

Why Standardise?

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SUMMARY

What are standards? How might they affect surveyors? What should surveyors do about them? Are they a surveyor's friend or his foe? What is the role of the surveyor's professional body in guiding him in matters of standardisation?

This paper sets out to address these questions. Its first half draws the conclusion that standards, properly utilised, are a surveyor's friend, and that there is a key role for professional bodies. The second half of the paper reflects on the work of FIG in this area to date, including in the cadastral domain, and its plans for the future.

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1. THE CONTEXT

1.1 What are standards?

A sensible place to start in answering such a question might be a dictionary. The Collins English Dictionary offers, amongst its 19 definitions of the word, the following: ‘of the usual, regularised, medium or accepted size’; ‘denoted, or characterised by idiom, vocabulary etc, that is regarded as correct and acceptable by educated native speakers’; ‘an accepted or approved example of something against which others are judged or measured’; and ‘a level of excellence or quality’. A common theme runs through all of these definitions of the word. The International Organization for Standardization (ISO) offers the following: ‘standards are documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose.’ As can be seen, this takes the dictionary definition of the word ‘standard’ and creates a process, purpose and measurement for it.

From these two sources, we can distinguish perhaps between ‘standards’ and ‘Standards’. The former are ‘norms’ against which we compare items for ‘acceptability’; the latter are formal, often legal, documents which define more closely what is deemed acceptable for a particular purpose and what is not. Both are of consequence to surveyors in their dual role as professionals and business people. We come across many examples of both every day, for instance:

- Plugs and sockets that fit into each other (as long as one remembers one’s international adaptor!);
- Accepted rules and conventions for road use;
- A single, consistent set of book numbers via the ISBN system; and
- Academic standards on which we can rely.

1.2 Why should we care?

The preceding section has perhaps started to answer this question – the frequency with which we encounter standards means that we cannot ignore them. The ISO web site (www.iso.org) lists with some pride, for instance, the following achievements of the organisation since its foundation in the 1940s:

- The ISO film speed code;
- Standardisation in the format of telephone and banking cards;
- The number of businesses implementing ISO9000 (quality management) and ISO14000 (environmental management);
- The internationally standardised freight container;

- The universal system of measurement known as SI;
- Paper sizes;
- The same symbols for automobile controls being used throughout the world;
- The safety of wire ropes;
- ISO codes for country names, currencies and languages; and
- ISO standard metric screw threads.

This list again points to the ubiquity of standards, but also begins to indicate the economic benefits that they provide – that confidence that things *will* work and *will* fit together. This becomes of increasing importance because of a number of key changes in the world around us, including:

- Globalisation of trade – more and more businesses and consumers require confidence that trade can flow between countries and continents;
- Competition laws – the need to prove that equivalent opportunity and standards are applied to equivalent transactions;
- Growing consumer requirements, whereby products and services need to be guaranteed to meet certain criteria;
- Technological developments to the stage that most equipment users (whether in business or social arenas) will not be in a position to understand the detailed working of the equipment and therefore to make unaided appropriate adjustments to the results; and
- The increasing intertwining of industries and professions meaning that professionals are expected to have a level of understanding beyond the discipline in which they trained.

All of these trends point to the need for a common language of expectations. Standards are designed to provide this language (and the necessary translation service).

Putting some validated numbers and comparisons to these general statements, a piece of work by the Technical University of Dresden and the Fraunhofer Institute for Systems and Innovation (DIN, 1999) found that:

- The benefit to the German economy from standardisation amounts to more than US\$ 15 billion per year;
- Standards contribute more to economic growth than patents and licences;
- Companies that participate actively in standards work have a head start on their competitors in adapting to market demands and new technologies;
- Transaction costs are lower when European and International Standards are used; and
- Research risks and development costs are reduced for companies contributing to the standardisation process.

As the area of standardisation gains a higher profile internationally, a number of further studies have reviewed its benefits. Peter Swann (2000) considered the economics of standardisation for the British Department of Trade and Industry. The findings of his in-depth research include the following:

- Standardisation is a key part of the microeconomic infrastructure; it can enable innovation and act as a barrier to undesirable outcomes;
- Standardisation increases competition and that does not necessarily increase the profitability of companies. However, it is in the interests of the economy as a whole;

- It is clear that traditional public standards setting procedures are under pressure. It is widely perceived that they are not ‘fast enough’;
- Uneven representation in the standardisation process can lead to short-sighted standards; and
- There is doubt that a producer led standardisation process can give full account to customer interests.

