BMN
Building Metrication News

Consultant editor
Anthony Williams, AADipl, FRIBA, MSIA

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.

CONTENTS

Metric data is lagging badly!

The metric bibliography* is proof that the ministries and institutions have done or are in the process of doing their job in providing information on metric change. Indeed the list of publications is getting so long that a short list is needed if one is to find one's way to the more essential books. But these are books about making the change, implications of the change, conversion factors, SI units, dimensional co-ordination and so on. The metric version of our standard reference books are not included in the bibliography. If they were included, however, the list would not be much longer. For publishers do not appear to share the sense of urgency or to see the need to provide us with metricated reference books. Presumably, since most publishers are not themselves members of the construction industry, our activities have passed unheeded or with only a vague sense of recognition. When a survey was undertaken over a year ago, by the RIBA, as to when these metric versions would appear, the answers were normally either that they would not be re-published before 1969 or that they would only be revised when existing stocks ran out. A reasonable reply, or was it?

Now 1969 is with us, we are starting to design in metric and our key data is still in imperial measure. If every book is to be read with a conversion table or slide rule in one hand life is going to be somewhat tedious. The sooner we can stop converting and can get our information direct in metric the sooner we can get over this rather tedious transitional stage and get on with the job. If your favourite reference books aren't available in metric yet, why not write to the publisher and jog him up a bit? If you are an author of a key book already slaving away at a metric version please let us know.

The other culprits who have failed to provide metric technical literature are the manufacturers, the producers of trade literature. Of course, there are lots of good or not so good excuses. The prolonged dithering over the decimal marker and that sort of thing. The recent survey by the GLC showed that only 5 per cent of trade literature gave metric equivalents. Whereas, apparently, when manufacturers replied to the BSI questionnaire they confirmed that metric equivalents could be included in all literature by the end of 1969. Perhaps the reason is cost, perhaps it is because manufacturers may be changing the sizes of their products shortly to conform to BSI recommendations and do not want to print two sets of new trade literature.

Both designers and contractors need to know the metric equivalent sizes of imperial products and they need this information now. If the problem is cost, then overprinting or a printed insert could be the answer and would save the time of innumerable different readers doing the conversions. If the cost of these two processes is too much, then a duplicated sheet giving the metric equivalent sizes will do the job quite adequately. As an eminent builder pointed out somewhat cruelly the other day, when there is a price change it doesn't take a manufacturer long to produce a duplicated amendment sheet.

We are getting off, quite properly, to a gradual start on metric change but basic technical and trade data is needed in metric terms and it is needed now. Please help everyone by providing it.

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* See Building Metrication News, 24 January, p. 111.

Metric office building

2—controlling dimensions

The second of three articles by Eric Corker, Dip Arch, ARIBA, describing a Crown Office in Penrith designed by the MPBW in metric units to conform with BS 4330.

This second article describes the application of horizontal and vertical controlling dimensions to the design of a typical three-storey office project. The idea of controlling dimensions is presented in BS 4330 ('Recommendations for the Co-ordination of Dimensions in Building : Controlling Dimensions') which provides a general dimensional framework of reference for the size of spaces to assist detailed dimensional co-ordination of the building components which enclose those spaces.

It is in the nature of the process of designing this type of building that all the various decisions which need to be taken about sizes and arrangements of both spaces and components are closely interrelated, and progress can only be made by making tentative decisions concerning one problem and testing the effect of these elsewhere in the design.

This account, therefore, does not attempt to describe the many forms through which the design passed before it reached an acceptable solution but is limited to reporting the major 'cross road' decisions where the application of policy for controlling dimensions was involved.

The Ministry's policy is to apply the recommendations of BS 4330, all of which are based on BS 4011 'Recommendations for Co-ordination of Dimensions in Building : Basic Sizes for Building Components and Assemblies.' (This latter is the head standard for the change to metric programme in the construction industry.) The only recommendation contained in BS 4011 is a hierarchy of preference when choosing dimensions, and of which only the first two are used in BS 4330: the preference is to choose dimensions which are multiples of 300 mm, and if this is not suitable, second preference dimensions (multiples of 100 mm) may be used.

Horizontal controlling dimensions

A useful device to assist the control of horizontal dimensions is the planning grid and although BS 4330 does not specifically recommend that one is employed, the Ministry nevertheless approves its use—provided that it is a multiple of 300 mm. Selection of a suitable planning grid size was made right at the start of the Penrith project during examination of user requirements. It was intended that the planning grid should be as large as possible to avoid too great a confusion of lines on the drawings; in opposition to this was the need for its size to be as small as possible to suit all the numerous different sizes to be defined. The dominant planning requirements in this project were first for the office spaces on the first and second floors, and second for the bay sizes for car parking under the building on the ground floor.

These spaces will, of course, exist only when they are enclosed by the building's walls and floors and it was therefore further considered how the use of the same planning grid could be extended to co-ordinate the dimensions of the relevant building components. In the Penrith offices, the important component co-ordinating dimensions which were closely related to the dominant planning requirements were the width of the cladding units (which limited the possible positions of partitions between offices) and the spacings of the columns (which defined the spaces available for car parking).

Suitable planning dimensions for the offices were established after consideration of two client requirements: the 'open' offices where the placing of the desks set up a rhythm of 3 300 mm, see Figure 1, and individual offices where minimum width requirements varied from 2 500 mm to 3 600 mm, see Figure 2. A planning grid of 1 200 mm was a little too coarse to be convenient for simple adaptation to the variety of sizes that were needed; further investigation showed that either 900 mm or 600 mm would be suitable. In the event, 900 mm was selected, partly because it was the larger of the two possibilities and partly because 900 mm was a simple factor of the minimum sizes for a car parking bay under the building (2 100 mm by 4 500 mm), see Figure 3; 900 mm was also subsequently found to be suitable for the width of a cladding unit and it also coincided with the size of another important component, the door frame width, although the latter was not so directly related to the main planning problems.

By centering the structural columns on the 900 mm planning grid, the architects conformed completely with the principle requirement for horizontal dimensions set out in BS 4330.

The initial design of the structure was considered in parallel with the evolution of the sketch plans and two types of scheme were prepared for investigation. The first type included six variations of reinforced concrete columns at different spacings and using the conventional form of beams and floor slab, see Figure 4. These column and beam structures were compared with a beamless reinforced concrete plate floor, the prime consideration for which was to use the most economical slab thickness for spans related to the car parking bays, see Figure 5.

The column and beam solutions all needed beams of up to 600 mm depth and this structural form would have required a suspended ceiling or else a series of variable heights for partition units. After consideration, the reinforced concrete plate solution proved to be a most convenient design, not only because it was comparable in cost to the alternative column and beam schemes but the economical slab thickness was 225 mm, which together with a 50 mm floor screed plus 12 mm of ceiling plaster and a tolerance of 13 mm, it made up most conveniently to a total thickness of 300 mm, a first preference size. This form of structure also had the additional economical advantage of having a flat soffit which required no suspended ceiling. In this project the only services needed in the floor zone were electricity cables and so there was no overriding need for a suspended ceiling.

The spacings of columns with a reinforced concrete plate floor was quite flexible in both axes of the plan; for this particular set of conditions, the columns could be spaced anywhere between 4 500 mm and 6 300 mm without affecting either the slab thickness or the economics of the design. Although the site itself is relatively confined, 900 mm flexibility for location of the columns was sufficiently adequate to be able to adjust the area of the whole building to fit within the various restrictions imposed by Town Planning and site limitation considerations. For the final design, it was possible to locate all columns at 4 500 mm centres in one axis and at either 5 400 or 6 300 mm in the other axis. This arrangement is constant over all three floors (giving vertically aligned columns up the whole height of the building) and is convenient both for the requirements of car parking at ground floor level under the building and layout of offices at first and second floor levels.

BS 4330 does not provide recommendations on how non-loadbearing external cladding should be located, nor on the location of partitions, and a description of the factors which controlled these components will be given in Part 3 of this series of articles. Figures 9 and 10 show the ground and first floors respectively. The drawings illustrate how the 900 mm planning grid has been used to control and define the spaces and components in plan.

