BMN
Building Metrication News

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This section appears in the second and fourth issues of 'Building' each month, and gives current news and information on metrication, as well as providing a forum in which the ramifications of the change to metric can be freely discussed. It is published in association with the Modular Society.

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The BMN Monthly Check List

A handy and up-to-date reference for designers of important news, publications and decisions published in BMN since 23 May.

Management course: a 'metrication for management' course syllabus has been published by the Construction Industry Training Board for large and large/medium firms ('Building,' 23 May, p. 147)

Ordnance survey maps: the first maps to be based completely in metric measurement are to be published in the autumn. ('Building,' 23 May, p. 147.)

Metrication Board: the constitution of the Board and the way it is expected to operate is outlined by the chairman, Lord Ritchie Calder. ('Building,' 13 June, p. 157.)

Paving flags and kerbs: metric sizes for paving flags and kerbs are recommended. The effective date for change is 1 April, 1970. ('Building,' 13 June, p. 157.)

RIBA metric organiser: the technical section of the RIBA's Professional Services Department, under assistant secretary Kenneth Claxton (A), is now responsible for all matters concerning metrication and dimensional co-ordination. ('Building,' 13 June, p. 157.)

Light rolled products: GKN (South Wales) Ltd announce the introduction of metric sizes for their light rolled products. ('Building,' 13 June, p. 157.)

Steel fabric reinforcement: a programme for changing to metric sized steel fabric for concrete reinforcement has been agreed. Only metric sizes after 1 January, 1970 ('Building,' 13 June, p. 157.)

Wire sizes: plans for the conversion to metric wire sizes indicates a target date for adopting metric standards of 1 July, 1970. ('Building,' 13 June, p. 157.)

Ductwork specification: a specification covering the manufacture and installation of ductwork for low velocity, low air pressure air systems, rectangular and circular section, has been published in both imperial and metric units. ('Building,' 13 June, p. 158.)

Changing over

This is the last time that BMN will be published bi-monthly. From July, as explained in our previous edition, a weekly metric news sheet will be appearing, to be backed up in every fourth issue by a full technical section. We have come to the conclusion that this is the best way to serve readers in preparing for the metric changeover: on the one hand we shall be giving immediate notification of any decisions or news items as they become known; on the other we shall be providing a regular supplement in depth which can be used as a constant reference.

One further word about this section. It is evident that over the next two or three years an increasing percentage of the building industry will become involved in metric, and most will be starting from scratch. Therefore it would be wrong for us to assume that, because we have now been in publication for nearly two years, the state of the game is known by everyone, in fact it is probable that most readers in the future will require some sort of restatement of the metric position. To do this we intend to publish a quarterly review which will not only chronicle our progress to date but also pinpoint useful data which has been published in the past. A summary will also be given of all the important items that appear in our weekly news sheet. In this way the monthly section will provide coverage of the total metric spectrum.

Millimetre or centimetre – it does matter!

by Philip Dunstone

British Standards Institution has said that, for the construction industry at any rate, the use of the centimetre is deprecated. There were a few murmurings at first, but on the whole the millimetre appeared to have been accepted. More recently, perhaps because of the imminence of the change to metric, the arguments in favour of the centimetre have revived. 'What is this all about and does it matter?' were the questions 'Building' put to the author.

The object of this article is not to chafe again at old sores, but to attempt a definitive, and I hope objective, essay on the subject. Not for the purpose of settling it, for it will never be settled, at least for a generation, but to enable new and non-players to understand a little of the game.

In putting forward the points for and against the use of the millimetre and of the centimetre, I must emphasise that the background is that of the construction industry and not, unless similar circumstances apply, of any other.

Let us also disregard, at least here, any question as to *why* we are going metric and also *if* we are going. The course is set and, for better or for worse, cannot now be altered.

Seven permutations

By definition, the discussion in this paper is confined to SI units of length, area, and volume. Assuming we all agree on death to the decimetre and regard units larger than the metre (e.g. the decametre) as impracticable, there are seven possible units and combinations which could be adopted:

(1) Metres only, (2) centimetres only, (3) millimetres only, (4) metres and centimetres, (5) metres and millimetres, (6) centimetres and millimetres, and (7) all three—metres, centimetres and millimetres.

The area of interest is not, therefore, restricted to millimetres against centimetres but is one in which other alternatives might be looked at again, if recent, sulphurous correspondence is anything to go by.

We should ask ourselves at this point what are the desirable criteria for the UK. The components of an ideal solution to the problem of finding a rational means of expressing metric sizes, as distilled from a number of publications, would seem to be: consistency, simple notation, minimisation of errors, and ease of communication.

We should also consider whether or not the problem can be narrowed to enable us to get to grips with it more readily.

Linear measurement

In my view, the dispute should centre around the representation of linear measure and should not be concerned with area, volume, or SI units which derive from area and volume. The reason for this contention is that in communication documents (drawings, specifications, bills of quantities, etc.), by far the majority of units are linear and only a small proportion of them relates to area and volume. In this I disregard numbered items and also the 'reduced' units in bills of area (square yards, square metres), and of volume (cubic yards, cubic metres) because they are not relevant to this argument.

