

Grids & Datums

DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

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“The first Sinhalese arrived in Sri Lanka late in the 6th century B.C. probably from northern India. Buddhism was introduced in about the mid-third century B.C., and a great civilization developed at the cities of Anuradhapura (kingdom from circa 200 B.C. to circa A.D. 1000), and Polonnaruwa (from about 1070 to 1200). In the 14th century, a south Indian dynasty established a Tamil kingdom in northern Sri Lanka. The coastal areas of the island were controlled by the Portuguese in the 16th century and by the Dutch in the 17th century. The island was ceded to the British in 1796, became a crown colony in 1802, and was united under British rule by 1815. As Ceylon, it became independent in 1948; its name was changed to Sri Lanka in 1972. Slightly larger than West Virginia, the lowest point is the Indian Ocean (0 m), and the highest point is Pidurutalagala (2,524 m)” (*The World Factbook*, 2009). “Extensive faulting and erosion over time have produced a wide range of topographic features, making Sri Lanka one of the most scenic places in the world. Three zones are distinguishable by elevation: the Central Highlands, the plains, and the coastal belt” (*Library of Congress Country Studies*, 2009).

“The Triangulation of Sri Lanka commenced in 1857 with the measurement of a base (one side of a triangle) in Negombo on the West Coast (latitude 7° 10') and at Batticaloa on the East Coast (latitude 7° 40'). Both bases are in low, flat country; and brick towers up to 70 feet high had to be built over the terminals to enable observations to be taken to surrounding points. The bases were measured in 1857 and 1859 respectively for the Topographical Survey. The Negombo base was measured with a 100-foot heavy iron chain along the ground, and this chain was compared frequently with two 100-foot ‘standards’ which had been laid out at either end of the line by means of a beam compass from a standard brass scale 1-yard long; the origin of this scale is unknown, but its graduations were evidently taken to be correct at 62° F. The Batticaloa base was measured with the same chain laid on planks and trestles, the 100-foot standards having been laid out with the chain itself before measurement; the ground here was very rough and the base was only intended as a check line. Each base was measured once, and each measurement took about six weeks. Computed from Negombo the triangulated value of the Batticaloa base was 2.25 feet shorter than its observed value. The triangulation was adjusted to both bases” (*Notes on the Base Lines of the Ceylon Triangulation*, J.E. Jackson, *Empire Survey Review*, Vol. 3, 129, pp. 129–130).

“Plane co-ordinates were computed using the Transverse Mercator Projection, with Pidurutalagala ($\phi_o = 7^{\circ} 00' 01.729'' N$, $\lambda_o = 80^{\circ} 46' 18.160'' E$ – Ed.), as origin. A recomputation of this Triangulation, with a few additional triangles observed, was carried out in 1888. Systematic large scale cadastral surveys had commenced in many parts of the country and during the first few years of this century (19th – Ed.), a good deal of triangulation of first order was carried out. Great difficulty was encountered in fitting the new work to the old.

“In 1929 it was decided to re-compute the Triangulation a second time for which purpose the two bases were re-measured more precisely and two astronomical azimuths observed which added greatly to the accuracy of the scheme. This recomputation was completed in 1933. The Triangulation is not of a geodetic or primary order but the results are the best which is possible from the existing observations made during different periods” (*The Geodetic Horizontal Control Network*, Sri Lanka Ministry of Land, 2009). This re-computation by J.E. Jackson of the classical triangulation

of Sri Lanka used the origin point in Kandavelu at: $\Phi_o = 7^{\circ} 14' 06.838'' N$, $\Lambda_o = 79^{\circ} 52' 36.670'' E$ with a reference azimuth to station Halgastota: $\alpha_o = 176^{\circ} 41' 33.18''$, the reference ellipsoid is the Everest 1830 where $a = 6,377,276.345$ m, and $1/f = 300.8017$. If the reader compares the previous sentence to commonly published data, a discrepancy will be found. The actual name of this datum is “The Jackson Datum of 1929,” and the origin point is Kandavelu which translated to English is *Hell Valley*, and is not Kandawala (Dr. Muneendra Kumar, personal communication, 25 September 2003).

The original Ceylon Belt Transverse Mercator Grid used the Indian Yard as the unit of measurement where 1 yard = 0.914399205 meters. The Latitude of Origin (ϕ_o) and the Central Meridian (λ_o) is at Mount Pidurutalagala (listed above), the Scale Factor at Origin (m_o) = unity, the False Northing = the False Easting = 176,000 yards. The limits of the Ceylon Belt are North: parallel of 10° N; East: Meridian of 84° E; South: parallel of 4° N; and West: Meridian of 78°E, northwards to 8° N, thence along this parallel to 79° 30' E, thence along this meridian to 10° N. A notation in the projection tables is as follows: “Within approximately 3° of the central meridian the formulae given on page iii are wholly adequate, but as $\Delta\lambda$ increases beyond 3° there is an increasing departure from conformality due to the omission from the formulae of terms with coefficients of higher than the fifth power. This condition does not seriously disturb the inter-relation of the grid coordinates in a limited area, but becomes apparent in the failure of the inverse solution to give geographic coordinated identical with those from which the grid coordinates were computed. The magnitude of this discrepancy varies with the latitude as well as with $\Delta\lambda$.” (*British General Staff, Geodetic Section, Survey Computations*, London, H.M. Stationery Office Second Edition, 1932, Reprinted 1941, page 98., *War Department Corps of Engineers, U.S. Lake Survey – New York Office Military Grid Unit*, 1944).

A test point offered for the Ceylon Belt is as follows: $\phi = 6^{\circ} 49' 53.769'' N$, $\lambda = 82^{\circ} 14' 41.813'' E$, X = 354,083.63 Indian Yards, Y = 155,849.30 Indian Yards, Convergence Angle (γ) = +0° 10' 31.02", Scale Factor at a Point (m) = 1.0003443. According to TR8350.2, **From** Kandavelu (Jackson 1929) Datum **to** WGS84 Datum, $\Delta X = -97m \pm 20m$, $\Delta Y = +787m \pm 20m$, $\Delta Z = +86m \pm 20m$.

A new local datum is named the Sri Lanka Datum of 1999. The new “Grid Co-ordinate System is: The Transverse Mercator Projection on Everest ellipsoid (1830) with the following parameters is used to compute new grid co-ordinate system, Central meridian, E 80° 46' 18.16710", Latitude of Origin N 7° 00' 1.69750", Scale factor 0.9999238418, False Northing 500000m, False Easting 500000m, Pidurutalagala trigonometrical station is used as the latitude of origin and central meridian” (*Sri Lanka Ministry of Land*, 2009). Curiously, the GRS80/WGS84 ellipsoid is eschewed for the antiquated Everest 1830 without explanation.



The contents of this column reflect the views of the author, who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the American Society for Photogrammetry and Remote Sensing and/or the Louisiana State University Center for GeoInformatics (C²G).