* CLIPPER

No. 2.

SUGGESTED ELIGIBILITY TEST FOR TECHNICAL OFFICERS (SURVEY)

GEODETIC TEST

DIVISION OF NATIONAL MAPPING

SUGGESTED TEST.

PART "A" FIELD PROJECT.

The following test is designed to show the candidates ability at, chaining and reading horizontal and vertical angles, and levelling.

(a) From a bench mark, chain a sub-base about ½mile (0.8 Km) at approximately right angles and 4 to 5 Km from a high point.

(b) Level this line to third order levelling standards

(c) Read horizontal and vertical angles from all three points.

(d) Finalize Field Books, arbitarily adjust triangle, calculate unknown distances and height of the high point from the two positions of known height.

TIME.

The above should be one days field work roughly thus:-

(a) The chaining, out and back, during the morning.

(b) Vertical angles from 3 stations in the early afternoon.

(c) Horizontal angles in the late afternoon as soon as visiblity is good enough.

Note:- This test can be done by a team of 2 or 3 candidates with a considerable saving of time, and a more realistic feeling about the test.

SUGGESTED TEST

PART "B" ORAL.

TIME ALLOWED:- Approximately 1 hour.

Note:- The development of these questions may limit the number asked to approximately 10.

Also this oral test may have to cover parts of the Field Project which may not have been completed.

SUGGESTED TEST.

PART "B". ORAL.

Question 1. What is the formula for calculating Tellurometer eccentric corrections? How do you know whether the correction is plus or minus?

2. When measuring with the Tellurometer what does the AVC reading tell you? Why is it recorded for both stations after each "fine" reading?

3. Why is the height of the Tellurometer above the Station Mark necessary?

4. What are the two most common errors made when using the prismatic compass?

5. What is the best way of obtaining a magnetic bearing from a map?

6. When using the heliograph, when would you use:-
(a) Simplex procedure? (b) Duplex procedure?

7. When showing a helio to a distant station for Horizontal or Vertical angles, within what interval of time must the beam be constantly corrected? Why?

8. What are the two most common uses of the hand held mirror in survey work?

9. If you have been showing the helio with the Simplex set up, to a distant station, and now find it necessary to change to Duplex, what is the most important step in the change over?

10. What is the difference between "step" and "slope" chaining? What is the limit for slopes read with the Abney Level?

11. In third order chaining, to what point is the Abney Level angle read?

12. How do find the index error of an Abney Level? Describe a good way to eliminate this error, when chaining?

13. What are "boning rods" used for?

14. What is the allowable error for distance in third order traversing, i.e., one part in .....? Also what is the allowable limit for angular adjustment per station?

15. Describe the adjustment of the Wild T2 theodolite for vertical collimation?

16. What different step is necessary when setting up the theodolite tripod for azimuth observations on Sigma Octantis?

17. Define Local Sidereal Time?

Give the "Specifications for Ground Control Surveys" for the following:-

18. The times of observation of vertical angles, for the various distances?

19. The formula for calculating allowable azimuth misclosure?

20. The altitude at which spot photo's of control points are to be taken? How many frames are required? What type camera and what lens is specified?

PART "C" WRITTEN TEST

From the data supplied on 4 tellurometer computation pages, calculate these measurements to SEA LEVEL DISTANCES.