In support of this opinion that linear units are all-important, practically 100% of all dimensions on drawings are linear—there may be a few angles and some rates of applying liquid finishes (gallons per square yard, litres per square metre) but broadly all are measures of length. (I am assuming everybody realises that a 3ft. x 2ft. x 2in. paving flag, for example, is defined by three linear dimensions and is not a cubic measurement). Similarly, specifications and bills of quantities, excepting the reduced units in the latter, use linear measure almost exclusively and every component, from the airbrick to the kitchen sink, is described by using one or more linear dimensions.

Calculations

Calculations are a different matter but these rarely appear in communication documents and are largely confined to the offices of those who originate them —architects, contractors, engineers, quantity surveyors and others. For this reason I want to set areas and volumes apart from the argument. This is not in any way minimising the problems of those who calculate, but for the most part they are people who are quite able to move decimal points or work in several different units at once. Also, and inevitably, computers will continue to take over the arithmetic, leaving the man to set only the parameters of his problem.

It is linear measurement, then, which is the important thing to standardise because this is the key to that clear and concise communication which we so badly need in changing to metric.

More or less as an aside, it might be appropriate to use an illustration as to why we should discount the problems that the choice of one unit or another could bring to the thinking, calculating man.

It is said that millimetres will involve the use of very large numbers and we are reminded that 1 cubic metre is equal to 1 000 x 1 000 x 1 000 mm or 1 000 000 000 cubic millimetres. This example, when given in the form 1 006 x 1 005 x 1 004 = 1 015 074 120 cubic millimetres, seems to be a clinching argument but, of course, the answer can be given and employed by man and computer in any of the following ways, according to its importance and use:

1 m^3

1.0 m^3

1.02 m^3

1.015 m^3

1.0151 m^3

etc.

Let us consider only the manual situation; it is pointless to regard the machine one—the computer couldn't care less about arithmetic. The working would be as follows (and please remember that the method depends on where, when and if you went to school!):

```
      1006 × 1005 mm
=        5030
      100600
      ------
      1011030 mm² × 1004 mm

=      4044120
    101103000
    ---------
    1015074120 mm³
```

To be accurate, the calculation would have to be made as shown initially to nine decimal places and then be rounded as required.

Consider the problem in centimetres: 100.6 x 100.5 x 100.4 cm

```
      100·6 × 100·5 cm
=        50 30
      10060 0
      -------
      10110·30 cm² × 100·4 cm

=     4044 120
    1011030 00
    ----------
    1015074·120 cm³

   = 1·015074120 m³
```

Conclusion: The use of centimetres is less facile in this instance than the use of millimetres. Reason: The number of cm^3 is still unhelpfully high and the decimal point has to be inserted or moved twice instead of once, with a consequent increase in the risk of inaccuracy.

This example indicates that the centimetre is marginally not as useful as the millimetre. On the other hand, it does not take into account rounding to the nearest centimetre which may, or may not, be permissible, and which will be considered later; but primarily it serves to support my view that we should consider only linear units in the main argument between mm and cm.

How long is length?

To return to the argument, another factor which comes to mind is the magnitude of the average linear measurement. Or how long is the average length? It seems strange that no research, that I can discover, has indicated the incidence of the dimensions we use. I am therefore obliged to fall back on some form of estimation of what this average length might be. The overall dimensions of a typical project (if such exists) are large but they occur infrequently in communication documents. Conversely, many component sizes and dimensions of details, sections and thicknesses are small and occur often. The feeling I have is that the average dimension used throughout these documents is in the order of 2ft.; erring on the generous side, I should have thought that it was certainly less than 1 m. Consider, without attempting to write an exhaustive list, the categories of items which come within, and some well within, this figure; most timber sizes, reinforcement bars, concrete profiles, pipes, thicknesses of work of all descriptions, spacings and centres of many things, steel sections, sections of all types for that matter, and the sizes of many manufactured items that go into buildings.

If the average dimension is, as I believe, less than 1 m, this should be borne in mind throughout all that follows.

What do metric countries do?

Consistency, being one of the desirable conditions, 'What they do on the continent' may be regarded as a factor, but not in the way many people think. In reality the ways in which metric countries handle the system is collective chaos. 'Some observations on metric practice' by W. H. Harrison goes into this matter exhaustively. He summarises his findings: 'Metric practice is not consistent, but consistency, *given familiarity with the system* (my italics), does not seem to matter. Nevertheless it is suggested that a consistent approach in the UK might ease problems in the changeover.' In the text is the sentence with which Harrison's research confounds the more casual observations of continental practice. 'Little guidance on the choice of unit can be obtained for the metrication of British Standards, for components, and for buildings.' A similar conclusion was reached by BSI after they had conducted an exhaustive survey into metric countries' use of the system. On this evidence, we must, therefore make up our minds.

How fine?

Yet another area which should be examined before the possible solutions are discussed is how fine our units of measurement need to be. For 'thinking,' with which I will deal with later, they should be reasonably coarse but to enable us to measure down to the lowest gradation used in construction, they need to be fairly fine. With the imperial system we use measurements as fine as 1/16in. and 1/32in.; the equivalent in the metric system is the millimetre.

On the other hand, if the basis of accuracy really is 4½in., then centimetres will do!

