"All right," you may say,

"but suppose it never happens? Surely it's all so horrible it never **COULD** happen".

Let's hope you're right. This country is doing all it can to prevent war. But the choice might not be ours.

There is nothing sinister about Civil Defence, any more than there is about a peace-time Navy, Army or Air Force. Civil Defence is an essential part of our ordinary national preparedness.

CIVIL DEFENCE

why we need it

Message from the Home Secretary and the Secretary of State for Scotland

For over 30 years our country, with our allies, has sought to avoid war by deterring potential aggressors. Some disagree as to the means we should use. But whatever view we take, we should surely all recognise the need – and indeed the duty – to protect our civil population if an attack were to be made upon us; and therefore to prepare accordingly.

The Government is determined that United Kingdom civil defence shall go ahead. The function of civil defence is not to encourage war, or to put an acceptable face on it. It is to adapt ourselves to the reality that we at present must live with, and to prepare ourselves so that we could alleviate the suffering which war would cause if it came.

Even the strongest supporter of unilateral disarmament can consistently give equal support to civil defence, since its purpose and effect are essentially humane.

George Younger

Why bother with civil defence?

Why bother with wearing a seat belt in a car? Because a seat belt is reckoned to lessen the chance of serious injury in a crash. The same applies to civil defence in peacetime.

War would be horrific. Everyone knows the kind of devastation and suffering it could cause. But while war is a possibility – however slight – it is right to take measures to help the victims of an attack, whether nuclear or 'conventional'.

But isn't it a waste of money in these days of nuclear weapons and the dreadful prospects of destruction?

No. It is money well spent if it shows people how they can safeguard themselves and their families.

But surely there is no real protection against a nuclear attack?

Millions of lives could be saved, by safeguards against radiation especially. But civil defence is not just protection against a nuclear attack. It is protection against *any* sort of attack. NATO experts reckon that any war involving the UK is likely at least to start with non-nuclear weapons. Indeed, while no war is likely so long as we maintain a credible deterrent, the likelihood of a nuclear war is less than that of a 'conventional' one.

But doesn't civil defence get people more war-minded, thus increasing the risk of conflict?

That is like saying people who wear seat belts are expecting to have more crashes than those who do not. Taking civil defence seriously means seeking to save lives in the catastrophe of an attack on our country.

To Sum Up

The case for civil defence stands regardless of whether a nuclear deterrent is necessary or not. Radioactive fallout is no respecter of neutrality. Even if the UK were not itself at war, we would be as powerless to prevent fallout from a nuclear explosion crossing the sea as was King Canute to stop the tide. This is why countries with a long tradition of neutrality (such as Switzerland and Sweden) are foremost in their civil defence precautions.

Civil defence is common sense

Further information:

Nuclear Weapons
ISBN 0 11 34055 X — HMSO £3.50 (net)

Protect and Survive
ISBN 0 11 3407289 — HMSO 50p (net)

Domestic Nuclear Shelters
ISBN 0 11 3407378 — HMSO 50p (net)

Domestic Nuclear Shelters – Technical Guidance
ISBN 0 11 34073786 — HMSO £5.50 (net)

Proceedings of the Symposium
held at Washington, D. C.
April 19-23, 1965 by the
Subcommittee on Protective Structures,
Advisory Committee on Civil Defense,
National Academy of Sciences—
National Research Council

Protective Structures for CIVILIAN POPULATIONS

1966

THE PROTECTION AGAINST FALLOUT RADIATION AFFORDED BY CORE SHELTERS IN A TYPICAL BRITISH HOUSE

Daniel T. Jones
Scientific Adviser, Home Office, London

Introduction

A house provides its occupants with some protection against radiation from fallout deposited outside, the radiation being attenuated by the material in walls, floors, and roof. The usual measure of the protection afforded is the ratio of the dose that would be received by a person in the open to the dose that would be received at some defined position in the house, usually 3 ft above the floor in a given room. This measure is known as the protective factor.

The protective factor varies widely between one type of house and another. In Britain there are some detached, lightly built dwellings such as bungalows having a very low order of protection, the factor ranging from about 3 to 10. Houses with two or more stories in the middle of a terrace have massive screening on two sides and the factor may be as much as about 40 or 50. In basements of some houses the factor may be well over 100.

In the event of a nuclear attack, it may be that private houses will form a great part of the fallout shelter available to the public. The protective factors in British houses are on the whole far from being as high as is desirable for a shelter. A sample survey carried out in eleven districts in 1958 gave the results listed in Table 1.

TABLE 1

Protective Factors in a Sample of British Houses (Windows Blocked)

Protective Factor	Percentage of Houses
< 25	36%
25-39	28%
40-100	29%
> 100	7%

Thus the majority of houses have factors less than 40. The table covers both urban and rural districts. The factors in rural districts are somewhat lower than in urban districts.

