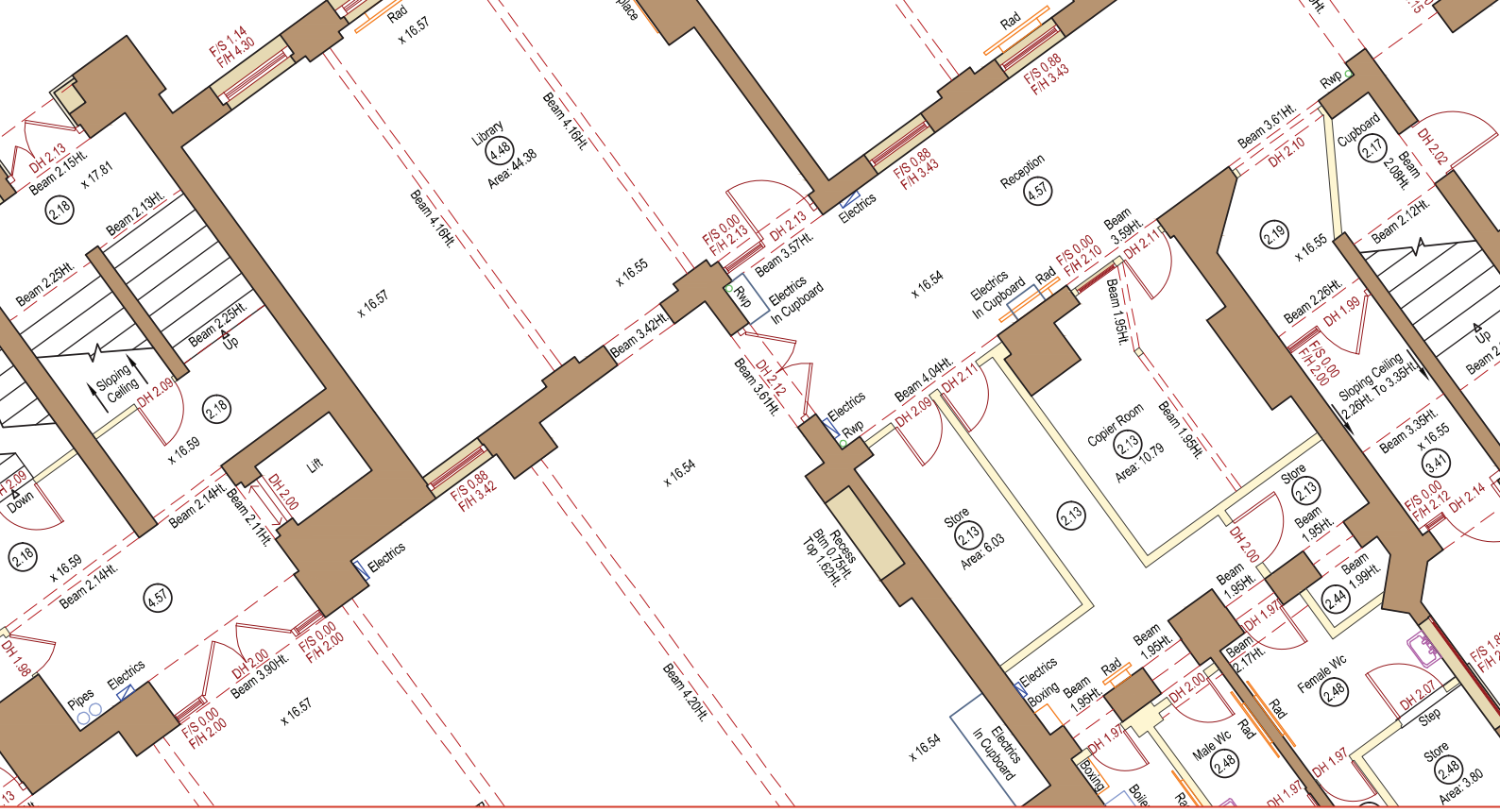

THE SURVEY ASSOCIATION

CLIENT GUIDE TO **MEASURED BUILDING SURVEYS**

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The Survey Association's Client Guides are primarily aimed at other professionals such as engineers, architects, planners and clients in general. They are not intended to go 'in depth' into practical issues but to act as a basic guide on a particular topic and in particular, on procedures and regulations which may govern how a particular aspect of the survey is carried out.

