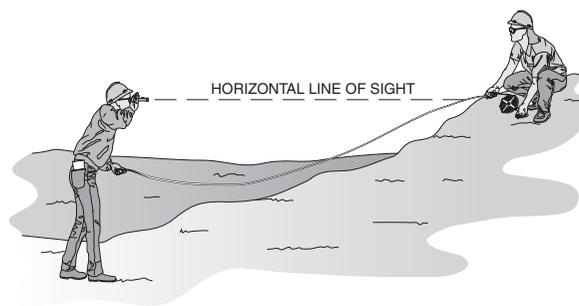


Chaining a Distance

Procedure for Measuring a Distance	4-8
Calculations	4-14
Field Notes	4-14



SCOPE

Even though it has been shown in the previous Section that the chaining process involves simple steps, it is still involved and requires constant attention to the details of performing chaining properly. To be successful at measuring distances accurately and precisely requires consistency in the chaining procedure. This Section will explain and demonstrate the step-by-step activities of the persons involved in the chaining process.

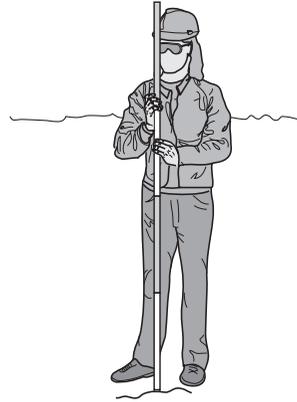
PROCEDURE FOR MEASURING A DISTANCE

REAR CHAIN

HEAD CHAIN

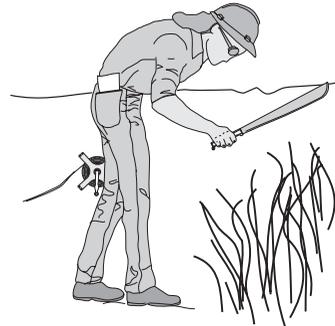
Step 1 Locates the beginning point and sets a range pole or lath with flagging to mark it.

Locates the end point and sets a range pole or lath with flagging to mark the point.



Step 2 Holds the end of the chain and gives direction to the Head Chain verbally or by hand signals.

Walks from the beginning point toward the end point, clearing brush, etc., out of the chaining path. Allows the chain to come off the reel while walking.



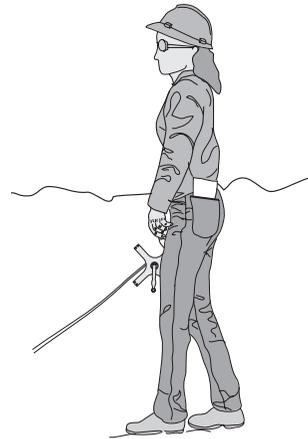
REAR CHAIN

Step 3 Stands on the beginning point, sights on the range pole at the end, and puts the head chain on line.

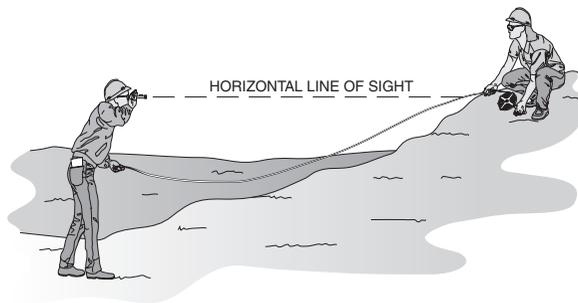


HEAD CHAIN

Upon reaching the end of the chain, turns and looks to the rear chain for alignment directions. Gets on line as instructed.



Step 4 Whoever is downhill will take out a sight level and determine the proper height to plumb while measuring to ensure that the chain will be horizontal.



Plumbing introduces small errors in the measurement, so if at all possible, only plumb at one end of the chain. If the line is going over the top to a bush or rock or something, of course it will be necessary to plumb at both ends. **The rule of thumb is to only plumb at one end.**

When chaining, it is necessary to position your body properly to be able to easily resist the tension that is being applied to the chain. The head chain and rear chain should not face each other when chaining; they should be standing so that they are facing the chain. Also, watch your feet—place your legs and feet apart so that you can brace yourself and be able to resist the tension. If you have your feet together when tension is applied, you will likely be pulled over and you will fall. Do not hold the chain at arm's length; instead, hold it so that your arms are against your body so the chain will be steady. By having your arms against your body, you are able to easily use your body and arms to resist the tension being applied to the chain.

