#### THE ARCHITECT JOURNAL



standard

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GC GG HC IAAS

IGE IHVB

IIBDID

every issue does not necessarily contain all these contents, but they are the regular features which continually recur

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Wanted and Vacant

No. 34131 [Vol. 132 THE ARCHITECTURAL PRESS 9, 11 and 13, Queen Anne's Gate, Westminster, 'Phone: Whitehall 0611

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\* A glossary of abbreviations of Government Departments and Societies and Committees of all kinds, together with their full address and telephone numbers. The glossary is published in two parts—A to li one week, Il to Z the next. In all cases where the town is not mentioned the word LONDON is implicit in the address.

93000 HILL		
AA	Architectural Association, 34/6, Bedford Square, W.C.1. Association of Art Institutions. Secy.: J.H.Holden,	Museum 0974
ABS	A Dillege Of A Pt Commercials Dancet & County of the	
ABT	Architects' Benevolent Society. 66, Portland Place, W.1.  Association of Building Technicians. 156, Waterloo Road, S.E.1.  Arts Council of Great Britain. 4, St. James's Square, S.W.1.  Aluminium Development Association	Langham 5533
ACGB	Arts Council of Great Britain. 4. St. James's Squage S W 1	Waterloo 5427
ADA		Whitehall 9737 Mayfair 7501/8
BAE	Auditoria Registration Council. At Portland Place W 1	Langham 5861
BC	Bourd of Architectural Education. 66 Portland Diago W 1	Langham 5721
BCC	Building Centre, 26, Store Street, Tottenham Court Road, W.C.1. British Colour Council. 13, Portman Square, W.1.	Museum 5400
BCCF	British Cast Concrete Federation. 105, Uxbridge Road, Ealing, W.	Welbeck 4185
BCIRA	British Cast Iron Research Association Alvechurch Diaminches	5. Ealing 9621 Redditch 716
BDA	BIHLISH DOOF Association 10 The Polyone C W 10	
BEDA	Building Exhibition. 11, Manchester Square, W.1.	Hunter 1951
BIA	Building Exhibition. 11, Manchester Square, W.1. British Electrical Development Association, 2 Savoy Hill, W.C.2. 7 British Ironfounders' Association. 145, Vincent Street, Glasgow, C.	emple Bar 9434
4	Classow, C.	2.
BID		Chancery 7772
BINC	Building Industries National Council. 11, Weymouth Street, W.1.	Chancery 7772 Langham 2785
BOT	Building Industries National Council. 11, Weymouth Street, W.1. Board of Trade. * Whitehall Gardens, Horseguards Avenue, Whiteha	II, S.W.1.
BRS	Building Research Station. Bucknalls Lane, Watford.	Trainigar 8855
BSA		Garston 4040
BSI	British Standards Institution. British Standards House, 2 Park St. W.	Mayfair 0515
CABAS	City and Borough Architects Society. C/o S. A. G. Cook, A.R.I.B.	A. Borough
	British Standards Institution. British Standards House, 2, Park St., W. City and Borough Architects Society. C/o S. A. G. Cook, A.R. I.B./ Architect and Director of Housing, Town Hall, High Holborn, W.	C.1.
CAS		Holborn 3411
	County Architects' Society. C/o S. Vincent Goodman, F.R.I.B.A.,	D-10-1 cmass
CCA	Cement and Concrete Association, 52 Grosvenor Gardens S.W.1	Bedford 67444
CDA	Copper Development Association. 55, South Audley Street, W.1.	Grosvenor 8811
COID	Council of Industrial Design. 28, Haymarket, S.W.1.	Trafalgar 8000
CUC	Coal Utilisation Council 2 Visual England. 4, Hobart Place, S.W.	1. Sloane 4280
CVE	Council for Visual Education 13 Suffolk Street, S.W.1.	Sloane 9116
DIA	Cement and Concrete Association. 52, Grosvenor Gardens, S.W.1. Council of Industrial Design. 28, Haymarket, S.W.1. Council for the Preservation of Rural England. 4, Hobert Place, S.W.1. Council for Visual Education. 13, Suffolk Street, Haymarket, S.W.1. Council for Visual Education. 13, Suffolk Street, Haymarket, S.W.1. Design and Industries Association. 13, Suffolk Street, S.W.1. English Loipery Manufactures: Association. 13, Suffolk Street, S.W.1.	Reading 72255
EJMA		Whitehall 0540 le House,
EPNS	40 Diagodilles W/ 6	. Regent 4448
FAS	English Place-Name Society. 7, Selwyn Gardens, Cambridge.	
FASS	Faculty of Architects and Surveyors. 68, Gloucoster Place, W.1. Federation of Associations of Specialists and Sub-Contractors,	Welbeck 9966
	14 Bruspeton Steams W/ 1	Welbeck 1781
FBBDO	Fibre Building Board Development Organization Ltd. (Fidor.) States, W.L.  Federation of British Industries 21 Tackill Street, W.C.2. Cove	rd House.
FBI	Norfolk Street, W.C.2. Cove	nt Garden 3006
FC	Federation of British Industries. 21 Tothill Street, S.W.I. Forestry Commission. 25, Savile Row, W.I. Federation of Coated Macadam Industries. 37, Chester Square, S.W. The Flush Door Manufacturers Association Ltd. Trowell. Nottingles	Whitehall 6711
FCMI	Federation of Coated Macadam Industries 37 Charter Sauces Care	Regent 0221
FDMA	The Flush Door Manufacturers Association Ltd. Trowell, Nottinghar	.1. Sioane 1002
FLD	Friends of the Lake District. Pennington House, nr. Ulverston, Lanca.	Ulverston 201
FMB FPC	Pederation of Master Builders. 33, John Street, W.C.1. Tel.: Chancer	y 7583 (6 lines)
FRHB	Friends of the Lake District. Pennington House, nr. Ulverston, Lancs. Federation of Master Builders. 33, John Street, W.C.1. Tel.: Chancer The Federation of Painting Contractors, St. Stephen's House, S.W.1. Federation of Registered House Builders. 82 News Cassedish Street.	Whitehall 3902
	DE, TOW CATHERINE DELOCE	Wale
GPDA	Gypsum Plasterboard Development Association. 11, Ironmonger La	Langnam 4341
OC.		Monarch 8888
GC GG	Gas Council. 1, Grosvenor Place, S.W.1.	Belgravia 4321
HC	Georgian Group. 2, Chester Street, S.W.1. Housing Centre. 13, Suffolk Street, Pall Mall, S.W.1.	Belgravia 3081
IAAS	Incorporated Association of Architects and Surveyors, 29, Beigrave S	Whitehall 2881
ICA	Institute of Contemporary Arts. 17-18, Dover Street, Piccadilly, W.1.	Grosvenor 6186
ICE IEE		
	Amendment of Electrical Engineers. Savoy Place, Victoria Embankme	ent, W.C.2.
IES	Illuminating Engineering Society. 32, Victoria Street, S.W.1. Institution of Gas Engineers. 17, Grosvenor Crescent, S.W.1. Institution of Heating and Vantilating Regions 200	et Garden 1871
IGE	Institution of Gas Engineers. 17, Groevenor Crescent, S. W.1.	Abbey 5215 Sloane 8266
IHVB	Institution of Heating and Ventilating Engineers. 49, Cadogan Squar	re. S.W.1.
IIBDID		pene 1601/3158
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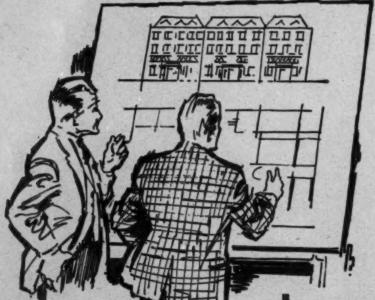
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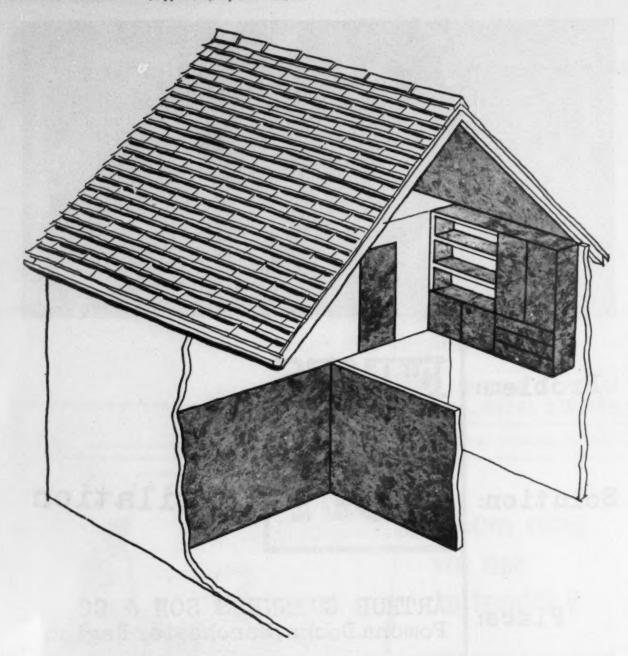


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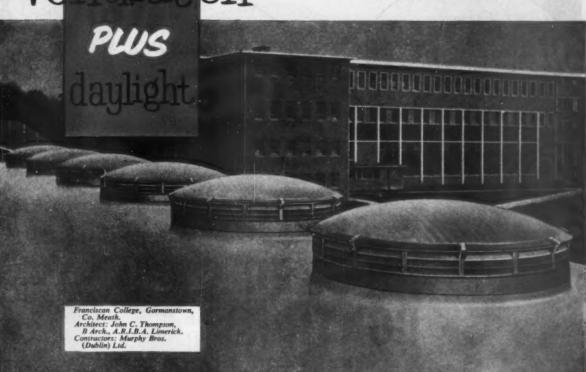
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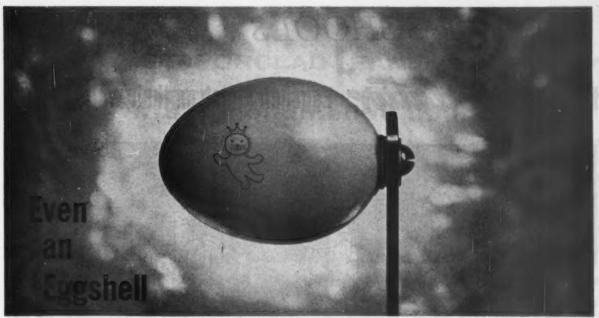
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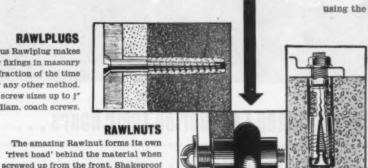
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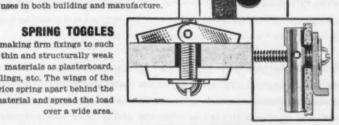
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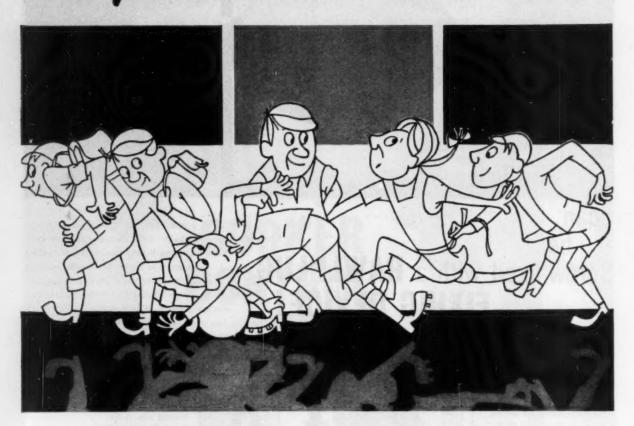


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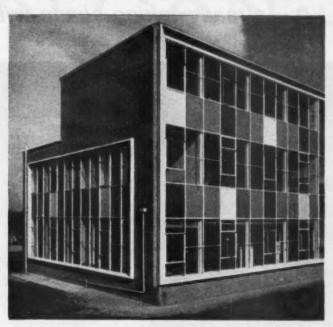


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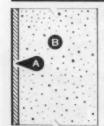
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Core thickness	∄ In.	⅓ In.	∄ in.
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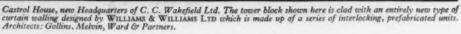
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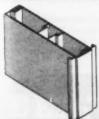


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A typical example of aluminium extrusion for in curtain walling

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Architect: Justin H. Alleyn F.R.I.B.A.



WILLIAMS & WILLIAMS LTD "Wallspan" aluminium curtain walling was selected for the Administration Block of Ford Motor Company's new Spares Division because of the low maintenance cost.

Architects: E. R. Collister and Associates.



Chosen for its lightness and pleasing appearance "Wallspan" curtain walling by WILLIAMS & WILLIAMS LTD was used for Marconi's new laboratory at Great Baddon, Chelmsford. Architects: F. J. Taylor, F.R.I.B.A.
E. R. Collister, A.A. Dip, F.R.I.B.A.

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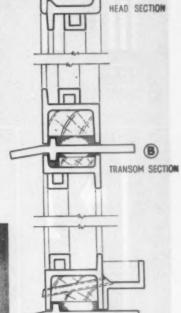
# (A)

## **BEACON WALLCLAD**

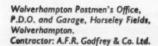
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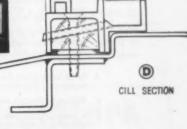
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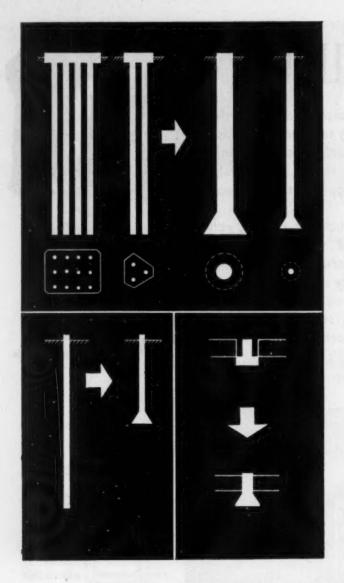


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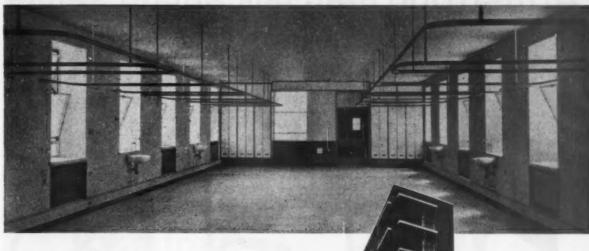
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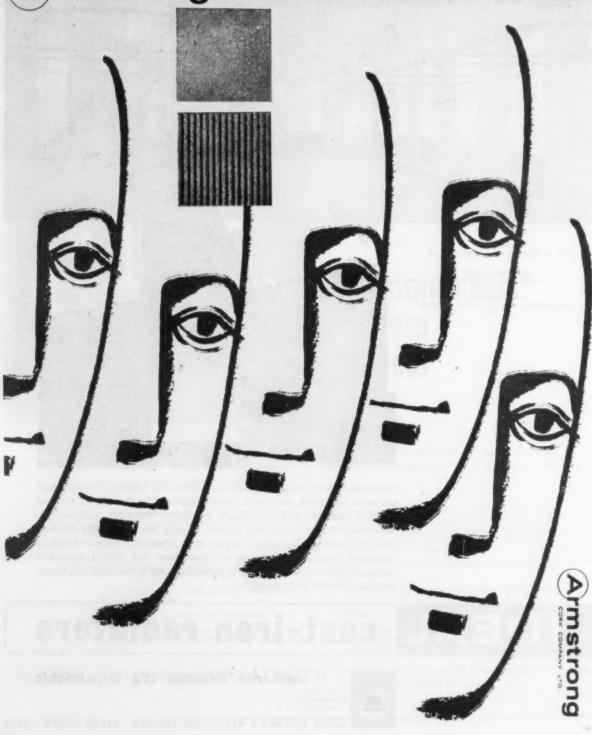
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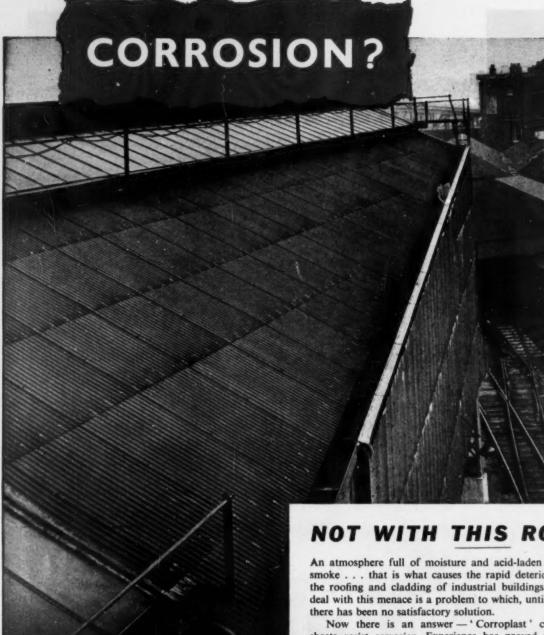
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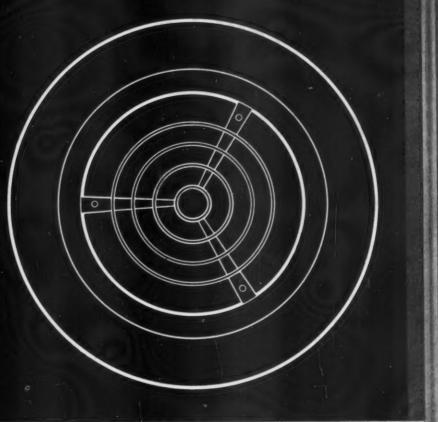
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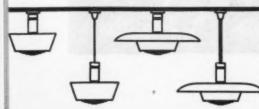




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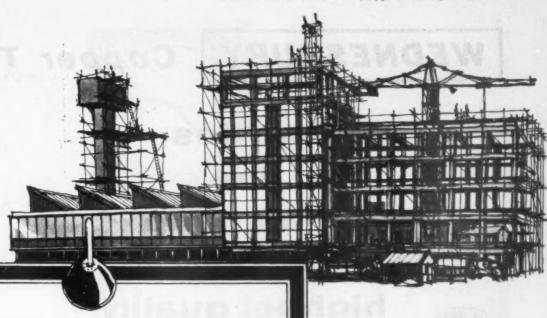
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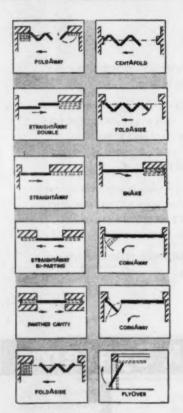
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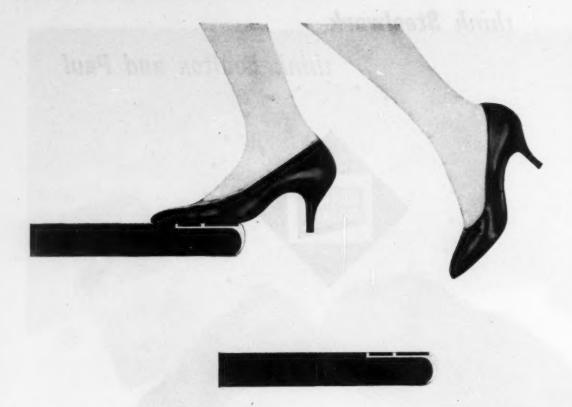
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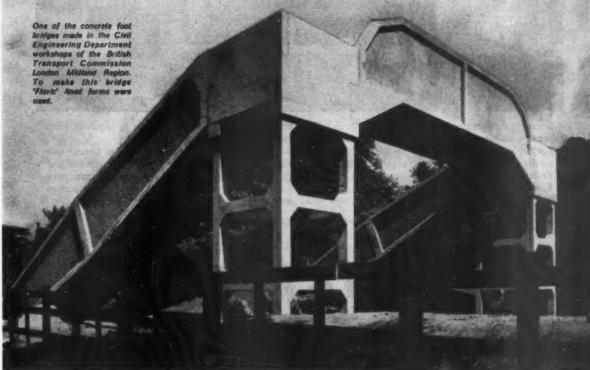
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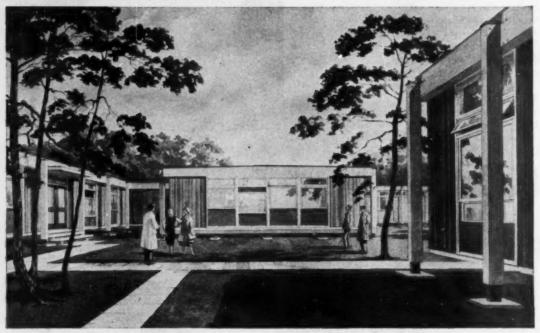


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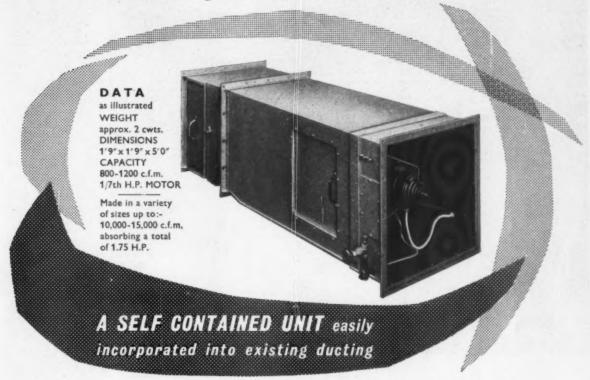
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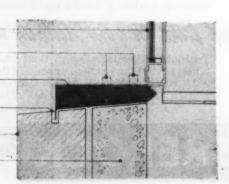
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5lb lead weathering to sill

sealing strip

Portland stone facing

concrete apron wall



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AT

STRING COURSE

Portland stone facing

5lb lead weathering

copper dowel sheathed in lead

sealing strip

Portland stone facing

floor slab

SECTION THROUGH
FLASHING AT FOOT
OF EXTERNAL WALL
TO PENTHOUSE

3lb lead flashing dressed round base of column and over asphalt

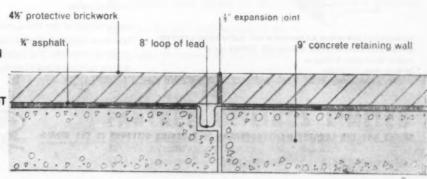
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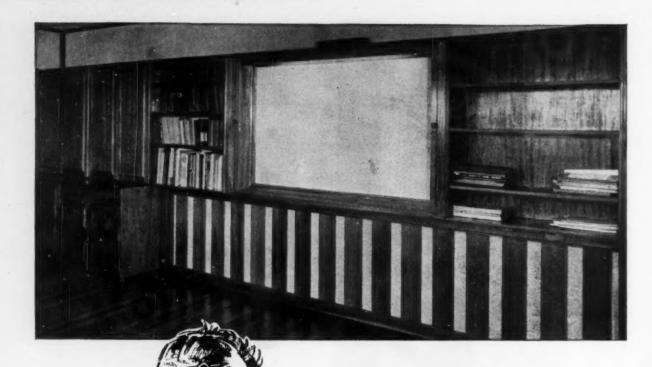
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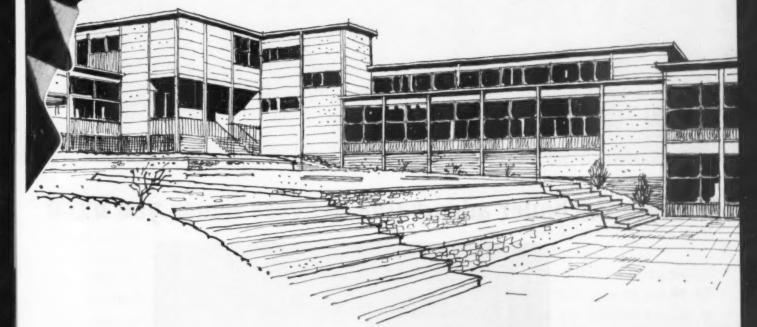
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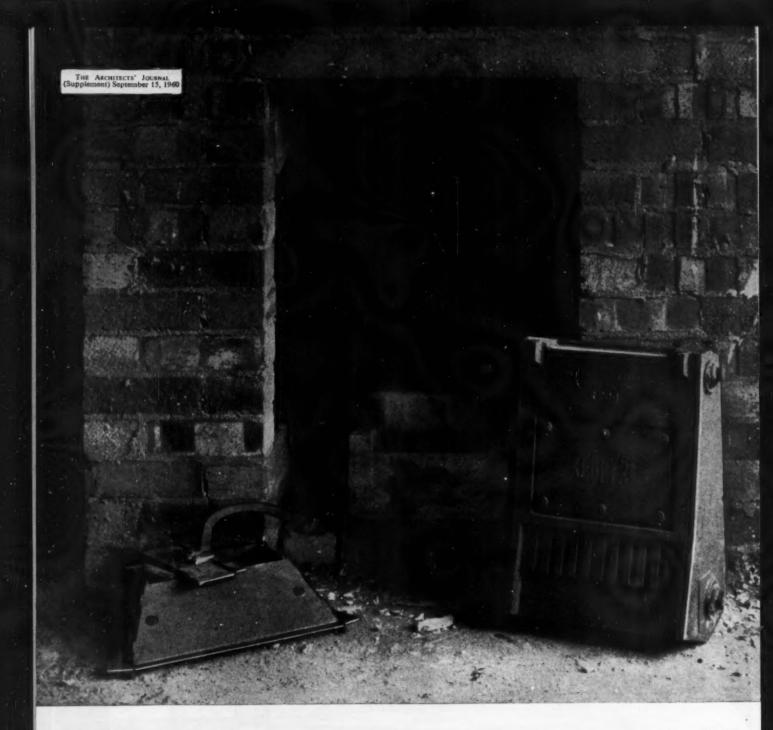
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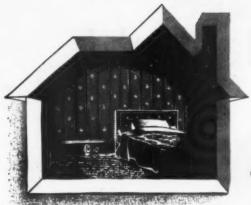
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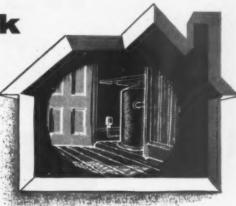


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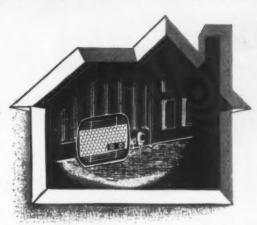


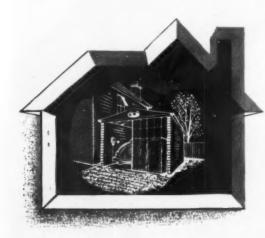


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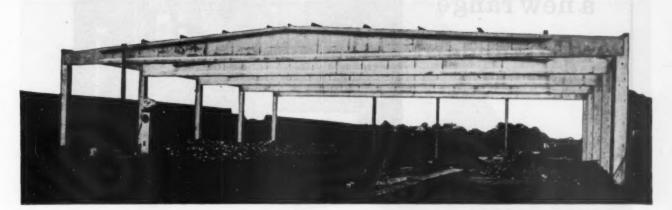
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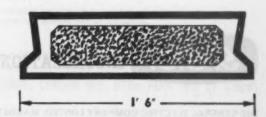
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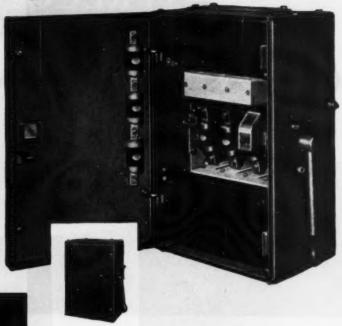


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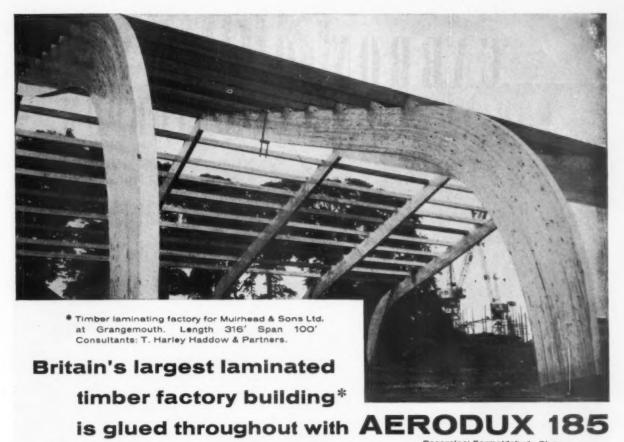
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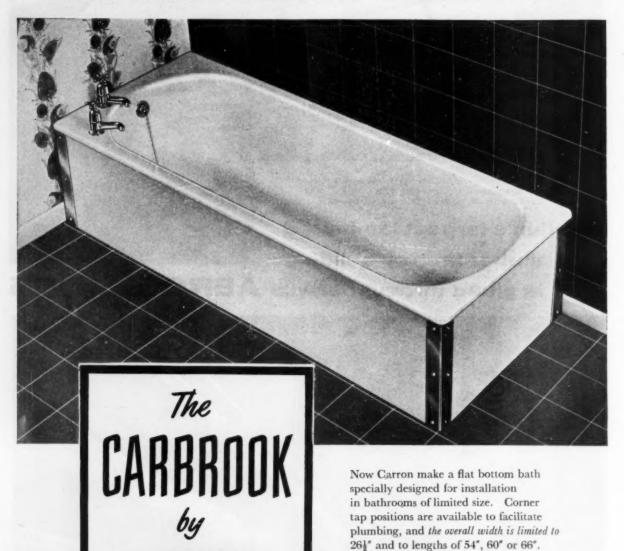








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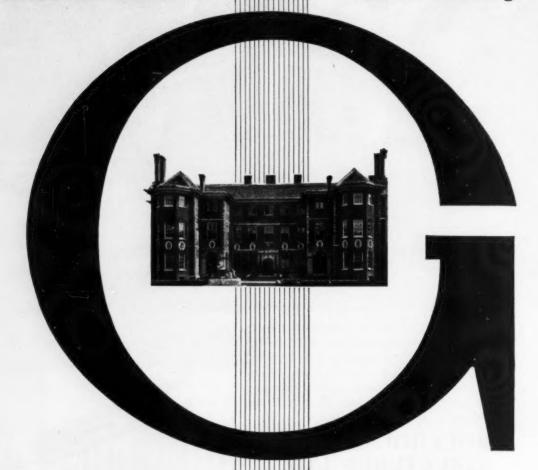
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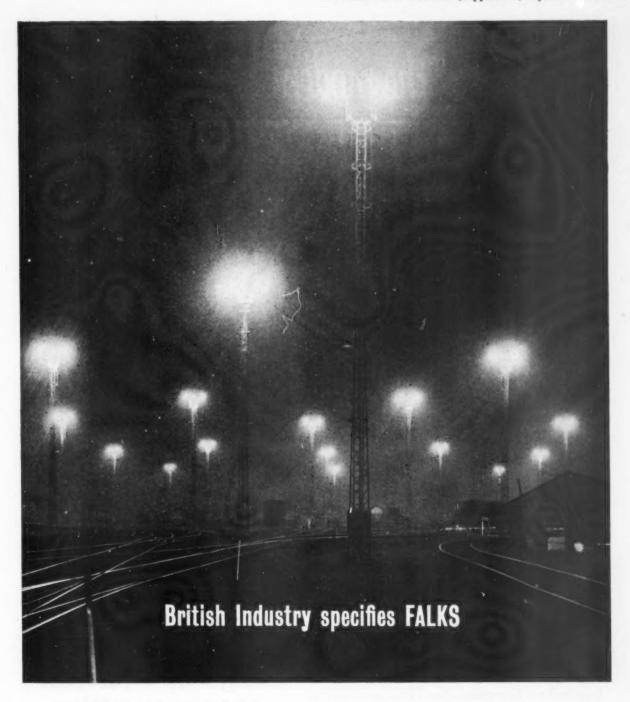
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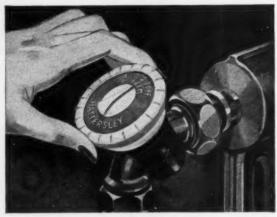
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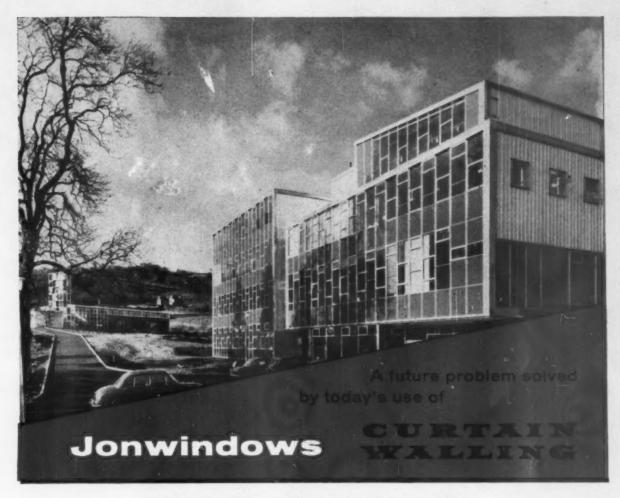
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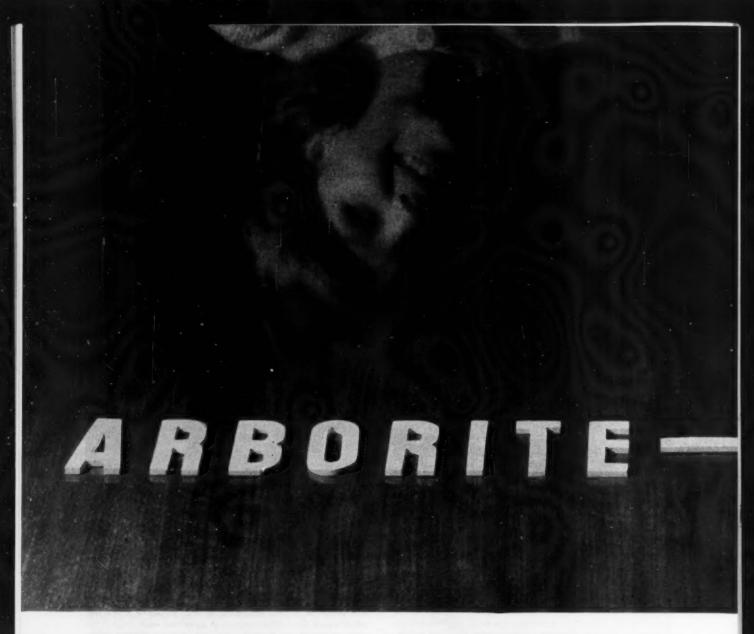
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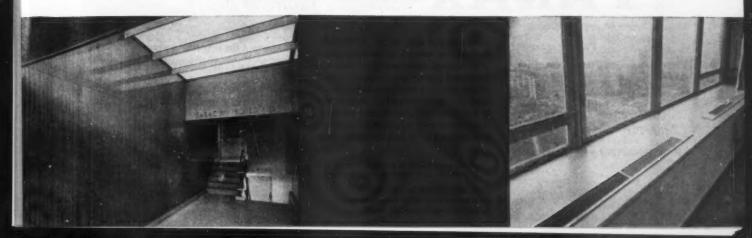
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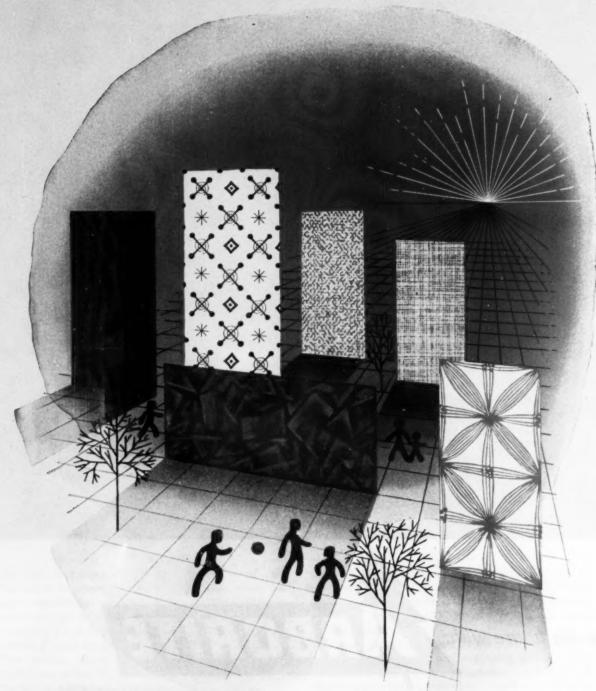
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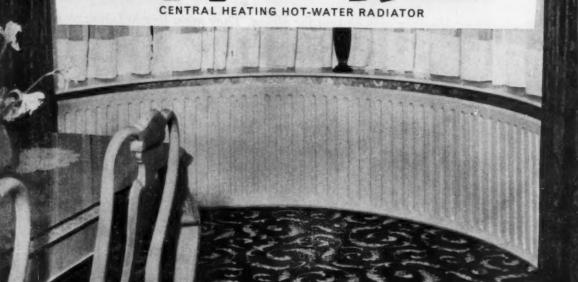
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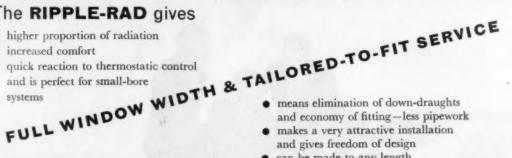
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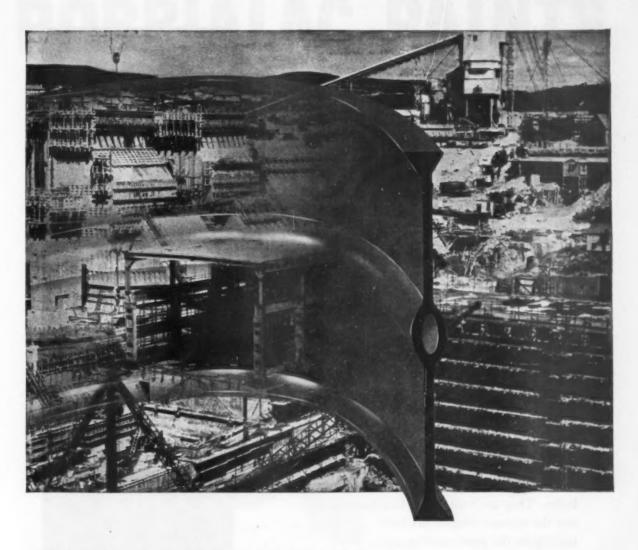


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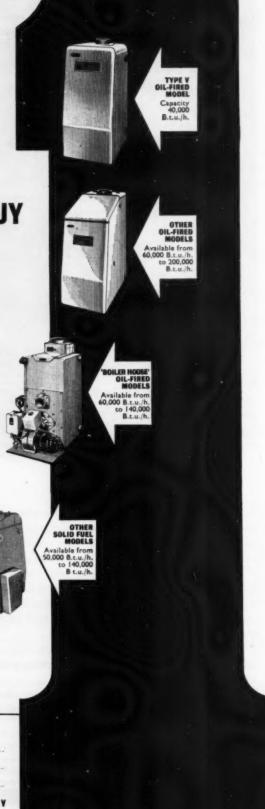
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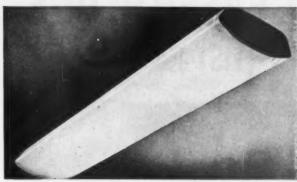
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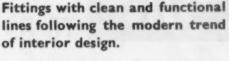


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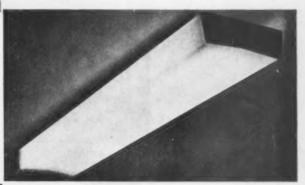
They are designed as diffusing fittings and not based on an industrial back spine, consequently the lamps and reflectors can be arranged to give

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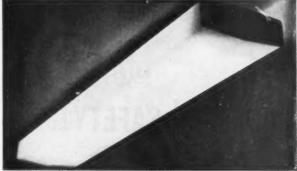
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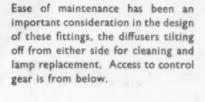
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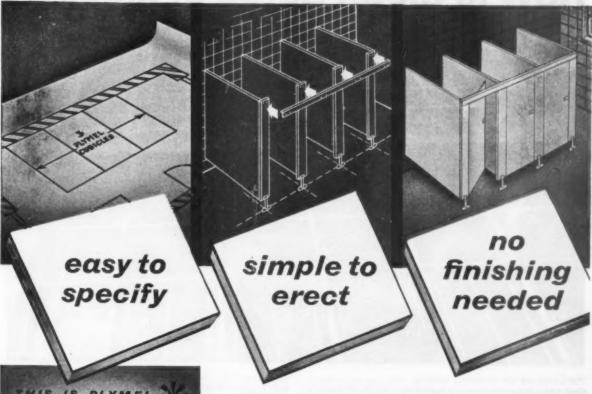
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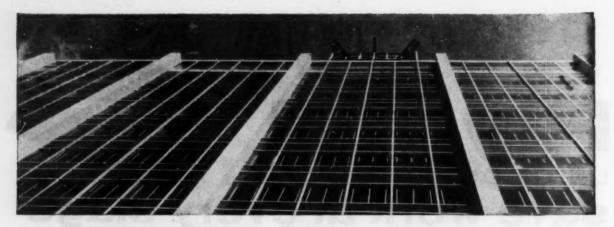
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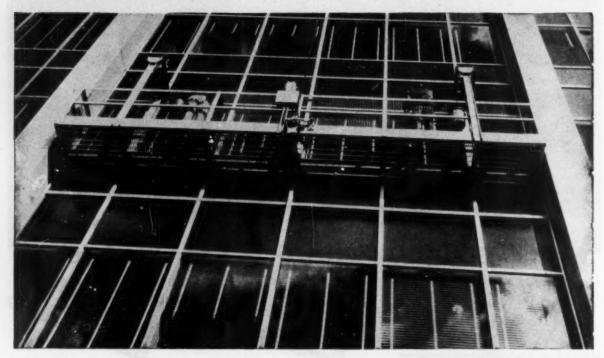
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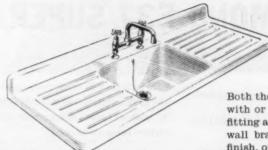
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The single drainer Hostess Sink is shown here complete with combination mixer fittings. List price (sink only without fittings) £10. With overflow £10.15.0.