1. What is a Measured Building Survey?

A measured building survey is the collection of measured data to enable the surveyor to be able to produce plans, elevations or sectional drawings of a building. Measured data can be delivered as two dimensional drawings but more commonly three dimensional 'BIM ready' solid or wireframe models are the requested deliverables.

2. Why is a Measured Building Survey required?

The existing detail of a building may be required for a wide range of purposes, most commonly for refurbishment of the property. A measured survey may also be required for historical archiving or lease plans to define a space.

Measured building surveys may also be required for:

- Sale, acquisition, letting or land registry
- Valuation or taxation
- Facilities management or services layout
- Redevelopment, alterations or structural changes
- Health & safety, e.g. fire plan layout
- Interior design layout
- Licensing requirements
- Modelling, visualization
- Rights of light, party wall issues.

It is worth bearing in mind that a survey prepared for one purpose is not necessarily going to be of sufficient accuracy or detail to be used for another. For example, surveying the overall outline of a room to define the lettable area may well be done at a lesser accuracy than when data collection will enable an architect to design structural alterations to the building, e.g. the difference between an unconnected survey and a fully connected survey.

Whatever the project, accuracy in planning is the key. A thorough survey will lessen the possibility of making costly mistakes at a later stage, as it will be lessen the likelihood of discovering unforeseen problems.

"The equipment chosen must be capable of meeting the accuracy requirements for the particular survey."

3. Equipment used

The choice of equipment is often best left to the surveyor. The equipment chosen must be capable of meeting the accuracy requirements for the particular survey and of operating in the particular survey location.

How a company carries out the survey and what equipment is required will be determined by the nature of the building and the scope of the planned works.

It is common on the majority of surveys, particularly if the data is to be used for structural refurbishment, that the building is externally controlled. The use of a Total Station to collect the building footprint will provide the template - the edge pieces of the jigsaw puzzle – to which the internal room layout will fit within; working from the whole to the part.

The size of the building, the complexity of the internal layout and the specification of the survey will dictate whether additional control is required internally.

It may be appropriate to continue measuring through the building using a Total Station; continuing the traverse through either the main spine of the building or in some cases through every room.

Many will take the controlled building footprint and will measure from it directly; filling in the rooms either using a sketch pad and a hand held laser distance meter, or utilising specific measured building software.

Data that is captured to be utilised in the production of 3D or 3D-BIM ready models will typically be captured in 3D and kept in 3D. Terrestrial laser scanners capture the space as a 3D point cloud, this data can then be translated directly into a 3D model.

Please see the TSA's Client Guide on Laser Scanning.

