

village and town plans; locally,—registered plans, information from local surveyors; or ordinance land plans.

Objects of Survey

To locate and mark on ground, centre line of proposed highway; to mark out the new proposed limits of highway; to establish by level suitable and sufficient bench marks along highway; to obtain sufficient information to plot a complete profile of the centre line of road, with all information re levels of culverts, bridges, buildings, structures, etc.; to plot complete cross-sections of road at every 100 ft. station and at all critical points in profile; to obtain information and measurements sufficient to prepare a plan for registration purposes, showing:—

The names of owners affected or abutting on highway; frontages and amount of widening; the location of new centre line and new limits of highway with respect to former registered plans and surveys, and with respect to original or old and established limits of road; all markings found, markings made or planted, land ties, etc.; all necessary measurements and bearings; position and ownership of poles, railways, houses, sheds, structures of any kind, wells, fences, trees, etc.

General Routine and Organization

Chief of party with at least two assistants should first of all lay out stations or points governing location of centre line.

While chief is thus engaged, the level party can bring along the levels, the property man can obtain the owners' names and identify the property lines, and 2-in. x 2-in. x 24-in. wooden stakes can be distributed along the route at points where they will be required.

If party consists all told of seven only, then the chief, with other members of party, including levelling party, later can carry on actual location survey, planting stakes, and obtaining all information necessary to survey.

If, however, party consists of twelve, while chief is laying out centre line or otherwise engaged, and while level party is carrying on levels, the location party continues with the survey, planting stakes, etc.

It is important that each member of the party, in a general way, has his own specific duties. After a few days trial it becomes quite evident what particular position each man is best fitted for.

All members of party should be instructed to refer all owners and outsiders asking particular questions re survey and widening, etc., to chief of party.

Location of Centre Line

By term centre line (C.L.) is meant the centre line of proposed new travelled roadway. This C.L. is intended also to be C.L. of the new limits of highway, except in the case of a highway upon which allowance is made for an electric railway, in which case more width is allowed between C.L. and limit of highway on the radial side of the C.L. than on the other. The line run and marked on the ground is for convenience in all cases the C.L. of proposed new travelled roadbed, but although always termed C.L. it is not, as explained in case of highway with radial, midway between the new limits of highway.

Traverse stations or points of intersection (P.I.'s) should first be selected carefully by chief of party so that courses of traverse will be suitable to define the centre line of the proposed new limits of right-of-way and at the same time the centre line of the proposed new roadbed. Careful consideration and due weight is to be given to present position of roadbed, ditches, embankments, culverts, bridges, buildings or other structures, rows of trees and electric railway lines, if any.

It is desirable to straighten out the roadway where it can be done without adding unreasonably to the cost of construction, utilizing to best advantage the existing ditches, if any, and old roadbed, and as before pointed out, taking into careful consideration other existing features, especially valuable trees and improvements. If trees are to be left standing, it would appear that generally C.L. should pass at least 25 ft. from same, preferably from 38 to 50 ft., according to particular cross-section of highway being laid out.

It is very necessary that the C.L. is laid down (so far as possible) to meet with the approval of the owners whose lands abut the highway. This will obviate the necessity of later making resurveys to change or adjust the C.L. to suit owners from whom land may be required for widening purposes and facilitate the procuring of such land for widening.

Trial Line Sometimes Necessary

Through thickly settled districts and where there are many houses standing close to road and many valuable trees to be considered, it is almost necessary to run a trial line measuring offsets to houses and trees, or any other particular features to arrive at a (location of) C.L. that will best fit the course and allow for the maximum widening with least destruction and expense.

The locating of angles, especially sharp angles on the brow of steep grades, should be avoided. In many instances, by moving the necessary angle or intersection point 50 or 100 ft. from brow of hill along the flattest grade, the angle in the road, although not much more noticeable to the eye, will be much safer for travel.

Better visibility and location at sharp angles may often be obtained by shifting one or both C.L. courses or tangents away from the corner.

The radius of curve to be adopted for a curve at any angle in road will be governed entirely by the existing conditions; the minimum radius to be, however, 300 ft.

For an intersection angle of less than 10 degrees, the limits of the highway will not be curved but run to an intersection.

A principle that generally it is well to follow is to avoid laying out new right-of-way in such a manner that a deep widening is required from an owner on one side of road while land is added to another owner on the opposite side of road, unless owners have been consulted and are agreeable. An equal widening on both sides of road usually appeals to the different owners. Where, however, there is the same owner on both sides of road, more freedom of choice for position of C.L. is given.

Standard Width Not Binding

In place of deviating or shifting C.L. to allow for obtaining land for widening according to standard cross-section or to lessen cost of widening by avoiding costly moving of buildings or other obstacles, in some cases it will be found preferable to lay out the C.L. to best advantage for the general purposes and to allow the building or obstacle to encroach upon the proposed plan of cross-section. The standard width is desirable, but is not absolutely binding.

In the case of one or more important trees noticeably standing out nearer to C.L. than the general line of other trees, it might be found suitable and advisable, depending largely upon general conditions, to allow roadbed to swing out clear of trees, that they may remain standing, but to continue limits of highway straight or through.

The foregoing deals practically only with the adjusting and improvement of the old road location, or what might be termed the "ironing out" of the irregularities in the present road location, and with the defining on ground of the new location. There will be places, however, where for safety and economy it will be advisable to deviate altogether from present position of road and open up a new right-of-way. These places are usually quite evident on the ground, and at such points or places complete information should be obtained regarding all features that would affect the relocation of the road. Generally, in these instances, with complete information at hand, the best location can be made upon a plan and then transferred to ground.

Limits of Road at Angles in C.L.

At the angles in C.L. or P.I.'s of tangents or courses, an iron bar 1 in. x 1 in. square and 12 ins. to 24 ins. long is driven to flush with road surface, the short bar being used only when found too difficult to drive the 24-in. bar. Reference stakes 2 ins. x 2 ins. x 24 ins. marked 15 to P.I. with black paint are to be driven in firmly on either side of road at 15 ft. offset from P.I., reference measurement to be taken also to any nearby prominent objects not likely to be disturbed by new road construction.