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TOMO double-glazed WINDOWS also offer the advantages of finely-controlled ventilation and total

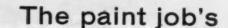
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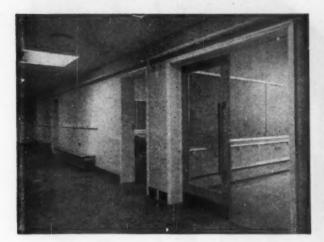
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The Williams & Williams phone boxes. The famous phone boxes in the Town Centre were specially made by Williams & Williams to the design agreed between the architects and the G.P.O.



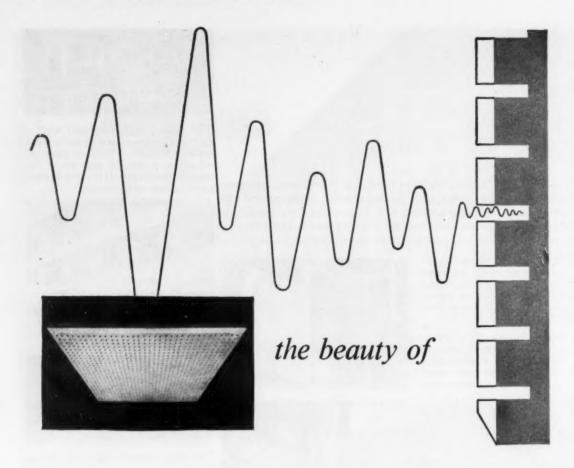
A new way with dustbins Standard equipment throughout Crawley are these dustbin units. The louvred steel front opens on to a steel box which has a hinged lid and contains the dustbin. Rubbish is disposed of from inside the kitchen and collected from outside the house. Specially designed and made for the Crawley Development Corporation by Williams & Williams.

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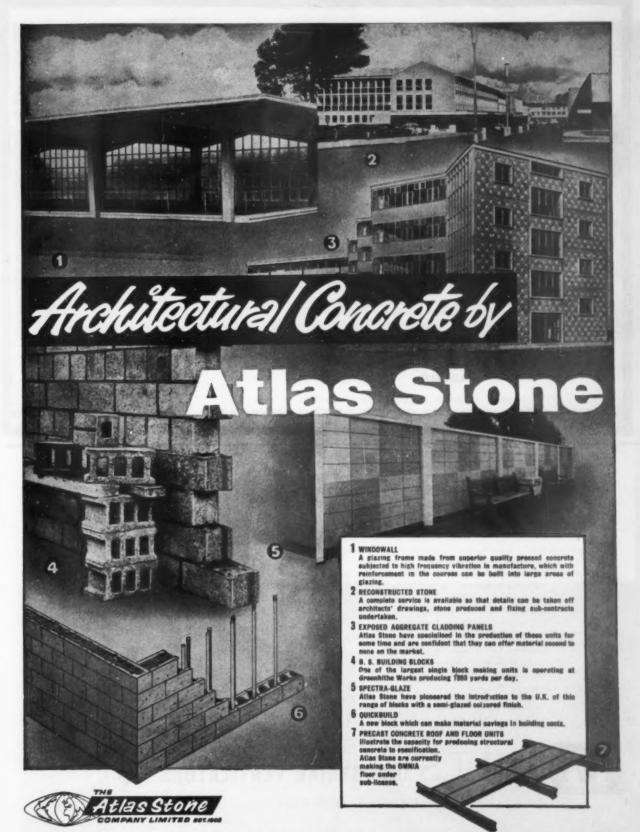
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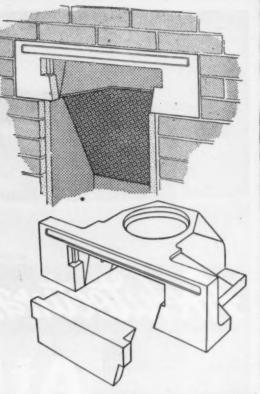
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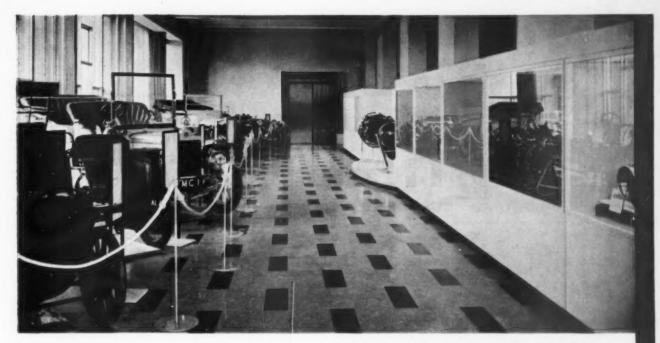
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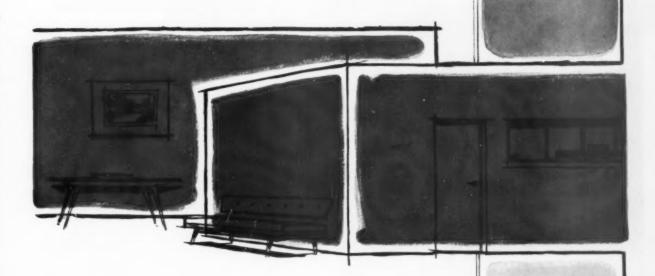
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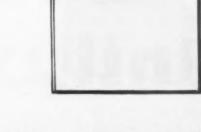
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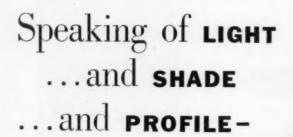


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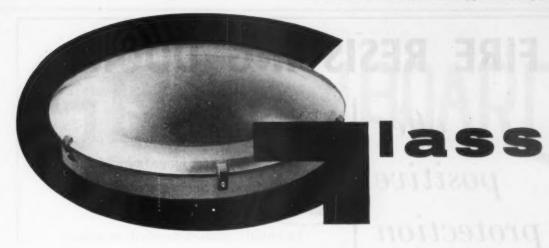
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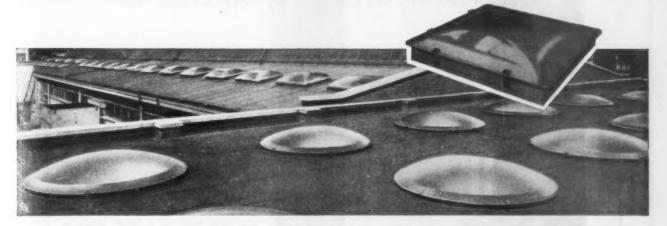
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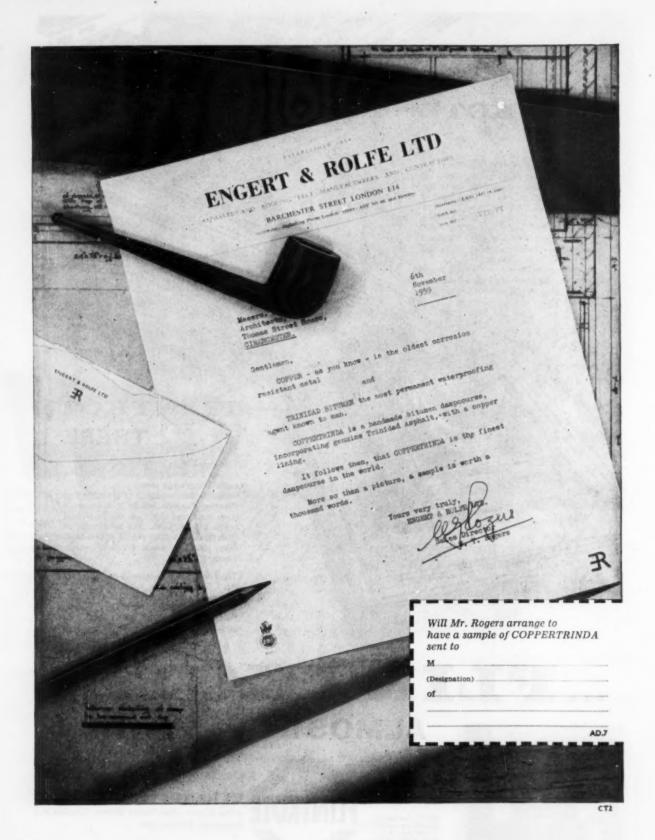


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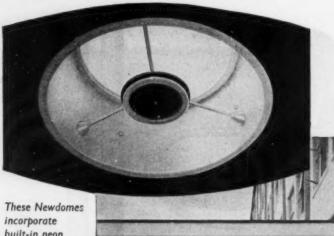
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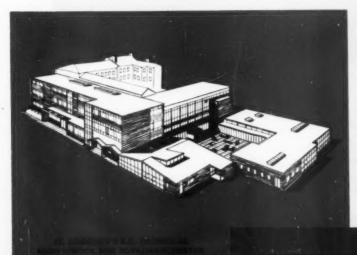


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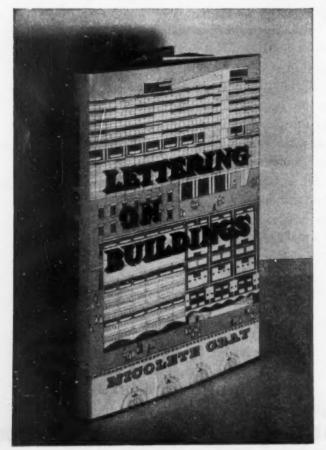
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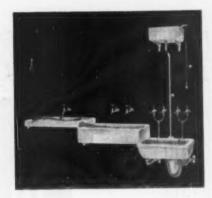
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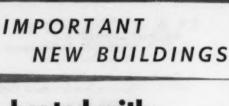
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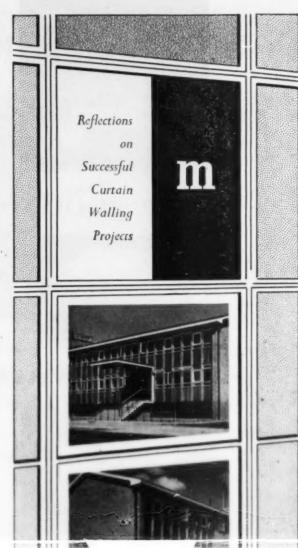


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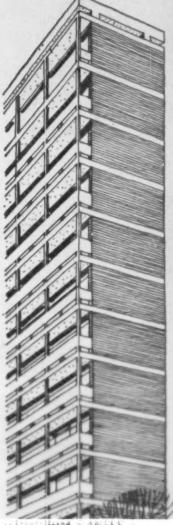
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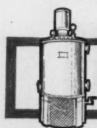


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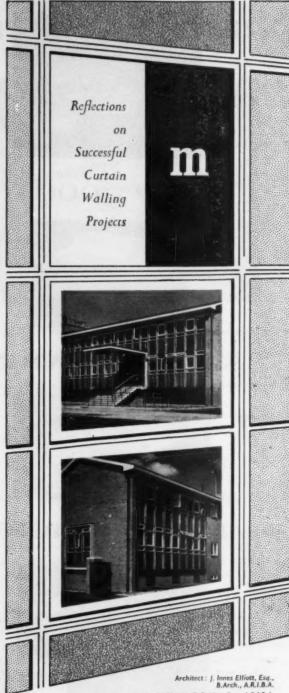
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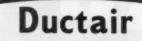
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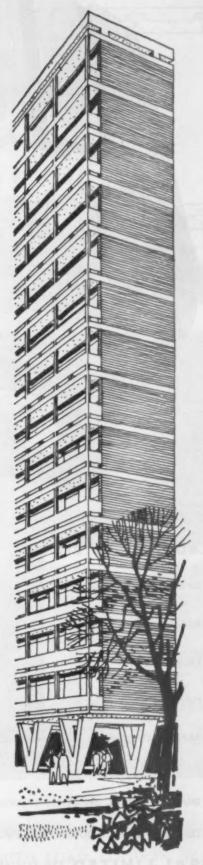
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THE ARCHITECTS' JOURNAL for September 15, 1960



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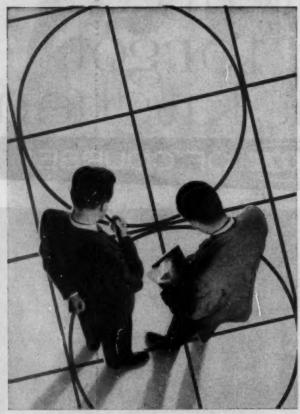


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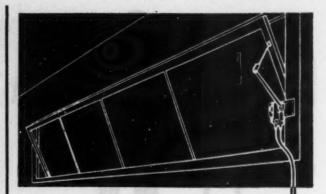
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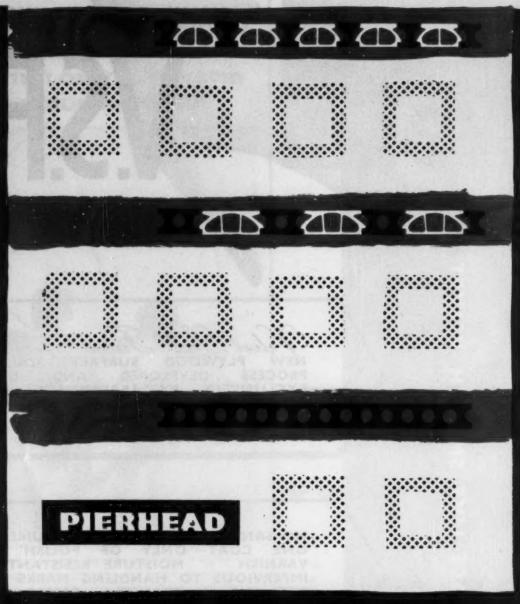
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#### The Architects' Journal

No. 3413. Vol. 132. September 15, 1960

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NOT QUITE ARCHITECTURE

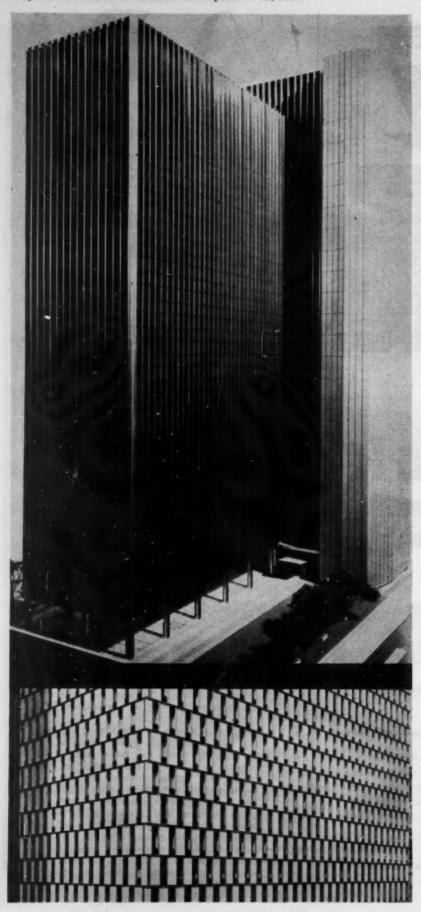
### Letter from Australia-2

Australians are an easy-going blend of conformity, individuality and good neighbour-liness. Perhaps I should say Sydneysiders, for they are the ones I know and they insist that Melbourne people 500 miles away are quite different. I wonder.

Sydney business men on the morning train tend to dress formally; indeed the waistcoat was abandoned only recently, and it took a heatwave of 113 degrees to remove neckties in the offices. Bank employees, it it true, were permitted not long ago to appear to the public in rolled up shirt sleeves, but behind the counter only. The older women deck themselves with prudent elaboration when going out-culminating in the hat (hats are a study by themselves). Undressing on the beach is not done and there are even reports of mothers being reprimanded by beach inspectors for the exposure of naked children. This may have something to do with the strong Catholic element brought over between the wars and reputed to dominate politics.

Town Planning Acts are administered on the assumption that blocks of flats will lower the tone of the neighbourhood. (It required a special Act to permit the dividing of houses into flats.) In certain of the "better" areas social degradation is kept at bay by the prohibition of shops. Yet what one might call "conformity" has its contradictions.

Although a man in a light tropical suit still risks derisive smiles, young women in the suburban centres can safely shop in playsuits that expose the full length of sun tanned leg; building workers seek the nearest pub at lunch time in swim trunks and bare feet; ticket collectors on suburban trains wear only an unpolished brass badge to distinguish them from the rest of the passengers. The passengers, by the way, insist on facing the way they are going, so the trains have to be fitted with reversible seats like the "outside" seats on the old London trams.



Stainless steel is a key material in this model of Four Gateway Centre, Pittsburgh, designed by Harrison and Abramovits. Lower left is the National Bank of Detroit by Albert Kahn, Associated Architects & Engineers. Both of these recently completed buildings make lavish use of stainless steel. Four Gateway Centre comprises a main office tower having deep stainless steel mullions at 4-ft. centres with glass windows and spandrels between and a service block entirely sheathed in 16 gauge stainless steel panels over a masonry structure. The staggered façade pattern of the National Bank in Detroit makes use of alternate panels of marble facing and stainless steel frames housing windows and coloured porcelain enamel panels above and below.

Both buildings were described, together with several others, in a lecture at the RIBA last week by Professor G. E. Danforth, Head of the Department of Architecture at IIT. Professor Danforth's lecture was sponsored by the Stainless Steel Manufacturers' Association and is one of a series he is giving in France, Belgium, Italy and Germany as well as this country. The lecture, entitled "Recent Developments in the Architectural uses of Stainless Steel in the USA," brought to light several facts which probably are not well known here. For example, it is generally accepted practice to protect stainless steel frames and sections by covering them with a pressure-sensitive paper applied either by the steel mill or despatching warehouse and simply peeled off after erection. The protective coating of one building described by Professor Danforth was a sprayed vinyl-based plastic cocoon. He described too the practice in America whereby an architect invites several manufacturers, none of whom has any commitment to carry out the job, to collaborate in a research project on the curtain wall before the design of the building is finalised. This and other facts seemed to emerge

### Boost for Stainless Steel

almost by accident and the lecturer made no attempt to link his examples or make any worthwhile summarising conclusions. Furthermore, he completely failed to appraise critically the material in the context of the building described. This is regrettable. If Professor Danforth is the expert on curtainwalling he is claimed to be this lecture was a unique opportunity to provide the profession with a balanced picture of the use of this material in the USA. In the event it was a lost opportunity. See ASTRAGAL'S comment, page 380.

What some writers have called the Victorianism of Australians is an English export that has defied the climate for longer than one would expect. Perhaps it has been nourished by the precariousness of a pioneering society (Australians talk about their "mates"). But Australia pioneers no longer. Social self-confidence grows almost visibly and that aggressive egalitarianism so prominent in the European picture of Australia gives way to a genial equality that fits the economic circumstances with a kind of rough charm.

For example, the cult of individuality demands that each man has his own house on his own plot of land. This works out at four or five houses to the acre (now enshrined in local bye-laws) which with an ebullient expansion of population spreads huge distances for public services. Thus the Australian newspaper boy does not walk up to every letter-box. His papers are rolled up with sticky tape and thrown from a slowly moving car, into your front porch (or near enough). You leave money and empty bottles at the front gate every night for the morning milk. Gas and water meters hide under weatherproof covers just inside the front fence; electric meters must be mounted in a wooden box under the eaves on an outside wall-all for the convenience of public service employees.

A Sunday evening drive through any suburb reveals at every front gate, the rubbish bin and heap of bottles (beer or wine according to locality) and discarded junk, so incongrous against the neat gardens, waiting for amiable collection men who may call on Monday. Postal delivery is conducted on the same principle. Each gate boasts a twee mail-box of rustic or modernistic design. I have even seen one that is a small scale replica of the house it represented. When the postman comes (rarely before 10 a.m.) he blows a whistle to tell you your letters may be collected.

Indeed, whistle blowing is popular generally. On the buses there is a bell rope stretching from end to end, but the conductor, when the last laden woman has clambered on, blows a whistle to start the driver. In the rush hour, when his hands are full of tickets and clippers, the whistle has, of course, to remain in his mouth. Some buses take economic informality even further. Instead of saying "Balgowlah" or "Lane Cove" on the destination board, they are inscribed "Pay as you enter." Others, more mysteriously—"First set down," often in amateur hand lettering.

At many bus stops, park benches are provided for the halt, the lame, and the pregnant. But at certain hours, when an approaching bus rouses the sitters into expectation it is seen to be marked "School Special" and full of satchels. No-one minds. No-one gets cross—and this is the real point. In this last-year-tropical, next-year-temperate part of Australia amiable goodwill prevails.

JOHN CARTER

# The Editors

# THE TECHNICAL COLLEGE: TO LEAD OR TO FOLLOW INDUSTRY?

THIS issue is devoted almost entirely to a presentation of the user requirements of the mechanical engineering department of a technical college. In presenting his material, the author of this issue has one persistent complaint: namely, that MOE have set too low a target cost for the workshop sections. What has happened, of course, is that the Ministry in setting their target have had regard to standards now current in industry.

It so happens that the industrial environment is still, despite the Factory Acts and despite a marked change of attitude among factory managements, far below other environments in respect of most functional criteria—particularly, of course, in respect of noise. This is a legacy of the heroic age of the Industrial Revolution. Since most of us spend the greater part of our waking hours in this environment, it would seem that its betterment should be an early charge on a wealthy society.

In a society which is not only wealthy but free, the best way in which Government can raise the standard is to use not the power of regulation but the power of example; and the most telling way of giving an example would be to raise the functional standard in the environment of industrial departments of technical colleges. This would be the most telling way because it would give the students an experience of the kind of conditions which they have the right to expect when, later, they go out to work.

Conversely, to keep the standard of amenity in the technical college as low as it now is in the factory, is a certain way of showing that the Government is indifferent to this matter. This is a matter of policy which the Ministry's officers cannot themselves decide; but we hope that, in view of the excellent record in primary and secondary school building which MOE has given to the world, the Ministry's officers will not lose time in persuading their Minister to let them give a lead in technical colleges also.

# WELCOME GUESTS

Next year, for the first time, it will be the turn of British architects to play host to the International Union of Architects, who are meeting in London from July 3 to 7 to discuss the influence of new materials and techniques on design. A stimulating subject, and with papers by Nervi, Russell Hitchcock, and Prof. Jerzy Hryniewiecki, president of the Polish Architects' Association, as well as the contributions from the member countries to open the conference, undoubtedly a stimulating discussion will take place.

The Congress will bring together some of the most influential architects from all parts of the world, and will not so much replace our own annual British Architects' Conference as enlarge and enrich it, turning it into the opportunity of a

lifetime to meet and exchange ideas with the architects of the world. Not surprisingly, the RIBA expects a record attendance of British architects, and no doubt the applications for membership will come rolling in.

Many of us have been nourished before now by the hospitality and the ideas of our colleagues in Scandinavia, in Holland, Germany, Italy, America, Brazil, the Soviet Union, and indeed in all quarters of the world, and this visit of the I.U.A. to London will give us an opportunity to pay some of our debts to our foreign friends.

ASTRAGAL NOTES & TOPICS

NO MORE BRIGHTON AFFRONTS?

There's good planning news this week from the Brighton front. You may remember that a few weeks ago the JOURNAL published three building schemes the local council had asked developers to submit in competitionand criticised the council, which hasn't got an architect, for considering the redevelopment of an eleven-acre site adjacent to the Grand Hotel without relating it to other future developments in the town. Fortunately the council had the good sense to ask the Royal Fine Art Commission for an opinion before deciding which of the three schemes to accept and/or modify. The Commission, of course, said the site should not be planned as an isolated area, and recommended the council to appoint a consultant architect to help not only in the choice of one of the three schemes but in preparing a plan for Brighton as a whole.

In July the Planning Committee approved this suggestion and this week (since I wrote this note) they have been asked to approve a name put before them. I hope they did approve it. There are few people so likely to do this job well as the man recommended, Sir Hugh Casson, He has what the job needs, a unique feeling for the atmosphere of a place like Brighton. If he has been appointed, it is a remarkable piece of

good fortune that a town which seemed to have put its future in the hands of commerce has fallen into the hands of an artist—a worthy successor to its last official architect whose name, if you recall, was Nash.

# COMMISSION FOR FINE ARTISTS

At the same time comes news of Sir Hugh's appointment, together with Raymond Erith's, on the Royal Fine Art Commission. These are good appointments. There has been far too much muttering about the Commission being a body of laymen telling architects what to do. And even if the architects have often needed telling what to do, it is just as well the Commission now has two more real experts to give the expert opinions expected of it.

# TRADE INTRUDES

If the Boy Scouts' Association rented its headquarters to a gang of beatniks for a party, you might suppose it approved of slovenliness and dirt behind the ears. And if the RIBA let its headquarters to a trade association for a public relations party, with top architects among the principal guests, you might suppose it had particularly strong sympathies with the association. It's no good assuming the Institute wouldn't do such a thing, because it has. Last week our profession's top brass were seduced by the stainless steel boys in a No. 66 crammed with tape recorders. cameras, microphones, food, babble and drink. The manufacturers' association was launching an exhibition of stainless steel in US architecture, and the whole thing was an ad-man's dream. Just imagine all those architects going home bung-full of free chicken and Scotch, carrying a stainless steel biro

One of these houses appeared, together with the woman in the middle picture, in the catalogue for the 1908 White City Exhibition; the other comes from the Daily Mail's 1960 book of bungalows.

Architects will spot that the construction of the right-hand bungalow reveals it as the more recent of the two, and will be reassured that modern techniques need not destroy our links with the past.







and memories of a lecture (largely a breakneck description of half a dozen buildings, badly illustrated, using stainless steel) by George Edson Danforth!

It cannot be easy for the RIBA's Finance Committee to decide how to handle applications for its hall. But on this occasion it fell down badly on its job. Was it so overwhelmed by Professor Danforth's position as successor to Mies at the department of architecture at I.I.T. that it failed to see it was, in effect, putting its stamp of approval on the whole evening?

# BRIEFS WITHOUT BREVITY

If competitions continue at their present rate, we shall soon be back at the pre-war state of one a month. Isn't it time, then, to reassess the assessors' role? So often the promoters of competitions don't know exactly what they want, and it might be useful if assessors were always expected to consider the requirements as carefully as if they were designing the buildings themselves. They would obviously deserve a higher fee for doing this, but it would pay off in the end, because all competitors would have a better basis to work on and the assessors would approach the selection with a greater personal interest in the job. Ideally they should then be retained to keep an eye on the development of the winning scheme and thus preserve continuity between the first brief and the completed build-

# RUNNER COMMENTARY

"The case for high building, and even for a continuation of the present scale of subsidies, seems very weak." The quotation comes, believe it or not, from that usually responsible paper the Observer-and from its city pages, which are usually filled with good, sound stuff. The subject was high building costs and the writer was Alan Day, who trotted out all the spec. builders' arguments for spreading little brick houses over the land. After discovering that a three-bedroom dwelling in a two-storey block "costs the community" £131, compared with £208 in a 12-storey block, he worked out how much this additional expense saved in land and in agricultural production, and came to the conclusion that it was "surprisingly little."

But look at his figures. He first assumed that 10,000 people need 137 acres for schools, open space, roads and car parking, and then calculated that they could be housed, in 12-storey flats, in 147 acres—as against 341 acres in houses with fairly generous gardens.

This doesn't seem such a small saving to me. But Mr. Day thinks in a curious way. For instance, he was impressed by G. P. Wibberley's claim that people grow nearly as much food per acre in their own gardens as farmers grow in their fields. No doubt we could all keep ourselves alive on runner beans if we were littered across the countryside in suburban boxes. But a paper like the Observer should surely point out what would be missing from the brick box and scarlet runner economy, which is, of course, the cheapest, the easiest and the most profitable to the building contractor.

# LIVERPOOL GIBBERISH

I was glad to see my colleague Abner of the Architect and Building News reproving Peter Rawstorne for the badmannered gibe he gave Frederick Gibberd in his comments on the result of the Liverpool Cathedral competition. Mr. Rawstorne wrote in the News Chronicle that Mr. Gibberd is "financially one of Britain's most successful architects and could afford to employ the finest brains in the country." Rawstorne has now replied to Abner in a rather silly letter, in which he pretends that it was his criticisms of Gibberd's design that were being taken exception to.

Architectural criticism is one thing and personal innuendo quite another. Architecture needs more well-informed criticism. As a newcomer, Mr. Rawstorne will be welcome if he confines himself to criticism of buildings, but if he indulges in these cheap personal gibes he will soon become a liability to the profession, not an asset.

# LEAST SAID, GOONEST MENDED

My apologies to Ford Jenkins. Somewhere in the process of printing this paper last week, someone took it upon himself to describe Mr. Jenkins as a "goon" client. The "n" should have been hard, as in dodo.

# ASTRAGAL

# **LETTERS**

D. L. Medd, A.R.I.B.A.

G. Grenfell Baines, F.R.I.B.A.

T. G. Jones, A.R.I.B.A.

# Windsor Castle

SIR: I was interested in your comments on the RMS Windsor Castle (AJ) August 11. While agreeing with your criticisms of the furniture, there are other design aspects to note which are of greater importance to the comfort of passengers. On the debit side for example there are the under-provision of washing facilities in the tourist accommodation, and the untidy planning of the cabins. But on the credit side there is the air conditioning system, providing a fresh, choppy atmosphere, the unusually high levels of well-designed artificial illumination, so important in spaces receiving no daylight, and above all, the superb day and night colour and lighting scheme of the first-class dining room, which is something of a tour de force.

D. L. MEDD

Welwyn.

# Liverpool Cathedral

We were pleased to note you elected to illustrate a design with which our name has been associated.

The design was actually submitted under the name of P. B. Jones (Student R.I.B.A.) in association with our firm, and we would like it to be known that full credit for the design is due to Mr. Jones.

G. GRENFELL BAINES

# Preston

We regret the error, which was not ours. We printed the names as given in the official list. THE EDITORS.

# Appeal Dismissed

With reference to Mr. P. G. Kelsey's letter of August 25, we have had the very same experience, where the Inspector recommended that the appeals should be allowed and the Minister (who is also the Minister for Welsh Affairs) dismissed the appeal.

On inquiring further into the Ministry's Appeal machinery, we were refused any further information, even the name of the person who had actually made the decision on behalf of the Minister. We were amazed to find such secrecy in what was supposed to be a fair appeal, and we wrote and told the Ministry so.

Our legal advisers informed us that the MOHLG appeal bears no relation at all to our long established court procedure, and it was their recommendation that we drop the whole matter and save ourselves any further unnecessary expense.

T. G. JONES

Cardiff

# NEWS

# Annual Report

The subject of greatest interest to most people in this report will be modular coordination. BSI is a member of the International Organisation for Standardisation (ISO) which has a technical committee dealing with building construction. A draft ISO recommendation which proposes a 4-in. module for inch-using countries and a 10centimetre module for metric-using countries, is about to be circulated for the approval of ISO member bodies. Working groups have been circulated with first drafts for glossaries of terms for modular coordination and for tolerances and fits for use in the building industry.

It is discouraging to learn that, while there is increased evidence of the establishment of the 4-in. or 10-cm, module in Europe (both East and West), India, USA and Canada (Canada issued a standard based on the 4-in. module during the year), this country has registered little progress so far. A draft proposing the size of the basic module as 4-in., which will form part 2 of BS 2900 (Modular Co-ordination in Building) has been circulated for comment, which appears to be so conflicting, however, that the subject temporarily has been dropped. though work continues on tolerances and the application of the modular system. Progress has been made in the preparation of a document making recommendations for a system of tolerances and fits for use in the building industry as an essential to the wider use of industrialised (prefabricated) components for building.

Concerning fire tests, the Joint Fire Research Station of DSIR and the Fire Offices Committee have put forward a test for assessing the fire hazard of a material in terms of its combustibility and the likelihood of its adding to the intensity of a fire. If the test (which broadens the range of results in the classification hitherto obtained under the spread of flame test) is accepted for inclusion in BS 476, part 1, Fire Tests on Building Materials and Structures, the spread of flame test will be withdrawn.

Work is progressing on a comprehensive standard for lightweight aggregates. Much has still to be done, however, to reconcile the requirements for the various aggregates because of the many differences between them. Within its engineering division BSI has started work on a standard for lighting fittings which will be of the "omnibus" type covering all general-purpose lighting fittings for discharge and incandescent filament lamps. The Hospital Equipment Standards Advisory Committee has requested a standard for special lighting units and fittings for hospitals, and work on this has commenced.

BS 2049, part 1, which deals with kerosene boilers, burners, space heaters, cooking and boiling appliances was revised earlier in the year as a matter of urgency after a number of accidents had occurred with such appliances.

BSI has been much concerned in discussions on an approvals scheme for domestic electrical appliances. First steps in setting up an authority to operate such a scheme have now been taken. The chairman of the North Western Electricity Board and of the British Electrical Development Association has been appointed chairman of a provisional board of management. The board consists of representatives of the electrical supply industry, the British Electrical and Allied Manufacturers' Association and the BSI, together with representatives from the electrical contracting industry, retailers and wholesalers.

# **ISBB**

# Urban Bioclimatology

At the second congress of the International Society of Bioclimatology and Biometeorology held in London last week a special section was devoted to the subject of Urban Bioclimatology. This is a relatively new subject for scientific study and is of great importance to the architect, as it is concerned not only with the influence which buildings exert on the climate immediately surrounding them (the "micro-climate") but also with their ability to produce an acceptable climate within. The sessions of the urban climatology section provided an occasion for some of the few research workers in this field to meet and to compare notes. Professor Victor Olgyay of Princeton University described his method of determining orientation and building shape from average meteorological data obtaining in open sites. Though his approach was perhaps the most comprehensive of those put forward, the discussions showed both the danger of using averages without taking account of the departures from them and the difficulty raised by the lack of precise information about indoor environment.

Professor Robinson and Mr. Peleg from Israel described a method of calculating the amount of heat which will reach a building of any shape and orientation through the rays of the sun. M. Dreyfus, of the Centre Scientifique et Technique du Bâtiment, Paris, described experimental work on the calculation of thermal inertia in tropical building design and both Dr. Dirmhirn of Vienna and Mr. Shellard of the Meteorological Office described work on recording climatic differences in different parts of a single city. Professor Page of the Department of Architecture of the University of Sheffield, summarised his own and other people's work on the influence of building shape and of external obstructions on natural ventilation in the tropics; and the last speaker, M. Givoni, described the influence of roof insulation on indoor climate in Israel.

Throughout the meeting there was evident difficulty in co-relating the results of different workers, chiefly because each was concerned with a slightly different problem and each had therefore chosen a different technical language in which to present it. Tom Markus, one of the few architects present.

expressed the fear that, by tackling one phenomenon at a time instead of all together, research workers risk producing results which are only partially valid. He instanced the measurement of daylight and the failure to take account of the indirect component. Dr. Landsberg, Head of the Department of Climatology of the U.S. Weather Bureau, replying to this criticism, pointed out that experiments in bioclimatology are exceedingly expensive and that unless investigators narrow the field to those single aspects which are felt to be critical, they cannot be undertaken at all.

