THE NEW LOOK IN STADIA

by D.H. Richardson, O.L.S.

Stadia has for a long time been used for topographic, geological and engineering surveys when contained within a control net or when used for preliminary mapping purposes. At no time was its accuracy considered adequate for extended survey work.

Meeting today's need for greater work economy in surveying and mapping is a new type of stadia instrument called a "Reduction Tacheometer". European instrument companies have been experimenting with, and producing this equipment for many years. One such instrument made by a well known European manufacturer is an "Auto-Reduction Tacheometer" or "RDS." To test its advantages a location survey was run for a distance of 35 miles in the rocky, bush-covered area northeast of Kenora. This survey was conducted on an experimental basis to obtain vertical, horizontal and angular measurements with the object of producing route and profile plans for engineering design purposes.

The personnel assigned to this work had a limited training in the use of RDS equipment. This consideration coupled with the fact that a system had to be devised whereby we could operate more efficiently and economically with fewer men then the conventional chain, transit and level method, presented some interesting problems.

Initially the centre-line was located for a distance of 3 miles, sufficient for the cutting crew to proceed, so that the survey party would not be held up during the training period. This training period was used to instruct the instrumentmen and rodmen as to their duties and to try out various methods of organizing the survey party to give the most satisfactory operation.

A system of note taking was studied in Toronto before the survey was undertaken, but it was realized that the practical application on the job could change the format and also the data recorded. The accompanying illustration is a sample of the field notes finally agreed upon.

We found difficulty in using the European RDS rod, not because of the mechanical features of the extension rod, but because the graduations were difficult to read at distances greater than 250 feet in bush country.

To overcome this problem and obtain greater distances, we designed a type of rod graduation that permitted readings to be taken at distances of 600 feet. However, due to the terrain, the average reading was taken at 400 feet with intermediate shots taken at major breaks in the topography such as brow of hill, toe of slope, edge of swamps, streams, lakes, clearings, roads, railways, etc.

At the start of the job we double checked all shots, but once the crew became adept at using the equipment, only reciprocal readings were taken between instrument stations and points of intersections of tangents.

Surprisingly, we found that the five man survey party progressed faster and with as good results as an eight man crew using the conventional methods of survey.

The survey commenced in the Maynard Falls area at an elevation of 1045 and then ran southerly over rough, rocky, heavy bush-covered terrain to a high point of 1577 feet near Patti Lake. From this area the elevations dropped to 1387 feet at the end of survey. A typical mile of this survey would have four or five ridges differing in height as much as 100 feet and crossing the line of survey at right angles. On an average, one ridge in ten had a slope that was too steep to climb.

Throughout the survey, sample checks of vertical and horizontal measurements were taken by conven-

tional methods. The following may give some indication of the comparisons.

Sample No. 1

RDS distance	1612.5 feet
Conventional method	1612.3 feet
difference	0.2 feet

Sample No. 2

RDS distance	6016.5 feet
Conventional method	6017.8 feet
difference	1.3 feet

Sample No. 3

RDS distance	1011.5 feet
Triangulation	1011.6 feet
difference	0.1 feet

Sample No. 4

RDS elevation	120.55 feet
Vertical triangulation elevation	120.75 feet
difference	0.2 feet

Comparison of station-to-station distances measured by the RDS and by 300' drag chain in conjunction with the clinometer for vertical angles, is shown in the following table.

Sample No. 5

An elevation check between a Geodetic Bench Mark at the start of

R.D.S.		DIFF.	300' DRAG CHAIN		R.D.S.		DIFF.	300' DRAG CHAIN	
STATION	DIST.		DIST.	STATION	STATION	DIST.		DIST.	STATION
124+93·0	139·5	-0·70	140·2	124+93·0	154+44·0	501·5	+0·30	501·2	154+45·5
126+32·5	313·5	+1·30	312·2	126+33·2	159+45·5	272·0	+0.10	271·9	159+46·7
129+46·0	116·5	-0·20	116·7	129+45·4	162+17·5	298·0	+0·60	297·4	162+18·6
130+62·5	300·5	+0·30	300·2	130+62·1	165+15·5	520·5	+0·50	520·0	165+16·0
133+63·0	350·5	+0.10	350·4	133+62·3	170+36·0	289·0	-0·50	288·5	170+36·0
137+13·5	438·0	+0·70	437·3	137+12·7	173+25·0	219·5	-0·30	219·8	173+24·5
141+51·5	199·5	-0·20	199·7	141+50·0	175+44·5	194·5	-0·70	195·2	175+44·3
143+51·0	478·0	-0·20	478·2	143+49·7	177+39·0	327·5	+0·40	327·1	177+39·5
148+29·0	110·0	+1·00	109·0	148+27·9	180+66·5	272·5		272·5	180+66·6
149+39·0	268·0	-1·10	269·1	149+36·9	183+39·0				183+39·1
152+07·0	237·0	-2·50	239·5	152+06·0					
TOTAL						5846·0	-0·10	5846·1	