Many persons make the chaining process difficult by the methods they use when holding the chain, plumbing over a point, and reading the tension—all required to be performed at the same time. To make this easy, determine how high to plumb using a hand level, and wrap the plumb bob string around your right index finger when the plumb bob string is the correct length. While holding the end of the chain in your left hand, place the string over the chain and bring your right hand down to the chain. If you intend to hold zero, place the string at zero and pinch the string between your thumb and the chain and your index finger. As tension is applied, you only need to glance at the tension and concentrate on getting the plumb bob on the point.

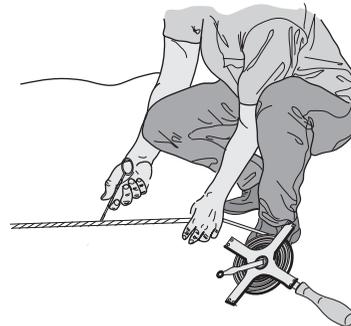
REAR CHAIN

Step 5 Resists the tension being applied and yells "good" or "mark" when the end of the chain is over the point.

HEAD CHAIN

Applies the proper tension to the tape to eliminate sag. Identifies the spot on the ground that marks the end of the chain and releases tension when the point is marked with a chaining pin or nail.

Insert the chaining pin at a 45-degree angle to the ground, and at a 90-degree angle to the chain.



REAR CHAIN

Step 6 Holding at the prescribed height, plumbs if necessary, checks holding the ZERO over the point.

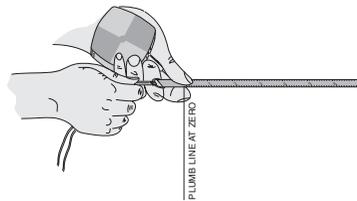


HEAD CHAIN

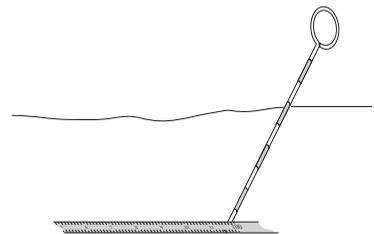
Holding at the prescribed height—using a plumb bob if necessary—checks the 100-foot mark.



Step 7 Rechecks alignment and makes sure ZERO was being held on the point.



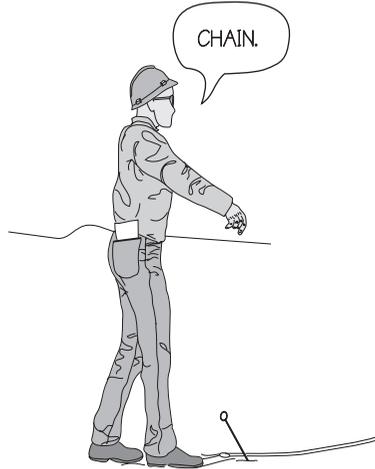
Checks the chaining pin or nail in the ground at the new point. Checks to make sure exactly 100 was being held.



Step 8 Steps 5 through 7 are repeated to check the measurement.

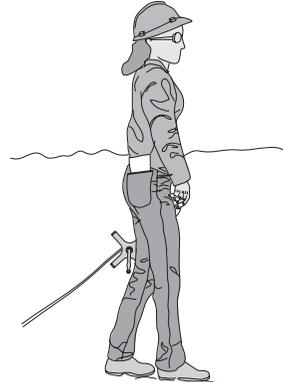
REAR CHAIN

Step 9 Gathers equipment and advances to the point just set. Watches the end of the chain and yells "Chain" when the end of the chain is near the point.



HEAD CHAIN

Moves ahead on line toward the end point dragging the tape behind. Stops when the Rear Chain yells "Chain."

