Building Metrication News

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This section appears in the fourth issue 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.

METRIC MONTH

Controlling Dimensions

Many individuals and organisations have commented on the Draft British Standard for Controlling Dimensions (published in BMN in November) and BSI's committee B/94/4 now have the mammoth task of sifting through them and making modifications before the standard is published. Apparently the draft has been criticised for containing too many sizes, although few practical suggestions have been received for reducing the number. Apparently, also, there has been some confusion over the purpose of the draft. It is not in itself a tool for variety reduction, rather it is a framework of dimensions for designers to ensure, as far as is possible, compatibility with the sizes of standard components. In fact designers are being asked to restrict the number of sizes used in building design which at present are probably in increments of $\frac{1}{8}$ in. to 300 mm. or 100 mm. for large spaces and 50 mm. and 25 mm. under 300 mm. This in itself should bring about some reduction. Further reduction of sizes for components may be expected in the ranges which the new Functional Group Panels will be considering over the coming months. The problem is how to balance the number of sizes for a range of components in a manner that allows the designer sufficient flexibility that he does not order specials, while providing a range that is small enough to make economic sense to the manufacturer.

The Metric Programme

So far in BMN we have been concerned with making preparations and debating the issues. Organisations have been establishing metric panels and committees, BSI has been looking at key dimensions and establishing Functional Group Panels. The coming months, however, should see a plethora of recommendations and advice. For example, next month the RICS will be publishing a metric guide and the RIBA a metric supplement of the Journal. It will be necessary for BMN to consider how best to present this information and over the next few months we shall be making gradual changes. But we should welcome comment and contributions, particularly on technical aids which might prove of value to the industry.

Building Products

One of the major objectives of BMN is to list new dimensionally co-ordinated metric products as they become available. As architects change to metric design of buildings, which is programmed for 1969, the demand for such information will become acute. It is too early for manufacturers to change size yet. BSI's recommendations will not begin to be made known until next year, and to change before then would mean a considerable risk. In the meantime BMN will publish information on products which are designed in metric for export and such reasons. When we do start listing new products it will be a major task.

Comma or Stop

It is presumably inevitable that the major economic and technical problems of metric change should almost be lost in such petty issues as whether the decimal marker should be a comma or stop. But this is so basic that the lack of a decision could prejudice the programme, at least for metric publications. Although there are varied opinions as to what marker should be adopted, the one opinion in common is that there should be one decision on one marker. This decision the Minister of Technology has ducked as can be seen in correspondence elsewhere in this supplement. It is true that there is as yet no international agreement and that it will be some time before there is. What is needed is a standard symbol for the decimal marker and one that has some chance of international adoption. It is now up to BSI's Metric Panel to decide what recommendation should be made to the construction industry. Let us hope that the panel, unlike the Minister, will make a decision and make it without further delay.

Calculating Costs

It is generally expected, in the initial period of the changeover, that buildings designed in metric will be more costly than those in imperial. That is why the Minister of Housing's recent circular, which requires all local authority schemes after 1 January 1972 to be in metric, is so important. It ensures that at least 50% of building in this country will undergo the change irrespective of budgetry limits. With the private sector, however, the position is less clear. It seems improbable that the client requiring a single building will opt for metric if this puts him out of pocket. On the other hand those with long-term programmes may well accept higher initial costs if they are persuaded that the long term benefits are worth while. Therefore, if the changeover to metric is going to be carried out with the minimum confusion, it is essential that any price rises are kept within reasonable limits. The wider the disparity between metric and imperial costs, the more difficult will be the transition period. For this reason manufacturers should now be calculating the effects of going metric on their production processes and how this will affect final costs. B. T. Keay's checklist of questions, published on another page, seems a very good starting point.

The Metric Change

6. THE MINISTRY OF HEALTH

In the sixth of our series on preparations being made for the change to metric, the work of the Ministry of Health in connection with their health building programmes is described.

Crucial to the BSI programme for the change to metric is the rider that dimensional co-ordination will be an essential factor in the change. The coupling of metric change with dimensional change provides a unique opportunity for the achievement of standard ranges of co-ordinated components, a vocabulary of design techniques within which these components can be used, and standard means of communication within the building industry.

These measures, taken with the rationalisation of building procedures adopted by the Department, the development of techniques to allow for the initiative of industry and proper site productivity, and means for achieving economic products, are intended by the Department for general employment in the health building programmes leading to an overall acceleration of the present industrialised health building programmes.

Background Documents

The emphasis placed by the Ministry of Health since 1962 on the co-ordination of dimensions on the design of buildings, the development of co-ordinated foot/inch components and assemblies, with improved site techniques, was set out in the two documents which initiated the industrialised health building programmes. These were Hospital Design Note No. 1 (HMSO 1962), Hospital Design Note No. 3 (HMSO 1965).

The importance of dimensional co-ordination and co-ordinated components industry is summarised in the following paragraphs from Hospital Design Note No. 3, PD.6030. BSI. The industrialised health building programme viz:

'Traditional building methods cannot any longer cope with the increasing demands on the industry as a whole. The objective therefore is to increase productivity and reduce cost. Attainment of this objective will depend on the utilisation and development of common techniques for all projects over the health programmes.'

The greatest scope for the industrialisation of construction lies in the production of standard ranges of co-ordinated components which can be manufactured and constructed on factory industrialised principles in alternative ways to meet the requirements of health buildings.

The purpose of the work on co-ordination of components is to develop material from which manufacturers can produce ranges of components which satisfy the dimensional and functional requirements of health buildings and provide them if necessary at fixed prices. The components must therefore be compatible with each other and capable of being combined.

