 Excavate the trenches 1.2m x 1.2m and length 2.5m (Fig 1).

2 Fix the poling board the minimum distance of 1.8m c/c. on both sid of trenches.

3 Fix the strut Horizontally to keep the poling vertically.

Fig 1



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TASK 2: **To set out a trench in moderately firm ground**

1 Excavate the trench similar to firm ground soil (Fig 2)

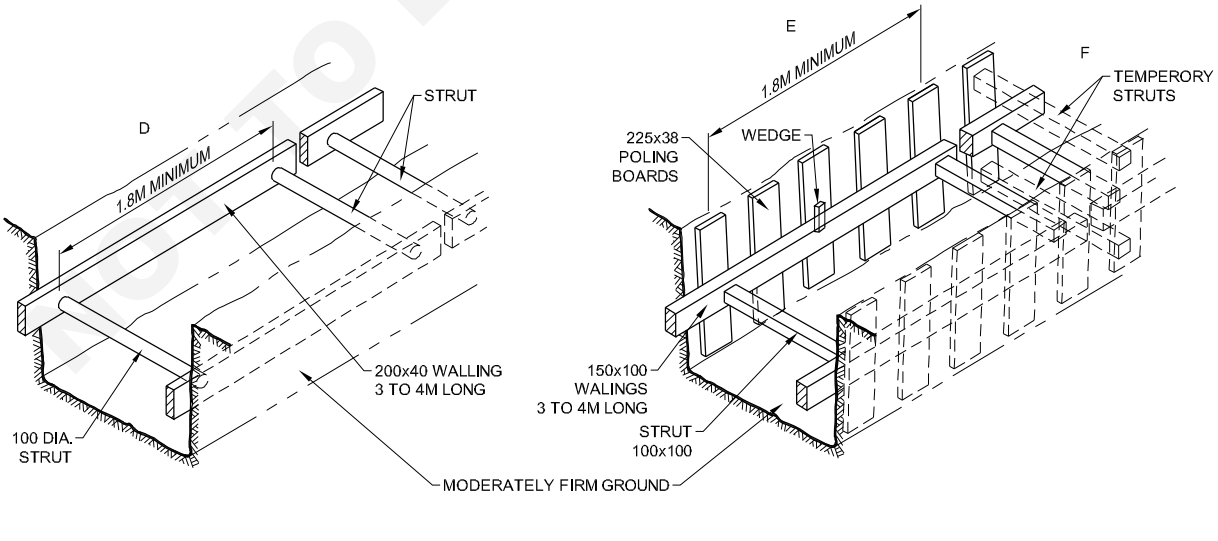
2 Fix the poling board as per the given figure on both side of the trench

3 Fix the waling boards 3 to 4 m length to keep in position of poling board.

4 If necessary, Wedges are insert in between poling board and walings.

5 Fix the strut in between waling board and complete the work.

Fig 2



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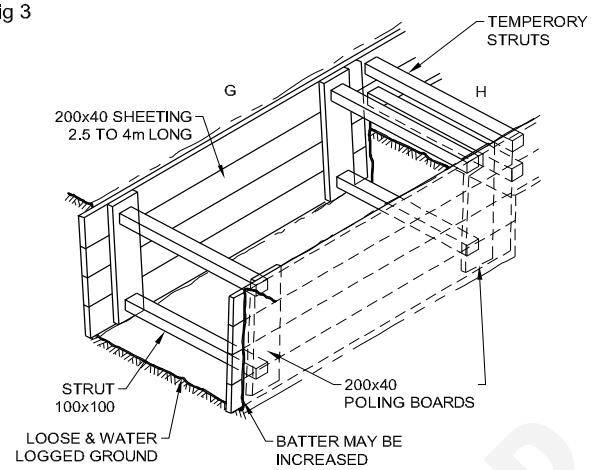
TASK 3: **To set out a trenches in loose and water logged grounds.**

- Excavate a trenches 1.5 m square and 2.5 m length (Fig 3)
- Fix the sheeting of size 20x4 cm and 2.5 to 4m long at the side of the trenches closely on both sides.
- Fix the poling board of size 20x4 cm, 1.8 m c/c on the both sides.
- Provide strut size 10x10 cm at the both ends of sheeting and complete the work.

Fig 3



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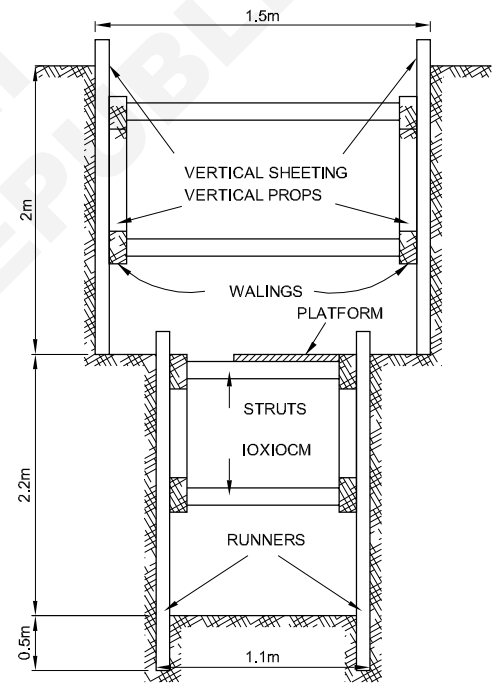
TASK 4: **Set out a deep trench in very loose soil. (Fig 4)**

- Excavate the trench 1.5m x 2.0 m and 3.0 length.
- Fix the vertical Sheeting on either side of trench
- Wailings are fixed on both side of trench.
- Fix the vertical props on both side to support the waling.
- Fix the struts at top and bottom
- Excavate another stage 1.1m and 2.2m deep
- Drive the runners into the ground by drop hammer.
- Provide the strut as shown in Fig 4
- Provide a plat form in between the different stages
- complete the trenches

Fig 4



TIMBERING FOR A TRENCH IN VERY LOOSE SOIL

— — — — — — — —

Fix brackets for wash basin and flushing cistern

Objective: At the end of this exercise you shall be able to
- **install different types of flushing cisterns.**

Requirements

Tools

• Pipe wrench	- 1 No.
• Steel tape	- 1 No.
• Measuring tape	- 1 No.
• Straight edge	- 1 No.
• Bracket	- 1 No.
• Spirit level 15 cm	- 1 No.

Materials

• Cantilever bracket	- 2 Nos.
• Cistern	- 1 No.
• G.I. Pipe 20mm 185 cm long	- 1 No.
• Clamp	- 2 Nos.
• Stop cock	- 1 No.
• Cement mortar	- as reqd.
• Flush pipe	- 1.3 m

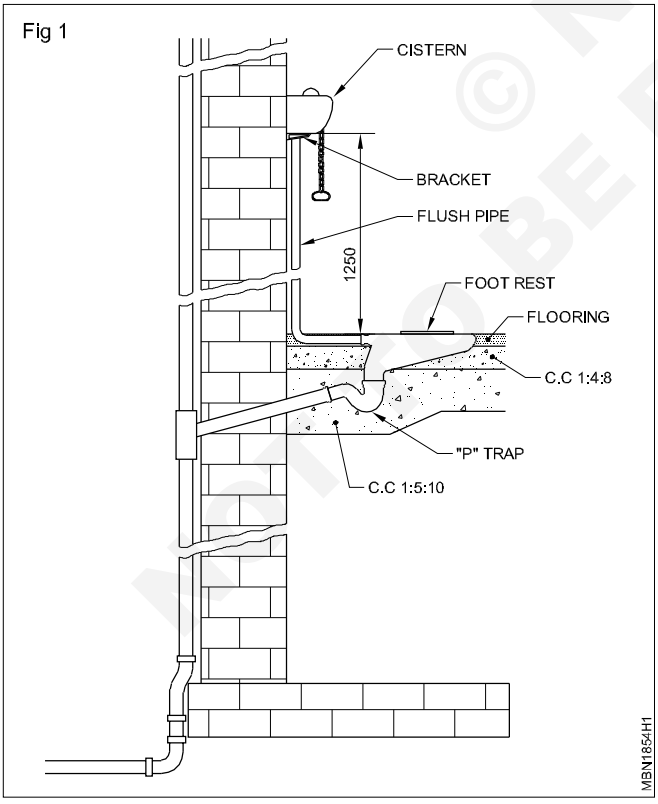
PROCEDURE

TASK 1: **Install different types of flushing cistern**

High level cistern

1 Fix C1 cantilever bracket on wall in cement concrete 1:2:4 of block size 100 x 75 x 150mm at a height on top of bracket 125cm from top of pan. (S.S).Fig.1.

Fig 1



2 Paint the inside cistern with anti corrosive paint.

3 Place the cistern over bracket after it sets properly i.e. after curing.

4 Fix 185cm long G.I pipe of 20mm to the overflow outlet.

5 Fix mosquito proof coupling at the end of overflow pipe.

6 Fix the clamps in wall in cement mortar 1:3 for flush pipe. Connect the outlet of flush pipe to pan with cement mortar 1:3.

7 Fix clamps for the flush pipe.

8 Fix stop cock to supply line.

9 Connect the water supply inlet to flush tank with a flexible pipe using pipe wrench.

10 Check the functioning and leakage after joints are set.

Low level cistern

1 Mark the bottom of low level cistern at 300mm above top of the pan.

2 Keep the bottom of the low level cistern on the marked line.

3 Mark the position of screw hole on wall.

4 Drill hole in wall.

5 Insert wooden plug in the hole.

6 Keep the cistern in position and fix it to wooden plug by means of screws.

7 Connect the cistern to supply line using flexible pipe. Fig.2.

8 Connect the cistern to pan with flush bend.

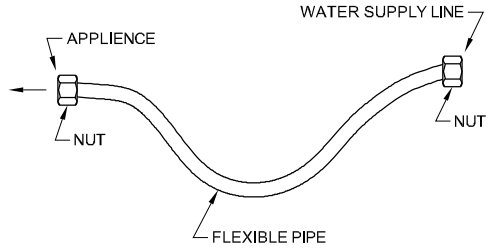
9 Fill the joint in the cement mortar.

10 Check the joint.

11 Open the inlet

12 Check functioning of cistern and leakages.

Fig 2



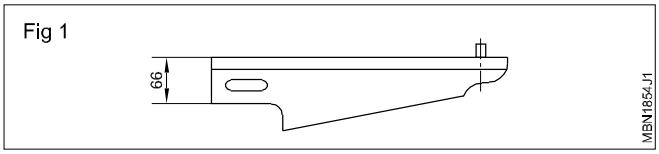
Skill sequence

Fix the brackets for cistern, wash basin, sink etc,

Objective: This shall help you to
- **fix the bracket for cistern, wash basin, sink etc.**

1 Mark the position of bracket on wall with pencil. Fig 1

Fig 1



2 Make chasing in the wall of size so that cement concrete of 50mm on alround can be filled after fixing bracket.

3 Clean the chasing by pouring water.

4 Keep the bracket in position temporary in the chase.

5 Check the level by placing a straight edge on top of bracket. Fig.2 & 3.

Fig 2

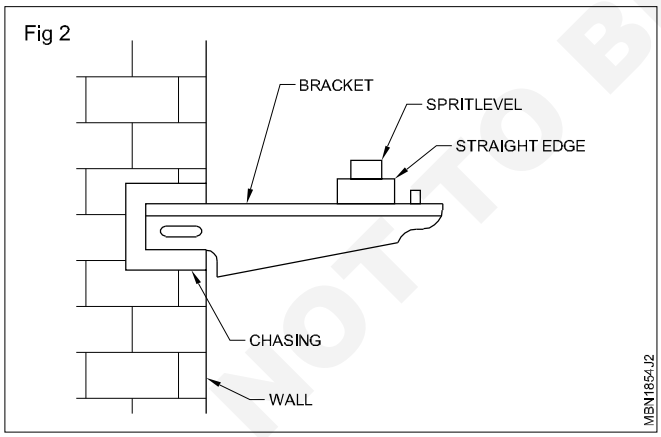
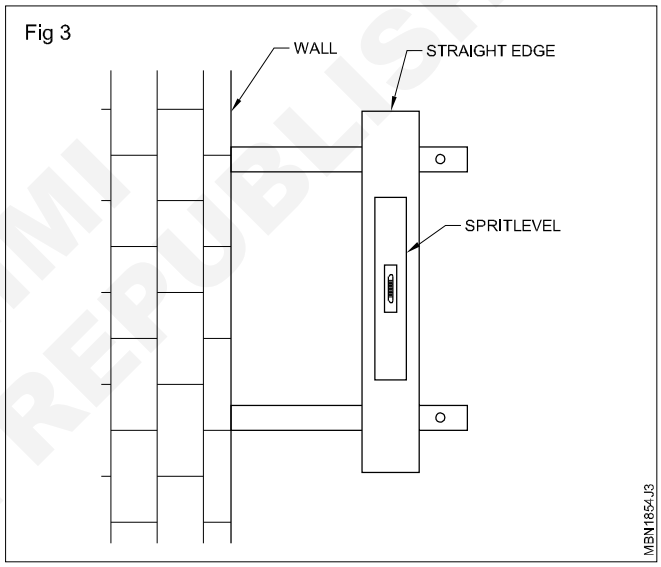


Fig 3



6 Place sprit level on the straight edge.

7 Adjust the height of bracket by lowering or raising so that bubble in spirit level is in centre.

8 Concrete the gap in the chasing with cement concrete 1:2:4.

9 Cure the concrete till it sets.

10 Paint the bracket.

Fix WC pan, kitchen and bathroom traps, sinks, etc. Fixing of vent pipe

Objective: At the end of this exercise you shall be able to
- **install Indian type water closet with foot rests.**

Requirements

Tools

- Mortar pan, Crow bar 1.5m - 1 No.
- Trowel 25 cm long, Spade - 1 No.
- Straight edge 1.5m long - 1 No.
- Spanner, Wrench, Pan, Screw driver - 1 No.
- Measuring Tape - 1 No.
- Spirit level 15 cm, Plumb bob - 1 No.
- Steel square 0.75 x 0.50m - 1 No.
- Line and thread - 1 No.

