Accuracy Standards of Control Survey

(Version 2.0)

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Contents

Introduction

This document states the accuracy standards and accuracy classes of control survey conducted by the Geodetic Survey Section of Survey and Mapping Office of Lands Department. The control survey shall adhere to the defined accuracy in order to achieve uniformity of quality control standard for control networks of Hong Kong.

Accuracy Standards of Horizontal Control Station Surveyed by Terrestrial Survey Method

Class	Class description	Assessment criteria for Least Squares Adjustment		Assessment criteria for traverse computation using Bowditch Rule	
		Allowable residual of distance measurement	Allowable residual of angular measurement	Allowable linear misclosure	Allowable angular misclosure
H1	Main Triangulation / Trilateration	1: 120,000	2"	---	---
H2	Minor Triangulation / Trilateration	1: 60,000	4"	---	---
H3	Main Control Traverse	1: 30,000	5"	1 : 30,000	5"$\sqrt{n}$
H4.1	Minor Control Traverse (Class 4.1)	1: 15,000 or 5mm (minimum)	10"	1 : 15,000	10"$\sqrt{n}$
H4.2	Minor Control Traverse (Class 4.2) Note : The origin of Class 4.2 station is Class 4.1 station.	1: 15,000 or 5mm (minimum)	10"	1 : 15,000	10"$\sqrt{n}$
H5	Traverse (Class 5)	1: 10,000 or 10mm (minimum)	20"	1 : 10,000	20"$\sqrt{n}$
H6	Traverse (Class 6)	1: 7,500 or 10mm (minimum)	30"	1 : 7,500	30"$\sqrt{n}$

Remark
n = Number of control stations of the traverse

Accuracy Standards of Vertical Control Station Surveyed by Terrestrial Survey Method

Class	Class description	Allowable difference between forward and backward run	Misclosure of level loop / level line or Residual of the height difference between stations (assessment criteria for Least Squares Adjustment)
V1	Precise Levelling (Class 1)	$4 \sqrt{K}$ mm when $K \geq 1$ $0.9 \sqrt{N}$ mm when $K < 1$	$4 \sqrt{K}$ mm when $K \geq 1$ $0.9 \sqrt{N}$ mm when $K < 1$
V2	Precise Levelling (Class 2) Note : The origin of Class 2 benchmark network is determined by GNSS / cross harbour levelling. (e.g. benchmark network in Lantau Island)	$4 \sqrt{K}$ mm when $K \geq 1$ $0.9 \sqrt{N}$ mm when $K < 1$	$4 \sqrt{K}$ mm when $K \geq 1$ $0.9 \sqrt{N}$ mm when $K < 1$
V3	Ordinary Levelling	$12 \sqrt{K}$ mm	$12 \sqrt{K}$ mm
V4	Precise Levelling and Trigonometrical Heighting	---	$12 \sqrt{K}$ mm
V5	Trigonometrical Heighting (Class 5)	---	$30 \sqrt{K}$ mm
V6	Trigonometrical Heighting (Class 6)	---	$50 \sqrt{K}$ mm

Remark

K = Total distance run between stations in km.

N = Total number of set-up

Accuracy Standards of Horizontal Control Station Surveyed by GNSS

Class	Class description	Residuals of horizontal components of baseline (V_{Lat}, V_{Long}) shall be less than 2σ. where σ = $\sqrt{[\,a^2 + (b \cdot L)^2\,]}$ L = length of baseline
GH1	Regional Geodetic Control Stations for connection to International Terrestrial Reference Frame	a = 3 mm b = 0.01 ppm
GH2	Satellite Positioning Reference Station Network	a = 3 mm b = 0.2 ppm
GH3	GNSS Control Network / Triangulation Station / Trilateration Station	a = 3 mm b = 1 ppm
GH4	Main Control Traverse / Minor Control Traverse	a = 5 mm b = 1 ppm
GH5	GNSS Control Station (Class 5)	a = 10 mm b = 3 ppm

Remark

V_{Lat} = Residual of latitude component of GNSS baseline

V_{Long} = Residual of longitude component of GNSS baseline

Accuracy Standards of Vertical Control Station Surveyed by GNSS

Class	Class description	Residual of vertical component (ellipsoidal height) of baseline (V_{EH}) shall be less than 2σ. where σ = $\sqrt{[\,a^2 + (b \cdot L)^2\,]}$ L = length of baseline
GV1	Regional Geodetic Control Stations for connection to International Terrestrial Reference Frame	a = 9 mm b = 0.03 ppm
GV2	Satellite Positioning Reference Station Network	a = 9 mm b = 0.6 ppm
GV3	GNSS Control Network / Triangulation Station / Trilateration Station	a = 9 mm b = 3 ppm
GV4	Main Control Traverse / Minor Control Traverse	a = 15 mm b = 3 ppm
GV5	GNSS Control Station (Class 5)	a = 30 mm b = 9 ppm

Remark

V_{EH} = Residual of vertical component (ellipsoidal height) of GNSS baseline