Another recent study, by the Delphi Group (2003), considers the value of software standards. It concludes that standards create liquidity – the ability to leverage IT investment in unforeseen ways. In so doing, standards provide the foundation for long-term advances in the way that software is built, bought and deployed. All of this has led to a sense of imperative to adopt software standards and a sense that standards and integration are not a luxury.

A further study (NASA, 2005) considered specifically the realm of geographic information standardisation. Two significant systems investments were reviewed by external consultants, one of the investments using a high degree of open geospatial standards, and the other using few open geospatial standards. Key findings of the report included:

- The project using open standards had a risk-adjusted Return on Investment (ROI) of 119%;
- The project using open standards saved 26.2% compared to the project using proprietary standards;
- Standards lower transaction costs for sharing geospatial data when semantic agreement can be reached between the parties;
- Standards lower transaction costs for sharing geospatial information when interfaces are standardised and can facilitate machine-to-machine exchange;
- Technical convergence is driving demand for interoperability and connectivity between an increasingly wide array of devices;
- Standards sometimes fail to meet expectations – usually due to the long lead times for developing a complete schema or the daunting task of implementing complex specifications - standards that proceed incrementally have a much better chance of adoption;
- Successful standards development and adoption rests on the ability of three key groups – government, industry, and the standards development community – to come together for a common good.

These figures and statements should certainly interest surveyors as business people. But what about surveyors as professionals? As the Institute of Management’s Code of Conduct (quoted in Davies, 1997) puts it: ‘A professional is someone who justifiably claims to provide an expert service of value to society, and who accepts the duties... including... honouring the special trust reposed by clients, employers, colleagues, and the general public’. We have already made the proposition that the development of technology means that even professionals can no longer be expected fully to understand the detailed workings of the equipment that they use. Surely standards are therefore an integral part in the process of professional surveyors fulfilling this ‘special trust’? In addition, ‘[complaints] can be substantially reduced by the provision of comprehensive, comparable and transparent

information.... Global standards can have a direct impact on the market, on society and on prosperity. Widespread adoption of International Standards in the field of services would mean that suppliers would base the development of their activity on specifications that have worldwide acceptance. This would be to the advantage of both consumers and businesses.’ (Ringstedt, 2001). Surveyors in each of their twin roles should therefore care about standards.

1.3 Who is involved in standards development?

ISO has already been mentioned several times in this paper. That’s not surprising, as the organisation can perhaps be described as the ‘big daddy’ of standardisation bodies. At the end of 2001, ISO consisted of 143 national standardisation bodies. It ran 2,885 technical (largely standards development) bodies; employed 500 people; and had a turnover of CHF 150 million. It had in print 13,544 standards consisting of 430,608 pages. The activity of the organisation is indicated by the fact that 813 standards (49,795 pages) were published in 2001, with 4,405 work in progress items. The number of standards in print has risen by over 1,000 (nearly 75,000 pages) since the end of 1999. This is a boom market! Current ISO standards include:

- ISO 2172 – Fruit juice – determination of soluble solids content – Pycnometric method;
- ISO 2729 – Woodworking tools – chisels and gouges;
- ISO 6806 – Rubber hoses and hose assemblies for use in oil burners – specification;
- ISO 8192 – Water quality – test for inhibition of oxygen consumption by activated sludge;
- ISO 11540 – Caps for writing and marking instruments intended for use by children up to 14 years of age – safety requirements;
- ISO 17123-3 – Optics and optical instruments – field procedures for testing geodetic and surveying instruments – theodolites; and
- ISO 19111 – Geographic information – spatial referencing by coordinates.

ISO’s mission is ‘to promote the development of standardisation and related activities in the world with a view to facilitating the international exchange of goods and services, and to developing cooperation in the spheres of intellectual, scientific, technological and economic activity.’ Its outputs, international standards, are more formally international agreements. Adoption of them is in theory voluntary, but often required by tendering processes and by customers (who are seeking the reassurance that conformance to a set of norms can provide). This comes through in ISO’s goals, which are to facilitate trade, exchange and technology transfer through:

- Enhanced product quality and reliability at reasonable price;
- Improved health, safety and environmental protection, and reduction of waste;
- Greater compatibility and interoperability of goods and services;
- Simplification for improved usability;
- Reduction of the number of models, and thus reduction in costs; and
- Increased distribution efficiency and ease of maintenance.

