

A copy of the certificate which covers the Standard Tape No. 1, and spring balance used with it when laying down comparators, is given below.

Copy of Certificate.

No. 319.

Dated 18th June, 1903.

This is to certify that twelve standard subdivided steel measures, riband form, each graduated at 66 feet or 100 links, 150 links and 100 feet, for the Lands and Survey Department of New Zealand (together with twelve spring balances for use therewith), have been compared with and verified by the Imperial Standards in the custody of the Board of Trade, and have been stamped as correct. The ribands were tested when subjected to a pull of 15 lb. at the temperature of 62° Fahrenheit, or 16.666° Centigrade, such temperature being measured in terms of the standard thermometers of the Board of Trade reduced to the hydrogen scale.

The errors of these twelve measures, or differences from Imperial Standard at 62° Fahrenheit are shown on the back of this certificate.

Board of Trade, Standards Department.

H. J. CHANEY,
Superintendent of Weights and Measures.

Measure No.					100 Feet.	99 Feet or 150 Links.	66 Feet or 100 Links.
					Inch.	Inch.	Inch.
1	..	..	..	..	+ 0.024	+ 0.014	± 0.000
2	..	..	..	..	+ 0.029	+ 0.016	— 0.002
3	..	..	..	..	+ 0.035	+ 0.025	— 0.010
4	..	..	..	..	+ 0.029	+ 0.013	+ 0.001
5	..	..	..	..	+ 0.030	+ 0.020	+ 0.006
6	..	..	..	..	+ 0.030	+ 0.030	— 0.003
7	..	..	..	..	+ 0.026	+ 0.013	— 0.005
8	..	..	..	..	+ 0.035	+ 0.020	— 0.007
9	..	..	..	..	+ 0.035	+ 0.020	+ 0.003
10	..	..	..	..	+ 0.038	+ 0.021	+ 0.005
11	..	..	..	..	+ 0.005	— 0.005	— 0.013
12	..	..	..	..	+ 0.015	+ 0.015	— 0.004

The signs + and — denote too long and too short respectively.

The subdivisions have been found to have no error greater than ± 0.015 inch on each link (the breadth of each defining-line being nearly 0.006 inch).

18th June, 1903.

H. J. C.

Comparators.

After some consideration—seeing that the 100-link steel tape was the one and only reference standard available, it was deemed preferable to lay down temporary comparators where and when-ever necessary and most convenient along the line, instead of one fixed comparator. This means that in every case where the differences of the tape from standard have been obtained for computation purposes, they are the results of comparisons with two different comparators, the precise instrumental and other conditions being of equal value for each determination. This method of standardizing naturally leads to an apparent greater discordance of results; but in the final means for any section, or for the whole base, there will be a closer approximation to truth than if one fixed comparator had been used.

In laying down a comparator, two tripods are erected 100 links apart, and always in the shade. At the recording end the tripod-head is mounted as shown in Fig. No. 7; at the other end the record-ing-scale D is not necessary, the rear contact-mark being the outer end of a finely engraved line on the gun-metal top itself, abreast of the capstan screw C, on which the tape rests when in use. The standard reference steel tape lying on its supports—5 links apart—with its rear-end contact-mark brought into coincidence with the mark on tripod, then the zero mark of the fine scale clamped on the tripod-head at the other end is brought into coincidence with the contact-mark on the tape at that end, careful temperature-readings being made simultaneously on two standardized thermometers placed at 33 links from either end of tape, with their bulbs just touching the tapes. (See Fig. No. 12.)

The procedure of recording is as follows :—

Determination of Length of Tapes.—Comparator.							
Standard steel comparator tape No. 1 is Imperial standard length of 100 links at ..						..	62° F.
Temperature by thermometer No. 263						50.3° F.	
" " " No. 264						50°	
Mean						50.15	
Difference							11.85 F.

The adopted coefficient of expansion for steel tapes = 0.00000625, which multiplied by 11.85 = 0.0074 links, or, the standard laid down is this amount short of truth, being 99.9926 links.

The above are the actual figures in the laying-down of a comparator, and Table 3 is a record of the comparison of two Invar tapes with it.

Thermometers Nos. 263 and 264 were tested in 1907 at the National Physical Laboratory, Kew, and found to be correct from 32° by 10° intervals to 92°, verified unmounted, and hanging in a vertical position.