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NO FALLOUT SHELTERS FOR OUR CITIZENS

See why, pg. 5

CONCRETE SHELTER CONSTRUCTION, pg. 28

What can you eat after a nuclear attack?

See **FARM ANIMALS**, pg. 25

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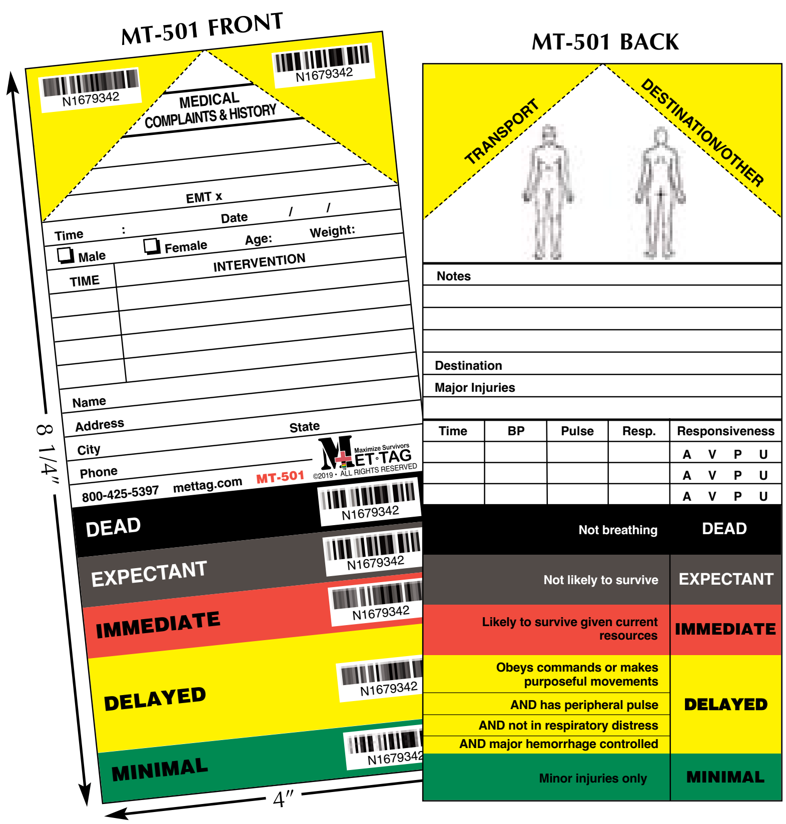

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PRESIDENT'S MESSAGE

We are marking the 60th anniversary of The American Civil Defense Association with this issue. As we look back, it is amazing to see that the issues we face today are very similar to what Americans faced sixty years ago. We still have a world that is very unstable with the possibility of large-scale warfare, food shortages caused by weather-related disasters or political disruptions, and political instability in our own country. We still have many western governments that have not taken serious steps to protect their citizens by establishing a civil defense program.

We suggest that everyone contact their elected representatives at all levels of government and demand that they take the threats of war seriously and establish an actual Department of Civil Defense to protect the population during and after a disaster. If enough people demand a change, it may happen, but it does take a long time to establish and build an effective civil defense program. We must start NOW!

In the interim, the only sure way for individuals to protect themselves from the consequences of possible disasters is to establish a significant food storage program, store other needed supplies, arrange for potential sheltering, and maintain the ability to grow and preserve food.

The prudent will prepare themselves and their families and watch world events carefully. We hope that The Journal of Civil Defense will help you in your efforts.

Sincerely,

FROM THE EDITOR

Peace Through Preparedness

By Roseanne Hassett, Executive Director

When Arthur Broyles founded TACDA in 1962, his goal was to convince our government to invest in a robust civil defense program for the people of the United States. He worked extremely hard on that goal, without success. There were many roadblocks and foolish leaders who wouldn't listen, but he and his influential comrades were able to reach thousands of Americans who were ready to take matters into their own hands and get prepared.

Now 60 years later, TACDA is still pushing forward, thriving, and dedicated to its mission to teach and prepare Americans how to survive disasters. Many things have changed over the years, but some things have unfortunately remained the same. Our government still has not developed and maintained a civil defense program for its people. And even through all the lobbying, letters, journals, and seminars TACDA devised in those early years, we still do not have sheltering for our people.

Hearing of the horrific war in Ukraine, it gives me hope that many civilians there have been able to survive in bomb shelters - most of which were built by the Russians during their earlier occupation of that country. How ironic!

We, in the great United States of America, do not have such a luxury. You are on your own. Please utilize the vast resources that TACDA has provided to learn how to protect your loved ones. Come to our monthly civil defense webinars. Get prepared. It's time!

"Nothing, absolutely nothing, is more important than preparedness through civil defense. It means the survival of our country and its people. It's that simple. The time is now. The place is Main Street, USA. The objective is peace through preparedness."

Walter Murphey
Managing Editor, Journal of Civil Defense
1968-1997

of

The American Civil Defense Association

TACDA HISTORY:
Then and Now

TACDA was formed in the early 1960s in response to our nation's reliance on atomic weaponry as a centerpiece of foreign policy following World War II, up to and including the onset of the Cold War. The organization was conceived by a group of professors at the University of Florida which included Dr. Arthur A. Broyles (President), Byron D. Spangler, Herbert Sawyer, Dr. Werner Lauter, Col. R.G. Sherrard, and Albert Edgar in response to public concern regarding The Cubin Missile Crisis and the Cold War and to provide solutions for personal and community survival in case of nuclear attack.

Dr. Arthur Broyles was the moving force behind this effort. He had previously worked on nuclear weapons at Los Alamos and had been employed by the Rand Corporation. He later encouraged renowned scientists, Dr. Edward Teller, Father of the Hydrogen Bomb, and Dr. Eugene Wigner, Nobel Prize winner, both comrades of Albert Einstein, to become active in the group. They worked tirelessly on the project with what little time they had, with the mission of educating and preparing Americans to be able to survive nuclear attacks and emphasizing the use of fallout shelters for this purpose. They presented programs at the University, held seminars, produced a journal, and diligently campaigned the federal government for a civil defense program for the American public.

THREAT OF NUCLEAR WAR

During the Cold War, many feared a nuclear strike from the Soviet Union. There was serious talk of nuclear war. Russia was shipping missiles to Cuba. People wanted badly to know what measures they could take to contend with the threatening situation.

In response to the Soviet's first atomic test explosion and the Korean War, the Federal Civil Defense Administration was started in 1951. American citizens now had to imagine a new kind of war, and it was the Federal Civil Defense Administration's job to encourage citizens to adapt to their nuclear present and future. Some doubted that physical protection from a nuclear explosion would be effective. The Federal Civil Defense Administration received a small budget and was involved in only limited construction of shelters and the publishing of publicity materials.

In 1958, a report indicating the Soviet Union was nearing the level of the nuclear arsenal held by the U.S. forced civil defense to be a priority. Spending increased. The Federal Civil Defense Administration became the Office of Civil and Defense Mobilization under President John F. Kennedy, who believed in and advocated civil defense.

In October of 1962, the Cuban Missile Crisis spurred a rapid, three-month program to improve civil defense. When the administration of President Kennedy abruptly ended, however, civil defense was once again regarded as unimportant and wasteful and not provided with adequate funding.