ISO, headquartered in Geneva, works closely with another organisation with its head office in the city – the World Trade Organisation (WTO). Standards underpin free trade, and an

agreement between the two organisations on removing technical barriers to trade enshrines the role of ISO standards in WTO activities.

A second standardisation body of relevance to surveyors is the International Valuation Standards Committee (IVSC). This is a younger and smaller body than ISO. It is, however, one which holds considerable sway, with its standards being adopted in many countries and linking closely to the international accounting standards that are gaining focus through the recent corporate accounting scandals. According to IVSC's aims, its standards 'will facilitate cross-border transactions involving property and contribute to the vitality of global markets by promoting transparency in financial reporting.'

These two bodies are joined by a myriad of others, including:

- National standardisation bodies (which are increasingly adopting international standards directly rather than creating their own);
- Regional standardisation bodies (including groups which one might not immediately think of in this regard, such as NATO);
- Governments (all laws can be seen as setting standards); and
- Companies (the larger of which can create *de facto* standards – such as those surrounding the Microsoft operating system).

All of these official standardisation bodies use similar techniques to create and revise standards. These all involve, at their heart, key individuals (often referred to as 'experts') who draft and review the documents. The drafts are then passed through a variety of formal and informal processes to ensure that consensus is reached amongst those participating that the standard appropriately reflects the requirements of user communities. By definition, therefore, all those involved in the creation of a standard can – if they so choose – make a substantial contribution to the documents published. The consensual process is designed to resolve any key objections from any group involved.

ISO's core experts are nominated by its members – national standardisation bodies. Recognising, however, wider interests, a variety of international organisations (about 550 in all) are registered by ISO as Liaison Bodies. These vary from Visa International to FIG. They can be involved in the standardisation process to the full extent of the national bodies, with the sole exception that they do not have a vote.

The experts nominated by national standardisation bodies are often academics and public sector staff – those whose employers are able and willing to support their activity. A certain mindset is also needed for the slow and sometimes tedious process of developing consensus and agreeing a standard. A number of private sector organisations are now starting to see the benefits of involvement in the standardisation process – which is positive news as long as it does not lead to corporate hegemony. This sectoral bias of the experts nominated by national standardisation bodies increases the importance of the Liaison bodies – which often represent the users of standards – nominating appropriate experts to bring the professional user viewpoint to the standards development process, and supporting them in this key work. Acceptable standards which will be of use require this balancing input.

1.4 What standards exist in the world of surveying?

The work of ISO started in the arena of manufacturing. Service industries have been a focus for it far more recently. It is therefore unsurprising that land and engineering surveying is more standardised than spatial planning.

The ISO standards that existed for survey instruments such as theodolites and total stations were a case study in where standardisation can lose touch with reality. That reality is often a muddy building site in the rain, whereas ISO standards required calibration standard facilities. In addition to this, two different and uncorrelated standards covered similar ground. In recent years, FIG and particularly its Commission 5 (Positioning and Measurement) has worked with the relevant ISO technical committees to harmonise requirements, and a number of new standards in the series ISO 17123 have been published. These incorporate two levels of tests – periodic calibration, and regular field-testing (see Becker, 2002 for further details).

A more recent area for ISO attention has been that of geographic information. A European initiative in the early- to mid-1990s had resulted in some provisional standards in this area, but ISO is now in the process of publishing over 40 standards in the ISO 191xx series (and the European standardisation work in the area has recently been re-commenced). They cover aspects from terminology to coordinate reference systems, including crucial areas such as interoperability. This is in line with an industry move to open systems standards, and the GIS manufacturers are key players in the ISO work. So are a number of professional surveying bodies, of whom FIG is probably the most active. Other professional bodies involved include ISPRS, ICA, IHO, IAG and SCAR (the Scientific Committee for Antarctic Research). See Ostensen, 2001 for further information on the work of ISO in this area.

This work on official standards is underpinning a governmental and industry move towards interoperability of geographic data and systems between data providers and across national borders. The INSPIRE initiative to create a European Environmental Spatial Data Infrastructure, for example, plans to rely on ISO and CEN standards.

The area of valuation standards, and its increasing importance as a key element in stating assets and liabilities and therefore of measuring corporate wellbeing, has already been mentioned.

Taking all of these elements together, therefore, surveyors are increasingly impacted by standards, and a key role of surveyors' professional bodies is to participate in and influence this work. Individual surveyors rightly look to their representative bodies to provide their voice in standards development, and to disseminate relevant information on how developing standards will influence (and enhance) their work.