Protection can be markedly increased by erecting a core shelter inside the house and the public have been advised on how to fortify a room in this manner:

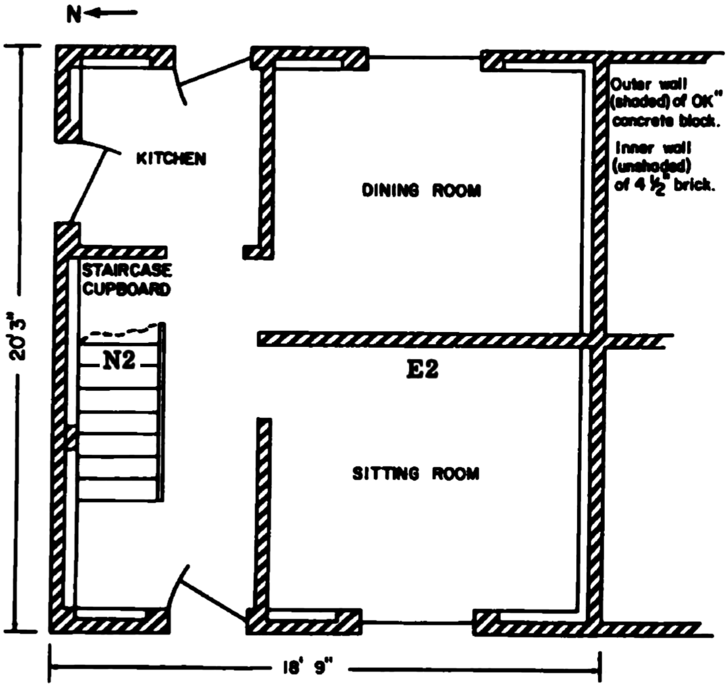
"A very much improved protection could be obtained by constructing a shelter core. This means a small, thick-walled shelter built preferably inside the fallout room itself, in which to spend the first critical hours when the radiation from fallout would be most dangerous."(1)

Objects of the Experiments

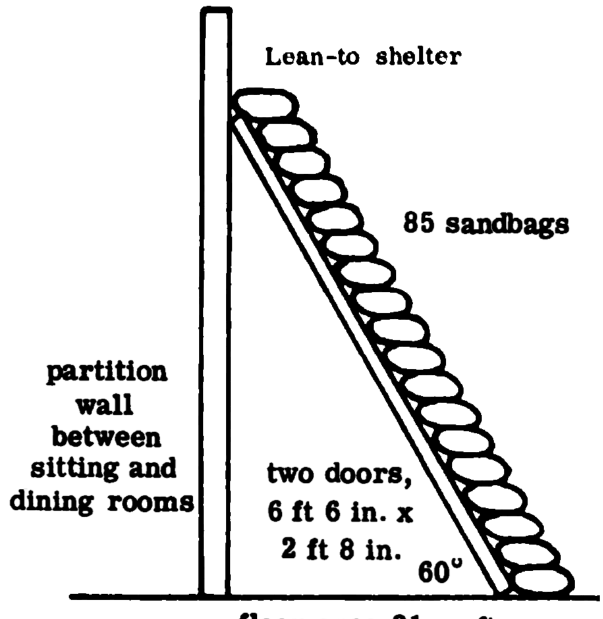
The full-scale experiments were carried out at the Civil Defense School at Falfield Park.(2)

General view.

The walls of the house were made of 4.25 in. of concrete but as typical British houses have 9 in. of brick or more in the walls, they were thickened with an additional 4.5 in. of brick up to the first floor level. The windows and doors were not blocked with shielding material.



Plan of the test house.



floor area 21 sq ft.

A 93 curies cobalt-60 source was used.

Core Shelters

In the staircase construction, the shelter consisted of the cupboard under the stairs, sandbags being placed on treads above and at the sides. The following three variants were investigated:

1. Six sandbags per tread, and a double layer on the small top landing. 96 sandbags were used.
2. As (1), together with a 4-ft-high wall of sandbags along the external north wall. 160 sandbags were used.
3. As (2), together with 4-ft-high walls of sandbags along the kitchen/cupboard partition wall and along the passage partition. 220 sandbags were used.

The sandbags used in the construction of the cores were made of 500-gauge polythene, and were chosen for their relative low cost and cleanness in use compared with the standard jute hessian bag.
They were: 24 in. x 12 in. when empty; 16 in. x 9 in. x 4 in. when filled with 25 lb of sand.

References

1. Civil Defence Handbook No. 10, HMSO, 1963.
2. Perryman, A. D., Home Office Report CD/SA 117.
3. Clarke, E. T., J. F. Batter, and A. L. Kaplan, Measurement of Attenuation in Existing Structures of Radiation from Simulated Fallout, Tech. Ops., Inc. Report TO-B 59-4, 1959.

TABLE 2

Comparison of Measured and Calculated Protective Factors (for a Full-Scale House)

		Ground contribution r/hr/c/ft^2		Roof contribution r/hr/c/ft^2		Protective Factor	
	Position	Measured	Calculated	Measured	Calculated	Measured	Calculated
House only	E2	15.0	21.9	8.4	9.4	21	16
Lean-to	E2	10.4	11.7	2.4	4.4	39	32
Staircase cupboard:							
Stairs only sandbagged	N2	29.2	21.2	5.3	5.1	14	19
Stairs and outer wall sandbagged	N2	16.4	11.9	4.6	5.1	24	29
Stairs, outer wall, kitchen wall and corridor partition sandbagged	N2	8.8	5.9	1.8	3.3	47	54

MODEL ANALYSIS

Mr. Ivor Ll. DAVIES
Suffield Experimental Station
Canadian Defense Research Board
Ralston, Alberta, Canada

Nuclear-Weapon Tests

In 1952 we fired our first nuclear device, effectively a "nominal" weapon, at Monte Bello, off northwest Australia. To the blast loading from this weapon we exposed a number of reinforced-concrete cubicle structures that had been designed for the dynamic loading conditions, and for which we made the best analysis of response we were competent to make at that time. Our estimates of effects were really a dismal failure. The structures were placed at pressure levels of 30, 10, and 6 psi, where we expected them to be destroyed, heavily damaged with some petaling of the front face, and extensively cracked, respectively. In fact, the front face of the cubicle at 30 psi was broken inwards; failure had occurred along both diagonals, and the four triangular petals had been pushed in. At the 10-psi level, where we had three cubicles, each with a different wall thickness (6, 9, and 12 in.), we observed only light cracking in the front face of that cubicle with the least thick wall (6 in.). The other two structures were apparently undamaged, as was the single structure at the 6-psi level.