Vertical controlling dimensions

The main controlling vertical dimensions in BS 4330 are concerned with defining clear room heights, floor (and roof) zone heights, floor to floor heights and changes of level. Although there are a few second preference dimensions (i.e. 100 mm multiples) included for room heights and floor zones, all floor to floor heights are listed as multiples of the first preference dimensions (i.e. 300 mm multiples) and this particular control is considered to be an overriding condition. For Crown offices, the range of vertical controlling dimensions derive from Appendix A of BS 4330 which are summarised in Figure 6. Changes of level are also restricted to increments of 300 mm but as this condition did not occur in the Penrith offices, it is not illustrated here. Intermediate vertical controlling dimensions in BS 4330 define sill and head heights of windows, and door set head

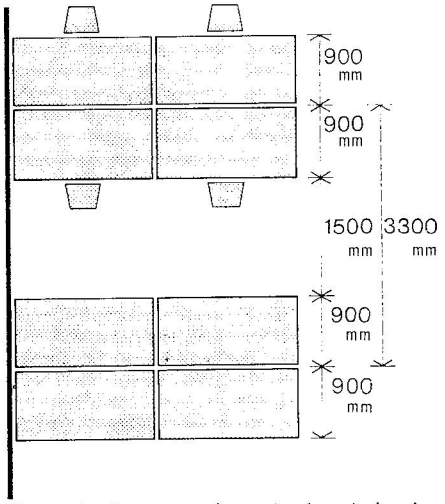


Figure 1. Space requirements for desks in 'open' offices

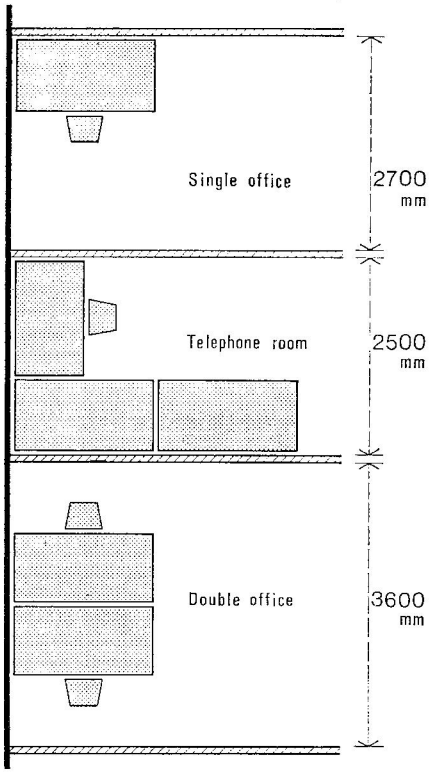


Figure 2. Some examples of the range of minimum space requirements for individual offices

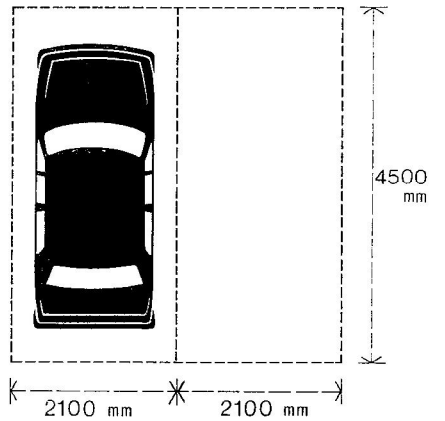


Figure 3. Minimum sizes for car parking on the ground floor under the building

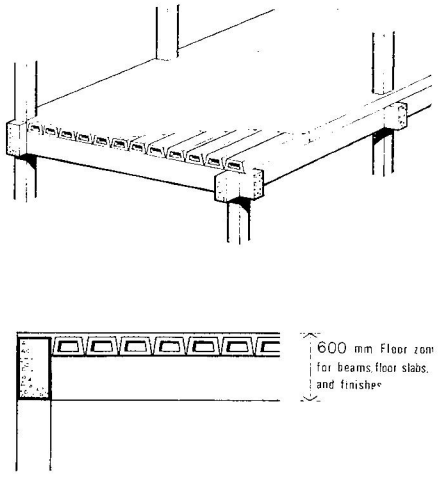


Figure 4. Structural scheme using reinforced concrete columns, beams and floor slabs

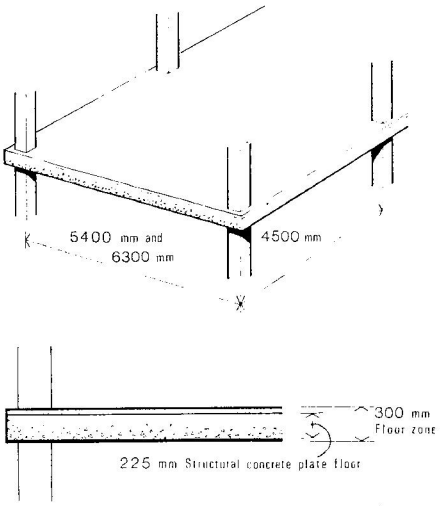


Figure 5. Structural scheme using a reinforced concrete plate floor and columns

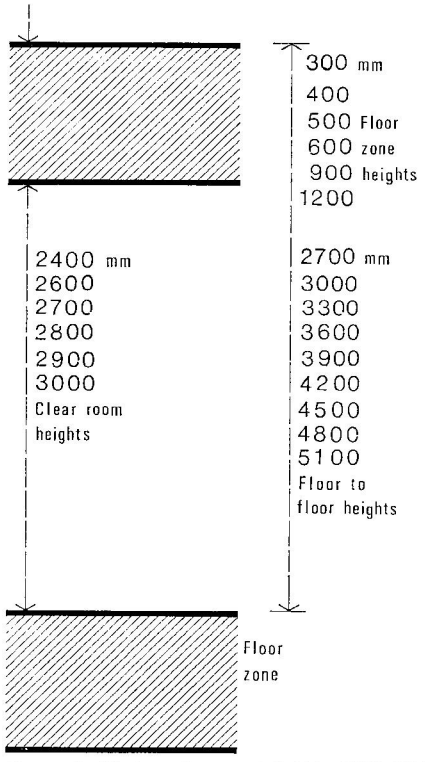


Figure 6. Choice of room heights, floor zone heights and floor-to-floor heights as given in Appendix A of BS 4330 as 'Source Information only'

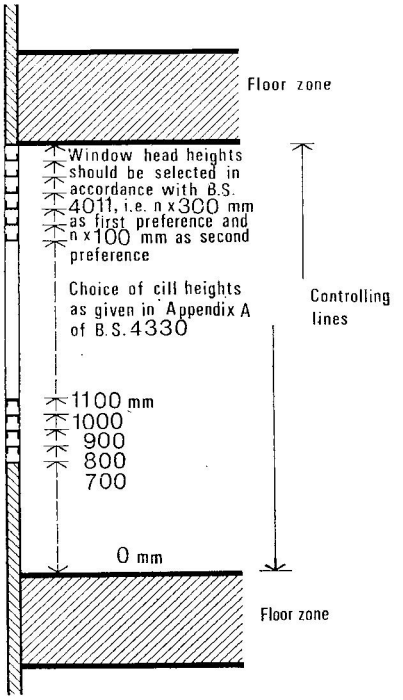


Figure 7. Choice of window head and sill heights given in BS 4330

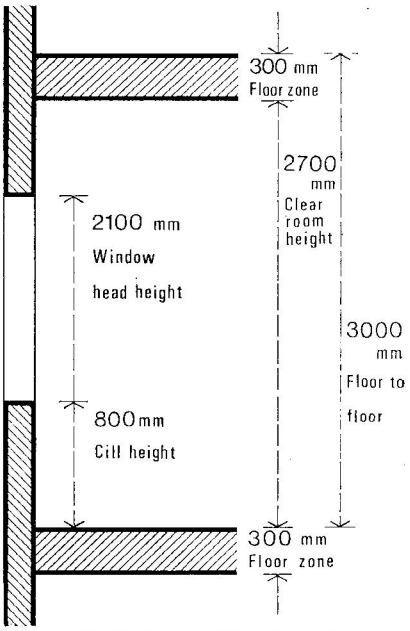


Figure 8. Vertical controlling dimensions used in the Penrith Crown office project

(continued on page 104)

heights; in this project, all door frames are storey height and so only the intermediate vertical controlling dimensions for windows are illustrated, see Figure 7.

