PORTABLE TEST EQUIPMENT FOR COMMERCIAL BUILDING SURVEYS – HELP OR HINDRANCE?

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ABSTRACT

This paper presents the first publication of the results of an RICS Research Foundation Education Trust funded project to investigate the use of modern non-destructive test equipment during surveys. The data collection and analysis phases are discussed in detail followed by the presentation of the preliminary findings of a national postal questionnaire survey of one hundred and forty-three building surveying practices. The authors have confined this paper to a discussion on the largest data set – equipment used for commercial and industrial surveys. New technology has made some impact in that more surveyors are using digital cameras and electronic measurement aids but little use is being made of portable materials testing equipment. The results have indicated that there are increasing trends in the use of endoscopes, some environmental measuring aids, metal detectors and electrical installation testing by surveyors.

Keywords: Test equipment, commercial buildings, condition surveys

1. INTRODUCTION

Technology is changing the lives of everyone – in the home and at work. It is difficult to imagine the work place without a personal computer at the heart of the office and yet only a decade ago this situation was relatively common. Today the Building Surveyor is likely to use a p.c. to access his or her e-mail, to type survey reports, to prepare drawings and even to share access to these and other project documentation with other members of the construction team over the web. Voice recognition software enables dictated survey reports to be typed without the necessity for a secretary. Indeed the advances in the technology of communication have meant that many surveyors work principally from home with only the occasional need to visit their firm's office. If technology has changed the way that the Building Surveyor works in the office how has it changed the way in which he or she operates when carrying out a survey? It is this question which is at the centre of the research reported in this paper. Does the surveyor still only carry a tape measure and a damp meter when undertaking a survey or have changes in technology meant that many other items of gadgetry now fill the surveyor's tool bag?

The study has been partly financed by an award from the RICS Education Trust and has looked at the equipment used by surveyors when carrying out a range of services. The focus of this particular paper is the Building Survey of Commercial and Industrial Property. When undertaking residential surveys the various guidance notes that would be

referred to by a court of law should there be any suspicion of negligence are very explicit about what should be used (RICS, 1996 and SAVA, 2000). For commercial and industrial properties however the guidance note is remarkably silent, stating only:

> *No list of equipment can be exhaustive nor can there be any suggestion that failure to carry items contained in a list of equipment may indicate a failure to carry out a survey adequately. It is also important to realise that the type of survey being undertaken will have a marked effect on the equipment likely to be required. The surveyor will make his decision based on the property being inspected and his instructions.*
>
> (RICS, 1998)

So what equipment is being used by building surveyors when undertaking this service? Have advances in technology led to a greater range and variety of equipment being used? The main research questions of this study insofar as they related to commercial and industrial surveys are concerned were:

- whether or not innovations in microelectronics and portable test equipment have made an impact into surveyors' practice; and
- whether surveyors are aware of, and making the most of, modern equipment;

This being a large scale quantitative study an early decision was made to collect data by postal questionnaire.

2. QUESTIONNAIRE DEVELOPMENT

The selection process, providing a concise range of equipment included in the questionnaire (for a copy please contact the authors) assumed that all professional surveyors have access to basic equipment as described in the RICS 'Guidance Notes for Domestic Surveys' (RICS, 1996). The questionnaire does not, therefore, ask about the specific details of, for example, ladders or basic hand tools. The authors assume, for example, that all those briefed and authorised to assess material integrity will have access to an integrity 'prodder' such as an awl or screwdriver. The questionnaire is based on the premise that all surveyors, through their education and training, have an awareness and respect for the recommended equipment. The investigation does not aim to quantify potential incompetence or negligence that may exist in any profession. The quest, however, is to determine whether the territory of the technical specialist and the building surveyor have come closer together with the advent and rapid development of affordable, portable technology.

2.1 Technical objectives of the questionnaire

With the specific aim of determining the level of sophistication beyond the recommended equipment levels described above, the technical objectives of the study are:

- To assess the extent and detail of common practice;
- To provide an illustration of 'what is potentially out there';

- To learn whether surveyors are leading, lagging, loathing or living without the latest technology;
- To provide a forum for those that lead to demonstrate their technical achievements to demonstrate their competence (albeit anonymously).