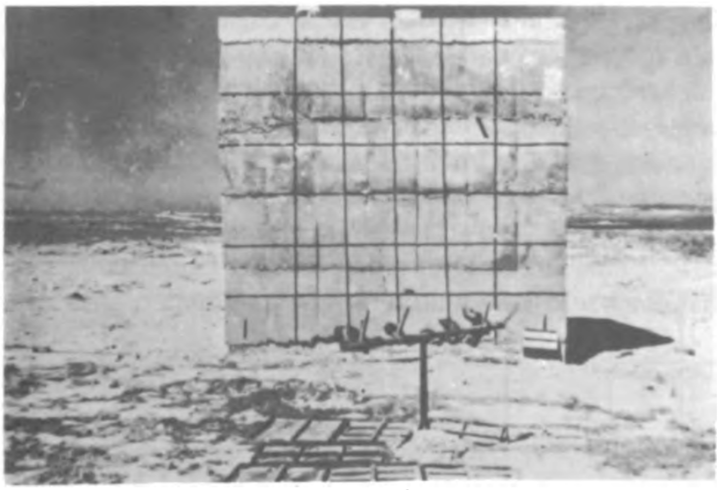
In our original analysis, we had used a method based on the well-known, suddenly applied load theory. After the trial, we reconsidered the problem and used a method based on the equation of motion:

$$P_{(t)} = F_{(x)} + m\ddot{x}$$

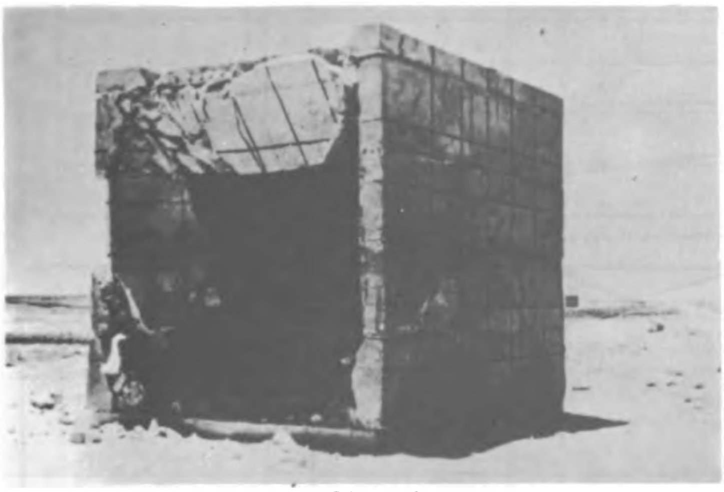
where $P_{(t)}$ is the time-dependent forcing function of the blast wave

$F_{(x)}$ is the static resistance, dependent upon deflection

$m\ddot{x}$ is the inertial resistance



10 p.s.i.



34 p.s.i.

FULL SCALE

Dynamic tests, Monte Bello cubicles.

Garage-Shelter Study

It was stated earlier that one of the objects of this work was to consider the problems of blast-resistant design. In 1957, the first proposals were made for the construction of the underground car park in Hyde Park in London. The Home Office was interested in this project since, in an emergency, the structure could be used as a shelter. Consequently a request was made to us at Atomic Weapons Research Establishment (A.W.R.E.) to design a structure that would be resistant to a blast loading of about 50 psi, and to test our design on the model scale.

Using the various load-deformation curves obtained in this test, an estimate was made of the response of the structure to blast loading. Of particular interest was the possible effect of 100 tons of TNT, since it was proposed to expose the structure in the first 100-ton trial at the Canadian firing range at Suffield in Alberta. These preliminary calculations used the very simple equation of motion:

$$P_{(t)} = F_{(x)} + m\ddot{x},$$

and it was estimated that at 100 psi the structure would be destroyed, and that at 50 psi it would experience some cracking.

A total of seven more models was made; six were shipped to Canada and placed with the top surface of the roof flush with the ground and at positions where peak pressures of 100, 80, 70, 60, 50, and 40 psi were expected. The seventh model was kept in England for static testing at about the time of firing. The results were not as expected. In the field, the four models farthest from the charge were apparantly undamaged; we could see no cracking with the eye, nor did soaking the models with water reveal more than a few hair cracks. The model nearest the charge was lightly cracked in the roof panels and beams, and one of the columns showed slight spalling at the head. This model had been exposed to a peak pressure of 110 psi. The second model, which was exposed to 85 psi, showed slightly greater damage than the one at 110 psi, but this was probably due to the more extensive failure at the head of one of the columns.

Foreword

If the country were ever faced with an immediate threat of nuclear war, a copy of this booklet would be distributed to every household as part of a public information campaign which would include announcements on television and radio and in the press. The booklet has been designed for free and general distribution in that event. It is being placed on sale now for those who wish to know what they would be advised to do at such a time.

May 1980

If Britain is attacked by nuclear bombs or by missiles, we do not know what targets will be chosen or how severe the assault will be.

If nuclear weapons are used on a large scale, those of us living in the country areas might be exposed to as great a risk as those in the towns. The radioactive dust, falling where the wind blows it, will bring the most widespread dangers of all. No part of the United Kingdom can be considered safe from both the direct effects of the weapons and the resultant fall-out.

The dangers which you and your family will face in this situation can be reduced if you do as this booklet describes.