Though it would be wrong to underestimate the difficulty of these studies, it is certain that their cost must be small when related to the great social benefits that can accrue from them. It is to be hoped that governments will see this point. The immediate advantage arising from any particular study may be small, but its contribution to the advancement of the science as a whole may make all the difference to architecture and environment.

# APPROVAL GRANTED

# Tower for the Tower

The Minister of Housing has granted permission for the building of a 12-storey office block at Tower Hill on a site in Cooper's Row, which was the subject of a public inquiry in June. The LCC, supported by the Royal Fine Art Commission. considered that the height of the main block should be reduced to eight storeys. But after viewing the site from a number of places the Inspector concluded that the proposed building would not distract attention from the Tower of London, and the development company, Bernard Sunley Investment Trust Ltd., proposed to set the tower block back from the Cooper's Row frontage, where, the Minister writes, "he thinks it would be less obtrusive than in the position in which it was shown to the Royal Fine Art Commission."

# PUBLIC WORKS CON-GRESS

# Metropolitan Problems

"Coping with the Car" will be a major subject of discussion at the Public Works and Municipal Services Congress at Olympia on November 14-19, and this is the title under which J. L. Womersley and L. C. Howitt, City Architects of Sheffield and Manchester respectively, will speak at the first session, on "The Architect's Contribution: (1) in the Housing Estate; (2) beyond." They will be followed by Mr. E. Ogden. Traffic Engineer to Lancashire County Council on "The Development of Traffic Engineering in a County."

The Conference will, as usual, be accompanied by an exhibition of plant, machinery and equipment for the needs of modern communicities, and will be opened by the Minister of Housing and Local Government.

10 DESIGN: BUILDING TYPES

SER No.	(97)
UDC No.	725-5

# TECHNICAL COLLEGES: A SURVEY OF USER REQUIREMENTS FOR THE MECHANICAL ENGINEERING DEPARTMENT

This is an attempt at something new in architectural journalism: an attempt to give an orderly presentation of user requirements. One of the difficulties of architectural practice today is that our society is continually asking for new sorts of building: further, that these buildings are not wanted one at a time, at decent intervals, but together. This poses a problem of information, for these new buildings are mostly large, they take a long time to plan and longer still to erect. By the time the first of a programme is built, a fair proportion of the remainder will be well under way. This means that there is little opportunity for the sharing of information and, as a result, each office must work out each problem for itself.

However educational this may be, it is still a great waste of professional labour. We believe that much of this waste could be prevented if architects who are the first to build a new type were to record their findings in a sufficiently systematic way to be of use to their successors.



The multi-storey building on the left is the main classroom block of the N.W. Kent College of Technology (described in the JOURNAL October 7, 1954, and April 28, 1955). The Mechanical Engineering Department is constituted in the two single-storey blocks on the right.

There are, of course, inherent shortcomings to this kind of study. The first buildings of a new type to be completed are not necessarily in themselves worthy exemplars. Information put forward early in a programme and by one practitioner can never have quite the authority of information put out later when experience has had time to accumulate. Those who use it, therefore, must do so more warily. In our opinion, however, the virtue of timeliness more than offsets the lack of authority.

The subject of this first "user survey" is the Mechanical Engineering Department of the Technical College.

The author is J. H. Garnham Wright, an architect formerly in the office of the Kent County Council (Chief Architect: E. T. Ashley Smith, FRIBA) who recently completed the Mechanical Engineering Department of the North West Kent College of Technology at Dartford. All the information recorded in this issue was assembled in the course of designing and constructing this building, which is also the sole source of illustration. So that Mr. Garnham Wright's experiences could be presented against a broader background, we have associated with him, not as co-authors, but as critics, two other architects who have also had some experience in this field: John Redpath, former Deputy County Architect to Somerset and now with the War Office, and Guy Oddie, formerly with the Architects and Buildings Branch of MOE, now with the University Grants Committee.

The Technical College seems to us to be a key building, if only because it stands at the meeting point between the schools programme and the environment of work. If the primary and secondary school prepares people for life in general, the Technical College prepares them for their working life; and, in fact, the different departments of the Technical College reflect the different working environments: the commercial department reflects the office, the mechanical engineering department reflects the factory and so on. Historically, in this country, the schools programme has

been the spearhead of architectural reform. No environment stands in greater need of this reform than that of work. Despite the influence of the Factory Acts, most people still work in conditions which, as regards sound, heat, cleanliness and light, fall far below the standards which apply in other sorts of building; and to these disabilities the architect would add visual disorder. It is no accident that when a man of today wishes to disparage a building he says that "it looks like a factory."

Technical Colleges, of course, have many departments other than that of Mechanical Engineering, but for the architect this department is much the most troublesome. It is inherently troublesome in that so much of the equipment is bulky, heavy, with complex service requirements and gives off noise, heat and steam in a way which makes comfort conditions very hard to obtain: it is also the most troublesome in the sense that information about it is the hardest to get. To be useful, a user survey must go into considerable detail. The number of possible departments which can be included in a Technical College is almost limitless. Mechanical Engineering, as well as being the most troublesome, is also one of the most common: it seemed better to consider this one department in the required detail rather than

to attempt many in less.

At the suggestion of John Redpath and Guy Oddie, the author's information is presented in a standard format for each room. What goes on in the room is described, official data bearing on the room (i.e. taken from MOE Bulletin 5) are summarised and commented on and the general room service requirements are listed. This completes the data which may be taken to be universally applicable; but this is followed by an annotated list of the equipment actually installed in the North West Kent College of Technology and each room is illustrated by plan and (usually) by photograph of the corresponding room in this College. This equipment is variable and it is most unlikely that it will correspond exactly to that used in a similar room in another College: it is, however, typical and its inclusion in this study was thought to be of value in showing relative newcomers to this field the kind of equipment they must expect. The real moral concerning equipment is contained in the typical schedule headings below where the author lists the data about each piece of equipment which the architect must obtain before he can begin detailed design (and which, in Mr. Garnham Wright's experience, school authorities are often loath to give him).

# 1 THE BRIEF

Technical colleges, as a whole, differ from their predecessors in one major respect: their equipment is extraordinary for the size, quantity and complexity of engine and machine; and from other educational projects in another major respect: the need for flexibility and a capacity for extension. Previously, the teaching and craft rooms, usually rectangular in plan, of evening institute or college, could house whatever equipment was needed. The buildings were self-assertive; monuments to the palaeotechnic faith in education. They were built to express ideas rather than to serve their users. Their major role was to provide accommodation. Equipment was furniture. When new buildings were required a list of rooms and room-sizes was pre-requisite, and from this the architect prepared his plans. The educational experts, on behalf of the clients, then made layouts of benches, tables and equipment, fitting whatever they could into each room, and the architect detailed the fitments which could be built-in, to be provided by the building contractor. This did not necessarily ensure an organic plan with rooms well suited to their use, but desks and benches with light equipment, if any, did not pose serious problems to the planners. A general system of procedure became established for some Authorities: first; the schedule of rooms was made and approved, then the educationalists arranged the equipment, sometimes with the help of the architect, whose working drawings would be in preparation. The layouts of the furniture in the rooms would be approved at any time during the progress of construction, so that the lists of equipment and fitments could be ordered separately for supply before the building was handed over. Perhaps if the headmaster had been appointed, he would be invited to choose his require-

ments from manufacturers' catalogues of suitably cheap furniture.

Today the ghost of this system of procedure haunts the teams of experts responsible for the design of the new colleges, and if not laid may thwart their efforts.

It is important that the changes in requirements are fully understood. The new colleges are built for people and equipment. They will be peopled by the pupils from the new post-war secondary and comprehensive schools, who will be familiar with the skilful designs which have made the British school building universally noted. These students will have been influenced by the newer methods of education. They will expect their colleges to demonstrate a further advance in buildings and technique. Familiar with an assembly hall in a new school, they may expect an auditorium in a college; trained in the use of a school library, they may expect a college to provide an ad-

Top strip of a standard equipment schedule which the author applied to every "room" in the department. Each heading represents a question to which an answer must be obtained in respect of each piece of equipment.

	Sched	fule of equipm	ent and	fittings for Mochin	e Sho	ob				
EQUIPMENT	01	FITTING	102 1		SER	VENTILATION	00	NNECTIONS &	ELECTRICITY	
DESCRIPTION	3 UPPEY	position type of floor fixing type . bench botted of	floor work 2	DIMENSIDMS overall best (too	connectes to other	machenics)	OSS	R hot cold	DC AC special requirements	REMARK

vanced and specialised library service. In every respect of amenity and design, the new college must be alive to these influences.

The equipment will be elaborate and expensive. Its value may equal the cost of the building. It will require services whose cost may constitute at least half of the building contract, and these services, if not carefully designed, will run riot, despoiling the unity of the building; thwarting efficiency and harmony, and the attainment of true eco-

If the architect is to carry out his work successfully, he must first secure the cooperation of his consulting engineers and educational advisers, to make available, in time, all the relevant information. The engineer will require the manufacturers' working drawings of the equipment before he can produce his own working drawings, which, in turn, contain information prerequisite to the architect's task of designing the college, if he is to use modern building technology to provide a building fitting to its task. The details supplied last in the old system of procedure must be first if the architect is to serve his client faithfully, and if the client is to avoid long delays and serious extra costs during the progress of the contract.

# 2 PROCEDURE

The present official system of procedure is still preoccupied with the schedules of accommodation. Any new system to replace this must begin, not from the room areas, but from the primary consideration of the people who will use the building, what they do, and what equipment and material they

(1) As at present, the courses should first be forecast, and the likely number of students estimated for each. This information should be given to the architect, who could usefully be involved in the discussions from the outset. The rate of development for student numbers and the future growth of the college should be estimated.

(2) The schedule of equipment for each course should be drawn up, given approval and issued to the architect, together with an approximation of areas per department. If a schedule of accommodation is required at all, it should follow this exchange, but no final stipulations should be made about it.

(3) The architect, with his consultants. should be given the opportunity to carry out a "user requirement research," and to obtain full details of equipment from manufacturers. In order to do this methodically he must prepare an equipment table. Suggested headings for such a table are given at the foot of the preceding page.

The architect will need access to existing buildings, and discussions with specialists; especially with the local inspectors and the HM Inspectors responsible for approvals. His aim should be to find out what is to be done in the building, how it is done,

used to do it. He must avoid asking any specialist what he wants, but examine what he proposes to do.

(4) The architect should then produce diagrammatic layouts of departments; and a preliminary estimate of the cost, drawn up in some cost-plan form, showing (such as by division into "elements") how the expenditure is allocated. The submission of this cost plan with the preliminary plans can be helpful to both architect and client. It enables the architect to illustrate difficulties, and gives the client a fuller understanding of the effect of indecision. Two factors of uncertainty must be taken into account (a) the client may be forced to change his requirements relating to equipment as the work proceeds (i.e., total finality is difficult), due to industrial or educational developments (b) the equipment is always subject to modification by the manufacturers, and the model eventually delivered may be different from the model ordered. A substantial contingency should be included as a separate sum in the estimates to cover these changes in schedules or specification.

(5) With these preliminary proposals approved, the architect should prepare equipment-layout details, in collaboration with the specialists. (The scale for these drawings can be usefully large: say, 1 in. to 1 ft.)

(6) The equipment layouts should be approved by the client, in the clear understanding that, subject to item 4 (a) and (b) above, such approval is final. The special contingency sum may be adjusted at this stage, which should be reached not less than 18 months before construction is to begin on

(7) Final working drawings may proceed. In view of the cost of the mechanical and electrical engineering services, and their complexity, it is important that full working drawings should be prepared for them by the consultants working together with the architects. This is indispensable for the purpose of cost control and ideally the services should be measured by the quantity surveyor, and included in the bills of quantities in the appropriate "element." It is doubtful if real cost control can be exerted until this is done. It is an odd fact that this form of engineering seems so inexact a science. The drawings and documents for it contrast increasingly with the growing number of precise and highly ordered drawings needed for the building

# 3 THE LAYOUT OF THE DEPART-MENT

The functional requirements of the courses indicate a classification of equipment and space thus:

1 Classwork: lecture; drawing practice; light laboratory work: involving the use of normal furniture and light equipment; in spaces used equally at all stages of the

how many people are involved, and what is course. (Space divisions are usually scheduled as (a) Classrooms; (b) Lecture rooms; (c) Drawing Offices; (d) Elementary Engineering Science Laboratories.)

> 2 Practical experimental work, whose purpose is to test or elucidate basic theories and principles: involving the use of special equipment and bulky or heavy plant; in spaces used at different stages of the course. Tangible end-products are not involved; the equipment is used for experimental investigations only. (Space divisions are usually scheduled as Laboratories for (a) Applied Mechanics; (b) Boiler House Equipment; (c) Heat Engines; (d) Hydraulics; (e) Strength of Materials; (f) Materials Testing; (g) Structures.)

The equipment for this purpose is best arranged by subject, and in the sequence required by the course, which usually accords with the sequence of the titles given here. Very often the subjects (b) and (c); and similarly subjects (e), (f) and (g) may be combined in one space. If a space division is employed, the suite of rooms should be intercommunicating, as at any one period, groups of students in the same class may be using equipment for the different subjects (i.e. in different rooms).

The absence of end-products means that storage space is not needed for raw materials and finished work. Storage is required only for the fuel for engines (solid fuel, oil, petrol, according to type of equipment); the maintenance of equipment (lubrication, tools and spare parts); materials for operations or testing (water, metal rods, etc.); and small apparatus. Access from a service drive is needed for the fuel stores to the Boiler House or Heat Engines, and for the equipment.

3 Craft work and practical machine operating, whose purpose is to enable students to acquire skill and a knowledge of tools; involving the use of special equipment, tools, machines and machine-tools, in spaces used at various stages of the main certificate courses; or for specialised courses. (Room titles may be scheduled as: (a) Fitting Shop; (b) Woodwork or Pattern-Making shop; (c) Foundry; (d) Welding shop; (e) Machine shop; (f) Machine Tool Laboratory.) End products are involved: the equipment cannot be used without materials being shaped or moulded.

The equipment for this purpose is best planned to production processes, so that factory methods are followed. The productive nature of the work implies a storage requirement for raw material and finished work, in addition to storage space for machine maintenance (lubricating oil, tools and spare parts) and operation (oxygen cylinders: fuel for forges, etc.). Access from a service drive is needed for stores and

4 Experimental and practical work, whose function relates to both the activities in 2 and 3 above, namely: fine measurement,

material processing etc., involving the use of specialised apparatus (mainly but not exclusively bench equipment) in spaces used either at special stages of the course (2) or in connection with special parts of the production process (3).

(Room titles may be scheduled as (a) Metrology, (b) Metallography, (c) Metallurgy

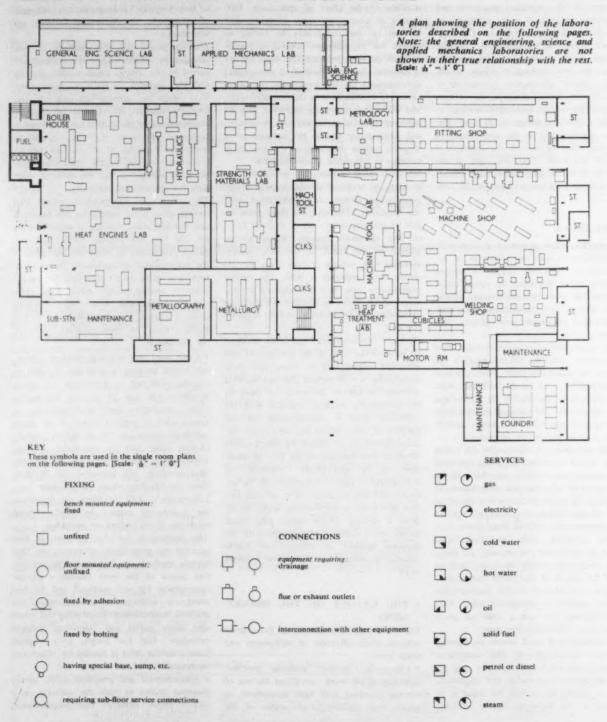
Laboratories, (d) Dark Room, (e) Heat Treatment Laboratory). There are no storage requirements meriting service access.

5 Maintenance work by laboratory technicians and staff, whose purpose is to carry out repairs and adjustment to the educational equipment, involving the use of a work bench with vices, a lathe, a bench

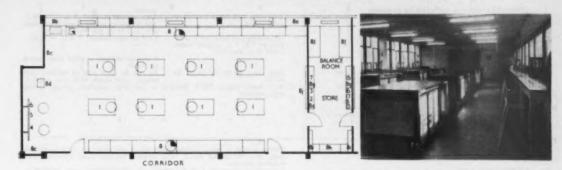
grinder and a drill or similar tools, in a space kept separate from student-occupation.

This is usually scheduled as a Maintenance or Laboratory Technician's Room. It may occupy an area of 300 to 500 sq. ft. and should be planned as an ancillary space to the whole departmental area.

# LAYOUT ADOPTED AT DARTFORD



# GENERAL ENGINEERING SCIENCE LABORATORY



Note fixed roller type chalk board for formal the room. The centre benches are specially designed for mechanics' experiments, having large flaps and cupboard storage for equipment. (Equipment schedule No. 1.)

# NATURE OF WORK

Simple experiments in elementary mechanics and in heat and electricity. (Specific and latent heat; Ohm's law, etc.) There are 20 to 30 students working in pairs at beaches, each pair using similar equipment and usually doing the same experiment; the whole class usually working under the teacher's verbal instructions. Notes and written reports

# OFFICIALLY RECOMMENDED DATA

- Ref. MOE Bulletin No. 5: Specification and Planning Requirements
  C Light and small equipment and materials
  C Any floor

- C Quiet not essential
  6 Special services
  Lighting: daylight: control of sunlight by blinds
  15 Lighting standards: general lighting only. Minimum illumination of 10 f.c. or 2 per cent daylight factor
  Special Services:
  29 Water: sink or basin with hot and cold water supply adjacent to the wall
- wall Electricity: A.C. single phase supply, 240V. to several sockets 35 36
- Fittings with gas supply: benches adjacent to wall with sockets
- Fittings with gas supply: benches adjacent to wall with gas taps Fritings:
  43 Weight: comparatively light equipment, 60-100 lb. per sq. ft. Fittings:
  49 Benches: adjacent to wall

Area per student 35 sq. ft. = 1,050 sq. ft. total Revised in Circular 1/59, April 1959, to 40 sq. ft. per student = 1,200 sq. ft. total

# Comments

Agreed, but position en suite with heavy laboratories is preferred and these must be on ground floor
Agreed
Agreed
Agreed
Agreed
Agreed. Sunlight best avoided by orientation or fixed external control
Not enough. 15-16 f.c. required and could be higher with advantage

Agreed: 1 sink 30 in. by 18 in. by 10 in. with standing waste

Agreed, but low voltage D.C. also required on wall benches, say, 14 points total Agreed. Wall benches can be made up from movable benches. 40 ft. 0 in. total length on each side of room (80 ft. 0 in. altogether). 2 ft. 4 in. minimum width. 3 ft. 0 in. high Agreed. No. 14 gas points required

Centre benches also required (see schedule), 4 ft. 8 in. by 3 ft. 0 in. by 3 ft. 0 in. by 3 ft. 0 in. high with 2 ft. 0 in. hinged flaps at each end and two cupboards

under 20 storage cupboard units approximately 1 ft. 4 in. by 1 ft. 8 in. deep to stand under benches are advantageous
Minimum of 1,250 sq. ft. required for equipment list, as shown, but this contains some "non-standard" items to suit local requirements

# SUMMARY OF SERVICE REQUIREMENTS

Heating: Warmed air heaters with facilities for external intake to speed up air change when required Electricity: 240V. A.C. single phase. Low voltage D.C. (from variable voltage supply unit in the room). (D.C. 2-24V, A.C. single phase 2-24V) Water: Hot and cold Drainage (limited requirements, as one sink in this room is usually enough) Services required only at wall benches

# LIST OF FOUIPMENT.

ACRES M	OR MARKET !			
Ref.	Description	Weight	Special Requirements	Remarks
1	8 Mechanics' benches (each containing the following set of equipment: a. inclined plate (for frictional experiments) b. screw jack (efficiency of single machine) c. four pulleys (triangle of forces) d. disc and cords (principle of moments) e. jib crane (4 ft. 0 in. approx.)	2½ cwt. each	Centre position	Included in cupboard under each are 6 pieces of equipment as per schedule
	f. 2 spring balances]			
2	1 Western pulley block	To carry 3 cwt.	Working position: hanging. Suspension required	Stored: with 20 ft. 0 in .chain. Fixed by college authorities when used
3	1 System of pulleys	To carry 1 cwt.	Hanging position required at high level	Sheaf of 3 and 2 blocks, with rope Fixed by college authorities only when used
4	1 Wheel and differential axle	½ cwt.	Minimum height to top 5 ft. 5 in. when mounted	Fixed by college authorities when used only
.5	1 Worm and worm wheel	-	Minimum height to top 5 ft. 5 in.	Fixed by college authorities when used only
6	1 Compound gear train	-	Minimum height to top when mounted 5 ft. 2 in	Fixed by college authorities when used only

7 8	Other small apparatus for mounting on panels 18 Beaches (standard) with gas, water, and electrical services	{ cwt. each	total length 1 in	w voltage outlets: 5 A.C. or D.C. h. gas cocks are for hose connections. h. and 1½ in. gas mains supply
			10 forming wall bench 41 ft. 8 in. Lov long by 3 ft. 5 in. overall width. 2-24V A.C. and D.C.	w voltage outlets: 9 A.C. or D.C.
Sa	1 Bench	½ cwt.		ets of balances in glass cases stored bench
86	1 Sink unit (bench)	½ cwt.	Sink size: 30 in. by Ill in. by 8a	and 8b form part of window wall ich; total length 50 ft. 0 in. approx.
8c	2 Variable voltage supply unit	5 cwt.	A.C. mains supply 230 V. feeds-in to requirements	
OTHER 8d 8e	1 Winch 1 Storage unit for weights	4 cwt. 8 cwt.		
Foure	MENT IN STORE/BALANCE ROOM			
80	2 Balance bench	# cwt. each	Centre section of bench isolated from b pads, etc., to special detail (To pro	ench and structure, on 1 in. rubber otect balance from vibration and
Sig Sh Si	4 Shelf storage units 1 Shelf storage unit 2 Shelf storage unit	cwt. approx. cwt. approx.	working shocks) Top section comprises lockable cupboar Open timber shelving Open timber shelving	rds. Remainder: open shelving
#j	1 Chalkboard	-	" Unique " type floor mounted	

# REMARKS

REMARIAS

Combined store and balance room would usually be required. Containing: 2 balance benches 5 ft. 9 in. by 2 ft. 4 in. by 3 ft. 0 in. high; 4 shelf units 4 ft. 0 in. long by 1 ft. 0 in. wide with minimum of 6 shelves, top section to consist of movable cupboards. 2 shelf units 4 ft. 0 in. long by 8 in. wide. 1 shelf unit 4 ft. 0 in. long by 1 ft. 8 in. wide

Additional equipment required in laboratory (according to local requirements): Chalkboard, "Unique," floor mounted. Type 6: 8 ft. 3 in. long by 7 ft. 6 in. high. Storage cabinet for laboratory sheets

The centre benches as detailed are not standard: this provision will vary to local requirements

# APPLIED **MECHANICS** LABORATORY



Light equipment and bench equipment. Note the wall bench which is made up from six separate "standard" laboratory benches, fixed together by a simple device in the slotted edge of the work top. The fixed bench under the windows is a continuous well district contribution. wall duct containing services.

# NATURE OF WORK

Experiments in applied mechanics; (a) involving statics (forces in equilibrium) and dynamics (moving forces); (b) determining the effect of forces. 20-24 students working in pairs but on a greater variety of equipment than in the Elementary Engineering Science Laboratory. Each pair engaged on a different experiment in any one class-period, and completing a round of experiments during the course of the year. Instruction cards are used to guide the experiments. Notes and written records are made (Up to 10 students may be using the Advanced work room)

# OFFICIALLY RECOMMENDED DATA

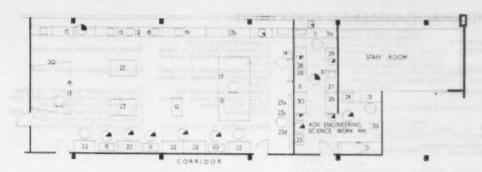
Wide varying requirements: consult local needs. Heavy and bulky equipment and materials

Not very noisy
Clean

Ref.

Comments

en suite with heavy laboratories



Lighting: Daylight: control of sunlight by blinds Lighting: Artificial: non-stroboscopic essential Lighting: Artificial: individual directional lighting: minimum 24 f.c. Lighting: Artificial: Individual directional fighting: minimum 24 i.e. al services:
Water: Mains supply essential
Water: Sink or basin with hot and cold water supply adjacent to wall
Fittings with water supply and drainage. Equipment supplied with
water for cooling, etc.
Electricity: A.C. 3-phase 400 V. (widely varying requirements)
Electricity: A.C. single-phase supply to several sockets 36 Fittings with electricity supply. Benches adjacent to wall, with sockets
38 Equipment supplied with electricity for motors, heating, etc.
39 Fittings with gas supply benches adjacent to wall with gas taps
4 Equipment: weight: heavy equipment, over 200 lb. per sq. ft. with
4 very heavy concentrated loads
5 ft. 0 in. by 7 ft. 0 in.
4 Fittings: Benches adjacent to wall
50 Fittings: Benches in centre of room (widely varying requirements)
4 Area per student = 50 sq. ft. = 1,500 sq. ft. (No change in Circular 1/59)

Sunlight penetration best avoided by orientation Agreed Not usual: 15-16 f.c. general lighting is normally sufficient

Agreed
Agreed
Not usually requiring more than flexible hose connections and drainage
to sink from bench equipment
Also D.C. sometimes required for motor-driven equipment
3-phase supply to perhaps I motor only
Approximately 6 single-phase outlets required
Agreed
Usually restricted enough to be confined to wall locations
E.g., 3 gas taps on 50 ft. window wall bench
Not normally

Not necessarily

Agreed Agreed 1,500 sq. ft. is sufficient for equipment numbered 9 to 23. Minimum of 1,700 sq. ft. would be required for full list

# SUMMARY OF SERVICE REQUIREMENTS

nent for Advanced Work Room:

Balancing machine
 Dalby Piston and crank balancing apparatus
 Whirling of shafts apparatus

Heating: Warmed air heaters with facilities for external intake, to speed up air-change when required Electricity; 240 V. A.C. single phase. 400 V. A.C. three phase. 240 V. D.C.

Gaser: Hot and cold
Water: Hot and cold
Drainage: usually I sink only suffices
Equipment can usually be arranged so that services are required on wall benches only

LIST	OF EQUIPMENT			
Ref.	Description	Weight	Special Requirements	Remarks
9	Motor driven worm gear	2 cwt.	230 V. supply rectified to 230 V. D.C. by rectifier in separate workshop	Built locally by college to suit own requirements. Not likely to be supplied elsewhere Volt and amp. meter in each case is mounted on a single tubular standard (on a circular base on the floor 4 ft. 6 in, high. This stands beside the
10	Motor driven gear box	24 cwt.	230 V, supply rectified to 230 V, D.C. by rectifier in separate workshop	equipment Built locally by college to suit own requirements. Not likely to be suuplied elsewhere. Volt amp. meter in each case it mounted on a single tubular standar (on a circular base on the floor 4 ft, 6 in, high. This stands beside the equipment
11	Motor driven belt drive	2 cwt.	230 V. supply rectified to 230 V. D.C. by rectifier in separate workshop	Built locally by college to suit own requirements. Not likely to be supplied elsewhere. You and amp, meter in each case is mounted on a single tubular standard (on a circular base on the floor 4 ft. 6 in. high. This stands beside the equipment.
12	Centrifugal force machine	2 cwt.	man.	
43 14	Flywheel Fletcher's Trolley Fletcher's Trolley (impact)	4 cwt.	- 7	Kept in store for occasional use only
15 16	Ballistic pendulum Weston pulley block	to carry 3 cwt.	Working position: hanging. Suspension required	Kept in store for occasional use only Stored: with chain. Fixed by college authorities when used
17	System of pulleys	to carry 1 cwt.	Hanging position required at high level	Sheaf of 3 and 2 blocks, with rope Fixed by college authorities when used
18 19 20	Friction of belts apparatus Torsional Vibration apparatus Steel framework	28 lb. 20 lb. 2 cwt.	To people become to assessed a	ulleys, weights, without making use of
21	2 Timber panels on tubular steel frame	1½ cwt.	structural steel beams. Loading: r To support panel-mounted equipm	naximum 2 cwt. on each span tent (see Engineering Science Laboratory)
22	6 Benches	½ cwt.	when used in this laboratory No. 2 outlets 230 V. A.C. I-phase (switched sockets)	Forming wall benches on internal wal
	7 Benches	½ cwt.	2 No. sockets, 230 V. A.C. I- phase	Forming window wall bench total length (including sink unit) 33 ft. 0 in approx., overall width (using wall duc) working top) 3 ft. 5 in. Drawer and
	1 Sink unit	4 cwt.	Sink size 30 in, by 18 in, by 10 in,	cupboard units under Taps of the type suitable for hose
23	4 Mechanics' benches	2j cwt.	Centre position	connections Included in cupboard under each are
				6 pieces of equipment as per schedule.  These are of the same pattern as supplied to Elementary Laboratory.
OTHE	R MISCELLANEOUS EQUIPMENT:			burners amounts
23a	1 Storage unit for weights	4 cwt.		
23b 23c 23d	1 "Rotating Masses" apparatus 1 Attwood Accelerator apparatus 1 Friction apparatus	12 lb. ½ cwt. 2½ cwt.	Must be 4 ft. 0 in. clear of floor Requires 230 V. A.C. 1-phase	Includes weights
	The Color of the section section		switched socket	

4 cwt. d cwt. Must be 4 ft. 0 in. clear of floor Requires 230 V. A.C. 1-phase switched socket

1 switched socket outlet 230 V. A.C.

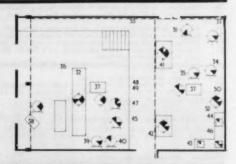
27 28	1 Governor (Watts)	1 cwt.	1 switched socket outlet in hosed gas supply. in hosed	Stored in cupboard under bench
	1 Oas carorimeter	2 cwt.	water supply. Drainage by hose to sink	Stored in cupoosid under bench
29	1 Bomb calorimeter	40 lb.	‡ in. hosed gas supply.  † in. hosed water supply. Drainage by hose to sink  **The control of the control o	Stored in cupboard under bench
30 31	1 Fuel testing equipment 6 Benches	30 lb. ½ cwt.	Drainage to galvanised tray 2 No. switched socket outlets, 230 V. A.C. 1-phase	Fire extinguisher should be available 1 in. gas mains supply. Standard cup- board and drawer units under
	3 Benches	½ cwt.	Wall position	l in. gas mains supply. Standard cup- boards and drawer units under
OTHER	1 Sink unit EQUIPMENT:	1 cwt.	Sink size 30 in. by 18 in. by 10 in.	Taps suitable for hose connections
31a 31b	1 Double coupling apparatus 1 Cupboard (2 door)	40 lb. 3 cwt.		Lockable Lockable

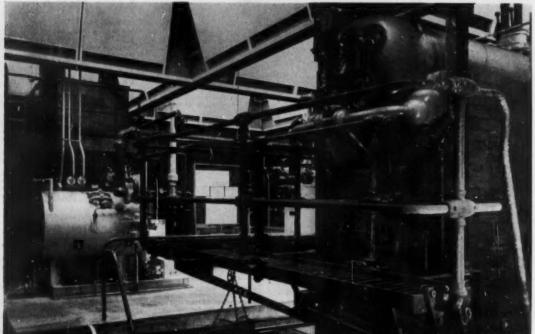
# REMARKS

The equipment numbered 24 to 31 is not a normal provision as it is likely to be used only by a small number of students working on "endorsement" subjects to H.N.C.

subjects to H.N.C.
It may sometimes be provided, therefore, in a small separate laboratory, or in an annexe to the main laboratory
It may sometimes be provided, therefore, in a small separate laboratory, or in an annexe to the main laboratory
A Store to be shared between these laboratories may be required. If there are only two Engineering Science Laboratories (Elementary and Senior) one shared store may suffice as storage is required for small apparatus only (e.g. spring balances, etc. See notes to Elementary Laboratory)
Access to a shared Balance Room is normally required
The free-standing steel frame described here is designed to replace an exposed steel beam suspended from the ceiling. The "beam suspended from roof or ceiling" is a normal request, but should be avoided if possible, as it is often subject to misuse by overloading

# **BOILER** HOUSE LABORATORY





The Babcock and Wilcox water tube boiler (32) in the right foreground and the oil fired boiler (41) on the left. Service pipes and lagging are painted code colours; the lagging on the boiler in the right foreground is painted code red on a blue brick casing below. Note the drop in floor level to the large boiler and, in the centre background, the movable chart panel with laboratory charts on display

# NATURE OF WORK

Experiments investigating the operation and efficiency of boilers and engines: their fuel consumption, output, process, etc. Up to 20 students working in groups of 6-10, sometimes larger, when the class is engaged on a major task. Experiments follow written instructions on programmes or "instruction sheets." Experiments are planned in advance, each student having a particular task. All members of a group must log readings on a central chart, these data forming a complete picture of the investigation at the end of the experiment. Individual students must copy the full results of the work of the group

# OFFICIALLY RECOMMENDED DATA

MOE Bulletin 5: Specification and Planning Requirements

None available

Most of the data recommended for Heat Engines Laboratory would be applicable with minor differences
Thus:

Zoning: heavy and bulky equipment and materials. Ground floor essen-

Zoning: heavy and bulky equipment and materials. Ground floor essential. Very noisy. Considerable vibration. Dust, dirt or fumes

Lighting: daylight: exclusion of sun desirable, as overall top light is required without heat-build up due to solar radiation
Artificial: non-stroboscopic essential
Colour Jiscrimination advantageous
Standards: general lighting only
Minimum illumination 10 f.c. or 2 per cent. daylight factor (Preferably
16 f.c. and 5-10 per cent. daylight factor)
Heating: heavy manual activity (if coal fired boiler is installed). Equipment producing heat. Control of room temperature is desirable
Ventitation: mechanical ventilation essential: from room and from equipment (large flues, etc.)
Special servoes:
Water: mains supply
Fittings with water supply and drainage: equipment supplied with water for cooling, etc.
Drainage: wash down sumps in floor
Large drainage sumps for draining boilers, etc., special drainage to
"blow-down sumps" placed externally; for discharging steam; or emergency boiler drainage
Electricity; A.C. single phase supply 240 V.
D.C. 240 V.
415 V. A.C. 3 phase
Fittings with electricity supply: equipment supplied with electricity for motors, heating, etc.
Fittings with as supply: equipment supplied with gas
Equipment:
Weight: heavy equipment: over 200 lb. per sq. ft. with very heavy concentrated loads. Equipment with moving parts, producing vibration or very heavy impact load
Size: equipment requiring installation before completion at walls, unless these are demountable
Fittings: benches adjacent to wall: 24 ft. run
Portable tables and chairs
960 sq. ft. is sufficient for the equipment listed, excluding a high level platform of approximately 90 sq. ft. for tanks

- 1. 90 sq. ft. per student would apply = 1,800 sq. ft.
- Circular 1/59 makes this nominal only: actual area depending more upon equipment than numbers of students
   Note: The laboratory is not named, but the term "Engineering (Heavy Equipment)" would apply

# SUMMARY OF SERVICE REQUIREMENTS

1 Economiser and superheater

SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters with facilities for external intake to accelerate air change when required. Heaters in roof, blowing warmed air downwards; with extractors at floor level dischargiing through roof are successful. The extractors are separate from the heaters and can thus be used independently at any time. Heaters can be switched to either "intake" or "recirculation" Electricity: 240 V. A.C. single phase. 400 V. 415 V. 440 V. A.C. three phase

Gas: ½ in., ½ in., 1 in. diameter supply to various equipment

Water: hot and cold supply

Steam: produced by equipment and used in other engines in this and Heat Engines Laboratory via interconnecting pipes. Pipes ½ in., ½ in., 1 in., 2 in., 3 in., 4 in. diameter

Drainage: equipment requires special drainage, i.e. (1) Sump in floor to receive water drained from equipment. This should be size 4 ft. 0 in. by 3 ft. 0 in. by 3 ft. 0 in. and covered. If not provided with drain, it should be connected by flexible on an open to a separate floor gulley (this arrangement may be necessitated if the sump depth is too low for direct connection to drains). (2) "Blow down" drainage from boiler to separate soakaway. (3) Overflow pipes, from various pieces of equipment, discharge to small containers or to sump.

Exhausts: 1 in., ½ in., ½ in., ½ in., 9 in.

Flue: 24 in. by 24 in.

LIST	OF EQUIPMENT		
Ref.	Description	Weight	Special requirements and services
32	1 Babcock & Wilcox water tube boiler	30 tons	Ventilation: natural, 22 in. by 15 in.; mechanical, 9 in. diameter extract; 9 in. and 34 in. diameter extract; 9 in. and 34 in. diameter exhausts; flue, 24 in. by 24 in. Steam: 3 in. Water: hot, 1 in.; cold, 1 in. Drainage: sump connection and blow down to soakaway. Electricity: 230 V. D.C.
33	I Lime soda water softening plant with storage	58 cwt.	Steam: 4 in. Water: hot, 120°
33	tanks	Jo cwt.	\( \frac{1}{2} \) in.; cold, I in. Drainage: tank overflow and drain down I\( \frac{1}{2} \) in. to sump. Lime store required.
34	1 Mixing tank with impeller	1 cwt.	Water: cold, 1 in. Electricity 415 V. A.C. 3 phase
35	1 Hot well with water weighing gear	64 cwt.	Steam: ½ in. Water: hot, ½ in. ½ in., ½ in.; cold, ½ in. Drainage ½ in. overflow and drain to sump
36	1 Coal weighing gear	to weigh 100 lb.	Hanging point on boiler frame work
37	2 Boiler feed pumps (1 electric, 1 steam)	I cwt.	Electric one requires: Water

Electric one requires: Water: cold, ½ in. Electricity: 230 V. D.C. Steam one requires: Steam: ½ in. Water: hot, 1 in., ½ in., 2 Boiler feed pumps (1 electric, 1 steam) cold, \$\frac{1}{2}\$ in. Electricity: 230 V. D.C. Steam one requires: Steam: \$\frac{1}{2}\$ in. Water: hot, \$1\$ in., \$\frac{1}{2}\$ in. Water: hot, \$1\$ in., \$\frac{1}{2}\$ in. Water: cold, \$1\$ in. \$\frac{1}{2}\$ in. whatst. Flue to 32, \$24\$ in. by \$24\$ in. Water: cold, \$\frac{1}{2}\$ in. Drainage: \$\frac{1}{2}\$ in. by \$24\$ in. Water: cold, \$\frac{1}{2}\$ in. Drainage: \$\frac{1}{2}\$ in. by \$1\$ in. Copper to sump. Electricity: 230 V. D.C. scan light \$4\$ V. 180 milliamps. Steam: \$\frac{1}{2}\$ in. wentilation: natural, in flue, \$1\$ in. by \$15\$ in.; mechanical, \$1\$ in., \$\frac{1}{2}\$ in., \$2\$ in. \$2\$ I Induced fan and motor 1 Cambridge CO instrument 60 lb.