2.2 Determining the extent and detail of common practice:

A technical specialist might be expected to have an awareness of, and be able to gain access to, all manner of test apparatus. Such specialist apparatus may be non-destructive or may require sample extraction and may be considered party or wholly destructive. The British Institute for Non-destructive Testing provides a platform for advanced and diverse levels of diagnosis and further information can initially be gained from their website (that provides an A-Z of NDT products and suppliers) at www.bindt.org, Other sources of information include the Institute of Materials at www.instmat.org.uk; international resources include www.ndt.org and www.ndt.net. It would be unreasonable to expect every surveyor to spend time gathering quantitative data in the general course of making qualitative judgements. Indeed, it is reasonable to expect most surveyors to recognise the need to refer specialist activities to specialists. The questionnaire is structured to examine whether technical innovations have allowed surveyors to carry out their own initial investigations before referring work to specialists. Referral to others has its place… but is self help (self diagnosis) now possible where once it was essential to 'call in an expert'?

2.3 Providing an illustration of currently available test equipment

The equipment included in the questionnaire was compiled after trawling in-house awareness of surveying and material science and testing, a review of currently available texts and guidance notes on Building Surveying practice, assessment of the relevance of specialised non destructive test procedures and a brief survey of technical trade literature. Without prompting for specific trademarks, the questionnaire aims to discover the extent to which a concise range of equipment is in common use.

2.4 To determine whether surveyors are leading or lagging

During the pilot interviews and as a result of the pilot questionnaires it became apparent that there is a wide divergence in attitudes towards portable test equipment. Some surveyors' practices had no involvement with any form of technical equipment whilst others were working very closely with leading specialists in portable test equipment. Whilst some surveyors were proud of their technical knowledge and used innovative equipment as part of their promotion material, another identifiable group of surveyors were keen to acknowledge the role of specialists but had no intention of producing quantitative analysis themselves. Part of the function of the investigation is to quantify the proportion of surveyors using modern innovations to improve their technical accountability. In the broadest sense, the questionnaire provides a forum for surveyors to demonstrate their expertise in portable testing.

2.5 Compilation of the questionnaire

Construction of the questionnaire went through a 4-stage process:

- Listing test apparatus used at a range of consultancy centres and test houses known to the authors;
- Editing and expanding the list to encompass material specific test apparatus in addition to general surveying aids;
- Telephone interviews with general practice and building surveyors to test and modify the appropriate content of the questionnaire;
- Pilot study to precisely target the appropriate audience, to examine the predicted response rate and fine tune the questionnaire content.

The final version of the questionnaire was judged to be comprehensive but not overwhelming, to contain areas general and specific technical content, to be illustrative and technically provocative.

3. DATA COLLECTION AND ANALYSIS

A sample frame of building surveyors was compiled from data supplied by the RICS. The RICS database manager filtered the 13701 RICS database entries: firstly by Building Surveying Division (leaving 2170 entries) then by Building Surveying as a speciality leaving 580 entries. Five hundred questionnaires together with a stamped addressed envelope were posted with an individually addressed covering letter in May 2001. For ethical reasons (and to encourage a response) the questionnaire survey was completely anonymous. Respondents were however encouraged to provide their e-mail address if they required a copy of the final report and several surveyors did so.

One hundred and forty three useable questionnaires were returned representing a response rate of 28.6% which is at the lower end of typical response rates for postal questionnaires (Weisberg & Bowen, 1977, p58). The most likely explanations for the slightly disappointing response rate are that the questionnaire was fairly long (four pages of A4) and required careful completion since it was designed to be optically read. This was the authors' first experience with using an optically mark read questionnaire and although the design and analysis framework stages of the study were quite long winded the data entry stage was greatly simplified. The data analysis carried out for the paper represents a first attempt at making sense of the data and details of the full analysis will be published in the final RICS Research Report.