Challenge to survival

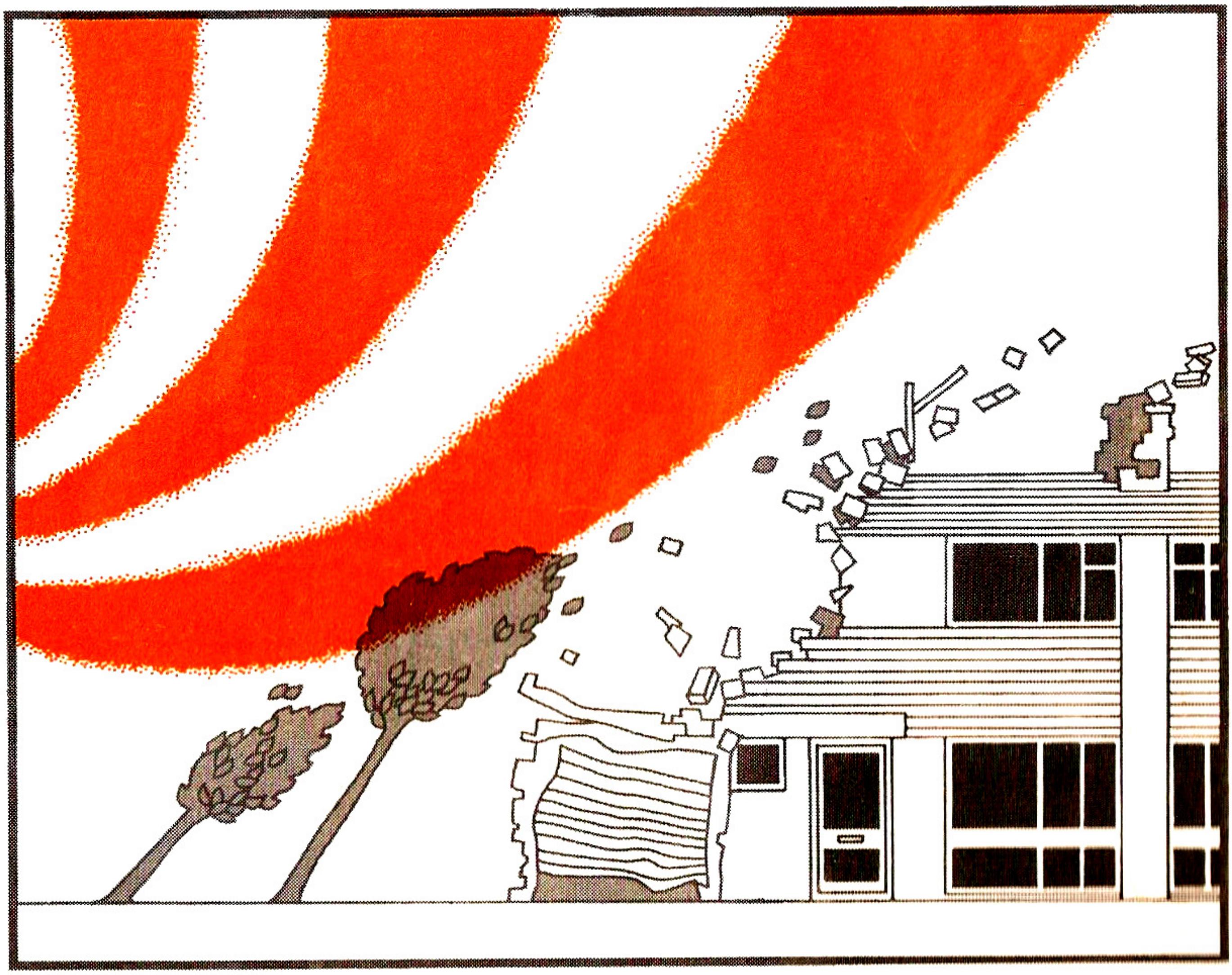
Everything within a certain distance of a nuclear explosion will be totally destroyed. Even people living outside this area will be in danger from –