BSI recommendation

In order to align with international policy, BSI has advocated adopting SI as a whole. This includes acceptance of the millimetre as the preferred sub-multiple of the metre.

Probably the most important reason for the original choice of the millimetre is that it minimises the risk of error; as there is a factor of 1 000 between metres and millimetres it is unlikely that one will be mistaken for the other. Even with our scanty experience of the metric system, we should be able to spot an error of say, 5 m for 5 mm but the risk of confusing 5 m with 5 cm (there being a factor of only 100 between them) must be greater.

Process of elimination

Having, after many preambles, now set the stage as it were, and bearing the factors and criteria firmly in mind, it should now be possible to eliminate some of the seven possible units and combinations which could be adopted, and then to examine in more detail the remaining contenders.

Though there might be some arguments in favour of using all three units—metres, centimetres, and millimetres—I believe that most people in the industry would opt for discarding at least one of them. This is the growing tendency in many of the metric countries and is obviously sensible when the retention of all three goes against the majority of the desirable criteria for the UK solution. In particular it would be necessary to write the symbols m, cm, or mm against every dimension. This can be avoided altogether if only one unit is retained, and can be circumvented somewhat if two units are used.

The slim factor of 10 between centimetres and millimetres is sufficient to eliminate the two together as a possible answer. The risk of error—of mistaking one for the other—would be too great and, without metres, neither would satisfy the need for a larger basic unit. The table below provides the basis for discussion of those alternatives which employ a single unit only.

Before a conclusion is drawn, from all this it might be helpful to consider how often whole metres and whole centimetres will be used in practice; in other words, what will be the incidence of dimensions which cannot be rounded to the nearest metre or to the nearest centimetre and which must therefore be given to the millimetre.

Apart from whole metres given as reduced quantities in bills of quantities which we have taken out of the argument, whole metres are likely to occur only as overall dimensions and be used as the broad thinking units in planning, in overall approximations and in cost analyses. Otherwise whole metres will only occur with about the same degree of frequency that dimensions of multiples of 3ft. do now. Perhaps less so because of the influence of the preferred increments of 300 mm and 100 mm.

It might at first sight appear to be certain that whole centimetres could be used extensively as dimensions, but how true is this? Admittedly the preferred increments of 300 mm and 100 mm could go down nicely to 30 cm and 10 cm but how often will these dimensions appear in practice when most drawings may be on gridded paper? Consider also those dimensions which cannot be rounded; even amongst those materials whose change to metric has been announced, there are many dimensions which could not be given in whole centimetres: six out of ten steel bar reinforcement diameters and sections, 12 out of 13 flat glass thicknesses, and 70 out of 86 timber sections could not be expressed in centimetres without decimalising. It should also be realised that while modular sizes will be expressable as whole centimetres, many of these will be indicated by grid lines whereas most maximum, minimum and work sizes will have to be the nearest millimetre.

The millimetre is therefore the only practical unit for these dimensions and for describing many such items as pipe diameters, sections of all kinds, and tolerances which have already been mentioned.

The answer to those who think the architect will be spending too much of his time writing useless zeros, is that they (the zeros) may hardly exist.

We may now draw conclusions from the table which compares the single units, bearing in mind that the probable

TABLE 1: The alternatives where only a single unit is used.

	m only	cm only	mm only
Consistency	o.k.	o.k.	o.k.
Covers lowest gradation	only by decimalisation	only by decimalisation	
Avoids conversion (positioning decimal point twice)	o.k.	×	o.k.
Simple notation Examples:			
lengths over the metre			
whole metres	1	100	1000
whole centimetres	1·02 } 1·020 }	102	1020
whole millimetres	1·022	102·2	1022
lengths under the metre			
whole centimetres (m–cm)	0·99 } 0·990 }	99	990
whole centimetres (cm–mm)	0·010	1	10
whole millimetres (m–cm)	0·999	99·9	999
whole millimetres (cm–mm)	0·009	0·9	9
Minimises risk of error		Follows notation	
Ease of communications		Follows notation	
Provides thinking units'	Too large?	About right?	Too small?

size of dimensions will be under 1 m. Most of these conclusions stem from the representation of the lowest gradation and from the ensuing notation.

The metre suffers from too much decimalisation; and, if most dimensions are going to be less than the metre, a zero before the decimal point will have to be used extensively.

Except for planning, it is too large as a general thinking unit but it does permit straight multiplication of metres to produce square and cubic metres without moving the decimal point.

The main objection to the centimetre is that it is near the lowest gradation but still has to be decimalised for a large proportion of the dimensions used in communication documents and, more importantly, for work on site. Though it would be possible to use centimetres alone for linear measurement, the decimal point would have to be moved (positioned twice) in order to give square and cubic metres.

It has been said that the centimetre is a useful thinking unit and the millimetre is to small. How true is this in practice, given no previous experience of thinking in centimetres? It could be said that with millimetres the figures are not too large as most dimensions are not likely to exceed three figures and four figures will take us to almost 10 metres. Probably the best thinking unit of all is the foot. I doubt whether we shall lose this on the change to metric especially in view of the preferred increments and the experience of the continentals that this is so. It is surely only a matter of training and use to think of this length as 300 and for it to become the same semantically as 30 or 12. At least one technical college has proved this to be so with its new apprentices who are being taught entirely in metric.