4. RESULTS

The sizes of the respondent firms as measured by the number of partners or directors are illustrated in Figure 1 below. This distribution, having very many small firms and very few large firms, is typical of building surveying practices as evidenced by other studies of such firms (e.g. Hoxley, 1994, p9).

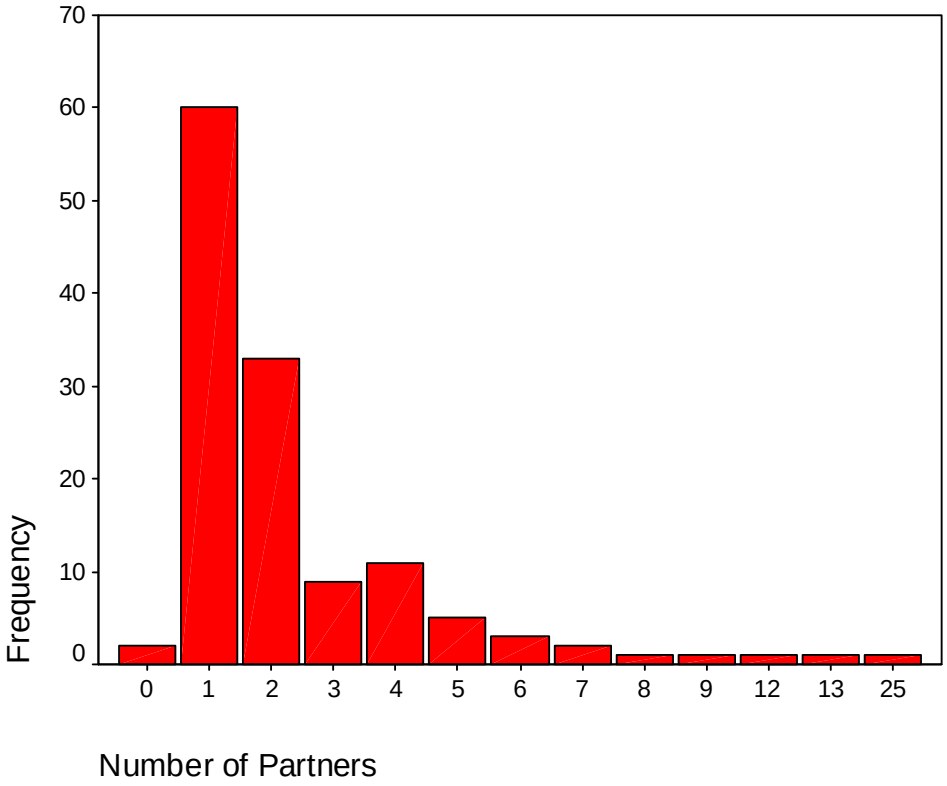

Figure 1 : Size of Firms

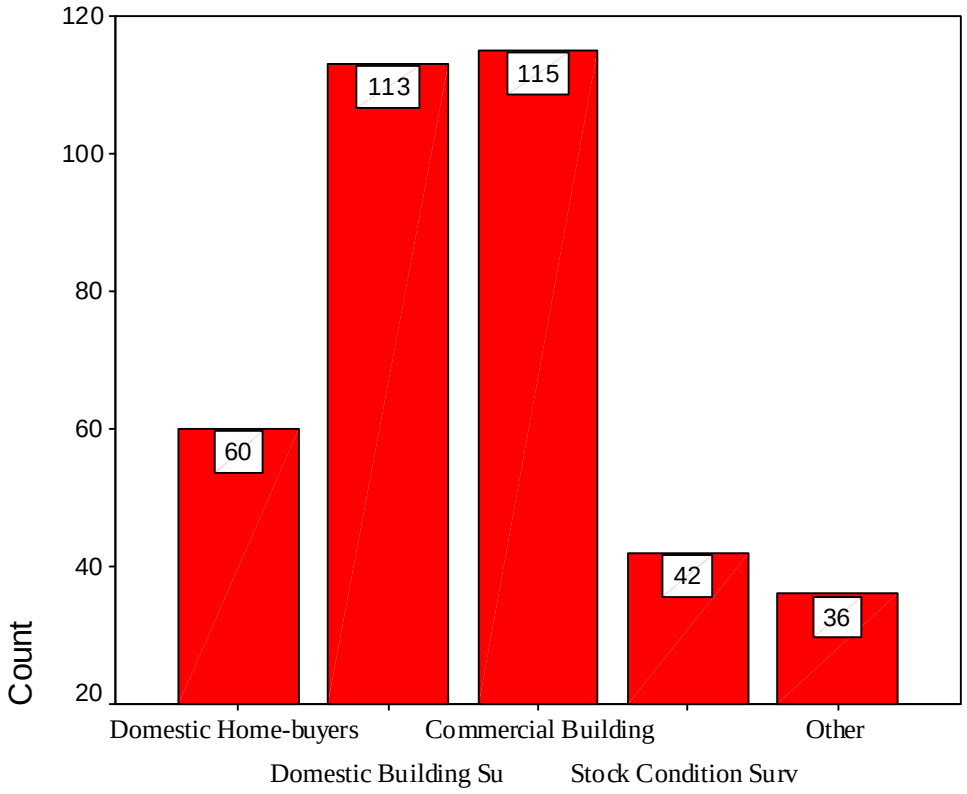

Figure 2 : Services Promoted

The services promoted by the 143 practices is illustrated in Figure 2 and it will be seen that the largest service promoted is "commercial building surveys" followed by "domestic building surveys". The results presented below are for the 115 cases where firms promoted commercial surveys.

The data collected for this part of the study are summarised in Appendix A. As will be seen there are few surprises. In the recording/viewing section twenty-seven surveyors (23%) said that they generally or occasionally use an endoscope. This is quite a high percentage for a fairly specialist item of equipment. Seventy-three (63%) make use of a digital camera and 77% use a dictaphone. In view of relevant case law precedents (see for example Watts and Another v Ralph Morrow, 1990) it is assumed that the dictaphone is used for note taking and not site dictation of the report. Although the surveyor still carries a tape measure, as will be seen from the "linear measurement" section, a wide range of other measurement aids are also used including an electronic measure (48%).

In the environmental section we see that 22% use a thermometer while 18% use a hygrometer. As is to be expected moisture meters of various types are the most used aid in this section. Limited use is made of metal detectors - twenty-two surveyors (19%) use some form of detector. A total of 28 (24%) of the sample use an item of electrical testing equipment. Certainly in the field of domestic inspections there is an increasing trend for the surveyor to carry out some form of rudimentary electrical test (in the United States it is common for the Home Inspector to test mechanical and electrical services). On the other hand many commentators believe that any