# Remarks

Remarks

Connected to 33, 37, 35, 38, 41, 43, 44, 45, 39, 40, 42, 46, 50.

Minimum 600 lb. steam/hour. Partly concreted in, lined with blue staffs 9 in, thick. Haya draught gauge sump pump. Bunker space for coal. Sump for drainage (dirty water). Green's Economizer fitted.) Raft at floor level. Duct sizes: (1) 4 in. by 3 in. pump bearing cooling water drain from 38. (2) 8 in. by 4 in. feed water pipe duct from 33. (3) Ash pit under fire, appr. limitely 1 ft. 6 in. deep sloping to back. Sump to 32 emptied by 400/440 electric pump through 1 in. pipe to discharge into soakaway

Connected to 32, 41

Height of platform covering fuel tanks (oil) 8 ft. to top of 9 in. R.C. slab

Connected to 32, 41

Connected to 32, 41 Weighing tank with spring balance hung to structure of platform carrying 33 Spring balance

Both connected to 32, 41

Connected to 32 The water supply is for cooling only the bearings

Head of water must not exceed 10 ft.; minimum 2 ft. Flue gas (i.e. smoke from boiler furnace from rear flue, highest point)

Connected to 32, 41
Connected to 32, 33, 35, 40, 42, 43, 44, 45, 46, 50
Motor driven forced draught. Ducts: 2 ft. 6 in. by 1 ft. deep; 6 in. by 9 in. deep; 6 in. by 6 in. copper to sump; ‡ in. copper condensate to sump; ‡ in. copper drain down

Connected to 32, 41, 33, 35, 40, 45 Pressure gas pump on separate by 9 in. by 9 in. by 5 in. thick r.c.

43	1 Lagged and unlagged pipe apparatus	21 cwt.	Gas: 1 in. Steam: 2 in. Drain-	Connected to 32, 41
44	1 Pressure temperature apparatus	½ cwt.	age: ½ in. copper into pail Steam: ½ in. Drainage: ½ in. to	Connected to 32, 41
45	1 Throttling and separating calorimeter	11 cwt.	pail Ventifation: mechanical, 1½ in. steam blow, exhaust. Com- pressed air: ¾ in. Drainage:	Connected to 32, 41
46	1 Barrel calorimeter	3 cwt.	I in. to sump Steam: 1 in. Drainage: 2-1 in. to pail	Connected to 32, 41 Pressure gauge 10 in diameter requires vertical mounting
47	1 Ascot gas peyser	20 lb.	Gas: ½ in. Water: cold, ½ in. Drainage: to pail	Connected to 33 A separate gas meter is fixed adjacent, forming part of assembly
48	l Chemical balance (sprung)	To weigh 5 lb.	-	Weighing materials for water softener, kept in store
49 50	! Flash steam apparatus ! Gas boiler	10 cwt.	Ventilation: flue, 6 in. diameter. Gas: ‡ in. Steam: 1 in. Water: cold, ‡ in. Drainage: ‡ in. to sump. Gas meter separate on	Connected to 32, 33, 41, and 35
51	! Fuel tank	1-8 tons	bench Ventilation: natural, 3 in. to roof. Drainage: 2 in. drain off for oil. Should be mounted on rollers (4) for removal for	Connected to 41 Tank size 4 ft. by 4 ft. by 4 ft. Weight includes oil and tank and rollers
52	2 Benches for equipment	230 lb. 220 lb.	periodic inspection and cleaning	Assembled from standard bench units
53	4 Portable tables (stacking)	29 lb.		

REMARKS

The equipment listed in this laboratory cannot be considered as standard, but it is an example of the special provision which is likely to be made to suit a specialised local demand from Industry

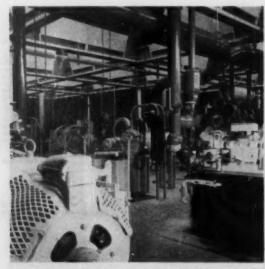
Normally, the boiler which is needed to supply steam for the steam engines in the Heat Engines Laboratory will be housed in the Heat Engines Laboratory itself. In this case, the equipment is contained in the Boiler House Laboratory, together with other similar or related apparatus

In this case, two special storage chambers are required: (1) 110 sq. ft., store for solid fuel, with a delivery chute accessible from the supply road, and (2) 80 sq. ft. fire proof chamber for oil-fuel storage, containing a storage tank with inlets accessible from the supply road.

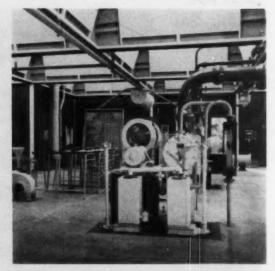
The Babcock & Wilcox Boiler requires about 13 ft. 6 in. headroom and is housed in a special area with a floor 3 ft. 0 in. below the normal floor level of the workshops; the normal floor level forms a viewing platform for students, of actively engaged in operations on the boiler. "Catwalks" are provided at high level against the boiler itself; the metal platforms being part of the equipment. A brick flue is also provided repeated is sufficient to this purpose

Access to Heat Engines is important. A connecting door is provided in this case. Though it was suggested (and rejected) that the two laboratories did not need dividing, a partition wall was fixed. In practice the door in this wall seems never to be closed

# HEAT ENGINES LABORATORY



The steam engines which are supplied from the boilers in the Boiler House Laboratory. Machines, painted white, are on black bases with services painted code colours.



Condenser, motor and vacuum pump in the foreground (63, 64). The gas turbine (68) is at right background, covered by a polythene sheet. Note the movable chart panels for logging experiments and the portable tables and stools. Note also how the steam pipes, which in this laboratory form part of the teaching equipment, follow the soffits of beams and the engines are placed clearly beneath the rooflights away from the beams. The engines are painted white with red on moving parts; concrete or metal bases are black; all services are painted code colours. code colours.

# NATURE OF WORK

NATURE OF WORK.

Investigation of the operation and function of engines and their efficiency (fuel consumption, output etc.). Steam, petrol, diesel, gas, compressed air, gas turbine engines are used. Up to 20 students working in groups of 6 to 10; sometimes more when whole class is involved in a major task. Experiments follow written instructions on programmes or "task sheets," and are planned in advance, each student having a particular role. Readings and data are recorded during experiments on a central chart (hence need for movable chart panels). All members of the working group must subsequently copy the full record of the experiments from the chart panel into notebooks (hence need for portable tables). Heavy moving parts on some engines necessitate safety precautions

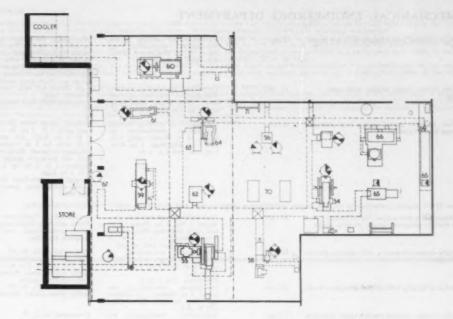
# OFFICIALLY RECOMMENDED DATA:

OFFICIALLY RECOMMENDED DATA:

MOE Bulletin 5: Specification of Planning Requirement
Zoning: Heavy and bulky equipment and materials
Ground floor desirable
Very noisy: considerable vibration
Dirt, dust, and fumes
Lighting: Artificial: non-stroboscopic essential
Standards: general lighting only, minimum illumination 10 f.c. er 2 per cent.
daylight factor. Individual directional lighting minimum 25 f.c.

# Comments

Agreed
Agreed
Agreed
Agreed
Agreed
Daylight: control of sunlight to prevent build up of heat is desirable
Standards: general level of 16 f.c. or 5 to 10 per cent. daylight factor is
desirable



Heating: Equipment producing heat. Control of room temperature desirable Ventilation: mechanical ventilation essential: from room and from equipment

SPECIAL SERVICES
Water: sink or basin with hot and cold water supply adjacent to wall
Fittings with water supply and drainage: several sinks and/or taps
adjacent wall. Equipment supplied with water for cooling, etc.
Drainage: wash-down sumps in floor

Electricity: A.C. single phase supply 240 V. to several sockets

# Fittings with electricity supply: equipment supplied with electricity for motors,

Fittings with electricity supply: equipment supplies with elasting, etc.

Fittings with gas supply: benches adjacent to wall with gas taps. Equipment supplied with gas

Equipment: weight: heavy equipment, over 200 lb. per sq. ft. with very heavy concentrated loads

Equipment with moving parts, producing vibration or heavy impact loads

Size: equipment requiring at least double doors 5 ft. by 7 ft. (but widely varying requirements)

Fittings: benches: benches adjacent to wall

90 sq. ft. per student = 1.800 sq. ft. Circular 1/59: 90 sq. ft. per student but nominal area only as equipment dictates area of room

Agreed
Agreed. Vents and exhausts from equipment are special problems
Facilities for outlets through roof to accommodate engine exhausts ar
essential to avoid severe restrictions on plan

Agreed
"Several sinks or taps" adjacent to wall are not necessary. Steam engines are interconnected; and others may be linked to a cooling system Drainage: ducts connecting steam engines require drainage: gulleys may be lower than ground floor level Electricity: 240-260 V. D.C. 230-230 V. A.C. single-phase 400-440 V. A.C. 3-phase; may be required. Local requirements vary

Benches adjacent to wall are no widely used. Portable benches and stools are more important Agreed. The door width quoted has no practical relevance to the equipment which is large and heavy and usually requires lifting equipment. Larger openings are required for initial installation

Local requirements may vary: but the main requirement is for portable benches which can be placed at will adjacent to any piece of equipment 1,872 sq. ft. accommodates equipment listed

# SUMMARY OF SERVICE REQUIREMENTS

SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters with facilities for external intake, to accelerate air change when required. Heaters in roof, blowing warmed air downwards; with extractors at floor level discharging through roof are successful. The extractors are separate from the heaters and can thus be used independently at any time. Heaters can be switched to either "intake" or "re-circulation."

Electricity: 250 V. D.C.

415; 400 to 440 V. A.C. 3 phase

230-250 V. A.C. single-phase (requirements vary widely)

Gas: 1 in. diam. supply to equipment

Steam: supply obtained from boilers which may, as in this example, be sited in an adjacent laboratory. Steam engines interconnected with 1 in. to 3 in. pipes. With lagging these are very bulky

Compressed air; generated by one item of equipment (i.e. not required from source outside laboratory)

Drainage: from sink; from floor gulley; from gulley to drain floor ducting system; individual sumps to some items of equipment

Exhausts: ½ in. to 3 in. exhausts from various engines. Larger from gas turbines if fitted. Exhausts are hot and require silencers. Roof outlets required to avoid serious impedimenta to the use of floor space

# LIST OF EQUIPMENT

Ref.	Description	Weight
54	1 Gas engine with rope brake	30 cwt.

## 1 Four stroke diesel engine with electric genera-55 60 cwt.

# Special Requirements and Services

Connected to cooling system.
Ventilation: mechanical, exhaust, 1½ in. Gas: 1 in. Water; cold, 1½ in. and ½ in. diameter.
Drainage: 1 in. copper c.w., 6
½ in. d.w. 6

Connected to cooling system. Ventilation: mechanical, exhaust, 2 in. Water: cold, ½ in., 1 in., 1½ in. Drainage: f in. to c.w. sump. ‡ in. to d.w. sump. Electricity: 250 V. D.C.

# Remarks

Remarks
Independent gas meter with equalising chamber. ½ in. water for cooling flywheel. ½ in. drain from same Hot exhaust
Safety precautions: Expanded meta guard 4 ft. 4 in. high on three sides
Large sub-floor ducts required
Connected to equipment No. 67. Diesel oil tank 1 ft. 11 in. × 1 ft. 9 in. × 5 ft. ½ in. 5-gallon tank mounted on stand, with ½ in. supply pipe
Calorimeter required: 6 ft. 2 in. × 1 ft. 0 in. diameter
Air intake cylinder 6 ft. 6 in. long × 1 ft. 0 in. diameter
Air intake cylinder 6 ft. 6 in. long × 1 ft. 0 in. diameter at high level, with air measuring panel mounted vertically; 1 jt. n. sir pipe connection to engine
Hot exhaust with silencer
Safety precautions: Expanded metal guard 4 ft. 6 in. high on 3 sides
Large sub-floor ducts required

<sup>\*</sup> c.w. = clean water (to drainage system in laboratory)

d.w. = dirty water (to sump in Boiler House Laboratory)

56	1 Single cylinder petrol engine with fan brake	2 cwt.	Connected to cooling system. Ventilation: mechanical, ex- haust, 1½ in. Electricity: 2 No. 400-440 V. 3 phase A.C.	Wall gauge. Petrol feed tank 1 ft. 5 in. by 1 ft. 3 in. by 6 ft. 3 in. high. Electric motor for starting and one for cooling by fan. Hot exhaust with silencer Safety precautions: Guard over paddlea and shaft and wood casing over 1 motor
57	1 Two stroke diesel engine with rope brake	1½ cwt.	Connected to cooling system.  Ventilation: mechanical; exhaust; 1½ in. Water: cold, 1½ in. and ½ in. Drainage: ½ in. d.w.,	Large sub-floor duct required in diesei oil feed from separately mounted tank Large sub-floor duct required
58	I Four cylinder petrol engine with Heenan- Froude brake (Austin)	6 cwt.	l in. c.w.  Connected to cooling system.  Ventilation: mechanical, ex- haust, 1½ in. Water: cold, 1 in. and ½ in. Drainage: ½ in. d.w.,  I in. c.w. and ½ in. c.w.	Vertical panel with petro gauge to feed tank 1 ft. 5 in. by 1 ft. 2 in. by 6 ft. 2 in. high. Air intake cylinder 3 ft. 3 in. by 6 in. diameter with air measure on panel. Panel with ammeter and oil pressure gauge and 12 V. battery: I ft. 6 in. by 1 ft. 4 in. by 5 ft. 1 in. high
				Several large sub-floor ducts required Safety precautions: guard over gener- ator belt
Non	:: Items 54-58 require connection to cooling syste	m comprising a co	mmon tank and circulatory system w	ith individual coolers
59	1 Compound steam engine, two cylinder, with electric generator brake, or rope brake	45 cwt.	Ventilation: mechanical, exhaust, 2 No. 2 in. Steam: 1 in. and 1½ in. diameter. Water: cold,   in. Drainage: 2-½ in. c.w., 2-  in. d.w., 2-½ in. taps to pail	Connected to Equipment Nos. 32, 41 Three sub-floor ducts required Safety precautions: two guards over coupling bearings
60	1 Triple expansion engine with electric generator brake	60 cwt.	Ventilation: mechanical, exhaust, 3 in. Steam: 3 in. Drainage: 1½ in. and ½ in. d.w., ½ in. oil to pail Electricity: 250 V. D.C.	Connected to 32, 41, 67 Vertically mounted panel with 5 gauges 2 ft. 1 in. by 1 ft. 3 in. by 5 ft. 1 in. high Safety precautions: flywheel guarded Two sub-floor ducts
61	l De-Laval turbine with electric generator brake	25 cwt.	Ventilation: mechanical, exhaust, 3 in. Steam: 2 in. Drainage: 2-‡ in. c.w. Electricity: 250 V. D.C.	Connected to 32, 41, 67 Safety precautions: flywheel guarded
62	1 Robey single cylinder steam engine with rope brake	12 cwt.	Ventilation: mechanical, exhaust, 1½ in. Steam: 1½ in. Water: cold, ½ in. Drainage: ½ in. d.w., ½ in. and 1 in. c.w.	Connected to 32, 41 Small foot-stand for reading gauge 2-½ in. oil drains from crankshaft Sub-floor duct Safety precautions: guards around flywheel
63	1 Condenser for steam engine	4 cwt.	Ventilation: mechanical, ex- haust, ‡ in. air vent. Steam: 3 in. Water: cold, 1 ‡ in. Drainage: 2-1 in. c.w. from weighing tanks; ‡ in. to pail, ‡ in. to pail	Connected to 32, 41, 64 Draw-off condensate water into 2 tanks each on a small platform weighing machine Large sub-floor duct Mounted together with Equipment No. 64
Non	:: Items 59-63 have: common steam supply from b	oiler (in this case f	xed in Boiler House Laboratory): sub	
64	1 Vacuum pump and motor for condenser	5 cwt.	Electricity: 230 V. A.C. single- phase	Connected to 63 Mounted together with Equipment No. 63 Safety precautiors: sheet metal guard
	1: Items 63 and 64 are mounted together			over flywheel
65	1 Refrigerator with indicators	4 cwt. 1 cwt.	Water: cold, \( \frac{1}{2} \) in. Drainage: 1 in. c.w. Electricity: 240 V. A.C.	Panel on steel angle frame bolted to
66	I Air compressor with rope drives; motor; air tank and cooling system	14 cwt. 4 cwt.	single-phase Ventilation: natural, 1½ in. Compressed air: 1½ in. Drainage: 1 in. c.w., ½ in. to pail; ½ in. d.w. 2½ in. draincocks to pail Electricity: 415 V. A.C. 3-phase. Electricity: 250 V. D.C.	Two sub-floor ducts.  Three sub-floor ducts.  Safety precautions: belts and flywheel and coupling bearing guards  Compressed air cylinder (4 cwt.) is  8 ft. 3 in. high by 2 ft. 6 in.
67	1 Resistance panel for dissipation of generated electrical energy	3 cwt.		Connected to 55, 60, 61 This equipment is mounted on a purpose made panel, floor-mounted
68	i Gas turbine engine (Rover) With control panel (desk type)	5 cwt. 1 cwt.	Ventilation: mechanical, exhaust, 1 ft. 2 in. diameter. Water: ½ in. cold. Drainage: ½ in. and ½ in. c.w.	Sub-floor duct Exhaust gases at 650 deg. C. Minimum bends required in exhaust (not more than one 90 bend). Requires insula- tion and screen at discharge. Safest to discharge through roof
		- 3		2 ft. 10 in. by 8 in. by 6 in. fuel tank on top of control panel
				Safety precautions: Insulation covered by sheet steel casing over exhaust Wire guard over shaft Control panel is 8 ft. 4 in. high by
	Wall benching	3½ cwt. each bench	Gas: 2-½ in. Water: cold, ½ in. Drainage: ½ in.	3 ft. 4 in. by 2 ft. 11 in. 6 benches of standard size fixed together to form continuous wall bench Steel angle to front edge for hard
69				wearing
70 71	22 Portable tables (stacking) 1 Movable chart panel HEENAN FROUDE COOLER;	29 lb. each 3 lb.	Ventilation, mechanical, 2 ft. 0 in. diam. water, cold: ‡ in. Drainage 2‡ in. hose; and 3 in. to drain	Size, including tank, is 8 ft. 1 in. long by 7 ft. 6 in. wide by 12 ft. 4 in. high 4½ in. feed from main tank to top of

Fire-fighting appliances, additional to general provision, maintained in this laboratory: 1 Phomene Bottle, lever type; 1 asbestos blanket

# REMARKS

The equipment listed here is likely to be in excess of normal requirements

Steam engines are not likely to be needed at all colleges

A store is required with shelves for tools; spare parts; laboratory charts, etc. There is no "end product" from the engines

Diesel oil and petrol are required; and also oil for lubrication. Bulk storage in a store with special precautions against fire and liquid escape serving the whole department is best; with local storage of small cans for this room. Store approximately 24 ft. by 12 ft. plan area is adequate. The cooling apparatus (to which many items of equipment are connected) needs special attention. It may be a very large piece of equipment standing 12 ft. high with plan dimensions 8 ft. by 7 ft. 6 in. and with a water supply tank 6 ft. by 3 ft. by 4 in. It requires drainage and a steam or hot vapour outlet. Technically, it may stand in the open and on this account information may not be supplied to the architect at a sufficiently early stage. It may be placed in a separate chamber with provision for steam outlets in the roof are special requirements for this room. Other special requirements are: (1) concrete boxes for engines, projecting above floor, in some cases bench-high, shaped individually to take equipment and with locations for bolts, etc. (2) circulatory pipes in ducts beneath the floor

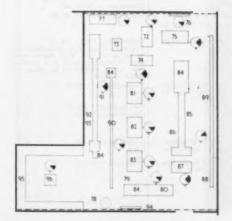
floor

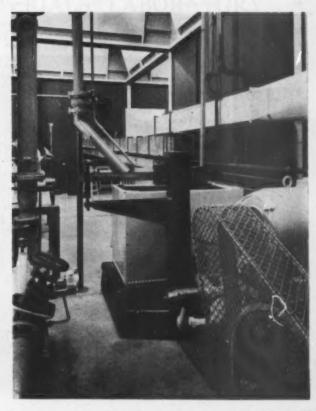
Access to Boiler House Laboratory, Hydraulics Laboratory, and service drive is necessary

The large collection of interconnecting pipes, some lagged, should be painted in identification colours. The location and arrangement is pipes should be carefully considered, as these are major visual elements; their organised array can be impressive. If these are not designed, the appearance and efficiency of the laboratory will be seriously impaired (it will be generally accepted that their arrangement is outside the scope of the architect's authority). (Special point to watch: the location of overhead stop cocks with hanging chains to operate!)

Moving parts on many machines require guards and to be painted red for danger

# **HYDRAULICS** LABORATORY





The Perspex flow channel (90) and the axial flow fan and ducting (91). The equipment in the foreground stands over the sub-floor water tank which is covered with concrete slabs.

# NATURE OF WORK

Experiments to investigate the pressure and flow of water; the science of hydrodynamics and its practical applications. Up to 20 students working in pairs or small groups, with one piece of equipment; or semines working on linked experiments involving a related series of equipment. Data are recorded on charts during progress of experiment, Individual students must copy the full results of the work of the group. Experiments follow written instructions

# OFFICIALLY RECOMMENDED DATA

Comments
The following recommendations from the Bulletin chart would be

The following recommendations from the Bulletin chart would be applicable:
Zoning: Heavy and bulky equipment. Ground floor desirable. Noisy. Considerable vibration. Dirt and fumes
Lighting: Day-lighting; top lighting; with sun control, preferable
Artificial: non-stroboscopic essential
Standards: General lighting: minimum standard of illumination 10 f.c. or 2 per cent. daylight factor (preferred: 16 f.c., 3-10 per cent. daylight factor)
Heating: equipment producing heat. Control of room temperature desirable
Ventilation: mechanical ventilation essential: from room and from equipment

cestrate ventilation: mechanical ventilation essential: from room and from equipment Special Services:
Water: fittings with water supply and drainage. (Equipment is supplied from large sump in floor with pumps for circulation)
Drainage: equipment drained via channels and ducts to central storage tank in floor
Electricity: 230-240 V. D.C.
415 V. A.C. 3-phase
240 V. A.C. single-phase to several sockets
Fittings with electricity supply: equipment supplied with electricity for motors, etc.
Equipment: weight: heavy equipment; over 200 lb. per sq. ft. with very heavy concentrated loads. Equipment with moving parts producing vibration. Size: equipment requiring at least double doors 5 ft. by 7 ft. (long troughs and tubes 20 in. and 24 in. long)
Fittings: benches: benches adjacent to wall 25 ft. overall length. Light portable benches and light stools
This laboratory is 1,092 sq. ft., but working space for some equipment is too cramped

Circular 1/59 gives "Fluids" Laboratory: 90 sq. ft. per student, but nominal only as area is determined by equipment = 1,800 sq. ft.

# SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters with facilities for external intake, to accelerate air change when required. Separate air extractors Electricity: 230-240 V. D.C.

415 V. A.C. 3-phase

240 V. A.C. single-phase

Water: cold supply only. Mains supply required

Drainage: special requirements

		ENT

LIST	OF EQUIPMENT			
Ref.	Description .	Weight	Special Requirements and Services	Remarks
72	1 Gilks No. 12 Pelton Wheel	4 cwt.	Water: 3 in. cold. Drainage:	Connected to Equipment No. 75
73	I Worthington Simpson Triplex pump	3 cwt.	Water: 1½ in. cold. Drainage: 1½ in. Electricity: 415 V. A.C. 3 phase	Connected to Equipment No. #4 1½ in. drain taken to 84 for weighing Safety precautions: flywheel guarded with wire-mesh
74	1 Dynamometer and Worthington Simpson pump with venturimeter	20 cwt.	Water: 4 in. cold. Drainage: 5 in. to weighing tank; 3 in. to	Connected to 81, 82, 83, 84 IB h.p. motor
			underground tank. Electricity:	Panel 11 in. by 7 in. by 4 ft. 4 in. high,
75	1 Gwynne 2½ in. p.h. 4 stage pump and motor	20 cwt.	240 V. D.C. Panel with 3 gauges Water: 3 in. cold. Drainage: 3 in. Electricity: 415 V. A.C. 3-phase	fixed to vertical flow pipe Connected to 72, 76, 84 Also has 2 in. by 2 in. steel angle base 2 ft. 1½ in. by 1 ft. 4 in. by 2 ft. 1½ in. high
76	I Venturimeter panel with gauges	30 lb.	Water: 41 in. cold. Drainage:	Connected to 75
77	1 A in House there is her a consensure	11 and	å in. to pail	Filled with sold water from horse sin-
78	Air flow through jets apparatus  Flow through orifice apparatus	1½ cwt. 10 cwt.	Water: ½ in. main, cold. Drainage: 8 in. duct from copper tray	Filled with cold water from hose pipe Copper tray with outlet to tank at floor level
79	1 Flow over notches apparatus	4 cwt.	Water: 1½ in. cold. Drainage: 2½ in.	Connected to 80, 84 Includes weighing machine Cold feed from 87. Tank size 2 ft. 6 in. by 2 ft. 6 in. by 2 ft. 9 in. high
80	I Pelton Wheel	1 cwt.	Drained into 79	Connected to 79, 84, 87
18	! Gilks Turgo 6 in. T.I. turbine with rope brake	8 cwt.	Water: 5 in. and ½ in. cold. Drainage: 1 in. and 1 ft. 10 in.	Connected to 74, 82, 83, 84
			by 1 ft. 10 in.	
82	1 Gilks Francis 7½ in. series N college turbine	8 cwt.	Water: 4 in. and ½ in. Drainage: 1 in. and 4½ in.	Connected to 74, 81, 83, 84  The outlet of the 4½ in. drain pipe must be buried at least 4 in. below water level. Therefore, there is a movable weir across water duct to retain this
83 .	I Gilks No. 15 Pelton Wheel	7 cwt.	Water: 4 in. and 1 in. Drainage: 1 in. and 1 in. 2 ft. 1 in. by	depth of water Connected to 74, 81, 82, 84
84	3 Weighing machines	Two 3 cwt. each	1 ft. 2 in.	Two to weigh 1,000 lb.
		One 24 cwt.		One to weigh 550 lb.
85	I Hydraulic flow channel 12 ft. long with deturbulating tank			
86	1 Pump for flow channel 1 Centrifugal pump with venturimeter and panel gauge	5 cwt.	Water: 3 in. cold. Drainage: 1½ in. to 80 and 90. Electricity:	Connected to 80, 90 8 h.p.
88	1 No. 9 Kieth fan with torque reaction motor	2 cwt.	240 V. D.C. Ventilation: natural 7½ in. dia- meter. Electricity: 230 V. D.C.	Connected to 89
			ment. Lacetteny. and v. D.C.	

89	1 20-ftlong test ducting for Kieth fan	1½ cwt.	Ventilation: natural 7½ in. dia- meter	Connected to 88  This is supported on 6 No. tubular steel legs with 2 in. and ½ in. in/s
90	1 Perspex flow channel 20 ft, long	2½ cwt.	Water: 13 in. cold. Drainage: into tank for weighing	collars holding the circular duct Connected to 80, 87 Separate weighing machine and tank are required The Perspex channel is supported by a pair of 4 in. by 2 in. m's channels bolted to 2 No. triangular tripoda (of
				steel angle) one of which is adjustable for height. The Perspex channel empties into a galvanised tank, size 3 ft. 1 in. by 2 ft. 2 in. by 2 ft. 3 in., standing on item 84. The tank is emptied into under- ground tank with 3 in. pipe
91	I Axial flow fan and ducting 24 ft. long	3½ cwt.	Ventilation: natural 12 in. by 12 in. square. Electricity: 230 V. D.C.	Duct supported on 2 No. 2 in, diameter tubes and 1 No. 3 in, diameter tube cast into floor slab
92	1 Flow-through-pipes apparatus	½ cwt.	Water: I in. mains; 4½ in. cold. Drainage: I in. into tank on 84	Connected to 93 Pipes fixed to 2 in. diameter tube into floor. Tank size 3 ft, 1 in. by 2 ft, 2 in. by 2 ft, 3 in. high
93	1 Manometer	20 16.	Water: 4½ in. cold	Connected to 92
93 94 95 96	Movable chart panel     Wall benching 25 ft. (approx.)     Portable tables stacking	£ cwt. 6 cwt, total 29 lb.		Made up of 9 standard units Also required are stools, cupboard, and nest of drawers
		4 -10		The state of the s

Equipment listed in this laboratory is not standard to all colleges, but those with Hydraulics as a subject on the curriculum will have similar provision. The laboratory design is successful only if maximum co-operation is obtained between engineer and architect.

The equipment is for the most part interconnected with pipes of various diameters, large and small (\frac{1}{2} in. to \frac{5}{2} in. or larger), which form part of the total

apparatus

Most of the units of equipment need to be mounted at bench height, on steel frames or concrete bases

Most are connected with the central reservoir, sump, or tank in the floor which can be formed in the concrete, and covered by the floor slabs and completely concealed (about 16 ft. by 5 ft. deep)

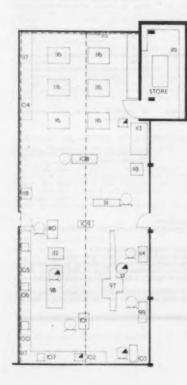
The pipes should be painted in identification colours

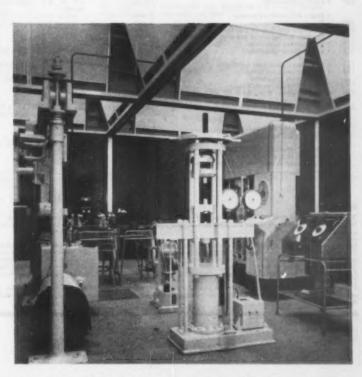
Careful arrangement of the pipes with overhead duots, etc., will enhance the efficiency and visual effect of the machinery in the laboratory

Access to Heat Engines Laboratory and Strength of Materials Laboratory is advantageous

No store is needed

# STRENGTH OF MATERIALS LABORATORY





Mixture of very heavy testing equipment (in the left foreground and right centre (97, 98)) and lighter bench equipment on the standard wall benches. Note the removable ceiling panels screening service pipes in roof ducts.

# NATURE OF WORK

Experiments to investigate the strength of materials and their behaviour under different forms of stress. Students work in pairs on different (but often related) experiments, following written instructions. Written work is involved in recording data and in taking notes

# OFFICIALLY RECOMMENDED DATA

MOE Bulletin No. 5: Specification of Planning Requirements Zoning:

Zoning: heavy and bulky equipment and materials. Ground floor desirable. Not very noisy. Clean. (Widely varying requirements; consult local needs) Lighting: Artificial: Non-stroboscopic essential Standards: General lighting only: minimum illumination of 10 f.c. or 2 per cent daylight factor Individual directional lighting minimum 25 f.c. (Widely varying requirements: consult local needs) Special Services: Water: Sink or basin with hot and cold water supply adjacent to wall

Electricity: A.C. single phase supply 240 V. to several sockets Fittings with electricity supply: equipment supplied with electricity for motors,

etc. Equipment: Weight: heavy equipment: over 200 lb. per sq. ft. with very heavy concentrated loads
Equipment with moving parts producing vibrations or very heavy impact load
Size: Equipment requiring at least double doors 5 ft. by 7 ft. (widely varying requirements)

Fittings: benches: benches adjacent to wall Area per student, 50 sq. ft. = 1,000 sq. ft. (Circular 1,199; 60 sq. ft. per student = 1,200 sq. ft. but nominal only: equipment dictates area)

Comments

Agreed
Daylight: general top lighting with sunlight control
16 f.c. or 5 to 10 per cent daylight factor will suffice, normally, without
individual lighting (excepting for equipment embodying dials especially
illuminated internally, or for equipment using light experimentally)

A sink is not essential

3 phase supply also required Agreed

For initial fixing: some equipment is so large that it must be installed before the walls are completed unless these are demountable. Subsequently there is no need for especially large doors Benches in centre of room are required also The equipment listed below needs at least 1,560 sq. ft.

# SUMMARY OF SERVICE REQUIREMENTS

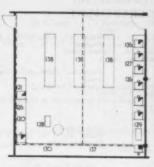
Heating: Warmed air heaters with facilities for external intake separate air extraction Electricity: 200-250 V. A.C. single phase 400-440 V. A.C. three phase Water: Hot and cold if sink provided, only Drainage: Only from sink, if provided

Ref.	Description	Weight	Special Requirements and Services	Remarks
97	1 Buckton universal tester	4½ tons	415 V. A.C. 3-phase	Sheet metal guard required to motor and gearbox
98 99 100	Denison universal tester     Izod tester     Rockwell tester	5 tons 6 cwt. 1} cwt.	415 V. A.C. 3-phase	Must be covered when not in use
01 02 03	1 Brinnel tester 1 Fatigue tester 1 Vickers tester	2 cwt. 3 cwt. 3 cwt.	400 to 440 V. A.C. 3-phase	Capacity 80 lb.
104 105 106	High temperature creep apparatus Hounsfield Izod Hounsfield Tensometer	1½ cwt. ½ cwt. 40 lb.	230 V. A.C. single-phase	Must be covered when not in use Must be covered when not in use
107	1 Firth Hardometer 1 Beam deflection apparatus	1½ cwt. 2 cwt.	230 V. A.C. single-phase; or battery	Must be covered when not in use
108 109 110 111 112	Heam denection apparatus  I Macklow Smith universal tester  I Torsion testing apparatus with torsiometer  I Strut testing apparatus  I Strain gauge apparatus	2 cwt. 12 cwt. 3 cwt. 2 cwt. 2½ cwt.	200 and 250 V. A.C. single-	Two batteries required, 16 V and 6 volt
113	l Polarised light strain apparatus l Cement test apparatus l Roof truss apparatus 2 Angle Deflection apparatus	5 cwt. 7 lb. 1½ cwt.	phase 230 V. A.C. single-phase	Must be enclosed when not in use
116	6 Heavy tables: 4 ft. by 3 ft. approximately	Each 172 lb.		
117	Wall benching (66 ft. total approx. length)	12½ cwt. approx.	5/13 amp. 240 V. A.C. single phase switched socket outlets	17 standard storage units standing under benches
110	6 Portable tables 16 Portable stools, tubular 8 Material storage racks	29 lb. each 8 lb. each 96, 77, and 40 lb.	priam switched social duties	under correctes
	9 Portable cupboards 8 Portable nest of drawers 1 Increase-of-velocity-on-inclined-plane appa- ratus	each 30 lb. 50 lb. 26 lb.		Miscellaneous extra items: depends on individual requirements

# REMARKS

REMARKS
This laboratory, as detailed, combines work of a "Structures" laboratory and a "Materials Testing" laboratory
Some of the equipment is larger and heavier than any other single item of equipment in the College, and special bases are required, extending beneath the
ground floor slab
A ground floor location is imperative
Some equipment uses artificial light and must be installed in a blacked-out space, or on a special bench with boxed-in superstructure
The equipment varies considerably from portable bench equipment and light equipment standing on the floor, to heavy fixed units floor mounted
A store with materials racks and shelves for weights, etc., is required, but this can be internal, without necessarily having direct relation to service drive
The laboratory needs to be conveniently placed to a number of other rooms, e.g. General Engineering Science Laboratories (Applied Mechanics); Heat
Engines and Hydraulies; Metallurgy; Heat Treatment; Metrology. It is a laboratory whose function is equally related to Mechanical Engineering
Theory and Production Practice
There is a very close relationship between this laboratory and a laboratory serving Applied Mechanics, and sometimes described by that name. Some items
of equipment are common to both types of laboratory, and local opinion may differ as to the most suitable final location for any particular item of equipment

# **METALLURGY** LABORATORY





A gas and air injection furnace and fire clay crucibles on the wall bench (127, 136). Note that both centre benches and wall bench are made up from standard bench units.

# NATURE OF WORK

Investigation of the microstructure of metals; the effects of alloying and heat treatment. "Specimens" of metals are prepared, one by each student. The preparation may take more than one class period. Each specimen is later examined by the whole class, using microscopes. Notes are taken written work is involved. There is a maximum of 10 students in this class

# OFFICIALLY RECOMMENDED DATA

MOE Bulietin 5: Specification and Planning Requirements

OFFICIALLY RECOGNISTANCE OF A CONTROLLY Specification and Planning Requirements

Zoning:
Heavy and bulky equipment and materials.
Ground floor desirable
Not very noisy
Clean
Widely varying requirements: consult local needs
Physical conditions:
Lighting: Standards: individual directional lighting; minimum 25 f.c.
Heating: Standards: individual directional lighting; minimum 25 f.c.
Heating: Equipment producing heat (widely varying requirements: consult local needs)
Ventilation: Mechanical ventilation essential from equipment, fume cupboards, etc.
Special Services:
Water:
Water:
Mains supply essential
Sink or basin with hot and cold water adjacent to wall
Fittings with water supply and drainage: several sinks and/or taps, adjacent to wall
Electricity:
A.C. 3-phase supply, 400V.
A.C. 3-phase supply, 400V.
A.C. 3-ping phase 240V. to several sockets
Fittings with electrical supply: equipment supplied with electricity for motors, heating, etc.
Essential etc. gas adjacent to wall with gas taps
Equipment: Weight: comparatively light equipment, 60-100 lb, per sq. ft.
Fittings: Benches: benches adjacent to wall; benches in centre of room
(widely varying requirements: consult local needs)
Circular 1/59: 50 sq. ft. per student = 500 sq. ft.