This is to be done in 3 steps:-

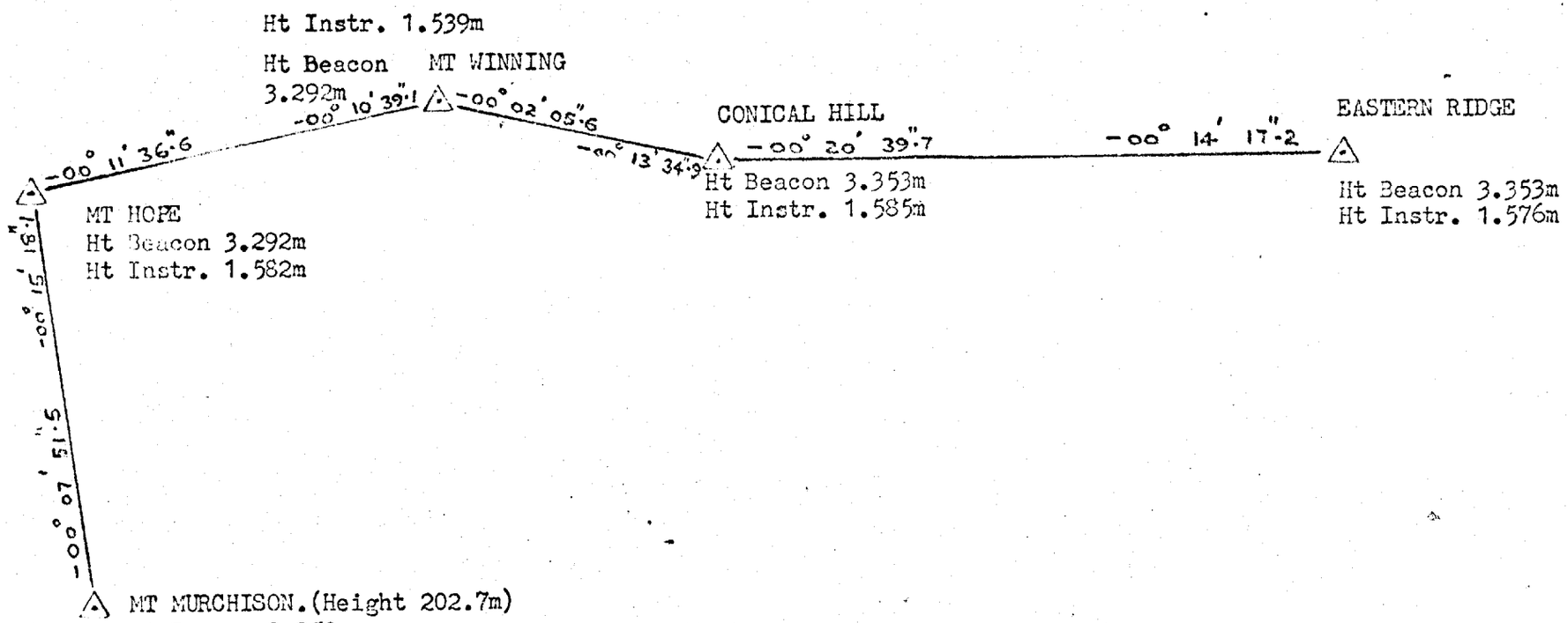
(a) From the transit times, and other data supplied on each computation page calculate the slope distances.

(b) Using these slope distances and the data supplied on the traverse diagram, calculate the heights of these stations.

(c) Finalize the slope distances to Sea Level distances.
For Chord to Arc correction use the formula:-

$$\frac{\text{Slope Distance}^3}{43 \times 6\,378\,160^2}$$

DATA REQUIRED FOR CALCULATING HEIGHTS OF STATIONS ON THE TRAVERSE.



MEASURING STN.: Mt Murchison

} Ecce. Stn. / Stn. Mk. (delete one)

Tellur. No.:

Date Last Calibration:

Altimeter No.:

Date Last Calibration:

Ht. Instr. above Ecce.: 1·372

Ht. Instr. above Stn. Mk.: 1·372

Ecce. Corrn. at Peg (if any):

Met. Conditions:

Topo. Conditions:

Date:

Operator: Recorder:

DISTANT STN.: Mt Hope 23

Mt Inder above Stn Mk 1·375

} Ecce-Stn / Stn. Mk. (delete one)

Tellur. No.:

Date Last Calibration:

Altimeter No.:

Date Last Calibration:

Field Book No.:

Operator: Recorder:

Note: Metre Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n.}$

∴ distance =

$Co = 0.299\ 7925$ m/mus

$n\text{-}1 = \frac{77.601(P+E)}{273 + t} 10^{-6}$

$E = \frac{4744\ e}{273 + t}$

where

n = Refractive Index.

t = Dry Bulb Temp. 9·8 °C

P = Barometric Pressure. 949·22 mb

e = Vapour Pressure. 6·689 mb

Co = Velocity of e.m. wave in vacuo.

1 mm mercury = 1.333 224 mb

Transit time 345 604.530

½ Transit time

Measd. Dist. (½T.T. x Co)

Atmosp. Corrn.

Index Corrn.

Ecce. Corrn. Meas. Stn.

Ecce. Corrn. Dist. Stn.

Slope Distance

Slope Corrn.

Sea Level Corrn.

Chord to Arc Corrn.

Sea Level Distance

Slope corrn. $= -\frac{\Delta h^2}{2S}$

Δh = Diff. ht.

S = Slope dist.

Sea Level Corrn. $= -\frac{hS}{R+h}$

h = Mean Ht.