TACDA REMAINS VIGILANT

When the Cuban Crisis subsided, protective measures for the general population were quickly forgotten. Interest in civil defense faded, and citizen civil defense organizations disappeared.

TACDA, however, remained vigilant. It saw missile stocks steadily growing and the development of new weapons of mass destruction increasing the possibility of nuclear war. Measures to deal with the looming threat were obviously needed more than ever.

LAUNCH OF THE CIVIL DEFENSE MAGAZINE, "SURVIVE"

In late 1967 and early 1968, planning meetings held at the University of Florida were attended by Teller, Wigner, Broyles, John Neiler of ORNL, Don Guier, Walter Murphey, and others to launch a civil defense magazine. Walter Murphey became involved with the group when his job as North Florida Civil Defense Director was moved to Gainsville. Murphey was appointed editor, as he had experience publishing a newsletter, and John Neiler furnished the capital. Publication of SURVIVE began with the May/June 1968 issue consisting of 12 pages.

In December of 1970, Murphey and his staff took full responsibility for publishing the magazine. The association remained as publisher. Wigner continued to play a major role in all aspects of publication. In 1974, Murphey retired from his state position to devote full-time attention to the magazine and association where he served for 29 years as editor of the journal and executive director of TACDA.

DEVELOPMENT OF METTAG

In 1975, Robert F. Blodgett conceived the idea for a medical emergency triage tag known as METTAG. METTAG is a field triage tag that serves to speed the processing of casualties at accident and disaster scenes. He donated the tag to the association with the hope that sales of the tag would support the magazine. The project was launched in 1976, and in 1977, METTAG provided much-needed financial help to the magazine. Today, worldwide METTAG sales continue to support TACDA financially. Professor Blodgett's brilliancy and generosity in developing and donating the tag has helped TACDA stay viable and able to offer civil defense resources to Americans for little or no cost.

THE JOURNAL OF CIVIL DEFENSE

In 1976, SURVIVE magazine was renamed to the Journal of Civil Defense. TACDA has continued to produce the journal since then and publishes articles on a wide variety of civil defense topics, boasting the greatest selection of survival information and tactics under one charitable organization. Articles are carefully selected and written by scholars, military professionals, emergency personnel, and experts on civil defense.

The Journal of Civil Defense has included topics such as:

- Current national security threats
- Practical survival techniques
- Home and personal defense strategies
- Nuclear weapons effects
- Protection of material assets and survival of natural disasters
- Food storage and preservation
- Underground sheltering
- Gun safety
- Mass shooting situations including prevention, analysis, and take down
- Homeopathic medicine
- Home safety equipment
- Evacuation in emergencies
- 72-hour kits
- And many more...

TACDA'S CONTINUING MISSION

In the 21st century, TACDA has broadened its efforts to include information on the mitigation and survival of all man-made and natural disasters. We offer articles on wildfires, earthquakes, power outages, pandemics, terrorism, and other threats of concern. Instead of in-person seminars, we now hold live monthly webinars for our members. This enables us to reach more members across the country on a regular basis and to assist them with their preparedness goals. The live webinars have encouraged members to meet one another, discuss similar needs, and even start civil defense groups of their own in their communities.

TACDA continues its efforts to educate the public in civil defense issues. Sadly, few people understand the basics of defense against the effects of nuclear weapons. Exercises such as "Duck and Cover" no longer exist in our public schools. Very few civil defense publications come from the federal government, and yet we continue to hear of nuclear threats from Korea, Iran, Russia, and even China.

We encourage our members to study past journals of civil defense to be prepared for current threats facing us as a nation. Articles written in our earliest productions in 1968 are still current and applicable to today's threats.

In this 60th anniversary issue of the Journal of Civil Defense, we have chosen to publish some older articles on nuclear threat. These articles come from various trusted sources and, in light of our 60th anniversary, include 'Voices from the Past', articles from the pioneers of TACDA. This information is still relevant. It need not change because the threat has not changed. Blast is still blast, and the effects of radiation, EMP, fire, and chemical and biological contamination are as real as they have ever been. Protection from radiation still requires the concepts of time, distance, and shielding. The basics of blast shelter design have also not changed. "Duck and Cover" is still necessary and needs to be reviewed and taught to everyone. We need to convince others that we can - if prepared - survive a nuclear attack.

By TACDA Staff

Photo by Lenzius on Pixabay

FALLOUT SHELTERS FOR OUR CITIZENS?

By TACDA Staff

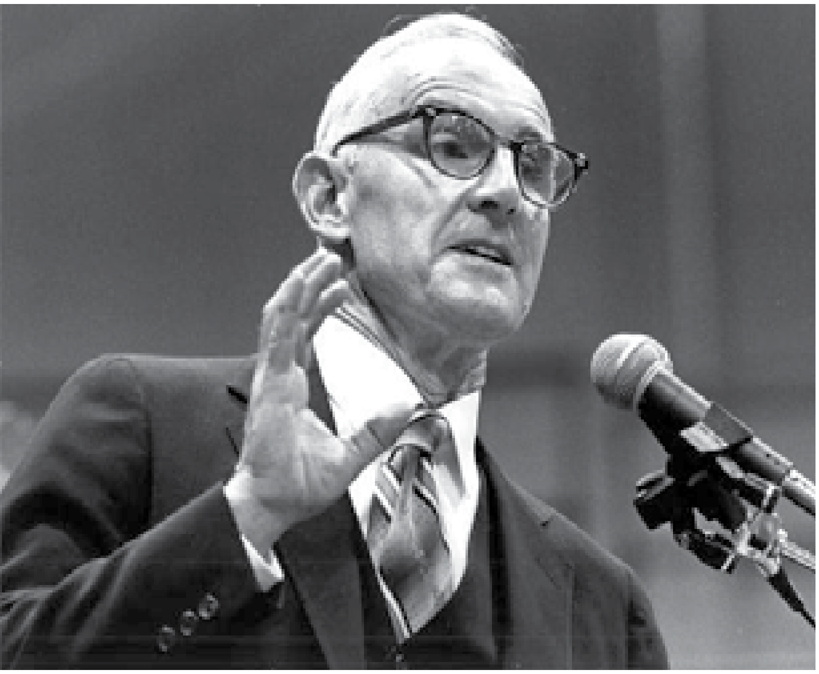
Currently there is NO effort from our own government to provide a civil defense program for our citizens. There is no Department of Civil Defense. There is no education of the effects of nuclear weapons in our public school systems, and there are no nuclear shelters provided for the general public. Some municipalities provide current guidelines for emergency shelters directed for the use and protection from tornados. There are antiquated FEMA plans still available for fallout shelters that can be found on the internet. TACDA, however, has not found any such guidelines that give specifics for the building of 'hardened nuclear shelters' against the effects of a nuclear attack. There is also no information for post-war survival. However, there is current information for pre- and post-attack preparations on our website found in "The TACDA Academy".

There are some sirens regularly exercised to warn of potential tsunamis, but as far as we have found, there are no government-directed warning systems, sirens, evacuation plans, or general preparations for nuclear attack available to the general public. There is, however, an ongoing program to provide for the "Continuity of Government". Government officials and needed personnel will be protected in hardened nuclear shelters reserved only for themselves.

It is of interest to note that Russia, China, and Switzerland have current, massive civil defense shelter programs for their citizens. Their shelters are well maintained, and the programs are exercised regularly. Many other countries have similar programs.

