At P.I., when intersection angle (Δ) is less than 10 degrees, and a curve is not necessary in limits of road, wooden stakes 2 ins. x 2 ins. x 24 ins. are planted at the points of intersection of the limits of highway by a line passing through the P.I. and bisecting the angle that is read and recorded in the field notes as the angle for that particular station or P.I.

An error can easily be made when measuring or laying off the "split angle" and the transitman should always follow the same routine, i.e., sight on backsight with vernier set at zero and turn off angle to right (clockwise), the angle being half the angle read and recorded in his notes as the angle for the station. This rule is simple, but important and should always be followed.

At Curves

When intersection angle (Δ) is 10 degrees or over, a suitable curve is chosen and the B.C. and E.C. of same is located. Chainage will be carried through, however, along the tangents from P.I. to P.I.

Stakes are then planted on the new limits of highway directly opposite the B.C. and E.C. on C.L. The C.L. B.C. and E.C. are occupied by transit for this purpose and a right angle is turned off C.L. in each case, and proper width of highway allowed for. Reference stakes are driven 15 ft. from C.L. at B.C. and E.C. and marked with black paint 15 B.C. and 15 E.C. respectively. These reference stakes are particularly useful for construction purposes.

The curves on limits of road are run in on ground only when buildings or other important features stand close to limits of road or in case a property line or limit of another road intersect the curve.

At points of intersection of curve by property lines or road lines, it is necessary that wooden stakes be planted.

It might be noted that it is generally best practice to actually run the curve of the limit of the road, not the C.L. curve. To obtain tangent when set up at B.C. of curve, it is convenient to sight on the E.C. with vernier set at $\frac{1}{2}$ Δ . Turning then into zero brings line of sight along tangent and required deflection angles may be turned off directly and curve run in.

Where Stakes are to be Planted

Wooden stakes 2 ins. x 2 ins. x 24 ins. shall be planted along the proposed limits of highway when same is intersected by property lines, township lot lines, fences marking limits of road or limits of road if readily located.

For the purposes of this survey, the approximate location of intersecting lines or limits is all that is required. The stakes are (generally) to be planted as closely as possible to the C.L. of the intersecting fence. The pluses on C.L. chainage opposite these stakes are to be obtained as closely as possible, however, although through farm lands the use of the transit is not considered necessary. The stakes planted do not necessarily mark off an owner's frontage, but merely define the limits of proposed new highway. Wooden stakes shall be planted also at every angle and

at B.C.'s and E.C.'s of curves in limits of highway.

Stakes shall be planted for reference and construction purposes at distances of 15 ft. from P.I.'s, B.C.'s and E.C.'s and any important points along C.L. and shall be marked with black paint, 15 to P.I., 15 B.C., 15 E.C., and 15 C.L., respectively.

Measurements, Where and How Taken

The survey is to commence at a particular and well defined point and chainage is continuous from said point to point of completion of survey.

The chains and tapes to be compared with provincial land surveyors' standard.

The chainage is to be accurately made along the courses or tangents of the proposed new C.L. of highway with a 100-ft. alloy steel chain.

A tally or wooden stake 1 in. x 1 in. x 12 ins. to be driven at side of road opposite each 100-ft. station at a convenient offset; the number of stations and number of feet offset from C.L. to be marked on two sides of same. In case profile only is being run of C.L. it is not necessary to place these stakes at any particular offset.

A 50-ft. steel tape is to be used for measuring in to establish stakes or limits of highway or in making any particular tie measurements.

A 50-ft. metallic tape is sufficient for other measurements.

Sufficient measurements are to be taken to plot position of existing fences, guard rails, walls, hedges, limits, trees, poles, buildings, sheds or other structures, wells, and railways, within the road limits, or within such a distance of same that the location of such features would have to be considered in connection with the construction or widening of the road.

All measurements to objects off C.L. to be made at right angles to C.L. and the plus on C.L. to be noted (the right angle to be ascertained by use of tape), only reliable tapeman with good judgment to be trusted with ascertaining the correct pluses on chain.

The plus of the point of intersection of C.L. by the production of any line upon which a stake has been planted, is to be carefully ascertained and noted. This will assist in plotting in on plan the direction of intersecting lines.

The plus on C.L. opposite all drives and all culverts, bridges, drives, etc., are also to be noted.

Reading and Recording Angles

The angle to be measured and recorded at any P.I. is not the intersection angle (Δ) but is the angle measured in a clockwise direction between the backward and forward sights without transitting the telescope. The angle is measured as follows :-

Backsight on last traverse station or P.I. with vernier set at zero. Unclamp vernier plate and turn to right, or clockwise, and bring line of sight upon forward traverse station or P.I. The angle is then read and is recorded as read and is the angle for that particular P.I. or station.

For rough check and for greater accuracy, the angle should be repeated. With a 6-in. horizontal circle, doubling the angle gives sufficiently accurate results. However, with a horizontal circle less than 6 ins. in diameter and reading to single minutes, the angle should be repeated at least three times. Very little would be gained by just doubling.

Precautions to be Observed for Best Results

Never read on a doubtful sight. Take time to send a man to identify the sight. It is necessary that back-ward and forward sights be both in position before any pointings are made for angle measurement.

Angles should be read quickly. No more time should elapse between the pointings than is absolutely necessary to turn and point the instrument. This applies to repeating measurements as well as first angle measurements.

When reading vernier, allow the light to fall on vernier from one direction only with respect to instrument. (This can be arranged by shading).

It is important that each and every angle is to be measured and read in the same manner, and with the same degree of precision. It is then reasonably possible to apply corrections to bearings of lines between stations where checks have been obtained.

Bearings

All bearings are to be astronomic; that is to say, the direction of all lines is referred to the astronomical meridian.

Since the Provincial Highway Survey extends over such a distance of longitude that it would be inconvenient to refer the bearings of the survey to a single meridian, the survey is divided into portions, each portion having a separate reference meridian.

The reference meridians chosen are the meridians having a longitude of an even ten minutes of arc apart.

In general, all bearings shall be referred to the nearest meridian of an even ten minutes of longitude as 79°,-79°-10', - 79° - 20', - 79° - 30', etc.

The position of any point with respect to these meridians, or with respect to the parallels of latitude, are to be ascer-