Materials

- Indian type water closet - 1 No.
- European water closet - 1 No.
- Foot rest, Rubber sheet, Floor trap - as reqd.
- Rubber sheet - 1 No.
- Bolt 6mm 75 mm long - 4 Nos.
- Bracket 100 x 75 x 150mm - 2 Nos.
- Wash basin - 1 No.
- Sink - 1 No.
- PVC Flexible pipe 32-800 mm long - 1 Nos
- Waste fitting 32 mm - 1 No
- Grating - 1 No
- Screws - 4 Nos
- Water - as reqd.
- Bucket, Mug, Sink, Brass Union - 1 No
- PVC Pipe 800 mm long - 1 No
- Cement, Cement Mortar, Sand - as reqd.
- Stone aggregate - 2 boxes
- Anti siphonage pipe - 2 Nos .
- Brick 230 x 110 x 70mm - 120 Nos.
- 8mm of mild steel - 2.8m

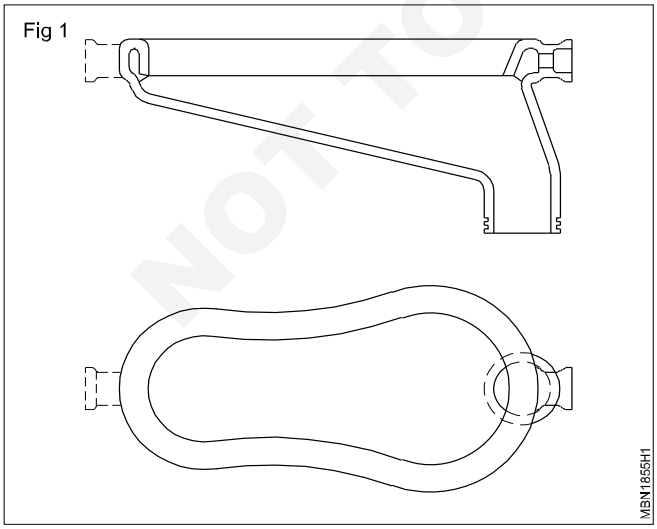
PROCEDURE

TASK 1: **Install Indian type water closet**

1 Mark the position for fixing closet. Keep the centre line of closet at 90^0 to rear wall.

2 Sink the floor to the required depth considering the depth of the closet and trap. Fig.1.(sink area to be water proofed).

Fig 1



3 Check the water seal of P or S trap (50mm) and visible defects.

4 Place the P or S trap in level at required height.

5 Check any visible defects in closet.

6 Joint the closet and trap flush pipe using spun yarn socked in cement paste and cement mortar 1:1 (1 cement, 1 fine sand)

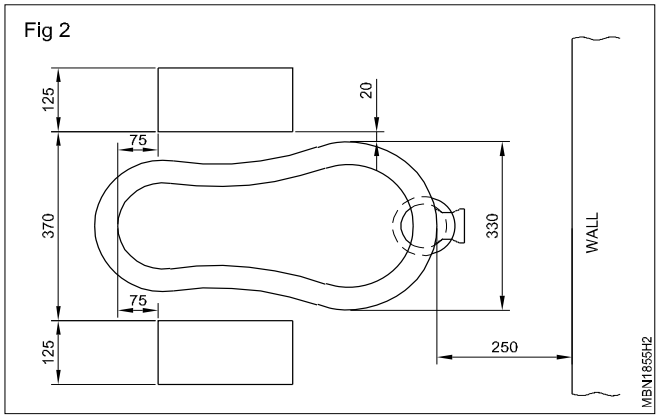
7 Lay cement concrete 1:5:10 (1 cement:5 fine sand:10 graded brick ballast 40mm normal size) in bed and surroundings upto 115mm below the top level of pan.

8 Lay the bed concrete 1:4:8 over the cement concrete 1:5:10.

9 Lay the flooring with slight slope towards the closet.

10 Fix a pair of foot rest in cement motar 1:3 at correct locations as per drawing.Fig.2.

Fig 2



Fixing sanitary appliance - European type water closet

Objective: At the end of this exercise you shall be able to
- **fix the european type water closet.**

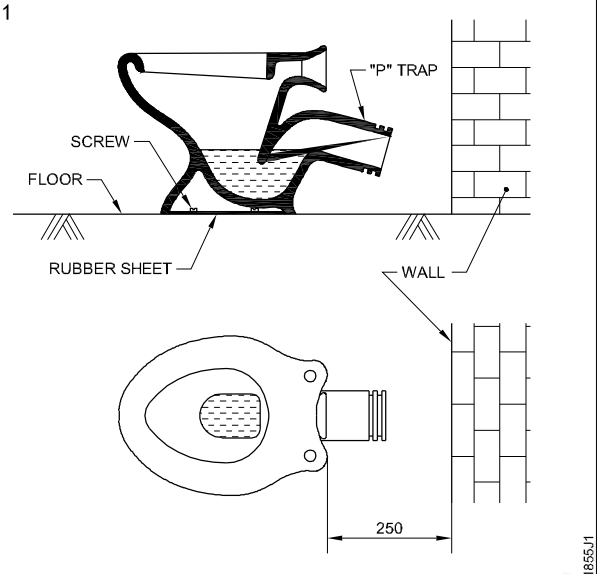
TASK 1: **Fix the european water closet**

1 Complete the flooring work after fixing outlet pipe.

2 Keep the closet at the required position.

3 Mark the bottom area of European type water closet on the floor.Fig.1.

Fig 1



WASH DOWN (EUROPEAN)

4 Mark the screw hole area.Fig.2.

5 Cut rubber sheet to the size of bottom area.

6 Fix 75mm long 6.5mm counter sink bolt on floor.

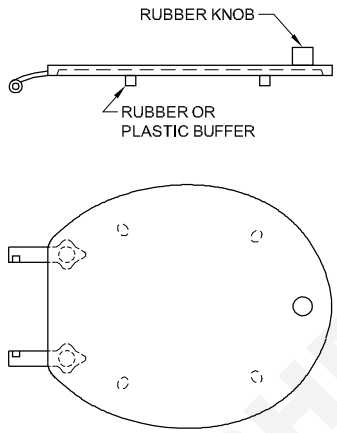
7 Keep the rubber sheet on the marked area.Fig.3.

8 Keep the closet in position.

9 Put the nut and tighten it.

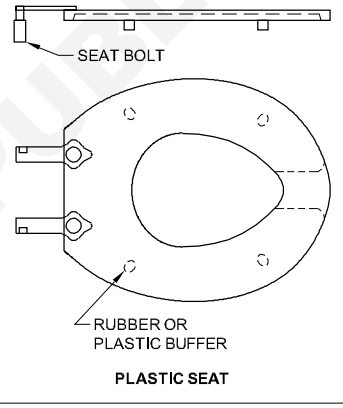
10 Connect the outlet to soil pipe.

Fig 2



PLASTIC COVER

Fig 3



PLASTIC SEAT

11 Fix seat and cover using spanner.

12 Connect to flushing tank.

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Installation of wash basin

Objective: At the end of this exercise you shall be able to
- **install wash basin.**

TASK 1: **Install wash basin**

1 Mark the position of CI bracket so that height of wash basin is at 800mm from floor.Fig.1.

In case it is for children use, fix at lower level as under.

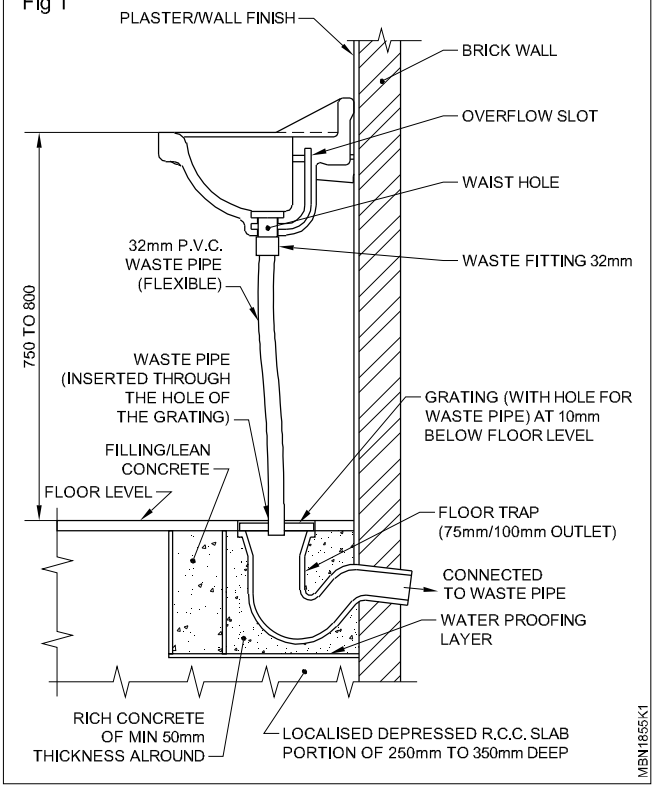
5 - 7 years	-	58cms
7 - 9 years	-	63cms
9 - 11 years	-	68cms

2 Cut chasing for fixing bracket of size 100 x 75 x 150mm.

3 Fix the bracket in cement concrete in the chasing.

4 Cure it.

Fig 1



5 Check the wash basin for any visible crack.

6 Assemble the wash basin with pillar tap, brass waste and union; rubber plug and chain.

7 Keep the wash basin on the bracket.

8 Connect the supply line to pillar tap with flexible pipe.

9 Connect waste pipe.

10 Leave the waste pipe to floor trap, semi circular open drain etc.

11 Make good, the damages on floor/wall etc.

12 Test the functioning and leakages in joints.

13 Check the mirror and shelf for any visible defects.

14 Fix the mirror with help of wooden plug and screw at a height of 120cm from floor.

15 Fix the glass shelf with wooden plug and screw at a height of 110cm from floor.

If wash basins are fixed in a row, 1st and last wash basin to be 40cms away from wall and 75cms (minimum) centre to centre.

Installation of sink

Objective: At the end of this exercise you shall be able to
- **install a sink.**

TASK 1: **Install a sink**

1 Hold sink in position in level. (The height of front edge of sink from the floor level shall be 80cm).Fig.1.

2 Mark the position of bracket.

3 Make a chasing of 100 x 75 x 150mm using chisel etc.

4 Fix CI cantilever bracket in the chasing using cement concrete 1:2:4.

5 Cure the concrete.

6 Check the sink for any visible defects.

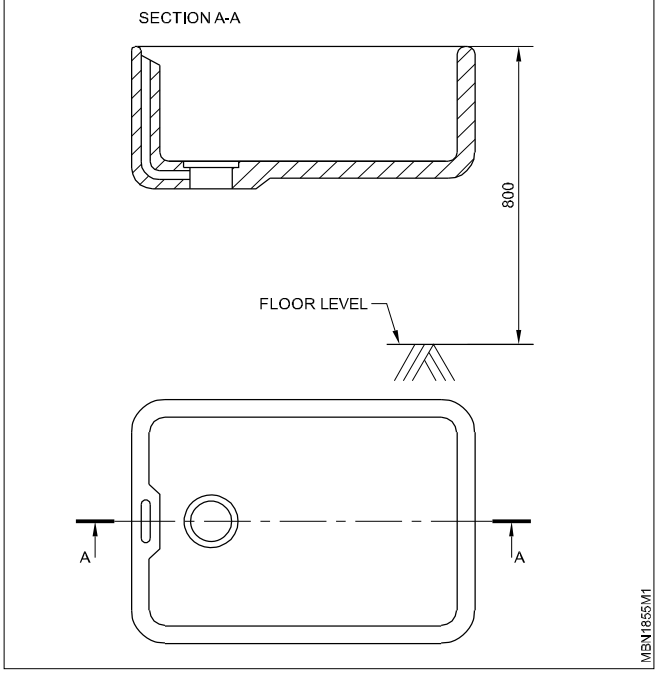
7 Place the sink on the bracket.

8 Connect brass union to sink.

9 Connect GI or PVC pipe to union and leave to floor trap.

10 Check the functioning and leakage in joints.

Fig 1



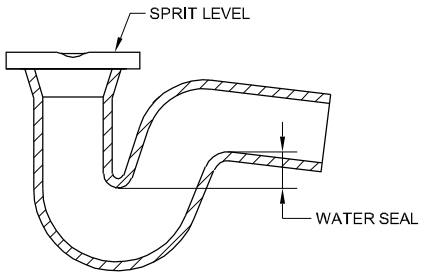
Laying of floor traps in house drainage

Objective: At the end of this exercise you shall be able to
- **fix floor traps.**

TASK 1: **Fix floor traps**

- Choose the correct type of floor trap.Fig.1.

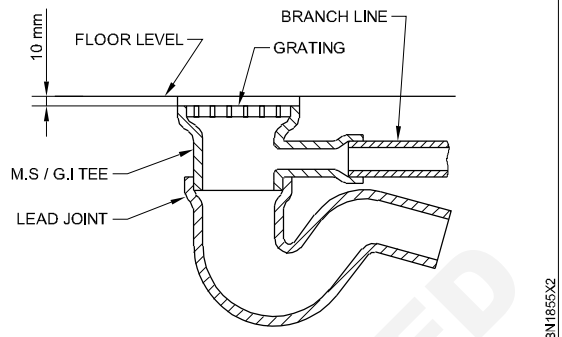
Fig 1



FLOOR TRAP

- Check the water seal depth.
- Mark the position of floor trap (it shall be near external wall and away from doors).
- Dig for the required depth considering branch connection and depth of floor trap.Fig.2.
- Place bed concrete.

Fig 2



- Place the trap in level at top.
- Join M.S or G.I tee in lead / wool joint. If, branch to join.
- Place the grating 10mm below the floor level.

In case of upper floors slabs shall be sink at the time of slab casting, to the required depth.

— — — — — — — —

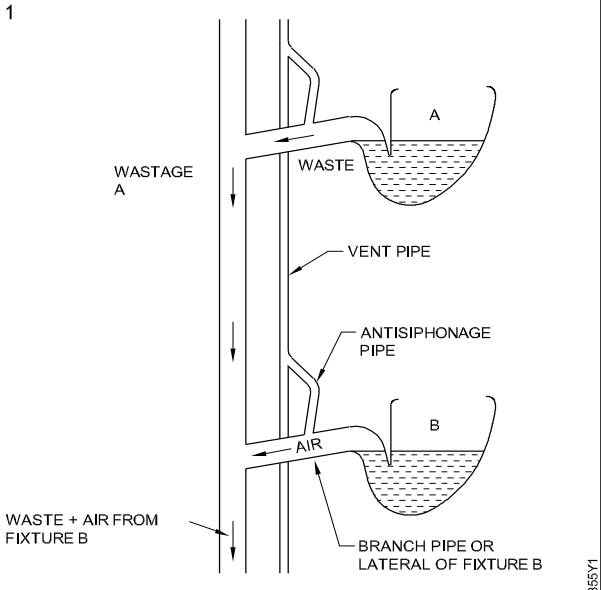
Fixing of vent pipe

Objective: At the end of this exercise you shall be able to
- **Fix vent pipe (PVC).**

TASK 1 : **Fix vent pipe**

- Measure and mark out the cement line of the pipe by chalk line and plumb (Fig 1)
- Check the pipe any visible defects.
- Fix the brackets at required length.
- Take the measurement of pipe line considering the joint of anti siphonage line and vent line.
- Make a hole in the wall larger than the dia of branch pipe.
- Fill the concrete 1:2:4 at the hole.
- Cure the concrete
- Joint the pipes
- Test verticality of pipe with plumb bob