Not usual, if Heat Treatment Room is provided separately Agreed (flues to be accommodated)

Higher standards should be provided for general lighting; 15 f.c. and 5-10 per cent d.f. should be general

Not necessarily Hot water from local heater (e.g. Ascot) at sink is appropriate Not necessarily more than one sink

Not necessarily Agrood: usually bench-mounted equipment only Agreed

This equipment is in a room 624 sq. ft, in area. Any reduction would result in cramped conditions

# SUMMARY OF SERVICE REQUIREMENTS

SUMMARY OF SERVICE REQUIREMENTS
Heating: Warmed air heaters with facilities for external intake; separate air extraction to accelerate air change when necessary Electricity:
A.C. 3-phase 400/415V.
A.C. single phase 230-250V. to switched sockets
Gas: Supply to gas-fired furnaces (possible requirement also for gas taps on wall bences)
Water: Hot and cold to sink. The use of the sink may be infrequent and a local heater only, adjacent to the sink, will suffice for the hot water service Compressed air: Provided by electric motor in laboratory
Drainage: normal from sink
Flues: 4-in.-diameter metal flues from small furnaces. These may become very hot

LISI	OF EQUIPMENT			
Ref.	Description	Weight	Special requirements and services	Remarks
120 121	1 Small gas furnace 1 Small electric furnace	2 cwt. 2 cwt.	Ventilation: flue 4 in. Gas: ½ in. Electricity: 230V. A.C. single phase	
122	1 Wire drawing apparatus	11 cwd	Prinance	Sometimes

Set of hand rollers Hot hardness tester

6 Benches with fire-resisting top 2-25 lb. each; 127 3 Injection furnaces, gas and air

128 1 Anvil

3 boxes of brass weights

Electricity: 230V. A.C. single phase. I point only

Gas: § in. Compressed air: § in. Electricity: 415V. A.C. 3-phase. Electric motor with compressor for air

Sometimes kept in Fitting Shop Sometimes kept in Fitting Shop

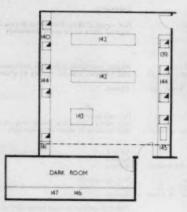
Sometimes transferred to benches in Metallography Laboratory Fire-resisting top; ‡ in, sheet ashestos cement set in rebate in hardwood to finish flush with bench top Gas and air points available for 6 furnasce, 5 h.p. "Alcosa" blower for air supply

12	9 1 Sink	1½ cwt.	Water: hot, 1 in.; cold, 1 in.	Sink fixed in a bench unit 4 ft. by 2 ft.
13	0   Bench vice	j cwt.	Drainage: 1½ in. "electric " water heater	by 3 ft. high. Weight includes bench
13	1 Equipment for macro-printing 2 I Dilatometer	56 lb.	Electricity: 230V. A.C. single	
13	3 1 Optical pyrometer	4 lb.	Single-cell battery	Dimensions are over wood case (Sometimes kept in Machine Shop Store)
13		½ lb.; 3 lb.		store)
13	6 3 Fireclay crucibles for injection furnaces	½ lb. 4 cwt.	Sink to have: Water: hot \( \frac{1}{2} \) in. cold \( \frac{1}{2} \) in. Drainage: \( \frac{1}{2} \) in.	The crucibles differ in size "Belfast" sink
	8 Wall benches without services	80 lb. each unit	Diamage, 17 m.	Made up into wall benches 12 ft. 0 in.
13	8 3 Centre benches	200 lb.		and 20 ft. 0 in. long on adjacent walls Each 10 ft. 0 in. long made up of standard bench units fixed together

# REMARKS

REMARKS
This Laboratory, en suite with the Metallography Laboratory and Dark Room, should be equally related to the Mechanical Engineering Theory Laboratories and the Production Workshops
Much of the work is related to the production operations (preparation of metal specimens from metal being used in production of machine-parts etc.)
A store is not necessary: most of the equipment not bench mounted can be stored in small cupboards under the benches
Bench tops are special: heat resisting tops are required on some wall benches for furnaces, etc. Asbestos sheet inserts in timber frame, or asbestos sheets placed on normal work top and fixed with frame, are suitable
If a separate Heat Treatment Laboratory is provided, the Metallurgy Laboratory will contain only light equipment and will be "clean." The furnace and cauldrons needed for heat treatment are large, heavy and produce factory-like conditions. In this case there is a separate workshop and the Metallurgy Room resembles a normal, clean, "light laboratory"

**METALLO-**GRAPHY LABORA-TORY





Polishing machines (139) on the wall bench, again formed from standard bench units fixed together. Note also the demountable panels forming the partition walls. Black cover strips between panels and black skirtings are removable. Asbestos pipes, painted white, are fixed at 12 ft. 6 in. centres where cruciform investors are likely as along. cruciform junctions are likely on plan.

# NATURE OF WORK

Investigation of the microstructure of metals. The scrutiny of metal specimens prepared or treated in the Metallurgy Laboratory. Up to 10 students each preparing a different "specimen" of metal. The preparation may take more than one class period. The specimen is later examined by the whole class (using microscopes). Notes are taken: written work is involved

# OFFICIALLY RECOMMENDED DATA

MOE Bulletin 5: Specification and Planning Requirements

None recorded

Circular 1/59 recommends 50 sq. ft. per student (Advanced Engineering Science Light Laboratories) = 500 sq. ft.

# SUMMARY OF SERVICE REQUIREMENTS

Heating: Warmed air heaters with facilities for external intake, etc.
Electricity: As for Metallurgy Laboratory, but 3-phase supply possibly not needed
Water: Hot and cold to sink. The use of the sink may be infrequent and a local heater only (adjacent to sink) will suffice for the hot water supply. This
also ensures very hot water when required
Drainage: Normal from sink

Ref. Description	Weight	Special requirements and services	Remarks
139 3 Polishing machines	1½ cwt.	Electricity: 230V. A.C. single	
140 4 Bench microscopes with cases	25 lb.	Electricity: 230V. A.C. single	

1 Carbon-in-steel determination apparatus 6 Tables with plate glass tops Glass tops: 3 ft. 8 in. by 1 ft. 8 i 70 lb. each

143 1 Bench (heavy type) 172 16

144 1	0 Wall benches with electric services	80 lb. each	Electricity: 230V. A.C. single	4 13-amp. switched sockets
145 1	Sink	1½ cwt.	phase Water: hot, ½ in.; cold, ½ in. Drainage: 1½ in. Electricity: 230V. A.C. single phase, for electric water heater	"Belfast "aink. Weight includes bench (Size 4 ft. by 2 ft. by 3 ft. high)
DARK RG 146 7	OOM® Wall benches with cupboard	4½ cwt.		Sink with cold water service usually required
147 1	Photographic copying equipment	2 cwt.	Electricity: switched sockets, 230V. A.C. single phase	rodaneo
• For sp	secial lighting, warning lights, etc., see " Dark	Room in Photography		

## REMARKS

This laboratory functions en suite with the Metallurgy Laboratory and is inseparable from it. One laboratory only often suffices for the work carried out here in two rooms

Broadly speaking, the work of preparation is carried out in the Metallurgy Laboratory and the scrutiny and investigation in the Metallography Laboratory and Dark Room.

The centre benches are special units, having plate glass tops

Direct access to Metallurgy Laboratory required. No separate store is needed

Dark Room requires timing clock, safety lighting and light-lock, etc.

# **METRO-**LOGY LABORA-TORY





Note the heavy table, the standard benches, one in the foreground and others forming a continuous wall bench, the movable storage cupboards and drawer units under the wall bench (common to all laboratories), and the polished wood block floor. The furniture, including the student's chair, was designed by the architect.

# NATURE OF WORK

Experiments and practical work in fine measurement (e.g. the accurate measurement of fine dimensions and surface finish of machined parts). Up to 10 students work individually or in pairs. Very accurate and practise equipment is involved. Notes and written work

# OFFICIALLY RECOMMENDED DATA

OFFICIALLY RECOMMENDED DATA
MOE Bulletin 5: Specification of Planning Requirements
Zoning: light and small equipment and materials
Any floor
Quiet not essential
Special services
Physical conditions: lighting: daylight: exclusion of light essential by blinds
giving complete blackout
Standards: individual directional lighting, minimum 50 f.c.
Heating: control of room temperature essential
Sound: exclusion of vibration essential
Special services: water: sink or basin with hot and cold water supply adjacent
to wall

to wain Electricity: A.C. single phase supply 240 V. to several sockets Equipment: weight: comparatively light equipment 60-100 lb. per sq. ft.

Fittings: benches: benches adjacent to wall 50 sq. ft. per student = 500 sq. ft.

Circular 1/59-50 sq. ft. per student = 500 sq. ft.

Comments Steel marking off tables, etc., are very beavy Ground floor location is best method of avoiding vibration Quiet is desirable Not necessarily special (see remarks) Blackout for part only will suffice and facilitates working

Agreed, but high general standard required Strict control of part of laboratory only, may be alternative Agreed

Agreed Not necessarily

Agreed
Apart from tables, agreed; but accumulation of instruments makes heavy
bulk for storage
Agreed, but also special centre benches
Equipment listed is in a room 624 sq. ft. in area, with adjacent space isf
approximately 80 sq. ft. with temperature control

# SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters with external intake; and separate extractors; all capable of being controlled from inside laboratory Electricity: 230-240 V. A.C. single phase to switched sockets

# LIST OF FOURMENT

Ref. 148	Description 1 Marking off table, C.1.	Weight 15 cwt.	Special Requirements and Services	Remarks Table is on adjustable screw jacks for
149 150 151	2 Inert benches. C.1 1 Inert table. C.1 1 Projector table with electrical service 230 V.	3½ cwt. each 13 cwt.	=	alignment 3 point bearing 3 point bearing
152 153 154	A.C. 1 Optical acreen 1 Rigid table for optical instrument 1 Surface plate	1½ cwt. 40 lb. 1 cwt.		On 2 ft. by 2 ft. by 3 ft. wooden table, 156
155	2 Inert tables	56 lb. 84 lb.	-	Fitted on No. 149
156 157	4 Tables Wall bench: total length approximately 24 ft.	35 lb. each	Electricity: 230 V. A.C. single phase	Electrical services: 6 13-amp.

# REMARKS

REMARKS

Provisions in this laboratory are usually the subject of controversy. Fine measurement in practice ideally requires perfect conditions of cleanliness, temperature control and freedom from vibration. These conditions can be provided only at high cost. It seems disputable that such conditions are needed for educational courses, at least for normal technical college standards

General \*\*Compromise\*\* arrangements found suitable are:

Ground floor location on R.C. slab to avoid vibration; room and thermostatic control of heaters and ventilators; well-fitted doors and no opening windows, with polished hardwood floor finish on insulating screed or foil (to obtain dust-free conditions); section of room capable of blackout; small separate room with air conditioning for special equipment and advanced work; cupboards with doors and drawers for storage of delicate equipment. Equipment falls into two main categories: (1) heavy marking out and "inert" tables, (2) delicate instruments and small equipment stored in cases, and requiring lockable cupboards and drawers\*

Small store also advantageous

The laboratory should be closely related to Production Engineering Department, with convenient access to Metallurgy Department and Materials Testing Laboratory

Laboratory

This type of equipment is acquired by the College continuously, as the courses are developed. The provision of ample storage space is, therefore, important

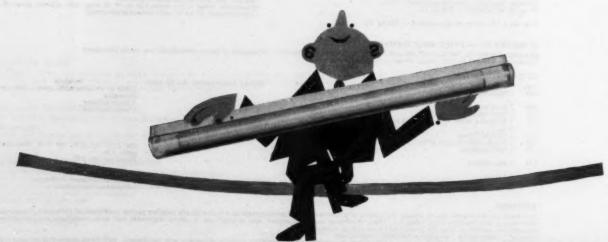
# SIELECT the low cost fluorescent lighting



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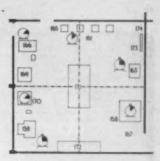


# **Associated Electrical Industries Ltd**

Radio and Electronic Components Division Lamps and Lighting Department 38/39 Upper Thames St., London, E.C.4, CEN 2332



# HEAT TREATMENT **LABORATORY**



Practical work in heat treatment processes; hardening and tempering metals. Up to 10 students, working in groups of up to 6, under direct verbal instruction and supervision. No written work. Considerable danger involved. Metal parts (e.g. machine parts) are made with machine tools, treated with this equipment, then tested on the Strength of the Materials equipment or examined in the Metallurgy Department.

# OFFICIALLY RECOMMENDED DATA

MOE Bulletin No. 5: Specification of Plan None recorded

# Comments

Comments

The following specification is suggested:
Zoning: Heavy and bulky equipment and materials
Ground floor desirable
Noisy
Considerable vibration
Dirt, dust and fumes
Special services:
Physical conditions:
Lighting: daylight; top lighting with sunlight exclusion preferable
Standards: General lighting only. Minimum illumination of 10 f.c. or 2 per cent
daylight factor (16 f.c.; 5 to 10 per cent d.f. needed)
Heasing: Heavy manual activity. Equipment producing heat, Control of room
temperature essential
Ventilation: Mechanical ventilation essential from room; and from equipment
Special services:
Electricity: A.C. 3-phase supply: Equipment supplied with electricity
Fittings with gas supply: Equipment supplied with electricity
Equipment:
Weight: Heavy equipment, 100-200 lb. per sq. ft.
Fittings: Special benches adjacent to wall
The equipment listed is accommodated in a room with area of 624 sq. ft.

90 sq. ft. per student = 900 sq. ft. Circular 1/59; 90 sq. ft. per student but nominal only; area depends on equipment

# SUMMARY OF SERVICE REQUIREMENTS

1 Induction heated tool tipping furnace

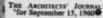
Heating: Warmed air heaters, with facilities for external intake; separate extractors (to accelerate air change, eradicate fumes) Electricity: A.C. 400/440V, 3-phase; A.C. 240V single-phase Gas: 4 in. to 13 in. diameter pipes to equipment. 3-in. gas main required Compressed air; generated by equipment where required Flues; Special requirements: large cowlings over groups of equipment. High temperature flues, 3 in. to 6 in, diameter

# LIST OF EQUIPMENT

Ref.	Description	Weight	Special requirements and services	Remarks
158	1 Gas and air blast heated twin chambered high speed steel hardening furnaces, 1,200°-1,400°C., with motor driven blower fan	20 cwt.	Ventilation: 6½-in. diameter flue. Gas: I in. Compressed air: I in. Electricity: 400-440V. A.C. 3- phase. 2 ft. 0 in. diameter blower fan bolted to floor with 4 No. 4-in. bolts	6j-in. flue enters. Canopy fumes then extracted by roof fan as equipment numbered 163
159	1 Optical pyrometer	4 Jb. 21 Jb. each	Single cell battery	
160	2 Mild steel carburising boxes 3 Natural draught gas heated tempering bath furnaces; pot size 7 in. diameter; 8 in. deep	21 up. each 2 cwt.	Gas: § in. Electricity to 2 No. bifurcated extract fans; each with A.C. 415V. 3-phase, § h.p. motor. Gas § in.	Gas connection to equipment No. 165. Canopy overhead with extract fans on roof
162 163	4 Mercury-in-steel thermometers 1 Gas and air blast heated rectangular cyanide bath furnace (850°-900°C.) with motor driven	15 cwt.	Ventilation: 3-in, and 5-in, flues. Gas: 1 in. Compressed air: 1 in.	3-in. and 4½-in. flues discharge under canopy then extracted by roof fan as
	blower fan		Electricity: 400V. to 440V. A.C. 3-phase (1 ft. 6 in. diameter blower fan bolted to floor with 4 No. 8-in. bolts)	158 (bifurcated fan with 415V, 3-phase
164	1 Pyrometer, 0°-1,000°C.	3½ lb.		Terminals on pyrometer wired to instrument fixed to top of boiler
165	1 Natural draught gas heated tempering both	14 curt.	Gas: 1 in.	Capony overhead, also servine aguin

Electricity: 240V. A.C. single ment No. 161, with extract fans on roof 166

furnace
1 Electrically heated toolroom tempering furnace, 650°C.
2 Quenching baths 70 lb. each 167 Wire beakets are fitted inside each. 2 ft. 0 in. high is sufficient for working 4 \(\frac{1}{2}\) in. as jets I Thermic gas fired semi-muffle furnace up to



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finish...
choice of sizes
and colours,
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look no further
than Bilston, the
Bath Specialists

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14 mut

- 7		
171	1 Steel bench, 8 ft. by 4 ft.	54 cwt.
172	1 Steel bench, 8 ft. by 2 ft.	4 cwt.
173	1 Tool rack	3 cwt.
174	1 Cyanide burns first-aid kit	15 lb.

Ventilation: 4-in. diameter nat-ural. Gas: 1 in. Compressed air: 1 in. Electricity: 230V. A.C. single phase. Air supplied by 1 ft. 6 in. diameter electric fan

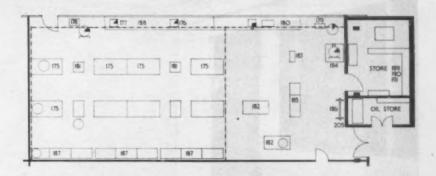
Includes:
2 1-litre bottlee cyanide antidote
1 glass tumbler
1 oxygen face mask (unless supplied by
Fire Brigade at call)
1 bottle amyl-nitrate capsules
10 c.c. Apm-nikethomide
10 c.c. advantages and 3 spare
10 chapter of the condition of the c 1 bottle 50 c.c. sodium thio-sulphate 1 warning chart: 17 in. by 14 in., for display on chart panel near equipment

# REMARKS

170 | Twin chamber formace

The equipment is dangerous and room plan should take account of operations to avoid accidents. The room is usually kept locked when not in use under strict supervision
The laboratory should be planned on suite with the production department, but with convenient access to the Metallurgy Laboratory and Strength of Materials Laboratory
Apart from equipment itself, electrical equipment (fuses, switches, etc.) relating to it occupies a good deal of space and needs careful planning
No store required, or direct access from drive

# FITTING SHOP



The forge (184), anvil (183), and the sink with acid resisting draining boards. The wall benches are standard movable units, but with special work tops. One forward edge is steel. Note the neat switch gear on the wall to the store.



# NATURE OF, WORK

Practice in the use of hand tools; practical applications of the process of soldering, brazing, etc. Up to 26 students working individually on various practical exercises involving heavy manual work in the making of some part or specimen. "End products" involved

# OFFICIALLY RECOMMENDED DATA

MOE Bulletin 5: Specification and Planning Requirements None recorded

Comments

Comments

Control beavy and bulky equipment and materials

Ground floor desirable

Very noisy

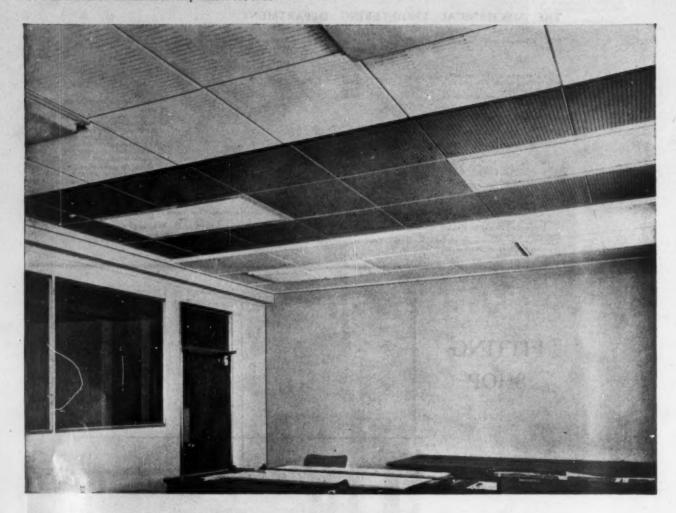
Considerable vibration

Dirt, dust and fumee

Physical conditions:

Lighting: daylighting: north light preferable (i.e. top light with sun control)

Standards: general lighting only minimum 10 for the control. control)
Standards: general lighting only minimum 10 f.c. or 2 per cent. daylight factor (16 f.c. or 5-10 per cent. daylight factor required)
Heating: heavy manual activity
Equipment producing heat
Control of room temperature desirable
Ventilation: mechanical ventilation essential from room and from Ventilation:
equipment
Special services:
Water: aink with hot and cold adjacent to wall
Electricity: A.C. 3 phase supply 440 V.
A.C. single phase 240 V.
A.C. single phase 240 V.
Equipment supplied with electrical supply: beaches adjacent to wall with sockets
Equipment supplied with electricity
Fittings with gas supply: beaches adjacent to wall



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Equipment:
Weight: comparatively light: equipment 60-100 lb. per sq. ft.
Size: equipment requiring at least double doors 5 ft. by 7 ft.
Benches: demonstration bencli (table)
Benches adjacent to wall
Benches in centre of room
This equipment is accommodated in a room of 1,560 as. ft. dated in a room of 1,560 sq. ft.

90 sq. ft. per student = 2,340 sq. ft. Circular 1/59: 90 sq. ft. is nominal; depends on equipme

# SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters with facilities for external intake; separate extraction for accelerating air change (to eradicate fumes, etc.)
Electricity: A.C. 400/440 V. 3 phase
A.C. 230/230 V. single phase
Gas: § in. and § in. diameter supply to bench equipment (limited extent)
Water: hot and cold to sink. Local water heater
Drainage: normal from sink
Flues: extract from forge 12 in. diameter

Weight

# LIST OF EQUIPMENT

175	8 Centre work benches with vices, cupboards, tool racks	weight	Special Requirements and Services
176 177	2 Bench grinders 1 Bench drill	70 lb. 13 cwt.	Electricity: 415 V. A.C. 3 phase Electricity: 400 V. and 440 V.
178	1 Pedestal buffer	1½ cwt.	A.C. 3 phase Electricity: 400 V. and 440 V. A.C. 3 phase
179 180	Brazing hearth and fan     Sink and acid-resisting draining boards forming one unit	1½ cwt.	Water: hot, § in.; cold, § in. Drainage: 1§ in. Electricity: 230 V. A.C. single phase
181	2 Surface plates	2 cwt.	230 V. A.C. single phase
182 183 184	I Marking off table Anvil and anvil stand I Forge and quenching bath	1½ and 1 cwt. 5 cwt. and 60 lb.	Ventilation: mechanical: extract flue 12 in. dia. 415 V. 3-phase A.C.
185 186 187	Teacher's table     Mobile chalkboard—chart panel     Wall benches	50 lb. 100 lb. 80 lb. each	
188	8 Wall work benches	90 lb. each	Gas: § in., 6 points Electricity: 230 V. A.C. 1-phase three 13 amp. switched socket
189 190 191	3 Electric soldering irons 1 Gas heater for soldering iron 6 Soldering irons (copper) ELANBOUS ADDITIONAL FOURMENT:	1 lb. 3 lb. 1 lb. each	outlets Electricity: 230 V. A.C. 1-phase Gas: ½ in.
-	12 Engineers' vices 1 Swaging machine 5 Clothes racks 1 Bunsen burner	1 cwt. (hand oper 35 lb.	ated, rotary action)  Gas: # in.
	1 Small furnace	8 lb.	Out, I m.

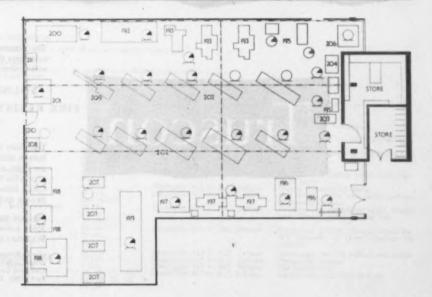
Hot water supplied by electric water heater. Sink size 2 ft. 6 in. by 1 ft. 6 in. by 10 in. ("Belfast" type) Surface plate size 2 ft. by 1 ft. 6 in.

Extraction fan is driven by ½ h.p. electric motor
The flue projects through the roof and has a top cowling

Fixed together by standard device to make wall bench 36 ft. 0 in. long Each bench has 1 free-standing cupboard unit under bench Fixed together, with sink unit, to make total length of 36 ft. 0 in.; 2 benches with asbestos tops

Sometimes described as Handtools Laboratory
This workshop should have access to Machine Shop
Storage for matterials required, with direct access from service drive. Deliveries if materials are frequent
Storage required for work in progress, and finished work; and for tools
Direct access required from service drive to workshop
Store shelving is best made of timber
Benches should be sturdy work-benches, not higher than 2 ft. 8 in. to facilitate working with hand-tools

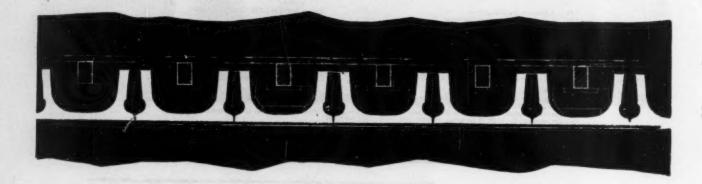
MACHINE SHOP



# NATURE OF WORK

Practice in the use of machine tools; the study of the skills, operations and functions of machine tools. Up to 20 students working individually or in pairs Instruction cards are used for most work. Working drawings are used. Notes and written work





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The Machine Shop showing the drilling machines against the wall on the left and some of the centrally sited lathes (202). Note flexible conduits to overhead bus-bars, the store in the background and the heater units at high level.



The Stores and Loading Bay to the Machine Shop and the Fitting Shop seen from the service drive. Double doors to the workshops are situated between the Stores.

# OFFICIALLY RECOMMENDED DATA

MOE Bulletin 5: Specification of Planning Requirements Zoning: beavy and bulky equipment and materials Ground floor desirable

Very noisy Considerable vibration Clean

Clean
Physical conditions: lighting: artificial: non-stroboscopic essential
Standards: individual directional lighting minimum 50 f.c.
Special Services:
Water: sink or basin with hot and cold water supply adjacent to wall
Electricity: A.C. 3 phase supply 400 V.
A.C. single phase supply 240 V to several sockets
Fittings with electricity supply: benches adjacent to wall with sockets
Equipment supplied with electricity for motors, heating, etc.
Fittings with gas supply: benches adjacent to wall with gas taps

Equipment: weight: heavy equipment over 200 b. per sq. ft. with very heavy concentrated loads. Equipment with moving parts producing vibration or very heavy impact load Size: equipment requiring at least double doors 5 ft. by 7 ft. (widely varying requirements: consult local needs)

Fittings: benches adjacent to wall: heavy type of wall benching

90 sq. ft. per student = 1,800 sq. ft.

Circular 1/59 gives 90 sq. ft. as nominal only: equipment being the criterion

# Comment

# Agreed

Oily waste and scrap Agreed. Daylighting: top lighting with sunlight exclusion is preferable 5-10 per cent. daylight factor

Agreed
Also bus bar system required for supply to equipment

# Agreed

Not necessary if there is a separate Fitting Shop with equipment for hand tools, etc.

Unloading gantry is desirable, preferably a movable type. This would require higher door openings than 7 ft. 0 in. (minimum 8 ft. 0 in.; preferably 10 ft. 0 in.)
These are not necessary if a Fitting Shop is adjacent. Portable tables are required and metal lockers for tools, laboratory sheets, etc., which may be placed adjacent to any machine
The equipment listed is accommodated in a room whose area is 2,632 sq. ft. but this room is too small for the amount of equipment

# SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters, with facilities for external intake and separate extraction Electricity: 415 V. A.C. 3 phase 240 V. A.C. angle phase switched sockets Bus-bar system overhead to facilitate new connections, or changes in workshop layout and equipment Water: hot and cold to sink (local water heater)

OF EQUIPMENT:	
Description	Weight
2 Capstan lathes (Ward 2a)	2 tons,
3 Shapers (Omerod) (Alba)	15 cwt. 35 cwt. 20 cwt.
2 Drilling machines (1 pillar type)	20 cwt. 25 cwt. 50 cwt.
	8 cwt.
2 Slotters (Omerod)	60 cwt. and 18 cwt.
2 Surface grinders (Churchill plain cylindrical) (Trident)	90 cwt. 35 cwt. 35 cwt.
3 Millers (Vertical) (Horizontal) (Universal)	60 cwt. 50 cwt. 60 cwt.
1 Planer (Stirk) 1 Tool-room lathe (Dean Smith and Grace) 1 Vertical lathe (Webster and Bennet)	60 cwt. 70 cwt. 6 tons
9 Lathes	28, 28, 35, 20, 30, 50, 25, 30, 30 cwt.
	Description  2 Capstan lathes (Ward 2a) (Gueck and Hickman) 3 Shapers (Omerod) (Alba)  2 Drilling machines (1 pillar type) (1 radial type) 1 Pedestal grinder (10 in.) 2 Slotters (Omerod) (Archdale) 2 Surface grinders (Churchill plain cylindrical) (Trideat) (Alwood with magnetic chuck) 3 Millers (Vertical) (Horizontal) (Universal) 1 Planer (Stirk) 1 Tool-room lathe (Dean Smith and Grace) 1 Vertical lathe (Webster and Bennet)

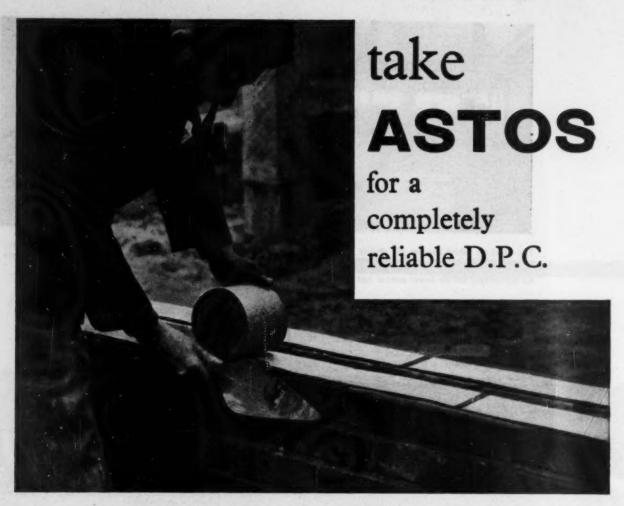
Special requirements and services Electricity: 415 V. A.C. 3-phase. Electricity: 415 V. A.C. 3-phase Electricity: 415 V. A.C. 3-phase

Guard required on feed attachment in each case Guards are required on belt drives and moving heads

Each having coolant sump with elec-trical pump Guards required on wheels Belt drives, motor and pulleys are on separate iron stand Coolant and separating tanks. Pump feed. Guards on wheels and beds

Pump feed coolant. Length allows for full traverse of table. Guards on

Steel-angle base for pulleys and motor Pump feed coolant On coolant tray Guards required in some cases



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Holborn 2501 (5 lines)

LAGI

203 204 205 206 207 208 209	1 Power saw 1 Flypress 1 Power press 1 Diefiling machine 4 Marking off tables 2 Portable stacking tables 22 Students work lockers	15 cwt. 3 cwt. 22 cwt. 18 cwt. 15 cwt. each 30 lb. each 60 lb. each	Electricity: 415 V. A.C. 3-phase Electricity: 415 V. A.C. 3-phase Electricity: 415 V. A.C. 3-phase	May be located in Fitting Shop Guards are required  Made of steel with detachable wood
210 211	1 Mobile notice board 2 Storage cupboards	100 lb. 32 cwt.		Unit-type timber built to facilitate extension

# REMARKS

REMARKS

This workshop should have access to Fitting Shop (which may be an adjunct); the Machine Tools Laboratory; and should be conveniently placed in relation to the Welding Shop; the Metrology Laboratory; and the Heat Treatment Shop Access from drive is required with lifting gear for unloading beavy equipment Stores are required adjacent to drive and with direct access (or very close) to the Shop for:

1. Oil (lubrication)

2. Tools and maintenance spares

3. Material for working; i.e. metal rod, sheets, etc. This storage is for heavy materials and requires metal racks and robust, tubular-steels stands

4. Waste and scrap. Metal boxes, or "skips," on wheels should be provided for the collection of oily metal-shavings and metal-dust, pending collection. This is most important, as otherwise metal scraps may be stored in disposal heaps, and considerable quantities of oil exude, to the detriment of the building.

5. Work in progress and completed work

6. Storage of overalls, etc.

The machines can be dangerous if not properly operated. Overhead lighting and conditions to ensure concentration on the work by students (e.g. avoid windows with clear glass at eye level). Tables which can be placed in any desired position in relation to a machine are required to facilitate working from laboratory sheets and working drawings

Metal lockers for storage of spares; students' belongings (notebooks or partly worked specimens, etc.), also capable of being placed adjacent to machines, are required

Storage fitments, containing lockable compartments for storage of small working parts and accessories may be provided in the room Most machines operate by electricity supplied from overhead busbars with vertical drops in rigid or flexible conduit

Cutouts are required on some machines or mounted close where these are not supplied by the makers

# MACHINE TOOL LABORATORY





Note the students' work lockers which stand adjacent to the lathes, and the cupboard for Note the students work tockers which stand disjacent to the taines, and the cupotary for storage of small machine parts and spares on the extreme right. Flexible connections are to overhead bus-bars. The white ceiling panels stand in slots at the base of the concrete beams. These are asbestos cement panels in timber frames and are lifted out or pushed aside for access to the services in the overhead ducts.

# NATURE OF WORK

Practice in the use of machine tools; the study of the skills, operations and functions of machine tools. Up to 10 students working individually or in pairs Instruction cards and working drawings are used. Notes and written work. Equipment consists of high quality and specialised machinery requiring careful surveillance and maintenance

# OFFICIALLY RECOMMENDED DATA

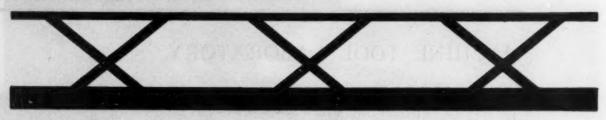
OFFICIALLY RECOMMENDED DATA

MOE Bulletin No. 5: Specification of Planning Requirements
As for Machine Shop
Summary of service requirements:
Heating: Warrice air heaters, with facilities for external intake and separate extraction
Electricity: 415V. A.C., 3-phase
230V. A.C., single phase to switched sockets
Bus-bar system overhead is required to allow for new connections, or changes, in equipment
and layout
Water: Hot and cold to sink if provided (Local water heater)

Comments
As for Machine Shop



OMNIA Concrete Floors installed in the ATV Headquarters building at the remarkable rate of 9,000 square feet every 10 days.



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SAMUEL TYZACK & CO. LTD., SUNDERLAND

Ref. 212 213	OF EQUIPMENT Description 1 Herbert vertical driller 1 Archdale vertical miller, jig boring attachment	Weight 25 cwt. 60 cwt.	Special requirements and services Electricity: A.C. 3-phase 415V. Electricity: ditto.	Remarks Independent coolant tank and pump
214 215 216 217 218 219 220 221 222 223 224	Parkinson universal miller I Holbrook tool room lathe I Ward 3A capatan lathe I Ward 3A capatan lathe I La Pointe broaching machine I Jones & Shipman universal grinder I Tool and cutter grinder I Kearns boring machine I Dowding V8 gear hobbing machine I Bechler machine I Jones tool room surface grinder	55 cwt. 85 cwt. 90 cwt. 80 cwt. 65 cwt. 55 cwt. 60 cwt. 40 cwt. 45 cwt. 35 cwt.	Electricity: ditto Electricity: ditto Electricity: A.C. 3-phase 415V. Electricity: ditto	Twin bases Twin bases; safety guard over belts Twin bases; guards both aldes Guarded end Independent tank. Wheel guarded Independent dust extractor  Well guarded Independent dust entractor. Well
225 226 227 228 229	Marking-out table     Portable stacking tables     Cupboard storage for machine parts     Students' work lockers     Engraving machine	15 cwt. 30 lb. 3 cwt. (unloaded) 60 lb. 20 cwt.	Nil Nil Electricity: A.C. 3-phase 415V.	guarded  Drawers, cupboards and shelves

# REMARKS

Tubular chairs and portable chalkboard are also required sometimes. This room accommodates special machinery whose value and precision-working imply a high degree of supervision. It is kept locked when not in use Should have access direct to Machine Shop; and also have convenient access to Metrology Laboratory and Heat Treatment Room. Storage is required for metal raw materials; and for finished parts; but is usually provided as part of Machine Shop accommodation. Storage for machine parts is needed in the form of cupboards within the Laboratory or in an adjacent lockable store
All comments relating to Machine Shop are relevant to this Laboratory.

# WELDING SHOP



Gas welding benches (233) in the foreground and the arc welding cubicles (232) in the background. Note the neat arrangement of electrical switch gear on the panel on the left at the end of the cubicles. All gear is laid out in this way on special panels to avoid fixture on demountable partitions. (This was carried out under the personal supervision of the architect on site.)



The cubicles for arc welding (232). This is not a successful layout, as may be diagnosed from the dangerous arrangement of cables and the indifferently rigged conduits. The shortcomings arose from an inadequate appreciation of the services-to-equipment problem.

# NATURE OF WORK

Practice in the skills of welding: instruction in the function and operation of welding equipment; practical applications of the process of welding. Up to 20 students working individually, with some group instruction or testing. No instruction cards are used. Verbal instruction

# OFFICIALLY RECOMMENDED DATA

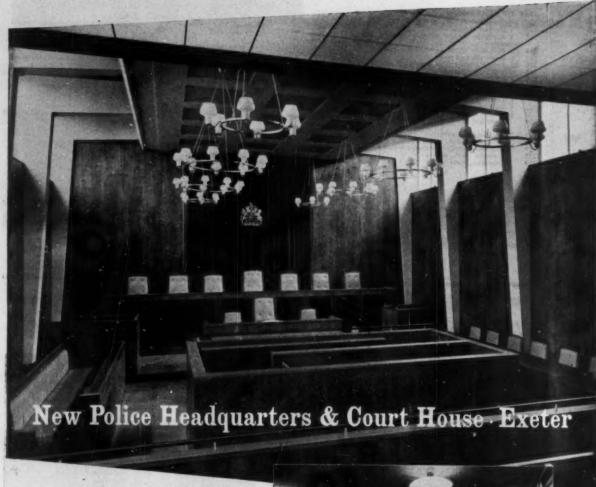
MOE Bulletin 5: Specification of Planning Requirements

MOE Bulletin 5: Specification by a management of a materials Ground floor desirable Not very noisy Dirt, dust and fumes Physical conditions:
Lighting: daylight (no special recommendations)
Standards: individual directional lighting; minimum, 25 f.c.
Heating: equipment producing heat. Control of room temperature desirable Ventiliation: mechanical ventilation essential from room Special services: sink or basin with hot and cold water supply adjacent to the wall

DEXAS

Motor generator for arc welding, if used, is one of the nossiest pieces of equipment in the college

Natural daylighting 5-10 per cent daylight factor: exclusion of sunlight necessary to prevent heat build up



The City Architect ensured a perfect result by specifying our:

Architectural Veneered Panels in English Walnut.

