NEW LOW COST PILL-BOX PATTERN BRICK SURFACE SHELTERS

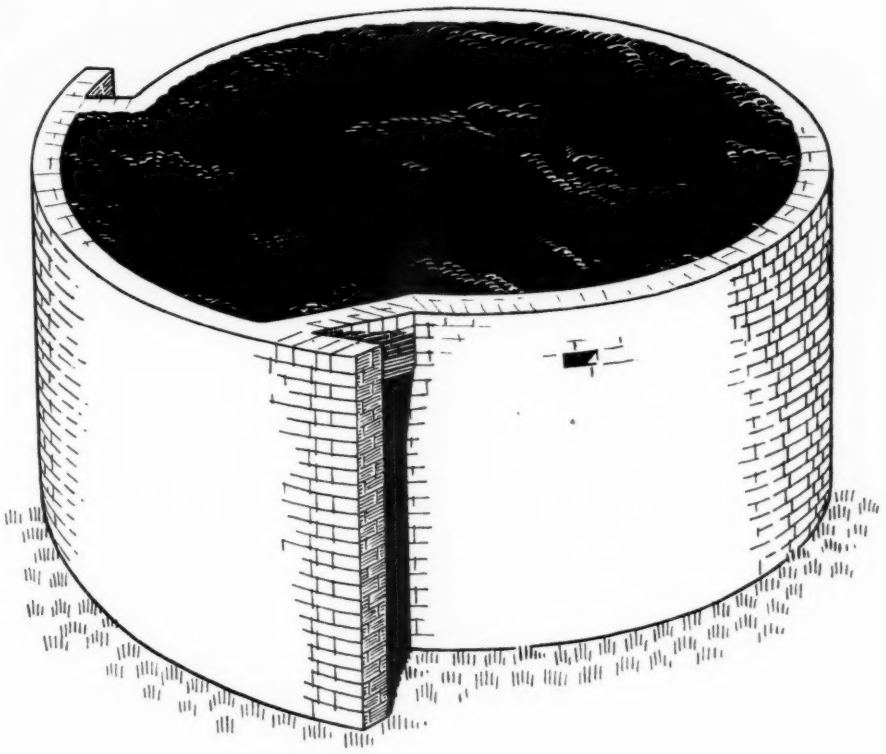
for WARDENS' POSTS

SMALL WORKS

PUBLIC OR

DOMESTIC

PROTECTION



Plan of shelter

Full particulars and variations of this design are available on request

Shelters to this design have been erected at a cost of under £2 per head by eliminating concrete for the roof and utilising a construction of railway sleepers, light rails and earth cover. Shelters are designed to accommodate either 12 or 24 persons with a space allowance of $3\frac{3}{4}$ sq. ft. per person in accordance with official requirements. An alternative roof construction is 6" of unreinforced concrete with 18" of earth cover.

These shelters can be very speedily erected and Phorpres bricks are available for such work in any part of the country at economical prices.

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B

THE ARCHITECTS' JOURNAL

THE ARCHITECTS' JOURNAL
WITH WHICH IS INCORPORATED THE BUILDERS' JOURNAL AND THE ARCHITECTURAL ENGINEER IS PUBLISHED EVERY THURSDAY BY THE ARCHITECTURAL PRESS (PUBLISHERS OF THE ARCHITECTS' JOURNAL, THE ARCHITECTURAL REVIEW, SPECIFICATION, AND WHO'S WHO IN ARCHITECTURE) FROM 45 THE AVENUE, CHEAM, SURREY

*

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*

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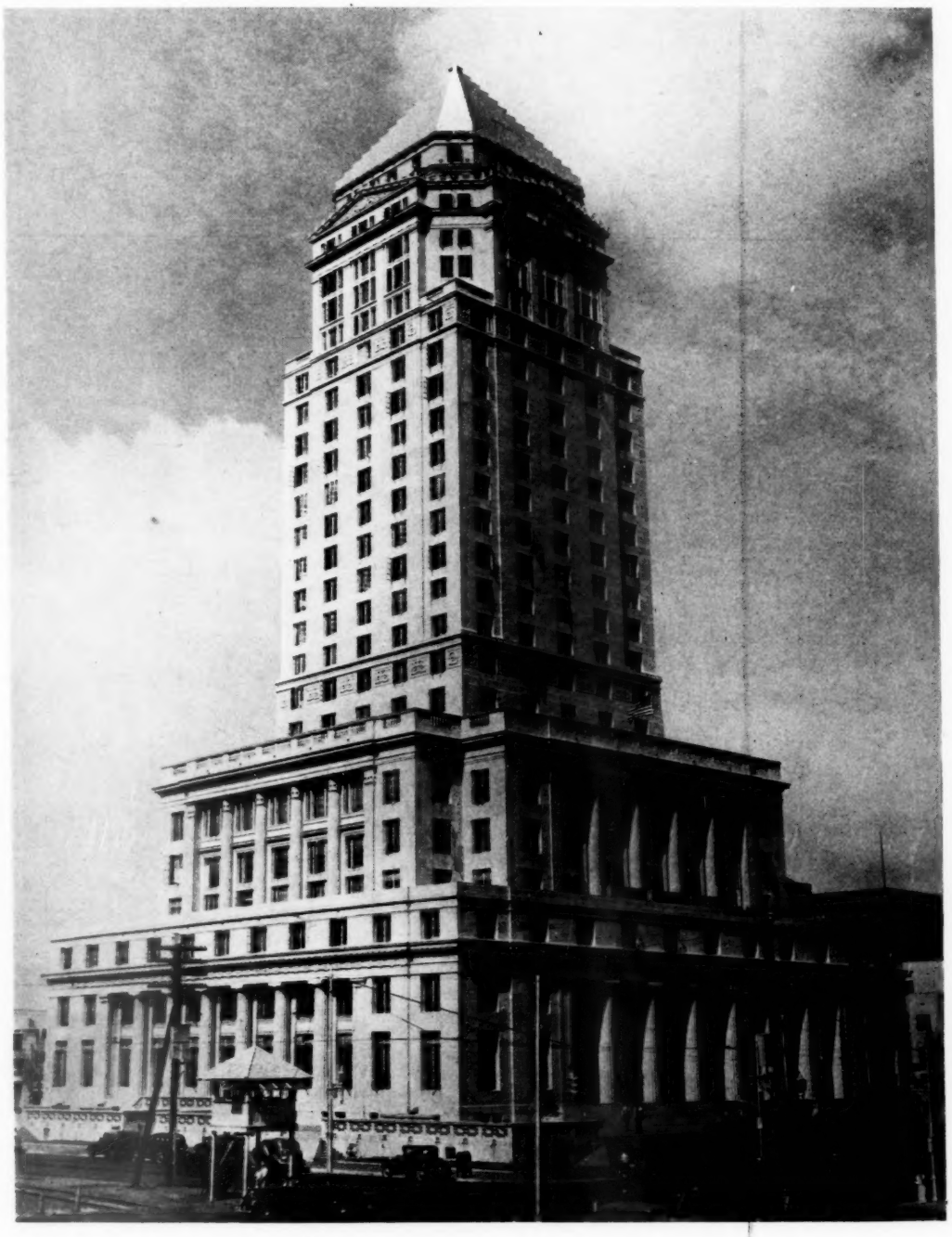
The Editor will be glad to receive MS. articles and also illustrations of current architecture in this country and abroad with a view to publication. Though every care will be taken, the Editor cannot hold himself responsible for material sent him.

THURSDAY, OCTOBER 12, 1939. NUMBER 2334 : VOLUME 90

PRINCIPAL CONTENTS

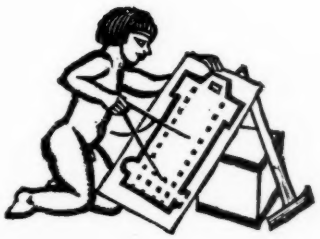
WORLD'S TALLEST JAIL



The jail at Miami, Florida, is claimed to be the tallest in the world. It is 28 storeys high and houses the Dade County Courthouse and the County and Municipal Offices. The upper ten floors contain the cells. The building was completed at a cost of approximately a million dollars.

LOG HUT

Old hut at Geilo, Norway. Some of these huts date back to the thirteenth century. They are all similar in design, consisting of two rooms, one over the other, with an external staircase. The whole structure is about 1 ft. 6 in. off the ground, standing in stones similar to rick stones. The logs are usually treated with creosote and their ends painted red or white. The roof is very often constructed with one layer of rough boarding, two layers of birch bark to lap joint, and a covering of turf. This type of roof provides excellent heat insulation, and lasts as long as 200 years with very little attention.



RESERVATION: WHAT IT REALLY MEANS

IT has been decided that all those aged 30 or over whose peace-time employment is the practice of architecture (whether as principals, assistants or draughtsmen) are now RESERVED.

The new announcement changes little. It simplifies the National Register by lumping together the underpaid draughtsman of an unqualified principal and the most expert in the profession, providing they are both 30 or more. And it will cause little interest among architects.

What does interest all architects is what Reservation means. That is what has been difficult to find out. The difficulty has lain not so much in interpreting official rulings—though these have been modified more than once—as in reconciling these rulings with exceptions made in individual cases. An architect hearing of these exceptions has often concluded either that Reservation is a bureaucratic gesture without much meaning, or that the rule holds good for everyone who does not know the right man or cannot find the Department which, in its need, will blandly ignore inconvenient instructions. The result has been much waste of time and effort.

In the past week the JOURNAL has tried to find out the facts—at least as they are *now*, and will presumably remain for some time. Here they are :

An architect, aged 30 or over (including all engaged in the profession, whether as principals or assistants) may not now join any whole-time national service, either fighting service or Civil Defence, except in a professional capacity.*

The existence of exceptions to this ruling, of which everyone has knowledge, appears to have arisen in two ways. Some architects have for a considerable time been members of Service Reserves, and so have been unaffected by Reservation. Others volunteered for various services some months before the outbreak of war. These applications were passed through the Ministry of Labour and were approved. The reasons for this approval may reasonably be supposed to be two : (1) the total of such applications was very small compared with the total number of architects and the general position was therefore unaffected; (2) it seemed probable that work would not be available for architects as architects for some months after the outbreak of war. The applications were therefore approved as a provisional measure, and the architects concerned will be recalled for more essential professional work as the need arises.

Whatever may have been the reasons which have led to one architect having a salaried non-architectural war service job while others have not got one, they were not (usually) due to muddle or influence. And the fact remains that the others have not got one, and *cannot* now get one—except in a " professional capacity."

This phrase is plain enough up to a point. An architect over 29 can be employed whole time by a local authority to provide shelters; he can join the works departments of the fighting services. But he cannot fill in the months of waiting (before architects are needed in bulk) by taking any whole-time unarchitectural Civil Defence Work—nor can he enlist or apply for a commission in the fighting forces.

What is not so plain is where " in a professional capacity " ends. It is generally admitted that holding a commission in the Royal Engineers is being employed professionally. But a part only of an architect's knowledge is of use in the Engineers. An almost equal amount is of use in the Artillery, the Signals, the Camouflage sections of all services. But there is so far no sign that this is to be taken into account in the expansion of the fighting services.

The services are to be enlarged slowly, and therefore a more immediate hardship of Reservation is its effect on architects as regards A.R.P. An architect employed in Rescue and Demolition, the Fire Service and some other branches of A.R.P. is not employed professionally. But there is no doubt that his professional training ought to make him, and does make him, far quicker at picking up what is required of him than a cinema attendant and a solicitor. With the exception of Rescue and Demolition (which is not yet organized with any thoroughness) these interim jobs are barred to the architect—except for unpaid part-time duties.

Reservation, therefore, means to the architect over 29 that he cannot enlist in the fighting or Civil Defence services (other than unpaid) unless he can find an architectural job. He cannot even take a temporary job in which his training would be of considerable use.

* In common with members of all other reserved occupations, an architect may enlist for long-term service (i.e. as a career) in Navy, Army, Air Force, Police and Fire Brigades. But as he would then cease to be an architect this point may be ignored.

The Architects' Journal
45 The Avenue, Cheam, Surrey
Telephone : Vigilant 5762

NOTES & TOPICS

NOTICE TO SUBSCRIBERS AND CORRESPONDENTS

The Architectural Press announces that in order to ensure production and distribution of THE ARCHITECTS' JOURNAL, THE ARCHITECTURAL REVIEW, SPECIFICATION *and the numerous books published by the firm, it has taken temporary offices at 45 The Avenue, Cheam, to which address editorial and advertisement matter should be sent. The telephone number is Vigilant 5762.*

Temporarily Therefore :
THE ARCHITECTS' JOURNAL
45 THE AVENUE
CHEAM, SURREY
Vigilant 5762

LATEST ON RESERVATION

ONCE more I feel myself well-informed about Reservation. Though this does not mean that the position of those of us who are no longer 29 is cut, dried and definite. The situation seems to have a hard core but at least one wobbly edge.

*

My information is that architects over 29 are divisible into two categories :—

1 : Architects who are already engaged wholetime in some fighting or civilian service. These are likely to be left where they are—for the present. Later they may be recalled and asked to take up some other work. Whether the architect so engaged can himself resign to take up more professional work appears to depend on the service in which he is engaged. In the fighting services—No ; in the A.F.S.—only if he is taking up work of equal national importance and of a professional kind ; in most other A.R.P. services—Yes.

*

2 : Architects who are not yet engaged wholetime in a national service. These will not now be accepted for such jobs "unless in a professional capacity." This exception can be defined narrowly or broadly and is meant, it appears, to be defined narrowly.

*

But it is at least arguable that an architect helping to organize A.R.P., who is dealing with the spacing of first-aid posts, trenches and other shelters, wardens' posts, and so on, is at least partially engaged in a professional capacity and has also considerable useful knowledge to contribute. To debar architects from doing this work for the months before they are used for other purposes appears a waste of ability.

In the meantime, "Reserved for what?" is a question which needs an answer which cannot be sidetracked by whispering "Bombs. . . ."

TWO-PURPOSE SHELTERS

In one of the "neutral" suburban districts, where Anderson shelters have just arrived for distribution, the Council was puzzled by the fact that whereas in one neighbourhood there were many cases of families refusing the offer of free shelters, in another very similar neighbourhood every single family accepted the offer.

*

On enquiry, it was discovered that in the first district some chatty soul had gone round telling her neighbours, "Coo, you won't see me goin' into one of them things, you won't. Catch me death, I would. Lummee, don't all want to die of pneumonia, do we?" While in the second district some other chatty soul had gone round pointing out what splendid sheds for prams, bikes and tools the shelters would make after the war is over—or even while it is still on.

GLASGOW

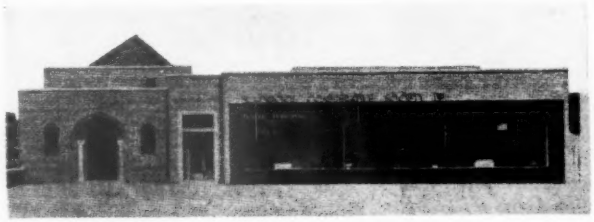
Glasgow is the latest city to foresee the likelihood of some reversion of the vigorous control of housing. Here there are 3,390 houses under construction and these it is anticipated will be completed. But preparations had also been made for the construction of a further 5,096 houses, and land had been acquired to build another 39,000. These, of course, come under the axe of suspended work, in the same manner as a multitude of English schemes.

*

Glasgow, however, is in the somewhat singular position of possessing a direct labour department with a total of 1,445 skilled artizans of various trades and 1,707 semi-skilled and unskilled labourers, many of whom are over military age. It is therefore not unexpected that the Corporation should adopt a report by Mr. William B. McNabb, the housing director, that certain preparatory work should be undertaken so that the department will be in a position to launch large building contracts when conditions permit.

CATHEDRAL

In the meantime, among the buildings, unconnected with war or home defence, upon which work is proceeding is Edward Maufe's cathedral at Guildford. The work is now being carried on with older men not called up for national service, and it is hoped to roof in the building soon to protect the fabric from the winter weather and to consolidate the part already completed.



CO-OPERATIVE REPOSE

For the first time, as far as I am aware, comes the news of a Chapel of Repose erected by a co-operative society. It is at Blackpool, and has been designed by Mr. R. J. Vernon, of the society's architects' department, as an extension to the funeral department. The main door leads through a spacious hall into the Monumental department, which has a window display space of about 50 ft. There are also a waiting room, a preparation room and a showroom with a selection of caskets, coffins and urns.

*

The Chapel of Repose has a separate entrance and seats one hundred persons. It contains pews and other woodwork in light oak, stained glass windows, and subdued artificial lighting from the ceiling and in front of the altar. Arrangements have been made for appropriate music during the services.

BRICK

Christchurch Town Council, according to the *Bournemouth Times and Directory*, does not usually meet in August. This year it did—three times. And despite this painstaking effort by its members a very nasty spirit appears to have been abroad in the place.

*

Consider : a builder had been notified that his scheme for a development at Friars Cliff was approved—whereas the Council had meant all along to disapprove it. Could anything have been more provoking ?

WEEKLY FEATURES

Until conditions become more normal certain features may be temporarily or intermittently suspended. This applies this week to Working Details, Information Sheets and Current Prices.

You would have thought any decent residents around Friars Cliff would have realized how upsetting the whole affair was to the Council. It's pretty awful, when we're all doing what we can to help, to see that some of those residents have now issued a writ against the Council and are claiming damages.

*

What with the mistake and the writ and all the worry, and then, of course, this war on top of everything, it will be a long time before the Christchurch Town Council meets again in August.

*

— Silly of them to have done so in the first place.

BUS AND OTHER BLUES

An answer in the Information Centre last week reminds me that bus windows in certain towns in the Midlands have all been painted blue—blue-bag and meths, they say. The interiors of the buses are illuminated at night by orange lamps, the assumption being, correctly, that no orange light can penetrate blue glass.

SANDBAGS

No one connected with the profession can fail to have noticed the many ridiculous methods of laying and building sandbag walls outside private houses and even shops. I am not, of course, thinking of the work of local authorities, who have known long enough the correct methods, but of the private individual, who is doing his best without realizing that even the laying of a sandbag calls for some sort of technical knowledge. I am aware that the building of sandbag walls is dealt with in an Air Raid Precaution Handbook, but few of the public study Home Office publications.

*

The ignorance concerning sandbagging extends also to the extravagant use of other materials for protecting buildings. A peculiar instance, referred to by a correspondent of *The Times*, is provided in the City by the head office of one of the big banks, where ten brand new heavy waterproof canvas covers, 12 ft. by 9 ft., are being used for the protection of barricades of sandbags.

SANDBAG THE STATUES

Mr. R. A. Walker, writing from the Athenæum Club to *The Times*, recently reminded us that : " During the crisis in September, 1938, all the public statues in the West End of London were protected. Now, during the war, when buildings are sandbagged, the statues are left unprotected."

*

What can one say ? Thank God ?

TAIL-PIECE

Notice on a chemist's shop in Lambeth : " Business as usual during alterations to Germany."

ASTRAGAL

ARCHITECTS' JOURNAL

EMERGENCY

If you have an A.R.P. problem which demands an expert answer.

If you want information regarding A.R.P. appliances.

If you have an A.R.P. problem which requires knowledge you have not got of official recommendations.

If you want information regarding MATERIALS.

If you want guidance in finding your way around the new Government Departments.

If you want the change of address of a firm or manufacturer.

Write to :—

THE ARCHITECTS' JOURNAL,
45, THE AVENUE,
CHEAM,
SURREY.

The INFORMATION CENTRE itself is working from London, but inquiries should be addressed to this *Journal* unless the question is urgent.

If the question is urgent, ring the *Architects' Journal* INFORMATION CENTRE *at* FLAXMAN 5322.

PLEASE write, don't ring the Centre unless the question is urgent.

These are typical of the questions we have already answered :

How are ventilated black-out window screens formed ..... ?

How is sandbagging rotproofed ?

How much safer is a 20-ft. deep shelter than a semi-surface type ..... ?

How is a light lock formed

How should screen walls be arranged ?

How is a basement shelter protected from bursting water mains ?

What is the definition of a light-proof material ..... ?

What publications are there on farm buildings ?

What would be the maximum spread of debris if a h.e. bomb hit a 330 ft. stack ..... ?

What publications are there on camouflage ?

What protection is needed for light shafts ..... ?

Is a 1938 contract binding ?

INFORMATION CENTRE

We continue to be flooded with questions, and it is impossible to find space in these pages to answer all those we receive. Rather than hold over replies for a week, we are answering personal questions through the post, and have selected those of most general interest for publication. Printed questions are now being numbered in order to facilitate reference back. This is necessary when identical or similar questions are asked at different times by different readers.