Fig 1



INDUCED SIPHONAGE AND ANTI-SIPHONAGE PIPE

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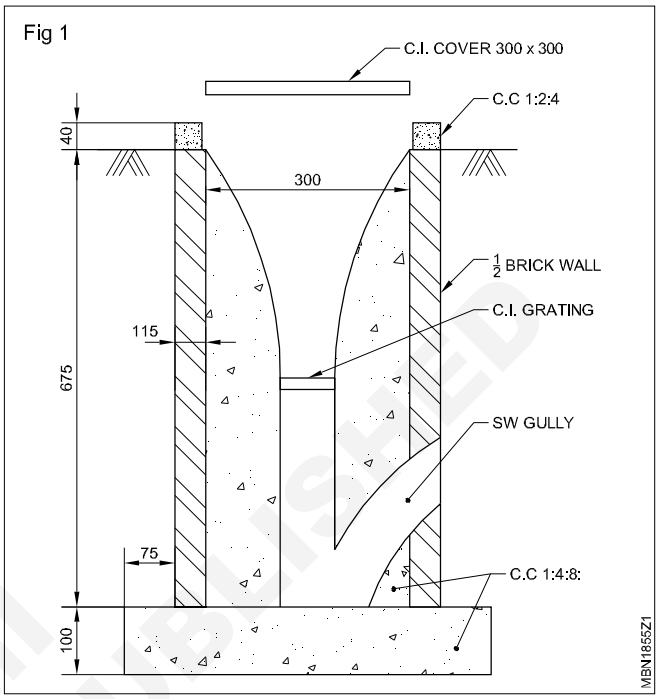
Construction of gully trap

Objective: At the end of this exercise you shall be able to
- **construct brick masonry chamber for the gully trap.**

TASK 1: **Fix gully trap**

- Excavate for gully trap as per Fig.1 to dimensions and levels.
- Lay concrete as per drawing. (Fig.1).
- Check the quality of gully trap.
- Place gully trap in level.
- Connect gully outlet to the branch drain.(Refer S.W pipe joint)
- Test the gully and branch drain.
- Construct 115mm thick brick masonary chamber 300 x 300mm inside around the gully trap. From top of the bed concrete upto ground level.
- Fill the gap between the chamber walls and trap with cement concrete.
- Plaster the upper portion of the chamber i.e. above the top level of the trap with cement morter 1:3 (1cement 3 sand).
- Finish the plaster area with a floating coat of neat cement. Round off the corners and bottom of the chamber so as to slope towards the grating.
- Fix C.I cover with frame 300 x 300 (inside) on top of the brick masonry with cement concrete 1:2:4 (1 cement 2 sand 4 graded stone aggregate 20mm).
- Render the concrete smooth. (Finished top level of cover about 4cm above the adjacent ground level)

Fig 1



Method of cutting stone in required size from a block

Objective: At the end of this exercise you shall be able to
- **mark dimensions and use of tools.**

Requirements

Tools

- Club hammer - 1 No.
- Ball peen hammer - 1 No.
- Punch - 1 No.
- Bunker - 1 No.
- Chisel 12mm - 1 No.
- Wedges - as reqd.
- Crow bar - 1 No.
- Steel square - 2 No.
- Straight edge 1.5m long - 1 No.
- Steel tape 3m long - 1 No.
- Line and pins - 1 No
- Mason's Trowel 25 cm long - 1 No
- Pointing Trowel 15 cm long - 1 No
- Mortar pan - 1 No
- Hammer 1 1/2 lbs - 1 No
- Measuring steel tape 15 m - 1 No
- Spirit level 15 cm - 1 No
- Measuring tape 5 m long - 1 No
- P.V.C tube level
- Polishing machine - 1 No.
- Line and string

Materials

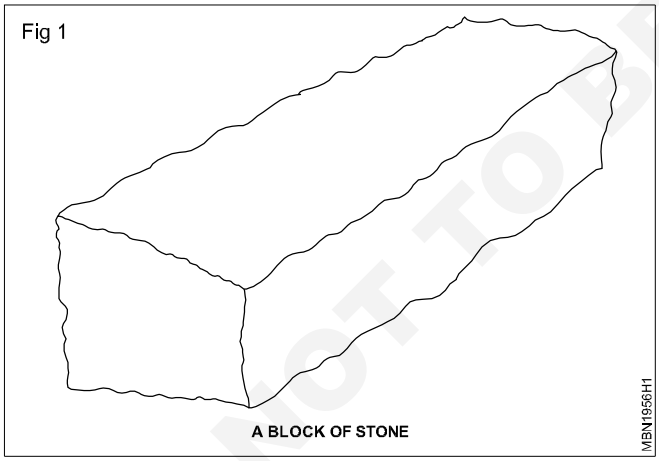
- Block of stone 300 x 100 - 1 No
- Cement - as reqd.
- Coarse sand - as reqd.
- Coarse aggregate - as reqd.
- Water

PROCEDURE

TASK 1: **Mark dimensions and use of tools**

1 Stone from quarry as an irregular block as shown in Fig 1

Fig 1



2 Cut and dress it to the required size

3 Cut stone block is known as “Coping”

4 Place a crowbar beneath the block of stone at required length as shown in Fig 2

5 Mark a line and make “V” groove on top and side as shown in Fig 2

6 Insert wedges gently at conveniently strike gently on the wedges with club hammer till the block is cut into two pieces

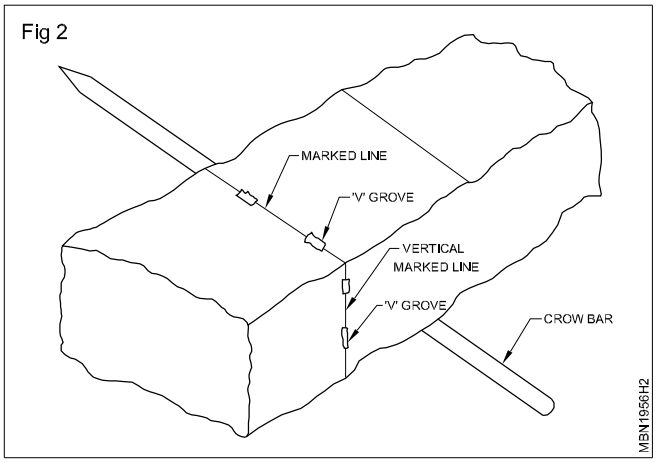
7 Check and ensure that wedge should be firmly fixed, before striking on the wedges

8 Place the crow bar exactly under marked line and ‘V’groove wedges

9 Blow should be equal by standing along the wedges

10 Required piece of stone cut from the block of stone.

Fig 2



Bunkering of the stone and taking out of winding

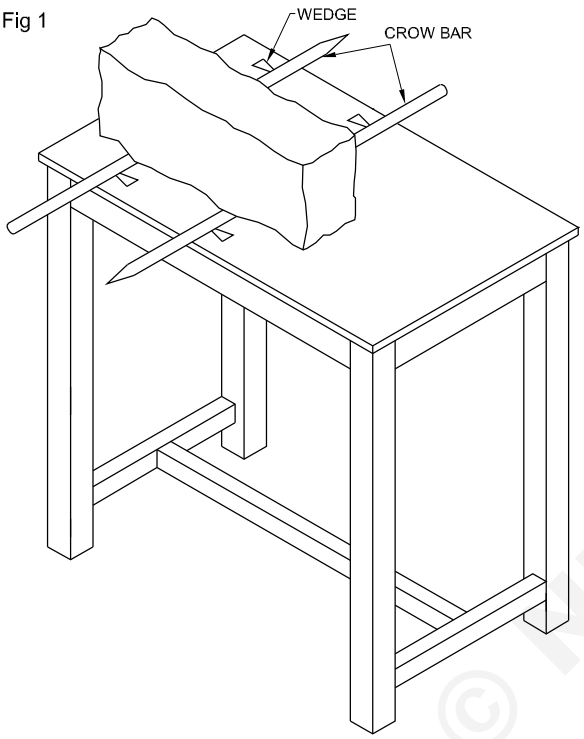
Objective: At the end of this exercise you shall be able to
- **bunkering of stone and taking out of winding.**

TASK 1: **Bunkering of stone and taking out of winding**

1 Place the stone of a convenient height, called bunkering

2 Insert the crow bar at one end and place another crow bar through at center as shown in Fig 1

Fig 1



BUNKERING OF STONE

3 Take firm hold depress one end of stone and insert fingers underneath.

4 Repeat the same operation at opposite end.

5 Lift the edge of the bunker and secure position.

6 Insert wedges to throw the stone away from the body and overhang the nearest surface over the edge of bunker to eliminate the obstruction to square.

Ensure adequate lifting strength

Lay down gently and care should be taken when removing fingers

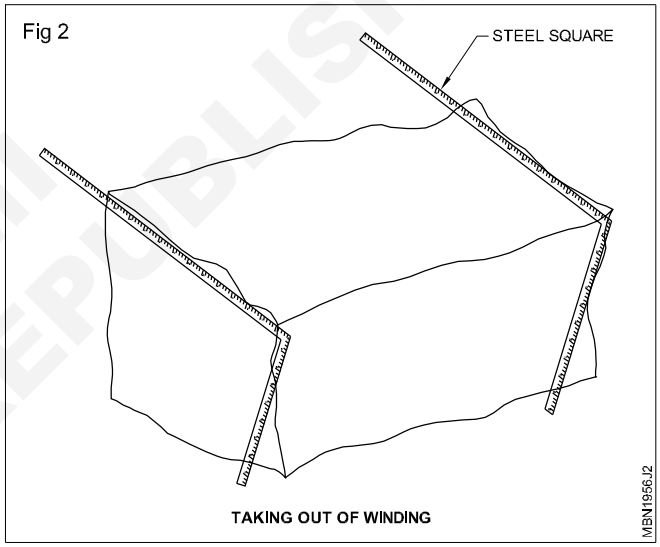
Select a good surface which involves less labour

On shorter side mark a line with punch

Rest the steel square on the line

On the other side (opposite) put another steel square and sight it to so that the top arises in one plane as shown in Fig 2

Fig 2



TAKING OUT OF WINDING

7 Mark the line on the other side

8 Put the drafts with reference to the line and check the same with square

9 Check the straight edge and square for true.

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Marble stone on stair floor

Objectives : At the end of this exercise you shall be able to
- **state selection of stones and its method of dressing and chiselling**
- **lay staircase flooring (rise and tread)**

TASK 1: State selection of stones and its method of dressing and chiselling

1 Check all stone tiles before laying for recklessness.

2 Give ringing sound while striking with a metal piece.

3 Check the stones for their intact structure. If tiles having loose layers should be rejected.

4 Select one colour stone materials as far as possible

5 Check the stones are dressed and chiselled to the required size and shape.

6 The procedure of fixing is same as that of marble stone laying.

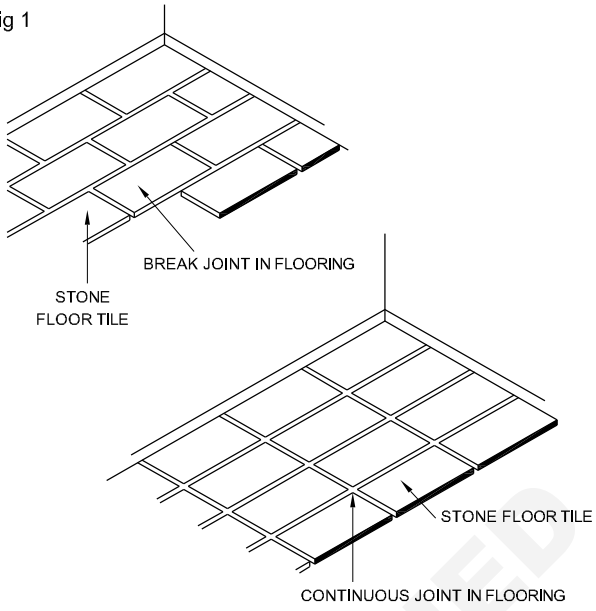
7 Keep with minimum joint as far as possible say 1.5 mm

8 After laying all joints of stone tiles should be filled with neatly by using cement mortar, as shown in (Fig 1)

9 The pattern of the flooring can be adjusted in break joint or continuous joints as shown in (Fig 1).

10 Then the surface of the flooring is done with carefully either by hand or machine polishing similar to that of granite stone polishing.

Fig 1



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TASK 2: **Lay staircase flooring (Rise and Tread)**

1 Select stone slabs should be quality, hard sound dense and homogeneous in texture.

2 Free from cracks, decay weathering and flaws.

3 Cut the stones hand or machine to the required thickness.

- **The top or exposed surface should well polished before laying and confirm to the size required.**
- **Landing should be kept 12mm (1/2") below the finished floor level.**
- **The treads should be fixed with 12mm bearing in staircase plaster.**
- **Treads should be fixed equal in horizontal distance between two landing.**
- **Separate or individual level of the tread should be maintained**

- Nosing should be kept to treads with rounding as shown in (Fig 2, 3).
- Risers should be fixed of require size after considering total landing to landing height divided by number of risers.
- The riser stones are fixed perfectly true and vertical.
- Finally risers and treads should be polished with carborundum 120 No.

Fig 2

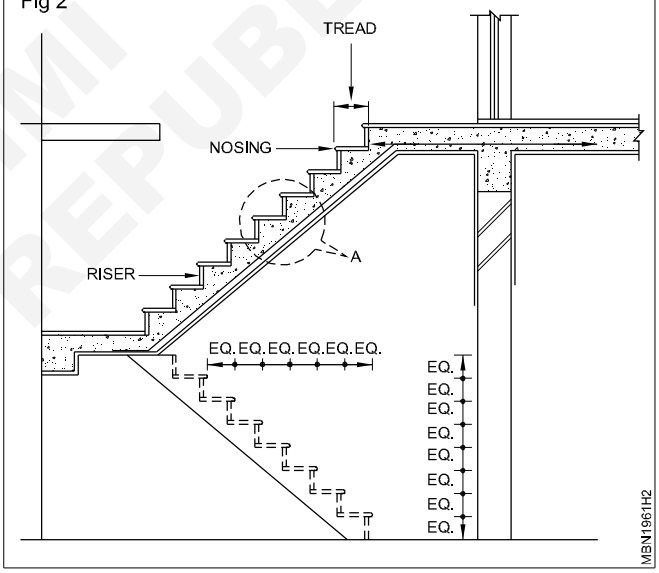
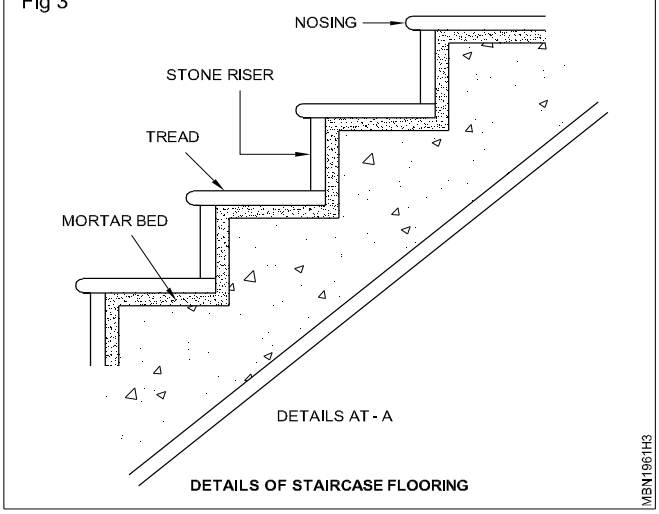


Fig 3



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Construct a 41/2” dia. X 9” thick circular brick wall 4 layers