TACDA Pioneers:
Voices from the Past

Arthur Broyles, Ph.D., Eugene P. Wigner, Ph.D., Edward Teller Ph.D., Walter Murphey



Arthur Broyles, Ph.D. (Founder)

34 Years of Dedicated Service

Professor Arthur Broyles received his Ph.D. from Yale in 1949 and then joined the University of Florida. After three years at Los Alamos and six years with the Rand Corporation, he returned to the University of Florida, where he was a professor of physics and physical sciences. He was especially interested in quantum electrodynamics and the equation of state. Dr. Broyles and Edward Teller were instrumental in the development of the hydrogen bomb. Dr. Broyles was Professor of Physics at the University of Florida, a member of the SURVIVE Editorial Board, and President of what was first known as the Association for Community-Wide Protection from Nuclear Attack (APNA), later, The American Civil Defense Association (TACDA).

HOW MANY CAN BE SAVED?

A dedicated scientist and veteran civil defense campaigner dissects a research study on shelter costs vs survival levels and achieves for the layman a revealing picture of what kind of federal financing it could take to protect our American society from the effects of an ABM-oriented nuclear attack.

How many people can be saved - and at what cost? These are the pointed questions asked about civil defense measures such as shelters, antimissile missiles, etc. They are also extremely difficult questions to answer, principally because of the large number of pieces of information that must be given beforehand. For example, it is necessary to know the numbers and sizes of bombs delivered, the targets chosen, wind directions, etc. The best that can be done is to make simplifying assumptions and to calculate specific cases.

A recent study of this type has been completed at the Oak Ridge National Laboratory by Dr. Richard A. Uher, a member of the Civil Defense Research Project. His report is entitled, “Blast Shelter Systems with a Light, Area-Ballistic Missile Defense”. This study was motivated by the recent decision by the U. S. Government to deploy a light ballistic missile defense system. Dr. Uher started out by asking,

“How many people can be saved by blast shelters built with a given amount of money if a ballistic missile defense system has already been deployed?”

The simplifying assumptions made are that:

1. people have time to get into shelters,
2. everyone has a fallout shelter also giving fire protection,
3. the enemy makes his attack in just the right way

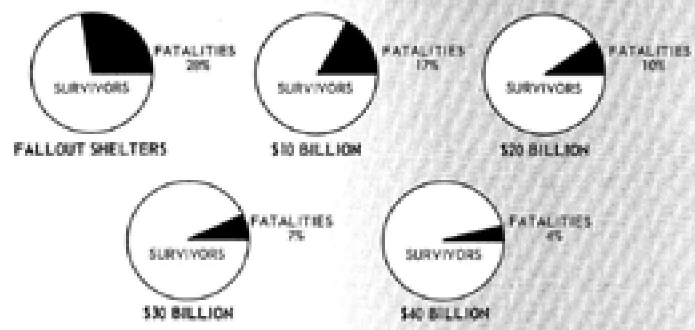
to create the most fatalities for a given shelter system, and

4. the only effect of the missile defense system is to force the enemy to use multiple warheads, each having a yield of three-tenths of a megaton.

The enemy will choose small multiple warheads instead of one large bomb so that the defensive missiles will be forced to fire at a large number of incoming targets at once. This technique is employed to pierce an anti-ballistic missile system, and it requires the use of significantly smaller weapons with a resultant decrease in total megatonnage. In this way penetration of the defensive missile shield is made more likely (see “Civil Defense in the Age of Russian Superiority”, page 1). A single, large, attacking missile may be launched, but it will send out a spread of the smaller bombs a short time before it reaches the range of the defensive missiles. The study by Dr. Uher assumes that only a negligible number of these three-tenths of a megaton bombs are destroyed by the defenses. The defensive missiles have been of value, however, because blast shelters are now more effective than they would be otherwise.

The study considers two types of shelter systems, one composed only of shelters built to stand a given pressure, the other optimized by allowing blast protection to vary with population density. Thus, in this optimized case, shelter providing greater protection may be placed where population density is highest. This distribution of shelter gives the smallest number of fatalities. Although it is found that the optimized system is appreciably more effective, unfortunately the optimization can be made for only one attack size. At other attack sizes, such a shelter system may be relatively poor. Thus, a shelter distribution created for an attack of a given size tends to become obsolete as people move and attack sizes change.

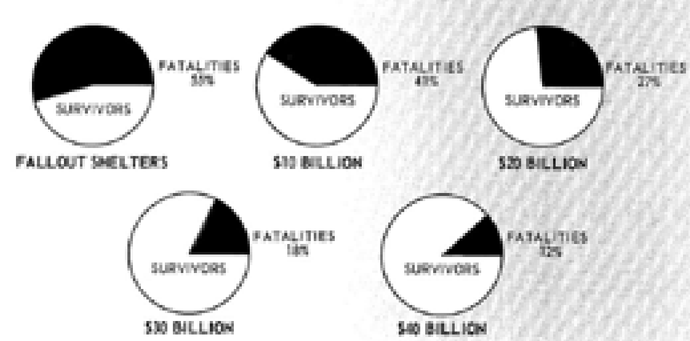
Some of the results of Dr. Uher’s study are illustrated in Figures 1 and 2*. Increasingly, investments in blast shelters markedly reduces fatalities. Figure 1 [top right] is for an attack on the United States where the total yield of all the bombs directed against the population was taken to be 420 megatons. This required 1,400 of the three-tenths megaton warheads. Figure 2 [bottom right] gives the same results for a larger attack of 2,160 megatons total yield or 7,200 of the three-tenths megaton warheads. Optimized systems are not illustrated in these figures.



Fraction of the U. S. Population Killed by a 420 Megaton Attack.
Figure 1.

Although these results were obtained under quite restricted assumptions, they do indicate that blast shelters can save a substantial number of lives in both small- and large-scale attacks. Although the Russians are probably capable of larger attacks, it seems likely that a major fraction of their missiles will be directed against the military installations of the U.S. and its allies leaving a relatively smaller number for a population attack.

(By Arthur Broyles, Ph.D.; previously published: July-Aug 1968, Vo1.1, No. 2)



Fraction of the U. S. Population Killed by a 2160 Megaton Attack.
Figure 2.

***These calculations are based on the 1968 population of the United States of America, which was 203,000,000. The current population of the U.S. is 330,000,000, which is an increase of approximately 60%.**

Eugene P. Wigner, Ph.D.

Eugene P. Wigner, Ph.D. was a Nobel Prize winner. He was also recipient of the Enrico Fermi, Max Planck, and Atoms for Peace awards. He was one of the scientists who, with Albert Einstein, first warned President Franklin D. Roosevelt of the possibility of nuclear weapons development. In 1942, he was part of the University of Chicago team that first produced a nuclear chain reaction. While a member of the faculty at Princeton University, Dr. Wigner carved time out of a hectic schedule to spotlight civil defense as a basic requirement for the survival of the United States in the nuclear age for TACDA.

ROADBLOCKS TO CIVIL DEFENSE

A renowned physicist and civil defense analyst probes behind the mask of apathy in the United States.