HEAT AND BLAST

FALL-OUT

Heat and Blast

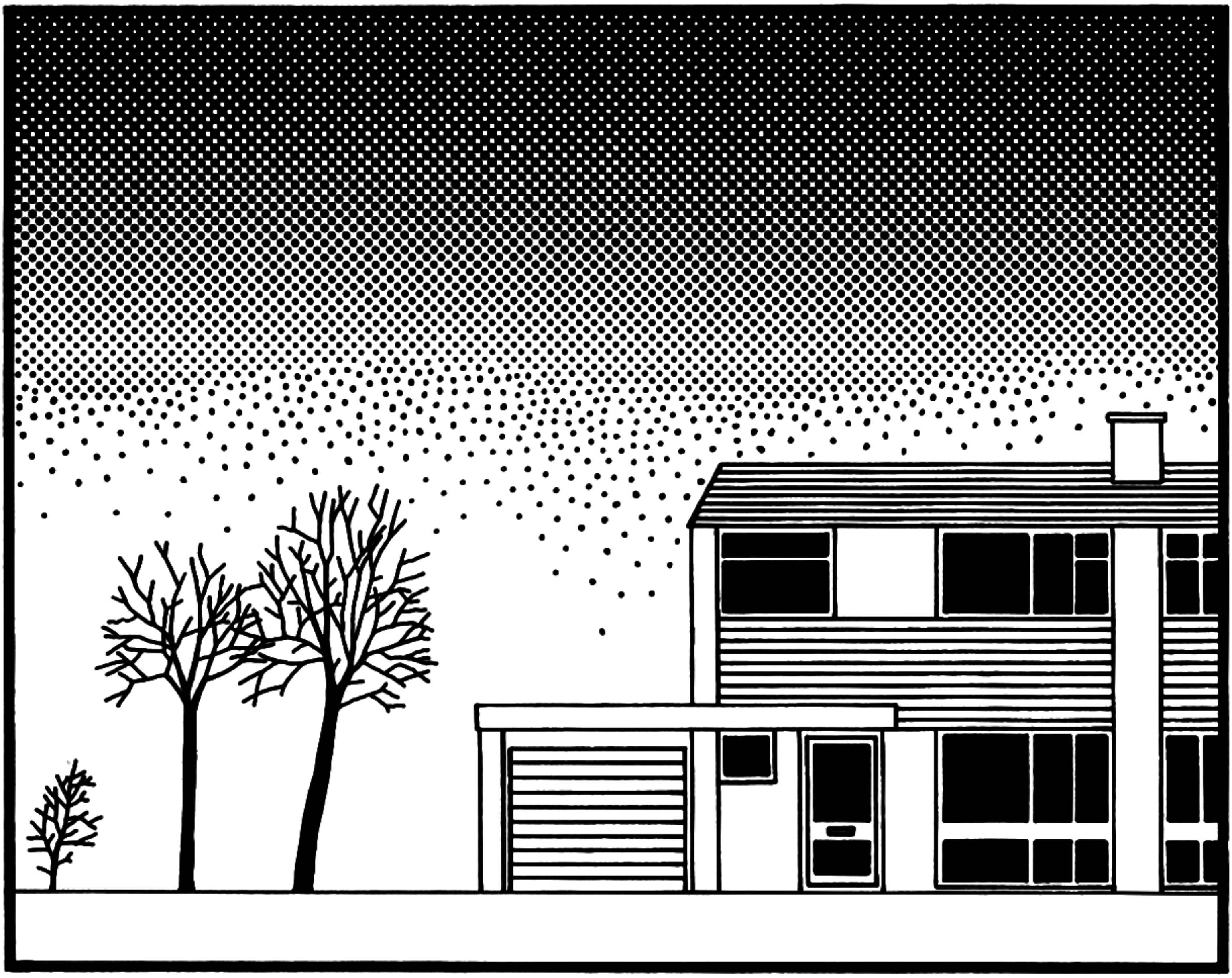
The heat and blast are so severe that they can kill, and destroy buildings, for up to five miles from the explosion. Beyond that, there can be severe damage.



Fall-out

Fall-out is dust that is sucked up from the ground by the explosion. It can be deadly dangerous. It rises high in the air and can be carried by the winds for hundreds of miles before falling to the ground.

The radiation from this dust is dangerous. It cannot be seen or felt. It has no smell, and it can be detected only by special instruments. Exposure to it can cause sickness and death. If the dust fell on or around your home, the radiation from it would be a danger to you and your family for many days after an explosion. Radiation can penetrate any material, but its intensity is reduced as it passes through – so the thicker and denser the material is, the better.



Planning for survival

Stay at Home

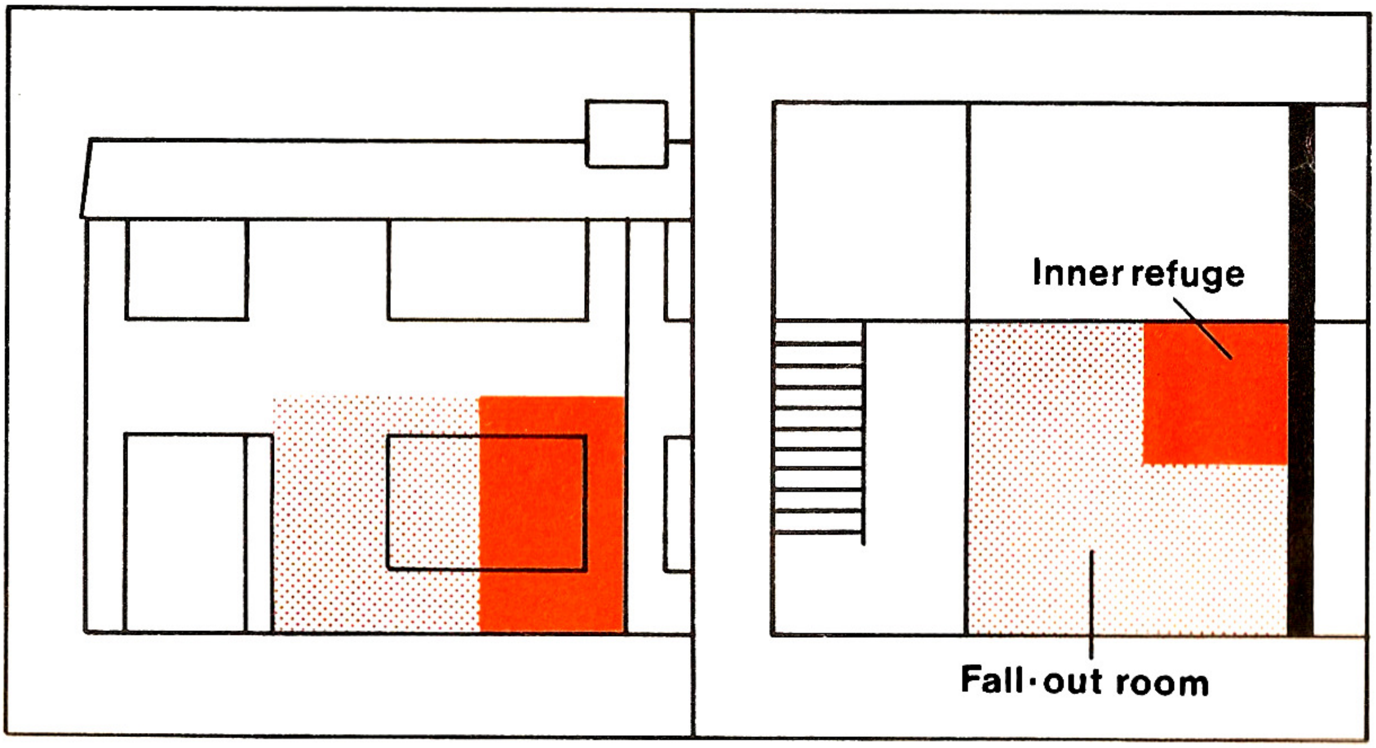
Your own local authority will best be able to help you in war.
If you move away – unless you have a place of your own to go to or intend to live with relatives – the authority in your new area will not help you with accommodation or food or other essentials.
If you leave, your local authority may need to take your empty house for others to use.
So stay at home.

