

PROVINCIAL HIGHWAY SURVEYS

BY JOHN T. RANSOM

Surveyor, Department of Public Highways, Ontario

SURVEYS are necessary in the preparation for improvement of any highway. The character or class of surveys depends upon the nature and extent of the proposed improvements. Provincial highway surveys, like railroad and many other types of surveys, are made for two purposes, namely, engineering and land.

If it were possible to make the land survey separately from the survey for engineering purposes, the work of either survey could be carried on to the best advantage, but the necessity of speeding up construction and the necessity at the same time of procuring lands to widen the existing roadways sufficiently to provide for the construction and maintenance of roads suitable to the demands of a Provincial Highway System, make it impracticable to separate the surveys, at least in the first stages, and for any particular highway a survey party as a unit must be organized to conduct a survey sufficient for the requirements of all engineering and land purposes.

Of the many methods of procedure open for surveys of highways, three commendable methods are briefly outlined as follows:—

First Method

- (a) Field.—Preliminary survey.
- (b) Office.—Preliminary plan.
- (c) Office.—Determination of location of new centre line and grades made upon plans.
- (d) Field.—Inspection of proposed lines and grades.
- (e) Field.—Staking out of alterations, if any, made to plans, fence line and limits of new highway location.
- (f) Office.—Final plan.

Second Method

- (a) Field.—Preliminary survey (proposed centre line carefully located and marked on ground).
- (b) Office.—Preliminary plan (made to conform with requirements for final plan).
- (c) Field.—Inspection of proposed location as staked out. Required alterations, if any, noted on plan.
- (d) Field.—Staking out survey. Monumenting.
- (e) Office.—Final plan (preliminary plan amended).

Third Method

- (a) Field.—Preliminary survey (proposed centre line and new limits of highway carefully located and staked).
- (b) Office.—Preliminary plan.
- (c) Field.—Inspection of location as staked out. Required alterations noted.
- (d) Field.—Correction surveys and monumenting.
- (e) Office.—Final plan (preliminary plan amended).

The first method of procedure as outlined above is quite unlike the other two methods in practically every respect. It is slow and sure, but too expensive a method to be applied to the ordinary run of provincial highways and suitable only for certain stretches of road.

The success of the third method depends entirely upon the location as staked out. If it is well done and few amendments or alterations are necessary, a great saving has been effected and the progress of the improvements to highway accelerated. If, however, the location has been poorly made and a large number of alterations required, the survey would prove not only expensive, but a set-back to the progress of the contemplated improvements to the highway.

Careful Inspection is Necessary

To insure the success of this method, or the certainty of the initial location as staked out being satisfactory over a sufficiently high percentage of the road, a careful inspection of the route is necessary, and an approximate location, or the governing features for the location, decided upon, before the issuing of the instructions for the survey or the commencement of same. With this provision, unless a de-

cided change in policy affecting the location takes place before the adoption of the plans and location as final, this method of survey should prove the most economic and of the greatest assistance to the other departments of the work.

The second method is a compromise between the other two.

The second and third methods are alike in that time and attention are given in the preliminary survey to the location for the proposed new highway, and the plans drawn of the preliminary survey, with amendments only required thereto, suffice for final plans. They are unlike in respect of the manner of staking out the limits of the highway.

The second method has the advantage in that no staking is done unnecessarily, and all stakes when planted are in their final position. The preliminary survey and plans can be completed more rapidly than in the third method, although upon the completion of the preliminary survey and plans, no markings exist on the ground to point out the new proposed limits. A second survey is certain of being necessary for the planting of stakes.

A draft of "general instructions," adaptable to provincial highway surveys made along the lines as suggested in the third method, follows. Consistent with the heading, these instructions are general, and intended only to be used and applied in the interpreting and for the simplifying of the "special instructions" which are necessary to be issued for each particular survey. An outline of the prints necessary to be dealt with in the "special instructions" is also given.

"Special Instructions"

Official name and description of highway; points of commencement and completion; reports daily, etc., address, etc.; preservation of records; returns, field books, plans, etc. (instructions to be filed with field notes); general instructions: (a) party, number and of whom composed, etc.; (b) equipment, where obtained, signature, care and responsibility, etc.; (c) data, responsibility for obtaining same, etc.; (d) object of survey, extent and character defined, proposed width and cross-section of highway, etc.; (e) survey; (f) monumenting; (g) plans; report upon completion of survey.

"General Instructions"

Party.—The survey party should number all told either seven or twelve.

Party of Seven:—Chief,—qualified land surveyor (keeps field notes, location); transit and levelman,—qualified as an instrument man (keeps level notes); rear chainman,—must be able to read a tape or chain quickly and accurately, and have a good eye and judgment; front chainman,—smart and good walker; tapeman,—active on feet; stake-man,—must be able-bodied and capable of swinging sledge hammer; chauffeur.

Party of Twelve:—Chief,—qualified land surveyor; transitman,—thoroughly competent (keeps field notes of location); transitman's assistant,—careful, ordinary helper (able to carry and set up instrument and give line); rear chainman; front chainman; tapeman; stake-man; property man,—intelligent, smart man, good writer; levelman,—thoroughly competent (keeps level notes); rodman; tapeman; chauffeur.

Equipment.—Transit and tripod; 2 pickets (heavy and light); 2 alloy 100-ft. chains; two 50-ft. steel tapes (graduated in tenths); 1 metallic linen 50-ft. tape; 6 refills; sledge; axe; 2 electric torches; black paint; octagon tool steel drill; heavy steel bar (for winter work only); and for level party:—level; rod; 50-ft. metallic tape (in tenths); hatchet; chisel; white paint.

The following data are to be obtained before commencing the survey:—From office,—route plan, Department of Interior plan of area showing meridians of longitude and parallels of latitude, any other department plans of road, plan of proposed cross-section of provincial highway, geodetic bench marks, special and general instructions; from Surveys Branch,—municipal surveys, township plans and surveys,