Q32 OXFORD.—*Will you please inform us where we can obtain a GAS FILTER similar to the container of a civilian respirator. Also canvas-covered rubber accordion type bellows?*

It is not possible to obtain a part only of a respirator, but you can get a complete mask and the canvas-covered rubber accordion type bellows from either the North British Rubber Co., Ltd., 204 Tottenham Court Road, W.1, or the Leyland and Birmingham Rubber Co., 31 Wilson Street, E.C.2.

Q33 BROADWAY. — *Is there any official definition of a LIGHT-PROOF MATERIAL, and, if so, where can I find out about it?*

So far as we know, there is no official definition, and the work done must be judged by results. The Federation of British Industries, 21 Tothill Street, S.W.1 (Whitehall 6711), however, have published a list of names and addresses of manufacturers who make suitable light-proofing materials, and further practical advice is being given by the Electrical Development Association, 2 Savoy Hill, W.C.2 (Temple Bar 9434).

Q34 HOUNSLOW.—*The writer would be glad to see some editorial opinion upon the urgent necessity for architects and quantity surveyors to deal expeditiously with the passage of accounts and the ISSUE OF CERTIFICATES due to the building industry and to its sub-contractors, particularly on work which was completed prior to the outbreak of war. We are finding in many instances that architects have changed their addresses and/or been called to the colours, which process is making it very difficult for us to collect accounts due and overdue. Another matter which you might like to deal with is the sanctity of contracts, particularly applying to sub-contractors like ourselves who are required to make machinery, for delivery to a building, in which the process of manufacture involves a substantial outlay and where an instruction to "suspend work" does not clear the financial difficulty, while an instruction to cancel leads to considerable bitterness if the normal law of contracts is applied.*

In view of the war, delays in issuing certificates and completing accounts will be unavoidable. But as there is no contract between the architect and the contractor, if an architect fails to issue certificates in accordance with the terms of the contract, a contractor cannot compel him to issue a certificate. The contractor's only remedy would appear to be to commence arbitration proceedings for a declaration that he is entitled to a certificate, and if there is a quantity surveyor to a final account. A party to a contract is under an obligation to fulfil the terms of his contract, and an instruction to suspend work (subject to any provision in the contract to the contrary) would not be binding on the person carrying out the work. We agree the strict application of the law of contracts in cases such as this must cause unnecessary bitterness. The parties should endeavour to come to some arrangement.

Q35 WOLVERHAMPTON.—*Thank you for yours of September 29 (see Q.21, A.J., October 5) giving various particulars for a FIRST AID AND DECONTAMINATION CENTRE, and also a tracing showing the suggested layout.*

We have studied our copy of the ARCHITECTS' JOURNAL *dealing with this subject, but the type of building we have in mind is somewhat different; we are afraid the particulars given in our previous letter did not adequately explain this. The building will not be below ground, and will not actually be joined up with the shelters; these will*

be detached and scattered over a fairly large area.

We are thinking of a building above ground, built probably with 14-in. walls, with windows 6 ft. 6 in. to the sill level, and reinforced concrete roof.

The accommodation will have to be duplicated, as approximately 500 men and 1,200 women are employed.

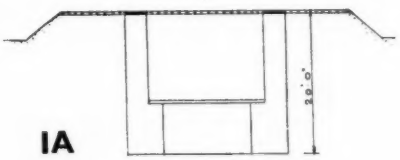
If you could give us any further advice on the equipment necessary and the sizes of the various rooms necessary for men and women, we should be very grateful.

The purport of your question is still not quite clear. First aid centres have been constructed in some cases independent of shelters, but we cannot see what would be the idea of a decontaminating centre which is not in direct contact with the shelter. Where are people who are decontaminated to go ? If they walk from the decontamination centre to the shelter through the open air is there not great danger of their being contaminated again ? On the other hand we can imagine that it is intended to provide decontamination only for those victims who are brought in for first aid, and in this case one would not have to take into account a large number of people for the decontamination centre, but only a certain percentage similar to that considered when a first aid centre is designed. This would still, however, leave the majority of the seventeen hundred people without a decontaminating centre.

There may be a compromise as follows : To allow in the shelters only such people who are not in danger of being contaminated (usually those who can reach the shelter without going into the open). The decontaminating centre together with the first aid can then be designed for the remainder, but would have to include shelter accommodation for this number. If this latter arrangement is what you really intend we can give you some suggestions if you will let us know how many people are likely to be caught in the open by a gas attack. When determining this number, it is wise to assume that the alarm has failed, which means gas might be in the air when people try to reach the shelter.

Q36 WIMBLEDON.—*Is it of advantage to have a SHELTER WITH ITS BOTTOM 20 FT. UNDER THE SURFACE, (fig. 1A) compared with a shelter with its floor only a few feet below ground (fig. 1B) ; bearing in mind there is only 13 ft. of earth over the first shelter, which cannot be considered really bomb-proof ?*

There are two types of bomb, the instantaneous action bomb and the delayed action bomb. If a delayed action bomb hits a shelter which is 20 ft. under ground level, the added depth is not a great advantage. On the other hand, if an instantaneous action bomb strikes the earth over a shelter situated only a few feet below the surface, the shelter is bound to be destroyed, but if such a bomb explodes over a shelter with 13 ft. of cover, this shelter will usually be safe, unless the bomb is a particularly heavy one. To provide additional safety, hard core, concrete or flagstones can be laid over the earth covering the shelter.



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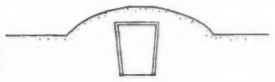


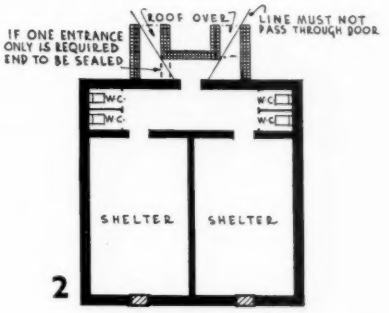
IB

This has the effect of preventing an instantaneous bomb from penetrating into the ground before exploding. The stone or concrete must be in small slabs in order to prevent an explosion underneath from being tamped. Delayed action bombs would be fatal to either type of shelter. It can be assumed that in rural districts delayed action bombs will not be used as their effect, blast and splinters, is considerably reduced in open spaces and the likelihood of one hitting a shelter is remote.

Q37 FINCHLEY.—*How are SCREEN WALLS supposed to act in order to protect openings, and what dimensions should such screen walls have ? I am particularly interested in the construction of such walls in relation to surface shelter entrances.*

Blast is perpetrated mainly in a straight line, and while the course of splinters is slightly curved, it can be considered as straight for short distances. Both blast and splinters can rebound, and thus change direction, and when this occurs they lose energy and become less dangerous. A screen wall, therefore, should be constructed so that no straight line can be drawn from the interior of the shelter to the exterior without cutting through material which is considered sufficient protection. The Code, paragraph 2, acknowledges screen walls if they are not more distant than 12 ft. from the opening, if they project beyond the sides and top of the opening for a distance not less than their distance from the opening.

For a larger shelter a somewhat higher degree of protection is recommended, and it is suggested a doubly broken



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corridor (Fig. 2) should be used, preferably covered with the overhead protection required for the shelter.

Architectural Front

LEEDS SCHOOL

Leeds School of Architecture re-opened on October 9. Full five-year course will be conducted ; adjustments made in the curriculum in order that students in junior years may obtain more advanced instruction in surveying, steel and reinforced concrete and timber design which is normally given later in the course. Courses will be adapted to train students who may later be required for service in the Royal Engineers and other technical units.

A.A.S.T.A.

Series of A.R.P. lectures in the Oak Room, Kingsway Hall, Kingsway, W.C.2, from 6.30 to 8.30 p.m. Price to A.A.S.T.A. members, 6d. per lecture, or 2s. for series of five ; unemployed assistants, whether members or not, can obtain free tickets. Price to all others 1s. per lecture or 4s. for series. First Meeting, Monday, October 16 : "Legal Aspect of A.R.P." By William Sedley. "Emergency Measures." By John Pinckheard. For details of other lectures, *see* page 441, ARCHITECTS' JOURNAL, October 5.

HOLLOWAY LITERARY INSTITUTE

Hilldrop Road, N.7. Daniel Roth's class for laymen re-opened on October 11, 6.30 to 8.30 p.m. every Wednesday.

N.R.I.A.D.

Conducting an enquiry into condition of employment among all artists and designers; it requests designers, whether registered or not, to enable it to make an accurate report on this matter by : (*a*) Informing it whether their

normal occupation has ceased owing to the war. (*b*) Whether they are engaged in other work which does not make use of their abilities as a designer, i.e. A.R.P. work, Military Service, etc. (*National Register Art of Industrial Designers, 32 St. James's Street, S.W.*)

*Changes of Address

ARCHITECTS AND SURVEYORS

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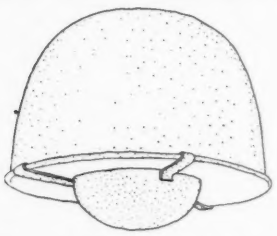
ELLIOTT, ARCHER AND MARSH
Norwich Union Buildings, High Street, Chelmsford. (Chelmsford 2276.)
EVANS, WILLIAM
8 Oaklands Avenue, Romford. (Romford 677.)
HARRISON AND COX
"Shepley Knoll," Shepley Road, Barnt Green, Birmingham. (Hillside 1393.)
KAUFMANN, E. C.
24 Pentley Park, Welwyn Garden City, Herts. (Welwyn Garden 3284.)
STEPHENSON, ELWELL AND KNIGHT
11 Kingsmead Avenue, Worcester Park, Surrey.

Building Front

What is happening in the trade? The emergency tends to affect every firm in a different way, and the notes found under Building Front *give the latest details. We are prepared to publish any vital information that is sent to us by manufacturers regarding their activities.*

AGA HEAT, LTD. Business as usual at 20 North Audley Street.

BENJAMIN ELECTRIC, LTD. From usual Tottenham address issue pamphlet *Factory Lighting in Wartime;* also described is A.R.P.



lighting unit (sketch) for the low illumination values that may be authorized for exterior use in raids in accordance with B.S.S. A.R.P./16.

BINNS, A. J., LTD. Maintaining London office with skeleton staff at 53 Gt. Marlborough Street, W.1, but main business now carried on from 14 Patterson Road, Upper Norwood, S.E.19.

CHANCE BROTHERS & CO., LTD., say English manufacturers have made no increase in prices ruling when war began for plate, sheet or rolled glass. In spite of this some contractors trying to exploit situation in manner reprehensible. Price of other glass, e.g. lighting ware, has risen. Opinion: no reason to fear shortage of supplies, lowering of quality or unreasonable delay in delivery.

DURANBRITE FLOORING CO., LTD. Parquet and composition floorings as usual. Opinion: for utilitarian products war conditions not likely to diminish the demand.

FURDECOR, LTD. Concentrating on contract side of business: hospital furniture and equipment (except operating theatres); A.R.P. curtains; camp equipment.

HAMMER, GEO. M. & CO., LTD. Since 1858 craftsmen in woodwork; now also in A.R.P. equipment, furniture and replaceable gas-proof screens and shutters.

HATHERNWARE, LTD. London office suspended, all business at Loughborough, now also making handsome stoneware A.R.P.

closed drinking-water storage vessels, in 2, 5, 10, 15 galls. capacity, at 17s. 6d., 27s. 6d., 48s., and 72s. 3d. each.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD. Subject to priority contracts for Government departments, still supplying Silvertown flooring and other rubber products for building industry.

LANCASHIRE DYNAMO AND CRYPTO, LTD. Busy supplying electrically-driven food preparing machinery and low-pressure steam cookers to hospitals, schools, institutions, etc., faced with problem of providing supplementary communal feeding arrangements. Opinion: Architects now more than ever called upon to embody in plans the detailed layout for kitchen and similar equipment.

NOBEL CHEMICAL FINISHES, LTD., from new address, Wrexham Road, Slough, Bucks, ask customers to assist firm to keep up all supplies by indicating on order for what job class paint is required: Class (A) direct Government work; (B) indirect Government work, including sub-contractors; (C) agriculture and foodstuffs; (D) utility services; (E) general industry; (F) export.

PRESSED STEEL CO., LTD. Busy making Prestcold refrigerators. War conditions demand more refrigeration, e.g. in crowded evacuation areas existing cold storage facilities often inadequate. Refrigerators required for A.R.P. first aid posts. Also for blood storage under blood transfusion scheme.

STERLING VARNISH COMPANY, LTD. Meeting insatiable demand for black and blue blackout paint and paint for camouflage in types and shades approved by Air Ministry. Orders met in 48 hours (ex works).

SUTCLIFFE, SPEAKMAN & CO., LTD., supplying hundreds of ventilation and air filtration units for shelters built by corporations, municipalities, and public and private companies.

URQUHART'S (1926), LTD. Head office transferred to Albion Dockyard, Cumberland Road, Bristol (Bristol 23050). London works and offices maintained for London jobs. Oil-burning equipment, etc., still available for general industrial purposes as well as Government work.

WALKER, CROSWELLER & CO., LTD., overwhelmed with orders for thermostatic mixing valves for showers at A.R.P. cleansing stations. Maintaining four/seven days' delivery.

WILLESDEN PAPER AND CANVAS WORKS, LTD. In addition to usual Willesden paper, now producing new paper: Willesden black, waterproof, for blackout, used mainly in light batten frames, also enormous quantities of rot-proof sandbags. Opinion: no use treating filled bags when in position; essential use rotproofed bags. Willesden Cuprammonium rot-proofing process adds less than 1d. to cost of each bag.

*Changes of Address

MANUFACTURERS AND AGENTS

ARNOLD-LACY CO., LTD.
Glyndon, near Wellington, Somerset. (Wellington 295.
CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.
2 Surrey Street, Strand, now closed; all communications to Head Office.
ERWIN, WASEY & CO., LTD., ADVERTISING
2 Dean Trench Street, S.W.1. (Abbey 3093.) (Temporary Brighton Office closed.)
GLIKSTEN DOORS, LTD.
7 Almond's Green, West Derby, Liverpool, 12. (Stanley 1217—8—9.)
LINOLEUM AND FLOORCLOTH MANUFACTURERS' ASSOCIATION).
c/o The Linoleum Manufacturing Co., Ltd., Staines, Middlesex.
WALPAMUR CO., LTD.
133 Park Road, Teddington, Middlesex.

Control of Timber Supplies

In pursuance of powers granted under the Emergency Powers (Defence) Act, 1939, the Ministry of Supply has made the Control of Timber (No. 5) Order, 1939.

The restrictions on dealings in timber imposed by the Control of Timber (No. 1) Order, 1939, as amended by the Control of Timber (No. 3) Order, 1939, will be revoked on and from Wednesday, October 4, 1939, from which date there will be substituted a new licensing system. Under this licensing system every purchaser of timber or boxboards for consumption must have a licence for his purchase (except in certain special cases), and the seller has to see that his purchaser duly holds a licence.

Special cases in which no licences are required are as follows: (i) Purchases by consumers of timber and boxboards up to a total value of £20 in any one calendar month provided that the timber and boxboards so purchased are for work of national importance or urgent necessity; (ii) Direct purchases by Departments of H.M. Government in specific cases covered by special or general directions issued by the Minister.

The No. 5 Order provides for the rendering of returns of sales of timber or boxboards for consumption. Details of the information required in this connection are contained in Direction No. 2 issued by the Ministry of Supply under the Control of Timber (No. 5) Order, 1939.

The Order does not apply to individual retail transactions not exceeding £1 in value.

Subject always to the control of the Headquarters Department of the Timber Control, the licensing system introduced by the No. 5 Order will be operated by the Timber Control Area Officers in respect of timber other than mining timber and by the Timber Control Pitwood District Officers in respect of mining timber. Copies of forms of application for licences should, therefore, be obtained from and returned when completed to the appropriate officers at the addresses shown below.

Copies of forms of application for licences in respect of boxboards should be obtained from, and returned when completed to, the Controller of Timber Supplies (Branch 8), Ministry of Supply, 2/7 Elmdale Road, Bristol 8.

Copies of the Control of Timber (No. 5) Order and of all Directions issued under the Order should be obtained directly, or through any bookseller, from H.M. Stationery Office.

I.—TIMBER CONTROL AREAS

1. Northumberland, Durham, North Riding of Yorkshire.—2 Devonshire Terrace, Jesmond, Newcastle-on-Tyne.
2. Yorkshire (West Riding and East Riding).—Craven Street Senior School, Holderness Road, Hull.
3. Lincolnshire, Nottinghamshire, Derbyshire (less portion in No. 9 Area), Leicestershire, Rutlandshire, Northamptonshire.—Third Floor, Vernon House, Friar Lane, Nottingham.
4. Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, Bedfordshire.—35 Goodwins Road, King's Lynn.
5. London, Essex, Hertfordshire, Kent, Surrey, Middlesex, Buckinghamshire, Oxfordshire.—25 Savile Row, London, W.1. ('Phone: Regent 8252.)
6. Sussex, Hampshire, Dorsetshire, Berkshire, Isle of Wight, Wiltshire (south of G.W.R. main line, excluding towns on that line).—Grayladyes, Old Bursledon, near Southampton.
7. Devon, Cornwall.—Sutton Road, Plymouth.
8. Somersetshire, Wiltshire (north of G.W.R. main line and including towns on that line), Gloucestershire.—Runnington Lodge, Dundham Park, Bristol.

* *Changes of address received this week; a full list will be printed next week.*

9. Cheshire, Lancashire, Cumberland, Westmorland, Montgomeryshire, Merionethshire, Caernarvonshire, Denbighshire, Flintshire, Anglesey, and, in Derbyshire, Buxton Borough, Glossop Borough, New Mills Urban District, Whaley Bridge Urban District, Chapel-en-le-Frith Rural District.—Eighth Floor, India Building, Water Street, Liverpool.
10. Warwickshire, Worcestershire, Staffordshire, Shropshire, Herefordshire.—West House School, 24 St. James' Road, Edgbaston, Birmingham, 15.
11. Northern Ireland.—77–79 Corporation Street, Belfast.
12. Lanarkshire, Ayrshire, Renfrewshire, Wigtonshire, Dumbartonshire, Argyllshire, Clackmannan, Kirkcudbrightshire, Dumfriesshire, Stirlingshire, Bute.—29 Park Circus, Glasgow, C.3.
13. West Lothian, East Lothian, Midlothian, Berwickshire, Peeblesshire, Selkirkshire, Roxburghshire.—45 Queen Street, Edinburgh, 2.
14. Angus, Fifeshire, Perthshire, Kinross-shire.—56 Reform Street, Dundee.
15. Aberdeenshire, Morayshire, Banffshire, Kincardineshire, Orkney and Shetland.—Amicable House, Third Floor, 252 Union Street, Aberdeen.
16. Inverness-shire, Nairn, Ross and Cromarty, Sutherlandshire, Caithness.—53 Shore Street, Inverness.
17. Monmouthshire, Glamorganshire, Carmarthenshire, Pembrokeshire, Cardiganshire, Breconshire, Radnorshire.—27 Newport Road, Cardiff.

II.—TIMBER CONTROL PITWOOD DISTRICTS

1. Whole of Scotland.—45 Queen Street, Edinburgh, 2.
2. Counties of Northumberland, Durham, Cumberland, Westmorland; the North Riding of Yorkshire; the detached part of Lancashire north of Morecambe Bay.—2 Devonshire Terrace, Jesmond, Newcastle-on-Tyne.
3. East and West Ridings of Yorkshire (except that portion of the West Riding which was transferred for administrative purposes from Lancashire by the Local Government Act, 1888).—Craven Street Senior School, Holderness Road, Hull.
4. Counties of Derby, Leicester, Lincoln, Nottingham, Huntingdon, Northampton, Rutland and Oxford.—Third Floor, Vernon House, Friar Lane, Nottingham.
5. Part of Lancashire (namely, so much of the county as is not included in No. 2 District); Cheshire, that part of the County of Stafford lying to the north of the road from Uttoxeter through Bramshall Field and Milwich to Stone and thence through Norton Bridge, Eccleshall, Croxton, Hookgate and Almington to Market Drayton; Anglesey; the Counties of Caernarvon, Denbigh, Flint, Merioneth and Montgomery.—Eighth Floor, India Building, Water Street, Liverpool.
6. Counties of Monmouth, Glamorgan, Brecon, Radnor, Cardigan, Carmarthen, Pembroke and Gloucester (west of River Severn).—27 Newport Road, Cardiff.
7A. So much of the County of Stafford as is not included in the No. 5 District; the counties of Cornwall, Devon, Dorset, Gloucester (except that part west of the River Severn), Hereford, Shropshire, Somerset, Warwick, Wiltshire and Worcester.—West House School, 24 James' Road, Edgbaston, Birmingham, 15.
7B. Counties of Bedford, Berkshire, Buckingham, Cambridge, Essex, Hertford, Kent, London, Middlesex, Norfolk, Suffolk, Surrey and Southampton.—25 Savile Row, London, W.1. ('Phone: Regent 8252.)

