

BOND
USA
DEPARTMENT

FREE LOCATION
OF
SECONDARY LOGGING ROADS

Submitted
to
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FREE LOCATION
OF
SECONDARY LOGGING ROADS

INTRODUCTION

Free location of secondary logging roads is planning the road in the engineer's head. The engineer will have the specifications of the road to follow in his planning. Probably the most valuable asset that the engineer can have is "engineering judgement".

Generally the specifications of the road are:

1. Width of the road.
2. Maximum grade.
3. Minimum curvature.
4. Cut and fill slopes.
5. Culvert location.
6. Maximum distance between turnouts.

The conditions that are adaptable to free location are; area in one ownership and cross slopes not over 50%. When the cross slopes exceed 50%, the road should be fully benched and the cut slope accordingly planned.

The location of the road is broken down into two phases each of which is broken down again. The first phase is reconnaissance and the second is location.

RECONNAISSANCE

Reconnaissance is to look over an area which is to be logged so that an effective road system can be constructed in the area. The roads should be planned so that they will tap the most area and, if there are existing roads near the area, to connect with existing roads now or in the future.

Office

The location of the terminal points is important; otherwise, time and money will be spent by working towards the wrong place. Often the area to be logged will determine the location of the roads. The engineer must be satisfied, and be able to satisfy others, that the routes decided upon are in the best location.

After the terminals have been selected, maps and aerial photographs of the area are examined to aid the engineer in planning the location of the roads.

The logging plan is studied to determine the boundaries of the area. Topographic maps are studied to locate governing points and to figure approximate grades.

Field

The engineer must not limit his reconnaissance to one route but should go over every possible route. As the engineer traverses the routes, he takes notes on each route for cost estimates.

The engineer will make a cost estimate of feasible routes for comparison. Some of the information needed is distance, grade, cross slope, cover, soil and any other necessary or unusual information.

After completing the cost estimates, the engineer will look

over the logging plan and decide which route will be the best for the area considering cost, area served, grades, and whether practical. The engineer will flag the grade line of the final route.

LOCATION

After the engineer has flagged the grade line, a crew will then put in the construction stakes. The crew chief should be experienced so that he can judge the effects of changing the centerline. Any changes made in the centerline should be checked by the engineer.

The crew's work will be to centerline stake, locate curves, slope stake, set culverts, and stake turnouts. The crew chief will keep a full set of notes showing the station, grade, centerline cut or fill, slope stakes, culvert stakes and length of the culvert.

Centerline

Ordinarily the centerline will be located along the grade line and the cut will be enough to remove the duff. When the centerline must be corrected for alignment, through cuts or through fills can be made.

Earthwork tables or graphs are valuable to avoid excessive or insufficient earthwork when through cuts or fills are planned.

The crew should centerline and slope stake alternately. In this manner, the centerline can be corrected for alignment before the slope stakes are set. Culverts and turnouts will be staked at the same time that the slope stakes are set. The centerline should be staked for one-half day, preferably in the afternoon, and then

walked over to check for alignment. Any misalignment will be noted and corrected then or later.

To run in the line, the abney is set on the grade and the instrument man stands on the station last set. The rod man then runs out fifty feet and plumbs the rod. The instrument man then moves the rod man up or down the hill until he reads his H.I. on the rod. If the cut or fill is different from the last station, the cut or fill is computed and marked on the centerline stake. The instrument man then moves forward to the station just set and the process is repeated.

Curve Location

When the crew chief estimates that a curve is less than the minimum degree of curvature, generally 84° , he will locate the curve by a method of curve location.

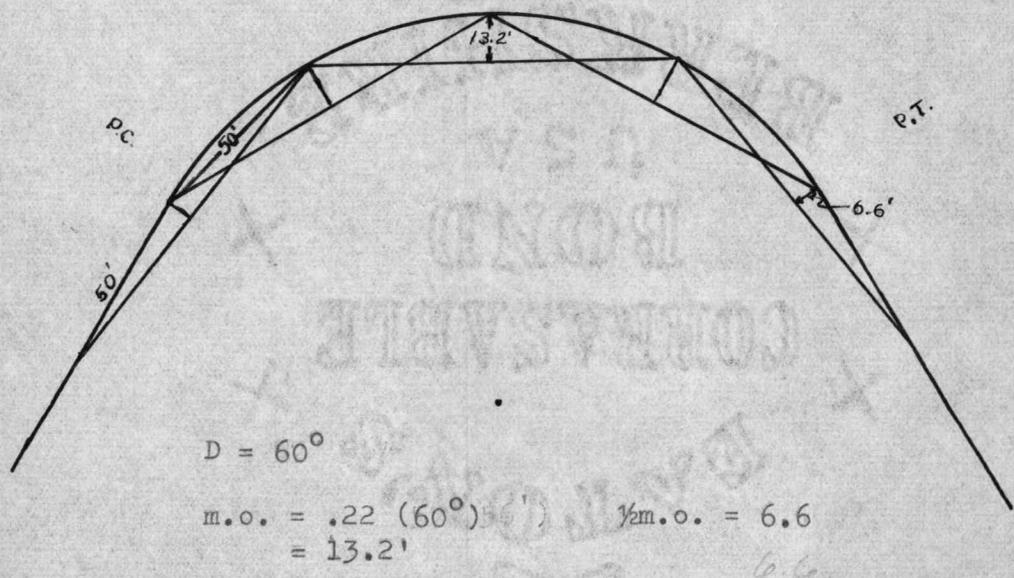
A method that is well adapted to free location is the middle ordinate method (see Figure 1, page 5). With this method, the degree of curvature is estimated and the middle ordinate computed. The middle ordinate is roughly equal to .22 times the degree of curvature, $D : m.o. = .22D$.