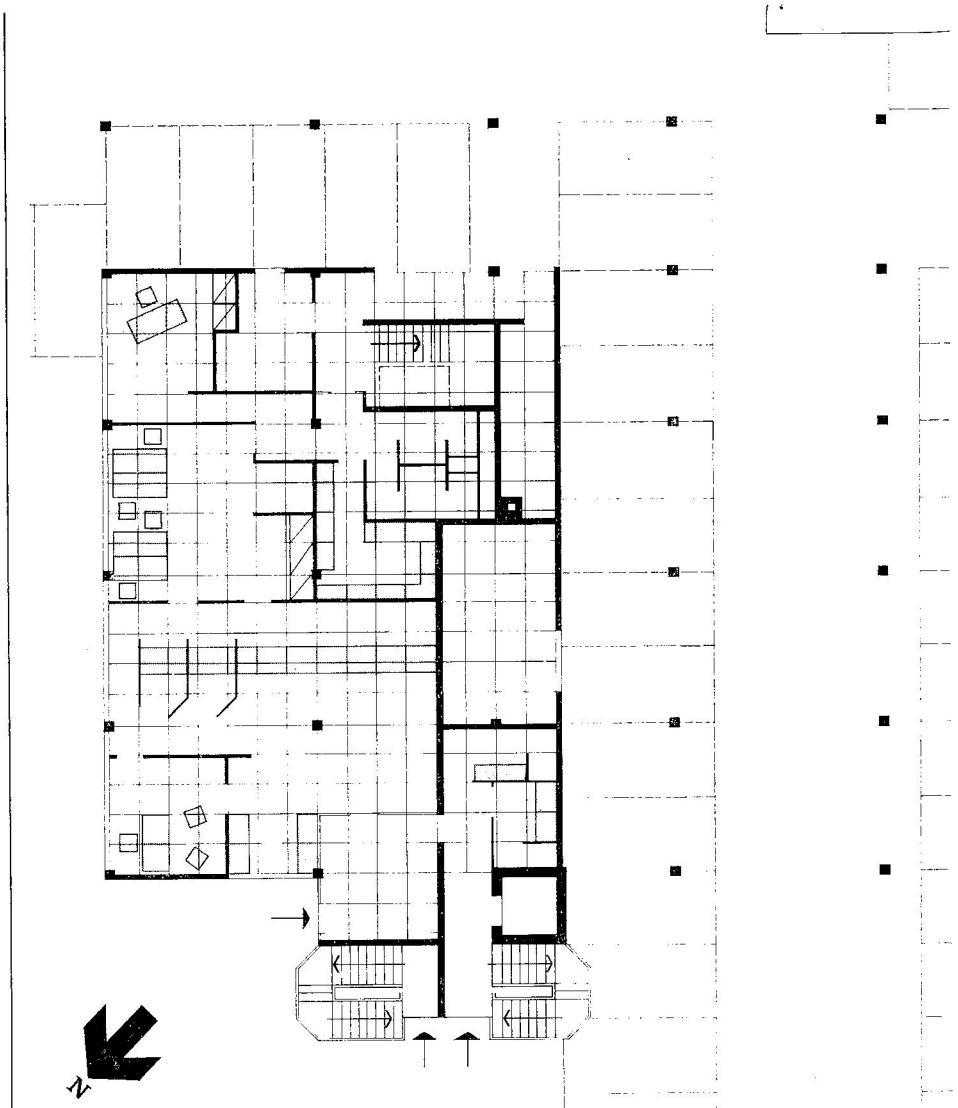
Since the design of the structure had allowed a 300 mm floor zone and the recommended floor to floor dimensions are to 300 mm multiple, the clear room height was consequently chosen as the lowest ceiling height to a multiple of 300 mm which was acceptable to the client; this was 2 700 mm.

The window head and sill heights were examined in relation to appearance and various functional requirements; it was found possible to choose a first preference dimension for the head height (2 100 mm) but a second preference dimension was needed for the sill height (800 mm).

Figure 8 summarises all the vertical controlling dimensions used in this Crown office building.

Conclusions

In the design, it was not found to be unduly difficult to apply the discipline of selecting controlling dimensions recommended in BS 4330 to define both the location of columns on plan, and to define the heights of floor zones in section. Choosing such dimensions tended to be an empirical process based upon discovering what was the maximum and the minimum possible dimensions in any given circumstances and then choosing an optimum somewhere between them to resolve all requirements as satisfactorily as possible. In all instances in this project, the range of manoeuvre was found to be sufficiently great to enable dimen-



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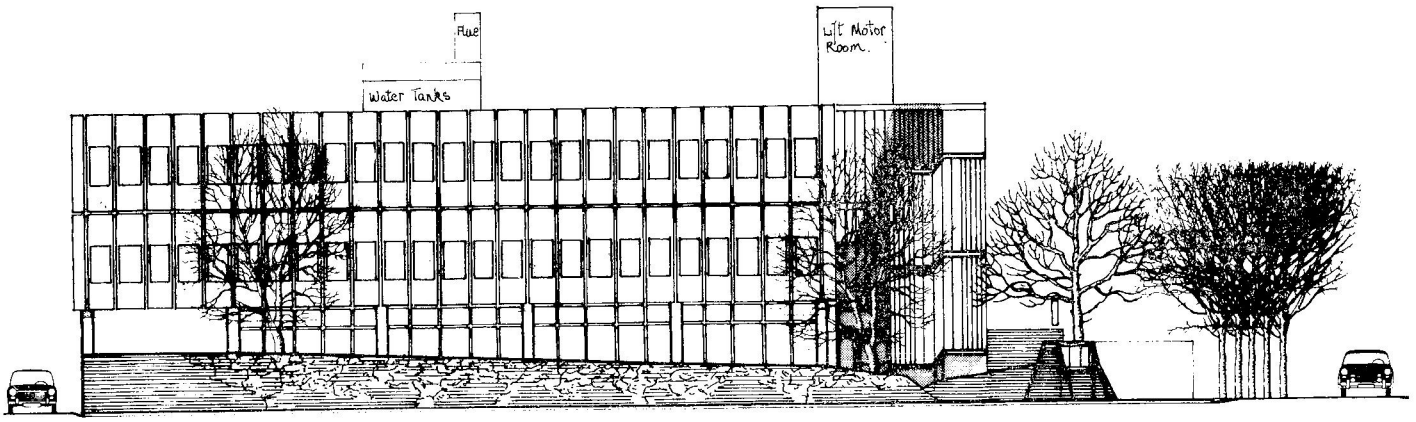
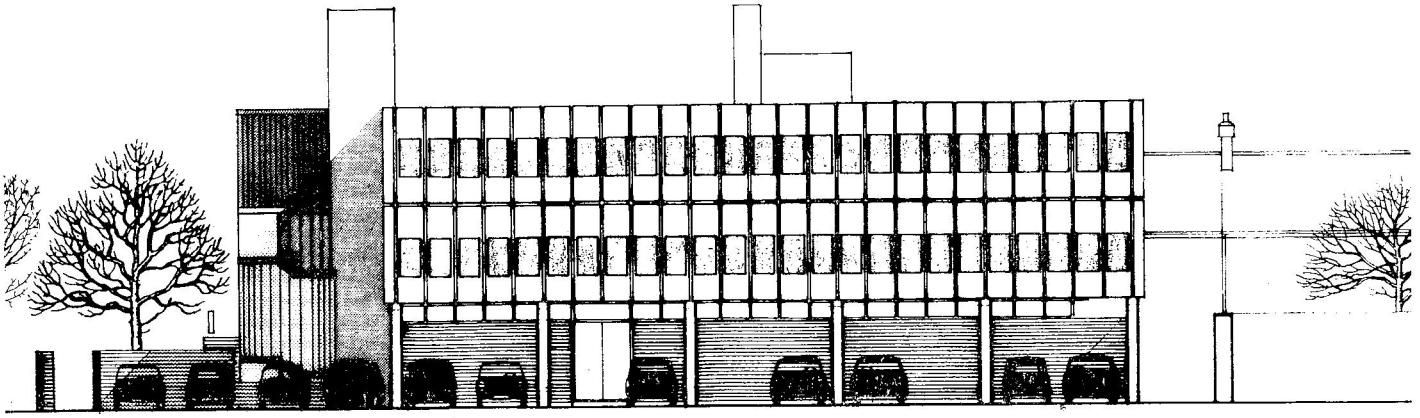
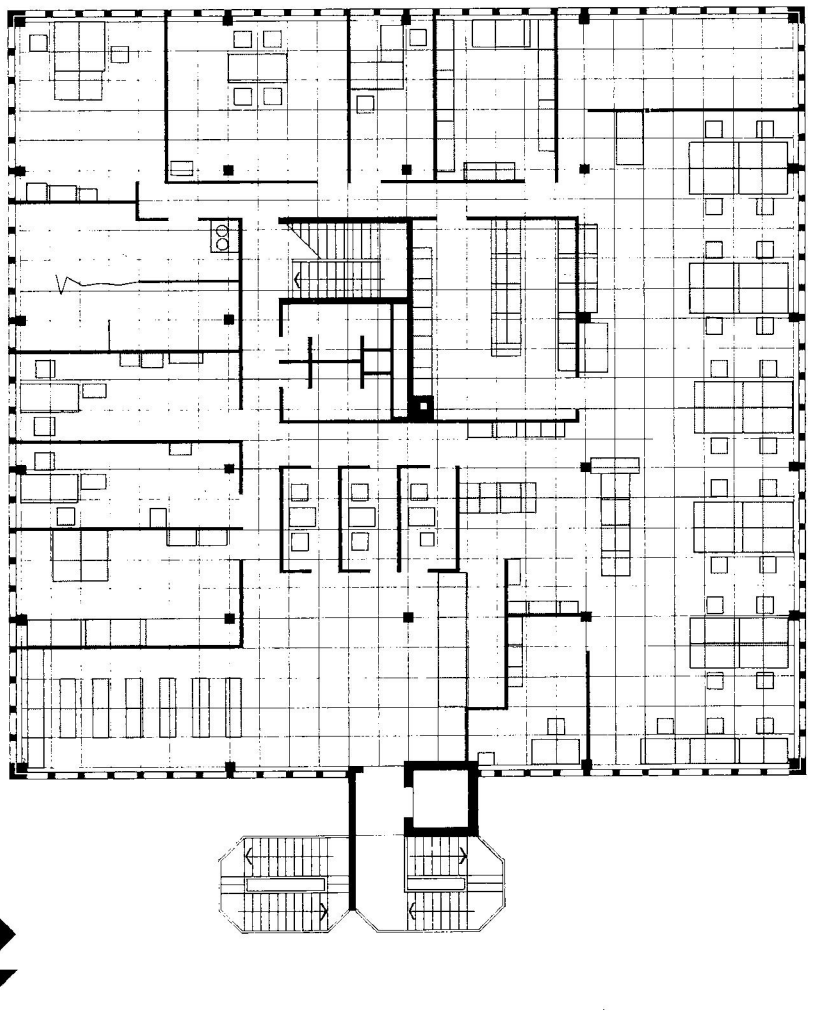