The millimetre used alone has many advantages. Not the least of these is that one is dealing entirely in integers and when these are multiplied to obtain square and cubic yards, the decimal point has to be positioned only once. An example of the use of millimetres from a do-it-yourself personal training method might be helpful; it illustrates the simplicity of the system and of the ease of working in integers which are millimetres.

Imperial	*Metric mm*
Shelf	
5′ $4\frac{3}{4}$″	1645
Divide by 7 to give centres for 6 brackets	
$\frac{= 64\frac{3}{4}'' = 9\frac{1}{4}'}{7}$	$\frac{1645 = 235}{7}$
Screws spacings	
$\frac{3' 1\frac{5}{16}'' = 9\frac{5}{16}'}{4}$	$\frac{948 = 237}{4}$

The millimetre used as a single unit would be satisfactory and a number of countries have adopted this but the thought of discarding the basic SI unit, the metre, has not proved to be generally acceptable to UK. In fact, the metre has been established by BSI as the prime unit and is not regarded as being built up from any submultiple of it.

The final choice

If we are not to abandon the metre, the choice lies between metre and centimetre and metre and millimetre. If there is any international tendency at all it is towards discarding the centimetre in favour of the millimetre and not the contrary as some commentators seemed to have supposed.

Most of the arguments which apply to the use of single units are relevant to the use of two units as a further look at the table will confirm. It may be said that combining mm or cm with the metre aggravates the disputed points between them. Particularly does this apply to the double use and double positioning of the decimal point so that 5.30 could mean metres or centimetres. With millimetres 5.30 could again mean either metres or millimetres but 5.30 mm would be rare, the factor of 1 000 would apply, and, as the thicknesses of most materials are apparently being rounded to the nearest mm, anything other than an integer would be suspect. In any case, I hope that undue decimalisation of the millimetre will be avoided as much as possible—we have already seen how ridiculous this can be. How many times do we go lower than $\frac{1}{16}$-$\frac{1}{32}$in. in imperial usage except for metal thicknesses?

The adoption of the centimetre would appear to be preferable to surveyors who are instructed by the Standard Method of Measurement to measure to the nearest 10 mm but, again, when used with metres, the double decimalisation would prove to be more confusing than helpful.

Accuracy on site

One argument, usually advanced in favour of the centimetre, which has not been examined is that of accuracy on site. Paraphasing what I have written elsewhere, on a wet and windy building site a tradesman will attempt to achieve a dimension of 3ft. 1in. or of 6ft. $1\frac{3}{8}$in. and he will fail by the same tolerance in each case—his inherent physical inability to do better. He will not assume, in one case, that something between 3ft. and 3ft. 2in. will do, nor in the other that only a dimension of between 6ft. $1\frac{1}{4}$in. and 6ft. $1\frac{1}{2}$in. will be acceptable. In both instances, he will work to the mark of the given dimension as closely as he can. Except for his initial ability to see the mark more quickly, it will not improve his situation whether the figure is 3ft. 1in. or 6ft. $1\frac{3}{8}$in. Similarly with metric. If we give him a dimension of 303 mm his only problem will be to pick up the mark. No convention of measurement will overcome his inability to work to an accuracy of 1 mm. It will not help if we give him a dimension of 30 cm instead of 303 mm. If we did, he would still find his mark, would work to this as accurately as he could and, on top of his own tolerance, *would be a further 3 mm out.* This is not to say that using dimensions in stages of 10 mm will not enable him to find his mark more easily, but, as we have seen, in many cases this will not be possible.

The use of the centimetre does not of itself improve accuracy on site.

Conclusions

To summarise:

Desirable criteria for UK are: (1) consistency, (2) simple notation, (3) minimisation of errors, (4) ease of communication.

Factors are: (1) Linear measurement mostly used in communication documents. Notwithstanding calculations of areas and volumes, linear measurement should be used to test the prime argument. (2) Average length of less than 1 metre is significant. (3) Metric countries have no consistent practice. (4) Millimetre is the graduation which compares with $\frac{1}{16}$-$\frac{1}{32}$in. (5) BSI recommends metre, with millimetre as the sub-multiple.

Having for practical purposes eliminated the other posibilities, the comparisons between m and cm and m and mm are: (1) How often will whole centimetres be used bearing in mind gridded paper. (2) Many dimensions can be expressed in whole millimetres but would require centimetres to be decimalised. (3) Double positioning of the decimal point when multiplying centimetres could lead to error. (4) A factor of 1 000 between metre and millimetre helps to minimise errors. (5) Accuracy on site is not improved by the use of centimetre.

I personally feel that the time has come to stop theorising; whatever we adopted now would be subject to review in a few years' time when we have some UK metric experience behind us.

BSI has recommended metre and millimetre. There seems to be no really compelling reason why we should not adopt this standardisation so that documents can be consistent throughout the industry and the contractor (the man who prices them!) is not obliged to use more than one system.