Considerable standardisation of building components and materials has taken place through the work of the British Standards Institution. It is now appreciated that the British Standards Specifications could be more useful if they were dimensionally compatible and if they specified performance requirements instead of products. This change will rely on joint actions by all involved in the building process.

For example, the needs of the user can be expressed in terms of performance, e.g. loading, insulation, fire resistance, ventilation, resistance to air and water penetration, resistance to impact, etc., the designer can readily incorporate the components within a simple dimensional framework and, finally, the components provided by the manufacturer must be easily installed at known costs.

The studies carried out by the Department in conjunction with co-ordinating the work of the Interboard Study Groups* which were set up to develop foot/inch components enabled ranges of co-ordinated components to be developed for the health programmes. Two Compendia of Building Components and Assemblies containing these components were produced. To ensure their use, installed prices were obtained for these components viz. term contracts (i.e. two or three year period agreements).

This fundamental work over the past five years, stemming from the use of the Design Notes and the adoption of components in the field, has contributed to the data needed to implement the metric change for health buildings.

Tasks for Metric Programme

Therefore it may now be helpful to recapitulate again the tasks which were carried out for the foot/inch. industrialised health building programme to derive basic dimensional and functional data and select, produce, use and evaluate co-ordinated components, since these tasks are appropriate to the metric programme. Briefly they are as follows:

1) Studies of the functioning of health buildings. This includes basic anthropometric data, user activity studies and room data materials.**

2) A dimensional framework and techniques for the incorporation of components. Emphasis is placed not on a formal theory of co-ordinated dimensions but on the adoption of design techniques and controlling dimensions evolved from studies of the functioning of health buildings and those components which are appropriate for that purpose and how they can be assembled together.

3) The use of performance specifications which identify the functions which must be fulfilled by the end product. These specifications open the way for the initiative of industry, the reduction of site labour and the determination of installed costs.

4) The identification of ranges of components. In the case of health buildings, basic to the final selection of a range is a balance between selected dimensions and the range of alternative physical performance properties of components. Experience has shown that considerable study is needed to rationalise performance data of components when used in combination, otherwise the total range becomes excessive. For example, a range of door assemblies will be selected from preferred dimensions, ranges of different materials with alternative performances for frames, leaf construction, face materials and their finishes, and ironmongery. These piece parts in combination will give over 12,000 assemblies.

5) The institution of ranges of compatible components also requires the setting down of conventions for jointing and tolerance in the context of industrialised building. This study is now linked to the work carried out by other Government departments and research organisations.

6) Verification of components by users.

Metric Guidance

The Department has reviewed the previous guidance and widened and extended in depth the previous studies carried out for the tasks above. Study Groups have played a great part in this work. This material has been brought together as Design Note No. 5, Health Buildings, The Co-ordination of Components. The Note will be published in 1968. The objective of the Note is to set out the common principles, design techniques and co-ordinated components to be adopted throughout the programme of metric health buildings, and to contribute to the general transition which will occur over the next five years. It is being prepared in informal consultation with the professions in the health building programmes.

*In the case of co-ordinated components 12 Interboard Study Groups were formed in 1962 to carry out the initial studies. Four more Groups were formed in 1966. The findings of the first 12 Groups were carried forward by the Department to produce the Compendia of Building Components and Assemblies. The first (Volume 1) illustrated components in foot/inches for the year 1965/67. The second (Volume 2) developed these in depth and extended the range and it is current over the years 1967-70. (The Study Groups and their progress on foot/inch components are set out in Hospital Design Note No.3).

**Two documents illustrating this material will be published this year within the Design Note series.

it will be necessary to test new standard metric components in practice and the Department will be asking Boards and authorities to co-operate with manufacturers and contractors in incorporating such practical tests in their schemes.
Until metric components conforming to a new Metric British Standard are available, Boards and authorities will be asked to specify the components in the Design Note. Again in a national context it is desirable that local or project metric standards are not developed since these may well prove to be different from the relevant British Standard and therefore uneconomic in manufacture within the national context of all buildings, including those for the health building programmes.

Co-ordination With Others

Co-ordination with the Interdepartmental Sub-committee for Component Co-ordination (ISCC) is fundamental to all work on metrication carried out by the Ministry of Health. This committee is responsible for the production of the DC series of documents published by the Ministry of Public Building and Works. The committee has a co-opted representative of the British Standards Institution. The Department is also a member of the functional panels now being set up by the BSI.

Metric Programme

A brief outline of the programme for change to metric dimensions to hospital authorities issued by the Department is as follows:
All projects starting on the ground before 1.1.70 will be in foot/inches.
All projects starting on the ground after 1.1.73 will be in metric terms.
Certain projects starting on the ground between 1.1.70 and 1.1.73 will be carried out in metric terms.
It is to be expected that the first metric schemes may bring to light various problems. The Department are keeping in touch with these schemes in order not only to ease the transition but also to provide a cross fertilising information service to ensure that the opportunity for metrication will provide benefits throughout the whole of the health building programmes.
In the context of the total industrialisation of the health building programmes, the progress towards metrication and the accent on higher productivity cannot be considered solely a matter for improved technology in the actual constructional process. The full benefits of those measures can only be achieved when commonly applied data and practices are managed by all involved in the stage through which a building must pass from inception to operation in use, viz. statements of the brief, planning policies, design, production material, construction, fitting out and evaluation. These are codified with appropriate guide material in a complete range of documents published or to be published by the Ministry of Health.*

*Hospital Procedure Notes Nos. 1-4 local Authority Building Note No. 1 (revision 1968).