Since issuing the above notice the Ministry of Supply has announced that all holders of timber stocks in the United Kingdom whether they are merchants or consumers of timber to the provisions of Article 5 of the Control of Timber (No. 1) Order, 1939, which states that every person owning timber situate in the United Kingdom shall furnish such returns as the Minister may request.

All holders whose stocks in one ownership exceed
Imported softwoods, 100 standards.
Imported hardwoods, 5,000 cubic feet.
Home-grown timber, 2,000 cubic feet.

All plywoods, 2,000 cubic feet (or 60 cubic metres), are now required to furnish on or before 12 October, 1939, to the Area Officer in whose area the stocks are situate, a return of such stocks as at October 7, 1939.

Stockholders who have not received a copy of the appropriate forms should apply to their local Area Officer at the address given in the list attached. Members of the Timber Trade Federation of the United Kingdom may also obtain copies of the forms from the Secretary of the Federation.

Equipment

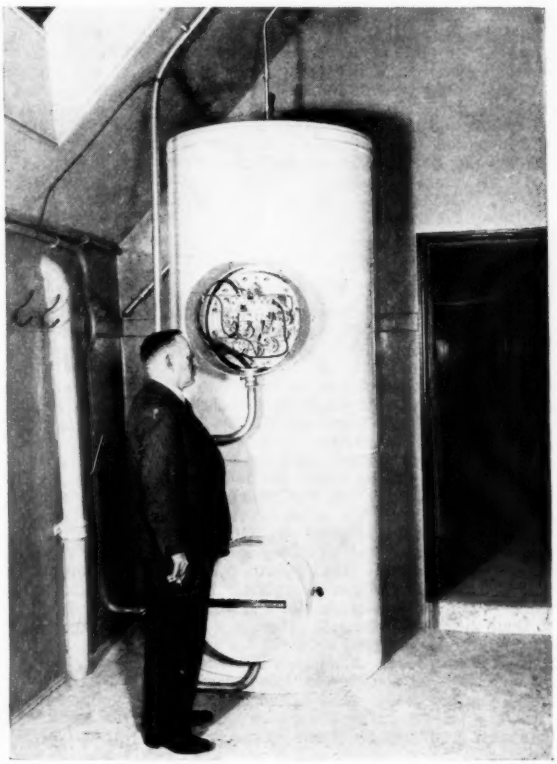
The majority of innovations in the building trade are, in these days, concerned directly or indirectly with Civil Defence, and for this reason it seems appropriate to include Mr. Philip Scholberg's Trade Notes in the Information Centre. Normal Trade Notes will continue, but their appearance will be intermittent.

Water Heaters for A.R.P.

THE St. Pancras Electricity Department has recently completed a SHOWER INSTALLATION FOR A.R.P. DECONTAMINATION at the local headquarters in Camden Town. The main apparatus consists of a large G.E.C. storage water heater of 300 gallons capacity, this heater incorporating a water-mixing valve for regulating the shower temperature. Adjustment of this mixing valve is made with a removable key which is stowed away after the required water temperature has been obtained, thus making it impossible for the predetermined figure to be exceeded, and ensuring complete safety in operation. The total loading of the heater is 27 kilowatts, and the galvanized interior tank is lagged with granulated cork. There is a photograph of the installation on this page.—(*The General Electric Company, Ltd., Magnet House, Kingsway, London, W.C.2.*)

Chemical Closets for Shelters

SANITATION in shelters and trenches is not a particularly easy problem, not so much because of the difficulty of finding a suitable design, but because deliveries are apt to happen after a rather long interval. Some time ago, however, the Home Office asked the British Standards Institution to prepare a STANDARD SPECIFICATION, and this (BS/ARP/5) is now available at the price of 3d. The principal requirements covered by the specification are safety and efficiency in use, capacity, handiness, and the essential qualities of the chemical to be used.—(*The British Standards Institution, 28 Victoria Street, London, S.W.1.*)

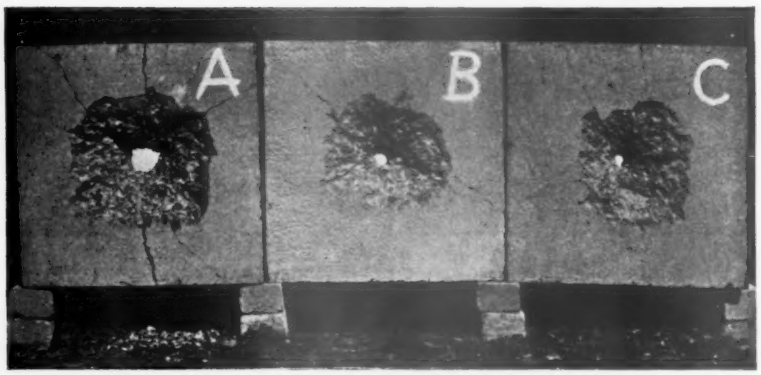


Shower installation for A.R.P. decontamination described in this page.

Blinds and Ventilation

I have just been allowed to look at a provisional patent SPECIFICATION FOR A WINDOW BLIND which will stop light from being visible outside the window while at the same time allowing adequate ventilation. The inventor is Mr. Tony Gibbons, a figure well enough known in the building industry and with an almost legendary reputation outside it. According to the patent specification the blind "comprises a series of mutually parallel opaque slats of divergent channel cross section so spaced apart that the base of each channel slat is within the trough of an adjacent channel slat." Stripped of its official Patent Office language this involves what amounts more or less to a double Venetian blind, the slats in a typical example being made in a V section instead of flat. A V section is the simplest shape, though it is suggested that for hospital purposes, where cleaning must be particularly easy, the section may be curved. The idea is perfectly simple, and depends for its success on the elementary principl. that light won't go round a corner very well Thus a series of V channels will be light-proof so long as the ridge of each V is within the mouth of the adjoining section. Since it might be possible for light to emerge by reflection, it is also necessary to coat all surfaces of the slats with a matt black paint or other non-reflecting covering, though if the slats are closely spaced and have relatively deep channels, the inner surfaces of the slats on the room side might have a white finish so that they would admit a certain glow of light during the daytime.

In application one or two problems arise, but in general there are no serious snags. Suspension can be either by cords or canvas strips to maintain the proper spacing, with the addition of lifting cords in the ordinary Venetian blind manner. The topmost slat should be fixed so that there is no danger of light spill between the slat and the window



Left to right: (a) gravel aggregate; (b) whinstone aggregate; (c) whinstone aggregate.

frame and a vertical strip of some resilient material may be necessary down each edge. It is suggested that the slats might be formed from a bituminous base hard cardboard cut into flat strips and hot pressed to the desired cross section. Such a material could be quite light, as the shape of the cross section gives considerable rigidity to the finished slat. In better quality fittings the material could be aluminium or some other light metal.

I understand that the patentee is presenting his invention to the building industry as a whole, and does not intend to demand any royalties from possible manufacturers.—(*A. B. Gibbons, Esq., The Old Mill House, Ringwood, Hants.*)

More Notes on Lighting

This BLACK-OUT business means, when you come to think about it, either plenty of light inside and no windows, or windows as usual and no light inside. All of which sounds like the more obvious cracker motto, but is none the less one of to-day's great truths, for many people have been spending untold money on blacking out vast areas of window when it might be much cheaper to make adequate arrangements about the amount of light inside. One may note also, with a certain degree of surprise, that none of our more elderly practitioners has so far written to *The Times* pointing out that Nemesis has at last overtaken our naughty modern boys who *will* provide these monstrous areas of glazing which will now be a snare and a death trap to their unfortunate owners. Here is a good opportunity for someone to make the Points from Letters section while they are waiting for the National Register to come over big with a team to design standardized barracks.

For the private house it may be assumed that there is nothing for it but proper screening, even though passages and halls could be adequately lit with pilot lamps of about 15 watts blue sprayed. The same lamps could be used in some industrial installations such as power stations or engine and boiler houses where only a limited number of objects have to be seen for the necessary work to go on. Another method of doing the same thing is to use a mercury vapour lamp with a black glass bulb. These can be used to excite fluorescence in various special paints, dyes or plastics, and to render almost any object visible if it is treated with one of these substances. Instrument dials, dangerous obstructions, exit signs in public buildings, or direction signs to dug-outs or shelters may all be rendered visible in this way, although no visible light rays are emitted by the lamp. It is also possible to employ paints and dyes which will fluoresce under the direct action of ultra violet rays from the lamps and will then continue to emit light by phosphorescence after the activating ultra violet radiation has been switched off, as might happen if the electricity supply were suddenly cut off. An alternative source of ultra violet radiation is the low wattage argon-filled lamp. The amount of radiation is very much smaller, but it is possible to produce fluorescence if the lamp is close enough.

The complementary colour system has also been suggested as a means for concealing artificial light at night-time. Windows and skylights, if covered with a suitable blue paint, will prevent the escape of amber light, but will at the same time allow a certain amount of natural light to enter during the day. At night time work can be continued with artificial amber light from tungsten filament lamps with amber bulbs, or sodium lamps in amber jackets. This system, however, has not been approved by the Home Office. For hospital work it is suggested that low wattage blue-sprayed lamps could be used in corridors and wards where curtains have not been provided.

For external lighting and street works much advice is given in the Home Office memorandum on aids to movement of traffic, in which it is pointed out that one way and other traffic signs must be kept in operation although they must be screened from above and so dim that, although they are legible under black-out conditions to drivers at a distance of 100 feet, they are inconspicuous at a distance of 250 feet. It is also essential that the colours of the signs should not be altered, and blue-sprayed lamps are therefore not suitable. It is best to use, for this purpose, 15 watt black-sprayed lamps which will give the required amount of illumination without colour distortion. All the lamps referred to in this note can be obtained from the General Electric Company, whose address is at the end of the first of these notes.

Whinstone as an Aggregate

Some months ago I referred in these notes to a series of TESTS which had been carried out ON SAMPLE CONCRETE BLOCKS MADE WITH A GRANITE AGGREGATE. The tests showed that granite had a better resistance to high explosive than the more usual gravel aggregate, and these tests have now been repeated with whinstone as an aggregate. The results, which are shown adequately in the photograph on this page, suggest that, like granite, whinstone, with its rougher texture and angular fracture, gives a better resistance to high explosive than the gravel aggregate. The slabs on which the tests were made were two feet square, and six inches thick, and a 1½-inch hole was cut 3½ inches into the face of each slab to take the half-ounce charge of Abelite explosive and the detonator. Boxes containing sand and whinstone were placed over each hole so that the maximum force of the explosion should be borne by the concrete, and the slabs were raised three inches clear of the ground. All the concrete was a six to one mix aged nine weeks, and was reinforced with ⅜-inch diameter rods bent in the form of a square, two rods in each slab having 1½ inches cover. —(*The British Granite and Whinstone Federation*, Ring Temple Bar 2173 for address.)

LETTERS

SIR,—Now there are so many young assistants and students who have finished or who were on the verge of finishing their training with nothing to do and time on their hands, would it not be a good thing to organize an atelier for the study of architectural problems, and more particularly of those which may crop up as a result of the present war conditions and post-war conditions.

There must be many who would like to make use of such an atelier if started and it could be so arranged that membership was on a monthly or even a weekly basis, more particularly for the benefit of those who are either waiting to be called up or waiting for other jobs and not quite knowing when they will mature.

I have mentioned the idea to a number of people and I am sure that there will be plenty of assistance forthcoming from seniors and instructors. Obviously very few will be able to afford to pay heavy fees, and therefore some arrangement worked out on a co-operative basis should meet the convenience of all.

I think there will be no difficulty in obtaining suitable premises for an atelier and I will be very glad to hear from anyone interested in the scheme so that if necessary a meeting could be called to set things going.

F. R. YERBURY,
158 New Bond Street, W.1.

NEWS

THE WATFORD COMPETITION

Mr. E. Maxwell Fry, B.ARCH., A.R.I.B.A., assessor of the competition for a fire station at Nescot Road, Watford, has made his award as follows :—

Design placed first (£150) : Mr. David W. Aberdeen, B.A., A.R.I.B.A., 22 Green Moor Link, Winchmore Hill, London, N.21.

Design placed second (£75) : Mr. Thomas F. Haughey, B.ARCH., A.N.Z.I.A., 3 Milford Gardens, Edgware.

Commended : Mr. Birkin Haward, A.R.I.B.A., 9 Tansa Road, Hampstead.

Forty-five designs were submitted.

CRANBROOK FELLOWSHIP

A Fellowship at Cranbrook Academy, Michigan, U.S.A., has been awarded to Mr. E. P. Elliott, who graduated with first-class honours in the Liverpool School of Architecture in June of the present year.

The Fellowship, which was open to competitive award, is of the value of £180 per annum, and is granted to enable the successful candidate to pursue a course of post-graduate study in architecture at Cranbrook Academy. The director of Cranbrook is Mr. Eliel Saarinen, the well-known Finnish architect, who several years ago left Helsingfors to settle in America.

SIR JOHN SOANE'S MUSEUM

We are informed by Mr. Arthur T. Bolton, Curator, that the above museum, 13 Lincoln's Inn Fields, W.C.2, is now open free from 10.30 a.m. to 4 p.m. on Thursdays and Fridays in October and November.

CIVIL DEFENCE

BY FELIX J. SAMUELY AND CONRAD W. HAMANN

Above are obtainable from H.M.S.O.

This article gives information on Civil Protection supplementary to that given in the issues of the JOURNAL *for June 1 and 8 last, and also deals with those publications which have appeared since June. Where these publications are merely revised editions of former publications, only the revisions are dealt with. These publications are as follows :—*

(1) The Civil Defence Act, passed by Parliament in July, contains certain additional regulations to those published in the Civil Defence Bill, which was discussed in the above-mentioned numbers of the JOURNAL. *These additions refer mainly to flats where, if the majority of the tenants require it, the landlord must erect an air-raid shelter. (2) The Provisional Code has been replaced by the Revised Code, which contains a certain number of new requirements and which clarifies a number of old ones. (3) Orders of the Minister regulating the amount of money considered reasonable for the purpose of exchequer grants. (4) Handbooks 5 and 5A have been published and deal strictly with defence. The first part of Handbook 5 and Handbook 5A deal with the subject of bomb-proof shelters, although the Government has not, in principle, agreed yet to build bomb-proof shelters. The second part of Handbook 5 covers such problems as ventilation, entrances, etc., and where the information given is supplementary to the Code, it will be discussed. (5) Handbook 11, dealing with the camouflage of buildings, gives certain indications of the way in which to deal with this problem, and, in addition, certain suggestions are made by the authors.*

The contents of the June 1 and 8 issues of the JOURNAL, *together with the revisions printed in this issue and a number of additional chapters dealing with such subjects as public shelters, the action and effect of bombs, the construction of bomb-proof shelters, etc., are now available in book form under the title " Civil Protection " (Architectural Press, price 8s. 6d.).*

INTRODUCTION

SINCE the articles on Civil Defence appeared in the ARCHITECTS' JOURNAL for June 1 and 8, 1939, a number of new Government publications have been issued, and this review is devoted to an analysis of those or the parts of those which will be of interest to architects.

The publications are :

The Civil Defence Act was passed by both Houses of Parliament and given Royal Consent on July 13, 1939. This Act follows generally the lines of the Civil Defence Bill in its Committee stage, as published in the JOURNAL, but several important amplifications are discussed below.

Handbook No. 5, *Structural Defence* (*see* page 474), was published in June and deals partly with the effects of bombs and partly with structural defence measures, amplifying the regulations set out in the *Revised Code* (*see* page 469). This handbook has recently been supplemented by Handbook 5A, " Bomb-resisting Shelters " (*see* page 478).

Handbook No. 10 deals with the training and work of first-aid parties, and is not of interest to architects.

Handbook No. 11, *Camouflage of Large Installations* (*see* page 480), was published at the end of July.

The Code for air-raid shelters for persons working in mines and commercial buildings (*see* page 469) was issued at the end of August in its revised form, together with an order of the Minister which approves the " Provisional Code " as well as the **Revised Code.** Attached to the " Revised Code " is a memorandum which draws attention to the differences between the " Provisional Code " and the " Revised Code."

Finally, there is an important Order of the Minister (*see* page 474), regulating the payment of recompense and grants and also defining the limits of grants which will be paid to owners or occupiers providing shelters under Part III of the provisions of the Civil Defence Act.

THE CIVIL DEFENCE ACT

As mentioned before, during the debates in Parliament none of the important provisions contained originally in the Civil Defence Bill were eliminated, but certain provisions have been added.

Owing to the addition of a number of sections, even such sections which as a whole remain unaltered have a different number in the Act than they had in the published Bill.

In order to allow readers of the ARCHITECTS' JOURNAL to make use of the former publications, where the Bill was reprinted in Committee stage, a list is given on page 468 showing the way the old provisions have been renumbered.

Below, those new provisions that are important for the technician are described first.

PART I, defining the authority, remains unaltered.

PART II, Public Shelters, etc., remains in general as before, with the exception of one addition contained in the new Section 9 of the Act.

This Section allows public authorities to build air-raid shelters on any highway or on land adjoining such highway. Notices are to be given 14 days before, but this requirement is superseded by recent war legislation. The local authority is to pay compensation for any damage to property caused by the construction of such shelters.

PART III, Section 12. The list of areas to which Part III refers has been enlarged and the following areas added :

ENGLAND

CHESHIRE

Urban district :
Cheadle and Gatley.

HEREFORDSHIRE

Non-county borough :
Hereford.

KENT

Parishes :
Frindsbury.
Hoo.

NORTHAMPTONSHIRE

Non-county borough :
Kettering.

Urban district :
Corby.

SOUTHAMPTON

Parish :
Millbrook.

SUFFOLK

Non-county borough :
Lowestoft.

WORCESTERSHIRE

Urban district :
Bromsgrove.

Parish :
Cofton Hackett.

YORKSHIRE, WEST RIDING

Urban districts :
Bentley and Arskley.
Cudworth.
Darton.
Knottingley.
Rayston.
Sowerby Bridge.

Parishes :
Brambton Bierlow.
Brinsworth.
Catcliffe.
Ecclesfield.
Warmsworth.

WALES

GLAMORGANSHIRE

Parish :
Coed-ffranc.

SCOTLAND

DUMBARTONSHIRE

Special Drainage District :
Vale of Leven and Renton Special Drainage District.

FIFE

Parishes :
Aberdour.
Carnock.
Dalgety.

FIFE—*continued.*

Dunfermline.
Inverkeithing.
Torryburn.

LANARKSHIRE

Parishes :
Blantyre.
Bothwell.
Cadder.
Cambuslang.
Glasgow.
Old Monksland.
Rutherglen.

The remaining sections of this Part remain substantially the same, but the method of paying the Exchequer grant for commercial buildings which are let to more than one occupier has been altered. While it was visualized originally that every occupier paying his share of the cost would be entitled to a grant, it is now arranged that the grant will be given to the owner of such a commercial building only. The occupiers have to pay their contribution to the cost in regular instalments spread over 10 years and they will receive no grant or other compensation. The owner is supposed to receive the full expenses due to the erection of the air-raid shelter paid back to him in the course of 10 years, but apart from that he receives the Exchequer grant. This serves, so to say, as interest and compensation for any loss due to his tenants leaving before the 10 years have elapsed. (Section 22 of the Act.)

As such Exchequer grant is equal to the standard rate of Income Tax for the year 1939–40, this grant is equivalent to considering an air-raid shelter required under Part III of the Act to be, not a capital outlay, but an expense necessary for the execution of business and thus exempt from taxation. As this standard rate has recently been increased to seven shillings in the pound, i.e. 35 per cent., this and not 27½ per cent. as was assumed when passing the Act is the "appropriate proportion" mentioned in Section 22 (formerly Section 21).

PART IV, Other Provisions as to Shelters, has been enlarged by the introduction of Sections 30, 31 and 32, and by an increase in the scope of Section 29 (formerly Section 28).