References

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The Change to Metric, Modular Quarterly, 1966/4

Harrison, H. W., *Some Observations on Metric Practice,* Building Research Station Design Series 44

British Standards Institution. PD 6031, 2nd edition: December 1968. *The Use of the Metric System in the Construction Industry.* PD 5686, *The Use of SI Units*

MPBW, *Think Metric,* 1969

Standard Method of Measurement of Building Works, Fifth Edition Metric, July 1968

Note: The way in which the gap is used as the thousands marker reflects the editorial policy of 'Building.'

Wall chart

BIP Reinforced Products Ltd., Streetly Works, Sutton Coldfield, the manufacturers of Filon polyetster/glassfibre/nylon roofing and cladding sheet have produced a 24in x 17in wall chart giving the metric equivalents of imperial dimensions.

A table arranged in $\frac{1}{4}$in. steps up to 25ft. $11\frac{3}{4}$in has been included as an aid for architects and others specifying building materials.

Not so difficult as it looks

Kenneth Wood gives views on metric changeover

Too much emphasis on the difficulties of going metric can make the operation look far more difficult than it is according to Kenneth Wood, chairman of the BSI metric panel and, in the commercial world, of Concrete Ltd. In a recent talk with BMN he said that apprehension was caused by the lack of positive information, something which was quite inevitable at such an early stage of the BSI Programme.

He felt there were three main areas of concern. The biggest has been the fear that the building industry would find itself well in advance of the rest of the country in metricating. This, says Wood, with the commitment by the Government that we are all going metric and the formation of the overall Metrication Board, has now been removed.

A second cause for worry is belief that the BSI programme is already out of date and, moreover, that it cannot be achieved.

When the B/-/9 Committee of the BSI issued its Review of Progress at the end of 1968, says Wood, it was accused on many sides as being complacent. 'This, I believe, is unfair because while it is true that the change will start slowly it is likely to be very rapid by early 1972 so that nothing has occurred which in any way prejudices the achievement of the original programme. BSI has a formidable task of metricating over 400 standards, but a satisfactory programme has been produced which will ensure that neither manufacturers nor designers are delayed through the lack of the necessary knowledge of the new standards. BSI can complete this programme provided the technical assistance from industry which is needed becomes available. It is likely that this will be so.'

The third, and at this date the most important cause for doubt, is the impossibility of obtaining definite information on the metric components available and on the timing envisaged for change by designers and building owners. At present there does seem to be some gap in our arrangements for collecting information, admits Wood, but he believes that the dissemination of definite information as it becomes available is satisfactory. 'The MPBW with the assistance of the RIBA is doing everything it can to collect and publish detailed information of the amount of work going into the design of metric contracts. Ministries such as the MHLG are giving specific target dates by which they expect design changes to be completed. Perhaps most important of all, certain large manufacturers such as the British Steel Corporation have already announced their own programme of change and consumers and designers are already basing their proposals on this. This tendency is certain to spread, and I believe that most very large manufacturers can and will tailor their own programme to minimize their manufacturing problems and to suit the way they see the programme progressing. This is one of the aspects which has been studied by the National Consultative Council of the Building & Civil Engineering Industries Working Party on Metrication, and steps are being taken to ensure that these decisions can be made in a coherent way. In the industries where there are no very large manufacturers, trade associations will be encouraged to assist their members in producing similar proposals although in this case they will, of course, be more flexible and less definite. To some extent I believe therefore that the availability and cost of metric components will be defined by manufacturers so that designers who are doubtful concerning, the availability of components, should wait until the position is clearer and not rush into starting their metric designs. This does not apply to long continuing contracts which are likely to end outside the period during which suitable imperial components are likely to remain available.'

Publications

Component building

A. H. Anderson Ltd. have published a new booklet on the A75 metric component building, a system which is aimed at rationalising the architect's normal process. It consists of a wide range of dimensionally co-ordinated components for the design and construction of buildings up to 5 storeys.

The new publication, which is well-illustrated with completed jobs, outlines the advantages of employing the first proved system designed to metric dimensions. These include complete planning freedom and the opportunity for architects to familiarise themselves with metric dimensioning in advance of the BSI programme. Copies are available from the company at 235 Vauxhall Bridge-road, London, SW1.

Dimensions for softwood

Though there is an accepted range of imperial softwood sizes in use in this country there has never been a British Standard on the subject. Nor has there been an accepted metric standard in Europe, and the result has been a steady proliferation of sizes in commercial use. With the change to metric comes the opportunity to adopt not only a rationalised range of softwood sizes, but a greatly simplified one, with all the benefits that this can bring in terms of design, production and stockholding. The range is now given in BS 4471 : 1969 Dimensions for softwood, which eases the adoption of metric measurements by specifying metric sizes close enough to the common imperial sizes to avoid the need for re-design, in most cases. It contains tables for basic cross-sectional sizes, basic lengths, permissible deviations, and reductions from basic size to finished size by processing of two opposed faces related to a number of specific applications.

BS 4471 costs 6s. (7s. including postage to non-subscribers).

Wing nuts

As a further consequence of the decision to adopt the ISO metric screw thread system in the UK, the BSI has revised BS 856—Specification for wing nuts (metric and inch units).