I have often tried to explain the need for a vigorous civil defense effort, why and how such an effort would go far in preserving peace and how it could save many millions of lives if war should come nevertheless. "Why Civil Defense?" would be an apt title for this subject because we want the civil defense effort to be strong and vigorous. But my subject is also the opposite: "Why No Civil Defense?"

What are the roadblocks? Why isn't the civil defense effort as strong and effective as we would like it to be? Why is there not a popular demand for it?

There are, it seems to me, three principal reasons for this.

The first reason is the power of the anti-civil defense establishment. What provides this strength? What are the motives of the establishment?

There are, of course, those who would like to see our country become a second- or third-rate power, the nakedness and vulnerability of its people forcing its government to accede to the demands of those governments whose people are better protected or who care less for human life. Persons who have these desires are, however, small in number, and they contribute but very little to the undeniably very great strength of the anti-civil defense establishment. Can this establishment muster valid arguments against civil defense? I think it can, and this is the reason for citing this cause for our lagging civil defense efforts as the first of my "principal reasons".

If we install shelters, store food and other supplies, we make preparations against an attack on our country. Such preparations naturally set us apart from those against whose attack we protect ourselves and render it more difficult to develop a true friendship between the governments of communist countries and ourselves. This is the theory of Festinger, often derided by social scientists, but I do think there is something to it even if not in the extreme form propounded by Festinger. It is, of course, true that the hate propaganda of the other side also interferes with the development of the true friendship, and it is sad - very sad - that this is never criticized by the anti-civil defense establishment.

The second reason why the civil defense effort is not more vigorous and why there is not more public demand for it is that it is unpleasant to think about disasters, particularly disasters as severe as nuclear war. Let us note that insurance policies offering compensation in case of fire are called fire insurance policies, but that the policies protecting our families in case of our death are called life insurance policies. No similarly euphemistic name has been invented for civil defense, and it would not help much if one were invented. Building shelters would remind us in any case of a great and terrible calamity that could befall us, and we all are reluctant to think about such calamities. Why dig a hole in the ground where one may have to live for weeks if one can, instead, walk in the sunshine? We have a tradition for work, and many of us enjoy it, but we do not have a tradition of thinking about disasters which may strike us. However, whereas our reluctance to face the temporary nature of our sojourn in this world does not, as a rule, shorten our lives, our reluctance to protect ourselves may bring war nearer.

The third reason that we do not take civil defense very seriously is that we are all too conceited. Sure, other people have been stricken by disasters, other nations have been wiped out or subjugated. But this cannot happen to us, we say. It is not even decent to think about it. I once went to see the now deceased Albert Thomas, who prevented a good deal of civil defense legislation from being enacted in the House of Representatives. He listened to me for a few minutes and then said: "Take it easy, young man, take it easy. This country is so strong it does not need any civil defense."

Most of us would express this self-defeating doctrine less clearly and less bluntly than did Mr. Thomas. But what he said is present in the minds of all of us. On a peaceful day like today, when we are absorbed by so many more pleasant thoughts, is it not unreasonable to think about some country attacking us with nuclear weapons?

In a very real sense, I believe, it will be a test of the democratic ideal whether our people can resist burying their heads in sand or not, whether or not they can muster the foresight and maturity to carry out the unpleasant and unpopular task of protecting themselves, their country, and their freedom against dangers which seem far away. Nothing but illusory comfort can be gained by closing our eyes to these dangers.

(By Eugene P. Wigner, Ph.D.; previously published: May-June 1968, Vol.1, No. 1)

Edward Teller, Ph.D.

Edward Teller, Ph.D. was the founder of the United States Atomic Energy Commission laboratory at Livermore, California. He was one of the world's leading theoretical physicists and served on the faculties of top research institutions such as the University of Chicago and the University of California at Berkeley. Under his guidance the United States won the race to develop the first H-Bomb, thereby making this powerful weapon first available to the free world. Dr. Teller participated in the development of nuclear weapons from their beginning. From his vast knowledge in nuclear weaponry, he pointed out the likelihood that the Soviet Union had overtaken the United States in nuclear offensive capability and the effect this had on the need for civil defense. Dr. Teller's involvement with TACDA resulted in great progress with the leadership in Washington D.C. and attributed to the accelerated growth within TACDA's membership and public interest in general.

EXOTIC WEAPONS

At Los Alamos in 1945 Edward Teller probed the secrets of the H-bomb before the A-bomb was developed. Later, in order to keep American weaponry in first place, he directed the work of the team of scientists which produced it. Here Dr. Teller looks behind the curtain of the future. What is possible in new weapons and defense against them? What is not possible?

When thermonuclear explosives followed the fission bomb, increasing a thousand fold the power of the A-bomb, an obvious question was asked: What will come next? The question remains unanswered. Nothing followed. Yet the suspicion remains that there may be no effective limit to man's ability of wreaking havoc. One can never evaluate what, as yet, has not been invented. But one can consider what types of developments appear to be possible.

First, we may consider a further increase of the power of an explosive. One might multiply the explosion again a thousand fold. Instead of kilotons or megatons, one may talk of gigatons.

There is, however, a simple reason why such an increase will not bring about a great change. Fissionable material was - and to a considerable extent still is - expensive. Fuel for fusion as used in the hydrogen bomb is cheap. This low price brought about a great increase in the explosive power one could buy. At present, however, the main expense - the limiting factor - is not connected with the explosive but with the delivery system. It is reasonable to assume, therefore, that larger bombs will have a greater weight and that it will cost more to deliver them unless one finds an essentially cheaper method of delivery. No one has succeeded in this, and there are no ideas on the horizon which are likely to change the situation.

Neither has any effect been discovered which would make a very big bomb appear as a desirable military item.

Many modifications of nuclear explosives make them much more appropriate for use on the battlefield or make them preferable tools for missile defense. But for the strategic attack we seem to have approached the limit.

In the race between the delivery of massive explosives and the protection against blast effects, defense is in a reasonably strong position, provided we make the needed effort. The most obvious effect of a nuclear explosion is the blast. Blast damage can be catastrophically augmented by a conflagration or a firestorm. But well-planned shelters can save most of the people in spite of these dangers. A really good blast shelter will also withstand fire.

The most insidious effect of a nuclear explosion is connected with radioactivities generated by the explosion. The fission products from a big explosion are extremely dangerous. In a thermonuclear explosion radioactivity may play a much lesser or a much greater role. On the one hand the radioactivity may be greatly reduced by the employment of clean explosives which are also useful for the peaceful project we call Plowshare. On the other hand substances may be placed into the explosive which, when irradiated, produce the greatest possible harmful effect. As always, man's knowledge and power may be used for good or for evil. In this case both good and evil are great.

This is the orgin of the cobalt bomb concept, used by many to prove that the destructive power of nuclear weapons is, indeed, unlimited. Cobalt, when activated, has a half-life of five years. It emits radiation of great penetrating power. It could produce terrible contamination.

The whole question of radioactive warfare is a difficult one. In some situations cobalt may be most dangerous. Other radioactive substances can certainly not be ruled out. Five years may not be the appropriate half-life to cause the most damage in a nuclear conflict. A shorter time with more intense radiation may be the strongest weapon. A two to three month period may turn out to be the most effective.

