AUS DER PRAXIS DER TRIANGULATIONSARBEITEN Ier ORDNUNG BEIM REICHSAMT FÜR LANDESAUFNAHME

by

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(METHODS OF Ist ORDER TRIANGULATION BY THE REICHSAMT FÜR LANDESAUFNAHME).

(*Zeitschrift für Vermessungswesen*, Part VI, page 187 — Stuttgart, 15th March 1936).

This interesting article contains some very useful details on the latest German methods used for 1st order triangulation work. Of these, special note should be made of the following :

It is endeavoured on the one hand to obtain the best shaped triangles possible and further, to observe from at least 3 to 5 metres above the ground so as to avoid lateral refraction. For this purpose very strong wooden 1st order station signals, resting on very solid supports, were erected ; the highest signal reached 64 metres and the observing instrument was placed 37 metres above the ground. The use of steel turrets was discontinued as they vibrated too much in the lightest wind and the torsion (phase) was too great. That of wooden signals is less, the maximum being 1" in 5 minutes time, while towards evening it is negligible. The best moment for taking observations is between 5 and 7 p. m.

The use of material points as targets has been completely abandoned ; use is now made of heliotropes, or else of oxyhydrogen or electric light projectors. These are observed at night and only when they actually show in the form of a star, and not, as was the case with the older models of telescope, in the form of a nucleus surrounded with concentric circles. Very few nights are favourable ; but, while during the day only half an hour or an hour is suitable for taking the observations, on the rare nights when they are possible, observations may be spread over several hours, so that at present 50 % of the observations are made by day, 50 % by night.

The instrument used is a BAMBERG or HILDEBRAND azimuth circle, 27 cm. diameter, fitted with two microscopes which are read solely by electric lighting. Formerly the axis of the instrument was always conical ; now it is often cylindrical. With a conical axis, the slightest variation in temperature, even during an after-noon's observation, made it necessary to rectify the play of the axis in order to avoid any change in magnification value consequent upon slight modifications of distances between the objective and the graduation. With a cylindrical axis this does not take place.

The method of measurement is that indicated by SCHREIBER, and consists in subordinating the measurement of the angles to the atmospheric conditions of the moment. The observer chooses the lights which offer the best conditions and measures the angles between their directions ; the distances of these lights are often as great as 100 kilometres and even more. (62 miles).

With modern methods and instruments the closing error of triangles should not exceed 1". A great step forward which would permit the maximum of time favourable for the observation to be utilized and so double the day's results, would be to replace the reading of the microscopes, which requires a great deal of time, by a cinematographical record.

Latitude and longitude are observed at many principal points ; latitude, longitude and azimuth about every 200 kilometres. (124 miles).

The use of BESSEL rules for base-measurements has been discontinued and replaced by that of the JÄDERIN apparatus. From 6 to 8 wires are used and the length of base measured tends to become longer, having attained as much as 10 kilometres. Minute precautions are taken for the calibration of the wires ; after having been done in the laboratory this is done in the open air on the basis of the Potsdam mile.

The invariability in length of this base has been checked many times within the limits of 1/1,000,000th. It has been proposed to link it to the international metric standard by the VAISÄLÄ method of interference of light (See *Hydrographic Review*, Vol. VIII, N° 1, p. 230).

On the ground, 24-metre ranges are marked out by wooden pickets, 10 to 15 cm. in diameter and 2.40 metres in length, which are planted in the earth until only 70 cm. emerge. A gudgeon marked by a cross is screwed onto each picket. The mean errors of base-measurements in 1932 vary between 0.26 and 0.34 mm.

P. V.

ISTRUZIONI PER LA COMPENSAZIONE DELLE TRIANGOLAZIONI DI ORDINE TOPOGRAFICO

(INSTRUCTIONS FOR COMPENSATING TRIANGULATIONS OF A TOPOGRAPHICAL ORDER)

by

PROFESSOR G. FORNI

Publication N° I. I. 3092 of the Hydrographic Institute of the Royal Italian Navy, Genoa, 1935 - 63 pp., 6 fig.

The length of the sides of coastal triangulations used in hydrographic surveying is generally between 5 and 20 kilometres — a value which is not exceeded except in very rare cases where it is a question, for instance, of connecting islands to the mainland. Measurements relating to this kind of triangulation must be made with a certain degree of accuracy. At the Hydrographic Institute of the Royal Italian Navy it is usual to measure the departure bases and also, when required, a control base at least 1,000 m. in length using 24 m. invar wires; and to measure the angles of the triangles with at least six repetitions by the Troughton & Simms theodolite giving the approximation of a second.

Passing on to the computations, the first problem to be solved to obtain this degree of accuracy is that of the compensation, always a delicate operation, even for a triangulation of limited extent, when it is proposed to adopt the method of GAUSS for geodetic triangulations based on the method of least squares.

The chief aim of Professor G. FORNI's manual, recently published by the Hydrographic Institute of the Royal Italian Navy, is to serve as a guide to the computers of this Service for the compensation problems most commonly met with in coastal surveys, by comparing the results of three methods of compensation which correspond to different degrees of accuracy. The manual also deals with the subject of rigorous compensation in such a way as to explain the general considerations on the principles of the compensation.

Articles on this subject appeared in *Hydrographic Review*, Vol. VIII N° 2 of November 1931, and Vol. IX N° 2, November 1932, and for this reason only an analytical summary of the new Italian publication is given below:

I. *The rigorous compensation of the quadrilateral*, p. 16 of the manual, gives the same results as those arrived at in *Hydrographic Review*, Vol. IX N° 2, pp. 53-54. The latter possess the advantage of deriving from general formulae the application of which is sufficient without restating and resolving the equations anew.

II. *The semi-rigorous compensation of the quadrilateral*, p. 23 of the manual, gives the same results as those given by the formulae shown in the above quoted number of the *Review*, p. 54 - Remark I.

III. *The summary compensation of the quadrilateral*, p. 29 of the manual, is the method developed in *Hydrographic Review*, Vol. VIII N° 2, p. 217 (Publication H. D. 295 of the Hydrographic Department).