Figure 11 above, Figure 12 below



Left (p. 104), figure 9, ground floor and site plan, below, figure 10, first floor plan



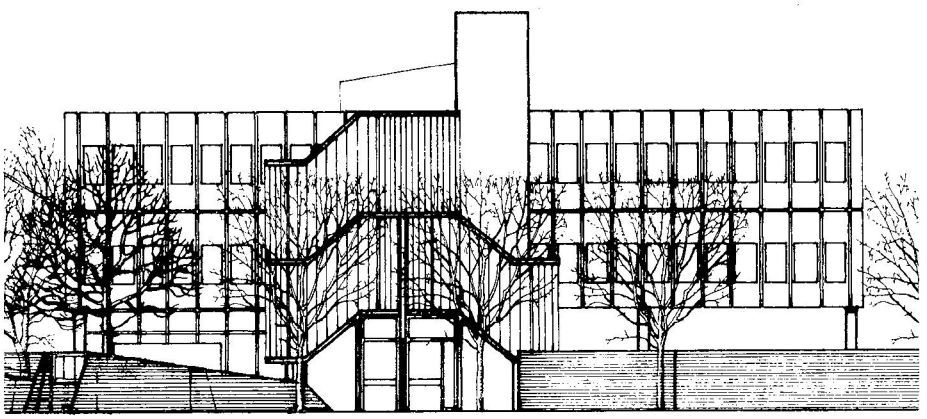
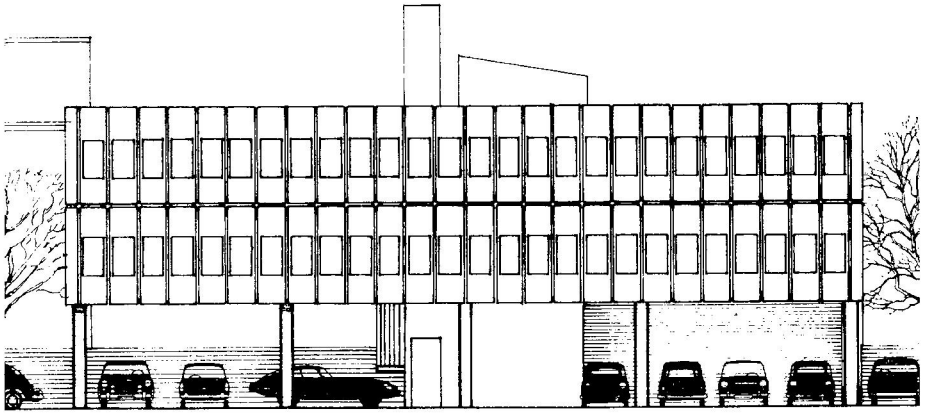


Figure 13 above, Figure 14 below



sions to be selected which not only satisfied the design requirements of the building itself, but also conformed to the recommendations of BS 4330.

BS 4330 is the first nationally agreed statement about how dimensional co-ordination shall be applied to new buildings in the UK. For dimensions in section, the recommendations are quite specific and whilst this gives clarity, it also implies quite a severe restriction on designers. For dimensions in plan, guidance is less clear; recommendations only refer to structural components (columns and walls) and two separate methods of dimensional control are offered: the first is to use co-ordinated dimensions measured axially (i.e. by centre lines) and the second is to use the same dimensions measured to boundaries of zones (i.e. face grid location). The duality of this presentation, limited as it is to structural components only, is rather inadequate. The Ministry recognises this and a good deal of thought and effort is being given to how horizontal dimensional control shall be developed. The first result of this work has just been published ('Going Metric; No. 2, Dimensional Co-ordination') and this document contains a very good exposition on the use of grids and their relevance to dimensional co-ordination.

The Penrith offices provide a very useful study at this time to demonstrate something of what is involved in the application of dimensional co-ordination in metric. Design skill and judgment are still the prime qualifications needed by architects although it is clear that the disciplines of dimensional co-ordination will have a considerable effect on the way that the skills are exercised.

Figure 9 (p. 104). Ground floor and site plan showing car parking bays under the building. Note the close relationship between the 900 mm planning grid, the location of columns and size of parking bays.

Figure 10, above. First floor plan showing the close relationship between the 900 mm planning grid, the layout of offices and the cladding panel width.

Figures 11, 12, 13, 14 showing, respectively, north, south, west (public entrance) and east (staff entrance) elevations.

News from the Industry

SI conference

The first open international conference on SI will be held in Brussels by PERA, the Production Engineering Research Association of Great Britain, on 24 and 25 June. Attendance of over 1 000 delegates from countries throughout the world is expected.
Some 25 countries have passed or are preparing legislation to make SI units the only official system of measurement. The French Standards Organisation (AFNOR) currently uses SI units, and in West Germany a Bill, likely to become law in 1969, will make SI units the only official system of measurement in ten years' time. In this country the BSI has already issued over 1 000 of the most widely used standards in SI units.
The movement towards the international adoption of SI should be encouraged by PERA's conference. Papers have been prepared by leading authorities from many countries including Dr H. M. Glass and Michael Clarke of BSI and A. H. A. Wynn of the Ministry of Technology from the UK. The admission fee for both days is £30 per delegate. Firms or organisations wishing to be represented should apply to the Conference and Education Department, PERA, Melton Mowbray, Leicestershire.

Sizes for concrete pipes

The Concrete Pipe Association has recommended a metric range of standard concrete pipe diameters for adoption by BSI. The diameters are as follows: (1) from 150 mm nominal internal diameter to 900 mm x 75 mm increments; (2) from 900 mm to 1 800 mm nominal internal diameter by 150 mm increments. Recommendations have also been agreed on the reduction of the number of strength classes for reinforced concrete pipes from the present Classes 1-5 listed in BS 556 : 1966. The proposed new strength classes take account of the recommendations of the Ministry of Housing and Local Government Working Party on the Design and Construction of Underground Pipe Sewers, and will be called: Standard; Class L; Class M; and Class H.
The Association has prepared tables of minimum crushing test loads for these classes, for the approval of BSI.