It will not be easy, however, greatly to surpass the radiation effects produced by the weapons which are now available. Fission, which is the main source of radioactivity even in the so-called hydrogen bombs, may not give optimal periods. However, for each neutron absorbed to produce fission, several - six or seven - radioactive nuclei are produced. If the neutron is absorbed by cobalt, or some similar "salting" material, only one radioactive nucleus results. The radiation of this nucleus may be more dangerous than that of any of the six or seven fission products, but in quantity it will not exceed the total of the six or seven fission products by a great margin; it is more likely to be below it.

Furthermore, the contamination may be spread in a form against which it is difficult to develop countermeasures. There is a great difference between the fallout pattern of a ground burst which gives local effects and a high-altitude burst which gives rise to a world-wide distribution of radioactivity. It might be possible by ingenious means to produce some radioactive nucleus which is difficult to eliminate by any known clean-up procedure.

The methods of cleaning up radioactivity have received some attention but certainly not sufficient financial support for development. To judge which will prevail - a poorly specified attack or an undeveloped defense - is, indeed, impossible.

What is possible is to make a few relevant statements. First, it must be recognized that the radioactive danger, great as it is, will not mean the end of the human race. To produce a contamination which might result in such a catastrophe, a Hiroshima-sized explosion would be needed on each square mile of our planet. The required effort is so stupendous that the danger can be dismissed.

The United States occupies, of course, only a very small fraction of the globe. Nevertheless, in order to contaminate this country alone with lethal radioactivity an aggregate of explosive power would be required which is of the same general magnitude as that required for a devastating attack utilizing blast. One must recognize that radioactive warfare is not cheaper than other modes of attack.

In the second place the immediate danger to life can be eliminated by a shelter program. Defense against radioactivity is less difficult than defense against blast.

What is difficult to counteract are the long-term consequences of radiation. After two weeks it will become necessary to begin leaving the shelters. The contamination may still be very severe after this period - it may remain dangerous for years. Therefore, the problem of how to clean up radioactivity becomes decisive.

It seems probable that methods can be developed to decontaminate limited areas within a short time. Defense has the advantage that a limited success suffices. The attacker has the difficulty that he must try to make the contamination high in practically all places.

Probably the only valid statement one can make is one that is not conclusive. Neither the attacker, nor the defender will attain full success. That the possibilities are grim can hardly be denied.

The last and perhaps most relevant observation I want to make is connected with the purpose of the attack. Most wars are fought for military victory, not for mass murder. Is it likely that sums of money comparable to our entire defense budget will be spent, not to win, but to kill? Radiological warfare is more frightful but is not an effective means toward military victory.

We cannot forget about a “Doomsday Bomb” (a bomb to destroy the whole world). One of my friends, after listening to all my arguments, remarked, “But you cannot prove that it is impossible.” He is right.

This brings me to the question of the arms race in the scientific age. At the beginning of the twentieth century, “arms race” meant an accumulation of familiar arms. At the time the race was massive. Its results were not completely unpredictable.

We have learned that there is something more dangerous than steel and TNT. We have learned that the greatest danger lies in human inventiveness.

Such inventiveness may, of course, take a direction other than development of ever more terrible nuclear explosives. Chemical and biological weapons are by no means excluded. The former are probably heavier and hence harder to deliver than nuclear bombs. Furthermore, good shelters which of necessity must be air-tight will provide adequate protection.

Perhaps the most ominous possibility is the production of biological agents. What makes the situation difficult to handle is the fact that the same type of research, immunology and biochemistry, gives the highest hopes to rid us from suffering and also brings with it the most dangerous potentialities of destruction. The specific danger of biological warfare is the fact that the poison can propagate itself and is not subject to strictly calculable limitations.

It would be a mistake to stop at this point. The real danger is not inventiveness in itself but rather the uncontrolled use of inventiveness. There is no defense that will insure us against all future attacks. There is also no weapon of aggression that can overcome all possible future defenses. Ingenuity and determination may well win the battle for survival by defense.

With those who say it would be better to make peace than to develop any defense, one must agree. However, we must develop a defense in order to gain time in which to make peace.

It seems to me that there is only one relatively simple conclusion which is probably correct: The questions connected with weapons, with survival, with new technical ideas and with human values never have simple answers. We cannot ask for a guaranteed future. We can only seek a chance to work toward a better and perhaps a safer way of life.

(By Edward Teller, Ph.D.; previously published: May-June 1969, Vol.2 No.3)

Walter Murphey

29 Years of Faithful Service

Walter was the Executive Director for TACDA for many years and served as the Managing Editor for the Journal of Civil Defense from 1968 until 1997. He was a passionate advocate for programs to improve our nation's civil defense against both manmade and natural disasters. He wrote many inspiring, helpful articles on a broad range of Civil Defense issues, related not only to the US Civil Defense (CD) programs, but also about CD programs in many other countries. Among his many accomplishments for Civil Defense was to provide vital support to the National Civil Defense/ Emergency Management Monument, which now resides at the National Emergency Training Center in Emmitsburg, Maryland (near Gettysburg) and that acts as a memorial to all who have served the cause of protecting our nation against disasters, terrorism, and war.

COP-OUT COMMANDOS?

***Notes from editor in bold.**

Why a growing number of civil defense professionals - or "emergency managers" or whatever we may choose to call them - have come to reject their defined roles as homeland defense (civil defense) officials and to limit their efforts to the smaller disasters is no big mystery. It's the popular, political "easy way out" in the face of the world's biggest problem-ever: nuclear war or terrorism - and the incredibly difficult defense against it. Is it appropriate to spotlight their reluctance or refusal to face national survival issues by referring to them as cop-out commandos.

FACT:

- Nuclear weapons are today zeroed in on targets around the world, ready at a moment's notice to be launched.
- U.S. fatalities stand, in the present state of unpreparedness, to exceed 60% of the population (144,000,000 million). ***Our current population is 330,000,000.**
- The Strategic Defense Initiative (SDI) and civil defense combined could reduce this figure to around 3%. ***The reference to the Strategic Defense Initiative (SDI) program, under President Regan, would have made ICBMs obsolete; but under threat from Russia, the program was dissolved before it became operational. Currently, we have replaced this program with 100 ICBM interceptors in Alaska and California designed to intercept missiles from North Korea and Iran, and they have never been tested against a combat ICBM – only against "test missiles". These anti-ballistic missiles are not geographically positioned against incoming missiles from Russia.**
- Unlike the United States, some countries alert to the threat and its consequences (e.g., the Soviet Union, China, Switzerland, Sweden, and Israel) have put in place extensive population protection measures.
- Predicted nuclear terrorist incidents also demand population protection measures.
- An effective civil defense program requires (1) full government acceptance of responsibility for public safety followed by (2) deliberate government planning and action.
- Government in the United States is enlightened to the extent that it sees the necessity for sophisticated protection for government and military "continuity" - protected locations for this purpose dot

the countryside from coast to coast.

VIP TOAST

To war' we've no real objection
Since we're part of the "bunker selection."
While you helter-skelter
Search madly for shelter
We'll be safe 'neath our hardened protection.

- Max Klinghoffer

- Government in the United States is not enlightened to the extent that it sees the necessity for protection for its people. In the top example-setting echelon of "cop-out commandos" many government leaders tend to look upon civil defense as useless, provocative, and much too costly.

Parroting the propaganda line of a potential enemy appears to be an irresistible urge for many Americans who thirst for shortcuts to peace. And in America we like to say that everyone has a right to his or her opinion. There are certain limits, of course. In wartime the right to sympathize with adversary viewpoints is (or should be) sharply curtailed.