The new Section 30 deals with buildings or blocks of buildings commonly called "flats," and it has been stipulated that where 50 per cent. of the tenants make a request for a shelter the landlord has to provide such a shelter. "Block of Buildings" is defined as a building or block of buildings which is situated in an area specified in an order made by the Minister under Part III of this Act and wholly or mainly used for residential purposes and which is let out in separate parts. Thus a two-storey house which is let to two tenants is included in this definition, but the same two-storey house, if let to a single tenant, is not included. The landlord is entitled to recover his expenses from all his tenants together in ten yearly payments, each of which amounts to 12½ per cent. of his outlay. Thus, if he is able to collect the payments from his tenants regularly for ten years he receives a total of 25 per cent. interest on the money spent.

For the sake of defining the "majority," each tenant is counted as a unit independent of whether the size of his flat is equal or unequal to that of other tenants.

The standard of such shelters is in no way defined, and while it seems reasonable that such shelters should have a similar standard to those for factories and commercial buildings, the wording of this section leaves it to the tenants to decide the standard, and if for instance the majority of the tenants require a shelter, proof against heavy bombs, it is difficult to see how the landlord could avoid being committed to provide it.

The owner of the flat may get a loan from the local authorities in accordance with Section 29, to whom he would have to make repayment within ten years, with an interest of at least ½ per cent. more than the rate fixed by the Treasury for loans to local authorities. The local authority can, in turn, get a loan from the Public Works Loan Commissioners.

These loans, though provided for in the Act, are by no means obligatory, and if the local authority does for any reason not intend to give such loan to a landlord, there is no means given in the Act to enforce it.

The new Section 31 allows the local authorities to use land which is used in common by the occupiers of blocks of flats, if 50 per cent. of the tenants require it. Public shelters can thus be built under the gardens of any group of buildings, even if the land is private and the owner of the land does not agree.

IT MIGHT BE POINTED OUT HERE THAT SECTIONS 30 AND 31 OFFER A WIDE SCOPE OF ACTIVITY FOR ARCHITECTS AND ENGINEERS, AND IT IS IN THEIR INTERESTS TO MAKE THESE PROVISIONS KNOWN TO THE GENERAL PUBLIC, WHICH HITHERTO HAS BEEN ALMOST UNAWARE OF THEM.

Section 32 enables the occupier of a dwelling-house to take any steps he requires to provide air-raid shelter without permission from his landlord on condition that his lease does not expire before December 22, 1940, i.e. three years after the commencement of the A.R.P. Act of 1937.

PARTS V, VI and VII have not been altered substantially.

At the end of PART VIII, provision is made for the Parliament of Northern Ireland to make laws similar to the provisions of this Act, which in itself does not extend to Northern Ireland, but as such laws have now been made, the Act can be assumed to be in force in that country too.

In Section 93 the Act is defined as "The Civil Defence Act, 1939" and it is permitted to cite the A.R.P. Act of 1937 together with this Act as "The Civil Defence Acts, 1937 and 1939."

As a number of the sections contained in the Bill, and reproduced in the ARCHITECTS' JOURNAL of June 1 and 8, have been incorporated in the Act under different numbers without being materially altered, the following list gives the old and new numbers of sections. This will avoid confusion.

	No. of Section in Bill	No. of Section in Act
Part I ..	1	1
Part II ..	2	2
	3	3
	4	4
	5	5
	6	6
	(subs. 1 and 2)	(subs. 1 and 2)
	7	7
	8	8
	9	10
	10	11
Part III ..	11	12*
	12	13
	13	14
	14	15
	15	16
	(subs. 1-7)	(subs. 1-8)
	16	17
	17	18
	18	19
	19	20
	20	21
	21	22†
	22	23
	23	24
	24	25
Part IV ..	25	26
	26	27
	27	28
	28	29‡
	29	33
	30	34
	31	35
Part V ..	32	36
	33	37
	34	38
	35	39
	36	40
	37	41
	38	42
Part VI ..	39	43
	40	44
	41	45
	42	46
	43	47
	44	48
	45	49
Part VII ..	46	50
	47	51
	48	52
	49	53
	50	54
	51	55
Part VIII ..	52	56
	53	57
	54	58§
	55	59
	56	60
	57	62
	58	63
	59	64
	60	65
	61	67
	62	70
	63	71
	64	72
	65	73
Part IX ..	66	74
	67	75
	68	76
	69	77
	70	78
	71	79
	72	80
	73	81
		(subs. 1 and 2)
	74	82
	75	83
	76	84
	77	85
	78	86
	79	88
	80	89
	81	90
	82	91
	83	93

For the exact wording of the Act and comments, *see* "Civil Protection," by Felix J. Samuely and Conrad W. Hamann, published by the Architectural Press at the beginning of October and reviewed in this issue.

* *See* list of additional areas, page 467.

† For altered meaning of sub-section 1, *see* this page.

‡ By provision of Section 30 (*see* this page), sub-section 11, the scope of Section 29 is enlarged to include the owners of blocks of buildings.

§ While the meaning remains the same, the text of sub-section 7 has been substantially altered, conferring on fire authorities the same powers as are conferred to local authorities by Part II of the Act.

THE REVISED CODE

Extracts from the Provisional Code reprinted from the memorandum mentioned below for the purpose of comparison are in italics marked P.C.; extracts from the Revised Code reprinted from the same source are in the adjoining column marked R.C. Authors' comments are printed below the extracts.

The order of the Lord Privy Seal, which under Section 13 of the Civil Defence Act is required to make any Code legal, put into operation from August 14, 1939, the "Provisional Code" published at the beginning of May under the title of "Air Raid Shelters for persons working in factories and commercial buildings." At the same time, however, it legalized the "Revised Code," which was published on August 23, 1939, and therefore the "Provisional Code" was, from August 23, 1939, no longer legally binding. In other words, anyone who commenced to build an air-raid shelter before August 23, 1939, is entitled to build it in accordance with the "Provisional Code" and no grant for such shelters can be refused solely for not complying with any regulations contained in the "Revised Code" only.

Any shelter, however, which was started after August 23, 1939, must comply with the "Revised Code" and no local authority or factory inspector must accept designs for shelters which do not comply with the "Revised Code."

The "Revised Code," similarly to the "Provisional Code," consists of two parts: Part I, Requirements with which the shelter must comply; Part II, Incidental matters.

The wording of the "Revised Code" is entirely different from that of the "Provisional Code," at least in Part I, and is, in fact, shorter; but there are no major alterations to the actual contents. These alterations are summarized in a leaflet published as a **Memorandum on the Revised Code.** *Air Raid Shelters for Persons Working in Factories, Mines and Commercial Buildings.* Not all alterations, however, have been referred to in this memorandum, which is reproduced below, and the authors have inserted such points which are omitted.

LATERAL PROTECTION

P.C.	R.C.
Ballast or broken stone not less than 2 ft. 6 in. thick.	2 ft. thickness of ballast or broken stone is accepted.
Ordinary concrete not provided for.	15 in. thickness of ordinary concrete is accepted.
No provision made for treatment of openings.	Openings in walls of shelters must be blocked to a height of 6 ft. above floor of the shelter and shuttered above this level. Openings may be protected by screen walls.

The "Revised Code," pages 5 and 6, states: "Provided that in the case of an air raid shelter wholly above ground where the aggregate area of door and window openings in any one wall of a shelter compartment does not exceed one-quarter the surface area of such wall and the total width of such openings does not exceed one-third the total length of such wall, it shall suffice if the protection in such openings extends to a height of 6 ft. above the floor of the air raid shelter, subject to movable protection being provided to the space above, such protection consisting of timber shutters not less than 2 in. thick or mild steel shutters not less than $\frac{3}{16}$ in. thick or other approved material, or it shall suffice if the openings are protected by a screen wall or walls giving the lateral protection required under section (2) above, situated not more than 12 ft. from the face of the wall of the shelter and extending beyond such openings for a distance sufficient to prevent the entrance of splinters. This requirement will be deemed to be complied with where the extent of such screen beyond the opening is not less than its distance from the opening." (*See* Figs. 1 and 2.)

According to the exact wording of the "Revised Code" the reference made here to openings in walls is only for shelters wholly above ground. Openings in basement walls (doors, etc.) are to be treated in accordance with the requirements for lateral protection, i.e. they are to be either completely blocked in or provided with blast and splinter-proof doors, or shielded by means of screen walls. It can be assumed that openings to light shafts may be dealt with in the same way as openings above ground if the opposite wall is not more than 6 ft. away and projects sufficiently over the opening.

The reference in the Code concerning shelters above ground seems to be mainly confined to so-called "surface shelters," which will rarely be used for commercial buildings.

It goes without saying that screen walls should not have any openings themselves and consequently it will be impossible to use as a screen wall an ordinary wall of a building which might happen to be opposite the entrance to the shelter. It might be pointed out that screen walls are much less efficient the further they are from the shelter entrance and it seems reasonable, therefore, that only in extreme cases should use be made of the permission to have a screen wall 12 ft. from the shelter opening.

OVERHEAD PROTECTION

P.C.	R.C.
Concrete in hollow type construction not provided for.	Concrete in hollow type construction conforming with requirements in the Appendix to Part I of the Revised Code is accepted.

In the Code, Appendix I, the use of hollow tile floors is restricted by three conditions:

(1) That hollow tile floors should be in accordance with the Code of Practice recommended by the Building Research Board;

(2) That the floor should be composed of either

(*a*) a system of hollow tiles or hollow concrete blocks of good standard quality and of a maximum width of 12 in., embedded between reinforced concrete ribs of width not less than 2 in. or one-quarter of the width of the tiles or blocks, whichever is the greater;

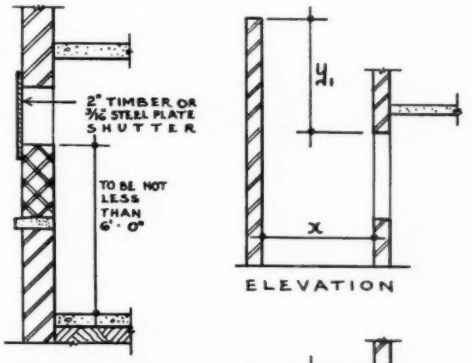
or (*b*) a system of precast reinforced concrete structural units of a maximum width of 12 in. with or without supplementary ribs of reinforced concrete deposited *in situ* or supplementary steel in the joints between the units.

(3) That in every case, above the system of tiles, blocks or precast units not less than either 3 in. reinforced concrete or $2\frac{1}{2}$ in. reinforced concrete and 1-in. of screed should be applied.

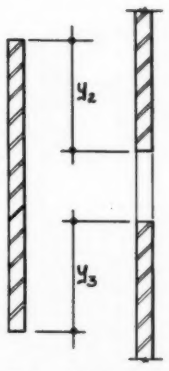
It is to be noted that only in rare cases will hollow tile floors conform to the third condition, and also that the second condition will not be complied with in very many cases. Where hollow tile floors do not comply with this regulation it seems that they cannot be considered to afford sufficient overhead protection unless there is a substantial building overhead (*see* below), and arrangements should be made to provide additional overhead protection (*see* page 969, THE ARCHITECTS' JOURNAL for June 8, 1939).

P.C.	R.C.
Arched construction not provided for.	$8\frac{1}{2}$ in. thickness of arching in sound brickwork or sound stonework is accepted.
No provision to allow an existing structure to rank as overhead protection.	A substantial building overhead consisting of a roof and two floors is accepted as overhead protection.

A "substantial building" is not defined in the Code but it may be assumed that a building constructed in such a manner that it complies with building regulations* (even if it is not called upon to do so) can be



1 *Blocking of openings in shelter walls*



2 *Screening of openings in shelter walls*

x must not be greater than 12 ft.
y_1 " " " less " x
y_2 " " " " " x
y_3 " " " " " x

* Model By-laws of Ministry of Health, 1938, or L.C.C. By-laws, 1938.

considered as substantial, provided that the floors are properly anchored to the walls.

P.C.	R.C.
No provision made against uplift of roof over isolated outdoor shelters.	Material affording overhead protection for outdoor shelters above ground must weigh 60 lb. per sq. ft. or must be fastened down to withstand an upward force of 300 lb. per sq. ft. of internal horizontal area.

While it is appreciated that a provision against uplift should be made, the requirements themselves seem open to criticism. Self-weight of 60 lb./ft.² is accepted to be sufficient but if the slab is anchored in any way, other than by its own weight, 300 lb./ft.² are required. The reasonable amount seems to lie between these figures and the authors suggest the provision of a load of 160 lb./ft.² under all circumstances. This would be existent, for instance, if a 5-in. concrete slab and 1 ft. of earth on top were provided.

P.C.	DEBRIS LOADING	R.C.
Debris load on floor additional to normal superimposed and dead load to be assumed :		Minimum static load on floor (in addition to the floor load) to be assumed to represent the effect of debris :
200 lb. per sq. ft. for 2 floors over.		200 lb. per sq. ft. for 1 or 2 storeys at a higher level than the top of the shelter.
* *Buildings which are partly steel framed and partly constructed with brick bearing walls with the permitted intermediate loads.*		No reference to such buildings.

It may be assumed that in reasonable cases a compromise will be permitted (*see* page 931, ARCHITECTS' JOURNAL, June 1, 1939).

P.C.	STABILITY	R.C.
No general requirement for stability or limitation of stresses.		All works in connection with air raid shelters must be so executed that all loading is safely sustained and transmitted to the ground without exceeding the limitations of prescribed stresses.
Debris loads are a reasonable provision for members designed in accordance with normal methods using normal working stresses.		Prescribed stresses are to be the maximum permissible working stresses shown below. *For concrete*, those in the Recommendations for a Code of Practice for the use of Reinforced concrete in building of the Reinforced Concrete Structures Committee of the Building Research Board. *For steel*, those of the British Standard Specification 449–1937. *For Pressures on load-bearing concrete and masonry (brick and stone)*, those given in Appendix to British Standard Specification No. 449—1937. *For timber*, those laid down in the London County Council Bye-laws for use of timber.
Linings to trench shelters should be designed to resist earth pressures according to normal engineering principles.		Except that where a trench shelter is distant not less than half the height from a building, the stresses prescribed above may be exceeded by 25 per cent. for trench linings in concrete or steel.

Clearly, the reference to the regulations is not limited to stresses but other requirements, as, for instance, prescribed buckling co-efficients, etc., are also to be observed. **This indicates that the structure for an air-raid shelter should be as permanent as an ordinary building and should be constructed with the same care. Constructions which ordinarily would not be accepted by the authorities should not be introduced.**

P.C.	SPACE REQUIRED IN SHELTERS	R.C.
(1) *For shelters which do not accommodate more than 12 persons—3¾ sq. ft. of floor area per person.*		(1) No change.
(2) *For trench or tunnel shelters of width not exceeding 7 ft. 6 in. with openings to air at either end of any bay or traverse and where not more than 50 persons are accommodated in any one bay or traverse—3¾ sq. ft. of floor area per person.*		(2) No change except that no limitation is placed on width of shelter.
(3) *For all other shelters wholly or partly below ground level ; a minimum for every person in the shelter of :* *6 sq. ft. of floor area, and* *50 cu. ft. capacity, and* *25 sq. ft. of surface area of walls, floor and roof.*		(3) All other shelters as follows : (*a*) Those ventilated naturally by entrances and exits, but not permanently sealed against gas, or those ventilated mechanically at a rate not less than 150 cu. ft. of air per hour per person ; a minimum for every person in the shelter of : 6 sq. ft. of floor area, and 50 cu. ft. capacity, and 25 sq. ft. of surface area of all walls backed by earth, other walls not less than 8½ in. thick, floor and ceiling or roof. Provided that these requirements may be reduced (i) where there is a substantially higher rate of ventilation (exceeding 450 cu. ft. of air per hour per person) when it will be sufficient if the shelter has a floor area of 3¾ sq. ft. for every person in the shelter, or (ii) where the construction of a shelter below ground level is abnormally massive, the latter being subject to authorization by the Minister. (*b*) Unventilated shelters intended to be permanently sealed against gas during the whole period of occupation ; a minimum for every person in the shelter of : 6 sq. ft. of floor area. and 50 cu. ft. capacity, and 75 sq. ft. of surface area of all walls backed by earth, other walls not less than 8½ in. thick, floor and ceiling or roof.
No rule given for shelters above ground.		
No requirement as regards headroom.		Every trench shelter shall have a horizontal floor and a clear headroom measured therefrom of not less than 6 ft. For computing floor area of tubular shelters, the area of seats may count as floor area where the floor does not extend under the seats.

Unfortunately, " natural ventilation " is not defined properly, and there is many a basement where natural ventilation has been assumed, while actually no sufficient ventilation is provided.

The omission of such definition is so much more regrettable, as the attention of the responsible authorities had been drawn to the fact that insufficient ventilation of shelters may have catastrophic consequences directly and indirectly.

Where the surroundings of a basement shelter are such that the leaving of openings from the shelter to its surroundings does not provide sufficient ventilation, technicians should persuade their clients to spend the little sums required for installation of ventilation even though the regulations do not expressly require it.

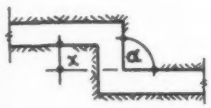
If ever at a later date shelters will be required to be gas-proof, such ventilation will nevertheless become necessary and thus the money spent now will not be lost (*see also* page 472).

P.C.	LIMITS TO NUMBER OF PERSONS AND SEPARATION OF SHELTERS	R.C.
All shelters should preferably be limited to parties of not more than 50 persons.		Every shelter should, wherever possible, be divided into sections or compartments for accommodation of not more than 50 persons. Every trench shelter intended to accommodate more than 50 persons must be divided into sections by changes in direction or by traversing.
		* Change in direction is to be at an angle of not less than 80° nor more than 100°, and where a second change in direction is considered the length of trench between these two changes should not be less than 5 ft. if the farther run of shelter is more or less a continuation of the first run (Fig. 3), and 25 ft. if the second run involves a return parallel or opposite the first run (Fig. 4).

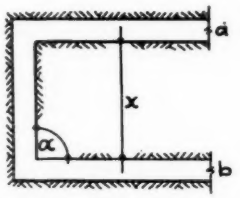
* Note omitted from memorandum ; inserted by author.

As in a number of cases it has proven impossible to have shelters with cells of less than 200 people, in order to simplify their own task and in contradiction to the regulation several local authorities have tried to persuade the owners of commercial buildings to provide cells 200 people, even where cells of 50 had been suggested.

All technicians should do their utmost to persuade their clients not to sacrifice the safety of their employees to a certain bureaucracy (*see also* page 474, where attention is drawn to the fact that local authorities cannot any more demand a reduction of standard with the threat to curtail the grant).



3: *Change in the direction of trenches.*



4: *Double bend of a trench.*

P.C.	R.C.
Maximum number in any party must be limited to 200 and where accommodation is limited, as in large basements, and parties of more than 50 persons must be accommodated, strong dividing walls should be provided not less in thickness than twice the thickness of the floor over the shelter where the walls are made of reinforced concrete, or not less than three times the thickness of the floor over where the walls are made in brickwork or masonry. No dividing wall to be less than 13½ in. thick if constructed in brickwork or masonry, nor less than 12 in. thick if constructed in reinforced concrete.	Every other shelter intended to accommodate more than 200 persons must be divided into compartments. The dividing walls to be constructed as follows: (*a*) if the maximum number of persons in a compartment does not exceed 50 13½ in. of brickwork, or 12 in. of reinforced concrete. (*b*) if the maximum number of persons in a compartment exceeds 50 24 in. of reinforced concrete, or two walls of 13½ in. brickwork, or two walls of 12 in. reinforced concrete with a space between them not used as an air raid shelter. No compartment of a shelter may be used to accommodate more than 200 persons.

It can be assumed that walls consisting of 36 in. to 45 in. of brickwork, depending on the quality, will be accepted instead of 24 in. of reinforced concrete, particularly in cases where existing basement walls are to be utilized.

Division walls are effective only if they are carried through to foundations for their whole length and are not standing on bressumers. Such foundations should be at least 3 ft. deep and 5 ft. wide.

The definition for the alternative arrangement recommended for division walls, namely to have two 13½ in. brickwalls with a space between not used as an air-raid shelter, is not sufficiently clear, as the width, of this air space is not given. The authors suggest, however, that the space between the two shells of the walls should not be less than 12 ft.

On the other hand, it might be reasonable to use this space as shelter if the number of occupants of all compartments is reduced (*see* page 938, ARCHITECTS' JOURNAL, June 1, 1939).