test of the electrical installation can only be carried out by a qualified electrician and that plug testers "…… are probably more misleading than helpful" (Parnham and Rispin, 2001, p262). These results may however indicate the start of surveyors taking greater responsibility for inspection and testing of the electrical installations of commercial buildings. Smaller numbers of surveyors are prepared to carry out their own drain tests although apparently there is one surveyor out there who carries out his or her own CCTV inspections!

Although 22 surveyors (19%) use an integrity awl for testing timber it was with the results of the materials testing section that the authors were most disappointed. Very small numbers are using any equipment to test concrete and mortar and none of the sample use anything to test metals, plastics or brick and stone. Two surveyors use a leak detector for flat roofs.

5. CONCLUSIONS AND RECOMMENDATIONS

One hundred and fifteen of the 143 surveyors responding to this UK wide questionnaire survey carry out commercial building surveys. New technology has made some impact in that more surveyors are using digital cameras and electronic measurement aids but little use is being made of portable materials testing equipment. This may be (as one respondent indicated on his or her questionnaire) because in most cases surveys (even of commercial and industrial buildings) are carried out of other peoples' buildings and any procedure which involves even the slightest damage would be resisted by owners. The

results have indicated that there are increasing trends in the use of endoscopes, some environmental measuring aids, metal detectors and electrical installation testing by surveyors. The authors recommend that this study be repeated in five years time and if the trends identified by this survey continue there may be a case for updating the advice given to surveyors in the RICS guidance note. The results of the analysis of the study data for commercial building surveys suggest that by and large surveyors of such buildings are preferring to rely on what they have relied on for centuries – their senses and in particular their eyesight!