METRIC GAUGE

BY PHILIP DUNSTONE

In the heat of the metric decimal point/comma controversy little attention has been paid to the decimalisation of the millimetre. Yet if thin, relatively expensive, materials are to be described by their thicknesses in metric terms, this is what must be considered.
At present we measure thin materials in a number of different ways—SWG, BG, AWG, ZG, 32 oz, 4 lb, etc.
Taking a common gauge, and using the Conversion Slide* we get:—

24 SWG=0,559 mm
(seven digits and symbols)
or
24 SWG=0,000 559 m
(nine digits and symbols)

If the former is used in documents employing the metre as the basic unit, the symbol mm will have to be retained but otherwise the expression may be reduced to 0,559 (five digits and symbols). The latter is hardly likely to be used where the millimetre is the basic unit and may therefore normally be reduced to 0,000 559 (eight digits and symbols).
Gauge numbers were originally used to avoid fractions or unwieldy decimalisation and to provide a simple labelling for thicknesses. What we need with metric is one similar system (not a number of them), which will do the same things but indicate metric thickness as well.
The answer is Metric Gauge.
Metric Gauge is a method of converting all existing gauges and other ways of expressing thin sizes, eg glass and lead, in metric without using cumbersome decimals.

Gauge Number

The gauge number always consists of three digits and can be read directly from the size in millimetres by taking the first digit to the left of the decimal marker (whole millimetres) and two significant decimal places. For example:—

24 SWG=0,559 mm=G 056
(four digits and symbols)
26 SWG=0,457 mm=G 046
33 SWG=0,254 mm=G 025

The abbreviation G is placed *before* the gauge number so as to avoid any possible confusion with metric symbols.

* BSI Plastic Conversion Slide 21s.

There are several advantages in using Metric Gauge:—

(a) Unlike other gauges, it indicates physical size by its gauge number.
(b) Its constant three figures distinguish it from all other gauges and this will be of assistance during the transition stage from imperial to metric.
(c) Manufacturers can immediately convert to Metric Gauge by using the metric equivalents while the rationalisation of sizes (gauge numbers) evolves.
(d) Any thickness may be converted into Metric Gauge by inspection and vice versa, and a direct reading of Metric Gauge may be made from the Conversion Slide.
(e) It avoids any controversy over the decimal marker.

Metric Gauge makes the assumptions that:—

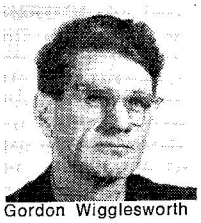
(a) Stages of less than 0,01 mm will not be required. NB. It successfully differentiates between all gauges down to 49 SWG (G 003) and only fails to do so between the two lowest SWGs, 49 SWG (G 003) and 50 SWG (G 003). 50 SWG (one-thousandth of an inch) and many of the preceding gauges are rarely used in practice in the construction industry.
(b) Metric Gauge will not be used for materials greater than 9,99 mm thick (10 mm). NB. It will encompass all SWGs below 7/0, 6/0, 5/0 and 4/0 and below 0 BG, all of which thicknesses are rarely given as gauges. Metric Gauge would also deal with these if it were allowed to go to four digits, but this would break the rule of three digits only.

A measure of the valuable rationalisation that Metric Gauge could bring, may be seen from the table below.
As with other gauges in present use, Metric Gauge gives no indication of the degree of tolerance involved which must be stated in technical literature by the manufacturers. For this reason, manufacturers might prefer to continue to give thicknesses in gauge form rather than in decimalised millimetres.
Metric Gauge is a tentative idea and has obviously never been used in practice. The views of members of the construction industry, and those in other industries, would therefore be welcomed as to the merits and demerits of this system of referring to thin materials which has all the advantages of gauge numbering and yet indicates metric dimensions.

Present gauge	Thickness	Metric gauge	Possible rationalisation	Possible eventual reduction to two digits
20 BG	0·996 mm	G 100	G 100	G 10
20 SWG	0·914 mm	G 091	G 090	G 09
20 AWG	0·812 mm	G 081	G 080	G 08
15 ZG	0·914 mm	G 091	G 090	G 09
4 lb. lead	1·730 mm	G 173	G 170	G 17
32 oz. glass	3·969 mm (approx.)	G 397	G 400	G 40

THE STRESSES OF COLLABORATION

As the building industry's collaborative machinery begins to take the strain of the metric programme certain points of stress are already emerging. These range from vaguely felt fears on the part of private industry that Government's superior organisation is allowing it to dominate the recommendations which are being drawn up, to the more specific example of what amounts to unilateral action by the Brick Development Association, whose statement of intentions on brick sizes has already been criticised by the Modular Society ('BMN' 24 Nov.). Gordon H. Wigglesworth, ARIBA, is well placed to comment on these issues. Formerly assistant chief architect, Department of Education and Science, he was appointed on 4 December as director of building development at the Ministry of Public Building and Works; more to the point, in the present context, he is chairman of the British Standards Institution Technical Committee B/94, set up to co-ordinate the timing and method of the work on modular co-ordination in step with the metric changeover.


Gordon Wigglesworth

Speaking in his capacity as chairman of B/94, Mr. Wigglesworth agrees that the public sector is better organised in its approach than private industry. 'But the public sector has the working mechanism for an organised approach' he told 'BMN.' 'In dimensional co-ordination the Interdepartmental Sub-committee on Component Co-ordination (ISCC) can co-ordinate the work of all Departments. Its work is concerned not only with dimensions but also with performance, jointing and tolerances, and the user Departments (e.g., the Ministries of Health, Housing, the DES and the MPBW itself) can feed into the central co-ordinating committee their experiences of users. The Component Co-ordination Group, directed by Roman Grunberg, supplies a working arm to what is a steering committee.'

Private industry was not so well organised, in contrast. There was not the same machinery by which, for example, the thousands of small and medium sized house-builders could organise themselves. Even in factory building there was no concensus of views on such things as dimensions. Mr. Wigglesworth stressed the organisational difficulties facing the private sector, and made it clear that he was not being critical of its efforts.