"Mallite" Standard Oak Panels.

Selected Yugoslavian Oak for solid joinery and specially made table-tops veneered in Figured Australian Walnut.



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# William Mallinson and Sons Ltd.

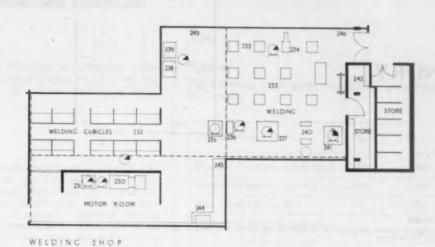
TIMBER AND VENEER MERCHANTS
130 HACKNEY ROAD - LONDON - E.2

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MANUFACTURERS OF PLYWOOD . ARMOURPLY . PANELS AND COMPOSITE PARTITIONING

# THE MECHANICAL ENGINEERING DEPARTMENT



Electricity:

A.C. 3-phase supply, 400V.

A.C. single-phase 240V. to several sockets
Fittings supplied with gas: equipment supplied with gas
Equipment: weight; heavy equipment, 100-200 lb. per sq. ft. Most suitably
sited on ground floor
Benches; benches adjacent to the wall
90 sq. ft. per student = 1,800 sq. ft.

Electrical requirements vary considerably and must be carefully checked in each case

The equipment listed is housed in a room 1,249 sq. ft.in area plus room for the generating equipment, 240 sq. ft.

Preferably on wheels or trolleys, for delivery to external unloading bay

# SUMMARY OF SERVICE REQUIREMENTS

Heating: warmed air heaters with facilities for external intake and separate extraction Ventilation: Special extraction required to eject fumes, etc. Ventilation: Special extraction required to eject tumes, etc.
Electricity;
D.C., 0-100, and 240V,
415V, A.C., 3 phase
90V, A.C., single phase
415V, A.C., two-phase
Generating equipment required: heavy and noisy and requiring special location
Water; Hot and cold to sink (local heater)

# LIST OF EQUIPMENT

Ref.	Description	Weight	Special requirements	Remarks
230	<ol> <li>Motor generator for arc welding equipment, A.C./D.C., 450 amp, at 60-100V.</li> </ol>	60 cwt.	Electricity: A.C. 3-phase 415V.	Connected to equipment No. 232
231 232	A.C. welding transformer at 60-90V. output     Cubicles for arc welding, 4 D.C. and 6 A.C.	15 cwt. 60 lb. each	Electricity: 4—D.C. with maximum 100V.; 6—A.C. with maximum 90V. single phase	Ditto.  Each with steel bench 4 ft. by 2 tt. by 2 ft. 9 in., 4 resistance sets for D.C. bench cubicles. Asbestos lining required to prevent side flash off galvanised sheets. Asbestos mats are required on
233	8 Gas welding benches with ancillary equip-	1 cwt. each		bench tops Fire brick tops required
234 235	nent I Power hacksaw I Cuilleaine fear in miste	7 cwt. 75 lb.	Electricity: 415V. A.C., 3 phase	
236 237	Guillotine for 1-in. plate Double ended grinder Profile cutter	4½ cwt. 6 cwt.	Electricity: 415V. A.C., 3 phase Gas: 1 in. Electricity: 230V. D.C.	Includes switchgear and motor Coal gas and oxygen or acetylene and
238 239	l Hydrogen arc apparatus l Argon arc apparatus	10 cwt. 2 cwt.; 8 cwt.	Electricity: 2-phase, 415V. A.C. Water: cold § in. Drainage: § in. Electricity: A.C. 2-phase, 415V. and 230V, A.C., single phase	oxygen On wheels Portable
240	2 Anvils	15 cwt.; 13 cwt.		Each with stands weighing I cwt. each
241	1 Blacksmith's forge	10 cwt.	Ventilation: mechanical extract, 1 ft. diameter. Electricity: 230V. A.C., single phase	Electricity is to operate extract and blower fans
242	15 200 cu. ft. oxygen cylinders	1½ cwt. each	A.C., single pluise	Also 200 cu. ft. dissolved acetylene cylinders required, say 8 in number
243	6 Wall benches, 24 ft.	5 cwt.		
244	1 Sink	1 cwt.	Water: hot, \(\frac{1}{2}\) in., cold, \(\frac{1}{2}\) in.  Drainage: \(\frac{1}{2}\) in. Electricity: 230V.  A.C.	Hot water supplied by local electric heater, 230V.

# REMARKS

245 1 Mobile chalk board 246 1 Metal bin for scrap disposal

REMARKS

Access from road required, direct to shop and stores

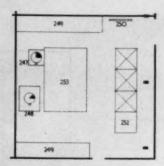
Considerable storage space for raw materials necessary: rod and bar (mild steel, etc.), on steel racks; sheet iron and steel, in stacking bays formed by bent tubes. (Store can be shared with Machine Shop.) Two stores, each 250 sq. ft., may suffice. Storage for oxygen cylinders, etc., in separate compartment Waste scrap is special problem: very jagged and heavy. Metal bins on wheels are required

Generating equipment for welding cubicles may be very noisy. Should be placed in space with sound insulation and separate ventilation or air intake

100 lb

# THE MECHANICAL ENGINEERING DEPARTMENT

# **FOUNDRY**



NATURE OF WORK

Practice in the casting of metals; instruction in the function and operation of foundry equipment. Up to 10 students working in groups of varying size to a maximum of 6 in one group

OFFICIALLY RECOMMENDED DATA

MOE Bulletin 5: Specification of Planning Requirements

MOE Bulletin 5: Specification of Planning Requirements
Zoning:
Heavy and bulky equipment and materials
Ground floor desirable
Not very noisy
Dirt, dust and furnes
Physical conditions:
Lighting: Standards: general lighting only. Minimum illumination of 10 f.c.
or 2 per cent daylight factor
Heating: Heavy manual activity equipment producing heat; control of room
temperature desirable
Ventilation: Mechanical ventilation essential from room
Water: Sink or basin with hot and cold water supply adjacent to wall
Electricity: A.C. 3-phase supply 400V.; A.C. single-phase supply 240V. to
several sockets
Fittings with electricity supply: equipment supplied with electricity, for
motors, heating, etc.
Fittings with gas supply: equipment over 200 lb. per sq. ft., with heavy
concentrated loads
Size: equipment requiring at least double doors 3 ft. by 7 ft.

Equipment listed is housed in a room of

Comment

Equipment listed is housed in a room of 624 sq. ft.

# SUMMARY OF SERVICE REQUIREMENTS

Heating: Warmed air heaters with facilities for external intake and separate extraction Ventilation: Special extraction to eject fumes, etc. Electricity: 3-phase 415V. A.C.; single-phase 240V. A.C. Water Gas: 1-in, supply Compressed air

LIST OF EQUIPMENT

Re	f. Description	Weight	Special requirements and services	Remarks
24	7 1 Crucible melting furnace, gas-fired tilting type	6 cwt.	Gas: 1 in. Compressed air: 2 in. Electricity: fan 415V. A.C. 3- phase. 1 ft. 6 in. fan for air	Alternative location Laboratory
24	8 1 Gas fired furnace	10 cwt.	Electricity: extract fan 230V. A.C. single phase. Air supply fan: 230V. A.C. single phase	Inverted cone-shape flue 3 ft. 6 in. diamet fan 1 ft. 8 in. diamet
249 250 251 252	8 Steel topped benches forming 2 wall benches 1 Mobile tool rack 3 Sand bunkers, I cu, yd.	2½ cwt. each 3 cwt. 34 cwt. empty		For storage purpose
252	1 Sink	1‡ cwt.	Water: hot ½ in., cold ½ in.	

Water: hot 1 in., cold 1 in.

on: Heat Treatment

ped duct to extract eter. Air supplied by seter

Furnace may be made up by College and size and weight depend upon material, space and effort available. External open area to be provided 20 ft. by 8 ft. in plan on flat concrete. R.C. slab with screen wall. Direct access to space from foundry is required

Access to road required direct to shop. Storage of sand in workshop space is required. Heavy metal-topped benches. Cupola furnace is not normally required and must be placed outside in a special space

# ·NOVOTAN· RESIN-BONDED CHIPBOARD

This Sheet describes Novotan resin-bonded chipboard which has a finished surface which is smooth and matt and may be painted without priming, filling or sanding.

### Material

Novotan is a laminated three-layer chipboard, the core being made from wood chips and the outer layers from fine wood flakes all of which are impregnated with resin-based glue. During manufacture a thin skin of specially prepared plastic-impregnated material is applied to one or both sides giving a board with either one or two finished surfaces. The method of application of the latter material makes it an integral part of the board as opposed to a surface separately applied. The finished surface is resistant to abrasion and impact damage, is water-repellent and provides an excellent base for painting. Boards suitable for shelving are also manufactured with one long edge lipped with hardwood (mahogany or oak). Boards with the two long edges lipped can be supplied to order. Novobord, which is identical to Novotan except for the finished surfaces, is also obtainable in shelving and board sizes.

The boards are dimensionally stable and will not warp or twist: they are treated to resist attack by fungi and insects. They can be easily cut to form

all normal joints.

The two surfaces of double-faced boards differ slightly in appearance and it is advisable, when using double-faced boards for panelling or partitions, to have similar surfaces kept to the same side.

Tools used for working the boards should be clean and fast-cutting. Coarse rip saws or similar tools should not be used. For edge grooving and rebating, high-speed cutters should be used.

# Sizes

The boards are 9 ft. 0 in. by 6 ft. 0 in. and 8 ft. 0 in. by 4 ft. 0 in.,  $\frac{1}{2}$  in.,  $\frac{1}{2}$  in., or  $1\frac{1}{4}$  in. thick. Edged boards are available from 5 ft. 0 in. to 9 ft. 0 in. long, in widths of 9 in., 1 ft. 0 in., 1 ft. 3 in., 1 ft. 6 in., 1 ft. 9 in., and 2 ft. 0 in. Special sizes can be manufactured.

# Weight

The following table gives the weights of the varying thicknesses of board:

Thickness (in.)	1	1	11
Weight (lb./sq. ft.)	1.61	2.40	3.66

### Propertie

The following table gives the physical properties of the boards:

Thickness (in.)	*	1
Modulus of rupture (lb./sq. ft.)	3,000	2,500
Flexural strength (lb./sq. in.)	2,546	2,205
Face strength (lb./sq. in.)	119	156
Modulus of elasticity (tons/sq. in.)	166-36	161-41
Shearing modulus (lb./sq. in.)	4.	3.7
Tensile strength (lb./sq. ft.)	7	75

# Thermal Insulation

The thermal conductivity (k) is 0.68 B.t.u./sq. ft. h deg. F and the U value is 0.56 B.t.u./sq. ft. h deg. F.

### **Sound Insulation**

Recent comprehensive tests have shown that a single thickness of  $\frac{3}{4}$ -in. Novotan will reduce the transference of noise by 25 dB at a frequency of 500 cycles per second, while a double-skinned partition will reduce the transference of noise by 37 dB at the same frequency,

# Fire Resistance

The boards have been tested for surface spread of flame by the J.F.R.O. and found to conform with Class 3 of B.S.476, Part 1, Section 2.

A double skin partition has been tested under Section 3 (Fire resistance tests of structures) and, depending on the type of construction,  $\frac{1}{2}$  hour to 1 hour resistance can be obtained. Further details may be had on request from the manufacturer.

# Fixing

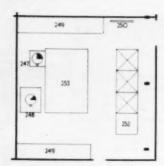
The boards may be fixed by nailing, screwing or adhesive. Nailing or screwing near the edges of the boards will not cause splitting and, although pilot holes for screws are recommended, they are not essential. When fixing with adhesive, synthetic resin glue is recommended, but any glue suitable for use with timber may be used with the exception of casein glues.

# Shelving Applications

Owing to their exceptional stiffness Novobord and Novotan are very suitable for shelving. The following graph, which was drawn up by the Fahrni Institute Limited Laboratories in Zurich, may be used to

# THE MECHANICAL ENGINEERING DEPARTMENT

# **FOUNDRY**



### NATURE OF WORK

Practice in the casting of metals; instruction in the function and operation of foundry equipment. Up to 10 students working in groups of varying size to a maximum of 6 in one group

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Comment

Equipment listed is housed in a room of 624 sq. ft.

# SUMMARY OF SERVICE REQUIREMENTS

Heating: Warmed air heaters with facilities for external intake and separate extraction Ventilation: Special extraction to eject fumes, etc. Electricity: 3-phase 415V. A.C.; single-phase 240V. A.C. Water Gas: 1-in, supply Compressed air

# LIST OF EQUIPMENT

Ref.	Description	Weight	Special requirements and services	Remarks
247	1 Crucible melting furnace, gas-fired tilting type	6 cwt.	Gas: 1 in. Compressed air: 2 in. Electricity: fan 415V. A.C. 3-	Alternative location: Heat Treatment Laboratory
248	1 Gas fired furnace	10 cwt.	phase. 1 ft. 6 in. fan for air Electricity: extract fan 230V. A.C. single phase. Air supply	Inverted cone-shaped duct to extract flue 3 ft. 6 in. diameter. Air supplied by

fan: 230V. A.C. single phase fan I ft. 8 in. diameter Steel topped benches forming 2 wall benches Mobile tool rack Sand bunkers, 1 cu. yd. Sink Sand pit Cupola furnace 2½ cwt. each 3 cwt. 34 cwt. empty 1½ cwt.

Varies up to several tons

For storage purposes Water: hot 1 in., cold 1 in.

Furnace may be made up by College and size and weight depend upon material, space and effort available. External open area to be provided 20 ft. by 8 ft. in plan on flat concrete. R.C. slab with screen wall. Direct access to space from foundry is required

Access to road required direct to shop. Storage of sand in workshop space is required. Heavy metal-topped benches. Cupola furnace is not normally required and must be placed outside in a special space

# TIMBER CHIPBOARD GENERAL DATA

The Architects' Journal Library of Information Sheets 783. Editor: Cotterell Butler ARARA

# ·NOVOTAN· RESIN-BONDED CHIPBOARD

This Sheet describes Novotan resin-bonded chipboard which has a finished surface which is smooth and matt and may be painted without priming, filling or sanding.

# Material

Novotan is a laminated three-layer chipboard, the core being made from wood chips and the outer layers from fine wood flakes all of which are impregnated with resin-based glue. During manufacture a thin skin of specially prepared plasticimpregnated material is applied to one or both sides giving a board with either one or two finished surfaces. The method of application of the latter material makes it an integral part of the board as opposed to a surface separately applied. The finished surface is resistant to abrasion and impact damage, is waterrepellent and provides an excellent base for painting. Boards suitable for shelving are also manufactured with one long edge lipped with hardwood (mahogany or oak). Boards with the two long edges lipped can be supplied to order. Novobord, which is identical to Novotan except for the finished surfaces, is also obtainable in shelving and board sizes.

The boards are dimensionally stable and will not warp or twist: they are treated to resist attack by fungi and insects. They can be easily cut to form all normal joints.

The two surfaces of double-faced boards differ slightly in appearance and it is advisable, when using double-faced boards for panelling or partitions, to have similar surfaces kept to the same side.

Tools used for working the boards should be clean

and fast-cutting. Coarse rip saws or similar tools should not be used. For edge grooving and rebating, high-speed cutters should be used.

# Sizes

The boards are 9 ft. 0 in. by 6 ft. 0 in. and 8 ft. 0 in. by 4 ft. 0 in.,  $\frac{1}{2}$  in.,  $\frac{1}{4}$  in., or  $1\frac{1}{4}$  in. thick. Edged boards are available from 5 ft. 0 in. to 9 ft. 0 in. long, in widths of 9 in., 1 ft. 0 in., 1 ft. 3 in., 1 ft. 6 in., 1 ft. 9 in., and 2 ft. 0 in. Special sizes can be manufactured.

# Weight

The following table gives the weights of the varying thicknesses of board:

Thickness (in.)	1	ŧ	11
Weight (lb./sq. ft.)	1.61	2.40	3.66

# Propertie

The following table gives the physical properties of the boards:

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Flexural strength (lb./sq. in.)	2,546	2,205
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Modulus of elasticity (tons/sq. in.)	166-36	161-41
Shearing modulus (lb./sq. in.)	4	3.7
Tensile strength (lb./sq. ft.)	7	75

### Thermal Insulation

The thermal conductivity (k) is 0.68 B.t.u./sq. ft, h deg. F and the U value is 0.56 B.t.u./sq. ft, h deg. F.

### Sound Insulation

Recent comprehensive tests have shown that a single thickness of  $\frac{3}{4}$ -in. Novotan will reduce the transference of noise by 25 dB at a frequency of 500 cycles per second, while a double-skinned partition will reduce the transference of noise by 37 dB at the same frequency.

# Fire Resistance

The boards have been tested for surface spread of flame by the J.F.R.O. and found to conform with Class 3 of B.S.476, Part 1, Section 2.

A double skin partition has been tested under Section 3 (Fire resistance tests of structures) and, depending on the type of construction,  $\frac{1}{2}$  hour to 1 hour resistance can be obtained. Further details may be had on request from the manufacturer.

# Fixing

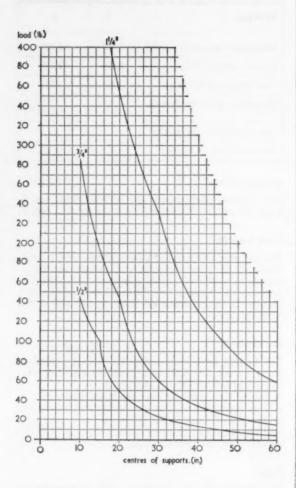
The boards may be fixed by nailing, screwing or adhesive. Nailing or screwing near the edges of the boards will not cause splitting and, although pilot holes for screws are recommended, they are not essential. When fixing with adhesive, synthetic resin glue is recommended, but any glue suitable for use with timber may be used with the exception of casein glues.

# Shelving Applications

Owing to their exceptional stiffness Novobord and Novotan are very suitable for shelving. The following graph, which was drawn up by the Fahrni Institute Limited Laboratories in Zurich, may be used to

# 11.F1 · NOVOTAN· RESIN-BONDED CHIPBOARD

determine the centres of supports for any given uniformly distributed load. The graph is based on 4 in. wide Novobord and Novotan panels, giving a safety factor of 2.5, with a maximum deflection of 1.25 per cent of the distance between supports where the maximum permissible load is applied.



The following examples demonstrate the use of the graph:

Example 1.

It is required to find the permissible load for 12 in.

wide shelving, \( \frac{1}{2} \) in. thick, with supports at 30 in. centres. Read upwards from the 30 in. mark on the base line to the intersection with the 2 in. curve. At this point follow a horizontal line to the vertical axis which gives 60 lb. The given width being 3 times 4 in., the load will be 60 lb.  $\times$  3 = 180 lb.

# Example 2.

It is required to find the spacing for supports for 18 inwide shelving,  $\frac{1}{4}$  in. thick, to support a load of 200 lb-The given width being 4.5 times 4 in., the load of 200 lb-should be divided by 4.5, giving 44.5 lb. From the mark 44.5 lb. on the vertical axis of the graph follow a horizontal line to the intersection with the 3 in. curve. At this point read downwards to the base line which gives 35 in. as the maximum spacing for supports.

### **Painting**

No sanding or surface preparation is required other than removing dirt or grease from the boards. is done by wiping with a cloth dipped in cellulose thinner or carbon tetrachloride. Should any difficulties arise in this connection, a light rubbing down with 400 grade wet and dry paper is all that is required. Paint may be applied by brush or spray and for ordinary purposes one undercoat and one finishing coat are sufficient. When polyvinyl or plastic emulsion paint is to be used careful attention should be given to the paint manufacturer's instructions on thinning.

# **Further Information**

The manufacturer maintains a technical advisory department available to answer questions dealing with all aspects of their products.

Compiled from information supplied by:

Novobord (U.K.) Limited.

Address: 1A, The Parade, Haven Green, Ealing Broadway,
London, W.5.

Telephone: Perivale 8833/4.

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# CONCRETE LIGHTWEIGHT

The Architects' Journal Library of Information Sheets 784. Editor: Cotterell Butler, ARABA

# ·CELCON· CELLULAR CONCRETE: PRECAST AND IN-SITU

Recommended uses	Density lb./cu. ft.	Relative density	Thermal conductivity (" K " values)	Crushing strength (28 days) lb./sq. in.
Cold store insulation with in-situ cell concrete or precast air-cured blocks	19	0.3	0.42	70
Insulation of steam and hot water heating systems, oil pipelines, etc. Insulation "mat" beneath floor panel heating coils	25	0.4	0.60	130
Roof insulation (maintenance traffic only)	31	0.5	0.68	200
Precast blocks for barrel vault roof insulation, etc.	38	0.6	0.85	350*
Precast lightweight loadbearing building blocks and structural roof slabs	45/50	0.8	1.2	600/800*
Lightweight floor screeds: soft flooring finishes	75/80	1.2	2.1	700
Lightweight floor screeds: hard flooring finishes	88	1.4	2.5	850

<sup>\*</sup> High pressure steam cured in autoclave.

This Sheet describes Celcon lightweight cellular concrete which may be used for in-situ applications and is also available in the form of precast autoclaved blocks and structural slabs. In-situ work is undertaken by the manufacturer using his own specialised equipment and skilled labour. The table above summarises the properties of the material as used for various applications and the following notes give fuller details.

# Material

The basic materials for the production of in-situ Celcon are the special foaming agent, rapid hardening cement and water. Sand is introduced for heavier densities. The materials are mixed in the Celcon mixer, poured, screeded and trowelled to a smooth hard finish when used for lightweight floor screeds. Celcon "gas concrete" for autoclaved blocks and slabs is made with cement, lime, pulverised fuel ash and water. A chemical reaction caused by the addition of an aluminium-powder activating agent distributes air bubbles throughout the mass, resulting in the formation of innumerable cells. The slurry is poured into large moulds where the mix expands and an initial set follows in approximately 1 to 2 hours. Blocks and slabs are then cut to the required sizes by moving the moulds through the cutting machine. The units are finally subjected to high-pressure steamcuring in autoclaves to give them strength and volume-stability.

Celcon is proof against fire, rot, vermin and frost; it is water-repellent and non-corrosive and, therefore, will protect steel and other metals.

# In-Situ Applications

Insulation of underground pipelines. The method of insulation may be applied to external mains laid underground and internal mains in floor ducts, for steam and hot-water heating systems, domestic hot and cold water services, heated oil supply pipelines, etc. It consists of the complete encasement of the pipes to give over 90 per cent insulation, dispensing with the need for brick or concrete ducts, simplifying pipe supports, anchorage and expansion joints and virtually eliminating maintenance work. All work, with the exception of trench excavation, blinding and

final backfilling and levelling off, is carried out by Celcon Limited after the pipes have been tested. For external work, the bottom and sides of the trench are lined with bituminous felt and the pipes wrapped in corrugated cardboard or building paper to allow for movement due to expansion. Temporary pipe supports are replaced by Celcon blocks and a pad inserted between the block and the pipe to prevent frictional wear. The Celcon concrete is then poured around the pipes to the required depth and, when it has set, a further sheet of bituminous felt is laid over it and heat-sealed to the side linings. Special precautions against water penetration must be taken for inspection pits, anchor points, expansion loop chambers, etc., and in permanently waterlogged ground a waterproof duct must be provided. For internal ducts, the lining of bituminous felt is unnecessary.

Roof insulation. For insulation of roofs to take maintenance traffic only, Celcon is east in-situ directly onto the structural roof and screeded to falls ready to receive the roof covering; no additional surface treatment is required. Electrical conduits can be enclosed in the screed. Celcon protects the structural roof against movement due to expansion and prevents condensation on the soffit. The minimum thickness recommended is  $1\frac{1}{2}$  in.

Specimen heat transmission calculation:

External Surface Asphalt Cell Concrete Hollow Concrete Units Plaster Internal Surface	Thickness  \$\frac{2}{2}\$ in.  2\frac{1}{2}\$ in.  5\frac{1}{2}\$ in.	Conductivity	Resistance 0·25 0·09 3·68 0·78 0·12 0·60
$U = \frac{1}{100} = 0.18 \text{ B.t}$	.u./sq. ft./hr	.°F.	5.52

Floor Screeds. The density of Celcon can be varied according to the degree of insulation or saving of weight it is desired to achieve. For soft flooring finishes, e.g., linoleum, cork, etc., a density of 75 to 80 lb./cu. ft. is recommended, as shown in the table. The screed has a hardened surface and is trowelled smooth to receive the floor finish direct. A lower density (31 lb./cu. ft.) may be used with tiles

# 6.Cl. ·CELCON· CELLULAR CONCRETE: PRECAST AND IN-SITU

set in mortar or as an infill between floor fillets in a timber floor. 25 lb. density concrete is recommended as an insulating mat under floor heating cables which are to be subsequently encased in a higher-density material.

### Precast Units (Air-Cured)

Blocks and slabs. Blocks are suitable for cold storage insulation and slabs for insulation of sloping roofs (gradients exceeding 1 in 8) and barrel vault and arched roofs generally. All of these units are non-loadbearing and can be cast in-situ to dimensions and densities to suit site conditions and insulation requirements. It should be noted that autoclaved blocks are also used for pitched and barrel vault roof insulation. When used in cold stores a vapour barrier must first be applied to the internal surface of the structural wall. This is designed to suit the desired temperature in the cold store and varies from a lining of cold bitumen in the case of fruit stores to a lining of hot bitumen and felt for meat and other low temperature stores. The Celcon blocks are placed up against the vapour barrier, laid with broken joints and set in hot bitumen. The surface of the blocks is then rendered with a \frac{3}{4}-in. thick cement and sand plaster reinforced with chicken-wire netting and held in position by hairpin binders fixed in the joints of the blocks. For pitched and barrel vault roof insulation the slabs are bedded in mortar on the structural roof and covered with a sand and cement screed or Celcon screed approximately ½ in.-1 in. thick, ready to receive the roof covering.

# Precast Units (Autoclaved)

Blocks. These loadbearing building blocks conform to type B of B.S. 2028 for strength and stability. They are 1 ft. 6 in. by 9 in., in thicknesses from 2½ in. to 9 in. in ½-in. increments. Their density is normally 50 lb./cu. ft. as shown in the table, but a lighter block may be obtained with a density of 38 lb./cu. ft. where the loadbearing quality is not essential. In addition to those shown in the table, the blocks have the following properties. They have a moisture movement of .05 per cent and a drying shrinkage of .05 per cent. A wall of 6-in. blocks gives a sound reduction of 50 dB. As a practical example of their thermal-insulating properties, it should be noted that a cavity wall consisting of an outer skin of 4½-in. brickwork and an inner skin of 4-in. Celcon blocks of 50 lb./cu. ft. density, plastered 1-in. on the inner face, with a 2-in. cavity between them, gives a U value of 0.17 B.t.u./sq.ft./hr./°F. A non-loadbearing wall of 4-in. cell concrete blocks, unplastered, was tested by the Department of Scientific and Industrial Research in accordance with B.S. 476 Part I and showed a fire resistance of four hours.

The recommended mix for laying blocks is 1:6 cement/sand, with a plasticiser (½ pint to 10 gal. mixing water); alternatively a 1:2:9 cement/lime/ sand mix is suitable except in cold winter conditions when a 1:1:6 cement/lime/sand mix should be used (see B.R.S. Digests 32 and 52 and C.P. 122: 1952). The blocks can be cut, chased, drilled and nailed without special tools. They can also be plastered or painted.

The blocks can be used in varying thicknesses for the inner skins of cavity and curtain walls, for partitions and for solid loadbearing walls with plastered or rendered surfaces, tile hung, without battens or clad with cedar boarding or other suitable hardwoods.

Reinforced slabs. These are structural units which can be manufactured in almost any length to suit spans up to 10 ft. 0 in. They are 1 ft. 6 in. wide although special filler widths can be supplied. They are reinforced with 1-in. mild steel bars in accordance with B.S. Code of Practice C.P. 114. As with blocks, the normal density is 50 lb./cu. ft. but slabs with a density of 38 lb./cu. ft. can be obtained if required: these are only recommended in special instances, as they are more liable to damage in transit. The edges of the slabs are normally cut in a special way to provide a joggled joint between them, but plain rebates or butt joints can be supplied. Joints can be masked if required with metal tee sections. Where openings are cut in the slabs, it is not advisable to exceed an area of 6 in. by 6 in. as this would lower the safety factor.

Plastering. When plastering Celcon blocks a backing coat of 6:1 sand/cement with a suitable plasticiser  $(\frac{1}{2}$  pint of liquid or 1 oz. of powder to 1 cwt. of cement) should be applied. If lime is used, the mix should be 1:1:6 or 1:2:9 cement/lime/sand. Immediately before the undercoat is applied, the blocks should be thoroughly wetted. The finishing coat should be applied in accordance with the plaster manufacturer's instructions. For Celcon slabs, Carlite plaster is often preferred as having a higher thermal insulation

Painting. Celcon blocks have a definite key on the external surfaces and unless it is desired to retain this as a decorative feature, it is unlikely that they would be painted. The slabs, however, can be decorated where their under-surface is intended to form an exposed ceiling in the building. Their smooth surfaces should be rubbed down and sealed by trowelling or brushing with a cement slurry. When this has dried any laitance or loose particles should be brushed off and the surface primed and given two coats of paint. As Celcon has a higher suction than ordinary concrete, a suitable sealer may be used in place of the primer.

The manufacturer maintains a technical advisory department available to answer questions dealing with all types of Celcon installation.

Compiled from information supplied by:

# Celcon Limited

Address: Universal House, 60, Buckingham Palace Road, London, S.W.1. Telephone: Sloane 0324-7.

Branch Offices: Belfast, Birmingham.

# working detail

SPACE FRAME ROOF: MUSEUM IN DURHAM

P. R. Middleton and Partner, architects



This space frame made up of tube, rod and angle, is based on a module 4 ft. 0 in, square to which woodwool slabs and rooflights of standard dimensions are related.

# 6.CL · CELCON· CELLULAR CONCRETE: PRECAST AND IN-SITU

set in mortar or as an infill between floor fillets in a timber floor. 25 lb. density concrete is recommended as an insulating mat under floor heating cables which are to be subsequently encased in a higher-density material.

# Precast Units (Air-Cured)

Blocks and slabs. Blocks are suitable for cold storage insulation and slabs for insulation of sloping roofs (gradients exceeding 1 in 8) and barrel vault and arched roofs generally. All of these units are non-loadbearing and can be cast in-situ to dimensions and densities to suit site conditions and insulation requirements. It should be noted that autoclaved blocks are also used for pitched and barrel vault roof insulation. When used in cold stores a vapour barrier must first be applied to the internal surface of the structural wall. This is designed to suit the desired temperature in the cold store and varies from a lining of cold bitumen in the case of fruit stores to a lining of hot bitumen and felt for meat and other low temperature stores. The Celcon blocks are placed up against the vapour barrier, laid with broken joints and set in hot bitumen. The surface of the blocks is then rendered with a 1-in. thick cement and sand plaster reinforced with chicken-wire netting and held in position by hairpin binders fixed in the joints of the blocks. For pitched and barrel vault roof insulation the slabs are bedded in mortar on the structural roof and covered with a sand and cement screed or Celcon screed approximately ½ in.-1 in. thick, ready to receive the roof covering.

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### Finish

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# Further Information

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Compiled from information supplied by:

# Celcon Limited

Address: Universal House, 60, Buckingham Palaco Roud, London, S.W.I. Telephone: Sloane 0324-7. Branch Offices: Belfast, Birmingham.

# working detail

SPACE FRAME ROOF: MUSEUM IN DURHAM

P. R. Middleton and Partner, architects

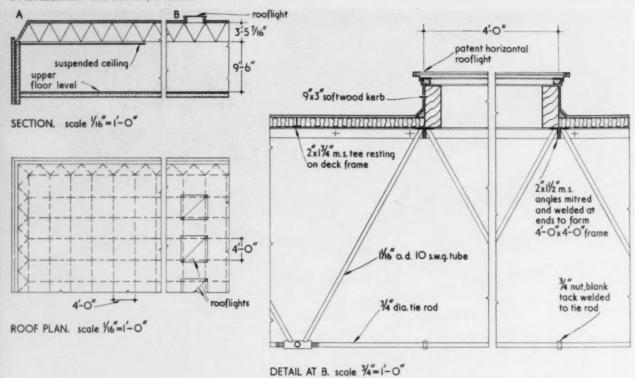


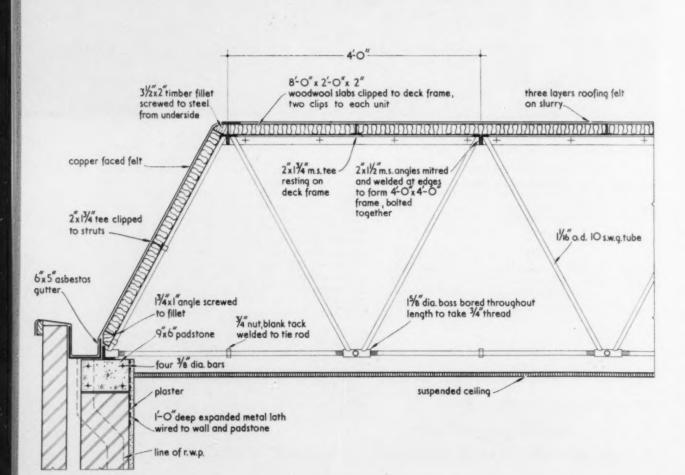
This space frame made up of tube, rod and angle, is based on a module 4 ft. 0 in. square to which woodwool slabe and rooflights of standard dimensions are related.

# working detail

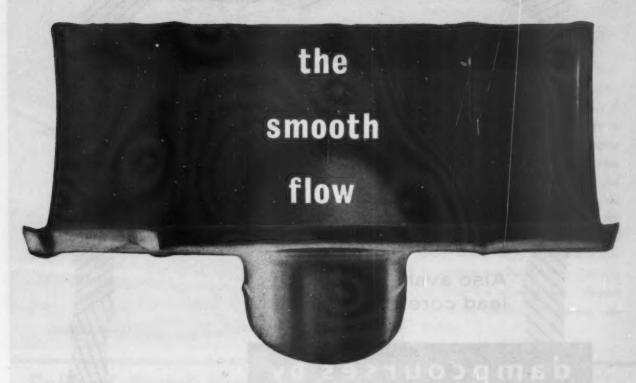
SPACE FRAME ROOF: MUSEUM IN DURHAM

P. R. Middleton and Partner, architects





# A great advance-



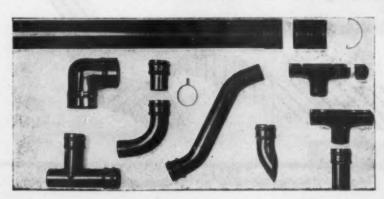
of

# MARLEY vinyl RAINWATER GOODS

Resistant to acids and mechanical damage, non-ageing Marley Vinyl Rainwater Goods are not affected by the atmosphere of coastal or heavy industrial areas. They will not abrade, or corrode, to cause clutter and stoppage. There are not, nor ever will be any sharp edges or uneven joints to catch at leaves or grit. There are no faults to start blockage. Everything that

collects in the smooth vinyl gutters flows freely into and through the down pipe.

Light inweight vinyl gutters and down pipes are easily handled and speedily installed. Now ready in grey or black, with more colours to come, they need absolutely no painting or maintenance at any time.



Marley Vinyl Rainwater Goods are readily obtainable throughout the U.K. 4, 4! and 5 inch gutters in 6 foot lengths, and 2! and 3 inch down pipes in 6, 8, and 10 foot lengths are available.

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highest grade flexible
Bitumen Dampcourse

-Asbestos based with
a lead core.

Also available without lead core—'Asbex' \*

# PERMANITES

designed and made with your reputation in mind, as well as our own.

'LEAD ASBEX' conforms to B.S. 743:1951 Type 5F.

'ASBEX' conforms to B.S. 743: 1951 Type 5C.

# FLATS FOR BASILDON NEW TOWN



This 14-storey block of flats for business and professional people is to be built in the central square of Basildon New Town centre, and was designed by A. B. Davies, chief architect-planner to the Development Corporation. It is the first residential building to go up in this area, which is largely for shopping and entertainment, and is part of the Corporation's policy of mixed development at the town centre in an effort to prevent the total nightly desertion of the area which follows when the centre of a town consists of shops and offices. The block will be raised above the surrounding shops on V-shaped concrete columns 27 ft. high, with a basement garage below. The job is expected to take 19 months to complete, and to cost £320,000 including three adjoining shops. General contractors, Holland & Hannan and Cubitts.

# Salford Royal Technical College . . . . . . another Stott installation

Salford Royal Technical College, a fine example of modern architecture, will eventually accommodate 2,500 students. The catering equipment used throughout is by Stotts of Oldham.

The architect was C. H. Simmons, Esq., A.R.I.B.A., architect to Lancashire County Council, and we are indebted to Sherratt & Smith Ltd., constructional engineers, for this photograph.



Other recent orders for complete schemes include:

College of Technology, Kumasi, Ghana.

St. Paul's College, Cheltenham. Cheshire Training College, Crewe.

Loughborough College, Loughborough, Leics. Teachers Training College,
Nottingham.
St. John Vianney School,
Blackpool.
Cranville College of Further
Education, Sheffield.
City Training College, Sheffield.
Doncaster Technical College.

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# Announcements

### PROFESSIONAL

Handisyde & Taylor of 68 Gt. Russell Street, W.C.1, announce that D. Ingram, A.R.I.B.A., is now an Associate of the firm.

P. J. Cozens, A.M.I.H.V.E., has entered into private practice as P. J. Cozens & Partners, Consulting Engineers, 30 Unthank Road, Norwich, NOR 28E, and will be pleased to receive trade catalogues, etc.

Louis Osman, B.A. (Arch), F.R.I.B.A., is now Consultant Architect to The British Aluminium Company Limited.

Alan W. Pipe, surveyor and architect of 8 Queen Street, Cheapside, London, E.C.4, has been elected a member of the Council of the Royal Society of Health.

Honeyman, Jack & Robertson, Chartered Architects, 195 Bath Street, Glasgow, C.2, have appointed Thomas Rankin. A.R.I.B.A., as Architect-in-charge of the Branch Office at 13 Allan Park, Stirling, where he will be pleased to receive trade literature.

Philip Beauchamp, A.R.I.B.A., has moved his office to 47 Mount Ephraim, Tunbridge Wells (Tel. 22259).

### TRADE

British Ratin Co. Ltd., have acquired the share capital of Wood Preservation Ltd., of 142 Sloane Street, London, S.W.1.