R = 6 378 160 m

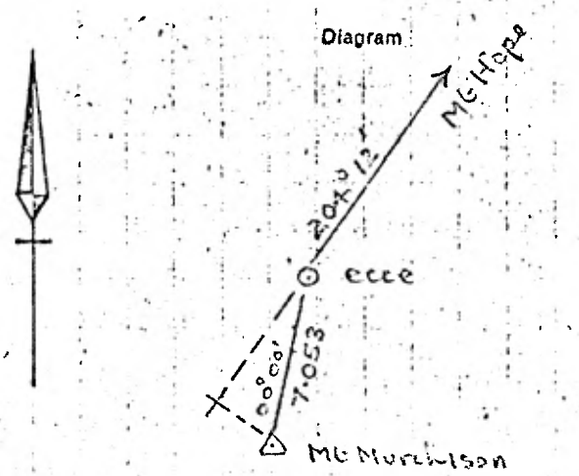
MEASURING STATION ECCENTRIC CORRECTION

Calculation

All Above Calc. by:

All Above Checked by:

Diagram



MEASURING STN.: Mt Hope		DISTANT STN.: Mt Winning	23
	} Ecce. Stn. / Stn. Mk. (delete one)	Mt Inglis above Stn Mk 1·391	} Ecce. Stn. / Stn. Mk. (delete one)
Tellur. No.:	Date Last Calibration:	Tellur. No.:	Date Last Calibration:
Altimeter No.:	Date Last Calibration:	Altimeter No.:	Date Last: Calibration:
Ht. Instr. above Ecce.: —	Ht. Instr. above Stn. Mk.: 1·375	Field Book No.:	
Ecce. Corrn. at Peg (if any):		Operator:	Recorder:
Met. Conditions:			
Topo. Conditions:			
Date:			
Operator:	Recorder:		

Note: Metre Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n.}$

∴ distance =

$Co = 0.299\ 7925$ m/mus

$n\text{-}1 = \frac{77.601(P+E)}{273 + t} 10^{-6}$

$E = \frac{4744\ e}{273 + t}$

where

n = Refractive Index.

t = Dry Bulb Temp. 11·4 °C

P = Barometric Pressure. 961·0 mb

e = Vapour Pressure. 7·059 mb

Co = Velocity of e.m. wave in vacuo.

1 mm mercury = 1.333 224 mb

Transit time	333 279·294
½ Transit time	
Measd. Dist. (½T.T. x Co)	
Atmosp. Corrn.	
Index Corrn.	
Ecce. Corrn. Meas. Stn.	
Ecce. Corrn. Dist. Stn.	
Slope Distance	
Slope Corrn.	
Sea Level Corrn.	
Chord to Arc Corrn.	
Sea Level Distance	

Slope corrn. $= -\frac{\Delta h^2}{2S}$

Δh = Diff. ht.

S = Slope dist.

Sea Level Corrn. $= \frac{hS}{R+h}$

h = Mean Ht.

R = 6 378 160 m

MEASURING STATION ECCENTRIC CORRECTION

Calculation

Diagram

All Above Calc. by:

All Above Checked by:

MEASURING STN.: Mc Winning } Ecce. Stn. / Stn. Mk. (delete one)

Tellur. No.: | Date Last Calibration:

Altimeter No.: | Date Last Calibration:

Ht. Instr. above Ecce.: 1·391 | Ht. Instr. above Stn. Mk.: 1·391

Ecce. Corrn. at Peg (if any):

Met. Conditions:

Topo. Conditions:

Date:

Operator: | Recorder:

DISTANT STN.: Conical Hill } ~~Ecce. Stn.~~ / Stn. Mk. (delete one)

HE Instr above Stn Mk 1·386

Tellur. No.: | Date Last Calibration:

Altimeter No.: | Date Last Calibration:

Field Book No.:

Operator: | Recorder:

Note: Metro Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

$$\text{distance} = \frac{\text{meas. dist.} \times 1{\cdot}000325}{n.}$$

∴ distance =

$$Co = 0.299\ 7925 \text{ m/mus}$$

$$n\text{-}1 = \frac{77.601(P+E)}{273 + t} 10^{-6}$$

$$E = \frac{4744\ e}{273 + t}$$

where

n = Refractive Index.

t = Dry Bulb Temp. 11·2 °C

P = Barometric Pressure. 960·82 mb

e = Vapour Pressure. 7·171 mb

Co = Velocity of e.m. wave in vacuo.

1 mm mercury = 1.333 224 mb

Transit time 230 [illegible]

½ Transit time

Measd. Dist. (½T.T. x Co)

Atmosp. Corrn.

Index Corrn.

Ecce. Corrn. Meas. Stn.

Ecce. Corrn. Dist. Stn.

Slope Distance

Slope Corrn.

Sea Level Corrn.

Chord to Arc Corrn.

