Why should I worry about this?

It's a question of risk. A low price could well represent value for money, or that the surveyor might be cutting corners.

Survey is the foundation of design and construction, so the knock- on effects of errors could be costs, delays and litigation further down the line. Who ends up footing the bill for that? Inevitably the client.

Some practical advice

- Make sure competent, qualified survey personnel carry out the work. If necessary arrange an audit of the company to ensure that it operates an acceptable quality system. Gross errors can cause the most issues for clients so beware of surveyors who cut corners.
- Make sure the surveyor's method statement covers the points in this leaflet, states the accuracies that will be achieved and assesses and mitigates for risks arising from inaccuracy.
- Ask to see verification and calibration documentation. Check certificates carefully to ensure they are genuine and up-to-date.
- If you explain the purpose of the survey carefully and specify critical information this will help your surveyor to evaluate the risks of inaccuracy.
- The quoted accuracy of bought-in data may mask patches of much more inaccurate or biased data that might be important to you.

You may wish to engage a Chartered Land Surveyor to represent your interests.

This client guide is one of a series from the MAPP Panel of RICS geomatics, the full series and professional guidance can be downloaded from www.rics.org/mappp

RICS HQ
Parliament Square
London SW1P 3AD
United Kingdom

Worldwide media enquiries:
E pressoffice@rics.org

Contact Centre:
E contactrics@rics.org
T +44 (0)870 333 1600
F +44 (0)20 7334 3811

Europe (excluding United Kingdom)
ricseurope@rics.org

United Kingdom
contactrics@rics.org

Asia
ricsasia@rics.org

Africa
ricsafrica@rics.org

Americas
ricsamericas@rics.org

Middle East
ricsmiddleeast@rics.org

Oceania
info@rics.org.au

India
ricsindia@rics.org

Advancing standards in land, property and construction.

RICS is **the world's leading qualification** when it comes to professional standards in land, property and construction.

In a world where more and more people, governments, banks and commercial organisations demand greater certainty of **professional standards and ethics**, attaining RICS status is the recognised **mark of property professionalism.**

Over **100 000 property professionals** working in the major established and emerging economies of the world have already recognised the importance of securing RICS status by becoming members.

RICS is an **independent** professional body originally established in the UK by Royal Charter. Since 1868, RICS has been committed to setting and upholding the **highest standards** of **excellence** and **integrity** – providing **impartial, authoritative advice** on key issues affecting businesses and society.

RICS is a **regulator** of both its individual members and firms enabling it to **maintain the highest standards** and providing the basis for **unparalleled client confidence** in the sector.

RICS has a worldwide network. For further information simply contact the relevant RICS office or our Contact Centre.

Endorsed by: THE SURVEY ASSOCIATION, chartered ICES

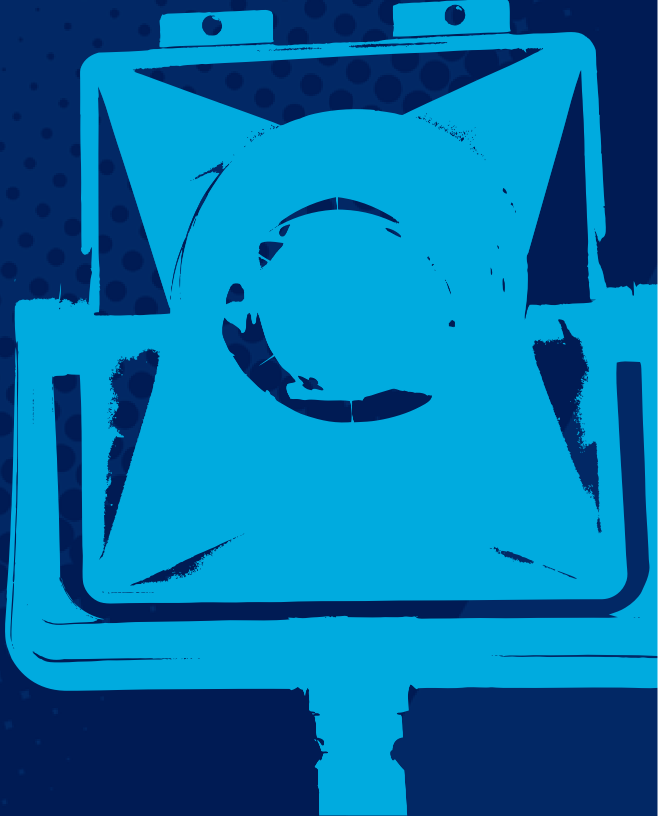
RICS the mark of property professionalism worldwide