'This is where the BSI comes in. The draft standard on controlling dimensions was built up from private as well as public views. Some people are saying that the public sector is dominating the proceedings, but it simply fed into the BSI machinery the information dictated by its needs.

'My hope is that the draft will attract proposals from the private sector. Already we have had interesting contributions from the Country and Land Owners' Association. Whether the private house-builders will contribute remains to be seen.'

To recent suggestions that trade associations were not, in the metric situation, a valid channel of communication between private industry and the BSI, Mr. Wigglesworth replied: 'BSI is open to anyone, not just trade associations. B/94, the main committee, has 50 people on it, representing all shades of the industry.

'If your question means that people are saying they are not properly represented, this implies that they are not being informed by their associations of what is going on. Associations are under an obligation to consult and communicate with their members.

He stressed the need for full briefing of representatives by trade association headquarters, particularly if they were representing multiple interests. 'This is of the essence. We are not just playing a game. There is a tough programme ahead, and the representative must do his homework behind the scenes. Associations must back up the work being done on committees and sub-committees.'

The nub of the problem was the decision to take the opportunity of the metric change to get greater co-ordination of sizes, and avoid the lack of consistency in the standards of similar products. Taking as an example the case of metal windows and wooden windows, he explained. 'We are trying to tell the manufacturers that whatever size they make their windows, they must be used in certain sizes of spaces.'

Organisational Build-up

Consistent advice was essential and the first step was to feed all the data to the various committees. As part of the organisational build-up, building products had been divided into six functional divisions —1) structure, 2) external envelope, 3) internal sub-division, 4) services and drainage, 5) fixtures, furniture and equipment, and 6) external works. By arranging building products in these groups, consistency could be given to each group and this would help to prevent individual product committees choosing unrelated sizes.

'Within these six divisions there will be some further breakdown, but basically we are starting from bigger units and working down to smaller' said Mr. Wigglesworth. 'Using the example of windows again, I would like to see the whole window industry co-ordinating their efforts outside the BSI. Work ought to be started at a technical level to match what is being done at BSI. We need contributions from industry, but we won't get them until industry starts doing some basic work. Some associations are active already and have started organising their work to match BSI's six functional divisions. But if industry in general wants to get its output, then it must be prepared to step up its input.

'Some are saying that the work being done at BSI will fall flat on its face' he went on, 'but we are working on a programme agreed by the industry. Granted we won't solve all the problems in time, but we will have a damned good try at solving a lot of them. It's all very well making those analogies about being able to put spaceships up to the moon and yet having difficulty about something so comparatively uncomplicated as a metric changeover, but we are here not only dealing with calculable problems; we are trying to change people's views, and putting forward ideas which challenge prevailing concepts.'

While admitting in general terms that it was perhaps hoping for too much to expect all the individual industries to wait until the full collaborative machinery was ready before formulating their own proposals, Mr. Wigglesworth expressed himself as 'worried' by the unilateral action of the Brick Development Association in suggesting metric sizes for bricks. 'I have written to the BDA, in my capacity as chairman of B/94, saying this, although I would make it clear that I am not commenting on the actual proposals. The whole purpose of B/94 is to try to help to control the proliferation of unrelated sizes. The BDA is represented on B/94, but the committee had no notice of their proposals, and had no opportunity to comment.

'If people are coming out with important proposals, the committee which is nominally responsible for these standards should be consulted' he declared.

Eventually architects must be encouraged to think in terms of standard ranges of components. 'The profession is going through a traumatic experience; it is moving from a traditional mode of operation in which, broadly speaking, each building is designed separately, into a world where it will use standard components to a much greater extent. Architects must participate in the new scheme of things, not turn a blind eye,' and the rôle of the RIBA in this is vital. It should be helping architects in private practice to accept the change, rather than fear it.

Mr. Wigglesworth thought that 1968 would be a good year. 'The mood in B/94 and the sub-committees is very good, and we are developing common views and building up useful international links. We hope that this will be supported by some new work on the part of industry as a whole.

Information Sheets

As the changeover to metric progresses we shall be including, within this section, details of metric products, and manufacturers will be invited to support these with information sheets. Manufacturers wishing further information on this service are invited to contact the Advertisement Director of 'Building.'

Problems for Manufacturers

QUESTIONS ON METRIC CHANGE

The aim of the following questions, prepared by B. T. Keay, BSc, BSc Eng, AIWSc (Department of Building, University of Manchester Institute of Science and Technology), is to provide a checklist which manufacturers will find useful when considering the BSI Programme for the change to metric.

The list has been compiled after studying the various official documents and other publications relating to the change to metric. It is not intended to be comprehensive, since new problems will arise as the programme is carried through, and problems which now seem to be important may not be in two or three years time. It is hoped that by raising such questions at the present time assistance will be given to BSI and other official bodies, who are responsible for fixing the timetable for the change and also are expected to provide some guidance as to the action required by industry to bring about the change.

The questions have been classified into five groups . . .

a) relating to the BSI Programme and its operation.

b) relating to dimensional co-ordination and size standardisation.

c) relating to cost.

d) relating to demand.

e) general.

The present list concerns questions which are likely to be asked by manufacturers. It is suggested that similar lists should be prepared by other groups within the industry, for example, contractors, designers, quantity surveyors, etc. The lists should aim at being more comprehensive in the future, and should be compiled jointly after discussion within the groups. They should be given some official status, perhaps through publication at BSI or the Building Research Station.

Although the aims and problems of changing to metric are usually stated in a general and over simplified way, they are extremely complex. Asking questions is one method of analysis which reveals the specific nature of the numerous problems, and breaks down the complexity. It is only when the separate problems are identified that action to solve them can be initiated. The alternative is that industry will tend to drag its feet and perhaps ultimately make ill-considered and hurried decisions.

a) Questions relating to the BSI Programme and its operation.