If for some reason shelters are arranged in two storeys, for instance basement or ground floor, the space in both storeys, comprising the same space in plan, is to be considered as one compartment. By no means should there be permitted 200 people in the ground floor *and* 200 people in the basement underneath. If such arrangement is required, the space which is provided for 100 people in the ground floor and 100 people in the basement is to be separated by proper division walls from the remainder.

P.C.	R.C.
No provision for openings in dividing walls.	Temporary openings may be left in dividing walls (not more than 6 ft. wide) for peace-time convenience subject to materials to fill such openings being kept available on the site.

Openings in division walls are sometimes required for inter-connection and emergency exits. In such cases it can be assumed that screen walls, equal in thickness to the division wall, will be required. Alternatively, double blast-proof doors will presumably be accepted.

The distance between shelters should not be less than 25 ft. in any direction and 40 to 50 ft. spacing is preferable where space permits.	No mandatory requirements are laid down, but it is recommended that: Wherever possible, shelters should be spaced at least 25 ft. apart, measured in the clear. With trench shelters situated outside buildings the rule should only be departed from in exceptional circumstances where space is very restricted. With shelters situated within buildings a clear space of 25 ft. between shelters should be maintained wherever possible, but it is realized that there will be many cases where it will not be practicable.

The explanation given here is not in accordance with the wording of the Code. The remark regarding the distance of 25 ft. refers only to trench shelters. For trench shelters the distance of 25 ft. is definitely given as a minimum, both directly on page 15, and indirectly on page 8, by the reference to the fact that a returning parallel shelter should not be less than 25 ft. from any other shelter.

ACCESS TO SHELTERS

P.C.	R.C.
Every shelter should be so located and boldly marked that access to it is easy, and that both in daylight and after dark all persons can reach their allotted places with a minimum of delay, and in any case within a period of not more than 5 minutes from alarm being given. *A convenient working rule for entrances to shelters is to allow 1 ft. width of opening for every 50 persons occupying the shelter with a minimum of 2 ft. 6 in.*	Every air raid shelter must be boldly marked and so situated and accessible by day and by night that the persons for whose protection it is intended may pass from the place where they work into their shelter within 7 minutes. Every air raid shelter and every compartment of an air raid shelter must be provided with an entrance which (except in the case of a shelter for not more than 12 persons) must have a width of not less than 2 ft. 6 in.

In the second part of the Code (Incidental Measures) on page 18 a rule is given superseding the arrangement allowing 50 persons per ft. width given in the Provisional Code. This new rule allows only 40 persons for each 22 in. width, but considers it reasonable to double this number in cases where people are disciplined. This new arrangement is in accordance with Handbook No. 5 (*see* page 475), and seems to be much more reasonable than the original suggestions, although 40 persons per minute seem very few. The authors suggest, however, that the 22 in. be replaced by 24 in. and another 6 in. allowed for the first lane of people, so that the width of openings would be 2 ft. 6 in., 4 ft. 6 in. and 6 ft. 6 in., allowing 80, 160 or 240 people to pass.

It should never be forgotten, although it is not mentioned in the Revised Code, that if people are to reach their shelter within seven minutes less time will be available for them to pass any one particular point, and this is to be considered in every instance in order to find the size of the entrance.

EMERGENCY EXITS

P.C.	R.C.
In order to provide an alternative means of exit in case the normal entrance should be blocked, each shelter must have two entrances situated as far as possible from each other. Where a shelter is situated inside a building, one of the entrances should, wherever possible, communicate with the outside air.	Every air raid shelter intended to accommodate more than 12 persons must have at least two exits as remote as may be practicable from each other, one of which may be the normal entrance if suitable. One at least of such exits must, wherever practicable, give access to the open air and where possible be so situated as to be free from the danger of falling debris. Where the emergency exit gives access to another air raid shelter or to another compartment of an air raid shelter, the opening must not exceed 3 ft. 6 in. in height nor 2 ft. 9 in. in width.

The size of emergency exits seems to be governed by the size of stretchers, and their limitation is explained by the fact that any blast effects should be as small as possible. If screen walls for ordinary openings are provided, there is sometimes difficulty in allowing for the transport of stretchers. It is suggested, therefore, that an opening of 2 ft. 9 in. by 3 ft. 6 in. should be provided in the screen wall, closed by two steel plates ¾ in. thick, which, however, may be removed at any time to allow stretchers to pass. For this purpose the plates should be fastened in position by means of four bolts with wing nuts on either side.

The opening of emergency exits should be arranged so that they are as far out from the building line as possible in order to reduce the risk of their being blocked. A good working rule is that the opening should be set back from the building line by a distance equal to half the height of	Where the entrances to or exits from an air raid shelter are in the wall of a building or are situated at a distance from any building or structure not exceeding one-half the height of such building or structure, all reasonable measures must be taken to afford one of such entrances or

the building. It is realized that this rule cannot be followed in many cases, and the important consideration then is that there should be as many alternative emergency exits as possible so disposed as to diminish the likelihood of all being blocked. *In large basement shelters there should be at least one emergency exit, and preferably more than one, additional to the normal entrances for every party of 200 persons.*	exits proper protection from falling debris.
All doors to entrances and exits should be made to open inwards.	No recommendation or rule is made as to the direction in which doors should open.
Where any opening into a shelter is above ground level it shall be protected by a screen wall or earth traverse affording not less than the standard lateral protection.	If an entrance of an air raid shelter be from or to the open air, and be above the ground level, such entrance or exit must be protected by a door or screen affording a degree of lateral protection not inferior to that specified in Paragraph 2 of this Code and of such extent as to prevent the entrance of splinters.

SANITARY ACCOMMODATION

P.C.	R.C.
Sanitary accommodation should be provided close to, and if possible within, the shelter. One closet seat should be provided for 25 persons with subsidiary buckets and urinal facilities. The closet partitions should be carried right up to the ceiling of the shelter.	The requirements as to sanitary accommodation are mandatory, but may be deemed to be complied with where adequate sanitary facilities are afforded (by an existing building or otherwise) in close proximity to the shelter and within ready and easy access.

Where lavatories are not within the shelters it is recommended that they be strutted in the same manner as the shelter, and also that the connection between the lavatories and shelter should be strutted in such a way that safe passage is afforded even if the building collapses.

LIGHTING

P.C.	R.C.
In order to avoid panic and confusion in an emergency due to failure of the ordinary lighting system some form of emergency lighting is desirable in shelters. Electric torches or electric battery hand-lamps will be suitable for this purpose. For large schemes it is preferable to instal a permanent alternative lighting system and the generators or storage batteries should be given as much protection as possible, but they should be isolated from shelters occupied by personnel and should have separate ventilation.	Every air raid shelter must be adequately lighted, and a system of independent lighting must be installed sufficient to afford such light as may be necessary in the event of failure of the normal lighting service. Where generators or large storage batteries are employed for such purpose, they must be isolated and have separate ventilation. Where electric torches or hand-lamps are employed for such purpose, a sufficient supply must be permanently kept in the shelters.

GAS-PROOFING

P.C.	R.C.
**The original Code did not make it quite clear to what extent provisions for gas-proofing should be provided.*	Paragraph 5, page 7, states: "Every air raid shelter providing accommodation for more than twelve persons must be so constructed as to permit of its being rendered gas-proof without structural alteration should the need arise."

The most important part seems to be the provision of space for decontamination rooms, sufficiently protected against blast splinters and any debris load due to the collapse of the building, but where shelters are not large enough to remain unventilated (*see* page 470) room must also be provided for ventilating equipment.

Where shelters are naturally ventilated, provision must be made for gas-proof doors to be installed later. For size of decontamination rooms and other information, *see* page 980, ARCHITECTS' JOURNAL, June 8, 1939.

POSITION OF SHELTERS

Shelters should be in basements or ground floors and only in special cases should other floors be used.	No requirements in the Revised Code.

As a rule, shelters in the lowest floor are preferable, but in special cases shelters in upper floors, particularly in tall framed buildings, can be considered. However, there will be in every case a difficulty to strut the shelters as the strutting has to be carried through all storeys to the foundations.

* Note omitted from memorandum; inserted by author.

DIVERSION OF SERVICES PASSING THROUGH SHELTERS

There will be cases where damage to certain of the service pipes in buildings might constitute a danger to persons in a shelter. Steam, gas, compressed air, refrigerants and chemicals generally would be a source of danger under any conditions. If the only possible shelter is in the vicinity of such services, steps should be taken to divert them. In rare cases water mains and sewers of large size may be hazardous and will require special attention.	Pipes, tanks, or containers which might prove a source of danger (such as pipes or containers conveying or holding steam, gas, compressed air, refrigerants or noxious chemicals) must not be permitted in any air raid shelter, and water pipes connected direct to the mains or to large supply tanks and gas pipes must be provided with such valves as may be necessary to permit of their being isolated where they pass through any shelter. Where water mains are of such size or in such proximity to an air raid shelter as to be hazardous such provision must be made as may be necessary to exclude their contents from the shelter in the event of damage.

For provision of thresholds, *see* ARCHITECTS' JOURNAL, p. 977 (Fig. 175), June 8, 1939.

5. Part II of the Revised Code gives advice as to incidental matters and as to methods to be followed in providing shelters. In general the subject-matter, allowing for changes necessitated by the inclusion of prescribed requirements in Part I, follows the lines of the Provisional Code. Certain of the diagrams have been modified, however, the better to illustrate shelter possibilities, and with the same object in view the relevant explanatory paragraphs have been expanded.

Of the four examples given in the Code, the first two, Mill building and Warehouse building, are the same as in the Provisional Code. The 3rd and 4th, however, have been materially altered and improved in that they now coincide with the requirements, whereas in the Provisional Code they did not. The two examples, together with their texts, are therefore reproduced.

PROVISION OF SHELTERS IN A BUILDING WITH BASEMENT AND AREA, SUCH AS AN OFFICE BLOCK

A building of this kind is shown diagrammatically in Figure 5. These buildings will usually consist of load-bearing masonry or brickwork with heavy timber floors, or in later examples with filler joist and concrete slab floors.

The basement would usually be chosen for the provision of shelter, but the lateral protection may fall somewhat below the required standard. Where the basement window heads come above the level of the area wall, as is often the case, it will be necessary to screen these windows, and this can often be done by raising the area wall in 13½-in. brickwork. With this arrangement the basement windows should be covered with heavy shutters to minimize effects of blast. An alternative, where the loss of light would not be a serious objection, would be to block up the basement window openings. The floor over the shelter will require strengthening against debris loads.

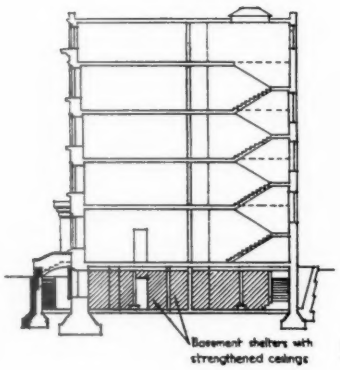
This basement is already considerably subdivided by substantial walls. Assuming that the whole area is required for shelter accommodation, the most economical allocation of the space available will be to keep to the existing subdivisions, treating each compartment as a shelter for a group not exceeding 50 persons in number.

Some of the existing walls will need to be strengthened up to the thickness of 13½ in. required in paragraph 7 of Part I, as shown in Figure 5a.

Access for the occupants of the building will normally be by way of the central staircase at the rear of the building, and emergency exits should be provided in war-time to the area in front of the building and to basements of adjoining buildings.

PROVISION OF SHELTERS IN A SHOP, ON CORNER SITE, WITH BASEMENT EXTENDING UNDER THE PAVEMENT AND WITH PAVEMENT LIGHTS

The building is shown diagrammatically in Figure 6. The external walls and central tower would often be in load-bearing masonry, the floors



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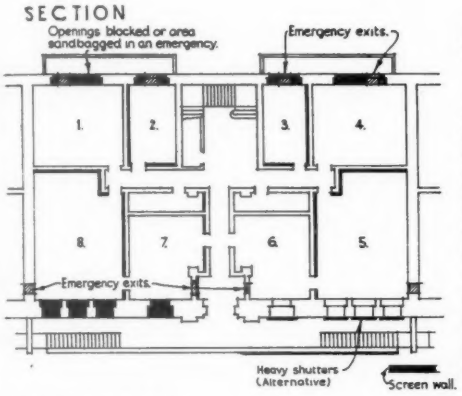


5a

5 & 5a. Suggestions for the provision of shelters in a building with basement having open area fronting on to street. (Heavy masonry construction with timber floors.) Diagrams are reproduced from the Code.

consisting of reinforced concrete or filler joist construction with cased steel beams.

The basement would normally be chosen for the shelter area, but it is somewhat vulnerable on the sides fronting on the streets owing to the pavement lights and large openings below first floor level.

As examples of the application of the rules for limits of accommodation set out in paragraph 7 of Part I, four arrangements of shelters in this basement are considered.

CASE I

There may be only a limited number of employees to be accommodated, in which case a part only of the basement need be set apart for shelter accommodation. Referring to Figure 7 it will be seen that there is a range of small rooms, in the area *EGDA* at the back of the basement which, with some strengthening of existing walls, are well suited for the provision of 50-person compartments.

The dividing walls between these compartments and the wall *AH* would require strengthening up to 13½ in. of brickwork or masonry and the area under the pavement lights might be blocked off by the 13½ in. wall on the side *GH*.

The normal entrance to the shelter compartments would be by way of the staircase from ground floor level and the entrance from the basement in the front wall of the shelter group. The front wall of shelter No. 3 might be strengthened up to 13½ in. in thickness to provide protection against splinters coming through the entrance to the shelter group, thus obviating the need of a screen to this entrance.

Emergency exits might be formed at *E* into the adjoining basement, and at *G* into the area under the pavement, with an access ladder, manhole in the pavement and a hood to cover the manhole in war-time.

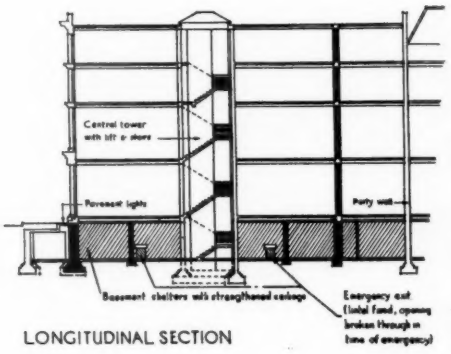
CASE II

Assuming that the part of the basement delimited by the area *ABCD* is occupied as stock-room accommodation, this could also be sub-divided as shown into 50-person compartments to an extent sufficient to provide for any personnel for whom there is insufficient accommodation in the small rooms *EGHA*. This need not seriously interfere with the use of the space in time of peace.

The dividing walls between shelters 6, 7, 8, 9 and 10 will need to be in 13½-in. brickwork or 12 inches of reinforced concrete. The front walls might be in 9-in. brickwork with a 13½-in. corridor wall against the open basement to cover the entrances against penetration of splinters.

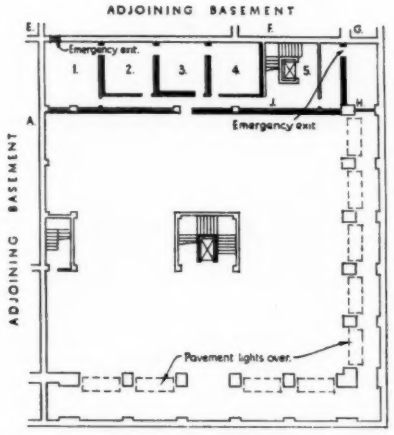
The area under the pavement lights on the side *CD* might be blocked off by 13½-in. walls as shown in Figure 8. There is an existing 9-in. wall to the staircase in shelter No. 8 and this is sufficient to arrest debris falling down the stair well.

An emergency exit might be formed to the area under the pavement lights at *CD* with an access ladder and manhole in the pavement, the latter being covered in war-time with a hood.



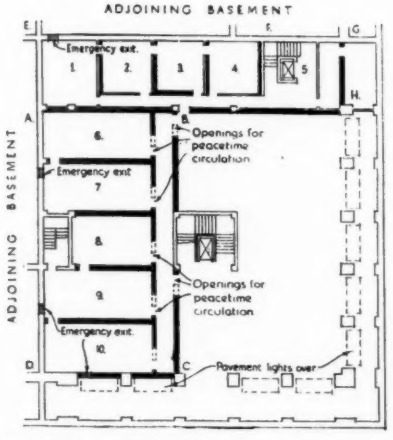
6

Suggestions for the provision of shelter in a large shop with basement. (Floors and basement not subdivided. Central tower with stairs and lift, fronting on to two streets.) Diagram reproduced from the Code.



7

Plan to Fig. 6 (large shop with basement).



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Plan to Fig. 6 (large shop with basement).

Assuming that shelters Nos. 6, 7, 8 and 9 might be used in time of peace as stock-rooms or stores, somewhat larger access doors may be required for the handling of goods than would be desirable as shelter entrances. These doors would be made larger as shown in Figure 6, but the materials to reduce the size of openings in war-time should be kept available on the premises.

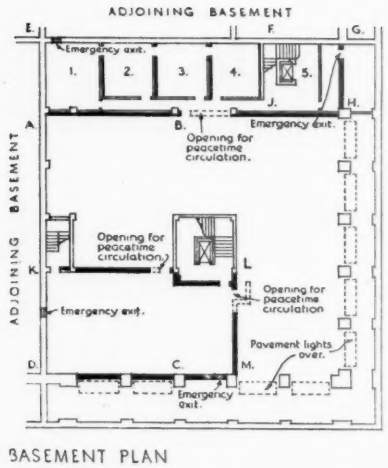
CASE III

The small rooms *EGHA* are insufficient to accommodate all persons for whom shelter is required, but for peace-time use it is necessary to preserve the maximum of clear space in the basement.

The rooms in the area *EGHA* are used as shelters as in Case I, and an additional shelter is made in the area *DKLM* for approximately 200 persons.

Walls of 13½-in. brickwork or 12 in. of reinforced concrete are provided at *KL* and *LM*. The area under the pavement lights on the side *DM* is blocked off with 13½ inches of brickwork (Figure 9).

Large openings are left for circulation in time of peace. One of these should be closed in war-time and the other should be reduced in size, and the materials for this should be available on the site. A screen wall

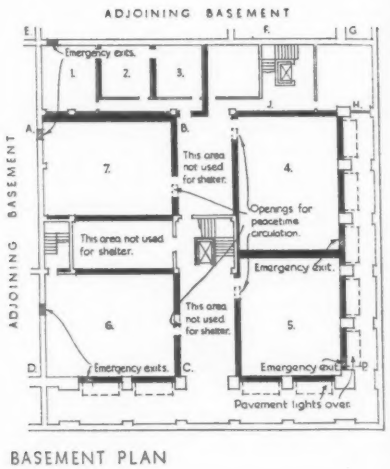


9

BASEMENT PLAN

Plans to figure 6 (large shop with basement)

10



BASEMENT PLAN

would be required in war-time to protect the entrance at *L*. Emergency exits should be formed in the adjoining basement and under the pavement light at *M*, with an access ladder, manhole and hood over in war-time.

CASE IV

It is required to provide shelter for the maximum possible number of persons and to use the space available to the best advantage.

The area *AHPD* is divided into four large compartments, Nos. 4, 5, 6 and 7, each for approximately 200 persons. The small rooms in the area *EFJA* are retained as set out in Case I, but compartments Nos. 4 and 5 of the original layout are eliminated. They might be used, however, if a strong dividing wall, 2 ft. thick, were to be provided along *BH*. The walls dividing compartments 4 and 5 and 1, 2, 3 and 7 must be 2 ft. thick in reinforced concrete as required in paragraph 7 of Part I. The space between shelters 6 and 7, if not taken as shelter accommodation, obviates the necessity for a very thick wall. (Fig. 10.)

Access to the larger shelters is by a central corridor which would be useful in time of peace but which should not be used for shelter. Since the corridor provides an unoccupied space separating the shelters, the walls need only be of 13½-in. brickwork or 12 in. of reinforced concrete. Emergency exits are arranged on the same general plan as those previously shown in Cases I, II and III. By staggering the entrances from the corridor the need for screening is obviated.

SPECIAL ORDER (NO. 906)

This order is of importance, particularly in that it limits and defines the costs of shelters.

Unless special reasons obtain, grants will be given for the appropriate proportion of sums not exceeding the following :

£3 10s. per head in trench shelters.

£7 per head in basement shelters.

This limitation is rather reasonable as very rarely will it be found necessary to exceed such sums.