Plan a Fall-out Room and Inner Refuge

The first priority is to provide shelter within your home against radioactive fall-out. Your best protection is to make a fall-out room and build an inner refuge within it.

First, the Fall-out room

Because of the threat of radiation you and your family may need to live in this room for fourteen days after an attack, almost without leaving it at all. So you must make it as safe as you can, and equip it for your survival. Choose the place furthest from the outside walls and from the roof, or which has the smallest



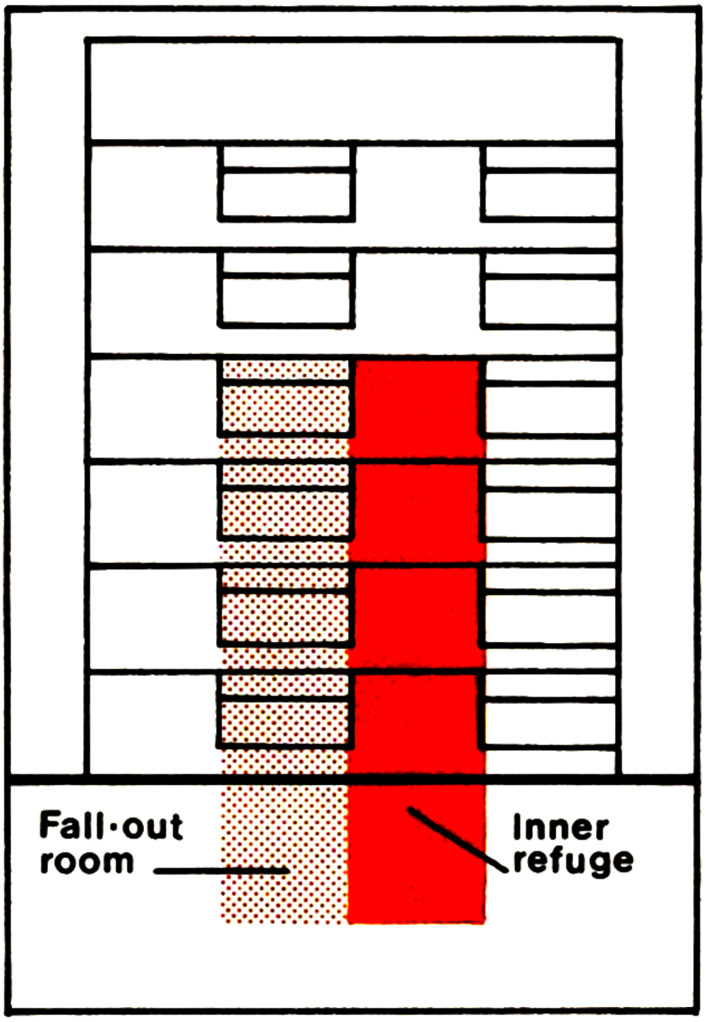
amount of outside wall. The further you can get, within your home, from the radioactive dust that is on or around it, the safer you will be. Use the cellar or basement if there is one. Otherwise use a room, hall or passage on the ground floor.

Even the safest room in your home is not safe enough, however. You will need to block up windows in the room, and any other openings, and to make the outside walls thicker, and also to thicken the floor above you, to provide the strongest possible protection against the penetration of radiation. Thick, dense materials are the best, and bricks, concrete or building blocks, timber, boxes of earth, sand, books, and furniture might all be used.

Flats

If you live in a block of flats there are other factors to consider. If the block is five storeys high or more, do not shelter in the top two floors. Make arrangements now with your landlord for alternative shelter accommodation if you can, or with your neighbours on the lower floors, or with relatives or friends.