Colin Baillieu is now Publicity Manager of Chemstrand Limited. He was previously Advertising Manager of British Aluminium Co. Ltd.

Cable Covers Ltd., have formed in the U.S.A., a subsidiary company called Ancarite Incorporated of New Jersey and a joint company in Australia called C.C.L. (Australia) Pty. Ltd., of Sydney.

British Geon Ltd. have appointed G. H. Garlick as Press Officer.

Sir Richard Powell, BT., M.C., Director-General of the Institute of Directors, has been appointed a Director of Bovis Holdings Limited, the parent company of the B.H. Group.

Peter E. M. Sharp, A.C.O.I., B.Sc.(Eng.), A.M.I.E.E., is now General Manager of Westrex Company Limited.

K. A. Skinner has joined the board of The Key Engineering Co. Ltd., as general manager. H. L. Harclerode has been appointed general sales manager. F. V. Wickham will, in future, be responsible for technical development. G. H. Mortley has been appointed commercial manager. Walker, Crosweller & Co. Ltd., Whaddon Works, Cheltenham, have changed the telephone number of their Publicity Department to Cheltenham 56366.

E. S. & A. Robinson (Holdings) Ltd. have formed a new company, Robinson Building Techniques Ltd., with a head office at Redcliffe Street, Bristol.

L. G. Mouchel & Partners announce that two of the partners are retiring; T. H. Bryce and B. A. E. Hiley, but they will still act as Consultants.

T. J. McArthur has joined the board of Blake Vitreous Enamelling Ltd., Clayton-le-Moors, as General Manager.

Frederick Baillie is now production manager of Cambridge Instrument Co.

Westrex Co. Ltd. have appointed F. Holmes as Technical Marketing Manager.

Spirax-Sarco Ltd. have moved their London Office to 41, Curzon Street, London, W.1 (telephone Grosvenor 1671).

D. A. F. Donald, Chairman and Managing Director of National Cash Register Co. Ltd. has been appointed Chairman of G. A. Harvey & Co. (London) Ltd. Sir Thomas Overy has resigned the Chairmanship but remains a Director of the Company.

# The NEW range of— "MEMREX-EXEL" 500 volt Switchgear

PRESSED STEEL ENGLOSURES FOR LIGHTNESS AND STRENGTH. FRONT OPERATING SWITCH HANDLES. REWIRABLE OR H.R.C. 10—15—30 Amp. Switches. 10—15—30—60 Amp. Switchfuses.

This new range of "Memrex-Exel" switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.

of 500 volt industrial switchgear yet offered to industry.

Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

# Features Include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel. Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels. Fuses are of the new "Kantark-Exel," pattern which will accept rewirable or H.R.C. fuses. Semi-enclosed rewirable (damper type) patterns comply with B.S.3036:1958.

H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S. 88:1952, Appendix 'J' Dimensions. M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S. 88:1952, Appendix 'J' Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).

MEM :

All these and many other features

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# CUTS COSTS!

# Longer lengths cut laying time

Flexpipe—the latest development in pitch-fibre piping—comes in 10 ft. lengths instead of 8 ft. This means that any length of piping can be laid as much as 20% faster with Flexpipe than with any other pitch-fibre pipe—an important saving in labour costs.

# Less jointing cuts material costs

This extra length also reduces the number of joints needed on any job—a valuable saving in time and labour costs.

Flexpipe is available NOW in both 4" and 6" internal diameters—and costs no more than other pitch-fibre pipes.

# AND REMEMBER FLEXPIPE HAS THESE OTHER ADVANTAGES

(a) Much easier to transport, stack, and handle—one man can carry three or four Flexpipes at a time without any sense of strain. If he drops them — they're unbreakable! (b) No jointing compound required: Flexpipes are joined together with a coupling that can be simply knocked on with a hammer and a block of wood. The joint is then completely sealed.

(e) Flexpipe cannot crack under earth movements and is corrosion-proof.

(d) It can be sawn to any length as easily as wood.

LIKE TO KNOW MORE? Send for Flexpipe literature or let us put our representative in touch with you. Or both,

# Flexpipe

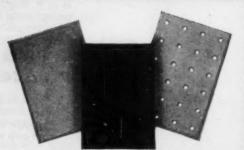
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FLEXPIPE LIMITED, Bowater House, Knightsbridge, London, S.W.r. Tel: KNIghtsbridge 7070. Now a member of the Bowater Organisation



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Perforated PANDA BOARD is available with  $\frac{3}{16}$ " holes at  $\frac{1}{2}$ ",  $\frac{3}{6}$ " and 1" centres in 4'x 18'x  $\frac{1}{6}$ " thick sheets. PANDA BOARD costs no more than ordinary hard-boards.

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# New water heating PARKRAY 6 convector fire

replaces back boiler fires without disturbing the surround

The new Parkray 6 is supplied complete with concrete panels which form a quickly constructed recess to receive the appliance and, at the same time, a convection chamber of the correct size. It can be installed direct through fireplace openings 16" to 18" wide by 22" to 24"

high without disturbing the tiled surround. It is a highly efficient replacement for the back boiler or boiler flue set and greatly improves the space and water heating services. Finished in Lexos porcelain enamel in a choice of 6 colours.

# PERFORMANCE

The Parkray 6 provides full space heating by radiation and convection in rooms up to about 1750 cu. ft. An adjustable throat restrictor cuts to a minimum the heat loss up the flue—achieving substantial fuel savings and increased comfort compared with the performance of a traditional open fire with back boiler.

Water heating outputs of 10,000 B.t.u./hr. with the damper open, and 7,500 B.t.u./hr. with the damper closed are easily maintainable. This will provide an abundance of hot water for all domestic purposes from a cylinder of about 30 gallons capacity.

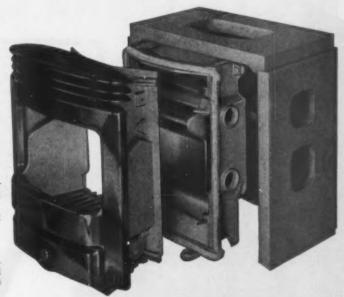
The Parkray 6 splits into 2 units. This is a unique design feature which

(a) enables it to be installed in existing fireplaces without damaging the tiled surround

(b) gives full access to boiler and flue connexions

(c) makes it easy for one man to handle.

The appliance backs into the pre-cast concrete convection chamber and is simply connected to the flue and fixed to the hearth. Boiler connexions can be made on either hand.





RADIATION GROUP SALES LTD 255 North Circular Road London N.W.10

# Space heating version

the low-cost Parkray 5 convector fire. Full heating by radiation and convection in rooms up to 2,000 cu. ft.

Other Parkray models are available with or without water heating to give even higher outputs. A series of technical bulletins from the Runnymede file

planning

for

rubber. . .

# where walls get hard wear

Avoiding damage to service staircases, and to bulky items carried up and down them, is a problem in any busy building. For Royal Insurance Company's newly constructed offices at Tunbridge Wells, under the direction of the architects, Messrs. Victor Kerr & Colbourn, F.R.I.B.A., and again specified at Watford, Runnymede Rubber Flooring was not only laid on the stairs, but also on the strings and walls to dado height. Now the staircase walls stay clean and bright; leave no trace of bumps and scrapes; and ensure a safer passage for furniture and equipment on the move.

That's the Runnymede Technical Service in action.

Advice on special uses of rubber flooring... and on the most economical preparation. The value that architects place on this service is, we like to think, one reason why Runnymede have become Britain's biggest makers of rubber flooring.

Moreover, Runnymede offer 34 stock colours; a vast choice of 'specials'; a unique built-in surface sheen that lasts the life of the floor; and the best marbling in the business. When you plan for rubber—on any surface—



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Planned lighting is more attractive, easier on the eyes, and far superior when it comes to any form of display.

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LIGHTING



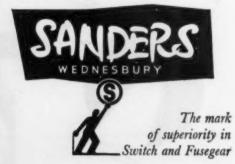


# ISOEARTH for SAFETY

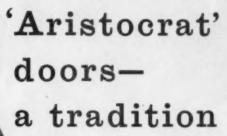
The ISOEARTH is the well-proved "Sandaclad" Fuse Switch incorporating a simple device enabling the main control switch to be locked in the 'off' position, and at the same time earthing the outgoing conductors, thus implementing the recommendation of H.M. Electrical Inspector for safety when working on or near to trolley wires, exposed conductors, etc.

Details of this Switch and full range of other competitively priced products in new Catalogue 158/59.

Make sure you have a copy !



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Photographs by courtesy of:—The Head Master, The King's School, Chester. Architect— Donald H. McMorran, A.R.A., F.R.I.B.A. 14 North Audley Street, London W.1. Contractor—H. Fairweather & Co. Ltd., Hyde Works, St. James Lane, London N.10.



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SATURDAY

DAY 2.30

You'll be glad you specified





Dress may be optional tonight, but gum-boots were de rigeur on site this morning. Surely the men weren't working in this rain? But they were—laying drains, testing and backfilling them almost before you could say 'Sanitary Inspector'.

Amazing how much difference dry joints and direct-to-earth laying make. How much difference a clear site makes to progress you'll see as the scene changes in the months ahead.

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- Cumulative savings from quicker, all-weather laying
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- Smooth inner bore giving better flow characteristics
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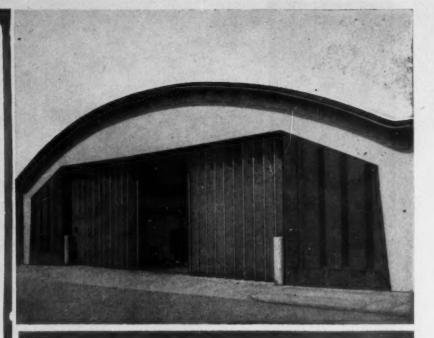
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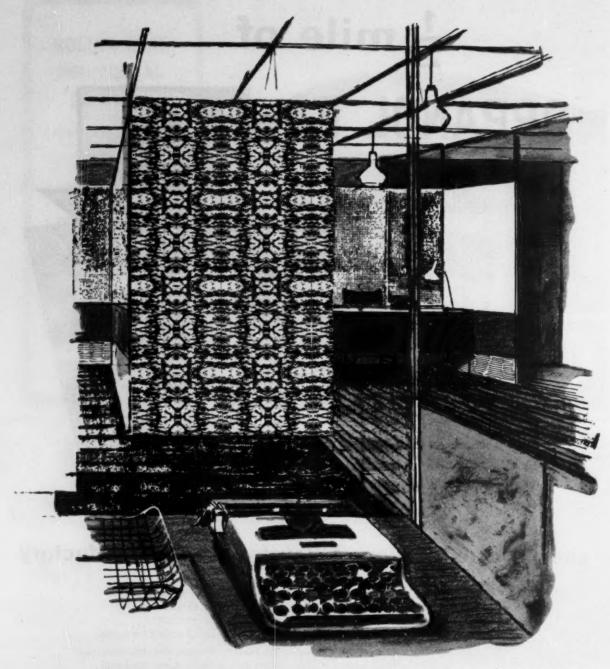
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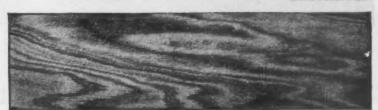


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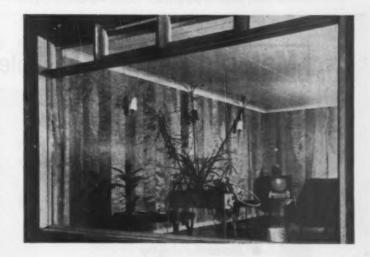
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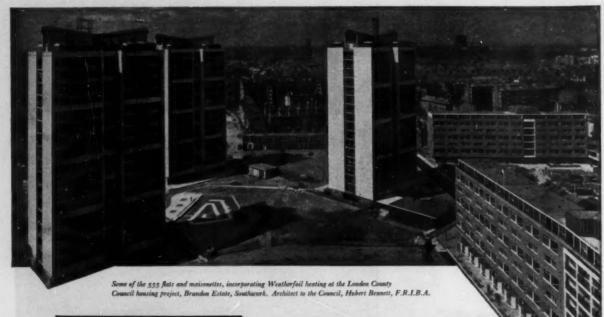
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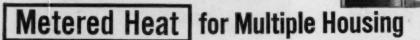
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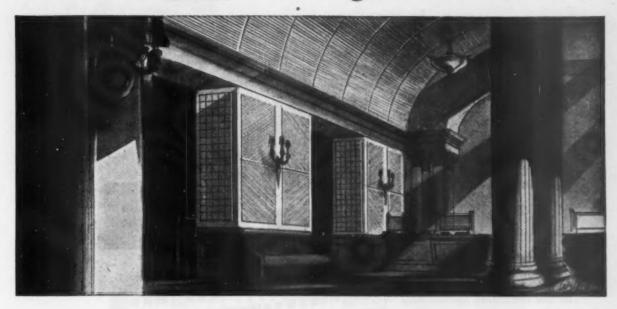
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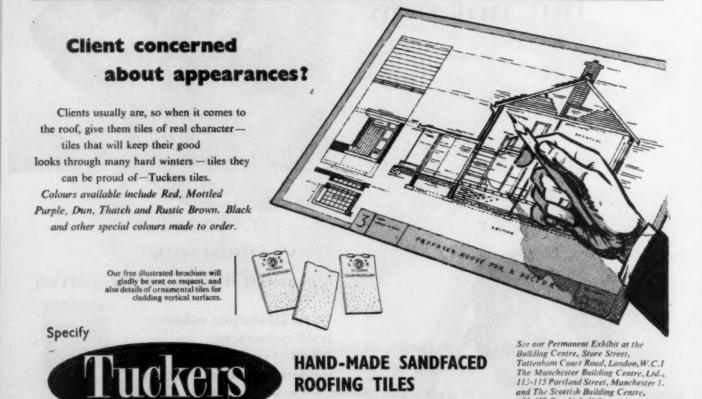


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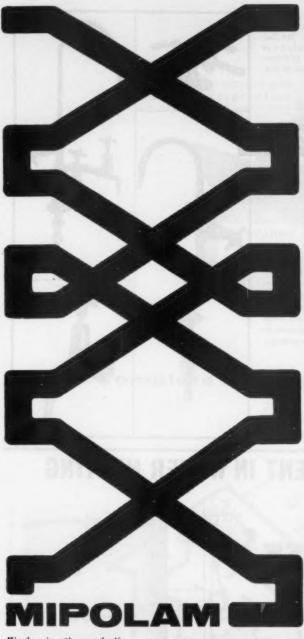
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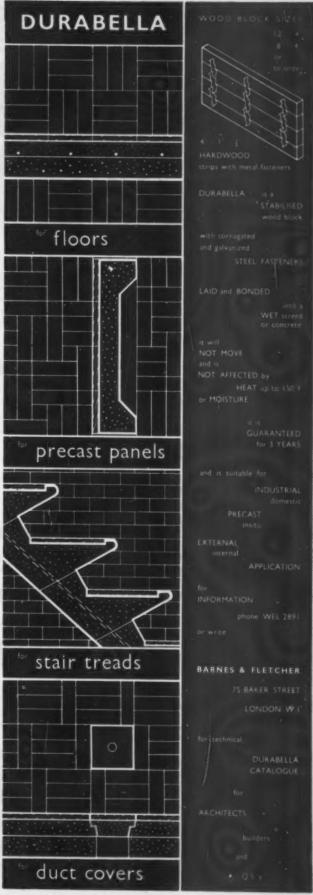


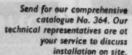
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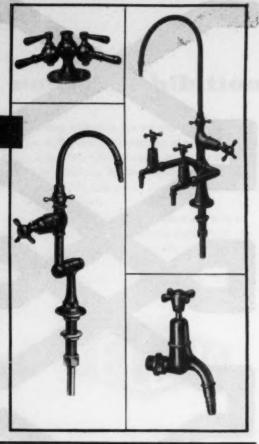




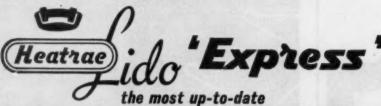


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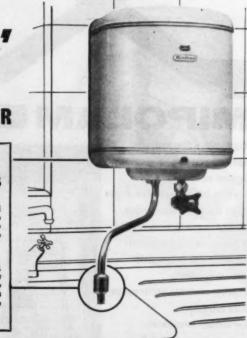
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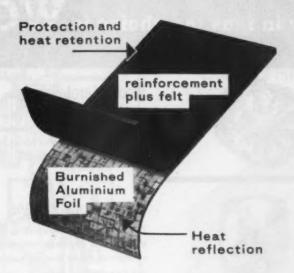
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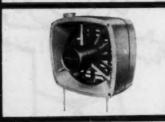
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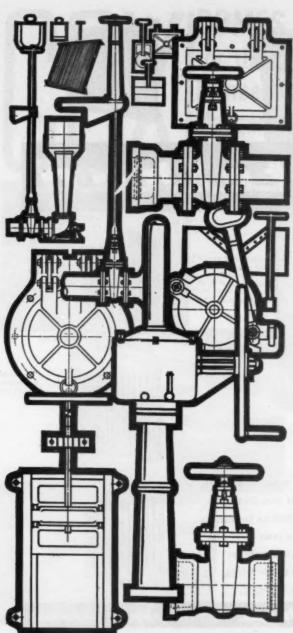


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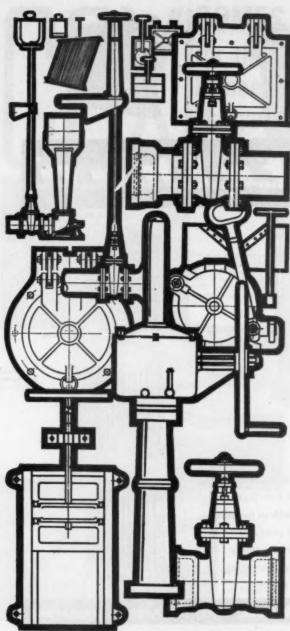


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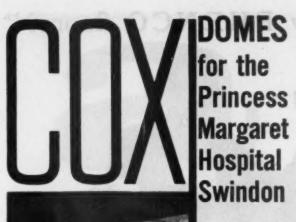
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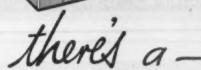
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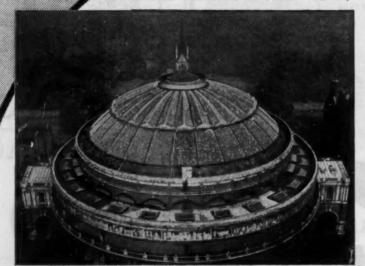
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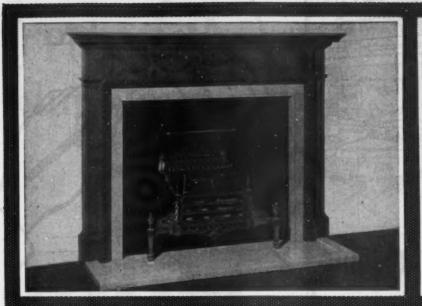
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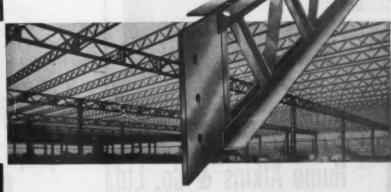
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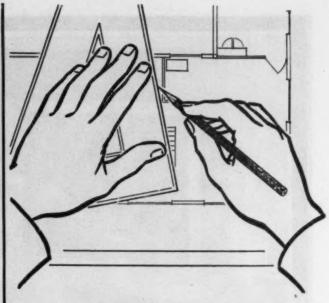
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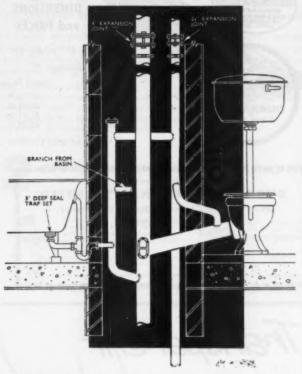
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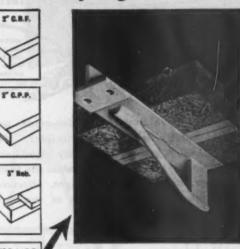


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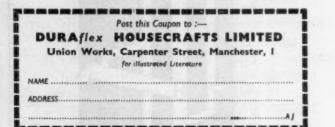


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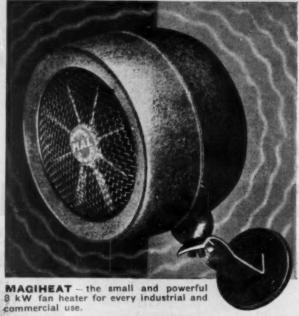
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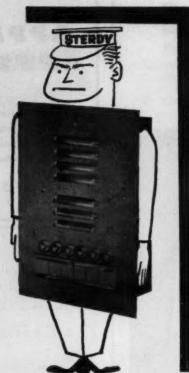
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SENIOR ARCHITECTURAL ASSISTANT.
Grade Scale "A" £1,25 to £1,420.
Candidates must have the accessary qualifications and experience relative to the Grade.
Housing accommodation will be available if
required.
Application forms (from the Borough Engineer,
Town Hall. Blackburn) are to be returned by
September 29th.
FRANK SQUIRES.

FRANK SQUIRES, Town Clerk. 3137

GLASGOW CORPORATION
ASSISTANT ARCHITECTS
TOWN PLANNERS
QUANTITY SURVEYORS
The Architectural and Planning Department of the Corporation of the City of Glasgow has vacancies for a number of qualified Assistants in the above professions.
The Department has in hand a large, varied and interesting programme of works including comprehensive redevelopment, multi-storey flats, schools and civic buildings. The work will provide scope for personal initiative in the preparation of designs and details of schemes upon which construction work will follow.
The salary scale for these Assistantships is up to £1,385 with placing according to experience.
Form of application may be obtained from the Principal Administrative Officer, 20 Trongate, Glasgow, C.L.

A. G. JURY, City Architect and Planning Officer. 3148

GLAMORGAN COUNTY COUNCIL
Applications are invited from qualified persons
with considerable experience in the particular
technical field for the following permanent
appointments in the COUNTY ARCHITECT'S
DEPARTMENT:—

(a) SENIOR ASSISTANT ARCHITECT: Grade B
(24,35)(24,348).
(b) SENIOR ASSISTANT QUANTITY SURVEVOR: APTY (21,220/24,375).
(c) SENIOR ASSISTANT HEATING ENGINEER: APTY (21,220/24,375).
(d) SENIOR ASSISTANT HEATING ENGINEER: APTY (21,220/24,375).
(e) ASSISTANT ARCHITECTS:
(e) ASSISTANT ARCHITECTS:
(e) ASSISTANT ARCHITECTS:
(f) ASSISTANT ARCHITECTS:
(g) ASSISTANT ARCHITEC

RICHARD JOHN.
Clerk of the County Council.
3124

FOROUGH OF TAUNTON ARCHITECT'S DEPARTMENT Applications are invited for the following opointments in the Borough Architect's Depart-

appointments in the Borough Architect's Departments.

1. ASSISTANT ARCHITECTS Grade APT IV (£1,065-£1,220 p.s.).

2. ASSISTANT ARCHITECTS Special Grade (£785-£1,070 p.s.).

3. ARCHITECTURAL ASSISTANT Grade APT II.II (£765-£380-£1,065 p.s.).

4. ARCHITECTURAL DRAUGHTSMAN General Division (£210-£956 p.s.).

4. ARCHITECTURAL DRAUGHTSMAN General Division (2210-2595 D.a.).
5. QUANTITY SURVEYING ASSISTANT General Division—Clerical Division Grade I (2210-2596-2570 p.a.).
8. Superamunable nosts subject to medical examination, and to National Conditions of Service. Applications stating age, present position and salary, qualifications, experience and names of two referees to be sent in C. Bacon. FR.I.B.A.. Borough Architect. Flook House. Station Road, Tannion. by Tuesday. 20th September. 1960.

K. A. HORNE.

NORTHAMPTON RURAL DISTRICT COUNCIL ARCHITECTURAL ASSISTANT Applications are invited for the above appointment. Salary in accordance with Grade A.P.T. Division scale £619 × £30 (d) × £35 to a maximum of £765 per annum.

Applicants should have passed the R.I.B.A. intermediate examination or its equivalent and have had a sound general experience.

The appointment will be subject to the Local Government Superannastion Acts, the National Conditions of Service, a satisfactory medical examination and to one month's notice, in writing on either side.

Applications, in candidates' own handwriting, stating age, endorsed "Architectural Assistant with personal details and details of experience and qualifications, together with names of two referees, to be sent to the undersigned by Saturday, the 24th September, 1960.

Canvassing, directly or indirectly, will be a disqualification.

CLIFFORD E. JONES.

Clerk of the Council.

CLIFFORD E. JONES,

Council Offices, 1, Cheyne Walk, Northampton. 1st September, 1960.

BOROUGH OF ENFIELD BOROUGH ENGINEER & SURVEYOR'S DEPARTMENT (Non-County Borough in the County of Middlesex Population-109,700; Area-12,400 acres)

AMENDED ADVERTISEMENT
Applications are invited, from suitably qualified ersons, for the following permanent appoint-

persons, for the following ments:—

(1) ASSISTANT ARCHITECT—AP.T. IV—£1,066—

£1,220 plus London Weighting.

(2) ARCHITECTURAL ASSISTANTS (2 No.)—
A.P.T.III—£880—£1,065 plus London

(2) ARCHITECTURAL ASSISTANTS.
A.P.T.III - 2880 - 21,055 plus London
Weighting.
(3) ARCHITECTURAL ASSISTANT-A.P.T.II2765-2880 plus London Weighting.
(4) FUNIOR ARCHITECTURAL ASSISTANTA.P.T.I-6510-2765 plus London Weighting.
The commencing salary will be fixed at points within the Scale commensurate with qualifications an experience.
There is a large varied programme of work, including the redevelopment of Clearance Areas and other areas scheduled for Comprehensive Development.
HOUSING ACCOMMODATION may be made available in appropriate cases. The Council is also prepared to consider 100% advances to successful applicants for house purchase within the Borough.
Saturday mornings are posmells for the support of the su

Borough.

Saturday mornings are normally free from duty. Application forms, obtainable from H. D. Peake, M.Sc. (Eng.), M.I.C.E., Borough Engineer & Surveyor, 7 Little Park Gardens, Enfield, Middlesex, must be delivered to the undersigned not later than MONDAY. 26th SEPTEMBER.

CYRIL E. C. B. PLATTEN,

Public Offices, Gentleman's Row, Enfield, Middx.

MINISTRY OF WORKS HOME COUNTIES REGION require in READING for work of widely

for work of widely varying and intergeting nature
LEADING ARCHITECTURAL ASSISTANTS
Applicants must have achieved inter-R.I.B.A.
standard, have good design ability and knowledge of modern building construction, and be capable of exercising leadership and supervision coupled with high quality individual work.
Salary range \$30-£1.085 p.a. Starting salary will normally be \$930 p.a. but may be higher for applicants with exceptional experience and qualifications.

ARCHITECTURAL ASSISTANTS
of inter-R.I.B.A. standard with keen, modern outlook.

of inter-K.I.B.A. came outlook.

Salary range £560 (age 21) to £930 p.a.
Starting pay according to age and/or qualifications.

GENERAL: Salary ranges slightly less for women but parity achieved 1961. 5-day week.

Weeks' leave per annum. Good prospects of promotion and permanency. Non-contributory cension scheme.

pension scheme.

APPLICATIONS: Stating age, training and experience to R. P. Mills, A.R.I.B.A., Superintending Architect, Ministry of Works, White-knights, Baading.

Vacancies for the following posts in the City
Surveyor & Engineer's Department:—
(a) SENIOR ASSISTANT PLANNING
OFFICER, A.P.T. V (£1,220/£1,375).
(b) GENERAL ASSISTANT PLANNING
OFFICER, Special Scale (£785/£1,070).
Candidates must be appropriately qualified by
examination and for post (a) should have had
considerable experience in the planning and
development work of a local authority.
These appointments offer practical experience
on large scale projects. Housing accommodation and femoval expenses.
Applications, stating age, education, qualifications and experience, together with the sames
of three referees, to the City Surveyor, Town
Hall, Manchester, 2, by 30th September, 1869.

BOROUGH OF SCARBOROUGH BOROUGH ENGINEER AND SURVEYOR'S

Applications are invited for the post of ARCHITECTURAL ASSISTANT, Grade APTII (27652889). Applicants should have passed the Intermediate H.I.B.A. Examination or its equivalent
at one of the recognised schools of Architecture.
The appointment is subject to the provisions
of the Local Government Superannuation Acts,
1937/1955, and to the passing of a medical
examination, and will be terminable by one
month's notice on either side. In appropriate
cases the Council will assist in the provision
of housing accommodation.

Applications in envelopes endorsed "Architectural Assistant" stating age, present and previous
appointments, training, qualifications and experience, together with the names of two referees,
must be delivered to the undersigned not later
than the 26th September, 1960.

Borough Engineer and Surveyor.
Town Hall.

SCARBOROUGH

Town Hall, SCARBOROUGH

SCARBOROUGH

SALOP COUNTY ARCHITECT'S
DEPARTMENT
Applications are invited from qualified Architects for the post of SENIOR ASSISTANT ARCHITECT. Salary grade up to £1,230 p.a.
N.J.C. Conditions. Five-day week. A disturbance allowance or weekly separation allowance will be payable to a married man taking up the appointment. Conditions of service and application forms obtainable from Ealph Crowe, A.A.Dipl., A.E.I.B.A., A.M.T.F.I., County Architect, Column House, London Road, Shrewsbury. Closing date 24th September, 1960.

LIVER POOL, REGIONAL, HOSPITAL, ROARD

House, London Road, Shrewsbury. Closing date 24th September, 1960.

LIVERPOOL REGIONAL HOSPITAL BOARD ASSISTANT ARCHITECT and ASSISTANT BUILDING SURVEYOR Salary £905 p.a. to £1,510 p.a.

STARTING SALARY SUBJECT TO AGE Applications invited for the above permanent pensionable appointments on the staff of the Regional Architect, T. Noel Mitchell, B. Arch., F.R. I.B.A. Architects should be Registered Architects having passed the requisite examinations. Surveyors must hold Corporate Membership of the Boyal Institution of Chartered Surveyors and have had experience in detailing and setting out of buildings, roads and services, and in land curveying, levelling and contouring.

Applications present post and salary, previous appointments and names and addresses of three referees (two technical) to me at 55, Castle Street, Liverpool, 2, by 27th September, 1960.

VINCENT COLLINGE, Secretary to the Board, 3113

LONDON COUNTY COUNCIL
ARCHITECT'S DEPARTMENT
Vacancies for AECHITECT'PLANNERS. Tasks
include three-dimensional planning in Compreheaeive Development Areas and all other important
areas of new development throughout London,
including those associated with road improvements. Up to £1,250 according to experience and
qualifications. Forms and particulars from
Hubert Hennett. F.E.L.R.A., Architect to the
Council (EK/AJ/1790/9a), County Hall, S.E.I.

1860

ARCHITECTURAL DRAUGHTSMEN required for London office; applicants should have experience in an architectural drawing office and be neat and accurate draughtamen, with ability to prepare working drawings and details. The work is primarily concerned with transport depots and includes offices, transit buildings, vehicle workshop and anciliary facilities. Projects in various parts of the country will involve some travel. Appointments, according to qualifications and experience, will be within the salary scales £905/£980 or £1,020—£1,000 and £755/£970 or £255/£980 or £1,020—£1,000 and £755/£970 or £255/£870. Pension fund and canteen. Applications, giving age, experience and qualifications, to Personnel Officer, Eritish Road Services Limited, Melbury House, Melbury Terrace, London, N.W.L.

CITY OF NOTTINGHAM
ESTATES DEPARTMENT
APPOINTMENT OF ARCHITECTS
Applications are invited from suitably qualified architects for posts in the Chief Architect's Section of the Estates Department at salaries in—

section of the Estates Department at salaries in—

(a) A.P.T. Grade 4 (£1.665-£1.220).

(b) Special Grade (£785-£1.070).

There is a large and interesting programme of comprehensive estate development and redevelopment schemes, including multi-storey dwellings, shooping centres, and all ancillary buildings. The architects appointed will work in small self-contained teams under the general direction of a Group Leader and will be responsible for the design, construction and management of projects.

The apointments will be subject to the National Joint Council's Scheme of Conditions of Service.

Applications stating age, qualifications, experience, present appointment and salary, and naming two referees. should be sent to the Estates Surveyor & Valuer. The Guildhall, Nottingham. by Tuesday, 4th October, 1860.

T. J. OWEN. Town Clerk

GLENROTHES DEVELOPMENT

ARCHITECTS (A.R.I.B.A.),
TURAL ASSISTANTS (Intermediate A.R.I.B.A.
with good office experience) and DRAUGHTSMEN required for a variety of work including
Industrial, Shopping and Commercial Buildings.
The vacancies offer variety of work and excellent opportunities to those with imagination and
Salaries:
Applies

Salaries:
Architects-Up to £1,371 per annum according to experience.
Architectural Assistants and Draughtsmen—Up to £380 per annum according to qualifications and experience.
Houses to rent available.
Medical examination under Superannuation Scheme. Applications to Secretary and Legal Adviser, Glenrothes Development Corporation, Glenrothes, Fife, by 24th September, 1960. 3175

Adviser, Gienrothes Glenrothes, Gienrothes, Fife, by 24th September, 1960. 3176
BOROUGH OF MALDEN AND COOMBE
BOROUGH ENGINEER AND SURVEYOR'S
DEPARTMENT
SENIOR ASSISTANT ARCHITECT
Applications are invited from Chartered Architects for the appointment of Senior Assistant Architect, Grade A.P.T. IV, 21,065—21,229, plus London "weighting," commencing salary according to experience and qualifications. Forms of application, which must be returned endorsed by not later than Monday, 3rd October, 1960, to be obtained from John Apse, A.M.I.C.E., Eorough Engineer.

HAROLD E. BARRETT,
Town Clerk.

Municipal Offices, New Malden, Surrey.

Surrey.

PERTH AND KINROSS JOINT COUNTY
Applications are invited for vacancies in the COUNTY ARCHITECT'S DEPARTMENT, Perth, on salary scales (a) £795—£1,075 and (b) £735—£855. Applicants for (a) must be fully qualified A.R.I.B.A. or hold a Diploma in Architecture, Applicants for (b) should be Intermediate A.R.I.B.A. or equivalent. Placing on either scale will be given according to experience. Particulars and forms of application from The County Clerk, P.O. Box 15, County Offices, York Place, Perth. Applications to be lodged by 8th October, 1960.

STAFFORDSHIRE COUNTY COUNCIL

COUNTY ARCHITECT'S DEPARTMENT
The following vacancies exist in a busy and expanding office for appropriately qualified Assistants seeking an opportunity to broaden their experience and display ability on the large programme of varied and interesting schemes being undertaken at present. Good working conditions in a pleasant County town. The Council has a generous post-entry training scheme which will be of particular interest to the Intermediate standard applicants. Lodging allowances to married officers and assistance with removal expenses. The Council also has a scheme for loan to employees wishing to purchase their own houses.

ARCHITECTURAL ASSISTANTS (Intermediate R.I.B.A.), Grade A.P.T. II (£765—£80). Successful applicants will work in groups. ASSISTANT ARCHITECT'S (Final R.I.B.A.). Special Grade (£785—£1.070). Grade A.P.T. IV (£1,065—£1,220). Successful candidates will work in groups, but those showing suitable qualities will be given greater scope within the groups.

Grade A.P.T. V (£1,220—£1,375). These will be responsible posts in charge of groups. Candidates must be enterprising, have wide experience in modern forms of construction, etc., and have good design ability.

QUANTITY SURVEYING ASSISTANTS

nave wide experience in modern forms of construction, etc., and have good design ability.

QUANTITY SURVEYING ASSISTANTS (Intermediate R.I.C.S.), Grade A.P.T. II (£765-£880). Required for recently-established "Taking-off" Section.

ASSISTANT QUANTITY SURVEYORS (Final R.I.C.S.), Grade A.P.T. IV (£1,065-£1,220). Work involves taking off a very wide variety of buildings, many in the region of £300,000 in alue.

of buildings, many in the region of value.

The Quantity Surveying Section is being developed and these posts provide excellent opportunities for keen Assistants.

Forms of application, which must be returned by 26th September, 1960, may be obtained from P. Woodcock, F.R.I.B.A., County Architect. Green Hall, Lichfield Road, Stafford.

Clerk of the County Council.

3156

BOROUGH OF POOLE

APPOINTMENT OF SENIOR ASSISTANT
ARCHITECT. GRADE A.P.T. V (£1,220-£1,376)
Applications are invited from Corporate Members of the R.I.B.A. who also have experience in Town Planning, preference being given to members of the T.P.I.

The successful applicant will be expected to take a leading part in large scale redevelopment (including multi-storey flats), the proposed new Civic Centre, and the comprehensive layout of a major development scheme.

Application forms from the Borough Architect, Municipal Buildings, Poole. Is be returned to me by Friday, 30th September, 1960.

J. G. HILLIER,

Town Clerk.

3146

COVENTRY CORPORATION

REQUIRE

SENIOR ASSISTANT HEATING AND VENTILATING ENGINEER—Grade 'A' (±1,200/£1,390),
commencing according to qualifications/experience, to be responsible for design and contract
supervision of heating, ventiming, air conditioning and other building programme, including
Central Swimming Batas, Schools, College of
Technology, Central Library, Law Courts, Residential College, 'Bus Station and Multi-Storey
Dwellings, Associate membership Inst. H. & V.B.
essential. Housing accommodation may be available. Interest free removal expenses loan up to
£50. Application forms from City Engineer,
Council House, Coventry, returnable by 22rd
September.

September.

AYR COUNTY COUNCIL require an ARCHI-TECTURAL ASSISTANT for County Architect's Department. Salary scale 4675 × 220 (8) and 230 (1) to 4286 p.a., with placing according to qualifications and experience. Applicants must have passed Inter. Exam. of R.I.B.A. and have had good practical experience of general architectural work. House available near Ayr if required. Post superannuable. Applications, giving age and particulars of qualifications and experience, with copies of two recent testimonials, should be lodged with the County Clerk, County Buildings, Ayr, by 26th September. Canvassing disqualifies.

RADNORSHIRE COUNTY COUNCIL

Buildings, Ayr, by 26th September. Canvassing disqualifies. 3202

RADNORSHIRE COUNTY COUNCIL ARCHITECTURAL ASSISTANTS Applications are invited for the following permanent appointments on the established staff of the County Architect's Department:

TWO ARCHITECTURAL ASSISTANTS—Salary Grade A.P.T. II (2766–2880 p.a.).

The Council have a varied and interesting building programme on hand including new schools, police houses and old people's homes.