Objectives : At the end of this exercise you shall be able to
- **setout circular wall and lay gravel**
- **lay bricks in position with 'Vee' shaped mortar joints.**

Requirements

Tools

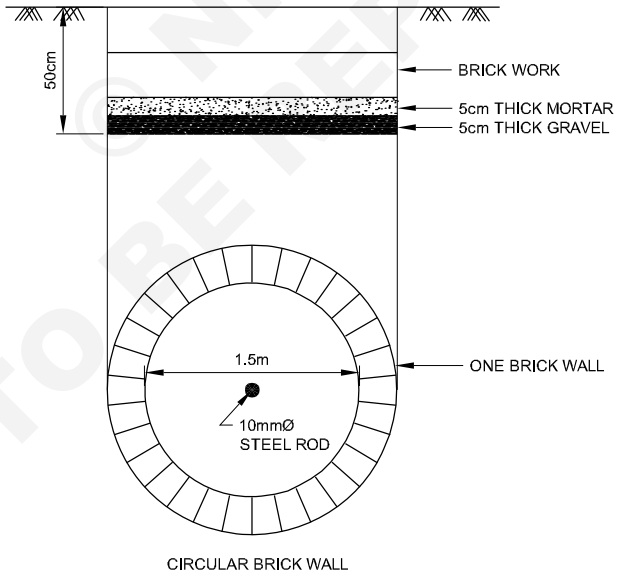
• Mason's Trowel 25 cm long	- 1 No.
• Mason's Brick hammer 1 1/2 / lbs	- 1 No.
• Spirit level 15 cm long	- 1 No.
• Steel tape 3 m long	- 1 No.
• Straight edge 1.5 m	- 1 No.
• Plumb level	- 1 No.
• Plumb bob	- 1 No.
• Steel Rod (1m long) Dia (10 mm)	- 1 No.
• Wooden stake	- 1 No.
• Circular gauge	- 1 No.
• Line and pins	- as reqd.
• Steel square 75 cm x 50 cm	- 1 No.
• Wire Brush	- as reqd.
• Nail (long size)	- as reqd.
• Steel rule	- 1 No

Materials

• Bricks 20 x 10 x 10cm	- 240 nos
• Cement mortar	- 1 No
• Cement	- 2 bag
• Stone jelly (40 mm size)	- as reqd.
• Water, Sand	- as reqd.

PROCEDURE

Fig 1



TASK 1: **Set out Circular wall and lay gravel (Fig 1)**

- A pit be at least 1.5m in diameter and a depth of 0.5 m below the ground level
- Lay 5cm thick bed of gravel 40 mm size (stone gravel or brick jelly)
- Drive a wooden stake or steel rod 10 mm into the center
- The stake or steel rod (10 mm) will be used for height and radius measurements
- Mix a small amount of mortar with water and place a 50 mm thick layer over the gravel around the edges.

Note: While this is still wet, smooth the top and scribe a circle from the stake with a string and nail.

- Establish an outer diameter guide for laying the brick the circle being scribed from the center stake.

- Use this will be the base for the build-up of a circular brick wall
- Allow 24 hours for the concretre to set

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TASK 2 : **Lay bricks in position with vee shape mortar joints**

- Lay first course of bricks on edge on a 20 mm bed of mortar

Note: The bricks should be dampened (wetted) before being mortared in place

- Butter the edges with mortar and follow the circle around the base
- Lay a complete circle of dry brick.
- Find the number of brick and the space between them.

Note: This course must be measured frequently with a level to make sure it is perfectly horizontal

If forms the base and guide for the remaining courses.

Above, the first course of brick on edge, set another course this should bring the construction level up to the level of the ground surface.

- Remove 5 of the brick and lay mortar bed 10 mm thick
- Butt the ends of the brick removed and put them back in place.

Note: Be sure the joints between bricks are completely filled with mortar.

It is obvious that the mortar joints will be wider at the outer edge than the inner.

- Lay brick on bed of mortar tapping them into place. A straight stick is used for alignment.
- Use a spirit level, plumb and correct curvature with level, plumb bob and curve guide respectively frequently.
- Use the handle of the trowel to tap bricks into position.
- Remove excess mortar on the outer edge of the circular wall.

Note: In this circular wall all the bricks are laid only on headers.

The joints of this circular wall is in form of 'V' shape.

- Conventional bricks place carefully to make sure the circle is even and smooth curvature.
- Improve the bonding the top two course of brick are laid as headers with an overlap.
- Make sure all joints are completely filled with mortar
- Strike off excess mortar after completing brick work

— — — — — — —

Construct circular gate pillars with brick / stone / tile / concrete

Objectives : At the end of this exercise you shall be able to
- **set out of circular pillar by trowel method**
- **construct a circular.**

Requirements

Tools

- Mortar pan - 1 No.
- Mason's Trowel (25 cm) - 1 No.
- Spirit level (15 cm) - 1 No.
- Plumb level - 1 No.
- Straight edge (1.5 m) - 1 No.
- Steel round Rod (1m)
- Nail - as reqd.
- Wooden batten - 1 No.
- Ball of nylon thread - as reqd.

Materials

- Bricks 230 x 110 x 70mm - 180 Nos.
- Cement Mortar
- Cement - 1 Bag
- Sand - 3 Boxes

PROCEDURE

TASK 1: **Set out of circular pillar by trowel method**

1 Set out the circular gate pillar with reference to the plan.

2 Mark centre point of circular and drive steel rod vertically or by pivot peg.

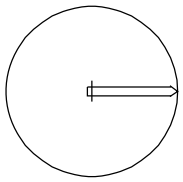
3 Excavate the soil for a depth of 0.5 m

4 Prepare plain cement concrete 1:4:8 and lay 15 cm thick .

5 Lay and spread thin layer of cement mortar, after well compacted.

6 Mark circular curve by using the aid of either tramel method or stretching loop thread as shown in (Fig 1 & 2)

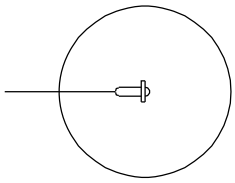
Fig 1



BY TRAMMEL METHOD

MBN11063H1

Fig 2



BY LOOP THREAD METHOD

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TASK 2 **: Construct a circular pillar**

1 Lay the bed course dry to check layout use chalk line for the side faces of the bricks.

2 Lay the bed course on a mortar bed. check level of brick and check circular by using tramel.

3 Lay second course following the pattern shown in the elevation view (Fig 3)

4 Bricks should be laid so that head joints are offset to provide an interlocking with 1/2 brick thick compound wall and circular gate pillar.

5 Mark the position of plumbing point with chalk.

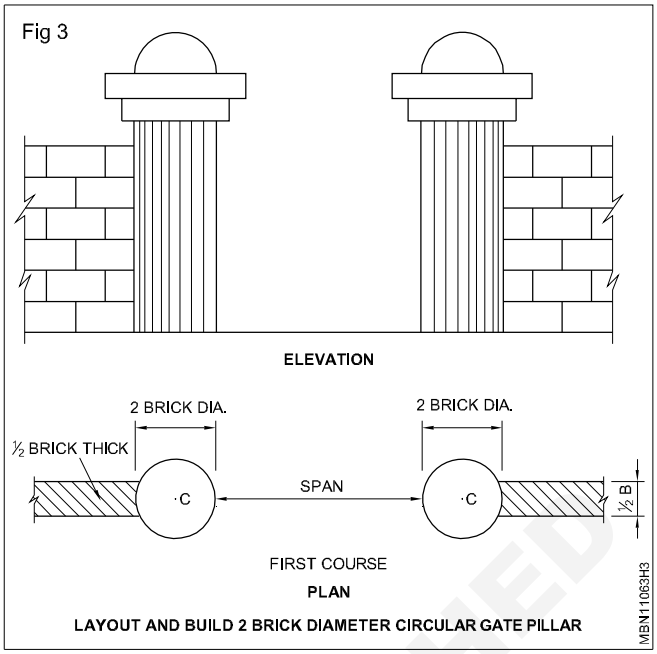
6 Proceed with further courses and plumb on the exact plumbing points already marked.

7 Construct the circular gate pillar 2m height.

8 Provide on the top of pillar and lay bricks 5cm projection for coping as shown in the elevation (Fig 3)

9 Clean the work after completion and neat pointing is done.

Fig 3



LAYOUT AND BUILD 2 BRICK DIAMETER CIRCULAR GATE PILLAR

— — — — — — — —

Construction of roof with R.C.C slab and beam

Objectives : At the end of this exercise you shall be able to
- **prepare R.C.C roof slab**
- **prepare R.C.C beam.**

Requirements

Tools

- Trowel (25 cm) - 1 No.
- Sprit level (15 cm) - 1 No.
- Steel tape (15mm) - 1 No.
- Mortar pan - 1 No.
- PVC tube level - 1 No.
- Spade - 1 No.

Materials

For Beam

- 16 mm ϕ straight bar 4580 mm - 2 Nos
- 12 mm ϕ cranked bar 4681 mm - 1 No.
- 12mm ϕ top bar 43 80 mm - 2 Nos
- 8 mm ϕ stirrup bar 1360 mm - 2 Nos

For Slab

- 10 mm ϕ straight bar 3.88m - 14 Nos
- 10 mm ϕ cranked bar 3.922m - 14 Nos
- 8 mm ϕ distribution bar 4.144m - 31 Nos
- Cement
- Sand

PROCEDURE

TASK 1: **Check the materials**

1 Clear and free from loose materials from reinforcement.

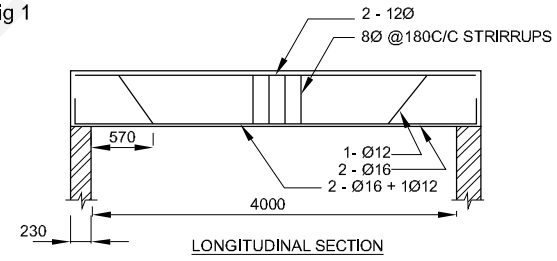
2 Bend the rod correctly and accurately as per specification.

3 Make the bar straightening and over lapping shall be as per drawing.

4 Check the form work.

5 Check the top level from work by PVC tube level.

Fig 1



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TASK 2 : **Lay reinforcement bar**

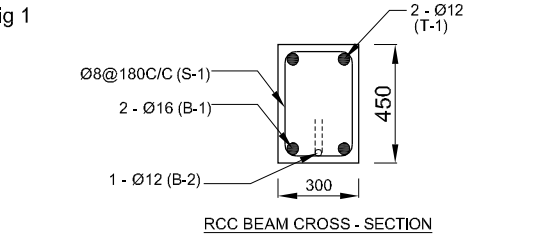
1 Provide 16 mm ϕ of straight bar.

2 Provide 12 mm ϕ of crank bar.

3 Make 12 mm of top bar.

4 Fix stirrup 8mm ϕ.

Fig 1



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TASK 3 : **Prepare cement 1:2:4 far 0.602 m³**

1 Mix the cement concrete 1:2:4 for 0. 602 m³**.**

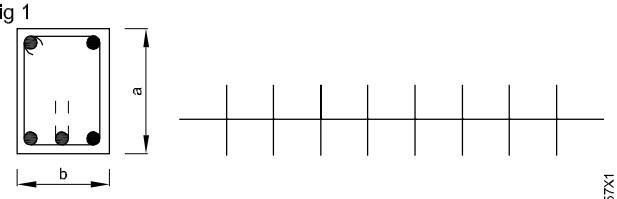
2 Clean and sieve the sand before mixing.

3 Mix the concrete for a minimum three times throughly.

4 Add sufficient quantity of water and mixed well by using spade.

5 Provide curing for 7 days.

Fig 1



RCC BEAM REINFORCEMENT DETAILS

— — — — — — — —

Construction of R.C.C Slab

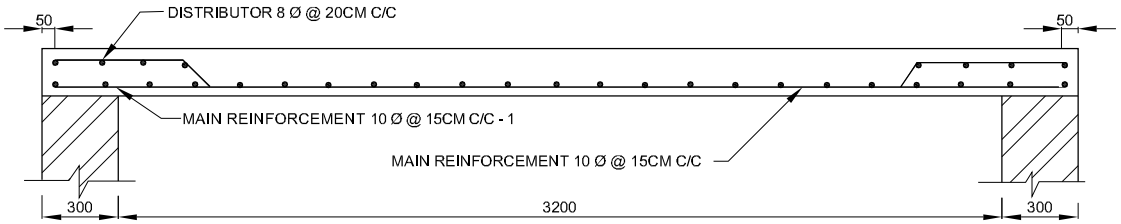
Objectives : At the end of this exercise you shall be able to
- **prepare R.C.C roof slab.**

Task 1 : **Prepare R.C.C roof slab**

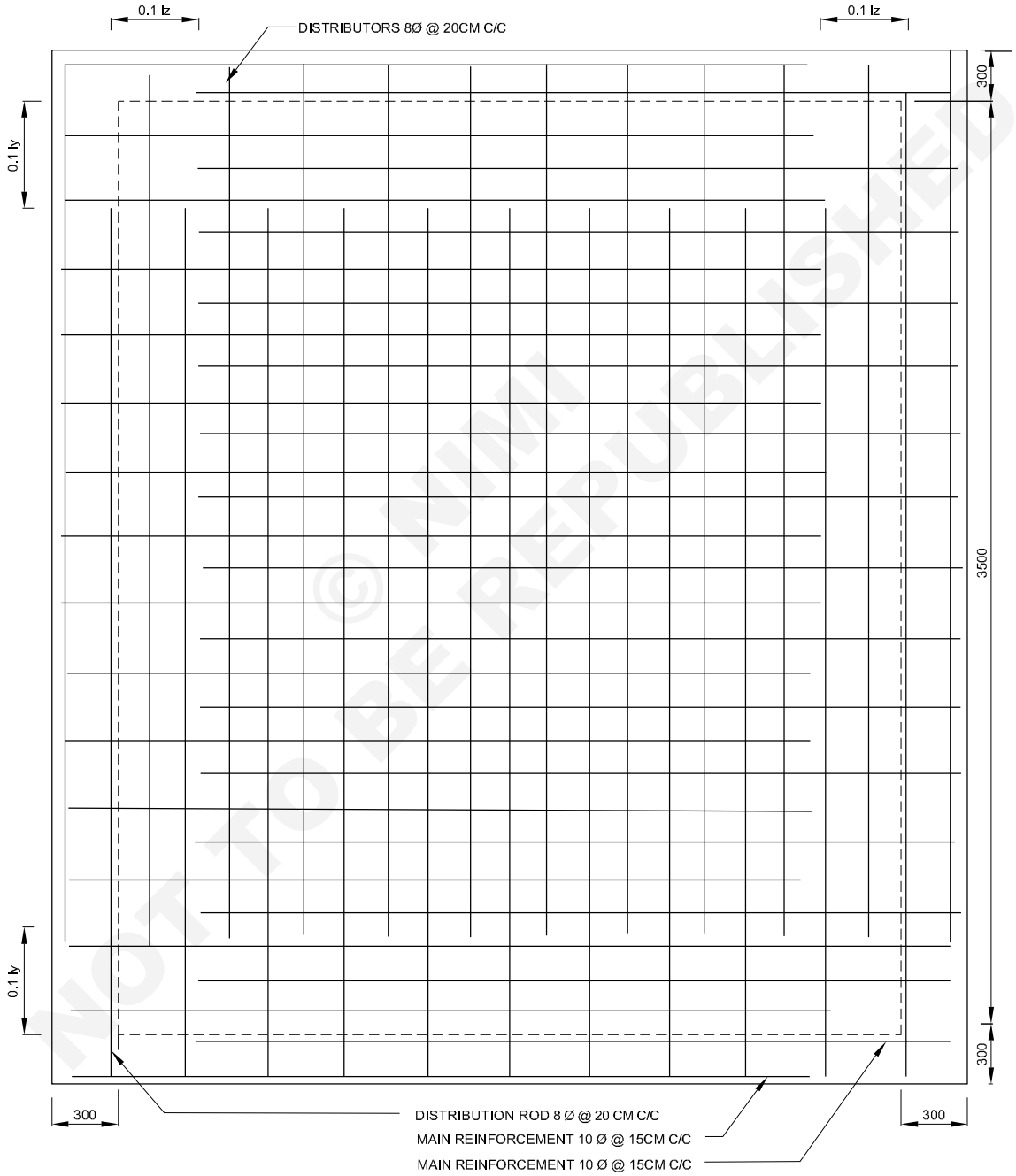
Follow the procedure of R.C.C beam.