Sea Level Distance

Slope corrn. $= -\frac{\Delta h^2}{2S}$

Δh = Diff. ht.

S = Slope dist.

Sea Level Corrn. $= -\frac{hS}{R+h}$

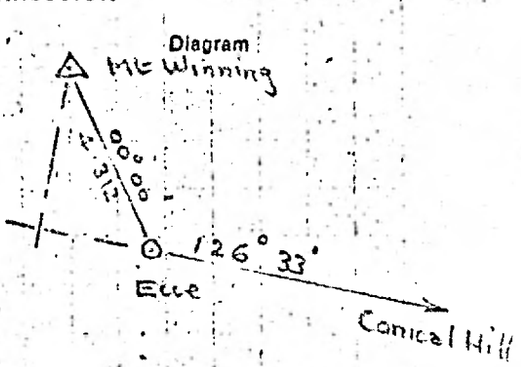
h = Mean Ht.

R = 6 378 160 m

MEASURING STATION ECCENTRIC CORRECTION

Calculation

Diagram



All Above Calc. by:

All Above Checked by:

ASURING STN.: Conical Hill — ~~Ecce. Stn.~~ / Stn. Mk. (delete one)

DISTANT STN.: Eastern Ridge — 23
Ht Instr above Stn MK 1·392 — ~~Ecce. Stn.~~ / Stn. Mk. (delete one)

r. No.: — Date Last Calibration:

meter No.: — Date Last Calibration:

nstr. / ve Ecce.: — Ht. Instr. above Stn. Mk.: 1·336

e. Corn. at Peg (If any):

Cond ns:

oo. Conditions:

le:

erator: — Recorder:

Telur. No.: — Date Last Calibration:

Altimeter No.: — Date Last: Calibration:

Field Book No.:

Operator: — Recorder:

Note: Metre Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—
distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n.}$

∴ distance =

Co = 0.299 7925 m/mus

$-I = \frac{77.60I(P+E)}{273 + t} I0^{-6}$

$E = \frac{4744\ e}{273 + t}$

ere

n = Refractive Index.

t = Dry Bulb Temp. 12·5 °C

P = Barometric Pressure. 972·32 mb

e = Vapour Pressure. 7·550 mb

Co = Velocity of e.m. wave in vacuo.

I mm mercury = I.333 224 mb

Transit time 505 323·428

½ Transit time

Measd. Dist. (½T.T. x Co) m

Atmosp. Corn.

Index Corn.

Ecce. Corn. Meas. Stn.

Ecce. Corn. Dist. Stn.

Slope Distance

Slope Corn.

Sea Level Corn.

Chord to Arc Corn.

Sea Level Distance

ope corn. $= -\frac{\Delta h^2}{2S}$

h = Diff. ht.

= Slope dist.

Sea Level Corn. $= \frac{hS}{R+h}$

h = Mean Ht.

R = 6 378 I60 m

MEASURING STATION ECCENTRIC CORRECTION

Calculation

13

Diagram

ll Above Calc. by:

ll Above Checked by:

SUGGESTED ELIGIBILITY TEST FOR TECHNICAL OFFICERS (SURVEY)

ANSWERS TO PART "B" AND PART "C".

Answers to part B not finalized 24-8-70

MEASURING STN.: Mt Murchison } Ecce. Stn. / Stn. Mk. (delete one)

Tellur. No.: Date Last Calibration:

Altimeter No.: Date Last Calibration:

Ht. Instr. above Ecce.: 1·372 Ht. Instr. above Stn. Mk.: 1·372

Ecce. Corrn. at Peg (if any):

Met. Conditions:

Topo. Conditions:

Date:

Operator: Recorder:

DISTANT STN.: Mt Hope 23 } Ecce. Stn. / Stn. Mk. (delete one)

Ht. Instr above Stn Mk 1·375

Tellur. No.: Date Last Calibration:

Altimeter No.: Date Last Calibration:

Field Book No.:

Operator: Recorder:

Note: Metre Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n}$.

∴ distance =

P 949·22 + E 112·21 = 1061·43 = 82368·029 / 282·8

$Co = 0.299\ 7925$ m/mus

$n-1 = \frac{77.601(P+E)}{273+t} 10^{-6} = 291.259$

$E = \frac{4744\ e}{273+t} = \frac{31732.616}{282.8}$ E = 112·21

where 273 + 9·8 = 282·8

n = Refractive Index.

t = Dry Bulb Temp. 9·8 °C

P = Barometric Pressure. 949·22 mb

e = Vapour Pressure. 6·689 mb

Co = Velocity of e.m. wave in vacuo.