1. Is that part of the programme which concerns you realistic?
2. What changes to the programme would you propose?
3. Are you prepared to make your changes in good faith according to the programme?
4. Are you waiting to see how other groups in the industry act?
e.g. designers/manufacturers in general/ rival manufacturers/Government or other official bodies (consortia)
5. Which group is most likely to affect your plan for action?
6. Describe the initiative which you believe is necessary from another group before you can act?
7. Are communication links with BSI adequate from the point of view of . . .
a) receiving information?
b) feeding back suggestions or requirements?
c) what improvements in communication can you suggest?

b) Questions related to dimensional co-ordination and size standardisation.

1. What factors affect the size or range of sizes of your product in its existing form?
e.g. Manufacturing process (adjustable jigs —degree of mechanisation).
nature of the material.
client's need (product made to order or standardised).
function.
storage/transport (nesting).
handling (by crane or by hand).
integration with other components.
2. Into which groups as defined in the BSI programme does your product fall?
a) Products for which dimensional co-ordination is essential.
b) Products which are dimensionally related to those in item '1.'
c) Products which are not dimensional'y related to those in Item '1.'
d) Products which are required to have only sensible metric sizes (and values).
(see programme for lists of typical products.)
3. What benefits have you already achieved by considering dimensional co-ordination?
4. What problems have you experienced in the past using dimensional co-ordination?
5. Do you expect your product to be located (by the designer) on an imaginary grid?
e.g. 100 mm./300 mm./tartan/etc. grid.
6. Is modular standardisation possible for the thickness of your product as well as the primary dimensions?
(If corner junctions are necessary as well as straight line end to end joints, thickness becomes a co-ordinating dimension.)
7. Can you predict all (or most of) the products which may come into contact with your own product?
(Joint details, often unique to the joint with a particular component, e.g. fixings, gaskets, etc., may cause small critical changes in the basic size of the components.)
8. The size of joint gaps between products affects the final choice of size for the product. Is the size of the gap constant or variable, predictable or non-predictable?
9. Is it possible to make adjustments to the size of your component on the site, e.g. by cutting, or can the jointing system accommodate changes in the component size?
10. Is there one major factor affecting product size which conflicts with the requirements of modular co-ordination, and which permits no compromise?
(e.g. manufacturing requirements dominate in the brick industry.)

c) Questions relating to cost.

1. Do you expect the rationalisation of component sizes (standardisation and reduction in numbers) to lead to cost savings which will compensate for the cost of the change to metric?
2. What are the major factors which will cause cost increases during the change to metric?
e.g. dual production of metric and non-metric components.
dual stocktaking.
new publicity and advertising.
marketing and distribution (assessing demand).
capital investment in new machinery.
longer design time.
education within the company and of the client.
inefficiency through confusion (communication breakdown).
(The importance of each of these factors varies with the product and the company.)
3. Will the cost of your product as it now is increase when the alternative metric product is introduced?
4. Will the cost of the new metric product be higher than/the same as/or less than the cost of the product as it now is, when both products are available concurrently?
5. Will the cost of your new metric product be higher than/the same as/or less than the cost of the existing product, after the existing product has been abandoned?
(In considering questions 3, 4 and 5 it is necessary to examine the possibility of the old product subsidising the new (vice versa) and also to ignore other variables such as costs of materials, bank rate, etc., fluctuations.)

d) Questions relating to demand.

1. Can you assess the demand for metric components?
2. Is it reasonable to expect the demand after the change to metric to be approximately the same as at present?
3. Will the effects of dimensional standardisation change the market structure?

(fewer products/greater demand for specials/new methods of tendering and buying).
4. Will assessment of demand have to wait until BSI have produced metric dimensional recommendations and new British Standards?
5. Can you predict the varying proportions of demand between metric and non-metric components during the period of the changeover?
6. What demand will exist for non-metric components after the change? Will production be continuous or intermittent?
(for purposes of repair and maintenance.)
7. Will the new metric product be suitable for repair and maintenance uses, in buildings not built to metric standards.
8. Do you export your existing product?
9. Will the change to metric affect your policy with regard to export?
10. Can other groups (designers/contractors/client bodies/government bodies, etc.) contribute to the solution of the problem of predicting demand?

e) General Questions.
1. What fields of activity in your company are affected by the change to metric?
(e.g. Designing/estimating/ordering of materials or parts/manufacture/selling/distribution, etc.)
2. Are the majority of the problems which you anticipate:
of a general nature for your section of industry?
peculiar to your own company?
unique to your one particular product which you make?
3. Can your problems be adequately presented by a trade association, or some other official body?

LETTERS

Metric Rules and Scales

Sir,—Writing in Building Metrication News ('Building,' 26 January), Mr. Brown asks whether BRS knew about the scales in common use in metric countries. We have, of course, studied Continental practice. On rules and scales there are three matters for decision: the scales (ratios) used in representing layouts, buildings, and constructions on drawings; the draughtsman's rules (or 'scales'); and the operative's rules.
The first—drawings scales—was not a direct concern of Mr. Pinfold's study. The BSI Metric Guide (PD 6031) gives recommended scales based on a draft ISO range—with two additional scales relating to Ordnance Survey. On the design of rules, BRS found that, on the whole, instruments on the Continent failed to take into account the principles of scale design resulting from ergonomic research of the last ten years. BS 3693: Recommendations for the Design of Scales and Indexes, published by BSI in 1964 gives details. We believe that the change to metric provides an opportunity to make use of this research in the design of instruments in building not only to reduce the risk of inaccuracies but also to help to give British industry a long term export advantage.
The draft BS published in the same Building Metrication News makes use of the BRS work at least in regard to site instruments. To help others as well as Mr. Brown to understand the main ergonomic principles I summarise them here:
a) Any instrument which has to be read rapidly but with accuracy, should not be overcrowded with graduation lines.
b) Both graduation lines and figures should be clearly visible at the same reading distance, under the widest possible range of lighting conditions.
c) Certain sequences and shapes of numbers are more easily readable than others.
d) The three major characteristics of the observer which influence his ability to read an instrument are: (i) eyesight or visual capacity; (ii) practice; (iii) age.