But in normal times of relative calm, we like to be more tolerant. Today, for instance, the Soviet view that the United States should scrap its plans for SDI, continue to emasculate its civil defense program and generally weaken its overall preparedness to contend with aggression, finds many supporters in our country. ***Our AEGIS destroyers use "standard" surface to air missiles. These are intermediate range missiles designed to protect coastal areas. They were not designed to protect the interior of our country against ICBMs.**

They are convinced (in the face of historical evidence to the contrary) that real prospects for world peace lie in "understanding" opposing viewpoints, in concessions, in appeasement, and in supporting the objectives of opponents.

It is not difficult for Soviet propaganda to bolster this thinking with attractive (but specious) arguments. It has been crying from the housetops that SDI results in arming space and is therefore dangerous when, in fact, the sole purpose of SDI (its ONLY capability) is to disarm space. The idea that civil defense is useless (without any logical reasons to support the view) is particularly easy to sell. So is, at the same time, the contention that civil defense is provocative. (Propaganda worries very little about contradictions.)

Strangely enough, there is a strong intellectual appeal to trusting the assurances of potential enemies. And history is rich with examples of their bloody consequences. Perhaps the most notable example is that of Neville Chamberlain, former British Prime Minister, a "nice guy" by usual standards, who with France's Daladier in 1938 came back from Munich with the Adolph Hitler promise of "peace for our time." Instead of peace it brought about the bloodiest war in history the following year.

The temptation today to grasp at bright-colored straws is greater than ever. Full-scale nuclear war would be by far America's greatest tragedy - as well as that of the entire world. Nuclear disarmament is, as Edward Teller has said, "the noble goal." Defense against nuclear attack, although possible, is difficult.

It is easy to be tempted to believe in the Hitler-like assurances of good intentions, in appeasing the adversary and in focusing attention on more manageable problems. Today's run-of-the-mill politician makes points, pleases his constituents, and gets elected and reelected by supporting the welfare state, adding his weight to the "hand-out" economy and becoming active in pork-barrel bargaining. His basic national security responsibilities seem too remote to merit attention. Money and support for them have little effect on his perceived efficiency and productiveness judged by a public interested in prosperity and the good life now.

This fits in well with a pampered electorate and with those who plot our downfall. As FEMA Director Julius W. Becton, Jr. put it in his FEMA report to Congress, civil defense is low and declining. "Government," he warned, "cannot afford the luxury of ignoring the subject of civil defense, notwithstanding the emotion thereby engendered...The basis of the U.S. civil defense program is that government has a responsibility to protect the lives and property of citizens." ***No such FEMA warnings are currently before the Congress.**

American civil defense, which began as a mediocre program with some promise of serving in the defense of the country, has indeed steadily deteriorated over the past 25 or 30 years.

It was long ago taken out of the Department of Defense - where it belonged, but where it also failed to get proper emphasis.

State and local politicians - sometimes called the "good ole boys" - who manage the infrastructure fall under the influence of the "laissez-faire" national political leadership. They too - with certain notable exceptions - feel no strong urge to contribute to national security.

The temptation, then, of many state and local civil defense directors - or "emergency management directors" as most of them are now called - is to follow the lead of those upon whom they depend for budgets and salaries and jobs. The overwhelming tendency is to restrict concern for public safety to the more manageable recurrent smaller disasters (which of course also need attention) such as chemical spills, storms, earthquakes, major accidents, and the like. It's easier that way, it "plays ball" with the bosses, and it produces pleasant publicity.

In World War I and World War II we were able to pay the tragic price of unpreparedness by using the buffer of our allies and the sacrifice of legions of green servicemen while we gathered our forces, trained them, and put them into battle over a period of many months. With nuclear weapons now poised to impact 30 minutes or less on targets, no such period of grace will accompany World War III.

Were full-scale nuclear war to break out today the deterioration of our defenses and our failure to develop properly known technologies would be responsible for our defeat, for wholesale American deaths - more than half our population. ***It is our belief that with our current dependency on solid state technology, the EMP accompanying such an attack would result in the loss of close to 90% of our population within one year.**

Or this failure would be responsible for blackmail and surrender without war but with the end of America and its freedoms. "The American Dream" would be buried for all time.

There is one group in particular that is in a unique position to recognize these facts and to realize that ignoring the warnings and failing to take known steps to defend the country and its people will prove to be fatal. That group is composed of disaster preparedness professionals whose training and responsibilities have made it crystal clear to them that homeland defense-civil defense and strategic defense - has become the most important factor in the survival of the nation.

Granted that the achievement of credible preparedness is difficult - so was the winning of the West.

For some members of this group across the nation, in possession of the knowledge of what will save America, to turn their backs on national preparedness and national survival, to ridicule it and to cater exclusively to the simpler tasks of smaller more easily managed disasters is indeed to render invaluable service to our potential enemies.

An emergency manager involved in such a fiasco may claim he is only following the policy laid down by his political superiors. No matter. It is his duty to advise his political superiors of the facts of national defense, of its necessity, and of the consequences of its neglect. If he does not, then he deserves to be called a "cop-out commando." Perhaps that is too gentle a term.

(By Walter Murphey; previously published: February 1987, Vol. XX, I-1)

*As the following quote from the cover of the February 1972 issue of Civil Defense (also the August 1985 issue) illustrates, the Soviet Union embraces passionately the concept of missile defense (SDI) for itself - as it does civil defense. It is understandable that Gorbachev (***now Putin**) and Company do not want either for the United States, and they work diligently to undermine both in the West. The Soviets are interested in Soviet survival. Not American.*

"I believe that defensive systems, which prevent attack, are not the cause of the arms race, but constitute a factor preventing the death of people. Some argue like this: What is cheaper, to have offensive weapons which can destroy towns and whole states or to have defensive weapons which can prevent this destruction? At present the theory is currently somewhere that the system which is cheaper should be developed. Such so-called-theoreticians argue as to the cost of killing a man - $500,000 or $100,000. Maybe an anti-missile system is more expensive than an offensive system, but it is designed not to kill people but to preserve human lives." - Alexei N. Kosygin, Premier, USSR

Q & A

Radiation Questions

By Sharon Packer, MS Nuclear Engineering

QUESTION FROM A TACDA MEMBER:

I want to buy a dosimeter and the charging station, but I have a question first:

- Are rad and rem the same?
- How many rad is safe to receive before entering a fallout shelter?
- How many rad per day is safe inside a fallout shelter?
- When leaving a shelter for short periods, how many rad is safe before getting back into the shelter?
- How long must I stay in the shelter after a nuclear event?

ANSWER:

The rad is a measure of the "radiation absorbed dose". Our dosimeters and radiation meters show rad measurements. Civil Defense charts of radiation levels are usually given in rad. Good estimates of radiation levels can be made to predict levels of radiation sickness or "acute radiation syndrome (ARS)". Please see the "Penalty Chart", below.

RADIATION PENALTY CHART
Accumulated Exposure (rad)

	1 week	1 month	4 months
Medical Care Not Needed	150	200	300
Some Need Medical Care	250	350	500
Most Need Medical Care More than 50% Deaths	450	600	*

The rem (Roentgen equivalent man) represents the "biological risk" from ionizing radiation, which is primarily "the risk of contracting cancer from radiation exposure". These levels vary from person to person. There is no good conversion constant in measuring rem from rad, and for civil defense purposes, we consider them to be the same; they are often used interchangeably.