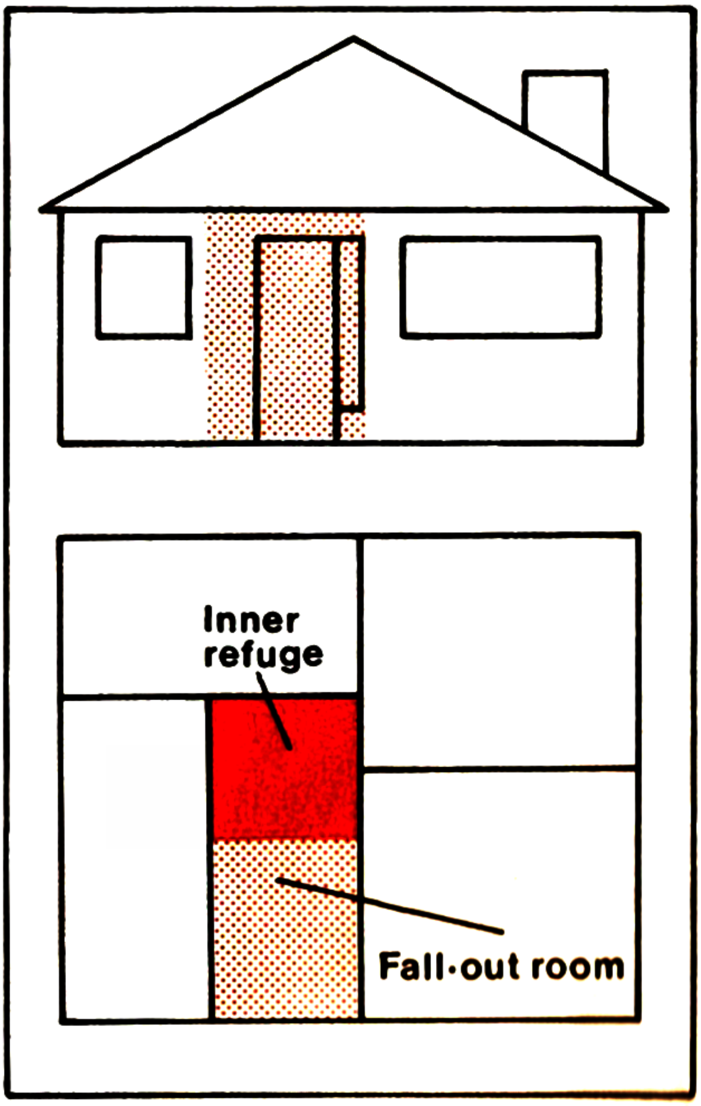
If your flat is in a block of four storeys or less, the basement or ground floor will give you the best protection. Central corridors on lower floors will provide good protection.



Bungalows

Bungalows and similar single-storey homes will not give much protection. Arrange to shelter with someone close by if you can do so.

If not, select a place in your home that is furthest from the roof and the outside walls, and strengthen it as has been described.



Caravans

If you live in a caravan or other similar accommodation which provides very little protection against fall-out your local authority will be able to advise you on what to do.

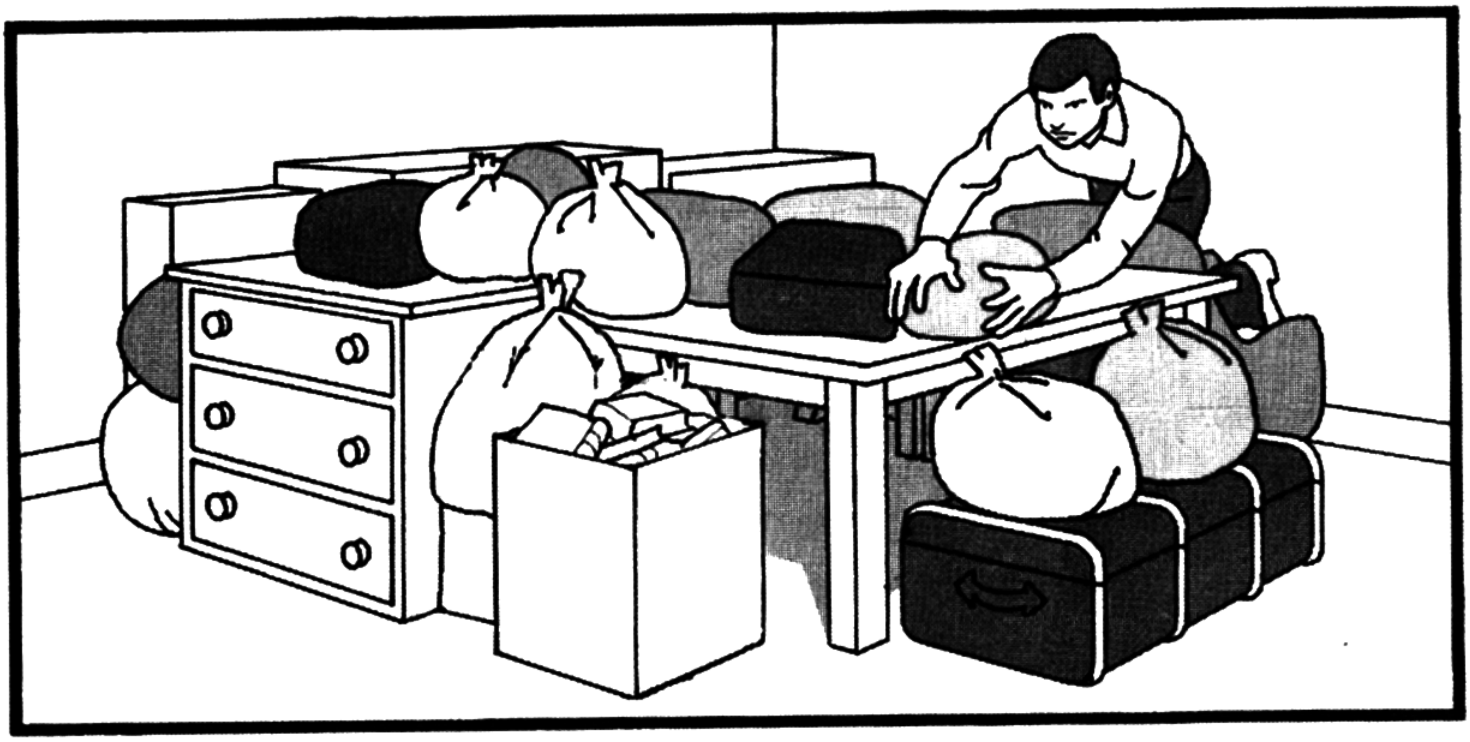
Now the Inner Refuge

Still greater protection is necessary in the fall-out room, particularly for the first two days and nights after an attack, when the radiation dangers could be critical. To provide this you should build an inner refuge. This too should be thick-lined with dense materials to resist the radiation, and should be built away from the outside walls.