The crew will start at the point of curvature, P.C., and lay off one-half the middle ordinate towards the center. The point established is used as a sighting point for the next station. One man stands on the station preceeding the P.C. and sights over the sighting point lining the forward man, the forward man will be fifty feet from the P.C. After he is lined in, he will set the centerline stake. The middle ordinate is then laid off towards the

center of the curve and the back man will use the P.C. as his station and sight over the new point to line in the forward man. The crew will then proceed around the curve until at the point of tangency, P.T., and use one-half the middle ordinate to set the station on the tangent.

If the curve is not in a good position, the degree of curvature will be changed, but not reduced below the minimum degree of curvature, and the curve ran over.

Figure 1
Curve Location by Middle Ordinates

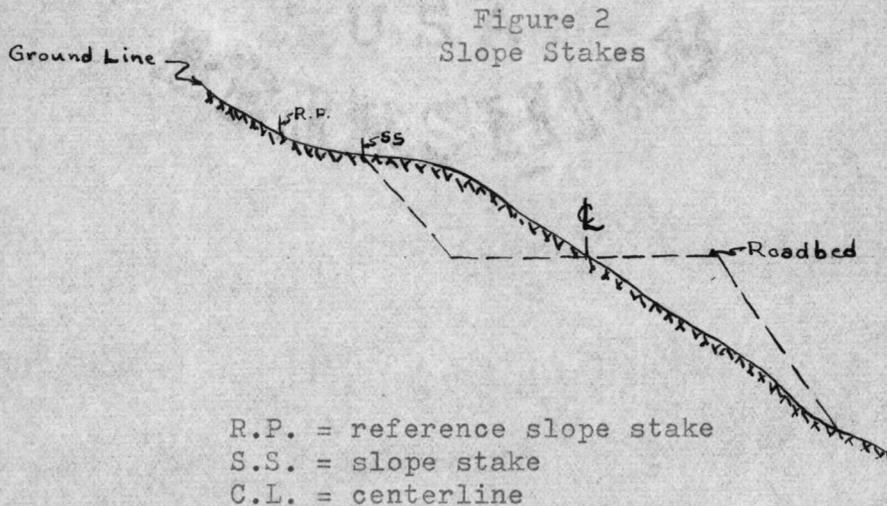


Slope Stakes

The slope stakes are set either mathematically or by tables. When set with tables, each stake should be checked before setting; otherwise, errors will nullify the engineering work.

The slope stakes will normally be set on the cut side (see

Figure 2). The exception is when the alignment calls for a through cut or fill, then both sides will be staked. The slope stake will be set at every one-hundred foot station and every fifty foot station on curves.



Setting the slope stakes mathematically is probably the easiest and most accurate method. For a difference in elevation from the grade, the horizontal distance is computed and added to one-half ^{Ditch 3} the width of the road. If the distance and difference in elevation coincide, the stake is set at that point. Each man on the party should make the computations; this will tend to eliminate errors in calculating.

When setting the slope stakes by tables, the crew chief will follow the centerline party taking the cross slope at each station. He will then mark down the cross slope and look up the distances and cuts or fills in the tables and note them in the field book.

The party will then follow up at a later time setting the

slope stakes. Before setting a stake, the cross slope must be checked by sighting on the rod at the proposed distance, any variation in the cross slope must be corrected. The reference stake is then set at a specified distance back from the slope stake, marked and noted in the field book.

Turnouts (1:108)

On single lane roads, turnouts must be provided to allow the trucks to travel freely. The turnouts should be visible from one to the other and two lanes wide - the lanes are to be wide enough to accommodate two loaded trucks. The turnouts should be next to the incoming lane, this will depend upon the side of the hill that the road is on and other factors.

Culverts

The main purpose of a culvert is to drain water through and from the road; thereby preventing excessive erosion and lowering maintenance costs. An eighteen inch culvert should be the minimum size used. The size of culverts in creeks are determined by formula, graphs, or cross section of the high water mark.

If a natural drainage does not occur within specified limits, a drop inlet culvert should be set to take care of the road drainage.

SUMMARY

The value of free location of secondary logging roads is because of the simplicity of location. The system is mechanical

in its methods except when variations in road alignment occur. Then the engineer must use judgement in changing the alignment.

The location of a road is in two phases. The first is reconnaissance, deciding where the road will go and flagging the centerline. The second is the location, staking the centerline, slopes, curves, turnouts, and culverts. The most important of the two is the reconnaissance as this phase decides where the road will go.



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