2. FIG'S RESPONSE

Recognising the increasing importance of standards in the work of surveyors, and the key role of professional bodies (especially at international level) in articulating requirements, FIG increased its focus on standards in the late 1990s. A range of activity has been underway since that date, and further work continues. The following sections of this paper give further information on the activity.

2.1 Policy

FIG promulgated the following policy on standards in 2002. It is reproduced and elaborated in FIG's Guide on Standardisation (FIG, 2002a):

'Overall, FIG's aim in the field of standards is to assist in the process of developing workable and timely official and legal standards covering the activities of surveyors. FIG is also committed in its objectives to developing the skills of surveyors and encouraging the proper use of technology, activities which are becoming increasingly shaped by standards.

FIG will generally seek to ensure that *de facto* standards become official standards as technology matures, or at the very least that all relevant official, legal and *de facto* standards are produced in full knowledge of all other related material.

FIG sees the following roles for professionals in the standardisation process:

- Assisting in the production of workable and timely standards by proposing material which can be transformed into international standards (rather than relying on work developed by others) and by participating in the process of developing standards; and
- Disseminating information and creating explanatory material and guidance notes to ensure that all members of FIG are aware of the most recent standardisation activities, standards and regulations, and their implications for surveyors.

In supporting this policy, FIG will dovetail the work of its Commissions and other bodies with that of official standardisation bodies, to ensure that the greatest possible benefit for practising surveyors and their clients is achieved. This dovetailing will be reflected in Commission, Task Force and Permanent Institution workplans – these will include the creation of necessary information and explanatory material, and any relevant planned output from any of FIG's bodies will be discussed with the relevant standardisation bodies before it is created. FIG will also seek to work closely with other international bodies representing surveyors, to ensure the most effective collective use of resources.'

These twin elements of workability and timeliness are key areas in which FIG believes that it can add value to the standardisation process, bringing the necessary experience and skills to the process.

2.2 Task Force

FIG set up a Task Force on Standards in late 1997 to focus and coordinate its efforts on standardisation. In the period until 2002, key elements of the Task Force's work included:

- The dissemination and analysis of a questionnaire on standards issues, to which over 50 responses were received. These results set the priorities for the Task Force's work;
- Gaining understanding of how ISO works, and recording this in the FIG Guide on Standardisation (FIG, 2002a);
- Active engagement with IVSC;
- The work referred to above on survey instrument standards, building on FIG's Publication No 9 in this area (FIG, 1994);
- Submitting the FIG Statement on the Cadastre (FIG, 1995) to ISO for fast-tracking to become an international standard (in this way taking FIG's expert work and using it to shorten standards development timescales). Because of the national legal aspects of the cadastre, ISO did not take this submission forward, but FIG learned more of the procedures;
- Active involvement in the ISO project on standardisation in the area of qualification and certification of personnel (Section 3.5 below expands on this);
- Building links with FIG's sister societies in the area of standards, leading to a joint session of papers at the FIG Congress in Washington in 2002; and
- Communicating on standards to FIG's members through channels including the FIG Bulletin and the FIG website.

Further information on all of this work can be found on FIG's website (www.fig.net).

This activity confirmed the importance of standardisation and standards to surveyors, and that a properly coordinated effort by FIG could add substantial value in this area. At the 2002 Congress, therefore, FIG decided to bring the Task Force on Standards to a close (a task force by definition having a limited life) and to set up a Standards Network to continue its work.

2.3 Standards Network

As mentioned above, the Standards Network was formed in 2002. Its agreed terms of reference are as follows:

- Building and maintaining relations with the secretariats of standardisation bodies;
- Proposing priorities on FIG's standardisation activities, including advising the Council on priorities for spending;
- Setting up necessary Liaison relationships with standardisation bodies;
- Ensuring that lead contacts to Technical Committees etc are in place;
- Maintaining an information flow on standardisation to FIG members, including through the FIG website and FIG Bulletin, and more directly to relevant Commission Officers;
- Maintaining the FIG Guide on Standardisation, and related material on the FIG website;
- Working with other NGOs, within the framework of the Memoranda of Understanding signed by the Council; and
- Advising FIG's officers and members on standardisation activities as necessary.