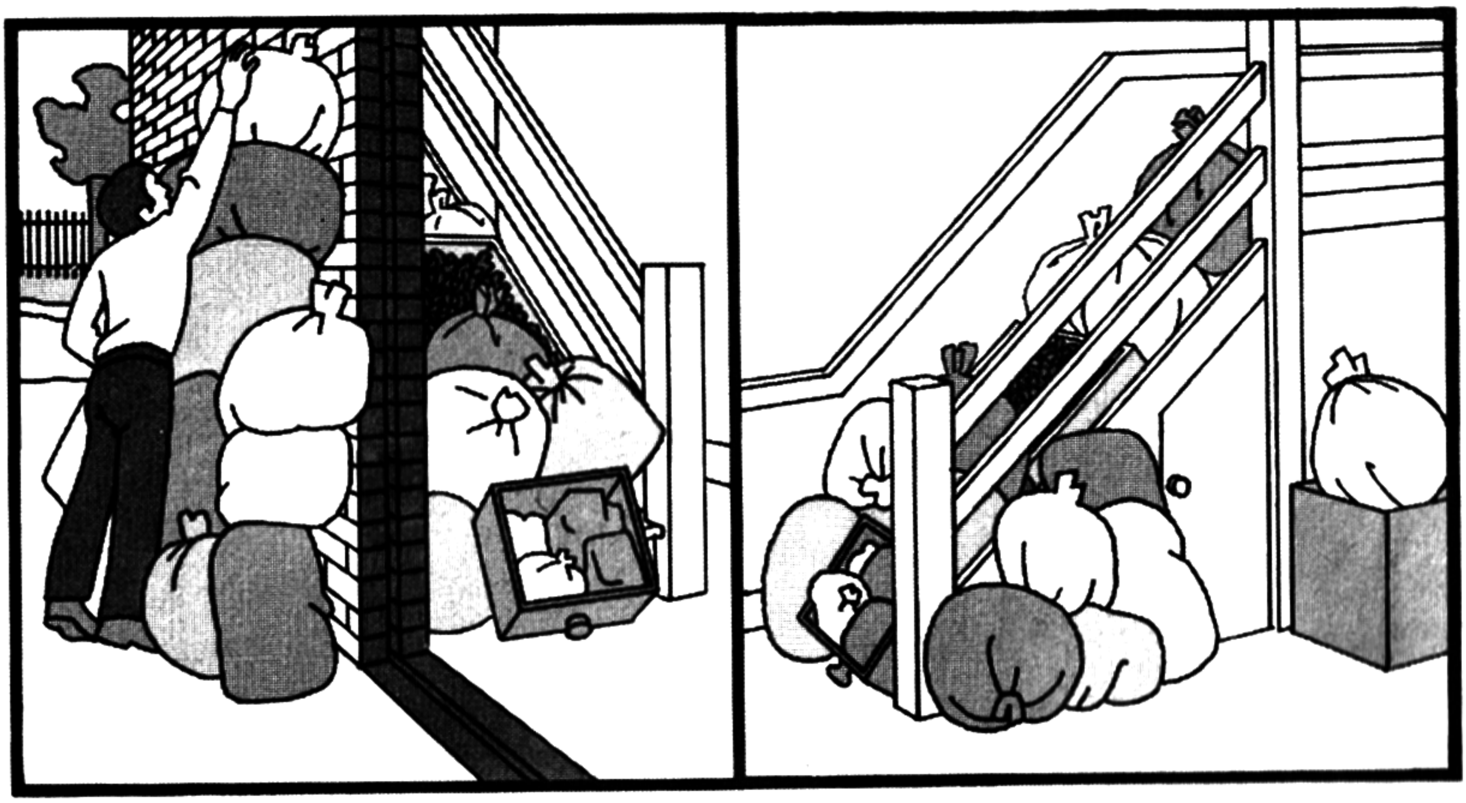
Here are some ideas:

1. Make a 'lean-to' with sloping doors taken from rooms above or strong boards rested against an inner wall. Prevent them from slipping by fixing a length of wood along the floor. Build further protection of bags or boxes of earth or sand – or books, or even clothing – on the slope of your refuge, and anchor these also against slipping. Partly close the two open ends with boxes of earth or sand, or heavy furniture.

2. Use tables if they are large enough to provide you all with shelter. Surround them and cover them with heavy furniture filled with sand, earth, books or clothing.



3. Use the cupboard under the stairs if it is in your fall-out room. Put bags of earth or sand on the stairs and along the wall of the cupboard. If the stairs are on an outside wall, strengthen the wall outside in the same way to a height of six feet.



What to do after the Attack:

After a nuclear attack, there will be a short period before fall-out starts to descend. Use this time to do essential tasks. This is what you should do.

Do not smoke.

Check that gas, electricity and other fuel supplies and all pilot lights *are* turned off.

Go round the house and put out any small fires using mains water if you can.

If anyone's clothing catches fire, lay them on the floor and roll them in a blanket, rug or thick coat.

If there is structural damage from the attack you may have some time before a fall-out warning to do minor jobs to keep out the weather – using curtains or sheets to cover broken windows or holes.

If you are out of doors, take the nearest and best available cover as quickly as possible, wiping all the dust you can from your skin and clothing at the entrance to the building in which you shelter.