G. A. ATKINSON,
Head, Design Division, BRS, and member BSI Metric Panel (Construction Industry).

Comma or Stop

Sir,—With reference to your questioning of the use of the comma or stop for the decimal point, our Standards Division (Ministry of Technology) has provided the following comment:
'The results of a survey carried out by BSI in consultation with the Decimal Currency Board are now available. This revealed a consensus only on one point: that there should be one form of notation for currency, commercial, industrial and other uses. The financial community were strongly opposed to any change in the general convention of the dot being used for the decimal marker (with the comma as digit spacer). The industrial community was less unanimous on whether the dot or comma should be preferred.
'As there is no international agreement covering the whole field of notation, the Ministry has concluded that it would be impossible to propose that either the comma should be imposed on the financial community, or the dot on the industrial community. A recommendation was made therefore that, pending international agreement on the whole field—and this will take some years to achieve—the sectors concerned should decide on the notation they wanted.
'For currency it will be the point, and in the BSI's metric construction panel it will be decided shortly whether this should also be adopted for the construction industry (and so probably by other industries) to avoid having two conventions in operation over the next few years.'

R. D. BELCHER,
Information Officer.
Ministry of Technology.

PUBLICATIONS

Metric Fasteners

A standard important in the internationalisation of fasteners has now been published by BSI—BS 4186—Recommendations for clearance holes for metric bolts and screws. The clearance hole sizes are in accordance with those given in ISO Recommendation R273, and the range has been extended up to 150 mm. diameter in accordance with an addendum to that recommendation, which was adopted by Technical Committee ISO/TC 2, 'Bolts, Nuts and Accessories,' at the 7th plenary meeting held in Budapest in October 1966. These recommendations cover three series of clearance holes for metric bolts and screws ranging from 1.6 mm. to 150 mm. diameter. The dimensions of the clearance holes have been chosen in such a way as to utilise the minimum number of drills.
The holes are suitable for bolts and screws specified in the following British Standards:
BS 3692—'ISO metric precision hexagon bolts, screws and nuts.'
BS 4168—'Hexagon socket screws and wrench keys. Metric series.'
BS 4183—'Machine screws and machine screw nuts. Metric series.'
BS 4186 is priced at 5s.

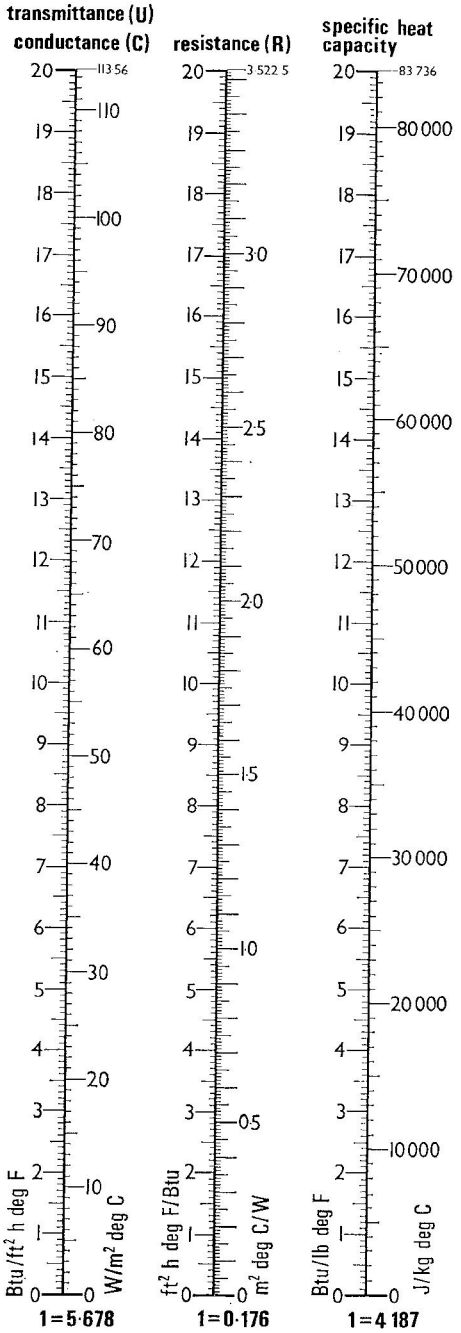
SI Units Booklet

The recent revision of PD 5686—The use of SI units—(a booklet first issued 22 months ago to provide a simple explanation of the units of the Systeme International) takes acount of recent discussions and agreements reached at the international level since December 1965. It has, for instance, been recognised that some departures from strict purity and coherence must be accepted for practical convenience. Thus pure SI would acknowledge only decimal multiples and submultiples of the second for time measurement, whereas it is quite clear that the minute, hour, day, month and year will continue to be used as convenient time units throughout the world.
The booklet embodies proposals made by the International Organisation for Standardisation (ISO) for restricting the ranges of multiples and sub-multiples to be commonly used. These have been examined and in general endorsed by BSI's major Industry Standards Committees, and they now form a 10-page appendix to the booklet for the guidance of British Industry.
Although probably not the last word on SI units the revision marks a long step forward from the original version in the detailed guidance it offers about the practical application of the SI.
Copies of PD 5686 cost 2s. each.
Publications obtainable from BSI Sales Office, 101/113 Pentonville-road, London, N1.