rics.org/mappp

Geomatics client guides

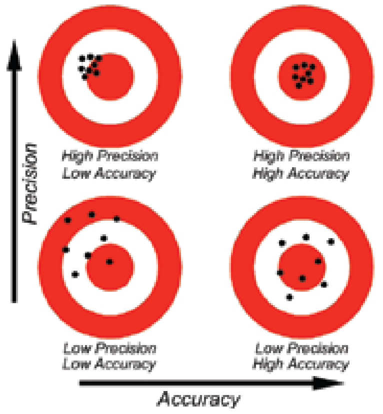
Reassuringly accurate

Controlling accuracy for better results



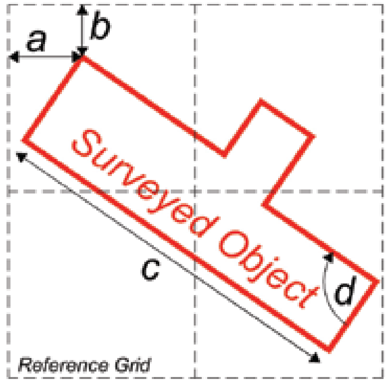
What is accuracy?

All engineering activity needs a given level of accuracy: too much can be expensive, too little can be disastrous. The skill of surveying is in deciding just what level of accuracy is needed for any particular task and then building a methodology to ensure that it is reached.



The diagram shows, in simple terms, the difference between accuracy and precision. Think of the centre of the targets as the true value of the measurement.

Absolute accuracy is accuracy of the measurement with reference to a defined coordinate system, for example ***a*** and ***b*** on the diagram, but could also be used for levelling networks. Relative accuracy is accuracy of measurements between points on the survey (***c*** on the diagram). Geometric fidelity concerns the accuracy of shapes (***d*** on the diagram). You need to bear this in mind when specifying your accuracy requirements.



Sources of Error

Accuracy is affected by three possible sources of error: gross errors, random errors and biases. Let's take each in turn.

Gross Errors

These generally arise from lapses of observing procedure (eg writing a benchmark value down incorrectly) or if survey equipment has been damaged or poorly maintained. Gross errors (or blunders) may affect one piece of detail or a whole area, and they are not always obvious. They affect accuracy rather than precision. Surveyors can detect and control these errors by observing the same detail using independent methods, by instituting self-checks in their procedures or by repeating observations under different conditions.

Random Errors

These are normal observing errors, reflected in the grouping of observations and related to precision. The more observations and the closer the grouping, the higher the precision.

Biases

Biases need to be controlled because they will give the wrong answer, regardless of how many observations you make. They therefore affect accuracy, not precision. They are mainly caused by equipment that is not measuring correctly – for example a measuring tape that has stretched. We can assess bias by comparing the equipment against a standard.

Verification and Calibration

Verification is the process of checking an instrument against a standard to ensure that it is measuring correctly to within a certain tolerance. All survey equipment should be verified on a regular basis, this process is outlined within various International Standards Organisation (ISO) standards and in the case of EDM within the relevant RICS guidance note. Calibration is comparison of the instrument against a standard and then either applying corrections to the instrument so that the readings conform exactly to the standard, or computing a table of corrections to apply to each instrument reading. For the highest accuracy, survey equipment must be calibrated regularly in order to keep biases at bay.

How do we assess accuracy?

Assuming that there are no gross errors or biases in the observations, accuracy and precision become closely related. We normally accept the mean of a set of observations as being as close to the true value as possible, but there may be only a few observations. We need to assess the accuracy of the mean and we do this by estimating the standard error of the mean of the dataset.

Standard error is the equivalent of the statistician's standard deviation. There is a 68% probability that the true value of the observation lies within one standard error (σ) of the mean and the true value is almost certainly within three standard error ($3\ \sigma$) from the mean.

But beware. The quoted standard error of a published dataset may be based upon testing of a small sample of favourable points, which may not represent the accuracy of the whole dataset. A bare-earth LiDAR terrain model, for example, is much more accurate in areas of flat grassland than in areas of sloping ground covered by dense brambles.