Before preparing this revision consideration was given to a completely new and separate specification based on purely metric concepts and modules of measurement, to cover ISO metric and ISO inch (Unified) threaded wing nuts, because BS 856 : 1939 referred only to BSW, BSF and BA threaded products. Accordingly a review was made of current European specifications covering metric series wing nuts, but since there was little agreement between these it was decided to maintain (pending any future ISO agreements) the basic geometry of wing nuts established by BS 856 : 1939 which was, of course, based on inch modules of measurement.

The revision thus makes provision for accommodating ISO metric and ISO inch (Unified) screw threads within the currently established wing nut blanks, which will avoid unnecessary retooling and expense within British industry. References to the obsolescent BSW, BSF and BA threads will be retained until they become obsolete and can be withdrawn. BS 856 costs 8s. (10s. including postage to non-subscribers).

Copies of these standards may be obtained from the BSI Sales Branch at 101-113 Pentonville-road, London N1.

Designing sewers and watermains

The first metric edition of Crimp and Bruges (Tables and diagrams for designing sewers and watermains) is to be published on 1 September. New metric tables are published with the equivalent imperial tables on facing pages and a table of proportional values for new form egg-shaped sewers has been added together with the percentages which must be subtracted to obtain values for these sewers from figures calculated for old form egg-shaped sewers.

There is a special pre-publication order price of 4 gns. a copy. After 1 September the price is 5 gns. Orders can be made direct to Crimp & Bruges, Municipal Publications Co. Ltd., 3 Clement's Inn, London WC2.

News from the Industry

Steel conduit system

As a result of a CEE meeting held in October 1968, a new series of conduit diameters has now been agreed throughout Europe. These sizes are based on the R.10 series of preferred numbers which has been agreed internationally by the International Organisation for Standardisation and it is hoped that they will be accepted by the International Electrotechnical Commission (IEC) and/or by ISO, for their Recommendations for conduit and fittings. The new nominal outside diameters will be 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, and 50 mm.

The British Standards Committee for all types of conduits were waiting for this decision before finalising drafts of the new British metric standards for both steel and non-metallic conduits.

The new metric standard for steel conduits and fittings is being issued in two parts. Part One is almost identical with its counterpart CEE, specification No. 23 with the amended diameters of conduits and the final draft is now being circulated by BSI, for approval. Every endeavour will be made to publish Part One of the Specification during 1969, whilst Part Two, which covers a very comprehensive range of conduit fittings should be published in 1970.

When the publication date for the Part Two is firmly established, the recently formed BECSM (comprising manufacturers of steel conduits and conduit fittings) will announce a date on which production of the new metric size tubing and fittings will commence, but this will be well into 1970.

Forum meetings

Metrication is the subject for the 1969/70 series of London Building Centre Forum meetings. The new pattern for these meetings, tried out experimentally last winter and proved successful, will be repeated, but with major differences. Instead of having a resident team of architect, quantity surveyor and contractor confronting teams representing other sections of the industry (as was done in last year's 'Links in the Chain' series on communication in the construction industry), the meetings in this series return to the original purpose of the Forum and will give building product manufacturers the chance to discuss matters of interest with the sections of the industry which use their products.

This year's resident panel will be an architect, a quantity surveyor or structural engineer (depending on the subject under discussion) and a contractor; they will meet visiting teams representing these sections of the manufacturing side—

Structural framework; bricks, blocks and tiles; sheet materials; doors and windows; sanitary fittings; and furniture and fittings.

At all the meetings the discussion will centre on mutual problems brought about by the change to metric.

A fee of £5 is charged by the Building Centre Trust for the series of six meetings and of £1 for individual meetings. Applications are to be limited to 200. The meetings will be held at The Building Centre, 26 Store-street, London, WC1 at 5.30 on the following dates—8 October, 5 November, 3 December, and the following year 7 January, 4 February, 4 March (all Wednesdays).

Metrication Board

Following its first meeting on 28 May, the Metrication Board announced the intention to set up a series of Sterling Committees which would assume responsibility for particular sectors of the economy.

The board has now considered in greater detail its approach to this task. The following members of the board will take the lead in co-ordinating work on metrication in the sectors shown:

Agriculture, Horticulture, Forestry, Fisheries and Land: The Earl of Bessborough, deputy chairman of the board, supported by Dr. F. Lincoln Ralphs.

Education and Industrial Training: Dr. F. Lincoln Ralphs supported by Professor M. L. McGlashan.

Engineering Industry: E. F. Knight, supported by Professor M. L. McGlashan and Sir Thomas Padmore.

Fuel and Power: Professor M. L. McGlashan, supported by Mrs. Ailsa Stanley.

Industrial Materials and Construction Industries: H. J. Cruickshank supported by A. G. Dawtry.

Transport and Communication Industries: Sir Thomas Padmore, supported by E. F. Knight.

Distribution, Food and Consumer Goods: The director, G. Bowen, will for the time being take the lead in this sector. He will be supported by Dr. Mark Abrams, Mrs. Ailsa Stanley and A. G. Dawtry.

Letters

Environmental design and SI

Sir,—While applauding J. Churton's excellent article summarising the interrelationship of the SI units of measurement, I think it unfortunate that the Nit (the unit) is shown in Figure 4. I have been told that this unit, a stranger to me, was dropped some years ago not too long after its introduction. It is not one of the adopted SI derived units and is not listed in FD 5686. Let us stay with cd/m² and not open up yet another front for the SI dissenters.