6. ACKNOWLEDGEMENTS

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APPENDIX A : Summary of Data Analysis

Multiple Response

Group $Q2AC3 **Recording/viewing - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Digital camera	Q2AR02C3	73
Video camera	Q2AR03C3	21
35mm camera	Q2AR04C3	90
Endoscope	Q2AR05C3	27
Hand lens	Q2AR06C3	22
Binoculars	Q2AR07C3	108
Inspection Mirror	Q2AR08C3	64
Compass	Q2AR09C3	59
Battery Torch	Q2AR10C3	110
Electric survey lighting	Q2AR11C3	20
Dictaphone	Q2AR12C3	77
Microscope	Q2AR13C3	1
Image analysis software	Q2AR14C3	1
Other viewing-recording aids	Q2AR15C3	2
Portable pc with checklist	Q2AR16C3	10
Portable pc with proprietary software	Q2AR17C3	2

	Total responses	687

3 missing cases; 112 valid cases

Group $Q2BC3 **Linear - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Steel tape	Q2BR01C3	80
Fabric tape	Q2BR02C3	91
Electronic measure	Q2BR03C3	55
Tread-wheel	Q2BR04C3	6
Crack Width Measurer	Q2BR05C3	51
Movement measurement	Q2BR06C3	43
Other measuring aids	Q2BR07C3	12
Level	Q2BR08C3	57
Other alignment aids	Q2BR09C3	48

	Total responses	443

5 missing cases; 110 valid cases

Group $Q2CC3 **Environmental - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Thermometer	Q2CR01C3	25
Hygrometer	Q2CR02C3	21
Anemometer	Q2CR03C3	1
Light meter	Q2CR06C3	4
Noise meter	Q2CR07C3	2
Pin probe moisture meter	Q2CR09C3	100
Surface moisture meter	Q2CR10C3	46
Other moisture meter	Q2CR11C3	7
	Total responses	206

5 missing cases; 110 valid cases

Group $Q2DC3 **Material detectors - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
'Studmaster'	Q2DR01C3	9
Metal detector	Q2DR02C3	17
	Total responses	26

93 missing cases; 22 valid cases

Group $Q2EC3 **Electrical testing - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Earth meter	Q2ER01C3	12
Mains tester	Q2ER02C3	16
Other detector	Q2ER03C3	5
	Total responses	33

88 missing cases; 27 valid cases

Group $Q2FC3 **Services testing - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
CCTV	Q2FR01C3	1
Smoke bomb	Q2FR02C3	2
Fluid dye	Q2FR03C3	8
Bung/balloon stopper	Q2FR04C3	10
	Total responses	21

98 missing cases; 17 valid cases

Group $Q2GC3 **Metals - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Other equipment	Q2GR02C3	1
	Total responses	1

114 missing cases; 1 valid cases

Group $Q2HC3 **Timber - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Integrity awl	Q2HR01C3	22
Other equipment	Q2HR03C3	2
	Total responses	24

91 missing cases; 24 valid cases

Group $Q2IC3 **Concrete/Mortar - Commercial**
(Value tabulated = 1)

Dichotomy label	Name	Count
Portable chemical analysis kit	Q2IR01C3	1
Rebound hammer	Q2IR03C3	2
Reinforcement cover meter	Q2IR04C3	4
	Total responses	7

110 missing cases; 5 valid cases

Group $Q2JC3 **Plastics - Commercial**
(Value tabulated = 1)
All cases for this variable/group were missing.
115 missing cases; 0 valid cases

Group $Q2KC3 **Brick/Stone - Commercial**
(Value tabulated = 1)
All cases for this variable/group were missing.
115 missing cases; 0 valid cases

Group $Q2LC3 **Flat roofs - Commercial**

Dichotomy label	Name	Count
Leak-detector	Q2LR01C3	2
	Total responses	2

113 missing cases; 2 valid cases