

Survey Equipment

Survey equipment can be sourced from various international manufactures, a number of which can be seen listed below:

1. Leica Geosystems
2. Topcon
3. Sokkia
4. Trimble
5. Faro

It is possible to purchase the survey equipment directly from these manufactures, however, it is far more common to deal with one of their agents.

Major retailers of survey equipment include:

1. York Survey Supply
2. Opti-cal Survey Equipment
3. Phoenix Survey and Safety Equipment, local office Cardiff
4. A1 Survey Ltd, local office Caerphilly

Typical Survey equipment available:

Automatic levels:

Comprise: level, tripod, levelling staff and change plate.

Types of levelling:

Rise and fall method: used when levelling from point to point i.e. from OSBM to site TBM

Height of collimation method: used when you are dealing with lots of intermediate sights i.e. checking kerb levels etc.

Note:

Height of collimation = Reduced level + Back sight

Reduced level = Height of collimation – Intermediate / fore sight

See levelling notes.

Digital laser levels:

Comprise: laser level, tripod, levelling staff with sensor or bar code staff and change plate.

Digital laser levels when used with an invar bar coded staff can be used as a precise level for monitoring work

Theodolites:

Comprise: Theodolite, tripod, plumb bob or ranging rod and steel tape

Used to measure horizontal and vertical angles, do not contain batteries, so can be used in coal mines.

Angle measurements should be taken on both faces so has to determine instrument errors

Total Stations:

Comprise: Total Station, tripod, detail pole and prism

Used to measure angles as above but also used to measure distances between Total Station and prism on detail pole, using an infra red beam.

If the total station can be flipped between infra red and red laser mode it can be used to measure directly onto any light coloured surface, dark objects absorb the laser signal and reduce the distances measurements can be taken over.

This can be used to take measurements onto railway ballast, the white lines on motorways or onto roof ridges, eave heights etc, points where access is either not permitted or restricted.

It can be used to collect data for the production of elevation drawings of buildings etc.

Newer total stations can be purchased that are robotic, allowing surveys to be undertaken by the surveyor without the need for a chainman, this is ideal for secured sites but not for undertaking surveys in public areas.

The very latest Total stations are being produced with a scanning capability, this will be discussed shortly.

The measurements and angles are recorded on the Total Station and can then be downloaded using various software including:

1. Leica Geo office tools for Leica equipment
2. Topcon Tools for Topcon equipment.

Terrestrial Laser Scanners:

Comprise: Laser Scanner, tripod, detail pole, prism and stick on reflective targets

Terrestrial Laser Scanners are used to undertake highly accurate, detail surveys of historical buildings, sites where access is restricted or complex cluttered area such as chemical works with large amounts of pipe work.

The survey produces a point cloud which can be rendered with photographs, which are taken by the kit while scanning the structure.

The basic point cloud can be accessed using the computer program “Pointools”. Using Pointools you are able to measure distances between points, rotate the structure, zoom in etc.

Until recently the cost of a Terrestrial Laser Scanner was in the range of sixty to seventy thousand pounds, however, Faro is now able to supply a scanner for between twenty and thirty thousand pounds, a significant reduction in price.

However, the cost of the equipment is not the only issue, being able to convert the point clouds into a format the client can use, must also be considered.

If your company does not have this capability, companies have been set up specialising in the use of scanning software and can present the information as required.

“Digital Surveys” based in Newcastle Upon Tyne is one of these companies

Airborne Laser Scanners, LIDAR (Light Detection and Ranging)

Comprise: Aircraft mounted Laser Scanner, a GPS system and an inertial navigation system

LIDAR by scanning the ground with swathes of laser beams is used to produce level surveys of large open areas.

It is used by the Environment Agency and Natural Resources Wales to produce digital ground models, used in the production flood risk mapping.

Photogrammetry

Comprise: Aircraft mounted photographic system, a GPS system and an inertial navigation system

Ground control and ground markers must also be produced by convention surveying

The aircraft fly's a fixed pattern of lines across the area to be surveyed, taking a series of overlapping photographs as it passes overhead.

By taking overlapping photographs stereoscopic pairs can be produced.

When used with a stereoscope these photographs can then be used to produce a 3D image of your site.

Used with the appropriate software the information can then be used to produce a ground model of your site.

Photogrammetry is best undertaken on clear days during the winter once the vegetation has died back.

LIDAR seems to have now overtaken Photogrammetry has the more favourable option.

Hand Held DISTO

These are used to measure rooms, using a laser beam.

Typically they are now able to record data and calculate room areas and volumes, they are produced by Leica Geosystems and most survey equipment suppliers stock them.

These are most frequently used to undertake building surveys.

GPS

Comprise: GPS Base Station, GPS Rover, Data logger, Tripod and detail pole

The GPS system works by taking measurements to the GNSS (GPS and GLONASS) satellites above your site.

By measuring the distance to the satellites and knowing their position you can accurately calculate your position.

Once you have set up your GPS Base station you must leave it picking up data from the GNSS satellite systems for a minimum of 4 hours.

During this period you can wander around surveying your site with the rover.

The GPS base station is constantly sending out a radio signal to the rover correcting its relative position to the Base station.

And on your data logger you should be able to see the survey slowly taking shape.

Once you have completed the survey and ensured that the base station has taken a minimum of four hours of observations to the satellites, you can pack up.

The data held on the base station must now be downloaded and processed using the appropriate software, i.e. Topcon Tools

The co-ordinates can be further adjusted using the RINEX data from the nearest Ordnance Survey Active stations, available from the Ordnance survey website.

Once you have processed the information from the Base Station you will now have its co-ordinates, the co-ordinates of the data collected using the rover can now be adjusted to tie into the actual position of the base station and the survey data can then be used to produce your final drawings.

You do not have to use a Base station and post process your data, instead you can use a Smart Rover.

The Smart Rover can obtain real time corrections through the mobile phone network giving you the actual co-ordinates of the points as you survey them.

These corrections are available only through a subscription service and are subject to having network coverage in the survey area. .