A key area in which the Network is strengthening the work of the Task Force is in its links with FIG's Commissions. These are the main engine house of FIG's technical work, providing information to professional surveyors and creating the material which can be introduced to the standardisation process. They are also likely to provide the FIG experts to standardisation activities. The Standards Network, officially part of FIG Commission 1 (Professional Standards and Practice), therefore consists of a representative of each of FIG's ten Commissions. In most cases, these are one of the Commission's vice chairs, thus providing a direct link to the leadership team of each Commission. The benefits of bringing together experts from across the field that is surveying have already become apparent, with a number of linkages being made.

2.4 Current work

Work of the Network currently includes:

- **Maintaining information on the work of the different Commissions that is relevant to standardisation.**
- **Strengthening links with other NGOs**, recognising that the whole is likely to be greater than the sum of the parts
- **Building further FIG's relationship with IVSC.** FIG is currently reviewing its formal relationship with IVSC, recognising the important role FIG (particularly Commission 9 – Valuation and the Management of Real Estate) can play in developing valuation standards, one current example being the work of FIG Working Group 9.3 in the area of valuation for compensation.
- **Inputting to ISO's work on standards for survey instruments.** FIG Commission 5 has been involved in the ISO work of refining standards for survey instruments for some years. The goal is a single, usable set of standards that are appropriate for field surveyors (and not just for calibration laboratories). Some of these standards are now published; Commission 5 will ensure that FIG continues its work in this field, with a particular current focus being a proposed standard on testing the repeatability of Real Time GPS measurements.
- **Inputting to ISO's work on Geographic Information Standards.** The work of ISO Technical Committee (TC) 211 will have a profound impact on large numbers of surveyors. Many of its first generation of standards are conceptual models. TC211, however, has now moved into the more detailed area, including the development of registries. Location Based Services is a particular focus. Another is geodetic codes and parameters, where FIG has been asked to assist in compiling a library of the definitive transformations required to move between different coordinate reference systems. TC211 also is becoming the place where the geographic information community meets – the liaison members of the Committee include the Open Geospatial Consortium, the Global

Spatial Data Infrastructure (GSDI) and FIG. FIG has played an active role, but has recognised that it can't be involved in everything. Particular aspects we are focusing on at present are:

- The work item on the **Qualification and Certification of Personnel**.
- **Involvement in outreach activity.** TC211 has set up an Outreach Group, tasked with ensuring that the market is aware of its standards and their implications, and that standards developers are fully aware of market views and the needs of the global community of users of geographic information. FIG has long advocated this work, and has two members of the Outreach Group. Recent activity has included the production of Fact Sheets providing information on each of the TC211 standards, and the running of a number of workshops (including a very successful workshop at the FIG Working Week in Cairo in April 2005).
- **Particular work items of relevance** to the different Commissions, including Commission 3 (work in Location Based Services, and to underpin Spatial Data Infrastructures), Commissions 4/5/6 (sensor models, including for hydrographic and laser equipment) and Commission 5 (coordinate reference system issues).
- **Leading the Focus Group on Data Producers.** This Group, set up in October 2004, seeks to ensure that Data Producers are aware of the work of ISO/TC211, are able to provide feedback on missing elements, and are supported in implementing the standards.
- **Considering whether any FIG material can expedite the development of standards.** There is a wealth of material that FIG could offer to the process, again supporting FIG's policy of creating workable, timely standards. This will become more clear through the process of collating Commission activity.
- **Promoting the development of best practice and standards** in the areas of construction economics (Commission 10, working with the International Cost Engineering Council) and spatial planning (Commission 8), areas not to date covered to any extent by official standards. Another area of interest to FIG is the further development of international hydrographic standards.
- **Maintaining and building links with the ISO Central Secretariat.**
- **Maintaining a profile for the Network** through articles, papers etc.

This body of work will build on the successes of the Task Force, whilst building stronger relationships with all of FIG's Commissions.

2.5 Why should FIG be involved?

FIG has limited resources in both human and cash terms. It is therefore necessary for the Federation to focus its efforts on those areas which are central to its members' interests and where it can add particular value. For the reasons given in this paper, the FIG Council and General Assembly have decided that international standardisation is one of these areas, and have supported first the Task Force and now the Network.

Key benefits for surveyors and standardisation from FIG's involvement include:

- Improved two-way linkages between standards developers and practising surveyors, ensuring that developers are more fully aware of the requirements of users and of what already exists; and that practitioners are aware of standardisation work and its consequences for them;
- Improved standards in terms of both workability and timeliness;
- Improved survey practice, with higher levels of conformance and quality, thus responding to customers' growing expectations; and
- Improved bottom line for both surveyors and their customers.

