

**AREA:** Agricultural Mechanics

**UNIT:** Surveying

**COMPETENCY:**

1. Lay a foundation.

**JOB:** #13 Laying a Foundation

**SITUATION:**

Students know how to operate a transit.  
Students know how to profile level.  
Students know how to differential level.  
Laying a foundation is important skill when building.  
A square foundation is a must when constructing a building.  
Activity to be performed at ?  
Two days required.

**OBJECTIVES:**

1. Given a land area, to lay a foundation square.

**MOTIVATION:**

Review key points of previous lesson.  
Tie key points to today's lesson.  
How many buildings are on your property?  
Who built them?  
Could have you built them ourselves?  
What is the first step in building construction?  
Show picture of a poorly laid foundation.  
What problems do you see?  
How could these problems have been avoided?  
State the objectives.  
Move out to the demonstration site.

**DEMONSTRATION:**

Demonstrate laying a foundation square.

**REFERENCES:**

Resource Unit on Leveling and Land Measurement Practices.  
JOS on Laying a Foundation

**SUPERVISED PRACTICE:**

Divide students into 4 groups.  
Each group is to lay one side of the foundation.

**TESTING AND APPLICATION:**

Student participation = 50 points.  
Information on unit exam.  
Information included in notebook evaluation.  
SOE application.

**MATERIALS NEEDED:**

4 - transits  
4 - rods  
4 - tripods  
stakes  
string  
shovels  
pencils  
boards used for batter boards

## LAYING A FOUNDATION

### Introduction:

There is more to constructing a good foundation than knowing the correct footing size and selecting a suitable wall material. The building must be laid out, the excavation dug, the drainage tile installed and the foundation walls waterproofed. This operation describes how to lay out a building foundation using the tripod level.

### Procedure:

#### Step I

The first step in laying out a building foundation is to clear the site. This involves the removal of sod and tree stumps from the immediate area. Vegetation will harbor termites and should not be used for fill or left under the building.

#### Step II

Establish minimum grade of foundation. The ground on which the foundation is to be placed should be graded to provide drainage without excessive slope.

#### Step III

Locate the property corner stakes.

1. Drive a stake into the ground at one corner of the intended foundation (Stake A). If the ground is sloping, place the stake at the highest elevation. If the ground area is near level, any of the four corners will do as a starting point.
2. Measure off the correct distance along one side of the foundation and place a second stake at that point (Stake B), on a line which parallels established buildings, fences and/or roads. Locate the center of the tops of the stakes by drawing 2 diagonal lines across the top. Where these diagonal lines intersect is the center of the stake; a nail is then driven part way into the center of the stake.

3. Attach builder's line to the nails in the stake tops. (Figure A-1)

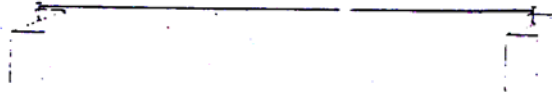


Fig. A-1

4. Position the level directly over Stake A using the plumb bob and sight to Stake B. (Figure A-2)

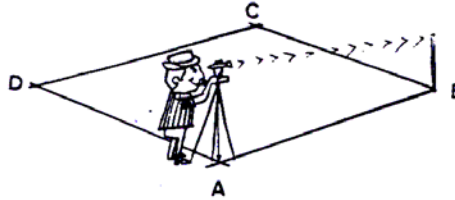
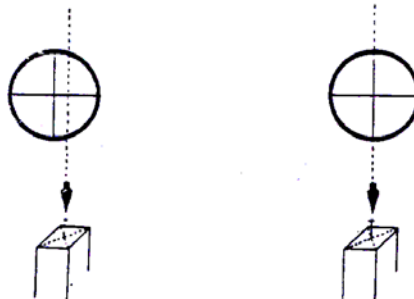


Fig. A-2

Hold the plumb bob over the nail in Stake B and align the vertical cross hair of the level with the plumb bob string. (Figure A-3)



- |                                                    |                                                |
|----------------------------------------------------|------------------------------------------------|
| A. Cross hair & plumb bob string out of alignment. | B. Cross hair & plumb bob string in alignment. |
|----------------------------------------------------|------------------------------------------------|

Fig. A-3. Aligning the vertical cross hair of the farm level with the plumb bob.