4. Factors affecting a Measured Building Survey

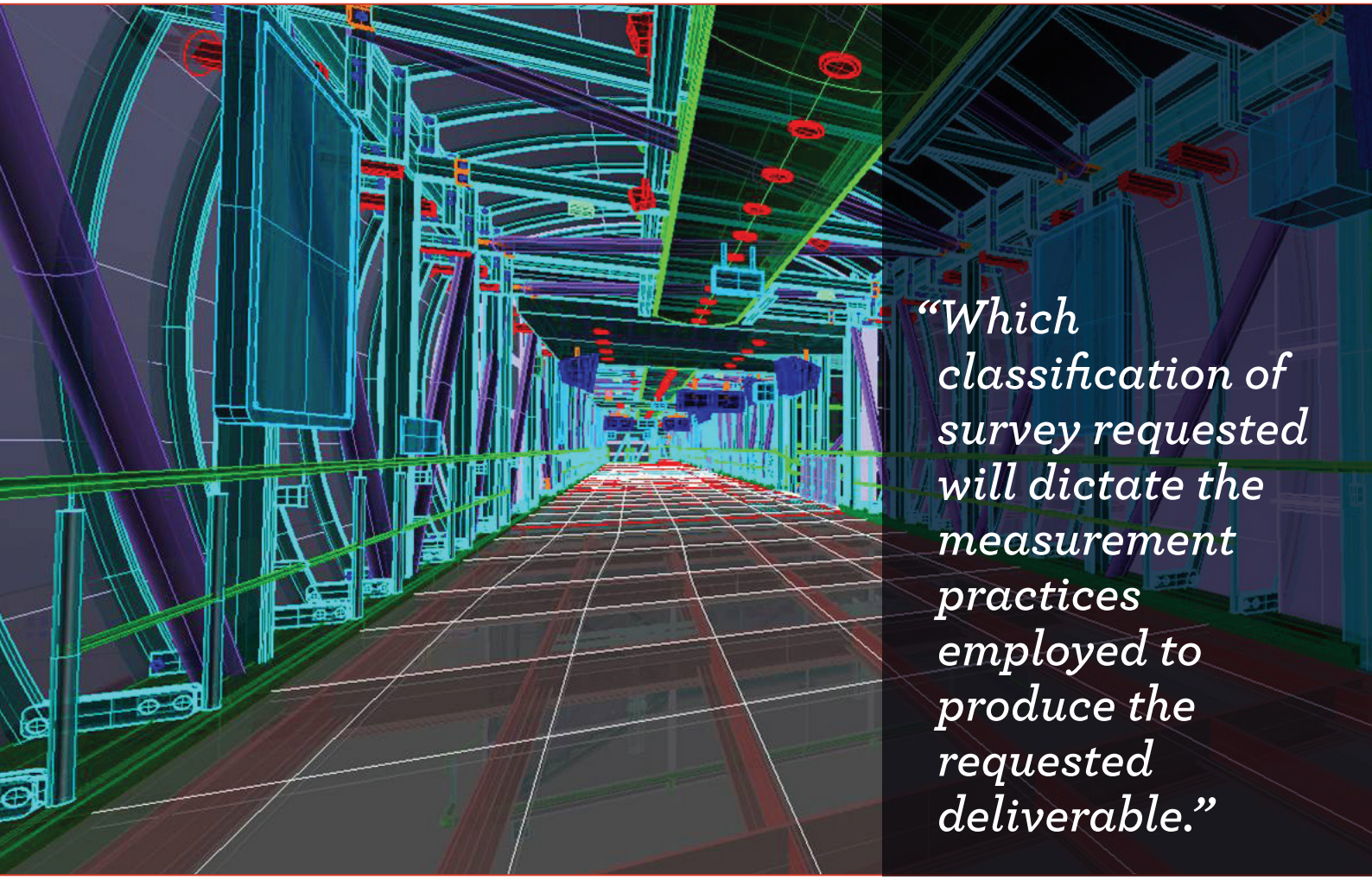
The majority of firms who are collecting data within the Geomatics sector will do so according to an industry recognized standard produced by the Royal Institution of Chartered Surveyors (RICS). The RICS publication is titled 'Measured Surveys of Land Building and Utilities 3rd Edition'. This document is regarded as the ultimate reference source by measured building professionals as it states from a client perspective what the required specification is with relevance to specific projects.

There is a key section within this publication which discusses types of survey, identifying three distinct categories: 'Connected', 'Semi-connected' and 'Unconnected'. The classification of the survey will dictate the measurement practices employed to produce the requested deliverable.

The guide states an *Unconnected* survey is one that using simple methods which do not enable one part of the survey to be related to another. This type of survey is traditionally associated with plans used for the determination of lettable areas, where the area of a specific region is required but its relationship to its surrounding space is not.

A *Semi-connected* survey is where one floor (normally the ground floor) is surveyed with all parts connected by instrumental control. Other floors are matched by assuming verticality of common features.

If major structural changes are proposed then it is usually the case that a . survey may be requested. This is defined as a survey where all floors are instrumentally related to a common survey control framework.



"Which classification of survey requested will dictate the measurement practices employed to produce the requested deliverable."

With each of these three types of survey, different factors associated with scope and scale, will influence the time taken and therefore the cost of the project.

A second source of reference is the English Heritage specification guide 'Metric Survey Specifications for Cultural Heritage – 2nd edition', and in particular section 5.0 - Standard Specification for Measured Building Survey. This document provides a thorough overview of survey drawing requirements, detailing expected information to be shown at specific drawing scales, standard symbol nomenclature and CAD features e.g. line weight, type and colours.

A third reference document is another RICS publication: 'The Code of Measuring Practice: A Guide for Property Professionals – 6th edition' is also highly regarded by the industry but from a slightly different perspective. This guide is primarily aimed at the measurement of buildings but from a valuation for sale or leasing perspective.

"It is also important to bear in mind the three following points – Scale, Accuracy and Precision."