These points respond to a number of the key findings from the most recent study of the effectiveness of standardisation in the geospatial domain (NASA, 2005). All this is possible in return for a limited amount of resource, and a clear focus within the Federation on this work.

To take one current example, an area which is not currently subject to international, *de jure* standardisation is that of the cadastre. As mentioned in section 2.2 of this paper, FIG a number of years submitted the Statement of the Cadastre (FIG, 1995) for fast-tracking to become an international standard, but this was not taken forward by ISO due to concerns over the inter-relationship with the national laws that generally govern a State's cadastre. What is, however, becoming increasingly evident is that, in a world of global trade, and with secure title to land being a key requirement for human development, many key stakeholders are requiring a greater degree of commonality within the cadastral domain, to provide the required security. FIG has long been respected as one of the leading international sources of expertise on the cadastre. It is therefore natural that the Federation should consider how it can bring forward the benefits above, into standardisation in the cadastral domain. It is generally agreed that a detailed, prescriptive specification of the content of a cadastre would be inappropriate, given the very different legal and cultural frameworks within which national cadastres operate. Neither is this the approach taken by ISO work in the geographic information arena. Instead, ISO/TC211 has used a model-based approach to describing and specifying relevant matters, supported by a concept of registers to list instances that conform to the models. The route taken by FIG Commission 7 over the last few years has mirrored this approach (see, for instance, Lemmen et al, 2005).

Agreement within the FIG community on a core cadastral domain model is a very important step, but it does not provide the quasi-legal statement of that model required by many of the key international stakeholders. A number of these look to ISO to provide such statements. The FIG Standards Network, and the links and performance record it has built within ISO therefore allows the bridging of the FIG work into the ISO arena. This work is underway. The

FIG work has been formally shared with the national standardisation bodies that are members of ISO/TC211 and a number of comments have been received. The next stage is for FIG, as a Liaison Body to ISO/TC211, formally to propose an ISO work item that will result in an International Standard covering the cadastral domain. The work of the FIG Standards Network, and key individuals, in the ISO community over the last few years has created an environment where such a proposal is likely to be received positively, and where the extensive work to date can be used as an input and further refined through the ISO process of consensus, whilst (hopefully) reducing the time for the work to pass through the various ISO stages.

This is exactly the sort of symbiotic interaction that was envisaged when FIG first formally decided to become involved in standardisation activity. That FIG can realistically aspire to play a leading role in such a fundamental area shows how much all of the stakeholders believe that FIG can contribute. It is through such participation that FIG can use its expertise to the benefit of its members, of their customers, and of the international community, essential roles of a professional body.

3. SUMMARY

Standards are of great interest to surveyors both as professionals and also as business people. Early and active engagement with the process of standardisation by professional bodies such as FIG should ensure more workable and more timely standards that meet the needs of practitioners, their customers and the wider community. This is a central role for professional associations and one in which FIG has made significant strides. There is still a good way to go, however, in this odyssey before all of FIG's members are aware of the standardisation issues which are relevant to them, and are providing appropriate input to the standards development process. The creation of the FIG Standards Network, tying its work closely to that of FIG's Commissions, is a further development in this regard. In the coming years, the Network should facilitate increased mutual understanding between surveyors and standards developers, thus introducing more of the benefits of standardisation to the world of surveying.

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BIOGRAPHICAL NOTES

Iain Greenway holds an M.A. in Engineering from Cambridge University, an M.Sc. in Land Survey from University College London and an MBA from Cranfield University (including study at Macquarie University, Australia). Between 1986 and 1999 he worked for the Ordnance Survey of Great Britain. His positions during those years included geodetic and topographic survey, strategic planning and pricing, sales and marketing, as well as a number of management consultancy inputs in Swaziland and Lesotho and technical consultancies supporting land reform in eastern Europe. In 1999-2000 he worked in Her Majesty's Treasury on improving public sector productivity in the UK. Since the summer of 2000, Iain has been Deputy Director of Ordnance Survey Ireland, responsible for much of the day-to-day management of a national mapping agency undergoing profound changes in status, structure, processes and culture. Iain is a Chartered Surveyor (MRICS) and a member of the Chartered Institute of Marketing (MCIM). He is the head of the RICS delegation to FIG, and Chair of the FIG Standards Network. He is also a member of the Management and Editorial Boards of the journal Survey Review. He has published a range of articles and papers on geodetic surveys, business and management practices, sales and marketing, and standardisation.

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