ICE conditions

To meet the difficulties which may arise during the changeover to metric, a clause has been prepared by the Institution of Civil Engineers jointly with the Association of Consulting Engineers and the Federation of Civil Engineering Contractors. It is for use as Clause 69 of the Institution of Civil Engineers Conditions of Contract, Fourth Edition (January 1955).
Broadly, it advises the contractor to notify the engineer if, by substitution of the alternate measure for the one stated in the contract, the supply of any material(s) can be expedited so as to avoid delay in carrying out the contract. As soon as possible after receiving any such notice, the engineer should direct the contractor to supply such materials in the alternate measure suggested or ask him to make some other variation whereby the need to supply such materials to the dimensions described in the contract (or originally ordered by the engineer) will be avoided.
Copies of the clause are available, free of charge, from the Federation.

Introducing decimal invoicing

As a practical first step towards decimalisation, Venesta International-Vencel Ltd., one of Britains largest producers of expanded polystyrene, are already showing both sterling and decimal values on all their invoices. This familiarisation exercise will continue throughout 1969 with invoices showing the price in shillings and pence per cubic foot and in decimals of £ per cubic feet.
Next year, the procedure will be reversed, invoiced figures being in decimals with the equivalent sterling figures in brackets alongside.

Publications

Concrete design charts

The Cement and Concrete Association will shortly publish tables and charts for the design of beams and slabs, and of columns, which are intended for use in conjunction with British Standard Code of Practice CP 114: 'The structural use of reinforced concrete in buildings, Part 2 : 1969: Metric Units.' This Code of Practice will make it possible to calculate in SI units instead of using imperial units and then converting. However, since cube strengths and permissible stresses have been rounded off in the metric versions of the Code, it will not be possible to use existing design tables and charts, with the possible exception of those in non-dimensional terms.
The new tables and charts for the load-factor method of design, in accordance with the equations given in the Code of Practice, have been prepared by A. H. Allen and will be issued by the C&CA in two publications:
LOAD-FACTOR DESIGN DATA FOR BEAMS AND SLABS (ref. no. Bb 34) price 15s.
This document will contain a total of 54 tables. Nine of these are for members reinforced in tension only and 45 are for members reinforced in both tension and compression using nine permissible concrete stresses.
LOAD-FACTOR OF SYMMETRICALLY REINFORCED RECTANGULAR COLUMNS (ref. no. Bb 35) price 10s.
For the design of columns, 15 charts have been prepared, five of each type of reinforcement—mild steel, high-yield cold-worked, and high-yield as-rolled.
Copies of both these publications will be available from the Association within two months and orders should be sent to: Publications Sales, Cement and Concrete Association, 52 Grosvenor-gardens, London, SW1.

Metric and local authorities

'Metric housing—what it means' is based on the first talk given at the series of NBA metric seminars for local authority housing designers last year. It has been published in booklet form etc. for members of the design team.
The booklet is divided into four parts. The first, which outlines the programme, indicates the three changes designers will have to make—metric measurement, dimensional co-ordination and the use of metric British Standard components—and summarises what each change means and the timetables for them.
The second part, deciding when to make the change, suggests that all schemes that start on the drawing board by the middle of next year will have to be metric in order to meet the deadline whilst larger schemes need to be metric much sooner. It puts forward criteria for deciding which schemes should go metric and which ones stay imperial.
The third section deals with preparations that have to be made once the decision to go metric has been taken. The work to be done includes collecting and classifying metric reference books and trade literature, budgeting for new equipment, co-ordinating with consultants, contractors, public utilities, manufacturers and other outside organisations and helping staff to convert from imperial to metric. It also indicates some sources of external advice that local authorities can draw upon.
The fourth section, on the metric system, explains the new units that will be used, the correct ways of using them and how to avoid some of the confusion that could occur through their incorrect use and the use of decimals.
'Metric housing—what it means' can be obtained, price 5s. post free, from the publications department of the National Building Agency, NBA House, Arundel-street, London WC2.

Strength properties of plywood

The third edition of the Forest Products Research Bulletin No. 29, 'The strength properties of plywood,' has been prepared as part of the programme for the change to the metric system in the construction industry. All numerical values in the second edition have been converted directly into the preferred SI units. Basic data is give for the design of structures in plywood made from Douglas fir, European birch, and sapele, utile and makoré.

BMN Building Metrication News

Rigid flat sheet materials

Draft British Standard for comment

This draft BS is for comment only. Comments, or an indication of general acceptance, should be sent to the Committee Secretary, C. J. Henry, BSI, 2 Park-street, London, W1, not later than 21 March.

RECOMMENDATIONS FOR THE CO-ORDINATION OF DIMENSIONS IN BUILDING: BASIC SIZES FOR RIGID FLAT SHEET MATERIALS USED IN BUILDING

FOREWORD

PD 6030, 'Programme for the change to the metric system in the construction industry'* outlines a programme for sizing building components and assemblies in metric terms, to achieve the co-ordination of dimensions wherever this is desirable. The process began in 1966 with the publication of BS 4011,† which stated that 'The co-ordination of the dimensions of components and those of the buildings incorporating them is essential in order:

1. to obtain maximum economy in the production of components;
2. to reduce the manufacture of non-standard units; and
3. to avoid the wasteful process of cutting components on site.'

BS 4330,‡ published in 1968, provided a dimensional framework as a basis for the derivation of the basic sizes of dimensionally co-ordinated components and assemblies. The preparation of dimensional recommendations for components, assemblies and elements of construction is being carried out at BSI by Panels, each one equating to groups of dimensionally related components arranged according to their functions in building (i.e. structure; external envelope; internal sub-division; services and drainage; fixtures, furniture and equipment; and external works).

Rigid flat sheet materials are taken to include:

Asbestos cement
asbestos insulating board
blockboard
compressed strawboard
expanded polystyrene
glass
gypsum wallboard
hardboard
insulation board
laminated plastics
metal (ferrous and non-ferrous)
particle board
plywood
wood wool

and in recognition of the fact that they are common to a number of the functional groups given above, a sub-panel was constituted (consisting of representatives of the various rigid flat sheet material manufacturing interests, together with representatives from the appropriate BSI Panels), charged with the task of formulating the recommendations for dimensionally co-ordinated basic sizes for such products contained that are in this draft British Standard.

These recommendations (in conjunction with recommendations on tolerances, joints and jointing, and the control of accuracy in building, currently being formulated in BSI) will assist BSI technical committees responsible for the metrication of existing rigid flat sheet product British Standards, to arrive at work sizes that will facilitate use of the various products in dimensionally co-ordinated buildings designed to the disciplines of BS 4330.

Where there are no British Standards for certain rigid sheet materials, it is proposed that industry should interpret these recommendations direct, in determining work sizes—having due regard to manufacturing and positional tolerances associated with a given product, and to jointing.

The necessity of reconciling the requirement of the user, with that which is currently technically and economically realisable by industry, dictated the collection of extensive data from the manufacturing interests represented on the Sub-panel. This data was collected in the form of replies to a questionnaire prepared by BSI, concerned with manufacturing and commercial practices and limitations attendant upon the production of rigid flat sheet materials used in building. This information was collated by BSI, and included a system of weighting against those existing sizes that accounted for a significant percentage of the total production for any given product. Such sizes as were common to a significant number of different products were also identified.

In an awareness of the problems confronting industry in any dimensional change, and the varying ability between sheet material manufacturers to implement the requirements of dimensionally co-ordinated building, these draft recommendations cover a minimum priority requirement only. When experience of building to the disciplines of BS 4330 becomes available, it is envisaged that the range of basic sizes given in this draft British Standard will be extended to accommodate more fully the dimensional flexibility required by building designers.

The following detailed factors were taken into account in arriving at the recommendations contained in this draft:

The dimensional framework for building given is BS 4330.

The increments of basic sizes for the co-ordinating dimensions of components and assemblies given in BS 4011.