1 mm mercury = 1·333 224 mb

Transit time	345 604·530
½ Transit time	172 802·265
Measd. Dist.	51 804·823
(½T.T. x Co)	
Atmosp. Corrn.	−15·089
Index Corrn.	
Ecce. Corrn. Meas. Stn.	+ 6·433
Ecce. Corrn. Dist. Stn.	
Slope Distance	51 796·167
Slope Corrn.	− 0·030
Sea Level Corrn.	− 1·884
Chord to Arc Corrn.	+ 0·079
Sea Level Distance	51 794·332

Slope corrn. $= -\frac{\Delta h^2}{2S}$ M 202·7 + 1·4 = 204·1; H 258·7 + 1·4 = 260·1

Δh = Diff. ht. 260·1 − 204·1 = Diff Ht 56·0

S = Slope dist. $\frac{56^2}{2 \times 51796} = \frac{3136}{103\ 592} = 0{\cdot}030$

Sea Level Corrn. $= -\frac{hs}{R+h}$ M 204·1, H 260·1 $4.64 \pm (232.1)$

h = Mean Ht. $\frac{232 \times 51\ 796}{6\ 378\ 392}$

R = 6 378 160 m

MEASURING STATION ECCENTRIC CORRECTION

Calculation

L dist Ecce − Δ(7·053) 0·848 37

Log Cos 204°12′ 9·960 05

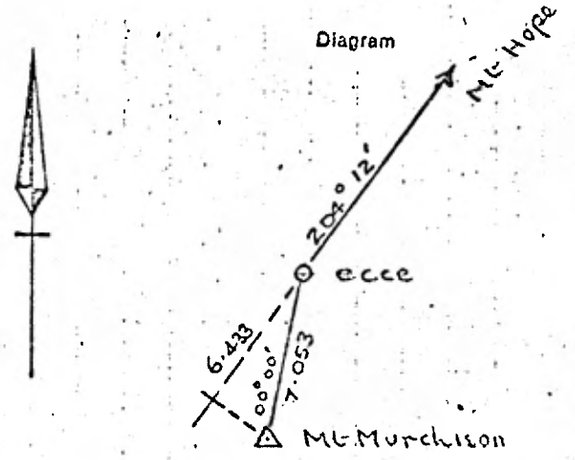
0·808 42

= +6·433

All Above Calc. by:

All Above Checked by:

Diagram



MEASURING STN.: Mt Hope

~~Ecce. Stn.~~ Stn. Mk. (delete one)

Tellur. No.: 2077

Altimeter No.: 58864

Date Last Calibration:

Date Last Calibration:

Ht. Instr. above Ecce.: —

Ht. Instr. above Stn. Mk.: 1·375 m

Ecce. Corrn. at Peg (if any): —

Met. Conditions: Cool clear 10-15 Knot S W Wind

Topo. Conditions: From top of low wooded hill across undulating timbered terrain to prominent rocky Hill

Date: 1 May 1970

Operator: Recorder:

DISTANT STN.: Mt Winning

23

Ht Instr 1·391 above Stn Mk

~~Ecce. Stn.~~ Stn. Mk. (delete one)

Tellur. No.: 2264

Altimeter No.:

Date Last Calibration:

Field Book No.:

Date Last Calibration:

Operator: Recorder:

Note: Metre Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n.}$

∴ distance =

P 961·0 + E 117·75 = 1078·75 — 83 712·079 / 284·4

Co = 0.299 7925 m/mus

$n\text{-}1 = \frac{77.601(P+E)}{273+t} 10^{-6} = 294.346$

$E = \frac{4744\ e}{273+t} = \frac{33\,487.896}{284.4}$ E = 117.75

where 273 + 11·4 = 284·4

n = Refractive Index.

t = Dry Bulb Temp. 11·4 °C

P = Barometric Pressure. 961·0 mb

e = Vapour Pressure. 7·059 mb

Co = Velocity of e.m. wave in vacuo.

1 mm mercury = 1·333 224 mb

Transit time	333 878·294
½ Transit time	166 939·147
Measd. Dist. (½T.T. x Co)	50 047·104 m
Atmosp. Corrn.	− 14·731
Index Corrn.	
Ecce. Corrn. Meas. Stn.	
Ecce. Corrn. Dist. Stn.	
Slope Distance	50 032·373
Slope Corrn.	
Sea Level Corrn.	− 2·016
Chord to Arc Corrn.	+ 0·072
Sea Level Distance	50 030·429

Slope corrn. $= -\frac{\Delta h^2}{2S}$ H 260·1 − 253·1 = 7·0; W 258·7 + 1·4 = 260·1; 251·7 + 1·4 = 253·1

Δh = Diff. ht.