BRIAN JOLLY [ARIBA],
27 Willow Bank,
Ham, Surrey

coming events

THURSDAY, 17 JULY

Metrication and dimensional co-ordination: a four-day course dealing with the change to metric measurement and dimensional co-ordination in the construction industry. The course, which is intended to cover the whole of Scotland, is designed primarily for senior architects, engineers and quantity surveyors working in public and private offices, and members of the construction industry. It is organised by the Department of Architecture, Heriot-Watt University, Edinburgh, in conjunction with the MPBW. Subjects covered will be: general principles of metrication; broad economics of metrication; general principles of dimensional co-ordination; British standards and codes of practice; metrication and the structural engineer; heat, light and sound; building regulations; metrication for the manufacturer; and metric measurement in practice.

The course ends on Sunday 20 July, and the fee is £12 12s. Additional information and application forms can be obtained from Alan Brown, Department of Architecture, Heriot-Watt University, Lauriston-place, Edinburgh, EH3 9DF.

FRIDAY, 18 JULY

Metric and the architect—2: in the second in the series of six one-day 'Seminars for metrication advisers in practices' organised by the RIBA, two metric case studies are to be considered: one is of a public sector, dimensionally co-ordinated housing scheme at Worthing and the other of two private sector factories at Andover. Problems relating to contract, supply, legislation, drawing and comprehension will be discussed. Speakers include Peter Hughes, ARIBA, deputy borough architect, Worthing, and Charles Burford, ARIBA, and Michael Garden, AADipl, ARIBA, of Carpenter Turner, Burford & Marlow.

Tickets £2 10s. available from Professional Services Department, 66 Portland-place, London, W1N 4AD (tel.: 01-580 5533, ext. 235). The meeting is held at the RIBA.

MONDAY, 22 SEPTEMBER

Face to face with metrication: the two-day BSI 1969 Standards Conference under this title is to be attended by Lord Ritchie-Calder, Lord Blackett, Eric Lubbock, Mr. Whitehorn, Deputy Director-General of CBI, and a number of senior executives of large industrial concerns. All talks and discussion points have been chosen to highlight the fact that the time for detailed planning and execution of the metric change is now with us. Practical guidance is offered to those faced with making the change in their own organisation. The final session, in particular, will, under Lord Blackett, indicate new tools which developments in electronics will make available to management. Other areas covered will be exports, mechanical engineering, power cables, structural steel and training. The Conference, to take place at the Imperial College on 22 and 23 September, is organised by the Standards Associates section of BSI. Conference fee is £18 (£11 for members of the Standards Associates Section). Further particulars obtainable from Miss Snashall, BSI, 2 Park-street, London, W1.

OCTOBER

Problems of SI unit introduction: a one-day seminar to be organised by the Coventry and District Information Group. It is hoped that the speakers will include an information officer of a large firm, a technical report writer, a standards engineer, a metrication officer, a journal editor and a member of BSI. Cost of attendance will probably be about £5 and the meeting is expected to be arranged towards the end of October. Anybody interested should contact J. L. Atkins, Liaison Officer, CADIG Liaison Centre, Bayley-lane, Coventry, CV1 5RG.

BMN Building Metrication News

Metrication the computer and SI

This series of conversion tables, compiled by R.M.E. Diamant and B.A.L. Hart, appears in this section periodically. They are to be used like logarithmic tables, using a ruler to ensure clear distinction of the horizontal lines. The tables have been set with the help of the English Electric KD9F computer at the University of Salford

Table 18
Watt/metre °C to Btu inch/foot² hour °F to Btu/foot hour °F
1 W/m °C=6.9334665 Btu in./ft.² h °F
1 W/m °C=0.5777909 Btu/ft. h °F