Sl.No	Description	Shape of bar	No.of bars	Length of each bar in m	Total length in m	Weight metre in kg	Total weight in kg
1	Main bar straight bar 10 mm dia at 15 cm c/c		14	3.88	54.32	0.62	33.68
2	Main bar cranked bar 10 mm dia at 15 cm c/c		14	3.922	54.91	0.62	34.04
3	Distributers bar 8 mm dia at 20 cm c/c		31	4.144	128.46	0.39	50.10 117.82

Fig 2



SECTION ALONG SHORTER SPAN



PLAN AT BOTTOM

DETAILS OF R.C.C. ROOF SLAB

DCN35128H2

Prepare of surface for external plastering

Objective : At the end of this exercise you shall be able to
• erect scaffolding

Requirements

Tools/Equipments

- Hammer 1/2 / lbs - 1 No
- Chisel 12 mm - 1 No
- Plumb bob - 1 No
- Line and pins
- 'U' Nails
- Plastering Trowel (25cm) - 1 No
- Pointing Trowel (15cm) - 1 No
- Mortar pan - 1 No
- Hammer 1 1/2 lbs - 1 No
- PVC water level tube
- Wooden float - 1 No
- Steel float - 1 No
- Steel tape 5m - 1 No
- Straight edge (Aluminium) 1.5m/1.8m - 1 No
- Right angle (small and Big)
- Line and Thread
- Wooden straight edge (1 metre) - 1 No
- Spade - 1 No

Materials

- Scaffolding material - as reqd.
- Ledger wooden /tubuler - 4 Nos.
- Putlog wooden/tubuler - 4 Nos.
- Bamboos (cross) - 4 Nos.
- Wooden planks - 2 Nos.
- Coconut coir - as reqd.
- Wire brush - 4 Nos.
- Fine sand - 1 box
- Cement - 20 kg
- Screen for sieving sand - 1 No.
- Water - as reqd.
- Bucket, Mug or Jar - 1 No
- Sponge - 1 No
- M.S chair - 1 No.

PROCEDURE

TASK 1: **Erect scaffolding**

- Erect and make scaffolding work in advance, where the plaster is to be done.
- Erect double scaffolding or independent to work having two sets of vertical supports.

The vertical supports shall be sound and strong.

The horizontal ledger and putlogs are tied with vertical supports by using coconut choirs firmly or tightly.

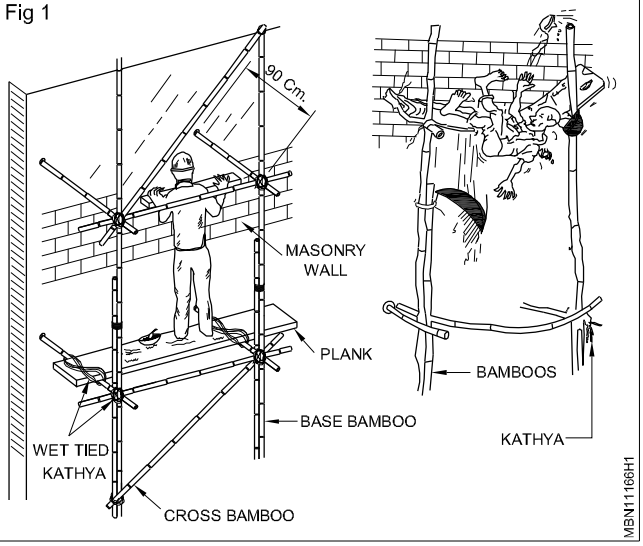
Before tied the coconuts coir or rope should be wetted.

Scaffolding wooden planks are laid and fixed firmly.

Gaurd board and diagonal bracing are also fixed for precautionary measures.

- Check the scaffolding carefully before starting plaster work.
- Wooden planks and wooden vertical poles should not be old and weak to avoid probable accidents.
- Scaffolding erect is in plumb for vertical as shown in (Fig 1)

Fig 1



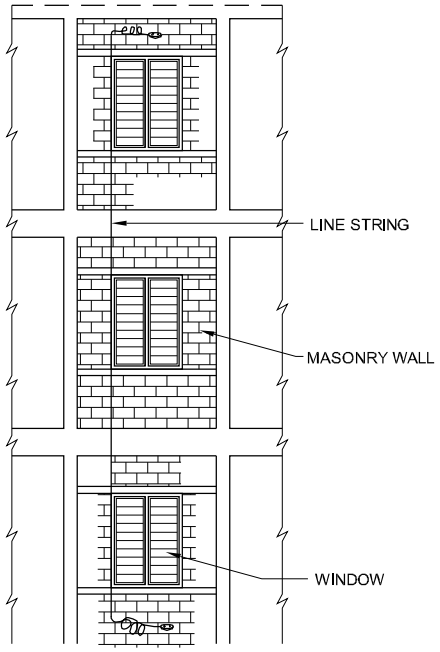
In case of tubular scaffolding all joints should well tied and fixed with couplers.

And necessary diagonal bracing are provided for additional strength and to avoid tilting.

- The joints should be raked out properly for 20mm depth
- Remove dust and loose mortar with brush.

- The plaster surface washed thoroughly with water.
- Cleaned and kept wet before plastering is commenced.

Fig 2



CHECKING OF WINDOW EDGES BY LINE STRING

- Fill the gaps or holes in masonry and joints of wall and slab or beam etc should be filled up well with rich cement mortar 1:3
- Check masonry work horizontally as well as vertically using line and thread from top to bottom at all the edges.

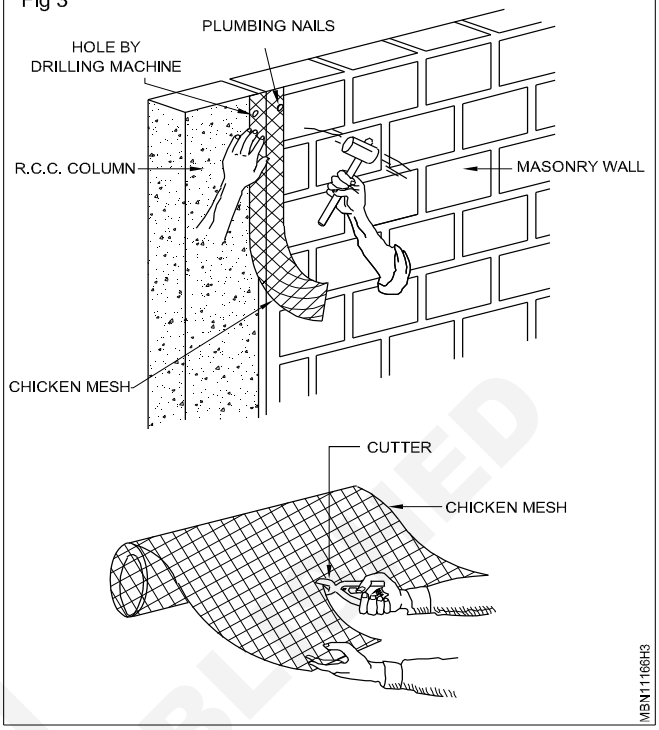
This will give an idea of thickness of plaster work. as shown in Fig 2. Plaster work confirming to these lines will give the finished surface

All concrete old plaster and stone surface if they seem too smooth, must be suitably roughened to provide necessary bonding for the plaster

If beam or column is bulged out then chiselling is to be done by chisel and hammer

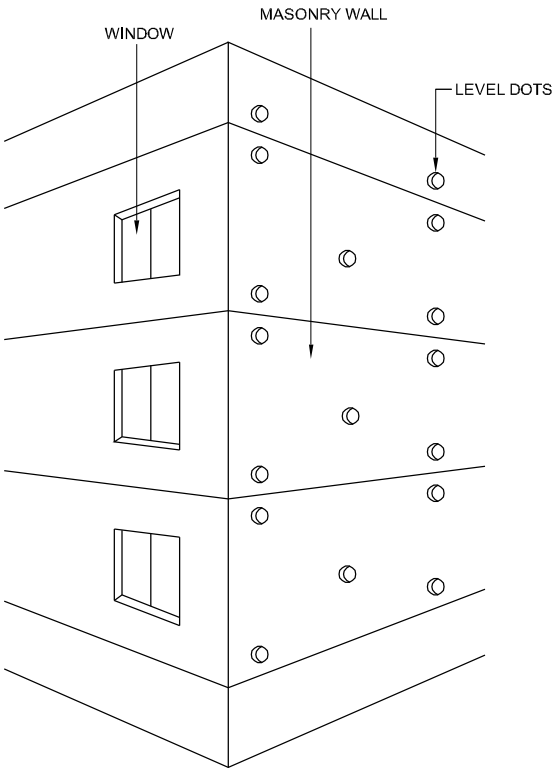
- Fix the chicken mesh to the all joints of masonry and R.C.C work such as masonry wall, column and beam using by 'U' nails
- Cut and fix chicken mesh in minimum 20mm size by cutter as shown in (Fig 3)

Fig 3



- Fix half width of chicken mesh will be on masonry wall and half will be on R.C.C structures.
- Chicken mesh tightly in both directions vertical and horizontal as shown in (Fig 3)

Fig 4



LEVEL DOTS FOR EXTERNAL PLASER

- Wet the wall surfaces with fresh water in advance before plastering
- Check all the windows, door frames for plumb, line and level (Fig 2)
- Rectify If any defect is found before plastering.
- Check the levels from the top of parapet wall to the bottom surface of masonry wall.
- Fix the level dots or spot points 10cm x 10cm as specified thickness
- Fix level dots should be 1.8m centre to centre equally as shown in (Fig 4)
- Put line thread from top slab to bottom level of all corners of walls. Corners of window line of elevational features, line of R.C.C grill and all straight lines in that portions.
- Use washed sand.

— — — — — — — —

Method of external plaster

Objectives: At the end of this exercise you shall be able to
- **prepare cement mortar**
- **apply of plastering.**

TASK 1: **Prepare cement mortar**

1 Mix mortar as specified ratio mentioned in drawing usually 1:5 (1 part of cement and 5 parts of sand)

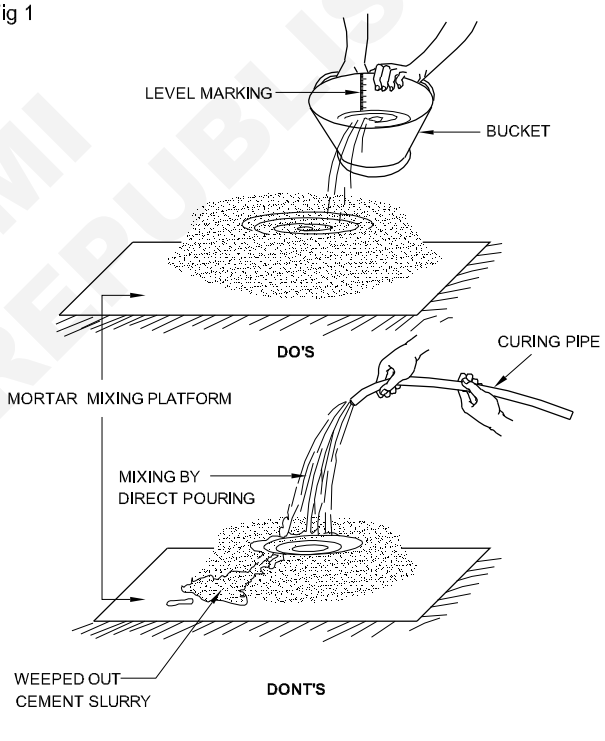
2 Before mixing cement mortar, sand must be sieved and cleaned well

3 Mix dry mortar for minimum three times throughly

4 Add sufficient quantity of water and mixed well by using spade or showel as shown in (Fig 1)

5 Check and verify the level dots both in horizontal and vertical

Fig 1



MIXING WATER (DO'S & DONT'S)

— — — — — — — —

TASK 2: **Apply plastering**

1 Cement mortar dash against brick masonry wall between two level dots. just above the thickness required.

2 Tamped slightly by using small strip of wooden straight edge or by wooden float to ensure through filling of joints.

Then the surface brought to a true surface by working a wooden straight edge or Aluminium hollow section reach acrossing the level dots. This is called as a mortar screed.

Take care and see that no uneven surface is observed.

3 Repeat the process for another two level dots and the surface should be finished.

4 Laid or dashed the mortar on the wall between mortar screed.

5 Checked plaster surface with line and thread on respective level dots.

6 Make rough surface by wires for better bonding to second coat as shown in the (Fig 2)

7 Second coat of plaster is applied on the wall where the first coat is already applied.

Fig 2

ROUGHNING OF PLASTER SURFACE

MBN111166J2

8 The thickness of two coats plaster is 18mm. ie first coat is 12mm thick and second coat is minimum 6mm thick

9 Use wooden straight edge to get uniform plain surface reaching across the level dots. with small upward and sideways movements at a time.

10 Finally the surface shall be finished off true with trowel or wooden float according as a smooth.

11 After the second coat, remove scaffolding step by step and fill the holes with mortar if any on the masonry wall.

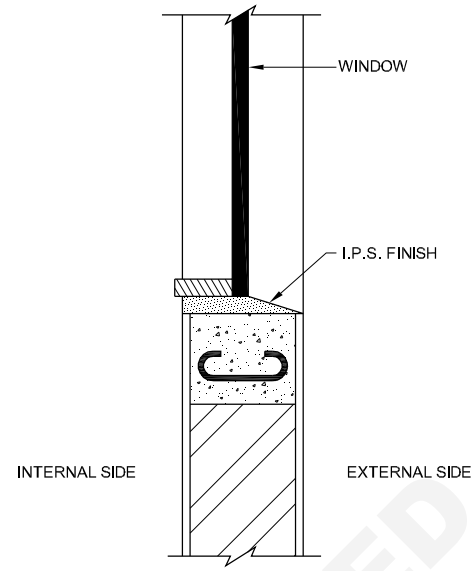
12 Clean all the surfaces of adjacent wall window, R.C.C grills etc.