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STATION	DIST.	ROD DIFF.	V.D. INT.	FACTOR	V.D.	ELEVATION	LEFT 25	LEFT 15		RIGHT 15	RIGHT 25
743+73·5						1281·60	0	0	△ H.O.T. Rivet	-2	-3
742+46·5	127	-	0·12	+0·1	+1·2	Av -1·2			Top of Slope		
744+60·5	87	-	0·32	-0·5	-16·0	1265·60					
									Rock		
									Rock		
742+46·5						1282·80	0	0	△ H.O.T. Rivet	0	0
740+77·5	169	-	0·98	-0·1	-9·8	(Av +9·75)					
743+73·5	127	-	0·12	-0·1	-1·2	1281·60			Jackpine 2" TO 8"		
741+83	106	-	0·49	+0·2	+9·8	1282·65	-1	0	Top of Slope	-1	-1
741+51	74	-	0·17	+0·1	+1·7	1274·75	+3	+2	Rocky	-1	-2
741+26	49	-	0·10	-0·1	-1·0	1272.05	+5	+4	Rolling terrain	0	0
740+85	8	-	0·30	+0·1	+3·0	1276·05					
740+77						1273·05					

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Typical RDS Survey Notes

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The
Re-Designed
Extension
Rod

Photo by Ontario Hydro

The RDS Instrument

Photo by Ontario Hydro

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the survey and a Geodetic Bench Mark 24.5 miles south of the Maynard Falls area showed a difference of 3.25 feet.

As fieldmen became more experienced in handling the equipment the rate of progress increased to the extent that it took only 14 more hours of work to complete the last 23 miles of survey than it did to complete the first 12 miles of survey.

To sum up the results of using RDS equipment, the following observations are interesting:

(1) As the RDS system of survey using shots up to a 450-500 foot range proved economical, set ups were made at approximately these distances. Because of reciprocal readings a vertical and horizontal check was obtained on every point on which the RDS instrument was set up. Intermediate points for profile were all single measurements.

(2) The RDS system of survey worked extremely well in rough as well as in rolling country.

(3) The field crew worked as a single unit eliminating extra transportation and camp facilities.

(4) Field notes are compact, with topographic detail and elevations shown on the same page. The reductions are simple, necessitating only additions and subtractions. These are completed in the field as the work progresses enabling the stations to be marked on stakes.

(5) A reduction in the cost of the operation was possible because half the number of men were required than would be used on a conventional survey, thus saving labour, transportation and camp costs.

As a result of the savings in time and money on this survey, nine RDS units were purchased. Subsequently, 300 more miles of line have been satisfactorily run with this equipment.

COMMENTS ON THE 68TH ANNUAL MEETING

by D. Wandabense, O.L.S.

The question of higher standards of education in our profession has finally reached that phase where it may be an actual fact within a few years. The next phase depends on what arrangement may be reached with university authorities. My own vote was cast in favour of such a step, although it is doubtful whether a college education is the sole answer to the problems which have begun to beset the Association professional-wise. It was pointed out that some of our most respected surveyors are both in the graduate and non-graduate group, as are some of the worst. Indeed the Committee on Education stated its belief that in future prospective Ontario Land Surveyors ought to be examined as to character and general suitability. A man's character is his moral constitution and status - as a man thinketh in his heart so is he. Any attempt to weed out undesirables in any society by character examination has not of course proven 100% or even 50% effective, but it is a good point, and anything which will further the stature of our profession ought to be acted upon. Clearly this suggestion falls within the scope of the Board of Examiners. Mention was also made that newly commissioned surveyors ought to receive some form of official welcome at our annual meetings. It might prove somewhat impractical for all to attend, but here again is meat for the Board of Examiners.

A point that was not mentioned and which is within the powers of the Discipline Committee is sterner treatment of offenders of our by-laws and ethics. The Committee tends to be