5. When the vertical cross hair of the level is in line with the plumb bob, set the azimuth of the level to 0 degrees.
6. Turn the telescope tube exactly 90 degrees to the left and sight. (Figure A-4) Measure off the correct length of the foundation. Use the plumb bob, aligned with the vertical cross hair to locate Stake D. (Figure A-3) Drive a stake at that position. Locate the center of the stake top and drive a nail into the top at this point. When a line is connected between Stake A and B the outside edge of the foundation will be located. Connect Stake A with Stake D with a builder's line.

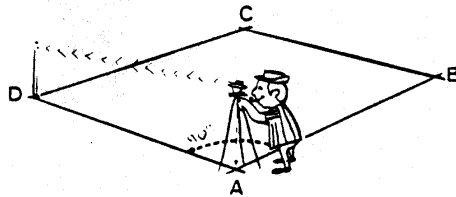


Fig. A-4

7. To determine the location of the fourth corner "C" you will need to measure the distance from Stake B to D. (Figure A-5) Measure the correct length and width of the foundation from Stake B to Stake C, from Stake D to Stake C, and from Stake A to C. Where all three points meet is the location of the fourth corner. (Figure A-6) Place Stake C at this point. Drive a nail in the center of the stake top. Connect a builder's line to the nail in the center of Stake C.

Step IV Right angle batter boards must now be placed on all four corners of the foundation. The batter boards are approximately 6 to 8 feet from the corner stakes and parallel with the foundation walls. (Figure A-7) Right angle batter boards are made by nailing two 1" x 6" to three 2" x 4" stakes. (Figure A-8) The first batter board may be set at any convenient

level usually 6" above the surface of the ground and the other three batter board corners made level with it.

Fig. A-5

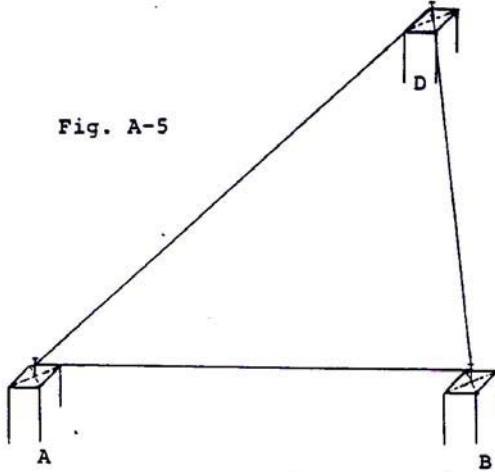
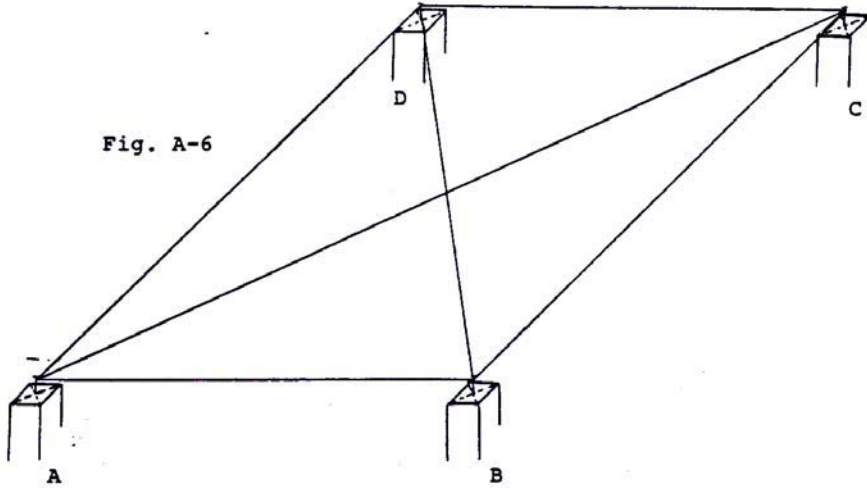


Fig. A-6



and by sighting the cross of the level  
board placed against the side of the  
structure.