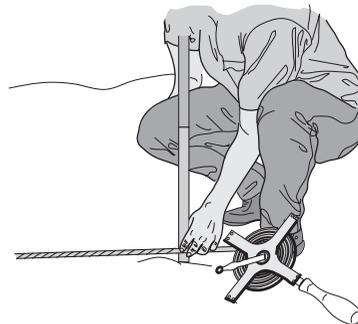


Step 10 Steps 2 through 9 are repeated for each additional full chain length measured.

The following steps apply when the full length of the chain is not used.

Step 11 When measuring the less-than-full chain length at the end of a line, don't forget to chain horizontally. Also, the amount of tension applied should be decreased slightly because of the smaller length of chain being used.

Step 12 Gets in position at the last point marked. Walks to the end point of the line, reels up the extra chain, and prepares to read the chain.

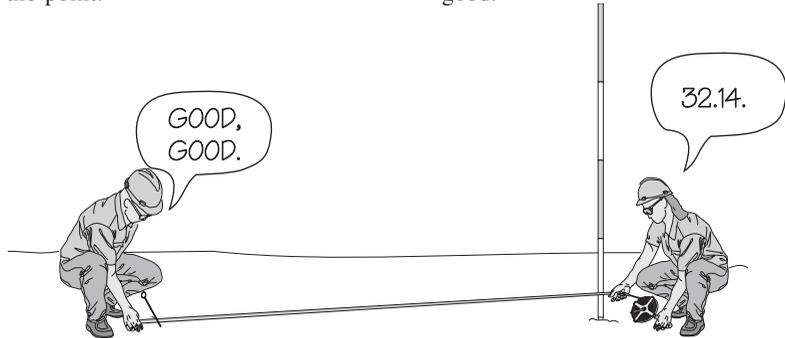


REAR CHAIN

Step 13 Holding chain at the determined height horizontal at the last point marked, resists tension being applied and yells "good" when the end of the tape is over the point.

HEAD CHAIN

Holding at the determined height to chain horizontal, applies tension and reads the chain when over the end point to the nearest 0.01 when the rear chain yells "good."



Step 14 Checks the last measurement. The head chain yells out the last reading for the notekeeper to record. The notekeeper adds the hundreds of feet to the final distance and repeats it back as a check as the head chain checks the reading.

Record all measurements at the time they are measured.



Step 15 The distance measured is the total of the number of chain lengths measured plus the reading the head chain made at the last measurement.

Step 16 Repeat all of the above steps anytime a measurement between two known points is desired.



This is the basic process for chaining a distance between existing points. This detailed procedure should be studied and used every time a measurement is made until it becomes second nature. To lay out a point by chaining, see *Chapter 19, Layout Techniques*.

CALCULATIONS

The forward and back distances are averaged by adding them together and dividing by 2 to obtain a mean distance. Some persons chaining also calculate a discrepancy ratio for each line measured. The calculated ratio is compared to an established standard to determine if the distance is acceptable or needs re-measured.

Forward – Back = Discrepancy

$$\frac{\text{Discrepancy}}{\text{Mean}} = \frac{1}{\chi}$$

For example, in the notes below for line 19-13.

$$\frac{168.29 - 168.25}{168.27} = \frac{1}{4200}$$

FIELD NOTES

HORIZONTAL DIST. MEASUREMENT / STEEL CHAIN					INITIALS J.O. R.C.
TAPE LINES	FOREWARD DIST. FT.	BACK DIST. FT.	MEAN DIST. FT.	DISCREP. RATIO	
10 - 11	105.85'	105.91'	105.88'	1/1764	M.B. C.B.
11 - 19	138.50'	138.53'	138.51'	1/4600	C.B. M.B.
19 - 13	168.29'	168.25'	168.27'	1/4200	J.O. M.B.
13 - 12	185.16'	185.18'	185.17'	1/9300	M.B. J.O.
10 - 21	91.24'	91.28'	91.26'	1/2300	J.O. B.C.

NOTE: EACH PARTY MEMBER DID DIFFERENT JOBS ON EACH DISTANCE.

NOTE: EACH MEMBER TOOK NOTES ONCE AND COPIED OTHER MEMBERS.

LOCKER #13
PARTY 4
3B; CLOUDY
"DRIZZLE"

FEB. 20, 2002
J. OCHS
C. BROWN
M. BAILEY
R. COLE
B. COUCH

GRANT ST.

K. Meyer