METRIC INSTRUMENTS

METRIC CONVERSION

Scales for Heat and Light



A series of conversion scales in connection with the metric changeover programme at The Polytechnic College of Architecture and Advanced Building Technology, Regent-street, London, has been prepared by Lyall Addleson and Istvan Fenyvesi. Scales for light (1 sheet) and heat (2 sheets, part of one being reproduced above) are available at a cost of 1s. per sheet. A sheet on mechanics will be available in the spring. Copies are obtainable from the college Registrar.

RIBA Scales

The RIBA has produced a British made all-metric scale, with dividings based on a draft International Standardisation Organisation (ISO) recommendation. They are designed expressly for the use of architects, engineering and surveying consultants, manufacturers and contractors. The scales and dividings were chosen on a consensus of what is most likely to be of practical help to users during the transitional period of the changeover. Two types of conversion scale have also been designed and can be obtained from the RIBA.

All three instruments are oval section and come in two familiar sizes: 300 mm. for office use and 150 mm. for the pocket, similar to the old 12-in. and 6-in. scales. Those in boxwood are engine-divided and hand figured and polished. Student needs for fully metric scales are met with the lower-priced 'Duraline' plastic version.

Metric Scales. 1:5, 1:10, 1:20, 1:50, 1:100, 1:200, 1:1250, 1:2500 fully divided. Polished boxwood type 300 mm. (16s.) and 150 mm. (11s.); plastic type, 300 mm. (11s.), 150 mm. (8s. 6d.).

Conversion Scale A. Metric dimensions 1:12, 1:24, 1:48, 1:96 open divided plus 1:1 in. and 1:1 mm. fully divided. 300 mm. (21s.), 150 mm. (15s.).

This instrument enables metric dimensions to be taken off old drawings made to traditional ratios.. The reverse side has measuring edges in mm. and in. divided to $\frac{1}{8}$.

Conversion Scale B. Foot/inch dimensions 1:5, 1:10, 1:20, 1:50, 1:100 open divided. 300 mm. (21s.), 150 mm. (15s.)

Scale has metric ratios with imperial readings. Drawings made with it need only the substitution or addition of metric-figured dimensions to complete the metric change. This is of value on long-term projects, with the further advantage of a reduction in the number of drawings to which fully metric scales could not be applied. This will help to avoid problems when converting buildings later on.

These instruments are available from the RIBA Publications Sales Office, 66 Portland-place, London, W1.

Metric Aids

Master metric conversion charts are being produced by E. N. Mason & Sons Ltd., Colchester, Essex. The charts can be made to specification (with conversion tables as required), provided that sufficient quantities are ordered, says the firm. The charts are A1 size, printed on polyester film, and cost 12s. 9d. each. They can be used to produce unlimited copies on dyeline paper.

A useful 6 in. pocket rule with optical scales for instant conversion of inch and metric units is now available free on request from D. Anderson & Son Ltd. of Stretford, Manchester. Along one edge of the rule is an inch scale which changes into a centimetre scale by tilting the rule or moving one's head slightly. Inch and metric dimensions, on drawings for instance, can therefore be compared and converted instantly.

On the face of the rule are fractions of an inch down to 1/32 with their decimal equivalents to five places.

Another visual aid, in the form of a conversion table, is available, free of charge, from Alfred G. Roberts (Exports) Ltd., 235 Southwark Bridge-road, London, SE1.

A scale rule has been designed by The John Madin Design Group, 123 Hagley-road, Birmingham, 16, for a short life during the initial change from imperial to metric. After the initial period a single 1:1 scale with millimetres and centimetres will be all that is required.

The scales included cover the whole range recommended in 'The Guide' (PD 6031) for 'component and assembly drawings,' 'location drawings' and 'sketch schemes.' The comparison with the imperial scales is as follows:

1 : 1	FULL SIZE
1 : 5	3 in. to 1 ft.
1 : 50	$\frac{1}{4}$ in. to 1 ft.
1 : 10	1 in. to 1 ft.
1 : 100	$\frac{1}{8}$ in. to 1 ft.
1 : 20	$\frac{1}{2}$ in. to 1 ft.
1 : 200	$\frac{1}{16}$ in. to 1 ft.

Discussions by the RIBA West Midlands, SAAT West Midlands and the Birmingham School of Architecture on the design of transitional scale rules are at present taking place and the symposium scale has been designed in the light of the latest information available.

COMING MEETINGS

WEDNESDAY, 28 FEBRUARY

The Change to Metric
Talk on the metric change organised by the London Branch, The Faculty of Architects and Surveyors, 6.45 p.m. at 68 Gloucester-place, London, W1.

FRIDAY, 1 MARCH

Change to the Metric System—lecture by Philip H. Dunstone at the Mid-Essex Technical College, Victoria-road South, Chelmsford, Essex, at 7 p.m. (Room E 310). Applications to attend to be sent to J. D. Canham at the College's Department of Construction Technology.

TUESDAY, 12 MARCH

Metrication and Marketing of Building Products
One-day seminar designed particularly for the manufacturers' sales managers and technical representatives. The problems they will have to face from 1968 onwards due to the metric change will be outlined. Organised by the Polycon Group of Building Industry Consultants, 96 Eltham-road, London, SE12. Fee is 12 guineas.