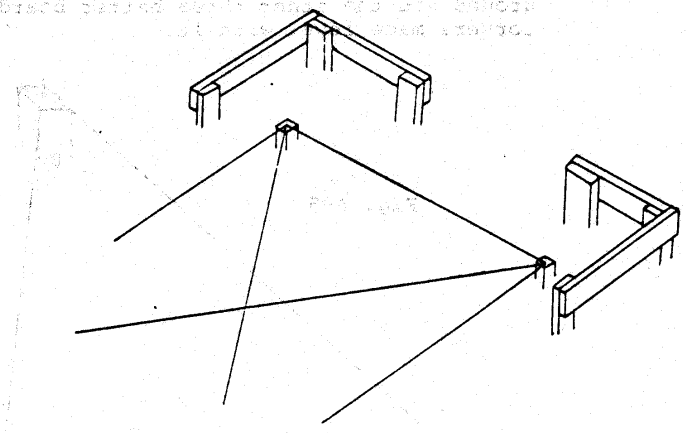
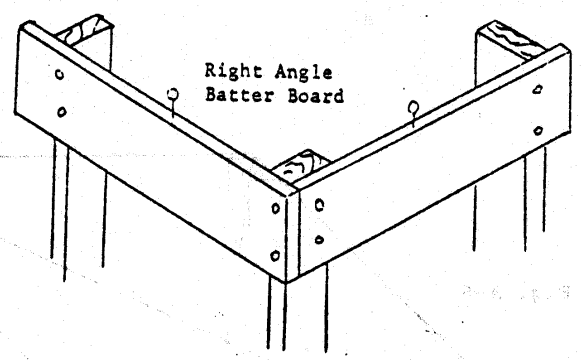


Fig. A-7



Right Angle  
Batter Board

Fig. A-8

The steps to follow in setting the batter boards at the correct elevation are as follows. Assuming that the ground is fairly level, we set up the tripod level in the center of the proposed building area, and locate the position of the batter boards at corner A. A good way to do this is to fasten the batter boards to the stakes at a point slightly higher than the derived elevation and then drive the stakes carefully into the ground to bring the top of

the batter boards to the proper height and make them exactly level. This can be determined by taking rod readings on several points on the batter boards as the stakes are being driven. (Figure A-9) The batter boards may be set at the other three corners and leveled in the same manner and to the same elevation as corner A.

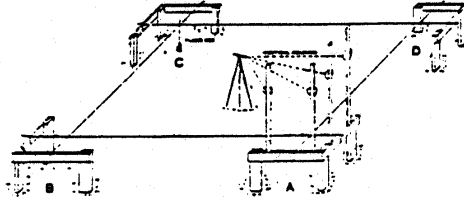


Fig. A-9

Step V. Tie strings on the batter boards to intersect directly over the four corners. Use a plumb bob to locate the intersections of the strings directly above the x marks on the tops of the corner stakes. You may find it useful to mark points of attachment of the strings to the batter boards by making a light saw cut or driving a nail into the batter board. You will then be able to take the string down and put them up again in the correct location after the corner stakes have been removed as the foundation trenches are dug. (Figure A-10).

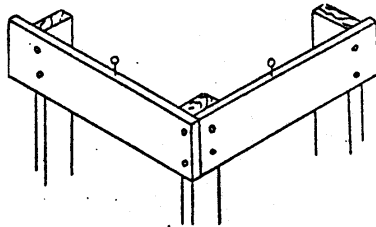


Fig. A-10