As long as it can be proven that

1. The shelter is required under Part III of the Act,
2. The shelter complies with the requirements of the Code for Air-raid Shelters,
3. A sum has been spent within the above-mentioned limits,

such sum is eligible for a grant, and no local authority is entitled to refuse a scheme on the grounds that in their opinion it is too generous.

Before this order came out a number of local authorities, misunderstanding their duties, tried to press down costs of shelters as much as possible, to save moneys of the Exchequer grant, without much regard to the safety of the occupants of shelters.

The above-mentioned sums allow, as a rule, proper application of the Code, and can be kept to, even if the following considerations are observed.

1. Compartments should be kept to 50 people, unless there are serious reasons which make bigger compartments necessary.
2. Several emergency exits should be provided, and protected in the same way as shelters to such point where they lead into the open.
3. Where shelters are not in effect "naturally ventilated," artificial ventilation should be installed.
4. All new walls, piers, struts should have proper foundations unless it is proven that the ground under an existing floor slab can take the pressures exerted.

HANDBOOK NO. 5, STRUCTURAL DEFENCE

This was published in June, and consists of the following chapters :—

Chapter 1.—Aerial attack.
Chapter 2.—High explosives.
Chapter 3.—Structural defence.
Chapter 4.—Shelter requirements.
Chapter 5.—New buildings.
Chapter 6.—Existing buildings.

It is clearly divided into two parts :—

Part I, Chapters 1, 2 and 3, gives information about the effects of attacks by bombs, and structural precautions which can be taken against direct and indirect effects.

Part II, Chapters 4, 5 and 6, gives practical information for the shelters visualized by the Civil Defence Act.

At present, Part I is of academic rather than practical interest, as the Government's policy does not visualize steps being taken to prevent damage by direct hits. It can be assumed, however, that the publication of such a handbook is an indication that when the short-term policy is complete, i.e. the policy of providing sufficient blast and splinter proof shelters for the population, a certain number of bombproof shelters will also be built. It has been indicated in the daily papers that such bombproof shelters are already under consideration for key industries, but such announcements must be treated with care, at least for the time being.

While the information given in the first part of the handbook is doubtless the most comprehensive of all that published by European Governments, it is still not sufficient for the design of shelters proof against any particular bomb.

It will be of less interest to architects than to engineers, particularly as there are still quite a number of contradictions, and a comprehensive knowledge of the subject is necessary to decide which part of the informa-

tion should be given preference. Elsewhere an attempt has been made to re-arrange this information in a methodical manner and sift it in order to eliminate the contradictions.*

* *See* "Civil Protection," by F. J. Samuely and C. W. Hamann.

Part II will be of interest to architects. It must be realized, however, that some of the information coincides with that given in the Code, while other information is superseded. In the following pages, therefore, only additional information is reproduced in the left-hand column.

TEXT OF HANDBOOK 5: PART II

Section 1. Not reproduced.

Section 2. *Entry to Shelters.*

Whatever type of shelter be adopted, it should be so located and boldly marked that access to it is easy, and that both in daylight and after dark all persons can reach their allotted places with a minimum of delay. The degree of protection afforded by a shelter depends on its accessibility as well as on its strength.

The question of the number of entrances to a shelter and their width in relation to the capacity of the shelter requires careful consideration and is one on which experience is limited. To some extent data and rules relating to exits and entrances at theatres and railway stations are relevant, but complicating factors have to be taken into account such as darkness, the hindrance offered by passing through air-locks, if these are in operation, the slowing of progress due to old and infirm people, young children, infants in arms, wounded persons and stretcher cases.

Consideration should also include the width of gangway between seats, dimensions and planning of stairways and corridors, arrangement and width of doors, emergency lighting, the types of fastenings used on doors; all such bear on the speed with which a shelter could be occupied or cleared.

In the calculation of theatre entrances a unit width of 22 inches is considered to be about the minimum which will allow the largest person, or even a woman leading a child, to pass in comfort.* This width is taken between the walls at any point or between the leaves of the doors when open, whichever is less.

No entrance to a public shelter should be less than two or more than eleven units in width. Wide entrances should be divided by barriers into lanes.

Entrances 40 to 55 inches wide count as 2 units.
Entrances 56 to 75 inches wide count as 3 units.
Entrances 76 to 100 inches wide count as 4 units.
Entrances 101 to 125 inches wide count as 5 units.

It has been calculated, in connection with theatres, that about 40 persons per minute can pass an exit or move down a stairway per unit of exit width.

TABLE 14

Observations by the Metropolitan Police upon the movements of crowds leaving football grounds. Crowds composed largely of young to middle-aged men.

Width of opening	Rate per minute	Rate per foot per minute	Remarks
24 ft. 4 in. (1st test)	605	25	Passage divided by barriers into lanes of 4 ft. 10 in., 7 ft. 4½ in., 7 ft. 4½ in., 4 ft. 9 in.
24 ft. 4 in. (2nd test)	665	28	
24 ft. 4 in. (3rd test)	656	27	
6 ft. 0 in. (1st test)	210	35	Downhill ramp.
6 ft. 0 in. (2nd test)	230	38	
6 ft. 0 in. (1st test)	165	27	Level.
6 ft. 0 in. (2nd test)	180	30	

TABLE 15

London general public passing at entrances or exits consisting of stairs of the normal pattern, and subways either level or sloped 1 in 6, in one minute, all moving in one direction, in daylight or artificial light.

Order of going	Width of opening			Remarks
	2 ft. 6 in.	4 ft. 0 in.	6 ft. 0 in.	
Unhurried	104	119	150	London P.T.B. Observation

TABLE 16

Table 16 has been prepared as a provisional guide to the rate at which persons could enter shelters when air-locks are not in operation. In it, attempt has been made to make allowance for the probable composition of crowds, including persons of both sexes and all ages, who might be expected to be making their way into a public shelter. When the crowd was a

* Manual of Safety Requirements in Theatres—Stationery Office.

REMARKS

IV.—*Shelter Requirements*

Section 1. *Unit size and floor space.*

The information is in agreement with that in the Code (pages 46-47*).

Section 2. *Entry to shelters.* It has been pointed out elsewhere that the Code requirements on this matter are rather vague. This Section therefore has been reproduced in full. A study of Tables 14, 15 and 16 will show that the sizes finally recommended in Table 16 are for public shelters only. In private shelters for factories and commercial buildings where the occupants will be familiar with the premises, trained in moving to the shelter, and under certain discipline, much higher values should be taken, and the handbook itself suggests that the rates may be doubled.

Assuming that a person requires 2 ft. to 2 ft. 6 in. of width, door openings should be 2 ft. 6 in., 4 ft. 6 in. or 6 ft. 6 in. wide, and corridors 3 ft., 5 ft. or 7 ft., when reasonably speedy entrance is needed. If people walk at a speed of 110 yds. per minute, which is a brisk pace, and if each person requires always 1 yd. of length in which to walk without pressing, 110 people per minute may enter a shelter in one line. The number generally assumed is 100 people per minute, and a door of 2 ft. 6 in. or a corridor of 3 ft. will allow that number of people per minute to pass.

A door of 4 ft. 6 in. or a corridor of 5 ft. will allow 200 people per minute to pass.

A door of 6 ft. 6 in. or a corridor of 7 ft. will allow 300 people per minute to pass.

Obvious as it may sound, the fact is frequently overlooked that no corridor or gangway, no matter how wide it may be in places, lets more people pass than the capacity of its narrowest portion, even if that narrow portion is purely local.

The time available for the actual occupying of a shelter is always shorter than the warning time, and varies with the locality. If, for example, trenches are 4 minutes away from the place of work which they serve, and if the total time from the alarm till the danger is 7 minutes, then only 3 minutes are left for actual occupation of the shelter, and even this is on the assumption that no delays will occur in the evacuation of the place of work. The lapse of time between an alarm and the entry of the first people to a shelter should always be tested in any particular case, and if the entrances are then not sufficient, based on the foregoing figures, to permit of the entry of all occupants in the time that is left (i.e. 7 minutes minus the recorded first entry time) then additional or enlarged entrances must be provided.

Three minutes may be assumed as an average value of the alarm first-entry period, and on this basis entrances should have the capacity per minute of one quarter of the total number of occupants.

Tables 14 and 15 seem to contradict each other in that crowds leaving football grounds (composed largely of young to middle-aged men) seem to move much slower than people passing entrances or exits of the Underground.

This may be due to the fact that people leaving a sports ground often stop talking to their friends not aware that they form an obstacle to the crowd.

The table of the L.P.T.B. is therefore of greater interest, particularly with regard to the smaller width of entrance, while the low figure of 150 people for 6 ft. 0 in. width is probably due to no more passengers being available.

* "Civil Protection."

TEXT OF HANDBOOK 5

disciplined one it is possible that the rates of flow might well be double those given.

Width of shelter entrance	Number of 22-in. units N.	Rate of entry for public shelters N × 40
		Persons per minute
4 ft. 0 in.	2	80
5 ft. 6 in.	3	120
7 ft. 0 in.	4	160

Section 3. *Division walls.* Not reproduced.

Section 4. *Ventilation.* Only tables are reproduced.

TABLE 17

Period of occupation	Unventilated gas tight shelters. Total surface area required per person	Mechanically ventilated shelters	
		Total surface area required per person if shelter is ventilated at the rate given opposite in column 4	Ventilation rate per person
1	2	3	4
		30 square feet if shelter is above ground.	450 cu. ft. per hr.
3 hours	75 square feet...	40 square feet if shelter is above ground, or 20 square feet, if the shelter is under ground.	150 cu. ft. per hr.
12 hours	100 square feet	50 square feet if shelter is above ground, or 25 square feet, if the shelter is under ground.	450 cu. ft. per hr.

For mechanically ventilated shelters at least 150 cubic feet of air per hour per person should be supplied and for periods beyond three hours' occupation the ventilation rate should not be less than 450 cubic feet per hour.

The application of Table 17 is limited to shelters of normal dimensions. If the surface area relative to cubic capacity is abnormally large, as for instance in narrow trenches or tunnels, consideration of cubic capacity and air composition may become more important than surface area and vice versa.

Tables 18, 19 and 20 have been prepared to show the number of people who can safely be accommodated in rooms of typical dimensions under different conditions.

TABLE 18

Capacity of unventilated gas-tight shelters (rectangular) whether above or below ground level

Dimensions of room in feet			Number of occupants for periods not exceeding	
Length	Width	Height	3 hours (Total surface area ÷ 75)	12 hours (Total surface area ÷ 100)
12	11	10	10	—
16	14	10	14	—
21	16	11	20	—
24	16	15	26	20
26	18	15	30	23
35	20	15	41	30
45	20	15	50	37

TABLE 19

Capacity of mechanically ventilated shelters above ground

Dimensions of room in feet			Number of occupants when ventilation rate is		
Length	Width	Height	150 c. ft. per person per hour for periods up to 3 hours	450 c. ft. per person per hour for periods up to	
			(Total surface area ÷ 40)	3 hours. (Total surface area ÷ 30)	12 hours. (Total surface area ÷ 50)
9	7	8	10	13	8
9	8	10	12	16	10
12	8	10	15	20	12
13	12	10	20	27	16
16	12	11	25	33	20
17	15	11	30	40	24
22	18	10	40	53	32
24	15	10	37	50	30
26	15	15	50	67	40

REMARKS

Section 3. *Division walls.* The information is superseded by the Code.

Section 4. *Ventilation.* This paragraph is superseded by the Code, but Tables 17-21 have been included here. It is of interest to note that whilst the requirements for unventilated shelters are the same as in the Code, those for artificially ventilated shelters are in some cases higher.

The definition of natural ventilation is inadequate, and the trials cited of which the results may be taken erroneously to apply to all basement shelters do not appear to have been made under the conditions which will normally obtain in such shelters. *See* page 470.

TEXT OF HANDBOOK 5

TABLE 20

Capacity of mechanically ventilated underground shelters

Dimensions of room in feet			Number of occupants when ventilation rate is	
Length	Width	Height	150 cu. ft. per person per hour for periods up to 3 hours	450 cu. ft. per person per hour for periods up to 12 hours
			(Total surface area ÷ 20)	(Total surface area ÷ 25)
9	9	9	24	20
12	8	10	30	24
14	11	10	40	32
16	12	11	50	40

The application of Table 17 to a shelter measuring 16 feet long, 12 feet wide and 11 feet high is illustrated by Table 21. The total surface area is 1,000 square feet.

TABLE 21

Conditions of shelter	*Period of occupation. Hours.*	*Total surface area required per person. Sq. ft.*	*No. of persons accommodated.*
Unventilated, gas-tight, above or below ground	12	100	10
Unventilated, gas-tight, above or below ground	3	75	13
Mechanically ventilated, 450 cu. ft. per hour, per person, above ground	12	59	20
Mechanically ventilated, 150 cu. ft. per hour, per person, above ground	3	40	25
Mechnically ventilated, 450 cu. ft. per hour, per person, above ground	3	30	33
Mechanically ventilated, 450 cu. ft. per hour, per person, below ground	12	25	40
Mechanically ventilated, 150 cu. ft. per hour, per person, below ground	3	20	50

It remains to consider shelter capacity when the respirator is regarded as the first line of defence against gas and the shelter is used in conditions which permit of reliance on natural ventilation, that is where air can be admitted freely and constantly through the permanent openings of access and exit, or even through windows. Trials have shown that air raid shelters situated in large basements, not adjacent to other occupied rooms, or sources of heat, such as boilers, can be regarded not as unventilated, but as positively ventilated at 150 cubic feet per person per hour.

VI.—Sections 5, 6 and 7. Not reproduced.

VI.—Section 2. *Windows.*

It is well known that blast can shatter ordinary glass window panes, and that its power in this respect is increased if the explosion which causes the blast occurs in a confined place such as a narrow street. In paragraph 2, 3 (*b*) the freakish character of blast has been mentioned, and it will be realized that it is not at present possible to state categorically distances at which glass is safe from the blast of a bomb of a given size bursting in given conditions. The power of blast to exert a "pressure-pulse" and a "suction-pulse" adds to the difficulties both of glass protection and of sealing against gas.

Reports from war areas have stated that if windows are open during air raids the glazing is more likely to escape damage by blast than if shut. It cannot be said whether this applies only to casement windows opening inwards, but it seems likely that sash windows would not benefit to the same degree even if adjusted to give the maximum opening.

In vulnerable areas the risk to glazing may justify removal of window frames and the substitution of light frames with plywood, canvas or coarse muslin as weather protection. Plywood shutters with felt attached to the rims made so as to have a friction fit in the opening have also been suggested as a protection from gas entry. The effect of positive pressure is to push the shutter undamaged into the room, permitting of its easy replacement, but pressure in the reverse direction may wreck it.

In business premises glazed partitions are often used to divide up rooms, or give borrowed light to corridors. In a vulnerable area it may be best to remove the glass or strengthen it by the methods mentioned in this chapter or by fastening thick cardboard or plywood on either side of the glass.

REMARKS

Sections 5 and 6. *Ventilating plant, and Air-locks.* The information in these sections is in the main covered by paragraph 16 of the Code.

Section 7. *Emergency Exits.* This is represented by paragraphs 6 and 20 of the Code.

V.—*New Buildings*

The amount of information given in this Chapter, on the manner in which new buildings should be designed and built so as to afford reasonable resistance, is rather limited. Certain supplementary notes have therefore been given on page 1011 of ARCHITECTS' JOURNAL, June 8, 1939.

Very full information has, however, been supplied in this section of the handbook on fire resistance and the methods and materials for protecting timber against fire.

VI.—*Existing Buildings*

Of the three sections of this Chapter in the handbook, (1) Inherent resistance; (2) Windows; and (3) Suitable Buildings for Shelters, the second is probably of most value, as the other matters have been dealt with elsewhere; and therefore the Section 2 has been reproduced.

TEXT OF HANDBOOK 5—(*continued*)

At the expense of shutting out light and air, it is possible to protect glass in windows from the positive shock of blast by constructing on the outside a sandbag wall or an earth traverse 2 feet 6 inches thick between shuttering which entirely covers the window openings and touches the face of the wall with an overlap of at least 12 inches all round. Sandbags to protect windows can be built up on timber staging. Where it is essential to retain natural ventilation the sandbag wall need not be carried to the top of the window, but the top of the sandbag wall should not be lower than 6 feet above the floor level inside the building. If a gap is left, the window is, of course, not fully protected, and in a raid the upper half should be opened to prevent glass fragments falling into the room.*

Against the blast effects of large bombs, protection cannot be given by steel or wooden shutters of practicable thickness on the outside of the window frame and the problem is to discover a means of preventing the shattering of glass without undue loss of transparency or of translucency.

In order to test devices which have been suggested as solutions to this problem, windows have been exposed to the blast of bombs weighing 500 to 1,000 lb. bursting on the surface of the ground at distances of from 50 to 100 feet or more. A technical difficulty in conducting such full-scale tests is to arrange that the windows are screened from damage by bomb splinters, while ensuring full exposure to the blast effects. It may be objected that in fact blast and splinters will always be associated, and that such screening creates unreal conditions. It is true that such association must be frequent but, especially in built-up areas, it will often be possible for bomb fragments to be stopped, and blast to continue.

The number of strikes of fragments per unit area of target decreases rapidly with distance from the explosion, whereas the area of attack of blast is continuous, so that even in the open it is quite possible for a target to escape splinters but suffer blast.

Some general conclusions which have been drawn from full-scale trials and small-scale research are :—

(*a*) Window frames whether of wood or metal are liable to fracture or distortion from blast. The same applies to leaded glazing.

(*b*) The resistance of ordinary 15-ounce to 26-ounce window glass to shattering by blast is increased by applying to the glass a film of some tough material which can be made to adhere strongly to it. Several types of such material in transparent or translucent qualities are used for wrapping purposes and sold by stationers. Though alike outwardly the various types require appropriate treatment to secure the best results. Unless the film is of an appreciably thicker grade than that generally sold for wrapping purposes, two layers should be applied.

Cellulose hydrate film is a common type. It burns quickly like paper. A " coated " waterproof grade is sold for wrapping purposes, but this is unsuitable for window protection. Uncoated cellulose hydrate film will soften slightly and begin to curl if moistened with the tongue, but the coated variety will not.

Cellulose acetate film also does not curl on being moistened. If lit it melts and drops.

Celluloid is recognisable by smell. It burns fiercely.

The adhesive, and the mode of applying the film to the glass are of less importance than the kind of film used. Uncoated cellulose hydrate film can be applied with an aqueous adhesive, such as a good clear gum, or glue to which should be added about 15 per cent. (1 part in 7) of glycerine. Gelatine, or gum arabic, dissolved in hot water with the addition of glycerine, is also suitable. Failing glycerine, treacle may be added.

Films expand when moistened and for this reason the adhesive should not be applied to the film but should be spread on the glass and the film should then be pressed to the glass, preferably with a roller. In this way wetting and application are done in one process.

Cellulose acetate and celluloid films require special non-aqueous adhesives which should be obtained from the makers of the films.

(*c*) Adhesive fabrics reduce the splintering of glass but do not eliminate it, and are somewhat easily torn.

(*d*) A vitreo-colloid material, by itself, or supported on wire netting, or other suitable foundation, has an advantage as a substitute for glass in freedom from splintering, but can be forced bodily from the frame.

(*e*) Glass reinforced internally with wire netting offers considerable resistance to blast.

(*f*) One or two layers of ¼-inch galvanised wire netting fixed about 1 inch on the inside of a window is a fairly effective means of stopping glass fragments from being projected into a room, but the netting is liable to be torn out of the supporting frame.

(*g*) ¼-inch toughened glass, solid or hollow building lenses, or glass bricks set in concrete frames are highly resistance to blast.

(*h*) Though laminated glass may be subjected to heavy cracking, splintering is practically eliminated.

(*j*) Glass coated with rubber latex can be shattered, but projection of splinters is practically eliminated. The durability of the latex is not fully ascertained, and there is loss of transparency. The latex is applied by spray or brush. These conclusions are qualitative only and more work is needed before quantitative data can be offered.

* *See also* Emergency Medical Services Memorandum No. 1—Structural and other Precautions against Air Raid Risks in Hospitals, secs. 13-17.

HANDBOOK No. 5A

(Bomb Resisting Shelters)

The latest publication from the Home Office is Handbook No. 5A, " Bomb Resisting Shelters," which can be looked upon as an addition to Handbook No. 5. At the Government's recommendation, a committee was set up by the Institution of Civil Engineers, under the chairmanship of Dr. David Anderson, LL.D., to investigate the question of bombproof shelters.