S = Slope dist. $\frac{7^2}{100\,064} = \frac{49}{100\,064} = \text{Nil}$

Sea Level Corrn. $= -\frac{hS}{R+h}$ H 260·1, W 253·1, 2) 513·2 (256·6

h = Mean Ht. $\frac{257 \times 50\,032}{6\,378\,417} = \frac{12,858,224}{6\,378\,417}$

R = 6 378 160 m =

MEASURING STATION ECCENTRIC CORRECTION

Calculation

Diagram

All Above Calc. by:

All Above Checked by:

MEASURING STN.: MC Winning } Ecco. Stn. / Stn. Mk. (delete one)

Tellur. No.: Date Last Calibration:

Altimeter No.: Date Last Calibration:

Ht. Instr. above Ecce.: 1·391 Ht. Instr. above Stn. Mk.: 1·391

Ecce. Corrn. at Peg (if any):

Met. Conditions:

Topo. Conditions:

Date:

Operator: Recorder:

DISTANT STN.: Conical Hill 23

MC Winter above Stn Mk 1·396 } Ecco. Stn. / Stn. Mk. (delete one)

Tellur. No.: Date Last Calibration:

Altimeter No.: Date Last Calibration:

Field Book No.:

Operator: Recorder:

Note: Metro Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n}$

∴ distance =

P 960·32 + 119·70 = 1080·52 83 849·432 / 284·2 = 295·037

Co = 0.299 7925 m/mus

$n\text{-}I = \frac{77.60I(P+E)}{273 + t} 10^{-6}$

$E = \frac{4744\ e}{273 + t}$

where 273 + 11·2 = 284·2 34 019·221 / 284·2 E = 119·70

n = Refractive Index.

t = Dry Bulb Temp. 11·2 °C

P = Barometric Pressure. 960·82 mb

e = Vapour Pressure. 7·171 mb

Co = Velocity of e.m. wave in vacuo.

I mm mercury = I.333 224 mb

Transit time	230 539·842
½ Transit time	115 269·921
Measd. Dist. (½T.T. x Co)	34 557·058
Atmosp. Corrn.	− 10·196
Index Corrn.	
Ecce. Corrn. Meas. Stn.	+ 2·568
Ecce. Corrn. Dist. Stn.	
Slope Distance	34 549·430
Slope Corrn.	− 0·049
Sea Level Corrn.	− 1·527
Chord to Arc Corrn.	+ 0·024
Sea Level Distance	34 547·878

Slope corrn. $= -\frac{\Delta h^2}{2S}$ W 251·7 + 1·4 = 253·1; C 309·4 + 1·4 = 310·8; 310·8 − 253·1 = 57·7

Δh = Diff. ht.

S = Slope dist. $\frac{58^2}{69\ 098} = \frac{3364}{69098} = 0.049$

Sea Level Corrn. $= -\frac{hS}{R+h}$ W 253·1, C 310·8; 2) 563·9 (281·9

h = Mean Ht. $\frac{282 + 34\,549}{6\,378\,442} = \frac{9\,742}{6\,378\,442}$ SIS

R = 6 378 160 m

MEASURING STATION ECCENTRIC CORRECTION

Calculation

Log dist ecce − Δ(4·312) 0·634 68

Log Cos 233°27' 9·774 90

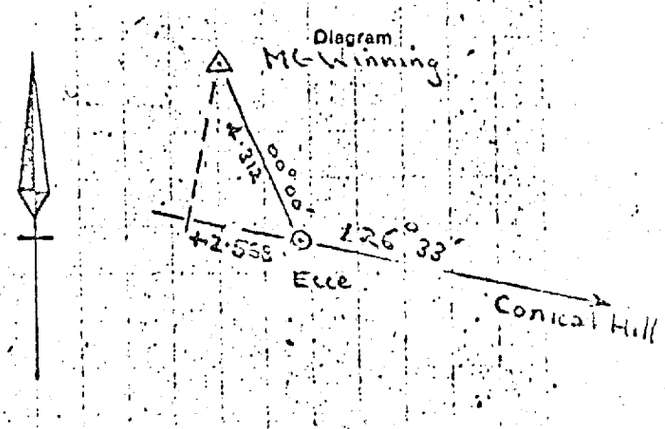
0·409 58

= + 2·568

All Above Calc. by:

All Above Checked by:

Diagram



MEASURING STN.: Conical Hill } Ecce-Stn. / Stn. Mk. (delete one)

