

# Surveyors' Role In Metrication

(The following paper was presented by D. K. MacDonald, D.L.S., O.L.S., of Ottawa, Legal Surveys, Department of Energy, Mines and Resources, to the Eastern Regional Group of the Association, on May 4, 1973 at Brockville).

Mr. Dugal has brought us through the history of metrication, given us a feeling for the S.I. units and an outline of the contemporary organization —

**Metric Commission** — overall program

**Eleven national steering committees** — each of which deals with several sectors of our economy.

**Two hundred planning committees** — industrial, consumer, service, labour, trade, agricultural, professional and educational.

The CIS is one of the associations asked to establish planning committees and our input goes to Steering Committee No. 5 which deals with construction, engineers, architects, surveyors and real estate. In March 1972, it was invited by the Metric Commission to establish a committee to consider the effects of conversion on surveyors and to suggest a suitable conversion timetable for the profession. An ad hoc committee under the energetic leadership of George Slee immediately set about drafting a questionnaire to all members. The report on this canvas has resulted now in the formation of a permanent CIS Metric Committee, again with George Slee as Chairman.

The main task of this committee will be:

- a) to **inform** the membership about the metric system and conversion;
- b) to **advise** the CIS Council about establishment of metric standards;
- c) to **liaise** with provincial associations;
- d) to **advise** the Metric Commission and the Standards Council;
- e) to **prepare** and **publish** a metric practice guide for CIS members.

## Provincial Sub-Committees

Since much of the burden of conversion will fall on the provincial land surveyor and his associations, emphasis has been placed on the establishment of Provincial Sub-committees which will advise on the planning, preparation and implementation of the conversion program in each province and particularly to estimate the probable timetable for conversion and to determine the effects on the various surveying practices.

## Academic Sub-Committees

The CIS Metric Committee has also established an academic sub-committee

to advise on changes in surveying curricula and on the availability of metric reference and text books.

## Ottawa Sub-committee

An Ottawa sub-committee has also been formed to study metric map and plan scales and to propose recommended national standards.

## Foreign Correspondents

The CIS Metric Committee has also embraced a number of non-resident CIS members as foreign correspondents and this is proving extremely fruitful in gathering the experience of fellow surveyors in countries that are in various stages of conversion. Of particular value at this time is the liaison that has been established with the chairman of the Metric Committee of the American Congress of Surveying and Mapping.

I should also point out here that George Slee represents the CIS both on **Steering Committee No. 5 of the Metric Commission** and on the **Metric Practice Guide Committee of the Canadian Standards Association**.

## The Surveying Profession

### General

If we think of the surveying profession as being composed of four basic specialties — geodetic, photogrammetric, hydrographic and cadastral — it is the cadastral man, the practicing land surveyor, who will be most affected by the change.

The hydrographer and geodesist already work in metric units, and hydrographic charts are now being published in natural scales with bathymetric information in metres; the Dominion Geodesist publishes values of control points in geographic and U.T.M. coordinates.

In photogrammetry, most of the equipment used in Canada is already metric and where necessary the photogrammetrist has simply scaled values to our customary units.

But the land surveyor has had to continue working in customary units whether he wanted to or not. For the legal plan produced by the land surveyor is a highly circumscribed document and for good reason.

Property, which is of course defined and identified by the land surveyor's plan is one of the cornerstones of our free

enterprise system. Most of the capital generated in our society is secured by or invested in property. So it is extremely important that legal plans be clear, concise, and unambiguous.

In addition they must be universally understood and interpretable by all involved in the process of land development and investment. And since a plan has to portray boundary information in both digital and graphical form all who use it must be conversant with the dimensional units used. Before any change of units is introduced into such a document, all who use it must be alerted to the change and prepared to cope with it in their operations.

To the land surveyor and his staff the conversion of his work to metric is no great problem but to the army of clerks, administrators and others who use the legal plan afterwards in many different places, in municipal or registry offices, in engineering law or real estate firms, in financial or even in private commercial or industrial firms it is a totally different matter.