The findings of this committee were given in a lecture by Dr. Anderson on June 20, 1939, and this lecture is reproduced, in a shorter form, in this Handbook. The committee considered four standards of protection :—

(1) Standard of protection against blast and splinters, debris loads and small incendiary bombs.

(2) Standard of protection against direct hits of medium weight incendiary bombs and high explosive bombs up to 50 lbs.

(3) Standard of protection against high explosive bombs of the medium case type, up to 500 lbs.

(4) Standard of protection against heavy case bombs of the same weight.

The first standard is actually dealt with in other publications, in particular in the Code, and is not, therefore, referred to in this report.

The second standard is not considered important for the time being, and was not investigated.

The report actually deals with the two last types:

The following standards of protection are given :—

	500 lb. medium case bomb	500 lb. heavy case bomb
	Ft. Ins.	Ft. Ins.
Overhead protection	5 0	7 6
Lateral protection above ground ..	3 3	3 3
Lateral protection below ground ..	6 6	6 6
Base protection within reach of bomb ..	5 0	5 0
Base protection out of reach of bomb ..	2 6	2 6

The main differences between a shelter for a heavy case bomb and a medium case bomb are in the overhead slab, as a heavy case bomb is more dangerous only if it scores a direct hit. There is not much difference in the explosive effects of the two bombs, and this is all that is important as far as the walls are concerned, as the resistance against a glancing blow need not be great. Actually, the explosive effect of a medium case bomb is greater than that of a heavy case bomb of the same weight. Attention is drawn to the fact that there is quite a muddle in the definition of medium case bombs and heavy case bombs. For instance, bombs with 55 per cent. charge are classed as heavy case in French publications, but as light case in Handbook No. 5. In considering the effect of a bomb, the shape as well as the type of bomb must be taken into account. While a

shelter may be proof against the majority of 500-lb. bombs, it is not proof against all of them, and the authors recommend that a shelter be classed not as proof against a bomb of a certain weight but against one of a certain weight per sq. ft. The bombs considered in Handbook No. 5A seem to have a sectional pressure (weight per area) of about 450 lbs. per sq. ft.

There seems to be no doubt that bombs of 500 lb. with a sectional pressure of 900 lbs. per sq. ft. can be constructed, and the shelters recommended would scarcely resist the impact of these.

The standard of lateral protection is higher below ground as a tamped explosion underground has a much more devastating effect than the same explosion above ground; therefore, thicker walls are needed to withstand it. No methods of design of shelter roofs and wall are indicated.

Foundations within and out of reach of bombs are defined in the following way.

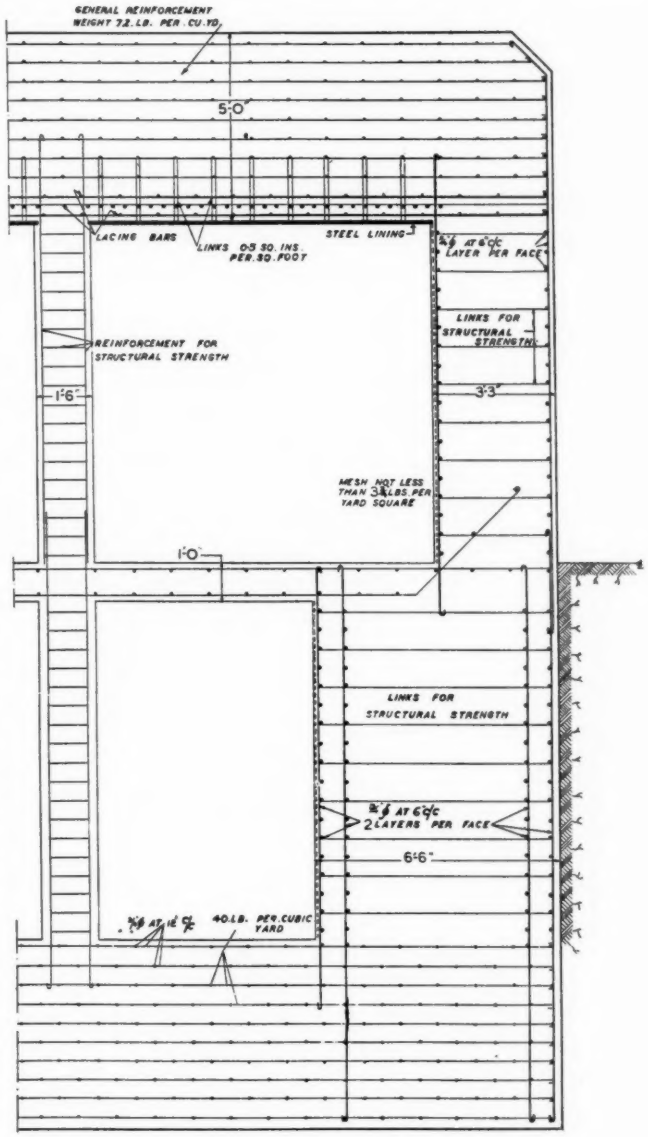
A bomb is likely to penetrate into the ground to a certain depth. It might, however, be deflected, and its course, therefore, will not be straight. It is suggested that the reach of a bomb should be considered equal to twice its penetration depth, measured along the surface of the shelter, i.e., down the wall and along the bottom. It is quite clear that this penetration depth depends on the soil, and while 12 ft. 6 ins. can be assumed for gravel and sand, the same type of bomb might penetrate 20 ft. into clay. (Figures Nos. 12a and 12b. in " Civil Protection ").

Alternative methods, by means of detonating slabs or air spaces around shelters, have not been considered, as examples show that they would be much more costly. It might be suggested here, however, that such shelters might prove advantageous in other ways, and they should not be left out of consideration altogether. The expense of detonating slabs is caused by the overhang which is required on all sides. The proportion of such overhang decreases, however, the larger the shelter, and for very large shelters a detonating slab might not be too expensive. In his lecture, Dr. Anderson referred to other cases also; for instance, two shelters in the yard of factories surrounded by substantial buildings, where a detonating slab might be of advantage, but this reference is not reproduced in the Handbook.

The limiting number of persons to be accommodated in a shelter depends on the standard of protection, and the higher the standard the greater the number. Although 200 is the highest number allowed in any blast and splinter proof shelter, 400 people would be permitted in a shelter proof against a 500-lb. medium class bomb and 1,200 in a shelter proof against a 500-lb. heavy class bomb. If these limits are accepted, it might be emphasised that it is much more economical to provide a shelter for 1,200 persons, as the difference in cost between these shelters lies in the roof only, and is, therefore, not very considerable. Where more than one shelter is to be constructed a clear distance of 25 feet must be left between them.

Access to the shelter, accommodation, etc., is the same as for ordinary blast and splinter proof shelters and need not be referred to here, although it is reproduced in the report.

The authors have reproduced figures for the sections only ; these give sufficient detail of the construction, and the authors have refrained from reproducing the plans, given in Handbook 5A, which contradict a number of regulations given in other publications, and which do not even provide for emergency exits.

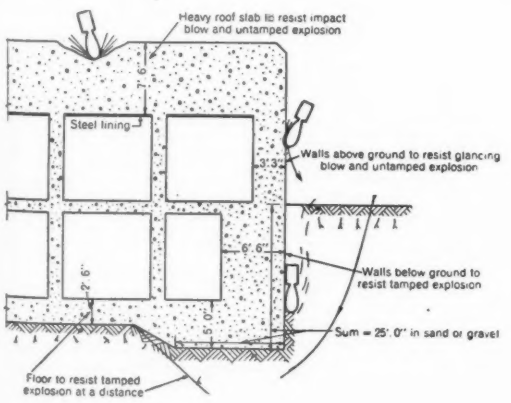


11 *Details of reinforcement.*

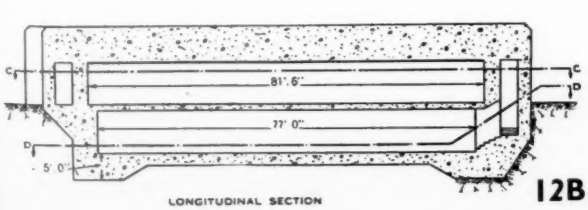
Circular plans of shelters have also been considered and a reduction in wall thickness underground from 6 ft. 6 in. to 5 ft. 6 in. has been suggested. Figure 11 gives the details of reinforcement suggested in Handbook 5A.

As pointed out before, types of shelters with detonating slabs or air spaces have not been considered on account of their expense. On the other hand, tunnel shelters, so called " deep shelters," have also not been considered, although the report agrees that cost is not one of the reasons against their application. It can be assumed that if bombproof shelters are considered at all, deep shelters of this type will play an important part.

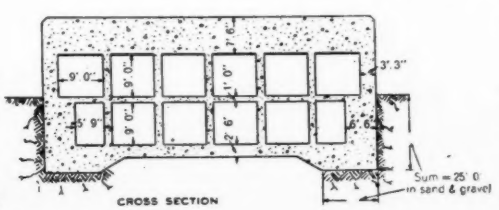
In order to provide a reasonable margin of safety they must be deep enough to allow the earth over to afford full protection, and in sandy soil this would require about 40 feet, while in clay it would have to be 55 feet. The shell of a tunnel need consist only of a tubular construction, strong enough to resist the earth pressure. Tunnel shelters have the advantage that accidents due to compression cannot occur, but on the other hand, a time loss will be sustained by the descent into them.



12A



12B



12C

Shelter against 500 lb. heavy case bomb.

Reproduced by permission from the report of a special lecture given by Dr. Anderson at the Institution of Civil Engineers.

HANDBOOK No. 11 (Camouflage)

TEXT

The general requirements are summarised on the right and are not reproduced here in full.

PART II.—PRACTICE

It is essential, when preparing a camouflage scheme, to form a picture of the neighbourhood into which the scheme is to be fitted; this can best be done by flying over it. Aerial photographs, preferably obliques taken from four quarters of the compass, are the next best means: failing these one must fall back on a plan of the neighbourhood and imagination.

Large unbroken expanses of roof are usually the distinguishing features of a factory as seen from the air. The problem is to break up these large areas into forms which resemble other innocuous forms in the locality. This may sometimes be done by Imitation alone, but more often by a combination of Imitation and Disruption.

Artificial distortion of the shape of a building by means of attaching shaped excrescences, although sound in principle, is not recommended for the following reasons; in order to be effective they must be large—for not only must they be visible from a distance of several miles but also they must bear a reasonable proportion to the building to which they are attached. The fixing of such excrescences so as to withstand weather is not a simple matter.

Installations or factories may be divided into two classes—those in urban and those in rural or semi-rural surroundings.

Urban

The general impression of the locality as seen from the air will be a chequered pattern of houses, back-gardens, streets and a few open spaces.

The colours represented will be the slate or red of roofs, the bronze green of grass and gardens, the brown of earth, the grey of roads and the black of shadows.

The prevailing tones will be dark, unless there happens to be a new building estate.

This pattern will be interrupted by the large homogeneous expanses of factory roofs broken by the characteristic shadows of their ridges; there will also be brilliant flashes from the sky-lights.

The first steps to be taken are:—

(i) Darken all light surfaces, roofs and walls, to conform to the prevailing tone of the neighbourhood.

(ii) Treat all roof lights to prevent shine—as described later under "Materials."

(iii) Darken all light concrete roads.

The above may be sufficient if there are no large expanses of roof and the factory consists of a close collection of comparatively small shops. Where there are big areas of roof:—

(iv) Paint bold patterns on a large scale in imitation of the general pattern of the neighbourhood. Fig. 2 illustrates this idea. The main purpose of the design is to destroy the succession of symmetrical shadows which reveal the normal factory roof.

Rural or semi-rural

The general picture in these cases will be:—

A broad expanse of fields, hedges and woods with scattered houses and perhaps a village.

The factory will appear as a mass of buildings with big expanses of roof, and a network of roads. It is probable that there will be a number of houses and gardens associated with the factory.

The preliminary steps to be taken are the same as for an urban situation, but the treatment of the roofs will be different. (*See* Figs. 3 and 4.)

It is essential to avoid a uniform pattern of camouflage for the whole factory. Part may be given a grass and earth pattern; on another part may be painted an imitation of houses and gardens: care should be taken to obtain a really matt surface when imitating vegetation (*see* Materials).

General

The following is a summary of practical hints:—

(i) Don't use bright colours except in special cases.

(ii) Don't use glossy paints.

(iii) Don't make your patterns small.

(iv) Don't paint roofs the same tones as walls: roofs should be darker.

(v) When matching colours remember that the colour on a small sample card will look lighter when applied to a large area.

(vi) When imitating grass on a roof it is essential to use a matt surface.

(vii) Use fast colours.

MATERIALS

Paints

Fundamentally, a paint consists of pigment, a medium to bind the pigment to the surface, and a thinner to enable the paint to be spread.

Normally the function of an outdoor paint is to act as a preservative from deterioration by weather and the respective proportions of the above constituents are therefore carefully balanced to achieve maximum durability. Mattness, however, is produced by increasing the proportion of pigment and consequently reducing the proportion of binder: the result is reduction of durability and elasticity.

In many cases camouflage paint is not required as a preservative, e.g. on asbestos cement or where preservative coats already exist: in such cases

REMARKS

The following notes, based on A.R.P. Handbook No. 11, are intended for the general information of the technician and, although they give an outline of the principles of camouflaging, they do not presume to cover all aspects. In fact, Handbook No. 11 itself points out that where camouflaging of works, etc., is required to be carried out as part of a national policy, more detailed information and advice will be given by the appropriate Government department.

The masking of factories and buildings in such a way that they cannot possibly be detected from the air is practically out of the question because of the high efficiency of aerial survey photography. However, such masking is not considered essential and, therefore, those precautions which merely cause delay in the distinguishing of any particular structure or group of structures are held to be sufficient. The aim is to make such use of disguise that an attacker cannot locate his target until it is too late to pick up the line and release his bombs. Thus, should he decide to return and make a second attempt he will be detained in the area, thereby affording the local defence much greater opportunity of bringing him down.

There are two fairly distinct methods of camouflaging, although in practice they are generally employed in conjunction.

The first is imitation. The name of this method "imitation" is self-explanatory, and all that need be added is that any particular object or structure which is to be disguised by this method should imitate its surroundings, and not something entirely remote from, or foreign to, the district. It will then be lost in the general appearance of the area.

The second method is that of "disruption," which comprises the distorting of a building in such a way that its altered appearance makes it unrecognizable.

In regard to the design of new structures there are certain general principles which might be held in mind. The first is that full advantage of the natural features of the site should be taken. This advantage is not often very great—for sites are generally so restricted that there is little choice, and even when there are alternative positions for the structure the site itself may be so small that little difference is made where the building is placed.

There are certain features in the landscape which cannot be easily disguised, as for instance rivers, lakes, railway lines, main roads, etc., and whilst a bomber might not be able to detect the exact position of an important target in time to release his bombs, he may be able to damage it by relating it to observed features from a previous study of photographs. For instance, long straight features, such as roads, canals, railways, etc., and their prolongations may lead to the destruction of an otherwise adequately camouflaged building. This can be avoided when care is taken in the siting so that the locality itself affords little help to detection.

The second is that on the site regular lines and symmetrical geometric forms are to be avoided both in plan and in elevation.

In this connection saw-tooth roofs may be cited as being particularly bad owing to the pronounced lines of light and shade which are visible from almost any angle. Sharp, well-defined shadows must not be thrown by any part of a building. Features of the one particular building may not be the only offenders in this respect. The problems of the grouping of buildings are of equal importance. Regular lay-outs and regular ways of communication should not be chosen. Nor is it enough that one building in a group should be camouflaged if the others are not also treated in the same way.

To existing structures imitative and disruptive disguise is usually best afforded by colour treatment. This involves a consideration of the three factors, colour, tone and texture, each of which is extremely important.

The term "colour" has its usual meaning, e.g. red, green, etc., whereas by "tone" is meant the intensity of colour or, in other words, the amount of light reflected by a surface of any given colour. Thus red surfaces, for example, may be of light or dark tone, although in each case the actual colour may be the same.

The "texture" is taken as being either matt or glossy, the criterion being whether light rays impinging on it are diffused in all directions or reflected geometrically, according to the normal laws. In order that a structure should be the least conspicuous, it is important that it should not produce bright reflections which not only draw attention to themselves but which, at the same time, drown the actual colour that has purposefully been applied.

In general, bright colours are to be avoided, as also are glossy paints. Roofs should be of darker tones than the walls of a building. In carrying out an imitative pattern care should be taken to obtain

TEXT

the essential requirements are colour fastness and sufficient durability to avoid frequent renewal, for a paint may retain its colour and pattern values long after it has lost its preservative qualities.

Types of paints and their characteristics

Paints may be classified broadly according to the type of binding medium employed :—

(1) Oil paints, in which the binder consists of drying oils with or without the addition of varnish, gums, or resins.

This is the commonest form of preservative paint ; they are glossy when new but tend to lose their gloss after exposure. Initial mattness can be produced by increased pigmentation, but only at the expense of durability.

(2) Oil-bound water paints, in which the binder consists of emulsified drying oils and or varnish.

Their normal use is for decorative purposes on walls. The proportion of pigment is high, with the result that these paints are matt and less durable than oil paints. They have good covering capacity and are comparatively cheap ; they are suitable for many camouflage purposes.

(3) Bituminous paints in which the binder is bitumen in solution or in emulsion.

The colours of these paints are dull but cover most of the range required in camouflage. Their respective characteristics are similar to those of oil paints and oil-bound water paints.

(4) Silicate paints, in which the binder is sodium or potassium silicate.

These are best suited for use on porous surfaces and offer good resistance to weather.

(5) Cement paints in which the binder is Portland cement.

These also are best used on porous surfaces. Unless special care is taken in the manufacture and application of these paints they are apt to lose their colour through efflorescence or " blooming."

The foregoing is intended merely as a brief indication of the general types of paint which are available ; in practice there are, of course, many varieties in each class which are adapted for different purposes.

Paints suitable for various surfaces

The materials to which camouflage will usually be applied include corrugated iron, steel, asbestos cement, slates, stucco, concrete, brick, concrete areas and roads, asphalt and glass.

Any of the paints mentioned above can be used, though in some cases only with special precautions ; it therefore becomes a question of weighing durability against cost.

Corrugated iron, steel

Oil or bituminous paints are the most durable : the other three classes tend to flake off non-absorbent surfaces.

Asbestos cement

A large proportion of modern factories are roofed with asbestos cement, and if the sheets are new their alkalinity is destructive to oil-bound paints ; it is not possible to specify any particular age when the alkalinity will cease to be destructive. It is therefore wise to apply an alkali-resisting priming coat before using an oil-bound paint. Oil-bound water paints are also affected by alkalinity, but not to such a serious extent.

Bituminous or special alkali-resisting paint can be used without special precautions.

Slates, stucco, concrete or brick walls

All the above-mentioned paints are suitable, but an alkali-resisting primer may be required if using an oil paint on concrete.

Asphalt

Only a bituminous paint should be used on a bituminous surface : any other type of paint is liable to be spoilt by the " bleeding " of an underlying bituminous coat.

Concrete areas and roads

There is no known method of colouring existing concrete roads permanently ; as the wear and tear of traffic may necessitate frequent renewal it will often happen that painting will not be carried out till necessary. In such circumstances the most suitable paint is one which is cheap, easy to apply, and proof against adverse weather occurring shortly after application. Bituminous emulsions fulfil these conditions most nearly, though all the other types of paints can be used. Durability is dependent on the binder employed.

*Glass**

It is always necessary to treat the glass of skylights in order to prevent shine, which can be seen for great distances. It is necessary to deal with north lights because often they are not oriented accurately and in any case they are struck by the rays of the sun at sunrise and sunset in summer. If there is any objection to stippling them with the same paint that is being used on the roof, they can be treated as follows :—

The windows should be covered with a clear varnish and then sprayed lightly with granite or similar dust of size which will pass 20 mesh ; natural sand is not recommended as the individual particles shine. It will be found that, with a little practical experience, adequate protection from shine can be obtained without cutting off more than 50 per cent. of light.

If it is desired to continue the roof pattern over the windows appropriately coloured particles should be used.

* In the case of skylights and windows camouflage will be additional to any methods employed for obscuration of lights.