NEWS FROM THE INDUSTRY

Changeover in N. Ireland

Since the launching of 'metric' in Northern Ireland on 15 May, the building industry there has built up a pool of seven speakers to give talks on the metric changeover. In addition, by arrangement with the education officer at London Building Centre, two members of the national pool are available to speak in Northern Ireland if required. The NI pool is administered locally through the Building Centre in Belfast and 11 talks to various associations have already been arranged for this year. One of the most heavily attended last year was that given at the Ministry of Finance, Works Division, which, over five afternoon sessions, attracted a total audience of around 600. An internal working committee at the Ministry is planning a joint exercise, made in a 'text book example manner,' on a very simple small job which is due to be built later. This is expected around the mid-year. The Works Division have also begun a small field experiment on new metric scales for levelling staffs. They say that the reason for the experiment is that, while at first glance 5 mm. divisions would appear to be more accurate, nevertheless when 10 mm. divisions (appearing as a letter E) are viewed through the telescopic sight they are more readily subdivisible by eye. Therefore paper replicas of both patterns have been purchased and field experiments are being conducted on both. It is expected that a statement of their findings will be issued in two to three months' time.

The committee responsible for implementing the BSI programme in Northern Ireland is known as the Metric Change (NI) panel of which there are seven members. Liaison between this committee and the Speakers' pool is maintained by Shane Belford, Director of the Building Centre, who sits on both bodies.

US Debate

The merits of going metric are currently being debated in America where, according to the publication 'Business Week,' the Senate Commerce Committee is working out a compromise of measures by two senators authorising a study of metric conversion. With 82 nations already using the metric system, it is felt that American products designed to inch standards are losing world markets. The case of Cinch Manufacturing Co., a Chicago maker of electrical components, illustrates the point. Not long ago an Italian computer company passed over a Cinch bid on an electrical connector order because, the company believes, of a standards conversion delay.

On the other side of the fence many businessmen feel that, with the lead they have in technology, America can make the trend instead of going with it. Meanwhile Congress has not shown much enthusiasm for the metric system. Bills calling for studies of conversion have twice been frozen in the House Rules Committee.

The latest activity on the metric scene is almost certainly encouraged by Assistant Commerce Secretary, John F. Kincaid, the main administration advocate of the metric system. He believes that the longer the US waits to convert, the more expensive any future changeover would be.

Louis Polk, a director of the USA Standards Institute, thinks that a compromise standards system may evolve which would meet the needs of both the US and the rest of the world.

Modular Discussion

At a Modular Society meeting held in December at the C & CA's Slough Training Centre, a number of points were considered concerning the change to metric. Dimensions for sheet materials were discussed and it was generally agreed that under the existing recommendations, as set out in B/94/4, no particular problem would exist regarding metrication. Mr. Rees of the Federation of Building Block Manufacturers also said that the blockwork industry had few worries apart from existing BS requirements which are based on works sizes with assumed $\frac{3}{8}$ in. joint thickness. It was indicated that the existing French Standard for blockwork would form a very useful guide. Discussion ranged around the existing Building Regulations which specify arbitrary non-modular thicknesses and dimensions. According to the present programme, these should be metricated by 1968.

It was generally agreed that the intermediate stage of metric equivalents should be dropped in favour of a direct conversion to co-ordinated metric dimensions. Preferably metric dimensions should be stated on all information, with imperial measure equivalents provided as a secondary consideration even though this is not in accordance with the existing programme.

Appointments

The appointments of chairmen to five of the BSI Functional Group panels, which are to produce the dimensional co-ordination recommendations for metric building sizes, have been announced. They are P. W. Edwards, MIStructE (associate partner, Scott Wilson, Kirkpatrick), for Group No. 1, Structure; Hugh Clamp, FRIBA, FIArb (Manning and Clamp), for No. 2, External envelope; G. A. Britton (director, John Laing), for No. 3, Internal sub-division; B. C. Simpson (Norris Warming Ltd. and chairman of SAB/-) for No. 4, Services; and T. Sibthorp, FRIBA (chairman of TIB/-), for No. 5, Fixtures and fittings. An appointment for the last Functional Group panel, External work, is not yet required.

It was earlier announced ('Building,' 2 February) that Anthony Williams, AADipl, FRIBA, had been appointed chairman of BSI's sub-committee B/94/4 Metric Building Sizes (Advisory), which is responsible for co-ordinating the work of the six BSI panels.

Ceiling Panels Working Party

As part of its preparation for the change to metric in the field of suspended ceilings, the Metal Fixing Association for Ceiling Systems has formed a special working party from its proprietary members to investigate the whole problem and to formulate proposals on the recommended future dimensions of ceiling panels. The working party is working in close liaison with the Electric Light Fittings Association (ELFA) to ensure that any proposed dimensions for ceiling panels are fully in line with the development of metric-sized modular lighting fittings.

Local Committee Formed

In an attempt to mitigate the effects of the change to metric, the Gloucestershire Architectural Association, in conjunction with the Gloucestershire College of Art, have formed a joint committee.

At the instigation of the joint committee, a meeting of 20 people from 12 organisations representing the various sectors of the industry and comprising architects, builders, engineers and surveyors, was held last month to discuss each other's problems in respect of the change.

As a result it was decided that the value of this co-operation should be extended by forming a working party to meet regularly throughout the period of the change.

SI Adoption

A recommendation from The Royal Society Conference of Editors suggests that the SI system of metric units should be adopted in all scientific and technical journals, and that the changeover should be effected as soon as possible. A pamphlet explaining SI has been issued by The Royal Society.

METRICATION INDEX

An index of references to metrication published in 'Building' since Building Metrication News last appeared:

Space and furniture requirements for the home, giving metric dimensions, sizes and distances, are outlined in 'Design Bulletin No. 6 'Space in the home' published by MHLG. **(2 Feb., p. 113).**

There is no doubt that the construction industry could achieve the programme for conversion to the metric system which it had set itself, declared Mr. Mellish, Minister of Public Building and Works, in a written reply on 26 January. **(2 Feb., p. 99).**