It is in this sphere of society that the greatest confusion is likely to occur, insofar as our profession is concerned, and we must make every effort to minimize this confusion.

### Standards

The preparation for change in the property survey field lies principally in the hands of the provincial governments who are responsible for property and civil rights.

In each province there will have to be a program to co-ordinate the conversion within that province to develop new standards where appropriate or to define how existing standards will be converted. And of course this planning will have to extend down to the individual regional and municipal level. For even city by-laws will have to be considered for revision.

All standards dimensions that affect the surveyor will have to be dealt with eventually. For example where roads are now required to be a minimum of **50 feet wide** one could, on conversion, simply make the exact conversion to **15.24 metres** but such awkward standards will undoubtedly be rationalized to less awkward figures such as **15 metres**. And

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a municipal side yard clearance of **4 feet** could be converted to **1.22 metres** or rationalized to **1.2 metres**.

There are hundreds of such standards that affect surveyors in every province and each one will have to be considered individually in light of conversion. I cannot emphasize too strongly the attention we should pay to this question of establishing the new standards.

It is not just a time for exact conversion or rationalized conversion to the metric system. It is the "**once-in-a-lifetime**" chance to review the standards we have built up over the years — to sort out and discard those which are no longer relevant — and to establish the minimum number of coherent standards to meet the needs of our profession for today and for the future.

Each province will have its own unique problems both in setting new standards and in scheduling conversion. But generally the processes will be similar across the country and very often the time frames for the processes will be comparable.

It is here that the exchange of information between the national and provincial organizations becomes important. Each province must establish its own timetable for conversion but since no sector of the national economy is totally independent, each province depends for its planning on the national sector conversion information being compiled by the Metric Commission and likewise the Metric Commission relies on information from the provinces to be able to develop the national timetable.

The National program will undoubtedly have to be in more general and less specific terms than the individual provincial plans.

### Word of Warning

I should add a word of warning — the time to start considering your selection of new standards is **now**. It appears to be a deceptively easy task but nothing could be farther from the truth. As an example, let us consider the selection of suitable new plan scales for just one organization. The management committee of our Division addressed themselves to this task recently with the intention of coming up with a consensus within 30 days. The various members retired to consider the subject and reported back in 30 days with **four** completely different sets of scales. Two hours of spirited debate failed to achieve the consensus we had expected.

At the international level it would appear there are also wide differences

of opinion on this subject. Two countries which have already gone metric within the past twenty years are Australia and India.

The Registrar General of New South Wales, Australia prescribes the following scale ratios (or multiples of powers of ten thereof)

1:50	1:400
1:100	1:500
1:125	1:800
1:200	1:1000
1:250	

In India, for cadastral maps, the following scales are to be used "as far as possible":

1: 1000
1: 2000
1: 5000
1:10000

"These scales may be supplemented where absolutely necessary by scales":

1: 500
1:3000
1:4000

It is to be hoped that, at least on the national level we can achieve somewhat better agreement.

This points out the need for the greatest possible degree of liaison and co-operation between agencies within the province, between provinces and between the provinces and the federal government.

### Conversion

At the start conversion is going to complicate the work of the surveyor. Most old survey records will have to remain unconverted. These records are widely dispersed and so voluminous that their conversion is simply not possible. This means that in connecting to old surveys the surveyor will have to convert the dimensions on existing plans to be able to compare values or to proportion dimensions between found evidence.

While this might not pose too much of a burden on us directly we might find increasing call on us from clients and other non-technical plan users for help in converting areas and lengths on pre-metric plans.

In the State of New South Wales the Registrar General's Department estimates that even after 50 years more than half of their recorded plans will predate conversion. They have therefore concluded that a good economic case can be made for some mass conversion of some records. They were still unsure in 1972 how to decide which plans to convert even after a rather careful analysis of plan usage; one of their difficulties being the classification of plans as "dead" "mortal" "live" or "immortal". However they have decided how they

will convert old plans and this might be of interest to us.