REMARKS

a certain regularity (but not necessarily repetition or sameness) when the building is in a built-up area. On the other hand, an irregular pattern should be adopted for rural areas. For the purposes of disruption, patterns should cross the contours of a building and be continued round corners. The addition of specially shaped masses to a building is usually effective in distorting it ; but, as they must generally be large, they become very costly, and distortion by surface colour only is considered to be sufficient.

It is very important that skylights and all other glass which might reflect light upwards should be treated to prevent that reflection. With a certain loss of light, such glass can be effectively rendered " matt " by first being varnished and then being covered lightly with granite dust or other fine particles which in themselves do not shine. Natural sand is not usually suitable for this purpose. For roofs, and elsewhere, the paint should be suited to the surface on which it is to be applied. For instance, on an asphalt surface a bituminous paint is necessary. The Handbook makes certain recommendations on this matter and also describes such methods as that of the introduction of gritty particles into a glossy paint in order that it should produce a matt surface.

One point of importance has not been dealt with fully in the Handbook ; that is the question of shadows.

In many cases shadows on a building itself, or on the surrounding ground, are readily recognizable. For instance, the roof of a factory, even when it is disguised by means of disruption, may throw a distinct shadow which may reveal the exact position of the factory to an approaching pilot.

Shadows are more pronounced the higher a building is and the more regular differences of level that there are.

New buildings of such importance that they might reasonably become special targets should as far as the uses of the buildings permit have flat roofs and should preferably be of only one storey. Towers and similar ornaments are to be avoided.

Where the above-mentioned precautions cannot be taken in new buildings, or where existing buildings are to be camouflaged, the disadvantages of shadows can be overcome to a great extent :

(*a*) by breaking the line which throws the shadows ; or

(*b*) by providing an irregular surface on which the shadows fall.

Both these methods will have their appropriate uses ; but it must be realized in the second case that as a shadow is transitory, quite a large area will be involved.

TEXT—*continued*

Special matt surfaces for roofs

The following are suitable materials for producing a matt surface :—

(i) A paint in which gritty particles have been incorporated during manufacture. The surface thus produced has an excellent texture and is truly matt.

Such paint belongs to the heavily pigmented class and is, therefore, not very durable : its characteristics are governed by the binding medium employed.

If the particles are sufficiently small (pass 20 mesh) the paint can be sprayed with a special gun.

(ii) Coloured particles sprayed on to a coat of varnish or coloured emulsion. The texture is excellent and the durability good if high-quality varnish or coloured emulsion is used.

(iii) In appropriate situations local grit such as breeze, or brick-dust, can be scattered over a surface previously treated with a binder such as bitumen.

The size of the particles should not exceed $\frac{1}{8}$ in. in order to secure a good adhesion.

CIVIL PROTECTION

The Architectural Press has just published "Civil Protection: The Application of the Civil Defence Act and other Government Requirements for Air Raid Shelters, etc.," by Felix J. Samuely and Conrad W. Hamann. (Price 8s. 6d.) It is reviewed below by

Peter Jackson

NOW that a large part of the energies of the profession are being diverted into channels of civil defence the appearance of this book is to be welcomed. One's only regret is that it did not appear earlier. This is no criticism of the authors, for some of the official material on which the book is based appeared as late as August this year, so that they have lost no time in preparing their material for the press.

This book is addressed particularly to architects and engineers, but because of its scope and thoroughness it will certainly find readers among all those, from employers to local government officials, who are interested in the provision of air raid protection. It is at once a guide to A.R.P. legislation, a practical handbook on the building of "blast-proof" shelters and a textbook on the theory of designing protective structures in general.

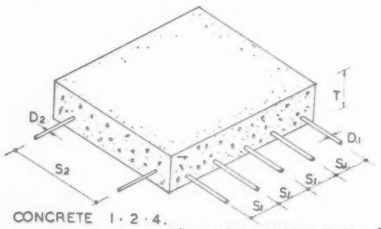
The overwhelming bulk of structural A.R.P. work must perforce be carried on within the framework of legislation, and architects and engineers who are turning to civil defence work find themselves obliged to know something of the legal requirements. Government policy on A.R.P. has been continuously evolving during the last two years, and although it would be rash to assert that finality has been reached, it can be said now that official policy—as set out in the Hailey Report and other documents—has now assumed a clearly defined shape. The value of the book is that it bases itself on the Government's present policy, and provides the architect with exactly the sort of information which he requires for designing shelters in conformity with the present official requirements.

The relevant portions of the Civil Defence Act (1939), the "Code," Memorandum No. 10 (on strutting basements), Handbook No. 5, ("Structural Defence") and other official publications are reproduced and fully annotated. In particular, the "Code" and the sections of the Act dealing with "Public Shelters" and with "Private Shelters," are reproduced almost in their entirety. The architect is enabled readily to put his finger on the required information, and the tedium of perusing masses of separate official documents is eliminated.

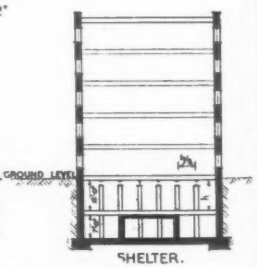
The "Code"—or to give it its full title, "Air Raid Shelters for Persons Working in Factories, Mines and Commercial Buildings, Revised Code, August, 1939"—is the most important technical publication yet issued by the A.R.P. Department. It translates the provisions of the Civil Defence Act into terms of building construction, and it is the only document which lays down legally enforcible requirements for air raid shelters. Although, as its title implies, it directly affects only commercial and industrial premises, its standards can be reasonably adopted for all shelters of the "blast-proof" category. The requirements of the "Code" and the solution of the multifarious problems which they arouse in practice occupy the largest and most immediately useful part of the book. The "Code," although it is treated in considerable detail, is not adhered to in any slavish manner; often it is the point of departure for the authors' own suggestions. For example, details are included for various types of composite walls, e.g., concrete on dovetail sheeting, twin brick walls with earth filling, etc., and rules are given for calculating the respective thicknesses of the components of such walls. Everywhere where it has been possible to do so, the authors have reduced their ideas to simple rules or formulæ which can readily be applied by the designer.

All shelters can be broadly classified either as "independent shelters" or as "shelters in buildings." With the exception of shelters in new buildings, the latter type almost invariably raise the greatest difficulties in planning and construction. Not only do they call for the maximum practical ingenuity on the part of the architect, but they are also met with more frequently. This subject, and particularly the methods of strengthening floors, has been dealt with in great detail, and it is to the authors' credit that they have been able to foresee and to suggest solutions to so many of the awkward contingencies that crop up on the job.

Typical of the sort of problems which arise is the basement which has insufficient clear height to admit the introduction of strengthening members below the ceiling. However, such a basement need not be discarded as a shelter on that account, as it is possible to strengthen the ceiling of the floor above and to carry the supports down through the two floors to the foundation (Fig. 2). It is naturally impossible to do more than indicate the scope of this part of the book, but it is sufficient to say that such points (to make a random selection) as the layout of trenches, the arrangement of baffle walls, the relative merits of different types of building, the construction of trenches under buildings, the strengthening of arches, and the arrangements of exits are each the subject of thoughtful examination.

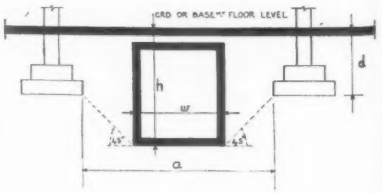


1 *Minimum reinforcement for reinforced concrete slab.*

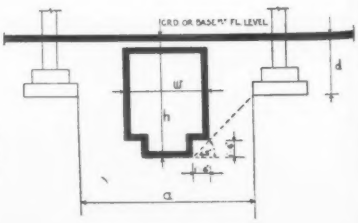


2 *Ground floor strutted to save headroom in lower basement. Area strutted is the area of the shelter increased on all sides by half the upper basement height.*

Although Government publications have been freely drawn upon, they do not always command the authors' whole-hearted agreement. In particular they level criticism at Memorandum No. 10, "Provision of Air Raid Shelters in Basements." This document, which has particular reference to dwelling houses, describes two methods of strengthening basements. One is by lining the ceiling with corrugated sheeting supported on R.S.J.s and tubular steel shores. The other is by lining the ceiling with timber sheeting carried on timber beams and struts. As the authors justly point out, neither of these measures affords the degree of



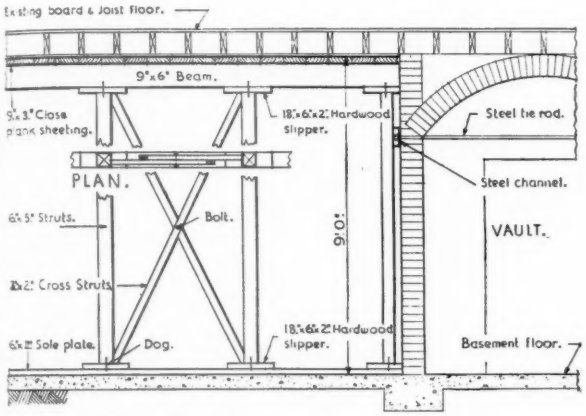
3 *Position of trench in relation to neighbouring foundations.*



4 *Trench with seating accommodation affording 3 ft. saving in "effective" depth.*

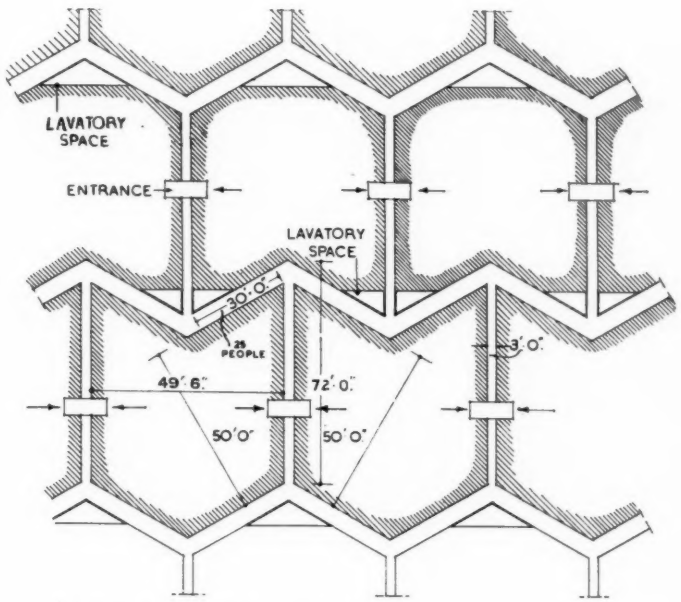
overhead protection which is required by the Code (e.g. 1 ft. 6 in. sand. 4 in. structural concrete, etc.), and furthermore, the steel shoring does not comply with general requirements of the Code with regard to stability. With regard to timber shoring, the official recommendations are criticised, *inter alia*, on the ground that plank sheeting is required to run in the same direction as the joists, and not at right angles to them (Fig. 5). Notwithstanding the objection that the official method would result not only in some planks bearing a larger proportion of the load than others but in being loaded eccentrically it would still appear that the official method has the advantage that the main strengthening beams are at right angles to the existing joists, and thereby giving them direct support.

A question, however, which has perhaps been more hotly debated than any other fails to elicit any opinion. The relative merits of "dispersion" as against "concentration" are barely considered here, and the authors remain discreetly sitting on the fence whence they inform us that "in the Government's opinion dispersion is the better." Indeed, the whole question "probable casualties" and of the relative

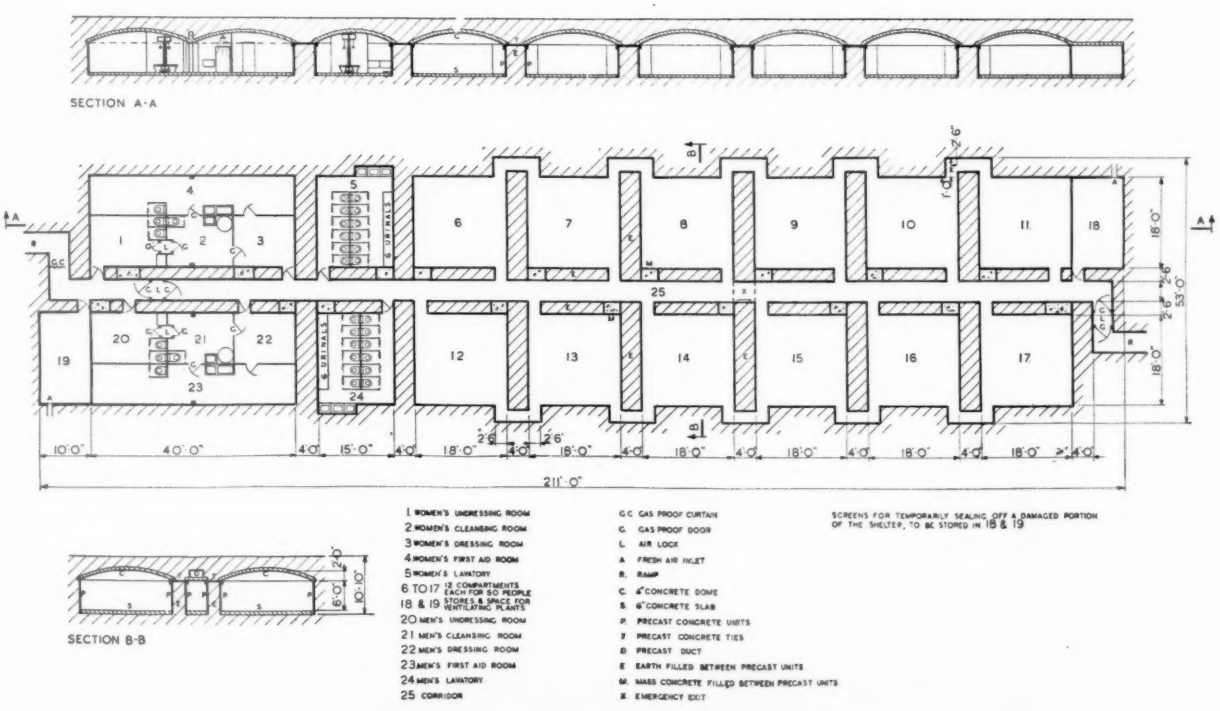


DETAIL OF PART SECTION A.-A.
—DETAILS OF TIMBER STRENGTHENING.

5 *Details of timber strengthening. Reproduced from Memorandum No. 10.*



6 *Trenches at 50 ft. spacing.*

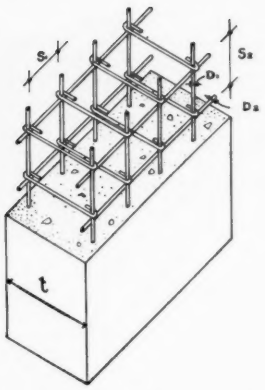


1 WOMEN'S UNDRESSING ROOM
2 WOMEN'S CLEANSING ROOM
3 WOMEN'S DRESSING ROOM
4 WOMEN'S FIRST AID ROOM
5 WOMEN'S LAVATORY
6 TO 17 12 COMPARTMENTS EACH FOR 50 PEOPLE
18 & 19 STORES & SPACE FOR VENTILATING PLANTS
20 MEN'S UNDRESSING ROOM
21 MEN'S CLEANSING ROOM
22 MEN'S DRESSING ROOM
23 MEN'S FIRST AID ROOM
24 MEN'S LAVATORY
25 CORRIDOR

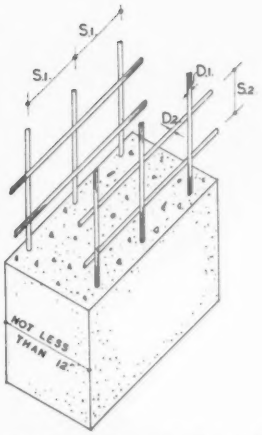
GC GAS PROOF CURTAIN
G. GAS PROOF DOOR
L. AIR LOCK
A. FRESH AIR INLET
B. RAMP
C. 4" CONCRETE DOME
S. 6" CONCRETE SLAB
P. PRECAST CONCRETE UNITS
T PRECAST CONCRETE TIES
D PRECAST DUCT
E EARTH FILLED BETWEEN PRECAST UNITS
M. MASS CONCRETE FILLED BETWEEN PRECAST UNITS
X. EMERGENCY EXIT

SCREENS FOR TEMPORARILY SEALING OFF A DAMAGED PORTION OF THE SHELTER, TO BE STORED IN 18 & 19

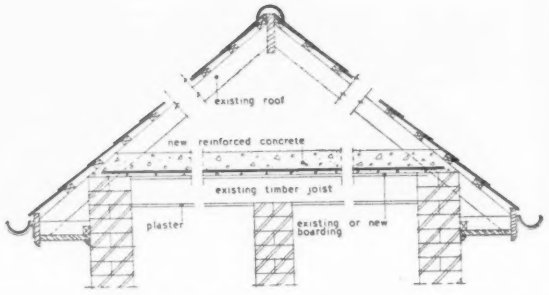
7 *Air raid shelter under public square for 600 people.*



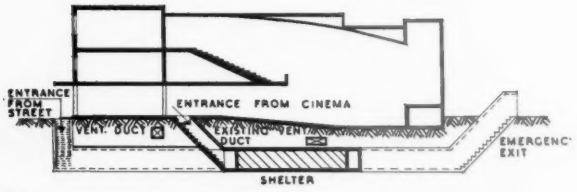
8 *Reinforced "structural concrete" wall.*



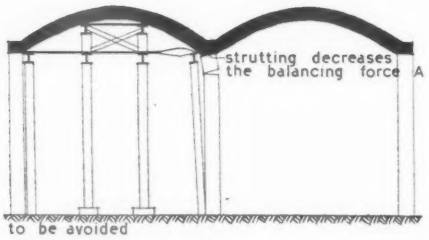
9 *Specially reinforced "structural concrete" wall.*



10 *New concrete floor under attic to prevent incendiary bombs from dropping into habitable rooms.*



11 *Shelter under cinema.*



12 *An arch should not be strutted in such a way as to weaken the abutments of an adjoining arch.*

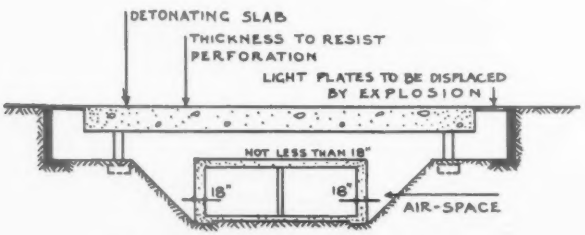
safety of different shelters has been rather avoided, and although the general principle is of course accepted that the more people a shelter accommodates the heavier should be the protection, no attempt has been made to establish the principle theoretically. These aspects of A.R.P. have been the subject of considerable discussion in the technical press and elsewhere, and it is something of a surprise that the authors do not give us the benefit of their views. Probably they were determined that their book should not become a battle ground. At any rate, they have succeeded in avoiding the stock controversies.

At present, bomb-resisting shelters are few and far between. Nevertheless, the possibility of a more widespread distribution of shelters of this category is one which we should not overlook. The theoretical aspects of the design of shelters to resist direct hits are particularly interesting. This section is largely indebted to Government Handbook No. 5, although the official data is not accepted uncritically. Indeed, the authors take the compilers of the Handbook severely to task on account of certain loose definitions.

Certain of the conclusions in the book raise extremely important points for designers. In particular may be noted the point that under a sudden impulse there is little time for bending stresses to develop in concrete slabs, and that invariably shear failure occurs. This, it is asserted, is the reason why no limitation has been placed by the "Code" on the span of roof slabs; and also why in bomb-resisting shelters the span of the roof slab does not necessarily affect its resistance to bombs.

Speculation on the nature and effects of concussion is not only confined to the man in the street, for even in technical circles the subject is shrouded in mystery. A great deal of research still requires to be done in this sphere before the design of bomb-proof shelters can proceed with certainty. In the absence of experimental data, the authors' treatment of this aspect of the subject is necessarily tentative, but if their conclusions regarding the transmission of shock waves from concrete to air are anywhere near correct, they are indeed alarming. Occupants of a shelter with a simple reinforced concrete slab roof could hardly hope to escape the effects of the pressure pulse inside the shelter consequent on a direct hit. For this reason they advocate the "sandwich" type of roof in which a detonating slab is separated from the shelter roof by an air space. Some suggestions for shelters of this type are indicated in Fig. 13.

A final word about the arrangement of the book. To ensure easy reference, each page is divided into three columns; the main subject matter occupies the centre column with the text of the relevant official document on the left and the diagrams on the right. The latter are usually adjacent to the reference in the text so that there is a minimum of turning over pages to find diagrams.



13 *Bomb-proof shelter of Type (c).*