The Co-ordinating dimensions for rigid flat sheet materials are the length and width dimensions. Of the various materials studied by the Sub-panel, in preparing these draft recommendations, only compressed straw slabs are considered to have a thickness dimension significant in terms of dimensional co-ordination. This significance derives from the partitioning or wall lining usage of this product.

The 100 mm user requirement flexibility indicated in the draft recommendations being produced by BSI functional group Panels, on components and assemblies that incorporate rigid flat sheet materials.

Location of the product in building (as identified in the component lists drafted by the functional group Panels, and shortly to be published as a BSI PD document).

The study referred to above, of current manufacturing and commercial practice in the production, distribution and usage of rigid flat sheet materials.

Whether or not the construction industry constituted the major user of a given flat sheet material.

Existing international standards or drafts for standardisation of size for various flat sheet materials.

The possibility of providing for the 100 mm design flexibility requirement for rigid flat sheets used additively through the application of the combination of numbers theory. (A BSI PD document on this subject is now in preparation.) It is envisaged that the relevance of this theory will become more apparent, when the range of basic sizes given in this draft British Standard is subsequently extended.

RECOMMENDATIONS

Scope

This draft British Standard makes recommendations for dimensionally co-ordinated basic sizes for rigid flat sheet materials for building, which are taken to include:

asbestos cement
asbestos insulating board
blockboard
compressed strawboard
expanded polystyrene
glass
gypsum wallboard
hardboard
insulation board
laminated plastics
metal (ferrous and non-ferrous)
particle board
plywood
wood wool

From these recommendations work sizes should be determined, taking account of space for joints and allowances for tolerances.

Definitions

Basic size:

The size of a theoretical dimension on which units of size and work size for that dimension are based.

Work size:

A size specified for manufacture so that, allowing for tolerances, the size of the finished building component lies between the required limits of size.

Basic sizes for rigid flat sheet materials

Basic width	Basic length
600 mm	1 800 mm
900 mm	2 400 mm
1 200 mm	2 700 mm
	3 000 mm

Basic thickness†
n x 25 mm*

†NOTE: Applies to compressed straw only, in partitioning or wall lining usage.

*Where n is any natural number, including unity.

*Published February 1967.

†BS 4011—Recommendations for the Co-ordination of Dimensions in Building. Basic Sizes for Building Components and Assemblies.

‡BS 4330—Recommendations for the Co-ordination of Dimensions in Building Controlling Dimensions.

MPBW lectures

The following lectures on the change to metric have been arranged by MPBW's Directorate of Research and Information.

TUESDAY, 11 MARCH
Edinburgh. Speakers: R. H. Macintosh of Scottish Special Housing Association and M. F. Brake of Scottish Development Department at Edinburgh University, George Square Hall, 7.30.

THURSDAY, 13 MARCH
Manchester. Speaker: N. B. Harries of Department of Civil Engineering, University of Salford, at Manchester Literary and Philosophical Society, 36 George-street, 7.15.

FRIDAY, 14 MARCH
Aberaeron. Speaker: W. A. Davies, LIOB, at the Feathers Royal Hotel, 7.30.

TUESDAY, 25 MARCH
Barrow-in-Furness. Speaker: J. Rowbotham, project manager, Christiani-Shand, at the Town Hall, 7.15.

Colchester. Speaker: G. F. Del Sizor of the Building Centre at N.E. Essex Technical College and School of Art, Sheepen-road, 7.15.

WEDNESDAY, 26 MARCH
Wrexham. Speaker: N. B. Harries of Department of Civil Engineering, University of Salford, at Denbighshire Technical College, 7.

THURSDAY, 27 MARCH
Colwyn Bay. Speaker: N. B. Harries at the Colwyn Bay Hotel, 7.30.

Education and training

A second survey by the MPBW

This second survey of education and training in the construction industry, carried out by the Education Group of MPBW, brings up to date the information presented in the first one, published in 'Building,' 22 March 1968, and so measures the industry's progress in preparing to train its manpower for the change.

The first survey said:

'The survey suggests that the size and difficulty of the training problem is not fully understood. . . . It may perhaps have been assumed too readily that technical colleges and other parts of the educational system will solve the industry's training problems and that the initiative can be left to others . . . it cannot be emphasised too strongly that the final responsibility for ensuring that all levels are familiar with the metric system rests with management of the firms involved.'

The training problem is undoubtedly more widely understood now than it was a year ago. Recruits to the industry at all levels are likely to be trained from the outset in SI metric units and to take their examinations in them. The work of the CITB relating to those in industry and mentioned in the earlier survey has now been published, and has been widely praised. The professional institutions have been adapting their essential publications (such as the IHVE 'Guide' and the IEE 'Regulations for the Electrical Equipment of Buildings') to SI metric terms. But there does not seem to be enough emphasis on immediate preparatory work for training the professions. It would be misleading to suggest that this is the only part of the industry which is slow to prepare for the change but as the programme requires them to begin work in metric a year before contractors do so, any delay at this time could obviously affect the orderliness with which the change to metric needs to be achieved.

Government departments

Department of Education and Science

The department issued a circular letter in March 1968 to inform local educational authorities and colleges about notification of changes to courses, syllabuses and examinations.

Some Regional Advisory Councils have organised short courses on metrication. In addition, the appropriate Joint Committees have decided that, from and including the summer examinations in 1970, all examination for National Certificates in Construction and Building and National Diplomas in Building will be set in metric (SI) units.

Department of Employment and Productivity

The department in its Government Training Centres is giving instruction in working to metric dimensions on some of the engineering exercises, and is preparing to introduce metric measurements in construction trade classes in 1970.

It is also introducing a campaign in the centres to familiarise trainees with the metric system. The booklet of programmed learning is being printed and should be available at the centres soon.

Ministry of Public Building and Works

Two bulletins in the Ministry's 'Going Metric' series have now been published —'Why and When' and 'Dimensional Co-ordination.' The Ministry, in association with other bodies, has also recently published a metric bibliography. In addition a series of metrication courses are being arranged for the benefit of lecturers and professionals outside the Ministry; two of these have already been run.

A metrication officer has been appointed to implement the change within the Ministry and to prepare courses for Ministry staff. Two kinds of course are so far being provided, one for senior professional staff (of one day's duration) the other for professional staff engaged in detailed design (2½ days). Other courses are in preparation.

Some civil and structural engineers are being sent on refresher courses at outside establishments; existing courses at the Ministry's engineering training school at Cardington are being reviewed with the object of changing to metric teaching.

Ministry of Technology

The sub-committee of the Standing Joint Committee on Metrication has sponsored posters and leaflets on the changeover in the engineering and construction industries and has commissioned a general film on the change to the metric system. The Metrication Board is soon to be set up to encourage and co-ordinate metrication throughout all sectors of the economy.

National Building Agency

The agency has recently completed a series of seminars mounted jointly with the MHLG for local authorities' housing designers. Thirty-five seminars were held throughout England and Wales and two officers attended from each authority.

A symposium for manufacturers of building components was held in conjunction with BSI.

The agency is considering running jointly with the CITB a series of seminars for professional staff from contract tors and private consultants.

Scottish Education Department

The department's main objective is to ensure that people in key positions are fully aware of the problems involved in the metric system, and of the resources available to them from the Construction Industry Training Board and from technical colleges. A number of short courses and conferences have been organised by the Scottish Association for National Certificates and Diplomas and other bodies. Comprehensive notes of guidance, with a bibliography, are being prepared for the Association.

Educational and training organisations

Construction Industry Training Board

In addition to its programme of research and diagnostic work which has been used to assess training requirements in the change, the board has now produced and begun to distribute training aids consisting of seven self-teaching learning texts, two reference cards, conversion tables and two types of course material.

A series of instructional posters is also being produced; three are available now and a further six will be available between February and June 1969. These aids are designed only for retraining as the initial training of those entering the industry after 1970 will be provided by universities and technical colleges. Distribution of these aids will take some time, but by the end of 1968 they had been sent to some 7 500 companies and local authorities.

Council and Technical Examining Bodies

The council has set up a number of sub-committees to determine the timing for introducing metric units into courses for the major industrial groups. One sub-committee is for the construction industry.

A memorandum will be published shortly to show how the new system will be incorporated into existing courses.

Other memoranda will be issued from time to time. Their timing will depend upon the availability of Metric British Standards and the re-equipment of colleges with metric tools and instruments.

