

TAPE STANDARDISATION & CALIBRATION

- OBJECTS: (1) Calibration of the U.N.S.W. Standard Base (M.E. Bdg) using Standard Tape \*APT3246.
- (2) Standardisation of Field Tape for 0-50 m and 0-100 metre intervals.
- (3) Determination of graduation errors in the 0, 10, 20, 30, 40 and 50 metre graduations.

## CALIBRATION OF STANDARD BASE (All 8 groups involved)

This consists of determining the distances between the 0-25, 0-50, 0-75 and 0-100 metre marks on the Standard Base using Standard Tape #APT3246. The data for this tape is:

| INTERVAL | LENGTH AT 15 lbs<br>& 20°C * |
|----------|------------------------------|
| 0-25     | 24.999 5 m                   |
| 0-50     | 49.999 7 m                   |
| 0-75     | 74.999 7 m                   |
| 0-100    | 99.999 6 m                   |

\* Estimated Accuracy 1 in  $10^5$

Coefficient of Linear Expansion

:  $11.2 \times 10^{-6}$  per deg.C.

The calibration consists of 10 determinations for each interval employing the whole range of the scales on the Standard Base. The tension applied to the Standard Tape is 15 lbs (i.e. standard tension) and the field temperature is to be measured by 3 thermometers situated along the base. The tape can be considered to be fully supported. The supervisor will explain the detailed procedure.

## STANDARDISATION OF FIELD TAPE: (Each group individually)

The calibrated base may now be used to standardise the field tape. This involves determining the temperature at which the field tape correctly measures 50 m and 100 m with a tension of 70 N. and fully supported.

This is achieved by measuring, with the field tape, the distances between 0 & 50 and 0 & 100 metre marks on the Standard Base. Each distance is to be measured three times. The field temperatures are to be recorded and the spring balance used calibrated.

## DETERMINATION OF GRADUATION ERRORS: (In pairs of groups)

The graduation errors at 0, 10, 20, 30, 40, 50 metre marks of the field tape are to be determined by 'Hanson's 1st Method'. This involves measuring the respective differences between the lengths 0-10, 10-20, 20-30, 30-40 and 40-50 on the field tape and an auxiliary scale which is very nearly 10 metres long. The auxiliary scale is the distance between specified graduation lines on two short sections of tape glued onto a concrete kerb. The differences are to be obtained by recording the readings on the short pieces of tape corresponding the graduations on the field tape. The readings are made with the aid of two theodolites set up at right angles to the auxiliary scale. Tension of 70 N is to be applied.

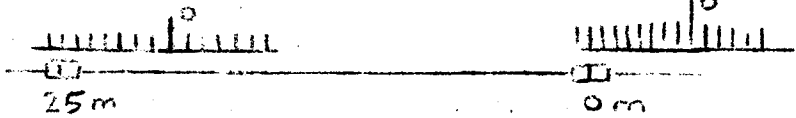
## EQUIPMENT REQUIRED:

Per Group 1 x 100 m band (2 mm)  
1 Thermometer  
1 Spring Balance

Per 8 Groups Standard tape + Accessories  
4 x 1' Theodolites and Tripods

\* Example of reading standard tape against standard base.

e.g. Observation No. 9  
(see below)



\* Example of reduction of standard tape readings.

Scale Readings

| No.  | 25 m  |        | 0 m  |        |
|------|-------|--------|------|--------|
|      | Red.  | Obs.   | Red. | Obs.   |
| 1    | R 0.9 | R 1.2  | 0    | R 0.3  |
| 2    | R 1.0 | R 9.0  |      | R 8.0  |
| 3    | R 0.9 | R 13.9 |      | R 13.0 |
| 4    | R 0.7 | R 20.4 |      | R 19.7 |
| 5    | R 0.9 | R 31.0 |      | R 30.1 |
| 6    | R 0.8 | L 29.2 |      | L 30.0 |
| 7    | R 0.9 | L 22.1 |      | L 23.0 |
| 8    | R 1.0 | L 15.9 |      | L 16.9 |
| 9    | R 1.0 | L 7.1  |      | L 8.1  |
| 10   | R 1.0 | L 1.0  | 0    | L 2.1  |
| Mean | R 0.9 | mm     | 0    | mm     |

| Field Temperature |
|-------------------|
| 18°C              |

Corrn. for temp:  $L \alpha (t_F - t_S)$   
 $= 25 \times 11.2 \times 10^{-6} (18-20)$   
 $= -0.0006$

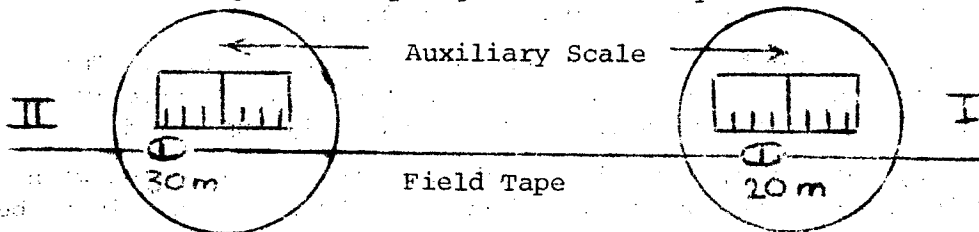
@ 20°C 0-25 on std. tape = 24.999 5 m

@ 18°C 0-25 on std. tape = 24.998 9 m



i.e. Distance between zero marks on 0 & 25 m scales = 24.999 8 m.

\* Example of reading field tape against auxiliary scale.



Difference =  $a_{20-30} = \text{Reading II} - \text{Reading I}$   
 $= 0.0032 - 0.0017$   
 $= +0.0015 \text{ m.}$