It is difficult to say what a safe level is in the circumstances you have proposed. Children are more susceptible than adults, and the sick, old, and frail will need more protection than a healthy adult.

Acceptable levels during war time will be much greater than those set during peace time. Occupational Radiation exposures set by the Department of Energy (DOE) have developed a pamphlet as part of the Health, Safety, and Security (HSS) outreach and can be found on the DOE website. The federal occupational limit has been set at 5,000 millirems (mrem) per year. An mrem is one-thousandth of a rem. That 5,000 mrem dose is equivalent to a dose of 5 rem per year. In a nuclear event, however, charts developed by the Federal Emergency Management Association (FEMA) would indicate that 150 rad in a week will, most likely, not result in the need for medical care.

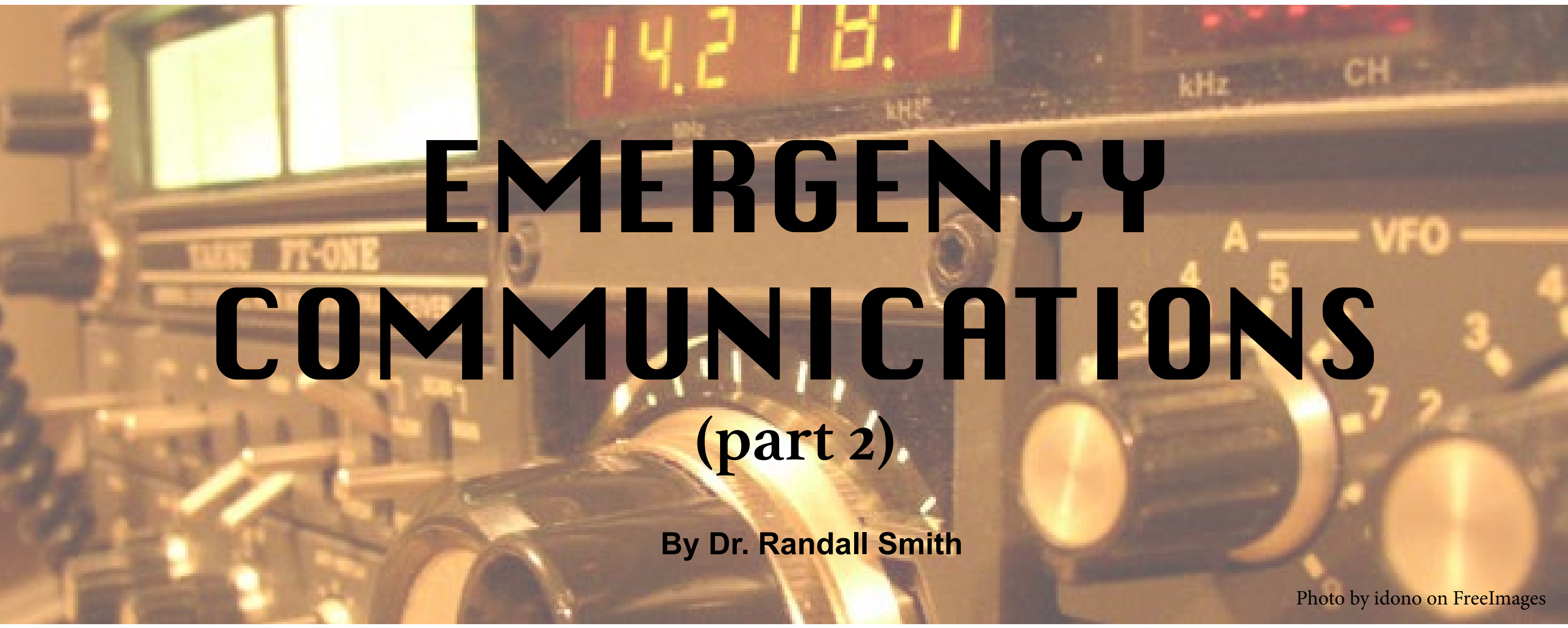
I would feel safe to leave my shelter for a short period at 1 rad per hour. However, if I had accumulated significant levels at an earlier time, I may decide to limit my stay outdoors to a few minutes. The important measure is the "accumulated dose" over a period of time. The penalty chart shows accumulated doses for one week's time.

Radiation meters measure radiation levels at an exact moment (similar to your vehicle's speedometer). Dosimeters measure accumulated doses (comparative to your vehicle's odometer). I like "dosimeters" better than "radi ation meters" because they do not need calibration. They just need to be kept charged.

During a nuclear event, you will need to carefully monitor your accumulated daily dosage. Keep a record of dosage, and then charge and reset the dosimeter for the next day. If you get a large amount in one day, limit your exposure during the next days.

Radiation decays quite quickly during the first days after an event. If there is a limited attack, after seven hours you should see a 90% decrease in levels. After two days, you should see another 90% decrease; after two weeks, you should see another 90% decrease in levels. You should stay in your sheltered area for the first two weeks. You may, however, need to go out for short periods to empty chemical toilets or for other emergency chores before that time. But, if possible, wait a couple of days to do so. Always wear your dosimeter and keep track of your accumulated rads. Each person should have their own dosimeter and chart.

Sharon Packer has a Bachelor's degree in Mathematics with a minor in Physics, and a Master's degree in Nuclear Engineering. She has served on the TACDA board of directors for over 20 years in several different capacities. Sharon is an expert in civil defense and in NBC shelter design.



EMERGENCY COMMUNICATIONS
(part 2)

By Dr. Randall Smith

Photo by idono on FreeImages

This is the second in a series of articles that will be published in the Journal of Civil Defense. If you have not studied part one of this article, please refer to the 2021 fall issue, "The Threat of EMP", page 30. The complete series of articles will be available to you in April 2022, in the TACDA Academy on tacda.org.

COMPONENTS OF ELECTRICAL COMMUNICATIONS SYSTEMS

There are three basic types of electronic equipment required in order to build an amateur - or any other type of - radio station. These include:

1. Radios (transceivers): devices which includes both a transmitter and a receiver in one enclosure.
2. Power supplies.
3. Antennae.

In this article, we will discuss the first of these components: radios. We will cover power supplies and antennae in coming articles.

RADIO TRANSMITTERS AND RECEIVERS (TRANSCEIVERS)

Amateur radio transceivers may assume many sizes, shapes, and configurations. These range from very small, hand-held units with short antennae to the largest radios intended for use in your (typically) home radio or base station. Between these two sizes of transceivers are mobile radios intended to provide communication capability in vehicles. Some mobile units can also double as base station radios when connected to a suitable power supply. Generally, as a radio's size increases, so does its output power. A transmitter's output power is expressed in watts (W). Low-powered, hand-held and Citizens Band radios typically produce from .5-10 watts of output power. Amateur radio operators are permitted to generate signals up to and including 1,500 watts. A typical AM, FM, or television station may produce anywhere from 5,000 to 500,000 watts of signal power.