Professional and other institutions

British Standards Institution and the Building Centre

Apart from the general application of British Standards and Codes of Practice there are some BSI publications which are very important for retraining. BSI are giving priority to these publications, which include those relating to the use of SI units, to site measuring instruments, to scales for use with the metric system, to building drawing practice and the more important Codes of Practice (for example CP 114 and 115).

Several publications relevant to SI units already exist, for example BS 3763, PD 5686 and PD 6031; a second edition of PD 6031 'Guide to the Use of the Metric System in the Construction Industry' was published in December. This contains detailed guidance and clarification of the rules for using SI units to supple-

ment the information already given in the aforementioned publications.
The services of the BSI sponsored pool of speakers are increasingly being used; the Building Centre, who administer this, are satisfying demands from all sectors of the industry. BSI staff are collaborating with Colleges of Further Education in formulating training courses.

Institute of Building

The institute has changed its earlier decision to conduct examinations in SI units from June 1969 and has announced that all 1969 examinations will remain in imperial measurements. The examinations in 1970 will now be the first in which SI units are used. Decimal currency will be introduced into the examinations in 1971.

Institution of Civil Engineers

Questions in the papers for parts IB and II of the Institution's Examination (excluding applied thermodynamics) normally set in imperial units, now also have alternative quantities in metric units. Candidates have the choice of using either set of data.
In the near future all examinations will be conducted using SI units, but in the interim period candidates have to be prepared to use metric units such as kilogramme force per square centimetre as well as the SI unit of Newtons per square millimetre for units of pressure or stress.
The present edition of the 'Standard Method of Measurement of Civil Engineering Quantities' is being revised; an addendum dealing with metric units is available now. The Institution will continue to publish in its 'Proceeding' notes and articles to give members information and to answer their question about metrication.

Institution of Electrical Engineers

The Institution has prepared a supplement to their 'Regulations for the Electrical Equipment of Buildings'—'The use of the 14th edition in metric terms' which is expected to be published early in 1969. It gives guidance on the metric values to be adopted where the 14th edition is to be used in metric terms, and is intended mainly for the use of designers and others who may be concerned in the advance planning of metric contracts. The supplement will run in parallel with the present imperial version of the regulations and have equal validity and force during the changeover period, pending a complete revision in metric terms.
A new edition of the booklet 'Symbols and Abbreviations for use in Electrical and Electronic Engineering Courses' detailing all the relevant SI units is available from the Institution.

Institution of Heating and Ventilating Engineers

The comprehensive metric reference manual is now available, and from autumn 1969 all material in the IHVE Journal will be written in SI units; from 1970 all examinations will make use of SI data. The members of the original Metric Study Group have offered their services to the Institution as lecturers. The Institution's 'Guide' is to be published in three books—those containing design data are expected to be published during 1969.

Institution of Municipal Engineers

The Institution, through articles in its Journal and other learned society activities, has been able to stimulate interest in the change to metric and regularly summarise progress. The membership is divided into district organisations which have held a number of meetings to consider the change.
In its function as a qualifying body, the Institution will complete the metrication of examinations by the end of 1970.
As a result of their responsibility for enforcement of statutory controls, principally through building regulations, members of the Institution will carry a considerable responsibility for advising other developers on the changeover.

Institution of Structural Engineers

All papers published in the Institution's Journal now use SI units (with imperial equivalents). Since January 1969 the same procedure has applied to all Institution examination papers. In this way it is hoped to familiarise members generally with metric units and with structural calculations carried out in SI units. In addition, by formal programmes of discussions and meetings, the Institution is playing a part in training and retraining personnel for the change.

Royal Institute of British Architects

The committee dealing with metrication recommended in July 1968 that the new RIBA associateship examinations, parts 1 and 2, to be introduced in 1970/71, should be set in metric terms. From the spring of 1969 existing examinations will be set so that they can be answered in either metric or imperial units, or alternatively optional questions will be set.
The RIBA has continued to issue publications on the change to metric and has also accumulated a stock of important up-to-date publications on the subject which are available to members.

Royal Institution of Chartered Surveyors

The training of members for the change has been based on the guidance given in the RICS 'Metric Guide'; this is to be amended early in 1969. Lectures are planned for branch meetings and general progress will continue to be reported in the 'Chartered Surveyor.'

Trade organisations

Association of Industrialised Building Component Manufacturers Ltd.

The Association's Metric Study Group assess the implications of the change and advise members and others by committee meetings, study groups, conferences and information leaflets. They provide speakers to keep members and others informed about the progress the construction industry is making on the coming change and its effect on the manufacturers of industrialised building components.

Electrical Contractors' Association of England

The association continues to maintain close liaison with the CITB on all matters relating to the change. The work of electrical installation contractors is greatly affected by the Regulations of the Institution of Electrical Engineers; the metric supplement to be published soon will be circulated to all members of the association; conversion tables will probably also be produced. Training needs for the industry are being assessed.

Electrical Contractors' Association of Scotland

The Association intends to work very closely with the CITB in training personnel for the forthcoming change. The CITB metric training aids and publication will be used to provide the basis for this training; individual firms are being encouraged to initiate their own programmes of training with these aids.

Federation of Civil Engineering Contractors

The Federation is making full use of the aids issued by CITB. The Federation's Bulletin is being used to emphasise the need for action by members in the change to metric. The value and importance of training is being stressed, although it is not envisaged that the changeover will present a great deal of difficulty.

Federation of Concrete Specialists

Members in the precast and insitu concrete flooring industry are preparing revised load span tables in SI units in readiness for the change and for use in conjunction with the metric version of CP114, 115 and 116 and the unified Structural Code when the latter is available. Metric data sheets and brochures are now available from individual members of the Federation: further information may be obtained from the Federation.

Federation of Piling Specialists

The Training Committee is at present considering training and retraining personnel for the change to metric.

Felt Roofing Contractors Advisory Board

Liaison with BSI and CITB continues and it is expected that training in the use of the metric system will be incorporated in future courses.

Flat Glass Association

A metrication committee has been formed and training is one of the matters being considered. Detailed arrangements are not yet available.

(continued on page 113)

Metal Fixing Association for Ceiling Systems

The Association has a Sub-Committee to advise its members on aspects of the construction industry's change to metric. Liaison is maintained with the Electric Light Fittings Association so that changes in lighting components may be inter-related with those required of the ceiling industry.

National Association of Lift Makers

Member firms pursue their own initiative in preparing for the change to metric. The larger firms have their own training scheme; other depend on the facilities provided by local colleges.

National Federation of Building Trades Employers

The Federation is using its journal 'The National Builder' and bulletins to keep members aware of the implications of the change to the metric system and, in particular, the importance of training their employees at the appropriate time for the changeover.

Full use is being made of the CITB metric training aids.

Courses and conferences are being organised to help member firms.

National Federation of Roofing Contractors

The Federation is represented on the BSI Committee and members are kept fully informed of literature issued by them and the CITB. Talks have been given to members on the change to metric.

Patent Glazing Conference and Metal Window Federation of Great Britain

Metric training is now included in all apprenticeship training schemes run by member firms. CITB aids to metric training are being circulated to all members, and the advice of CITB only to train staff immediately before undertaking metric work will be followed.

Society of Railing and Balustrade Makers

A metrication sub-committee has been formed to provide members with an advisory service on all aspects of the metric change. It will meet from time to time to consider general problems relating to the change. Information and advice will then be passed on to members.

The sub-committee is also willing to consider any problems which individual members foresee or encounter; members have been invited to communicate with it through the secretaries.

Timber Research and Development Association

Courses for training officers will begin in the spring of 1969. They include the use of programmed learning booklets prepared by the Association. From January 1969 the Association introduced metrication into all its training courses approved by both the CITB and the Furniture and Timber Industry Training Board.

Timber Trade Federation

Periodic bulletins are issued by the Federation's Metrication Committee giving advice on the new metric dimensions for timber, on the conversions and calculations which firms will need to understand and progress reports of outstanding aspects. Softwood in the new range of metric sizes will be arriving by late 1969/early 1970 and the trade is preparing for a complete changeover to metric selling on 1 April 1970. Facilities for retraining will be available this year; training grants are available to firms paying levy to the Furniture and Timber Industry Training Board and the Federation is encouraging members to take advantage of these.