Tellur. No.: Date Last Calibration:

Altimeter No.: Date Last Calibration:

Ht. Instr. above Ecce.: Ht. Instr. above Stn. Mk.: 1·236

Ecce. Corrn. at Peg (if any):

Met. Conditions:

Topo. Conditions:

Date:

Operator: Recorder:

DISTANT STN.: Eastern Ridge 23 } Ecce-Stn. / Stn. Mk. (delete one)

Ht Instr above Stn Mk 1·392

Tellur. No.: Date Last Calibration:

Altimeter No.: Date Last Calibration:

Field Book No.:

Operator: Recorder:

Note: Metre Read-Out Instruments have an average refractive index of 1·000325 incorporated in crystals.

To find distance:—apply own computed n, thus:—

distance = $\frac{\text{meas. dist.} \times 1{\cdot}000325}{n}$.

∴ distance =

P 972·32 + E 125·45 = 1097·77 $\frac{85\,188{\cdot}050}{285{\cdot}5}$ = 298·382

$Co = 0.299\,7925$ m/mus

$n-1 = \frac{77.601(P+E)}{273+t} 10^{-6}$

$E = \frac{4744\ e}{273+t}$ $\frac{35\,817{\cdot}200}{285{\cdot}5}$ E = 125·45

273 + 12·5 = 285·5

where

n = Refractive Index.

t = Dry Bulb Temp. 12·5 °C

P = Barometric Pressure. 972·32 mb

e = Vapour Pressure. 7·550 mb

Co = Velocity of e.m. wave in vacuo.

1 mm mercury = 1·333 224 mb

Transit time	505 336·428
½ Transit time	252 668·214
Measd. Dist. (½T.T. x Co)	75 748·036
Atmosp. Corrn.	− 22·602
Index Corrn.	
Ecce. Corrn. Meas. Stn.	
Ecce. Corrn. Dist. Stn.	
Slope Distance	75 725·434
Slope Corrn.	− 0·033
Sea Level Corrn.	− 3·277
Chord to Arc Corrn.	+ ·248
Sea Level Distance	75 722·372

Slope corrn. $= -\frac{\Delta h^2}{2S}$ C 309·4 + 1·4 = 310·8; ER 239·2 + 1·4 = 240·6; 310·8 − 240·6 = 70·2

Δh = Diff. ht.

S = Slope dist. $\frac{70^2}{151{\cdot}452} = \frac{4900}{151{\cdot}452} = 0{\cdot}033$

Sea Level Corrn. $= -\frac{hS}{R+h}$ C 310·8, ER 240·6, I 551·4 (275·7

h = Mean Ht. $\frac{276 \times 75\,725}{6\,378\,436} = \frac{20\,900\,100}{6\,378\,160}$

R = 6 378 160 m = 3·277

MEASURING STATION ECCENTRIC CORRECTION

Calculation

Diagram

All Above Calc. by:

All Above Checked by:

DIVISION OF NATIONAL MAPPING.

GEODETIC HEIGHT COMPUTATIONS BY RECIPROCAL OR SINGLE RAYS.

DATA	Known station	A Conical Hill	A	A
	New station	B Eastern Ridge	B	B
	Ht. of Instr. (I)	A: + 1·585	A: +	A: +
	Ht. of Signal (S)	B: − 1·576	B: −	B: −
		+ 3·353	+	+
		− 3·353	−	−
		+ 4·938	+	+
		4·929		
	(For single rays see note.)	− 4·929		
		2) ·009	2)	2)
	I & S corr'n (m)	+ ·004		
RECIPROCAL RAY	Elev A (+), Dpn A (−)	− 00 20 39·7		
	Dpn B (+), Elev B (−)	+ 00 14 17·2		
	Algebraic sum	2) 00 06 22·5	2)	2)
	V	− 00 03 11·2		
	V (secs)	− 191·2		
SINGLE RAY	Elev (+), Dpn (−)	+	+	+
	C & R (SEE BELOW)			
	V ±			
	V (secs)			
	Log V (secs)	2·281 49		
	Log tan 1" (angles less than 50')	4. 6 8 5 5 7	4. 6 8 5 5 7	4. 6 8 5 5 7
	Log A to B (m)	4· 879 24		
	Log diff ht. (sum)	1· 8 46 30		
	Diff ht. (m)	− 70·191		
	I & S corr'n (m) ±	+ 0.004		
	Known height of A	+ 309·387		
	Height of B	239·200		
	Adopted height of B	239·2		
	Log C & R index			
	+ log dist A to B			
	Log C&R corr'n (secs)			
	C & R (secs)			
	C & R			

DETERMINATION OF C & R INDEX FROM RECIPROCAL RAYS.