5. Considerations when tendering

We have already briefly touched on some of the considerations which should be made when tendering for a measured building survey, such as the end deliverable and instrumentation used. Just as the methodology and instrumentation used is determined by the type of survey e.g. connected, semi-connected and unconnected, it is also important to bear in mind the three following points – scale, accuracy and precision.

"The critical factor in receiving a Measured Building Survey that it is fit for purpose."

When we define scale we are assessing the relationship of the measured dimension to the actual measurement. This relationship has important significance as it determines both the accuracy of the survey requested and the amount of detail that is required to be collected and shown in a survey drawing.

For example a 1:100 survey, strictly speaking, does not require window sill and head heights to be shown but survey professionals include this information as they are key dimensions. Likewise on a 1:100 survey it wouldn't necessarily show all the internal façade elements such as dado rail profiles, cornice levels and profiles but on a 1:25 survey you would expect to see them, as standard. If specific details are required which go beyond 'standard' specification then this should be specified at the point of tendering.

Accuracy and precision are interrelated. Accuracy is defined as a faithful representation of someone or something, e.g. in our case the nearness of any measurement to its absolute value. Precision is the consistency or repeatability of those measurements taken, e.g. the scatter of the measurements. Dimensional accuracy is not only the individual discrete measurements that make up the entire space, but more importantly it is the overall relationship of the configuration of the measurements combined.

With regards to the expected accuracy of points and the resolution of features to scale, the RICS Geomatics client guide "Scale" quotes for a 1:100 outline floor plan at 1:100 an accuracy of 0.02m and a resolution of 0.1m (1mm at scale). A fully controlled measured building survey should be accurate across the parts of the building that the surveyor can't measure between directly, as well as those where a simple check dimension is possible.

This is possibly the key factor when assessing the validity of a survey. Many measured spaces are far from regular and, as such, their relationship to the space that makes up the whole in question is key to the production of a complete and accurate measured survey.

6. Summary

The critical factor in receiving a Measured Building Survey is that it is fit for purpose. The specification will dictate the features and level of detail required. Scale, accuracy and precision are factors in this 'fitness for purpose'. The methodology employed for data collection will be dictated, not only by the building itself but also the use of the requested data.

Client engagement will assist the surveying team and ensure the clients' expectation on deliverables are met.

Further information

Surveys of Land, Buildings and Utilities at Scales of 1:500 and larger Second Edition 1996 published by the RICS. ISBN: 0854065393

Metric Survey Specifications for Cultural Heritage Second Edition 2009 published by English Heritage. Product code 51481

Code of Measuring Practice Sixth Edition published by the RICS. ISBN 1842190601

The Survey Association

Formed in 1979 as The UK Land and Hydrographic Association, TSA is now established as the representative organisation for UK private surveying firms. The Association's aims are:

> To provide a vehicle for members to act effectively together on agreed courses of action

> To promote the interests of the profession to all those who determine the economic and social conditions in which the industry operates

> To identify and represent the views of the industry.

Using a TSA member

By using a TSA member you can be assured that your project will get off to the best possible start. Whatever the size of project, you can be certain that TSA member companies are expert in the provision and management of spatially related data on which to base your concept, design and construction.

Professional attention from a TSA surveyor will reduce risk, repetition, possibly save you money and will ensure that your project receives the best possible attention.

TSA Contact Details

If you would like any more information about the TSA or its members or about other Information leaflets then please contact Rachel Tyrrell at:

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Glossary of Terms

TERM	EXPLANATION
BIM	Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places. Building information models (BIMs) are files (often but not always in proprietary formats and containing proprietary data) which can be exchanged or networked to support decision-making about a place.
2-DIMENSIONAL	A 2D drawing will be in plan only and any indication of height will be as text.
3-DIMENSIONAL	A 3D drawing will have the features mapped in 3D model space.
HAND HELD LASER DISTANCE METER	A Laser Distance Meter sends a pulse of laser light to a target and measures the time it takes for the reflection to return. The primary use of this instrument is to measure distances typically up to 60m or more so with a precision of 2-3mm, depending on the manufacture.

Document Revision History

Issue 1	October 2008	Original document
Issue 2	January 2015	Full revision
Issue 3	May 2015	TSA disclaimer added
Issue 4	February 2016	Text amendments