Letters

Confusing the metric change

Sir,—I am very concerned about the trend that is beginning to develop and which is going to cause a great deal of confusion. This is the tendency for commercial firms, in the interests of marketing, to present unchanged imperial size products in such a manner as to suggest they are new and co-ordinated to a dimensional framework. An announcement from a brick company is an example of the kind of thing I mean. It illustrates a brick dimensioned 219 x 105 x 67 mm. It refers to 'New metric equivalent' and 'Stage 1—co-ordination of dimensions in building BSS 4330—1968,' the inference being that this is a new and co-ordinated product.

The imperial brick sizes, as the leaflet rightly says, is 8⅝in. x 4⅛in. x 2⅝in. for which the metric equivalent is actually: 219.075 x 104.78 x 66.675 mm and very awkward it is too. Clearly within the limits of the manufacturing tolerances for bricks it is not unreasonable to call this 219 x 105 x 67 but this is not a new size; it is only an old imperial size by a metric name. The word 'new' and the reference to BSS 4330 create a different impression.

A reference to Stage 1—BSS 4330 is puzzling since there is no mention of stages in that BS. One wonders if it has been confused with PD 6030 'Programme for the metric change in the construction industry' in which the first step for manufacturers is 'to provide technical information in metric terms for their products as they are now produced.' If this is the case then it seems probable that this example is an innocent mistake by some misinformed advertising man.

Not so innocent, however, is the pronouncement of the Brick Development Association that the metric brick will measure 225 x 112.5 x 75 mm (See BMN —24 Nov. 1967); this is a mere 6-8 mm larger than the present nominal imperial size and assumes a 10 mm joint. Now BS 3921 sets out a manufacturing tolerance of ± 3in. over 24 bricks which is roughly equivalent to a ¼in. or 6.5 mm gross variation per brick. Thus the BDA's so-called metric brick is clearly the old imperial size rounded up to within a double positive manufacturing tolerance. It is still the old rose by another name.

Although no one in their right minds would suggest that the brick should change its size overnight, in the long term machinery does need to be replaced and changes can be made economically despite the contrary impression it sometimes gives. The brick industry is not dead, development work is going on, and it is probable that some kind of change in size is inevitable. It would be sensible, therefore, if research was undertaken to try to establish the best size of brick for the whole building purposes so that a preferred size can be adopted as and when change becomes feasible, in say 10 or 20 years. The evolutionary change would produce a real metric co-ordinated brick. In the meantime the brick industry should stop deluding themselves and confusing their customers by claiming that their present proposals are something other than a metric equivalent product.

JOHN BRUNTON [DipArch, ARIBA],
Partners, Brunton, Baden,
Hellard & Boobyer,
201 Greenwich High-road, SE10.

Metrication, the computer and SI

Sir,—The value of the five tables recently published relating to the above subject would have been enhanced if the symbols employed to denote the quantities involved had been consistent and were in agreement with those set out in BS 350—Conversion factors and tables.

H. M. MOSS,
Engineering Services Department, ICI.

Coming events

WEDNESDAY, 19 MARCH

Trend 69: a conference on metrication in the building industry chaired by Peter Cocke, chairman of the RIBA Metric Advisory Group and arranged by Dibben Builders' Merchants Ltd. Held at the company's headquarters at Antelope House, Bursledon-road, Thornhill, Southampton, at 5.30. Applications for tickets (10s.) should be made to the Conference Secretary, c/o Dibben Builders' Merchants.

MONDAY, 31 MARCH

Metrication and modular co-ordination: a three-day mid-career course for architects in preparation for the change to metric and an introduction to modular co-ordination will be held in the School of Architecture, Department of Environmental Design, Manchester College of Art and Design, All Saints, Manchester 15. (31 March-2 April).

The fee for the course, which is non-residential, is £12. Accommodation is limited and those wishing to attend the course should make application by 28 February to the Secretary, School of Architecture, at the above address.

FRIDAY, 18 APRIL

Change to metric: one-day symposium on the change as it affects the construction industry. Arranged by IAAS Manchester & District Branch; Manchester University.

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Metrication the computer and SI

This is the eighth of a series of conversion tables compiled by R. M. E. Diamant and B. A. L. Hart which 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 8
Metre^4 to foot^4
1 m^4 = 115.8618324ft.^{4}
Note: DIFF signifies single units so that the reading for any number required is taken at the intersection of the appropriate horizontal 10 unit line and the vertical single unit column.

DIFF	0	1	2	3	4	5	6	7	8	9
m^4					ft^4					
0		116	232	348	463	579	695	811	927	1043
10	1159	1274	1390	1506	1622	1738	1854	1970	2086	2201
20	2317	2433	2549	2665	2781	2897	3012	3128	3244	3360
30	3476	3592	3708	3823	3939	4055	4171	4287	4403	4519
40	4634	4750	4866	4982	5098	5214	5330	5446	5561	5677
50	5793	5909	6025	6141	6257	6372	6488	6604	6720	6836
60	6952	7068	7183	7299	7415	7531	7647	7763	7879	7994
70	8110	8226	8342	8458	8574	8690	8805	8921	9037	9153
80	9269	9385	9501	9617	9732	9848	9964	10080	10196	10312
90	10428	10543	10659	10775	10891	11007	11123	11239	11354	11470
100	11586	11702	11818	11934	12050	12165	12281	12397	12513	12629
110	12745	12861	12977	13092	13208	13324	13440	13556	13672	13788
120	13903	14019	14135	14251	14367	14483	14599	14714	14830	14946
130	15062	15178	15294	15410	15525	15641	15757	15873	15989	16105
140	16221	16337	16452	16568	16684	16800	16916	17032	17148	17263
150	17379	17495	17611	17727	17843	17959	18074	18190	18306	18422
160	18538	18654	18770	18885	19001	19117	19233	19349	19465	19581
170	19697	19812	19928	20044	20160	20276	20392	20508	20623	20739
180	20855	20971	21087	21203	21319	21434	21550	21666	21782	21898
190	22014	22130	22245	22361	22477	22593	22709	22825	22941	23057
200	23172	23288	23404	23520	23636	23752	23868	23983	24099	24215
210	24331	24447	24563	24679	24794	24910	25026	25142	25258	25374
220	25490	25605	25721	25837	25953	26069	26185	26301	26416	26532
230	26648	26764	26880	26996	27112	27228	27343	27459	27575	27691
240	27807	27923	28039	28154	28270	28386	28502	28618	28734	28850
250	28965	29081	29197	29313	29429	29545	29661	29776	29892	30008
260	30124	30240	30356	30472	30588	30703	30819	30935	31051	31167
270	31283	31399	31514	31630	31746	31862	31978	32094	32210	32325
280	32441	32557	32673	32789	32905	33021	33136	33252	33368	33484
290	33600	33716	33832	33948	34063	34179	34295	34411	34527	34643
300	34759	34874	34990	35106	35222	35338	35454	35570	35685	35801
310	35917	36033	36149	36265	36381	36496	36612	36728	36844	36960
320	37076	37192	37308	37423	37539	37655	37771	37887	38003	38119
330	38234	38350	38466	38582	38698	38814	38930	39045	39161	39277
340	39393	39509	39625	39741	39856	39972	40088	40204	40320	40436
350	40552	40668	40783	40899	41015	41131	41247	41363	41479	41594
360	41710	41826	41942	42058	42174	42290	42405	42521	42637	42753
370	42869	42985	43101	43216	43332	43448	43564	43680	43796	43912
380	44027	44143	44259	44375	44491	44607	44723	44839	44954	45070
390	45186	45302	45418	45534	45650	45765	45881	45997	46113	46229
400	46345	46461	46576	46692	46808	46924	47040	47156	47272	47387
410	47503	47619	47735	47851	47967	48083	48199	48314	48430	48546
420	48662	48778	48894	49010	49125	49241	49357	49473	49589	49705
430	49821	49936	50052	50168	50284	50400	50516	50632	50747	50863
440	50979	51095	51211	51327	51443	51559	51674	51790	51906	52022
450	52138	52254	52370	52485	52601	52717	52833	52949	53065	53181
460	53296	53412	53528	53644	53760	53876	53992	54107	54223	54339
470	54455	54571	54687	54803	54919	55034	55150	55266	55382	55498
480	55614	55730	55845	55961	56077	56193	56309	56425	56541	56656
490	56772	56888	57004	57120	57236	57352	57467	57583	57699	57815

Table 8. Metre^4 to foot^4. This table is to be used for the moment of section (second moment of area).