Reciprocal Stations	A	A	A
	B	B	B
		A B	A
Ht. of Instr. (I)		+ +	+ +
Ht. of Signal (S)		− −	− −
		2)	2)
I & S corr'n (m) ±			
Log I & S corr'n (m)			
Log cosec 1"		5. 3 1 4 4 3	5. 3 1 4
Co-log dist A to B			
Log I & S corr. (secs)			
I & S corr'n (secs)			
Elev A (+), Dpn A (−)			
Elev B (+), Dpn B (−)			
Algebraic sum		2)	2)
Half sum			
Convert to secs.			
I & S corr'n (secs) ±			
C & R (secs)			
Log C & R			
+ co-log dist A to B			
Log C & R index.			

Log C&R	7.667	7.657	7.648	7.638	7.628	7
"K"	0.03	0.04	0.05	0.06	0.07	0

NOTE: FOR SINGLE RAYS.

(i) Height of instrument at known station and height of signal at new station only, are required.

(ii) Do not divide by two (2).

COMPUTED..... DATE.....

GEODETIC HEIGHT COMPUTATIONS BY RECIPROCAL OR SINGLE RAYS.

DATA				
	Known station	A Mt Murchison	A Mt Hope	A Mt Winning
	New station	B Mt Hope	B Mt Winning	B Conrad Hill
		A B	A B	A B
	Ht. of Instr. (I)	+ 1·341 − 1·582	+ 1·582 − 1·539	+ 1·539 − 1·525
	Ht. of Signal (S)	+ 3·353 − 3·292	+ 3·292 − 3·291	+ 3·292 − 3·353
		+ 4·694 4·874	+ 4·874 4·831	+ 4·831 4·938
		− 4·874	− 4·831	4·938
	(For single rays see note.)	2) 0·180	2) 0·043	2) 0·107
	I & S corr'n (m)	−0·090	+0·022	−0·054
RECIPROCAL RAY	Elev A (+), Dpn A (−)	− 00 07 51·5	− 00 11 36·6	− 00 02 05·6
	Dpn B (+), Elev B (−)	+ 00 15 18·1	+ 00 10 39·1	+ 00 13 34·9
	Algebraic sum	2) + 00 07 26·6	2) − 00 00 57·5	2) + 00 11 29·3
	V	+ 00 03 43·3	− 00 00 28·8	+ 00 05 44·6
	V (secs)	+ 223·3	− 28·8	+ 344·6
SINGLE RAY	Elev (+), Dpn (−)	+	+	+
	C & R (SEE BELOW)			
	V ±			
	V (secs)			
	Log V (secs)	2·348 89	1·459 39	2·537 32
	Log tan 1" (angles less than 50')	4·685 57	4·685 57	4·685 57
	Log A to B (m)	4·714 30	4·699 25	4·538 41
	Log diff ht.(sum)	1·748 76	0·844 21	1·761 33
	Diff ht. (m)	+ 56·071	− 6·986	+ 57·721
	I & S corr'n(m) ±	− 0·090	+ 0·022	− 0·054
	Known height of A	+ 202·7	+ 258·684	+ 251·720
	Height of B	258·681	251·720	309·387
	Adopted height of B	258·7	251·7	309·4
	Log C & R index			
	+ log dist A to B			
	Log C&R corr'n(secs)			
	C & R (secs)			
	C & R			

DETERMINATION OF C & R INDEX FROM RECIPROCAL RAYS.

Reciprocal Stations	A	A	
	B	B	
		A B	A B
Ht. of Instr. (I)		+ +	+ +
Ht. of Signal (S)		− −	− −
		2)	2)
I & S corr'n (m) ±			
Log I & S corr'n (m)			
Log cosec 1"		5.314 43	5.314 43
Co-log dist A to B			
Log I & S corr.(secs)			
I & S corr'n (secs)			
Elev A (+), Dpn A(−)			
Elev B (+), Dpn B(−)			
Algebraic sum		2)	2)
Half sum			
Convert to secs.			
I & S corr'n (secs) ±			
C & R (secs)			
Log C & R			
+ co-log dist A to B			
Log C & R index.			

Log C&R	7.667	7.657	7.648	7.638	7.628	7.618
"K"	0.03	0.04	0.05	0.06	0.07	0.08

NOTE: FOR SINGLE RAYS.

(i) Height of instrument at known station and height of signal at new station only, are required.

(ii) Do not divide by two (2).

COMPUTED..... DATE.....