diff	0	0.02	0.04	0.06	0.08	0	0.02	0.04	0.06	0.08
W/m °C	BThU in /ft² h °F					BThU /ft h °F				
0.0		0.139	0.277	0.416	0.555		0.0116	0.0231	0.0347	0.0462
0.1	0.693	0.832	0.971	1.109	1.248	0.0578	0.0693	0.0809	0.0924	0.1040
0.2	1.387	1.525	1.664	1.803	1.941	0.1156	0.1271	0.1387	0.1502	0.1618
0.3	2.080	2.219	2.357	2.496	2.635	0.1733	0.1849	0.1964	0.2080	0.2196
0.4	2.773	2.912	3.051	3.189	3.328	0.2311	0.2427	0.2542	0.2658	0.2773
0.5	3.467	3.605	3.744	3.883	4.021	0.2889	0.3005	0.3120	0.3236	0.3351
0.6	4.160	4.299	4.437	4.576	4.715	0.3467	0.3582	0.3698	0.3813	0.3929
0.7	4.853	4.992	5.131	5.269	5.408	0.4045	0.4160	0.4276	0.4391	0.4507
0.8	5.547	5.685	5.824	5.963	6.101	0.4622	0.4738	0.4853	0.4969	0.5085
0.9	6.240	6.379	6.517	6.656	6.795	0.5200	0.5316	0.5431	0.5547	0.5662
1.0	6.933	7.072	7.211	7.349	7.488	0.5778	0.5893	0.6009	0.6125	0.6240
1.1	7.627	7.765	7.904	8.043	8.181	0.6356	0.6471	0.6587	0.6702	0.6818
1.2	8.320	8.459	8.597	8.736	8.875	0.6933	0.7049	0.7165	0.7280	0.7396
1.3	9.014	9.152	9.291	9.430	9.568	0.7511	0.7627	0.7742	0.7858	0.7974
1.4	9.707	9.846	9.984	10.123	10.262	0.8089	0.8205	0.8320	0.8436	0.8551
1.5	10.400	10.539	10.678	10.816	10.955	0.8667	0.8782	0.8898	0.9014	0.9129
1.6	11.094	11.232	11.371	11.510	11.648	0.9245	0.9360	0.9476	0.9591	0.9707
1.7	11.787	11.926	12.064	12.203	12.342	0.9822	0.9938	1.0054	1.0169	1.0285
1.8	12.480	12.619	12.758	12.896	13.035	1.0400	1.0516	1.0631	1.0747	1.0862
1.9	13.174	13.312	13.451	13.590	13.728	1.0978	1.1094	1.1209	1.1325	1.1440
2.0	13.867	14.006	14.144	14.283	14.422	1.1556	1.1671	1.1787	1.1902	1.2018
2.1	14.560	14.699	14.838	14.976	15.115	1.2134	1.2249	1.2365	1.2480	1.2596
2.2	15 254	15.392	15.531	15.670	15.808	1.2711	1.2827	1.2943	1.3058	1.3174
2.3	15.947	16.086	16.224	16.363	16.502	1.3289	1.3405	1.3520	1.3636	1.3751
2.4	16.640	16.779	16.918	17.056	17.195	1.3867	1.3983	1.4098	1.4214	1.4329
2.5	17 334	17.472	17.611	17 750	17.888	1.4445	1.4560	1.4676	1.4791	1.4907
2.6	18.027	18.166	18.304	18.443	18.582	1.5023	1.5138	1.5254	1.5369	1.5485
2.7	18.720	18.859	18.998	19.136	19.275	1.5600	1.5716	1.5831	1.5947	1.6063
2.8	19.414	19 552	19.691	19.830	19.968	1.6178	1.6294	1.6409	1.6525	1.6640
2.9	20.107	20.246	20.384	20.523	20.662	1.6756	1.6871	1.6987	1.7103	1.7218
3.0	20.800	20.939	21.078	21.216	21.355	1.7334	1.7449	1.7565	1.7680	1.7796
3.1	21.494	21.632	21.771	21.910	22.048	1.7912	1.8027	1.8143	1.8258	1.8374
3.2	22.187	22.326	22.464	22.603	22.742	1.8489	1.8605	1.8720	1.8836	1.8952
3.3	22.880	23.019	23.158	23.296	23.435	1.9067	1.9183	1.9298	1.9414	1.9529
3.4	23.574	23.712	23.851	23.990	24.128	1.9645	1.9760	1.9876	1.9992	2.0107
3.5	24.267	24.406	24.544	24.683	24.822	2.0223	2.0338	2.0454	2.0569	2.0685
3.6	24.960	25.099	25.238	25.376	25.515	2.0800	2.0916	2.1032	2.1147	2.1263
3.7	25.654	25.792	25.931	26.070	26.209	2.1378	2.1494	2.1609	2.1725	2.1840
3.8	26.347	26.486	26.625	26.763	26.902	2.1956	2.2072	2.2187	2.2303	2.2418
3.9	27.041	27.179	27.318	27.457	27.595	2.2534	2.2649	2.2765	2.2881	2.2996
4.0	27.734	27.873	28.011	28.150	28.289	2.3112	2.3227	2.3343	2.3458	2.3574
4.1	28.427	28.566	28.705	28.843	28.982	2.3689	2.3805	2.3921	2.4036	2.4152
4.2	29.121	29.259	29.398	29.537	29.675	2.4267	2.4383	2.4498	2.4614	2.4729
4.3	29.814	29.953	30.091	30.230	30.369	2.4845	2.4961	2.5076	2.5192	2.5307
4.4	30.507	30.646	30.785	30.923	31.062	2.5423	2.5538	2.5654	2.5769	2.5885
4.5	31.201	31.339	31.478	31.617	31.755	2.6001	2.6116	2.6232	2.6347	2.6463
4.6	31.894	32.033	32.171	32.310	32.449	2.6578	2.6694	2.6809	2.6925	2.7041
4.7	32.587	32.726	32.865	33.003	33.142	2.7156	2.7272	2.7387	2.7503	2.7618
4.8	33.281	33.419	33.558	33.697	33.835	2.7734	2.7850	2.7965	2.8081	2.8196
4.9	33.974	34.113	34.251	34.390	34.529	2.8312	2.8427	2.8543	2.8658	2.8774
5.0	34.667	34.806	34.945	35.083	35.222	2.8890	2.9005	2.9121	2.9236	2.9352

Table 18. Thermal conductivity of building materials. Watt/metre °C to Btu inch/foot² hour °F to Btu/foot hour °F