They propose keypunching every length and area on a plan, sorting and converting them to metric equivalents by computer, printing out a conversion table for each plan and microfilming the plan, incorporating in the frame the appropriate table of equivalents.

### Plotted to Scale

In our own office we produce a cadastral compilation plan showing the total cadastral pattern with reference to each individual survey plan in an area. These plans do not show dimensional data but are plotted to scale. They are extremely useful both to surveyors and to the land administrators but of course their usefulness will be impaired after conversion if they are in non-coherent scales.

Since they do not carry digital information they can be readily converted photographically to an appropriate metric scale. And that is the approach we will take once nationally recommended scales are available.

And what of the new survey plans after M day? Here we should try to be as firm as possible in our resolve and insist that they be entirely metric. We expect to face considerable pressure from outside the profession to use dual dimensioning, showing both metric and customary measures. I can appreciate the concern of the user and his desire to be able to continue using the units with which he is familiar and which he is more readily able to handle. But in the long run such an approach can only prolong the changeover process.

### Costly Procedure

We must recognize that the change to metric is going to be a difficult and costly procedure for many persons not accustomed to manipulating figures or to applying scale and conversion factors to dimensions. And if we try to ease their burden by spoon feeding we simply prolong the agony. It is one of those cases where it is kinder to be cruel.

While conversion is in progress, and of course it will take years to complete the process, we will find we have to work with awkward standards. Those standards that we have the right to change ourselves could be converted and rationalized within our own time frame to coincide with conversion.

For example where we prescribe minimum spacing of monuments or dimensions of posts, we can decide ourselves what these should be. But where standards are prescribed by others and are often enshrined in legislation of one sort or another we cannot expect always to have the change of standards coin-

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cide with our own conversion date. So we will surely find ourselves laying out new 15.24 metre wide roads in subdivisions, and 20.117 metre wide roads in the country.

In general, the cost of conversion with regard to equipment will be small.

Minor items such as thermometers, tension handles, tapes and level rods can be phased out during the conversion period and replaced with metric equipment.

The glass circles of optical theodolites can easily be replaced by the maker with new circles at a nominal cost.

Certain makes of E.D.M. instruments already offer a readout in feet or metres. Only with the unilingual models will we be forced to continue measuring in feet and converting the answer to metres. Those of us considering the purchase of E.D.M. instruments in the near future should keep the latter point in mind.

## CIS Action To Date

The Metric Practice Guide Committee of the Canadian Standards Association has been informed by the CIS that it favors as National Canadian Standards:

- 1) Retention of the present sexagesimal system for angular measure.
- 2) Permissive use of the S.I. Unit - hectare ( $10^4\text{m}^2$ ) - 2.471 acres - by the authority having jurisdiction over land surveys. CSA has advised that the "hectare" will be an approved unit in the Canadian Standard.
- 3) Only the metric (S.I.) Universal Transverse Mercator system of projections be used to avoid proliferation of projection systems.
- 4) Rationalized and standardized map and plan scale and ratios.

## Closing Remarks

To the public, I believe we have a clear and unavoidable responsibility. In our daily contacts with people from all walks of life we must present and explain the new system as clearly and

simply as possible.

Within our own organizations we must foster a positive approach to conversion. I know that every province has at least started considering its metric conversion. Some are well advanced in their planning and are even pressing the Metric Commission for more guidance. All of our associations should by now be considering their role in metrication and we should be giving them all the support we can. If you have not heard from your council about what is happening ask to be told, show that you are interested and prepared to help. For the task of converting all our standards and of implementing the change is formidable and our councils deserve all the help we can give. If we are to take the initiative that I believe we should in this metric conversion of Canada then we cannot leave the task to our few elected officers. It is up to every one of us to take an active part and to demonstrate the leadership that the community expects from its professions.