

ADVANCED SURVEYING / INDIA

TOPOGRAPHIC SURVEY MANUAL

Control, capture, contours, checks. The specification a site team should agree on before the first point is ever recorded.

DGPS / RTK

Total Station

Drone Photogrammetry

UAV LiDAR

DEM / DTM

Contours

SWIPE THROUGH →

What you are actually buying.

A topographic survey is a three dimensional inventory of the ground. Every recorded point carries a position, a height and a description of what it is.

PER POINT

XYZ

Easting, northing, elevation, plus a feature code. Drop the code and the drawing cannot be built.

GROUND ACCURACY

1 to 3 cm

Horizontal accuracy from DGPS and RTK in open sky conditions, with 2 to 5 cm on the vertical.

COMMON INTERVAL

0.5 m

The contour interval used on most 1:500 site development plans in India.

CORE OUTPUTS

05

Contour map, DEM, DTM, cross sections and orthomosaic. Everything else is derived from these.

RULE 01

A drawing with no stated datum, scale and accuracy is a picture. A survey is a picture plus proof.

Scale decides everything else.

SCALE	CONTOUR INTERVAL	POINT SPACING	TYPICAL USE
1:200	0.25 m	2 to 3 m	Plot layout, plinth levels, landscaping
1:500	0.50 m	5 m	Site development, internal roads, drainage
1:1000	1.00 m	10 m	Township layout, corridor design
1:2000	2.00 m	20 m	Master planning, route reconnaissance

HALF INTERVAL RULE

90 percent of independently checked spot levels should fall within half the contour interval. At 0.5 m contours that is 250 mm. Agree this number in writing before mobilisation.

Point spacing is a floor, not a target. Grade breaks are surveyed wherever they occur, no matter how dense the grid already is.

Four tools. Four different jobs.

Total Station

2" / 2 mm + 2 ppm

- Best** Obstructed sites, structures, stakeout, alignment checks
- Limit** Needs line of sight, slow across large open areas

DGPS / RTK

1 to 3 cm H

- Best** Control networks, boundaries, open ground topography
- Limit** Canopy, urban canyon and tall structures block the sky

Drone Photogrammetry

2.7 cm GSD

- Best** Large open areas, orthomosaic, DEM, volumes, progress records
- Limit** Cannot see ground through dense vegetation. That surface is a DSM

UAV LiDAR

100+ pts / m²

- Best** Vegetated corridors, power lines, bare earth under scrub
- Limit** Higher cost, heavier processing, needs careful calibration

Photogrammetric ground sample distance quoted at 100 m flying height with a 20 MP, 1 inch sensor. Fly lower for finer detail, fly higher for speed.

Control first. Data second.

01 GNSS gives ellipsoidal height, drawings need MSL

A geoid model such as EGM2008, or a local geoid, converts one to the other. The two can differ by tens of metres.

02 Tie to two known benchmarks, keep a third as a check

Two points define the level. The third is the only thing that tells you the first two were right.

03 Fix the coordinate system before day one

UTM zone (India spans 42N to 46N) or the client project grid. Changing this later reprocesses everything.

04 Spread ground control, never cluster it

Corners, edges and centre of every drone block, with separate checkpoints that are never used in processing.

WARNING

Never mix ellipsoidal and orthometric heights inside one deliverable set. It is the quietest and most expensive error in survey handover.

Six steps. Every single time.

STEP 01

Recon and datum plan

Site walk, sky visibility, access, benchmark search, agreed coordinate system and scale.

STEP 02

Control network

Establish and observe control, tie to benchmarks, close the level circuit, record everything.

STEP 03

GCP and checkpoints

Targets laid and observed. Checkpoints kept aside and never fed into processing.

STEP 04

Capture

RTK, total station, drone block or LiDAR pass, chosen by terrain, canopy and accuracy demand.

STEP 05

Process and QC

Adjust, classify, build the surface, then test residuals against the untouched checkpoints.

STEP 06

Deliver

Drawing, model, coordinate register, accuracy statement and a report that survives an audit.

TYPICAL PACE

A 5 to 10 sq km drone block takes 1 to 2 days of field work. Corridor teams cover 15 to 20 km per day. Processed deliverables follow in 3 to 5 working days.

Grids do not make terrain. Breaklines do.

ALWAYS SURVEY THESE

- Top and toe of every slope
- Kerb line and drain invert
- Ridge and valley lines
- Road crown and edge
- Culvert and manhole levels
- Plinth and finished floor levels
- Boundary walls and tree positions

SAME KERB, TWO SURFACES

GRID ONLY (5 m)



GRID PLUS BREAKLINES



A 150 mm kerb averaged across a 5 m grid becomes a gentle slope. Drainage design then fails on paper long before it fails on site.

RULE 02

Model the break, never the average. Point count is easy to inflate, breakline discipline is not.

The deliverables checklist.

Contour map

DWG / DXF

Digital Elevation Model

GEOTIFF

Digital Terrain Model

GEOTIFF

Orthomosaic

GEOTIFF / ECW

Point cloud

LAS / LAZ

Cross and long sections

DWG / PDF

Coordinate register

CSV / XLSX

Control and benchmark sheet

PDF

Cut and fill volumes

XLSX / PDF

GIS layers

KMZ / GEOJSON

3D mesh model

OBJ / FBX

Accuracy and survey report

PDF

ASK FOR THIS

Request the accuracy report alongside the drawing. Residuals at checkpoints, in numbers. Adjectives are not a quality metric.

Six ways a topo survey quietly goes wrong.

01 No independent checkpoints

Control points cannot grade their own work. Without held back checkpoints there is no accuracy claim, only hope.

02 A DSM handed over as a DTM

Under vegetation, photogrammetry maps the canopy. Bare earth needs LiDAR, ground shots, or honest filtering.

03 Contours generated from a smoothed grid

No breaklines means kerbs, toes, drains and embankment edges disappear from the surface entirely.

04 Two datums in one drawing set

MSL on the plan, ellipsoidal on the sections. It surfaces during earthwork billing, at the worst possible moment.

05 Ground control clustered in the middle

Drone blocks then bend at the edges. The classic dome or bowl error, invisible until someone stakes it out.

06 Level circuit never closed

An open traverse cannot be verified. Close it, record the misclose, adjust it, and state the value.

Map it once. Map it right.

Topographic survey, DGPS and RTK control, drone mapping, LiDAR, bathymetry, GPR and GIS. Delivered across India from Bhavnagar, Ahmedabad, Surat and Delhi NCR.

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Topography

Contour

DEM

DTM

Stakeout

Site Leveling

Quantity Takeoff

Save this manual. Send it to whoever signs off your next survey scope.