13 All the corners arises, angles and junctions shall be truly vertical or horizontal must be carefully finished.

14 Sills of windows to be finish with Indian Patent stone (IPS) smooth finish in sloping form, from outside, as shown in (Fig 3)

15 Sunshade projections over the window Lintel level should be finished with drip mould at bottom of the sunshade, and should be finished with smooth finish as per the specification.(Fig 4)

Fig 3



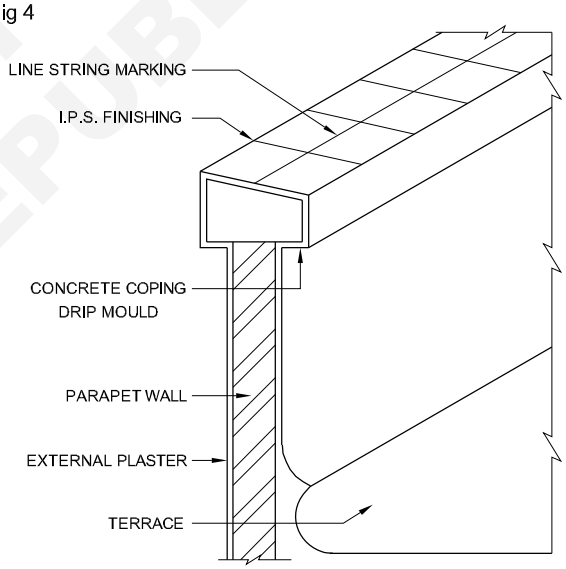
FINISHING OF WINDOW SILL FROM OUTSIDE

MBN111166J3

16 The top of the parapet wall must be finished with smooth surface and line square cheques.

17 Top should be sloping inside for minimum 12mm slope

Fig 4



FINISHING OF TOP OF PARAPET WALL

MBN111166J4

18 The second coat finished should be with sponge for uniform texture and finish

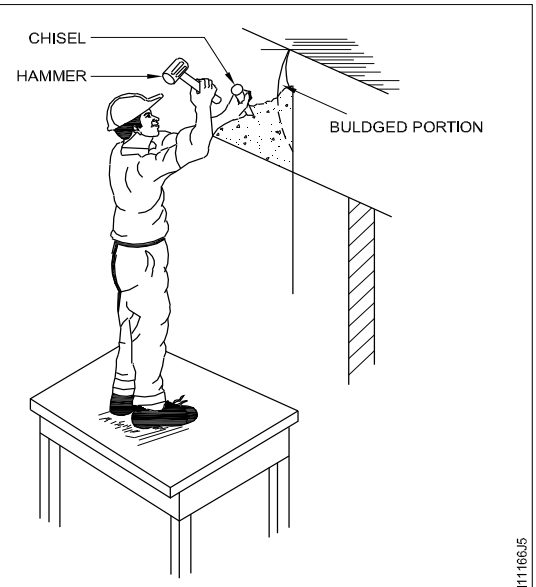
19 Curing is required for minimum two days.

20 The bulged portion of R.C.C beam, column and slab must be cut off before plaster work take place as shown in Fig 5

21 Rounding or chamfering corners, arrises provision of grooves at junctions etc should be done very carefully by using M.S corners and mouldings.

22 Any projected band of parapet wall should be cut in slope. This will help to keep the rain water away from wall

Fig 5



CHISELLING OF BULGED PORTION

23 The plaster should be finished to a true and plumb surface and to the proper degree of smoothness.

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6mm cement plaster on R.C.C slab ceiling

Objective: At the end of this exercise you shall be able to
- **make ceiling plastering.**

TASK 1 : **Make Ceiling Plastering (Fig 1)**

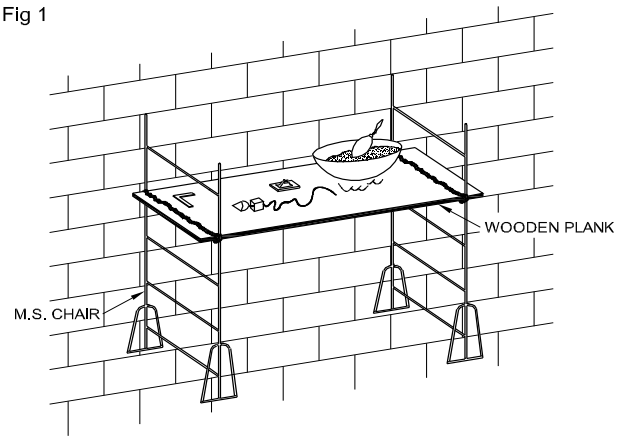
- Stage scaffolding is provide for the ceiling plaster work
- Remove projecting burrs of mortar formed due to the gaps at joints in shuttering.
- The surface clean with wire brush.
- Concrete surfaces to be plastered should be pock marked with a pointing tool, of spacings of not more than 5cm centres.
- The pock not less than 3mm deep, for a proper key for the plaster.
- The surface of wall should be well wetted before the plaster is applied.
- The mortar for ceiling plastering is 1:3 or 1:4 ie one part cement and three or four parts of sand as specified in drawing or otherwise as directed.
- Make even thickness and a true surface "Level dots' are prepared (15cm x 15cm square)
- Make level dots are 1.5m intervals in both directions to serve as a guides for the plastering.
- Make level dots are truly in the plane of the finished plaster surface.

Note : Then cement mortar is applied or dashed in a uniform surface to a thickness slightly more than the specified thickness.

The surfaces of mortar applied is screened to brought to true and even surface by using wooden straight edge or Aluminium hollow section 1.8m long reaching across the gauges of level dots.

Finally the surface should be finished true with a trowel or with wooden float to give a smooth or sandy granular texture as required.

Fig 1



M.S. CHAIRS FOR INTERNAL PLASTERING

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Fixing of cement concrete jolly work

Objectives : At the end of this exercise you shall be able to
- **verify and check the dimension as per the drawing of jolly work**
- **lay C.C. jolly work and fix in position firmly.**

Requirements

Tools

- Mason's Trowel (25 cm), Mortar Pan - 1 No.
- Straight edge (1.5 m), Plumb bob - 1 No.
- Spirit level, PVC Tube level - 1 No.
- Steel Square 0.75 x 0.50 m - 1 No.
- Line and Thread - as reqd.
- Chisel 12 mm, 18 mm - each one
- Hammer - 1 1/2 lbs/ 1 lbs - 1 No.

Materials

- Cement concrete jolly - as reqd.
- Cement, Sand, Aggregates, water - as reqd.

PROCEDURE

TASK 1 : **Verify and check the dimension as per drawing of jolly work**

1 Check size and diagonals of cement concrete jolly work

2 Check straightness C.C jolly work

— — — — — — —

TASK 2 : **Lay C.C Jolly work and fix in position firmly (Fig 1)**

1 Fix the exact position of the jolly work as per working drawing

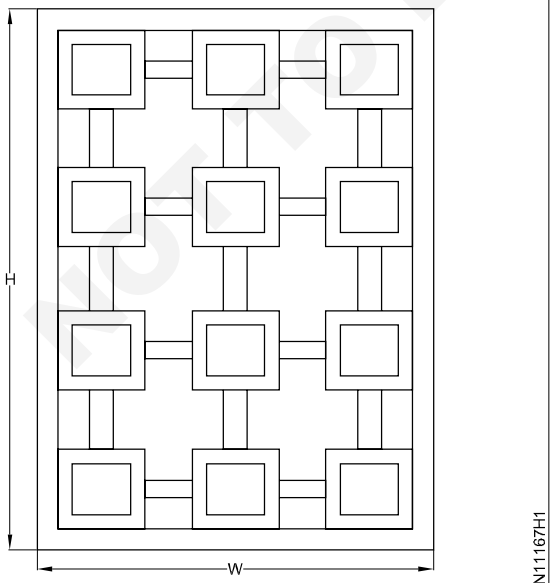
2 Provide a gap for plaster margin between wall and C.C jolly work atleast 25 mm away for margin

3 Check the parallelity of the window with masonry wall by help of line and thread

4 Check the top and bottom of C.C jolly work with tube level and also check the sides with plumb for vertical (Fig 2)

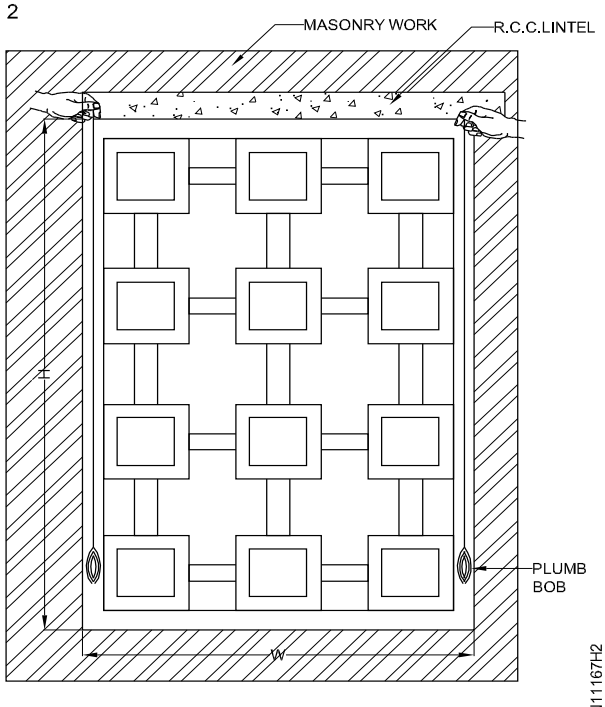
5 Fix the C.C Jolly work permanently by concreting all sides.

Fig 1



CEMENT CONCRETE JOLLY WORK

Fig 2



CEMENT CONCRETE JOLLY WORK

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Laying of glazed tiles

Objectives: At the end of this exercise you shall be able to
• check the dimensions and squareness of glazed tiles
• lay tiles in proper sequences of joints.

Requirements

Tools required

- Mason's Trowel (25 cm) - 1 No.
- Pointing Trowel (15 cm) - 1 No.
- Mortar pan - 1 No.
- Spirit level (15 cm), PVC tube level - 1 No.
- Straight edge (1.5 m) - 1 No.
- Steel Right angle 0.75 X 0.5 m - 1 No.
- Measuring steel Tape 15 m - 1 No.
- Line and Thread - as reqd.
- Tile cutting machine - 1 No.
- Chisel 12 mm - 1 No.
- Hammer, Brush, Spade, Mallet - 1 No.

Materials

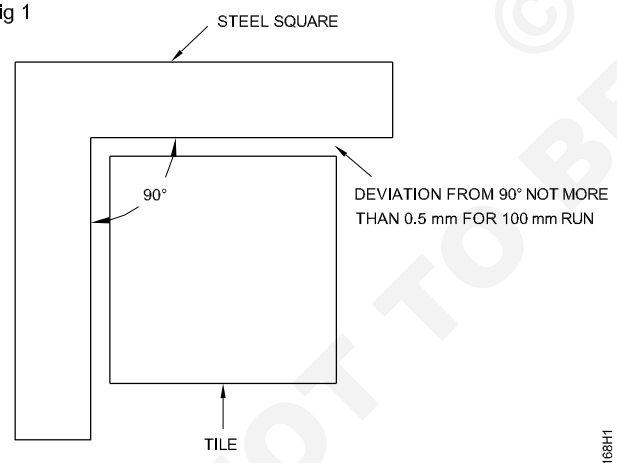
- Glazed/ceramic tiles 15 x 15 cm - 50 nos
- Colour pigments - 15 Kg
- Water, Sand, White cement, Cement - as reqd.

PROCEDURE

TASK 1 : **Check the dimensions and squareness of glazed tiles**

- The glazed tiles should be approved make and with good quality
- Check thickness and size of the glazed Tiles
- Check for the squareness and war page of glazed tile as shown in (Fig 1).

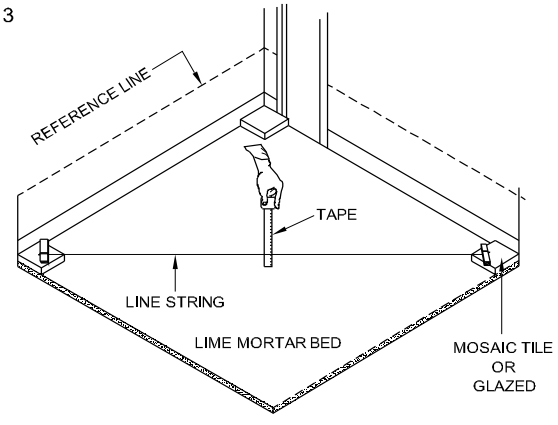
Fig 1



METHOD OF CHECKING SQUARENESS OF TILES

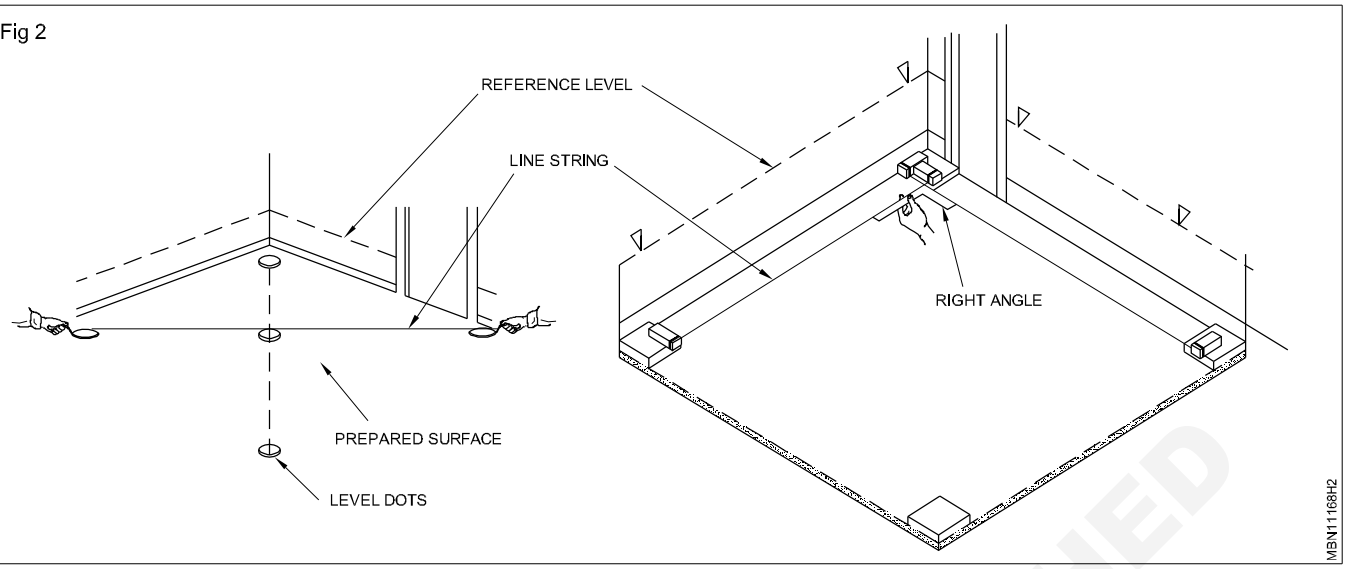
- Check colour and Design pattern of tile. There should not be any difference between the colours of the tiles.
- Check sizes and diagonals of the tiles.
- Check the edges of tiles and also check the confirm that tiles are free any cracks or damages.
- Check the tiles should be square, rectangular and tiles sizes are 150 x 150mm, 100 x 100mm, 100 x 200mm
- The thickness of the tiles should be 5mm or 6mm as specified.
- Check the top surface of the tiles should be glazed and glaze should be either glossy or matt.
- The under side of the tiles should not have glaze
- Check the base concrete or R.C.C slab on which the tiles are to be laid should be cleaned and levelled.
- Prepare and mix cement mortar 1:3 (one cement and three coarse sand)
- Mix the mortar two or three times in dry mix.
- Add required quantity of water until workable consistency.
- Fix the string line from the right angle corner with one corner reference tile as shown in (Fig 2).
- Match all the four corners of the tiles properly with the help of wooden mallet and check the uniform thickness of bedding mortar. The line stretched in between the tiles laid diagonally as shown in (Fig 3).