The appointments will be subject to the National Scheme of Conditions of Service; to the Local Government Superanauation Acts and to termination by one month's notice in writing by either party.

Applications, stating age, qualifications and experience, with the names and addresses of two persons to whom reference may be made, must be received by the undersigned not later than the 30th September, 1960.

County Hall,

Llandrindod Wells.

D. C. S. LANE,
Clerk of the Council.
Llandrindod Wells,
Radnorshire.

HUNTINGDONSHIRE
COUNTY ARCHITECT'S DEPARTMENT
Applications are invited for the following appointments:—

(a) ARCHITECTURAL ASSISTANT
Special Grade (2785—21.070).
(b) ARCHITECTURAL ASSISTANT
Grade APT II (2765—2880).

The persons appointed will become members of small architectural teams engaged in projects of varying size. It is desired that the persons appointed shall be keenly interested in architecture with an up-to-date approach to both planning and design.

Application forms and further particulars may be obtained from The County Architect, County Buildings, Huntingdon; completed forms should be returned to the undersigned as soon as possible.

A. C. AYLWARD,
Clerk of the County Council.

Clerk of the County Council.

County Buildings, Huntingdon.

CITY OF BRADFORD
JUNIOR TOWN PLANNING ASSISTANT
POST 57, A.P.T. I (£510-£765),
Applications are savited for the above superannuable appointment in the City Engineer and
Surveyor's Department.
Candidates should have had general experience
of technical work in a planning office and have
passed an appropriate Intermediate examina-

Applications on forms to be obtained from the City Engineer and Surveyor, Town Hall, Bradford, 1, together with three testimonials, must be received by the undersigned not later than 30th September, 1960.

HENRY PATTEN. Town Clerk.

Town Hall,
Bradford, 1.

CITY AND COUNTY OF KINGSTON UPON
HULL
CITY AND CHITECT'S DEPARTMENT
INTERESTING AND VARIED SCHOOL
BULLDING PROGRAMME
Applications are invited for the posts of
SENIOR ASSISTANT ARCHITECT'S, A.P.T.
Grade IV (£1,66-£1,220). The applicants are
required to have had considerable experience in
educational building and in the control of projects from sketch plan stage to completion.
Extensive scope is offered as there is an interesting and varied programme of work in the department.
Housing accommodation may be provided for
the successful married applicants if they are not
already resident in the city. The point of entry
to the scale will be determined by experience.
Application forms may be obtained from
Andrew Rankine, O.B.E., A.R.I.E.A., City
Architect, Guildhall, Kingston upon Hall, and
should be returned completed on or before 28th
September, 1960.

MODERNISATION OF
BEITISH EALLWAYS
THE WESTERN REGION
requires the following technical staff:
CIVIL ENGINEERING
ARCHITECTURAL
HEATING AND VENTILATING
SOIL MECHANICS
resting work in pleasant conditions

Interesting work in pleasant conditions with promotion on MERIT; Superannuation Fund; Reduced rates of travel and other concessions; Commencing salaries up to £1,000 according to

Commencing salaries up to allow abolity;
A limited number of posts in ranges between £1,595 and £1,695;
Five-day week.
Applications in the first instance, giving qualifications and experience, to:—
Chief (ivil Engineer,
British Railways,
Western Region,
Paddington Station,
London, W.2.

JUNES OFFICERS

London. W.2.

DEPARTMENT OF HEALTH FOR SCOTLAND Four pensionable posts in Edinburgh for men or women at least 30 on ist June, 1960, with practical experience in town and cowarty planning; must be corporate members of Town Planning institute. In addition, they must either (i) have been registered as Architects, or (ii) have achieved corporate membership of B.LC.S., Institute of Civil Engineers, Institute of Municipal Engineers, Institute of Landscape Architects or Chartered Land Agents' Society or (iii) have a university degree in an appropriate subject. Duties include collaboration with local authorities on development plans, reports on housing and industrial development proposals and special studies in planning technique, new towns, etc. Male salary scale 21,385 cit age 35 or under)—£1,785. Write Establishment Officer, Department of Health for Scotland, Room 30, 84. Andrew's House, Edinburgh, for application form. Closing date 24th October, 1960. 3196

Andrew's House, Edinburgh, for application form. Closing date 24th October, 1969. 3186

CITY OF SHEFFIELD-WATERWORKS

UNDERTAKING
YORKSHIRE DERWENT SCHEME
Applications are invited from appropriately qualified persons for the appeintment of QUANFITY SURVEYOR, scale A.P.T. V, salary £1,220 to £1,375. Commencing salary within the scale according to qualifications and experience.
The successful candidate will be required to "take off" and compile Building and Civil Engineering Bills of Quantities for the Works of the Yorkshire Derwent Scheme and later be responsible for the measurement of the works. Further details of this Scheme can be obtained from A. B. Baldwin, M.Eng., General Manager and Engineer, Shemeld Corporation Waterworks, Town Hall, Shemeld, 1.

The appointment is superannuable and subject to a medical examination and to the National Joint Council Conditions as applied by the City Council.

Applications are to be forwarded to the underwigned by 26th September, 1960, stating age, qualifications, past and present appointments (with dates and salaries), details of relevant experience and schemes engaged upon, together with the names of two referees.

Town Hall,
Shemeld, 1.

3140

Sheffield, 1. 3140

METROPOLITAN BOROUGH OF

METROPOLITAN BOROUGH OF

ARCHITECTURAL STAFF
Applications invited from unqualified or partly
qualified ARCHITECTURAL ASSISTANTS for
posts grades A.P.T. I, II and III (2650—21.110).

Grade and salary according to ability and experience. Application forms from Forough
Engineer, Municipal Buildings, S.W.I.S. Closing
date 21st September.

J. NOEL MARTIN.

J. NOEL MARTIN. Town Clerk.

NORTHERN IRELAND HOUSING TRUST
ARCHITECTS
The Trust has vacancies for ASSISTANT
ARCHITECTS on scales ranging from 2950—
21,390. Candidates must be qualified Architects
and placing will be according to experience.
The persons appointed will be required to contribute to a superannuation scheme which
allows for the transfer of benefits in Local
Government Schemes in suitable cases.
Housing accommodation may be arranged for
married candidates.
Please apply not later than 25th September.
1960, giving full details of age, education, qualifications and experience including present post
and salary to the General Manager, Northern
Ireland Housing Trust 12, Hope Street, Belfast.

Please mark envelope 33/86. Please mark envelope 33/86.

3160

H.M. Treasury (University Grants Committee) require unestablished ARCHITECTS to work as members of small team engaged on design of university hall of residence. Applicants must be registered Architects, previous office experience desirable. but not essential. Salary range: £830—£1,300 (London) p.a. Minimum is linked to age 25 with addition of one iscrement for each year above that up to age 34. Forms from Ministry of Labour. Technical and Scientific Register (K). 26. King Street, London, S. W. 1. quoting J 309/0A. COUNTY BOROUGH OF BURNLEY
Applications are invited for the underentioned appointments in the Borough Engineer

mentioned appointments in the Borough Engineer and Surveyor's Department:—

(a) ASSISTANT ARCHITECT: Special Grade (£785—4,070 p.a.).

(b) QUANTITY SURVEYING ASSISTANT: Grade I (£610—4765 p.a.).

Applicants for appointment (a) must hold appropriate qualifications sad have had considerable experience in Municipal work. Commencing salary to be in accordance with ability and experience. and experience.

Provision of housing accommodation will be

considered.

Applicants for appointment (b) should have a sound knowledge of building construction and experience in the preparation of Quantities and Measurement of Building work is essential.

Forms of application may be obtained from the Borough Engineer and Surveyor, 22/24, Nicholas Street, Burnley, to whom they should be returned not later than Monday, the 3rd October, 1960.

C. V. THORNLEY.

CITY AND COUNTY OF NEWCASTLE UPON
CITY ARCHITECT'S DEPARTMENT
The City Architect will be pleased to receive applications for the following vacancies in the RE-HOUSING Section of the Department:

(a) PRINCIPAL ASSISTANT ARCHITECT
(I), J.N.C. Scale "C" (£1,385-£1,620 per angum).

(b) PRINCIPAL ASSISTANT ARCHITECT (II). J.N.C. Scale "B" (£1,255—£1,485

per annum).
(c) SENIOR ASSISTANT ARCHITECT—A.P.T.
Division, Grade IV (£1,066—£1,220 per

Division. Grade IV (21,066—21,220 per annum).

Application forms and full particulars may be obtained on application in writing to George Kenyon. A.R.I.B.A., A.M.T.P.I., City Architect. 18, Cloth Market, Newcastle upon Tyne, 1. Applicants must state the post applied for when requesting particulars.

Closing date for completed application. Satur. Closing date for completed application: Saturday, 1st October, 1960.

JOHN ATKINSON, Town Clerk.

Town Hall. Newcastle upon Tyne, 1. 5th September, 1960.

Town Hall.

Newcastle upon Tyne, 1.

Sth September, 1960.

BOROUGH OF BEXLEY

ASSISTANT ARCHITECT

Applications are invited for this appointment at a salary within Grade A.P.T. III (£880—£1,065 per annum) plus London weighting.

Candidates should have auitable qualifications and have had experience in school and housing projects.

Form of application and conditions of appointment are obtainable from Borough Engineer.

West Lodge, Broadway, Excleyheath, to whom completed applications must be returned by Monday, 3rd October, 1960. The Council may be prepared to assist in the provision of housing accommodation.

Canvassing will disqualify.

ARTHUR GOLDFINCH

Town Clerk.

3166.

ARCHITECTS AND MAINTENANCE SURVEYORS. Pensionable posts for men and women at least 25 and under 35 on 1.1.60 (extension for regular Forces service, Overseas Civil Service, established civil service and temporary Government service as Architect or Maintenance Surveyor). Candidates must be registered Architects or, alternatively, for Maintenance Surveyor). Candidates must be registered Architects or, alternatively, for Maintenance Surveyor posts, have achieved Corporate membership of R.I.C.S. (Building Section), or have passed examinations necessary for attaining Corporate membership. Salary (men, London) 2830-£1,125 according to age, rising to £1,300. Promotion prospects. Write Civil Service Commission, 17, North Audley Street, London, W.I. for application form quoting \$60-51. 3165

DORSET COUNTY COUNCIL require ASSISTANT ARCHITECT in County Architect's Department. (Special/A.P.T. IV-£789-£1,220 per annum.) Applicants must have passed Final R.I.B.A. Examination. Local Government experience not essential. Application form from the Clerk, County Hall, Dorchester, to be returned by 29th September, 1960. 3163

ROROUGH OF SCARBOROUGH

BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT

ABSISTANT ARCHITECT at a salary on Grade

BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT
Applications are invited for the post of ASSISTANT ARCHITECT at a salary on Grade A.P.T. IV (£1,065-£1,220).
Applicants should be associates of the R.I.S.A.
The appointment is subject to the provisions of the Local Government Superannuation Acts 1937-1953, and to the passing of a medical examination, and will be terminable by one-month's notice on either side. Housing accommodation will be made available for successful applicant, if married, and the Council will pay one-half of the removal expenses incurred.
Applications, in envelopes endorsed Assistant Architect, stating age, present and previous appointments, training, qualifications and experience, together with the names of two referees to be delivered to the undersigned not later than Monday, 3rd October, 1960.

\*\*FORSHAW\*\*
\*\*Borough Engineer and Surveyor\*\*
3150

BOROUGH OF SWINDON
SENIOR TOWN PLANNING ASSISTANT
APT. IV (£1,666-£1,220)
Applications are invited for the above appointment in the Borough Surveyor and Planning Officer's Department.
The Borough is expanding rapidly under the Town Development Act, and there is considerable scope for imaginatize and skilful planning work—both in the tayout of the large open areas earmarked for industrial and residential development about to proceed, and in the town centre, which is being extensively remodelled and developed on pedestrian way lines for shopping.
Candidates should have had suitable experience and have passed the final examination of the Town Planning Institute. The commencing salary will be in accordance with qualifications and experience.
A FIVE DAY WEEK is in operation. HOUSING ACCOMMODATION will be offered to married candidates from other areas, and assistance towards removal expenses may be granted.
Applications on forms to be obtained from the Town Clerk, Civic Offices, Swindon, must be returned by 30th September, 1960.

3198

Town Clerk, Civic Offices, Swindon, must be returned by 30th September, 1960.

AUSTRALIA
THE UNIVERSITY OF NEW SOUTH WALES, SYDNEY

LECTURER—SCHOOL OF ARCHITECTURE The University invites applications for appointment in the position of LECTURER in the SCHOOL OF ARCHITECTURE at Kensington.

Salary: £A1,745 range £A2,448 per annum.
Commencing salary according 5 qualifications and experience.

Applicants must be qualified town planners and possess an appropriate degree, diploma or equivalent qualifications and should be eligible for membership of the Town Planning Institute in Australia or Eritain.

The successful applicant will be required to lecture and conduct studio work in the subject of town planning and assist in the subject of town planning and assist in the subject of two planning and assist in the subject of tw

New South Wales, Australia, Delore 14th October 1960.

CITY OF CHICHESTER CHIEF ASSISTANT

Applications are invited for this appointment at a salary within the Grade for Special Classes of Officers (2785-21,070) and A.P.T. IV at a maximum salary of 21,120. The appointment is to be made on the grade considered suitable having regard to the experience of the successful applicant.

The person appointed must be an Associate Member of the K.I.B.A. or R.I.C.S. and will be responsible to the City Surveyor for the design of new council houses and other work connected with housing and housing estate layout. He must have a complete knowledge of building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience in design, and fully competent to arrange and supervise building construction, experience of the successful and and the successful and and a successful and a successfu

COUNTY BOROUGH OF ROTHERHAM
ARCHITECTS
Applications are invited for the following

Applications are invited for the following appointments:

(a) ARCHITECTURAL ASSISTANTS, A.P.T. I. (2610-2765) to Succial Grade (£785-£1,070).

(b) SENIOR ASSISTANT ARCHITECT.

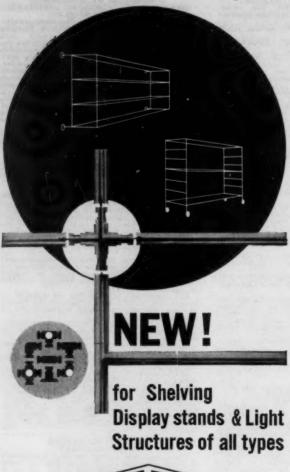
A.P.T. IV (£1,065-£1,220).

The department has a varied and interesting programme of architectural work and candidates for (a) are required to have passed Parts i and II of the R.I.B.A. final examination and (b) to be Associate Member of the R.I.B.A. with 2000 general experience in design and construction. The commencing salary in the grades will be according to capabilities and experience. Housing accommodation will be available in necessary for the higher grade appointment. Applications to be endorsed "Architecta," stating age, qualifications and details of experience, together with names of two referees, should be received by me not later than Thursday. 29th September, 1960.

Canvassing will disqualify.

Municipal Offices,

Municipal Offices, Rotherham. September, 1960.





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for every purpose where appearance is important. Extremely rigid, yet assembled and dismantled in seconds. Hygienic and easily cleaned. No bulges at joints — every structure looks 'purpose' built. All joints and tubes interchangeable and reusable. Full range of joints, etc. In 1" aluminium alloy tubing specially chosen for exceptional polish retention. Finished to high polish or specification.

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EVERCREECH, SOM. TEL 352

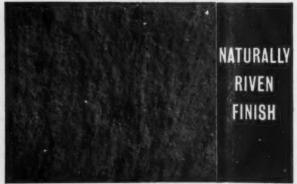
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COUNTY BOROUGH OF WALLASEY
APPOINTMENT OF ASSISTANT ARCHITECTS
AND ARCHITECTURAL ASSISTANTS
Applications are invited for the following
appointments in the Borough Architect's Depart-

appointments in the Eorough Architect's Department:—

(4) ASSISTANT ARCHITECTS, Grades A.P.T.

1V/V (£1,065—£1,375).

(b) ASSISTANT ARCHITECTS, Special Grade

IV.V (£1,085-£1,570).

(b) ASSISTANT ARCHITECTS, Special Grade (£735-£1,670).

(c) ARCHITECTURAL ASSISTANTS, Grades A.P.T. 1/II (£616-£380).

(d) ASSISTANT ARCHITECT, Temporary, at a salary to be determined within the range of £1,506-£1,500. This appointment will be for a period of two years and for specified for a period of two years and for specified works.

For appointments (a), (b) and (d), applicants must be Fellows or Associates of the R.I.B.A., and for appointment (c), applicants must have passed the Intermediate R.I.B.A. Examination. Commencing salaries will be according to capabilities and experience and in connection with (a) and (b), favourable consideration will be given to the provision of housing accommodation, if required. Forms of application may be obtained from the Borough Architect, Town Hall, Wallasey, to whom they should be returned by the 3rd October, 1960.

A. G. HARRISON,

Town Clerk.

NORTH RIDING COUNTY COUNCIL
COUNTY ARCHITECT'S DEPARTMENT
Applications are invited for the following
appointments on the permanent staft;—
A.P.T. II and SPECIAL (2765—21,070). Intermediate R.I.B.A. standard, point of entry
will depend upon experience, with promotion to Special Grade on passing Final
R.I.B.A. examination.
SPECIAL—A.P.T. IV (£785—21,220). Final
R.I.B.A. examination.
The National Scheme of Conditions of Service
and the Local Government Superannuation Acts
apply, and medical examination and experience,
together with particulars of past and present
appointments and names of three referees, to be
delivered to the undersigned not later than 3rd
October, 1960.
Canvassing, directly or indirectly, will be
deemed a disqualification and candidates should
state whether they are related to any member
of, or senior officer under, the Council
The appointments relate to the amalgamated
architectural department dealing with both
Education and General Works.

ROBERT A. WOTHERSPOON.

Clerk of the County Council.
3176

HOSPITAL BUILDING PROGRAMME APPOINTMENT OF ARCHITECTS
North East Metropolitan Regional Hospital

40, Eastbourne Terrace, LONDON, W.2.

North East Metropolitan Regional Hospital Board,

40. Eastbourne Terrace,
LONDON, W.2.
W. G. PLANT, DIPL. ARCH. (LIV.), F.B.L.B.A.,

Regional Architect.

ARCHITECTS are argently required for the Board's expanding Architectural Department in LONDON.

A considerable programme of building is now getting under way offering scope for research, imaginative design and progressive thinking, and excellent opportunities for young architects, including those just qualified, for gaining experience in a wide field ranging from specialised hospital structures to Nurses' Teaching Schools, Domestic Residential Buildings, Recreational Centres, Workshops, Nurses' Homes, etc.

Architects will either be allocated jobs of their own and be responsible under limited supervision, or will work, as members of teams, on the larger projects and share in the work of research, design and detailed drawings.

The Region which comprises the City of London, and parts of the administrative County of London, parts of Middlesex and Hertfordshire, and the County of Essex, serves a population of over 3,000,000 and is responsible for over 130 hospitals.

Applicants should have passed the Final R.I.B.A. examination, and registered architects would be appointed on the basic professional (assistant) scale c945 × 253 (1) × 245 (6) × 250 (2)—61,360 inclusive, the commencing salary depending on age and experience. The initial salary for architects awaiting registered architects would be somewhat lower during the sinterim period. A generous mileage allowance for use of private car when visiting sites will be paid. Promotion prospects are good and the maximum of the senior grade is £1.650 p.s.

PREVIOUS HOSPITAL EXPERIENCE IS NOT ESSENTIAL.

Leave entitlement ranges from 3—4 weeks p.a. Freeday week. Posts are permanent and participate in superannuation benefits.

Applications, giving age, details of education, professional training, qualifications, experience and past and present appointments, present salary and other relevant details, together with the name

LEEDS REGIONAL HOSPITAL BOARD
Applications are invited for the following
appointments in connection with the construction of a new multi-storey reinforced concrete
framed general hospital at Huddersfield (500 beds
approximate cost £3,500,000). The building work
commenced in March this year and it is anticipated that site works will continue until 1962/63.

(a) ASSISTANT CLERK OF WORKS
(Mechanical and Electrical)
salary scale £300,£900 per annum.

(b) ASSISTANT CLERK OF WORKS
(Building)

(b) ASSISTANT CLERK OF WORKS
(Building)
salary scale £600/£750 per annum plus payment for overtime.
Applications stating age, qualifications, previous experience together with names and addresses of two persons to whom reference may be made to the Secretary, Park Parade, Harrogate, by not later than 30th September, 1960.

BOYAL COUNTY OF BERKSHIBE
ASSISTANT ARCHITECT, A.P.T. Grade V.
£1,220-£1,375. Candidates must be Associates
of the R.I.B.A. and have had considerable experience in design and the running of contracts.
The post will rank as second in a group of

eight.
ASSISTANT ARCHITECT. Special Grade.
2785—£1,070. Candidates should be members of
the R.I.B.A. and have had good architectural

the R.I.B.A. and have had good architectural training.

ARCHITECTURAL ASSISTANT. A.P.T. Grade II, £765-2880. Candidates should have passed the Intermediate Examination of the R.I.B.A. One day per week will be allowed for study at a recognised School of Architecture.

ASSISTANT QUANTITY SURVEYOR, Special Grade, £785-£1,070. Candidates should be Associates of the R.I.C.S. (Quantities Sub-Division) or members of the I.Q.S.

The office is engaged on all types of County buildings and owing to the rapid increase in population a very full programme lies ahead. There is a number of staff houses and flats, some of which become available from time to time, and assistance up to 75 per cent. of removal expenses is given.

Application forms obtainable from the County Architect, Wilton House, Parkside Boad, Reading, are to be returned by September 27, 1960.

CITY OF BRADFORD
ARCHITECTURAL ASSISTANTS
Applications are invited for the following superannuable appointments in the Architectural Section of the City Engineer and Surveyor's

ection of the City Engineer and Surveyore Department:—CIURAL ASSISTANT, Post 204. Special Grade (2785/£1,070) according to qualifications. (b) TOWN PLANNING ASSISTANT, Post 30. A.P.T. I/Special (£610/£1,070) according to qualifications. (c) ARCHITECTURAL ASSISTANT, Post 122. A.P.T. II/Special (£765/£1,070) according to qualifications.

AP. II (Special (£765/£1,070) according to qualifications.

(d) AECHITECTURAL ASSISTANT, Post 123.

April 1 (£510/£765).

Applicants for (a) and (c) should have had experience in the design of houses, flats and shops and the layout of houses, flats and shops and the layout of houses, flats and shops and the layout of large corporation in the preparation of working and detail drawings. Candidates for (b) will be required in connection with the layout of large Corporation Housing Estates and schemes of development as the result of slum clearance. Applicants for (d) should have had experience in architectural design, and should have passed the Intermediate examination of the appropriate professional body.

Applicants for (a) (b) and (c) should be either A. B.I.B.A. or A.M.T.P.I.

Application forms obtainable from the City Engineer and Surveyor, Town Hall, Bradford, I. with three testimonials, must be received by the undersigned by 30th September. 1960.

HENRY PATTEN.

Town Hall.

CITY OF BIRMINGHAM

Qualified Architects, Grade APT.IV (21.066 to £1.20 per annum). required in the CITY ARCHITECT'S DEPARTMENT to work on new Exhibition Hall and other buildings. Commencing salaries according is experience and capabilities. A great opportunity exists for enthusiastic and imaginative Architects who wish to assist in work of such architectural importance. Pension Scheme. Five day week. Medical Examination.

Applications stating age, present position and salary, qualifications, experience and two referees to reach the undersigned by 30th September, 1960.

A. G. SHEPPARD FIDLER City Archite

Civic Centre, Birmingham, 1.

DRAWING (ARCHITECTURAL)—
CIVILIAN INSTRUCTORS
Two posts for men fully skilled and experienced in the trade, able to teach it and to supervise trainees. Appropriate O.N.C. C&G Certificate or equivalent qualification desirable. Selection by trade test and interview. Starting salary 2665 (at age 21)—2810 (at age 26 or over) rising to £1.000. Provincial rates. Prospects of pensionable employment and promotion. Write for details to Commandant. School of Military Engineering. Chatham. Closing date 16th October, 1960. 3201

CITY AND ROYAL BURGH OF DUNFERMLINE ARCHITECTURAL ASSISTANTS Architectural Assistants required for programme of Traditional Housing, Redevelopments, and Public Suildings in the office of the Burgh Architect, Dunfermline, Salary within the range ETIS to 2967 with placing according to experience to

The posts are superannuable, and assistance may be given with housing.
Detailed applications, giving names of referees, should be submitted to Leonard Howarth, A.R.I.B.A., A.M.T.P.I., Burgh Architect, 6, Abbot Street, Dunfermline, within seven days from

City Chambers, Dunfermline

3205

COUNTY BOROUGH OF HUDDERSFIELD
BOROUGH ARCHITECT & PLANNING
OFFICER'S DEPARTMENT
Applications are invited for the following
appointments:

(a) ASSISTANT ARCHITECT—Grade A.P.T.
(b) ASSISTANT ARCHITECT—Special Grade
(£785 to £1,375).
(b) ASSISTANT ARCHITECT—Special Grade
(£785 to £1,375).
Applicants must be Associate Members of the
Royal Institute of British Architects.
The Department has in hand a large programme of building including the First Phase
of a new Civic Centre, Technical Teachers' Training College, including Hostel, Secondary Modern
and Primary Schools, Homes for Aged Persons.
Abattoir and Cattle Market, etc. Applicants for
appointment (a) will be expected to take charge
of some of these projects and appointment (b)
offers an opportunity for a young and enthusiastic Architect to gain valuable experience.
The posts are subject to the National Scheme
of Conditions of Service, as adopted by the
Council, and to medical examination.
Housing accommodation will be provided, if
required.
Applications, with the names of two referees.

Applications, with the names of two referees, should reach S. M. Richmond, F.R.I.B.A., A.M.T.P.I.. Borough Architect and Planning Officer, High Street Buildings, Huddersfield, not later than the 10th October, 1960.

Canvassing directly or indirectly will disqualify.

HARRY BANN.

HARRY BANN Town Clerk. 3172

3176

BOROUGH OF RADCLIFFE
APPOINTMENT OF
JUNIOR ARCHITECTURAL ASSISTANT
Applications are invited for the abovementioned permanent appointment, at a salary
in accordance with Grade A.P.T. I (2610-2765).
The commencing salary will depend on age,
qualifications and experience.
The person appointed will have the opportunity of working on a wide variety of projects
under the supervision of experienced staff.
The appointment will be subject to the provisions of the Local Government Superamulation
Act. 1937, and a medical examination.
Act ouncil house will be made available if
required.
Applications, stating age, qualifications and
experience, and the names of two persons to
whom reference may be made, must be received
not later than first post Tuesday, 27th September,
1960.

R. A. FOX.

H. A. FOX.

Town Hall. Radcliffe.

CAERNARVONSHIRE COUNTY COUNCIL COUNTY ARCHITECT'S DEPARTMENT APPLICATIONS invited for post of ARCHI-TECTURAL DRAUGHTSMAN in the County Architect's Department (Salary APT. I—2675— 2795).

E725). Further narticulars and application forms from Clerk of County Council. County Offices, Caernaryon. Closing date, 30th September. 3183

Architectural Appointments Vacant per line; minimum 12s. Boz Nu including forwarding replies, 2s. estre.

RONALD WARD AND PARTNERS invite applications from ARCHITECTS, Senior and Junior. Long-term prospects. Scope for initiative and responsibility in interesting commercial. industrial and civic projects in British Lsles, West Africa and Australia. Salaries. commensurate with ability. Non-contributory Pension and Life Insurance schemes. Five-day week. Pleesant offices. Apply 29. Chesham Place, Belgravia 3361.

DASIL SPENCE & PARTNERS require quali-fied and experienced ARCHITECTS to fill positions of responsibility on a major building programme. Write to 43, Queen Ame Street, W.I., stating experience and salary required.

LEWIS SOLOMON, KAYE & FARTNERS, rapidly expanding practice require ARCHI-fEUTS and ASSISTANTS with initiative and competence to work on major design projects in the London area. These projects include Comprehentative Development Schemes, Hotels, Schools, Office, and Laxery Flats. Good salaries according to ability and experience, luncheon voachers, sive-day week, and excellent working conditions. Write 5, Holborn Circas Thavies Inn House, E.O.1, or telephone CiTy 3811, quoting SLB in both instances.

A RCHITECTURAL ASSISTANTS required in busy Bloomsbury office with varied practice. Good salary and prospects for suitable applicants. Five-day week. Write giving particulars of age, qualifications, experience, etc., to Box 91s, c/o 7, Coptic Street, W.C.I. 8815

A BCHITECTURAL ASSISTANT, about Inter-mediate standard, required for general practice in North Devon Office. Pension scheme. Box 9744.

£1.000 /42,006; p.a. will be paid to experienced competent ARCHI-TECTS by a private practice in the City of London. The work will be primarily on the drawing board on new and interesting projects of magnitude. A high standard of design and detailing ability is required. Please apply in writing to Box 9360.

A SSISTANTS required argently in busy West End practice, offering excellent oppor-tunities for gaining all-round experience. Write, stating experience, to Box 2657, or telephone MAYfair 3112.

EICESTER.—SENIOR ARCHITECTS and ASSISTANTS required for general practice. Appropriate salary paid. Five-day week. Apply by telephone or in writing for an interview to Herbert, Son & Sawday, 18, Friar Lane, Leicester. Tel. 56476.

WEST END OFFICE requires ASSISTANT ARCHITECTS of Final and Intermediate sandards for interesting Industrial projects in Home Counties. Good salaries offered to men with initiative and ability. Bonus Scheme, fiveday week, heliday arrangements honoured. Box 5319

A RCHITECTURAL ASSISTANT required, able to work on own initiative, varied practice, small office, opportunity for advancement. Write or phone: Nicholson & Rushton, 2, New Square, Lincoln's Inn, W.C.2. Holborn 2346

LIE MAYORCAS requires ARCHITECTURAL ASSISTANTS, preferably with some office experience, for interesting work. Write, giving particulars of architectural education and experience, and salary required to: 13, David Mewataker Street. W.l. 2214

C'ROYDON. Varied and interesting experience offered in progressive and growing practice to SENIOR and JUNIOR ASSISTANTS. Holiday arrangements respected. Five-day week. Please write or telephone: L. A. Macintosh & Haines. A./A.R.I.B.A., 33/35. High Street, Croydon. CRO 3780/9992.

£850—£1,400. TUBAL ASSISTANTS with imagination and designing ability required to assist with large and important new developments in the central London Area. Telephone or write—Trehearne & Norman, Preston & Partners, 83 Kingsway, W.C.2. HOLborn 471.

ONALD MOWSWELL argently requires for Croydon office. Salary by agreement. Holiday arrangemente honoured. Apply with full details Os., Friends Road. Croydon, or telephone OROydon 4880.

REQUIRED for work on interesting Industria)
Project affording first class design and techproject affording first class design and technical experience.
Apply in writing to:
Sir William Halcrow & Partners,
(B.A. Architects' Section),
47, Park Lane, London, W.1.

VALUE OF THE PARTNERS, of, Custner ine Place, S.W.I. require SENIOR and JUNIOR ASSISTANTS for work on large hospital projects. Excellent opportunities for those seeking first hand experience in this most interesting and rapidly developing field. Luncheon Vouchers and pension scheme in operation. Write giving full particulars.

SENIOR ASSISTANTS required immediately.
Salary by arrangement. Theo. H. Birks, 38,
Portland Place. 'ondon, W.L. LAN 7236. 1486

MONRO AND PARTNERS require ABCHI-Final R.I.B.A. standard in their London, Watford, and Glasgow Offices for work on interesting indus-trial and commercial projects. Salary range 2800 —21,000 p.a. Non-contributory Pension Scheme. Five-day week. Apply in writing to 32, Claren-don Road, Watford. 8669

ENIOR ASSISTANT required by Hasker & Hall, L./F.R.I.B.A., in their office in Warwickshire. Good salary, with scope for initiative and responsibility. Write Longdon House, High Street, Knowle, or telephone Knowle (Birmingham) 3502.

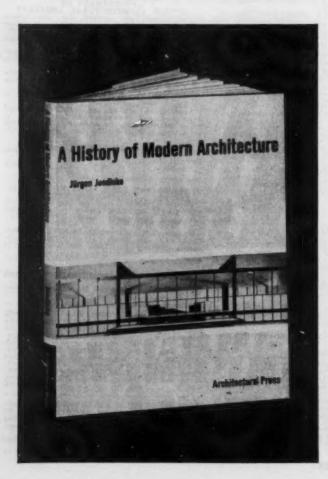
INTERMEDIATE to Final ASSISTANTS required immediately. Salary according to ability and experience. Theo. H. Birks, 38, Portland Place, London, W.L. LAN. 7336. 9739

SIR GILES SCOTT, SON & PARTNER require ARCHITECTURAL ASSISTANT, qualified or unqualified, with practical experience. Interesting and varied practice. Salary up to £1,000 plus luncheon vouchers. Write 9, Gray's linn Square, W.C.1, or telephone CHAncery \$387/8.

SELLY AND PAGET, 41, Cloth Fair, E.C.1.
Experienced ASSISTANT (2 or more years) needed. Education at least to Intermediate E.I.B.A. standard. Luncheon voucher scheme is operation. Your holiday arrangements respected. Pay according to qualifications. Annual salary review. General varied practice. Easily accessible effice in quiet part of City. Telephone MET 5511 or write to above address.

A RCHITECTURAL ASSISTANT, qualified or unqualified, with practical experience, re-quired for busy, interesting and varied practice. Salary up to £1,000. Box 2347.

A RCHITECTURAL ASSISTANT required, with at least two years' office experience. Apply in writing to Thomas Mitchell & Partners, 29, Bedford Square, London, W.C.1.



#### A History of Modern Architecture

by Jurgen Joedicke, translated by James Palmes

HITHERTO there has been no general history of the modern movement in architecture available in English. Professor Joedicke's book thus satisfies an important need, but it goes further than this-it is more comprehensive, yet more compact and better illustrated than any of the general histories of modern architecture available in other languages. His approach is straightforward and imposes no personal system on the material, accepting the classic distinction between the age of the Pioneers, and the age of the Masters, so that the contributions of famous architects can be found where one would expect to find them. In addition to the dominating personalities of the movement, Professor Joedicke, who teaches at the celebrated Technische Hochschule in Stuttgart, also gives a full account of the part played by new structural materials and new spatial concepts in the creation of the new architecture, and also surveys the contributions made by the leading architectural countries of Europe and the Americas. He thus covers the field from Joseph Paxton to Felix Candela in time, from Helsinki to Rio de Janeiro and Los Angeles in space

Size 101 by 71 ins. 244 pages with 400 halftones and 50 line illustrations, a bibliography and index. 45s. net, postage 2s. 0d.

The Architectural Press, 9-13 Queen Anne's Gate, Westminster, SWI. VACANCIES in leading Bristol Office for all grades of quaiffed ARCHITECTS and ARCHITECTS and ARCHITECTURAL ASSISTANTS. Modern approach to design essential and considerable freedom of expression allowed. Salaries from 2500 to £1,500 according to ability and experience. Outstandingly good working conditions; five-day week. Annual bonus; contributory pension scheme. Existing holiday commitments honoured. Apply giving particulars of age and experience to W. H. Watkins, Gray and Partners, 5, Colston Avenue, Bristol 1.

Bristol 1.

BIR JOHN BURNET, TAIT & PARTNERS have vacancies for ARCHITECTURAL ASSISTANTS of all grades. Salaries ranging from £1,000 to £1,500 per annum. Luncheon vouchers. Pension and Medical schemes (non-contributory). Telephone LANgham 3326 for appropring the statement of th

A PROGRESSIVE and expanding building and civil engineering organisation requires the services of an ARCHITECTURAL ASSISTANT in their Housing Division. Applicants should be experienced in the design and execution of working drawings in connection with Housing and Flat Development Schemes. Permanent and progressive position. Pension and Luncheon Youcher Schemes. Salary according to ability and experience. Holiday arrangements honoured. Write or phone Percy Bilton Ltd., Bilton House, 54-58 Uxbridge Road, Ealing, W.5. Tel. EALing 7777.

A RCHITECTURAL ASSISTANTS of all cateA gories required for busy City office engaged in industrial and commercial work. Good working conditions, 5-day week, luncheen vouchers, Salary by arrangement. Please contact Eric Firmin & Partners, Thavies Inn House, Holborn Circus, E.C.I. Tel.: City 8311.

BRYAN & NORMAN WESTWOOD & PARTNERS require ASSISTANT ARCHITECTS. Please apply to 21, Suffolk Street, S.W.I. TRAfalgar 4411.

CITY OFFICE requires ASSISTANTS for industrial and commercial work.

VILTY OFFICE requires ASSISTANTS for industrial and commercial work. 5-day ek. luncheon vouchers. Salary £1.200 p.a. 2691 C. H. ELSOM & PARTNERS require Senior
C. H. ELSOM & PARTNERS require Senior
c and Junior staff. The posts offer long
term prospects and the opportunity of experience
in all facets of Architectural work in a large
effice. 10 Lawer Grosvenor Place, London, S.W.1,
Tel. VIC 4594.

Tel. VIC 4504.

268

SIE GILES SCOTT, SON & PARTNER require
a SENIOR ASSISTANT with good general
experience in practical supervision of work and
also in administration. Varied work including
schools, hostels, churches, office buildings, municipal buildings, etc. Five-day week, luncheon
vouchers, and salary in accordance with experience. Please apply in writing to 9, Gray's Inn
Square, London, W.C.I.

KINGSTON - UPON - THAMES -- MALE or
FEMALE ASSISTANT in Architect's office.
Interesting and varied work, five-day week. Apply
in writing to Donaldson & Co., Architects, 75,
London Road, Kingston-upon-Thames.

2664

ASSISTANT ARCHITECTS required to join an

in writing to Donaldson & Co., Architects, 75. London Road. Kingston-upon-Thames. 2864

A SSISTANT ARCHITECTS required to join an imaginative and busy Staff Architect's Department of a large Multiple Organisation with Head Office in Loeds. Numerous interesting projects throughout the country. Flair for shop design and detailing an advantage. Fully qualified or experienced Intermediate R.I.B.A. standard. Salary by arrangement. Apply Box 2753.

SENIOR and JUNIOR "ASSISTANTS with initiative required immediately to work on varied and interesting projects with the minimum supervision. Congenial working conditions. Excellent salaries offered for competent assistants. Write, stating age, experience and availability, etc., to Mossys. J. W. Hammond. Lloyds Bank Chambers, Main Road, Gidea Park. Romford. Basex.

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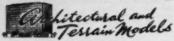
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