Fig 3



- Soak the glazed tile in water wash and clean before fixing.

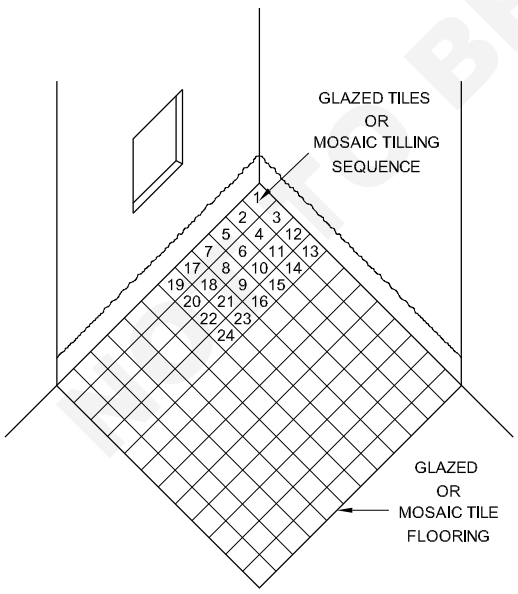
Fig 2



TASK 2: **Lay tiles in proper sequences of joints**

- Place and fix the glazed tiles in particular sequence for better result and line joints as shown in (Fig 4).
- Tap each tile gently with wooden mallet till it is properly bedded and in level with the adjoining tiles.
- Keep the joints as thin as possible and in straight line and suit the required pattern
- Check the surface of the flooring during laying of glazed tiles frequently with using a straight edge.
- Cut glazed tiles where full tiles can not be fixed to the required size.

Fig 4



SEQUENCE FOR PLACING AND FIXING OF TILES

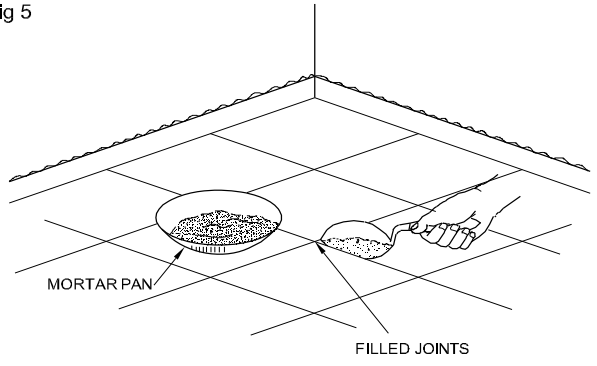
The cutting tile edge should be rubbed smooth and true joints.

In case two types of tiling (ie in living room white and in other rooms grey)

- Break the joint at shutter groove line. or on inside edge of other room's masonry.
- Check the overall level, after completing the tile work of the floor.
- Find any unevenness rectified with wooden mallet.
- Fix with the cut pieces in the gaps between the walls and the floor laid should be made cut with cutting machines.
- Do the gap filling/Joint filling between the glazed tiles with cement or pigment mixed with white cement as shown in (Fig 5)
- Cure this flooring for minimum period fo 14 days

After curing is done the surface of the flooring is well cleaned with wooden rags and polished.

Fig 5



FILLING OF JOINTS

Fixing the thread, filling between ends plumbing, setting out a jamb bonding

Objective(s): At the end of this exercise you shall be able to
- **Layout marking, fixing the thread and setout bonding.**

Requirements

Tools

• Trowell 25 cm long	-1No.
• Steel tape 5m long	-1No.
• Spirit level 15cm long	-1No.
• Plumb level or bob	-1No.
• Line and pin	- as reqd.
• Mortar pan	-1No.

Materials

• Bricks 20x10x10	-280 Nos.
• Mortar	-1 No.
• cement	-1 Bag
• Sand	-5 Box
• Water	-as reqd.

PROCEDURE

TASK 1**: Layout marking, fixing the thread on a setout bonding**

1 Clean the work area

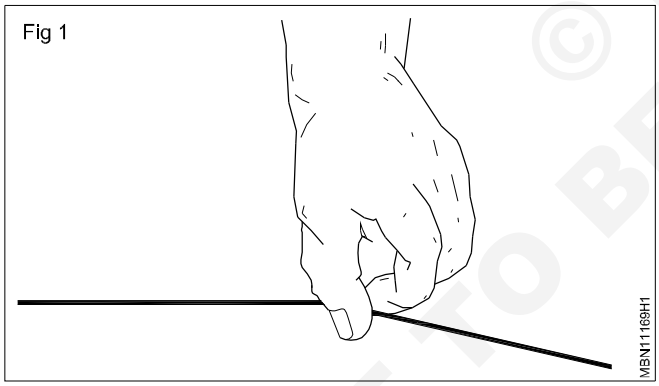
2 Collect the materials above 1m near the work place.

3 Mark the line with chalk and setout the position of job.

4 Hold a brick layers line of a convenient height above and between these marks.

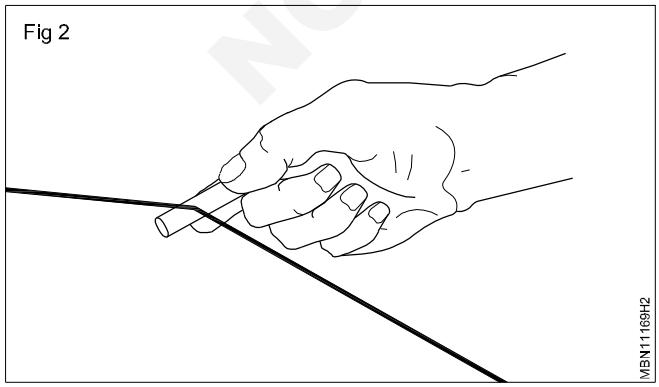
4 Keeping the line tight.(Fig 1)

Fig 1



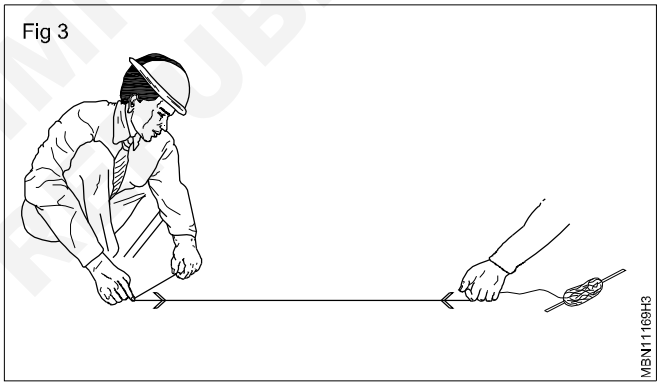
6 Chalk it thoroughly by running the chalk two or three times along its length.(Fig 2)

Fig 2



7 Lower the line to the two end marks and hold under tension (Fig 3)

Fig 3



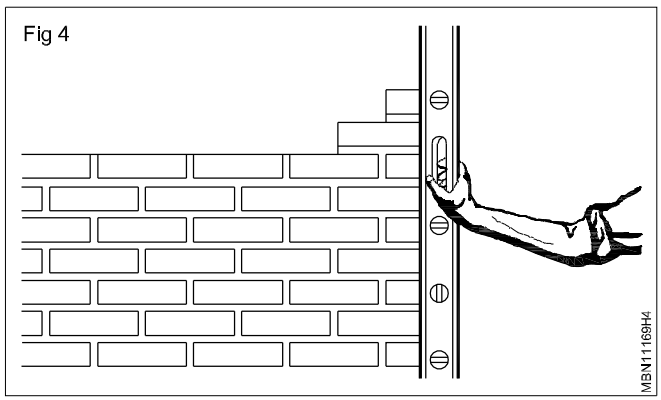
8 Check width of the first course of front and rear.

9 Check for alignment level and width.

10 check for gauge, level, plumb ranging in width.

11 Job needs accurate setting out and squaring of the ends on the first course (Fig 4)

Fig 4



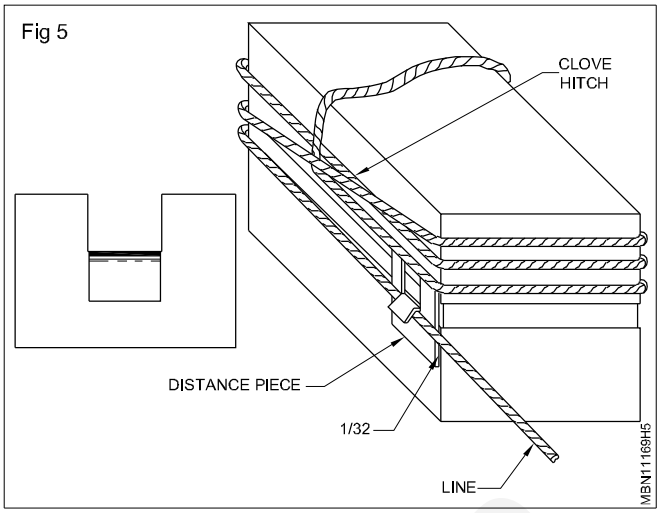
12 Raise the line vertically 30cm at its enter and release, marking sure the line strikes the ground direct.

13 Mark the Jamb brick exactly vertical.

14 Level the first five bricks with masons level

15 pull the line up over the top of the brick and push the line to the face of the brick (fig 5)

Fig 5



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Marking and cutting tiles

Objective(s): At the end of this exercise you shall be able to
- **Cutting ceramic tiles with a hand held tile scribe.**
- **Cutting ceramic tiles with a mechanical cutter**
- **Cutting tiles electric tile cutter**
- **Cutting ceramic tile with hand saw.**

Requirements

Tools

- Hand held tile scribe - 1 No.
- Contractors tile cutter - 1 No.
- Electrical tile cutter - 1 No.
- Tile saw blade - 1 No.

Materials

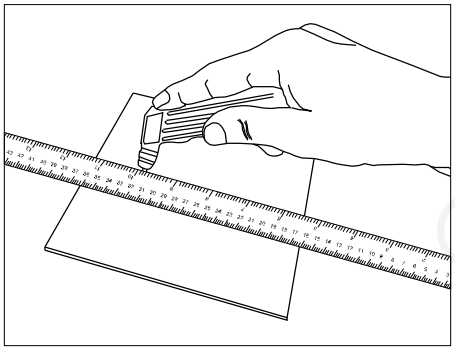
- Ceramic Tiles - as reqd.

PROCEDURE

TASK 1**: Cutting ceramic tiles with hand held tile scriber**

- Mark the tile where you want to cut (Fig 1)

Fig 1



HANDHELD TILE SCRIBE

MBN11170H1

- Lay another tile across the one to be cut as a straight edge.
- Pressing down firmly on the cutter.
- Draw it across the tile paying particular attention to the start and finish of your line.
- Press down firmly on the work surface, then your other hand apply downward pressure on the section of tile.

— — — — — — — —

TASK 2: **Cutting ceramic tile with a mechanical cutter**

- Keep the tile in the mechanical cutter. (Fig 2)

Fig 2 **Apply downward pressure on handle for cutting wheel**

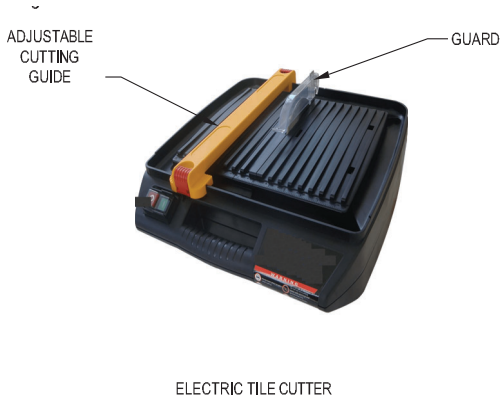
Contractors tile cutter

- A circular blade on the end is pushed over the tile along the line, need to cut.
- The clamp is down on the tiles.
- Breaks it in the required place.

TASK 3: **Cutting tiles with electric tile cutter**

- Push the tile along a spinning cutting blade that then makes your cut. (Fig 3)

Fig 3



ELECTRIC TILE CUTTER

- Specific size can set to make by adjustable guide.

Note: The guide will ensure that your cur is straight and true while working, do not get your fingers too close.

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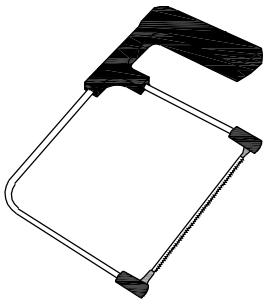
TASK4: **Cutting ceramic tiles with hand saw**

- Use profile gauge, for marking out the correct shape of the tile (Fig 4,5)

Fig 4

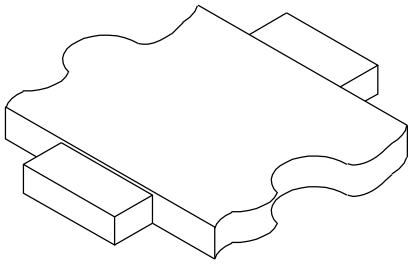


150 mm TILE SAW BLADE

MBN11170H4

- All tiny cuts needed in the corners of tiles two fit in to places.
- While cutting through tiles, your pull the blade back and forwards.

Fig 5



PROFILE GAUGE

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Mosaic terrazzo and tiles flooring

Objectives: At the end of this exercise you shall be able to
- **check the tiles**
- **prepare surface of flooring where tiles are laid**
- **set out proper border line for use of maximum full tiles**
- **prepare bedding of mortar.**

Requirements

Tools / Instruments

- Trowel (25 cm) - 1 No
- Mortar pan - 1 No
- Spirit level (15 cm) - 1 No
- PVC tube level - 1 No.
- Measuring tape (3m) - 1 No
- Steel right angle 0.75 x 0.5m - 1 No
- Wooden mallet - 1 No
- Chisel 12 mm - 1 No
- Hammer 1 1/2 lbs - 1 No
- Line and string - 1 No.
- Straight edge (1.5 m) - 1 No
- Brush - 1 No
- Spade - 1 No
- Tile cutting machine - 1 No
- Polishing machine - 1 No

Materials

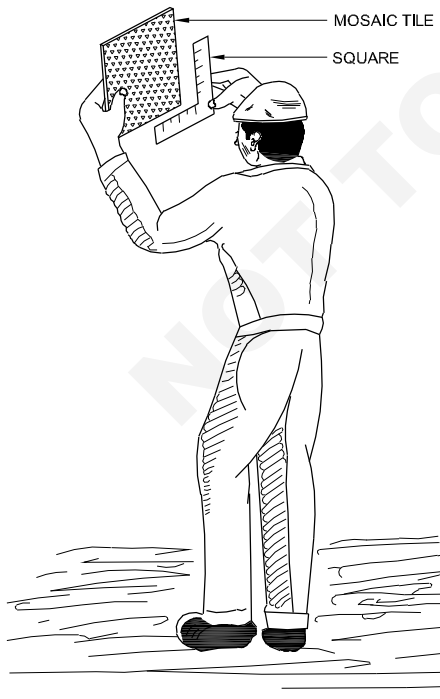
- Mosaic/Terrazzo tiles 20 x 20 cm - 25 Nos
- Lime or cement - as reqd.
- Cement - 3 bags
- Sand - 6 boxes
- Stone ballast 12 mm gauge - 12 boxes
- Water - as reqd.
- marble chips 3mm - 1 No.
- marble dust - 1 No.
- oxalic acid powder - 1 No.

PROCEDURE

TASK 1 : **Check the tiles**

- Check all the mosaic / Terrazzo tiles for its squares and measurement of dimensions as shown in (Fig 1).

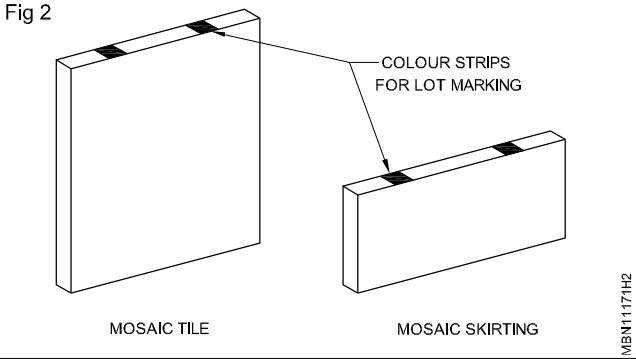
Fig 1



RIGHT ANGLE CHECKING OF MOSAIC TILES

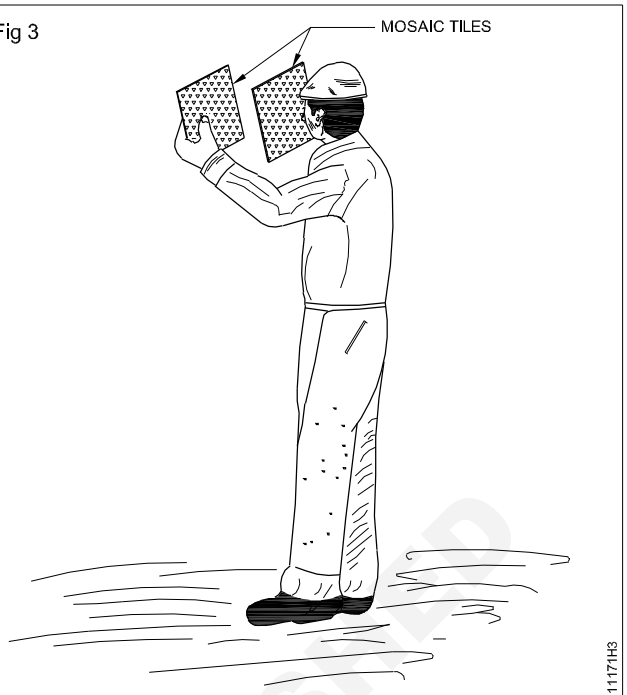
- Check the uniform thickness of each tile.
- Diagonals and size of tiles should be checked, and also checked for its straightness.
- Check the mosaic /Terrazzo tiles can by the colour strips marked on the side of the tiles as shown in (Fig 2).

Fig 2



- Select any one of the mosaic/Terrazzo tile at random and the tile is made hand polish by polishing stone or brick bat to check whether they are matching with each other as shown in (Fig 3).

Fig 3



CHECKING OF TILES AT SITE

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TASK 2 : **Prepare surface of flooring where tiles are laid**

- Prepare base concrete or R.C.C slab on which the mosaic /Terrazzo tiles are to be laid should be cleaned and wetted.
- Level and clean the surface of flooring work.

Note : There should not be any cement mortar lumps on slab and corners of the rooms as shown in (Fig 4).

Fig 4

SURFACE PREPARATION BEFORE TILING WORK

- Mark reference levels, on main floor frame of the building as shown in the (Fig 4).
- Mark reference levels, on main door frame of the building as shown in the (Fig 5).

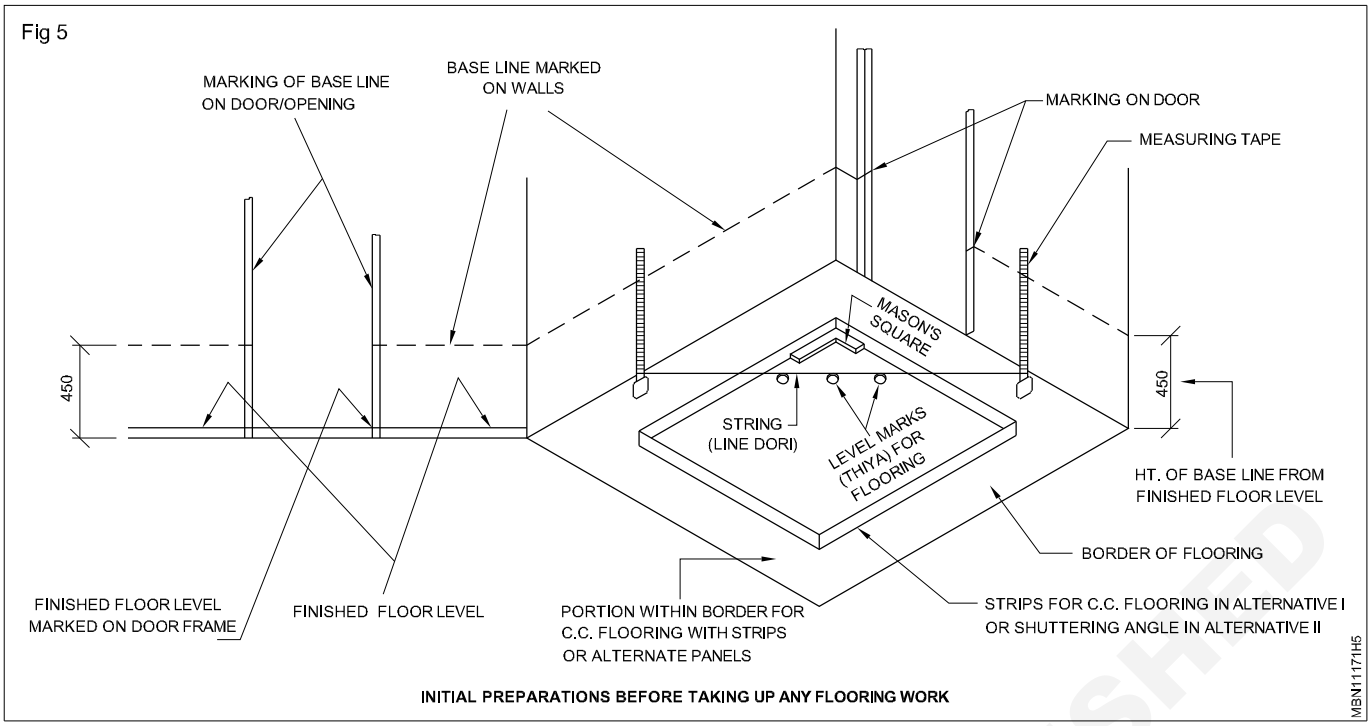
Note: After the plastering work is complete and before taking up the work of flooring. transfer the finished floor level very accurately at one of the door opening (main door frame) as shown in the (Fig 5).

- Measure the height of 450mm from the above marking of finished floor level along the door frame upwards and move temporary mark on the door frame as shown in the (Fig 5)
- Carry this level on all the door of the flat/Building and make mark on all the doors.
- Transfer this level on all the walls of the rooms to be taken up for flooring and make temporary marking as shown in the (Fig 5).

Note: This line can be called as baseline and the flooring of the room should be done only with reference to this base line.

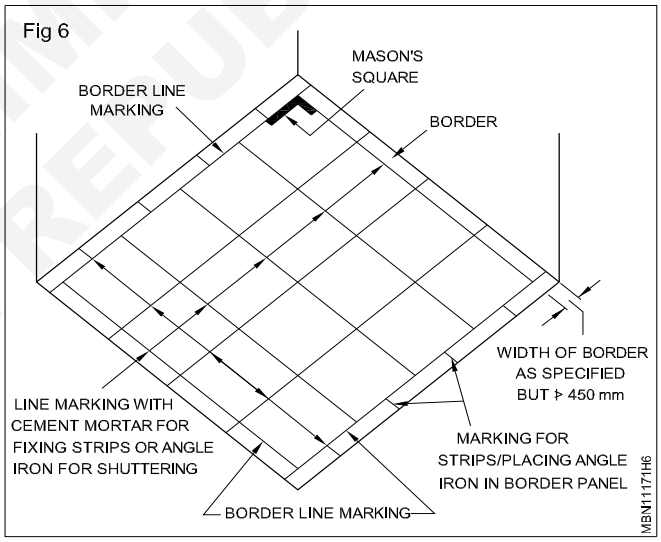
After the baseline is marked on the walls of the room and conform in the slope in the floor.

Setting of right angle is the most important work of preparation in flooring work.



TASK 3 **: Set out proper border line for use of maximum full tiles**

- Fix border line on all sides of the room.
- First fix right angle taking in consideration the longest span of the room for setting right angle for minimum wastage of tile.
- Complete the marking of borderline on four sides of the room.
- Check all the four angles of the square so formed with the help of mason's square as shown in Fig 6.
- Make slight adjustment in the width of the border if due to any mistake in the construction of walls and not getting all corners in perfect right angles.



TASK 4 : **Prepare bedding mortar**

- Prepare the bedding for the tiles should be with lime mortar 1:3 (1 lime : 3 coarse sand) or mix cement mortar 1:4
- Mix the lime mortar by volume in dry form.
- Care should be taken to ensure that there are no hard lumps present.
- Add water and mix thoroughly until good consistency for workable.

Note :Base concrete on which the tiles are to laid should be cleaned and wetted.

Lime mortar bedding should be spread tamped and corrected to uniform levels and allowed to hardened.

Lay cement mortar as bedding the mosaic/Terrazzo tiles these should be set immediately after laying the cement mortar.

Prepare cement slurry of honey like consistency should be spreader at the rate 4.4 Kg of cement per square metre.

- Fix the tiles in this grout one after another.
- Tap each tiles gently with a wooden mallet till it is properly bedded.

- Check the tiles level in the adjoining tiles.
- Keep the joints as thin as possible not exceeding 1.5mm and in straight lines.
- Check the surface of the flooring during laying should be frequently with straight edge.
- Check the flooring surface with the required slope as per the specification.
- Cut full tiles to the required size.

Note : The cut tile edges rubbed smooth to ensure a straight and true joint.

The tiles should be fixed in the floor adjoining the wall should be minimum 12mm under the plaster.

The junction between wall plaster and tile work should be finished neatly.

After the tiles laid surplus cement grout coming out from joints should be cleaned off.

- Apply the grey cement slurry with brush or trowel on the surface of the laid tiles at the depth of about 5mm uniformly.
- Clean all dust or loose mortar should be removed.
- Keep the flooring surface for curing to a minimum of seven days.

Note: The surface of tiled flooring should started for polishing with machine as shown in Fig 7.

For small areas hand polishing may be used after laying tiles.

After the final polish, oxalic acid should be dusted the surface of the flooring.

The acid mixed with water and sprinkled and rubbed with a pad of wooden rags.

- The surface of tile flooring wiped with a moist rag and dried with soft cloth and finished clean

Note: If any tile is disturbed or damaged, it should be refitted or replaced properly jointed and polished. as shown in the Fig 8.

The finished mosaic tile/Terrazzo tile floor should not have hollow sound while tapped with a wooden mallet.

Fig 7

POLISHING OF MOSAIC TILES

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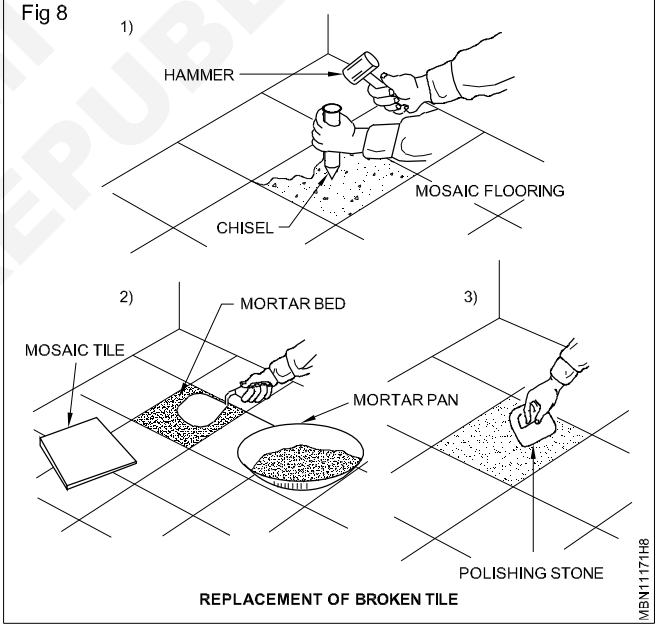
Fig 8



REPLACEMENT OF BROKEN TILE

MBN1117H8

Laying out of a stair on the ground

Objective(s): At the end of this exercise you shall be able to
- **mark the layout of stair on the ground.**

Requirements

Tools

- Builder square - 1 No.
- Nylon marking thread - 1 Roll.
- Hammer - 1 No.
- Measuring tape - 1 No.
- Spade - 1 No.
- Plumb bob - 1 No.

Materials

- Wooden peg (about ϕ80 to ϕ100mm) and 450 to 600 mm - as reqd.
- Mortar - as reqd.
- cement - 1Bag
- Sand - 5Box
- Water - as reqd.

PROCEDURE

TASK 1**: Layout of a stair on the ground. (Fig 1)**

- Inspect the plot where setting out is to be done
- Study the plot layout drawing.
- Study the building drawing.
- Mark the building on the ground as per drawing.
- Locate the stair care in verandah.
- Mark the Dog-legged stair 5x2 m.
- mark thickness of wall 30cm all-round.
- Mark width of stair and landing 1m.
- Mark tread and rise 25cm and 17.5 cm respectively.
- Complete the layout of stair on the ground.

Fig 1