A fundamental unit of measurement used when discussing any type of radio equipment is the frequency or frequencies on which it operates. Frequency is the rate at which a radio signal is generated by a transceiver and radiated by its antenna. The basic unit of frequency is the Hertz (Hz), named in honor of Heinrich Hertz, an early pioneer in radio technology. One Hz is equal to one cycle per second. For example, a radio signal with a frequency of 1000 Hz vibrates or oscillates electro-magnetically 1000 times per second. A kilohertz (kHz) is equal to 1000 Hz. If the signal oscillates one million times per second, this expression can be reduced to one megahertz (MHz).

Most are familiar with the tuning dials or displays on automobile, home, or portable radios capable of receiving both AM (amplitude modulated) and FM (frequency modulated) radio station broadcasts. AM dials typically begin at the number 55 and end at the number 160. The 55 and 160 on the dial are merely shorthand versions of the full expressions: 550 kHz and 1600 kHz. AM radio signals, therefore, oscillate at frequencies from 550,000 to 1,600,000 cycles per second. Note that this can also be expressed as .55 MHz through 1.6 MHz. In the United States, FM radio broadcasts are found between 88 MHz and 108 MHz. These signals, then, oscillate 88 to 108 million times per second as they broadcast intelligence (voice, music, etc.) from transmitter to receiver via the antennae attached to each radio.

RADIO BANDS

Groups of radio signals are often referred to as "bands". The band length (usually measured in meters) is the distance (crest to crest) between that signal's wavelength. To provide a frame of reference, healthy human ears can detect sounds from about 20 Hz to 20 kHz. The low frequency (LF) radio band begins at 30 kHz and ends at 300 kHz. Medium frequency (MF) radio bands are found between 300 kHz and 3 MHz. The high frequency (HF) band extends from 3 MHz to 30 MHz. The HFs between 7.0 and 7.1 MHz are called the 40-meter band, which is one of the favorites of ham operators. The HF 80-meter band is very reliable and tends to be less subject to variations in the sunspot cycle. Next is the very high frequency band (VHF) which covers frequencies between 30 MHz and 300 MHz. We call the VHF frequencies between 144 and 148 MHz the 2-meter band. The 2-meter VHF band is very popular for emergency communications. The ultra-high frequency band (UHF) has a frequency range from 300 MHz through 3000 MHz.

Licensed amateur radio operators have operating privileges in the following frequency ranges: 135.7-137.8 kHz; 472-479 kHz; 1.8-2.0 MHz; 3.5-4.0 MHz (app. 80-meter band); 7.0-7.4 MHz (app. 40-meter band); 10.1-10.150 MHz; 14-14.350 MHz; 18.068-18.168 MHz; 21-21.450 MHz; 28-28.7 MHz; 50-54 MHz; 144-148 MHz (2-meter band); 222-225 MHz; 420-450 MHz; 902-928 MHz; and 1240-1300 MHz. There are also frequency privileges that range from 2300 MHz through 81 GHz (gigahertz) or 81 billion cycles per second.

As you can see, licensed amateur radio operators have more frequency privileges in more bands than any other class of license offered by the Federal Communications Commission.

HANDI-TALKIES

Popular hand-held radios (handi-talkies, walkie-talkies) generally cover the VHF, UHF, or both bands (VHF/UHF or V/UHF). For example, the popular Baofeng UV-5R series of radios transmits and receives between 136 and 174 MHz as well as 400 and 520 MHz. Their output power is approximately 4-watts - comparable to Citizens Band radios - and they sell for about $35. A more powerful version is the BF-F8HP with an output power of about 8-watts and a price tag around $65. In smaller communities, these radios can sometimes serve as scanners to receive public safety (e.g. law enforcement, fire, EMS, Civil Defense) communications. Note that the 144-148 MHz and 420-450 MHz amateur radio bands fall within these radios' operating range. These radios are particularly useful for family, group, and tactical communications. Other brands are similar. A review of offerings on e-Bay provides a good idea of popular, alternative brands and pricing. These radios typically use relatively short antennae, ranging in size from about 4 to 17 inches in length.

SKIP WAVES

Radio waves propagate (or travel) from one point to another, or into various parts of the atmosphere. HF bands such as the 40- to 80-meter bands, can be bounced off the ionosphere (an electrically charged layer of the upper atmosphere) and reflected back to earth. This phenomenon is called the "Skip Wave" (or "Sky Wave"). This phenomenon permits radio communications over great distances - from hundreds to thousands of miles - often achieved with surprisingly low power levels. Higher frequencies pass through the ionosphere and continue their journey into space.

The use of higher frequencies permits signals to reach orbiting amateur radio or military satellites. Some amateur radio operators are able to bounce and retrieve signals that they direct at our moon called, not surprisingly, "moon bounce" communication.

The paths of travel for frequencies above roughly 50-60 MHz are called line-of-sight; that is, they tend to travel in a straight line much like the beam of light from a flashlight (unless reflected by buildings or other solid objects). They are not reflected earthward by the ionosphere. Therefore, these VHF and UHF frequencies have a shorter over-the-horizon range than their lower-frequency counterparts. The coverage area of VHF and UHF radios can be extended through the use of repeaters (discussed in a later lesson).

All hand-held and mobile transceivers considered acceptable for Civil Defense emergency communications share the following characteristics:

1. They are small, lightweight, portable, and readily accessible.
2. Operation is intuitive; that is, they are easy to learn and use.
3. They tend to be much less expensive than their larger, base station counterparts.
4. While they tend to be low in output power, they are also low in power consumption.
5. They operate over a wide frequency range.
6. They have functions required for use with amateur radio repeaters.
7. Antennae for both hand-held and mobile radios are smaller than those used with base stations.

When purchasing a handi-talkie, consider also purchasing a couple of spare batteries and possibly a mobile charger so that you have fully charged batteries for your radio available at all times.

Please watch for our next journal article where Dr. Smith will discuss "Base Stations", "Antennae Gain", "Mobile Transceivers", and "Scanners".

Dr. Randall Smith has held an FCC license since 1984. He has served as a radio operator in the U.S. Army's Military Affiliate Radio System, and with the IBM Corporation first as a field engineer, then as a systems engineer and finally as a marketing representative. He participated in the construction of the emergency communications portion of the St. Louis Civil Defense Agency's underground emergency command center.

Photo by Andrea Piacquadio on Pexels

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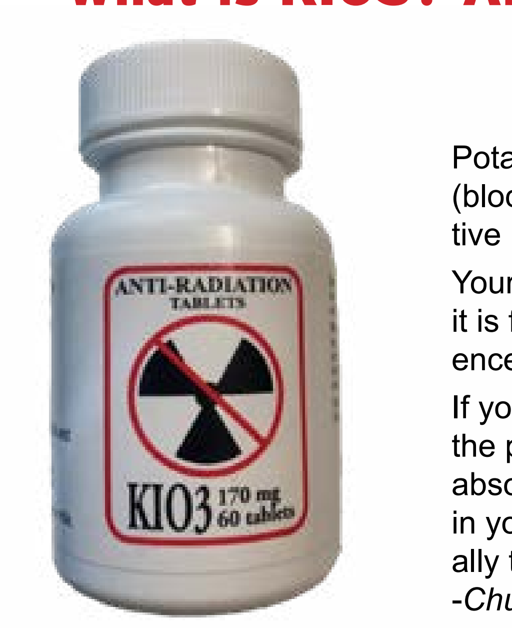
What is KIO3? And why should you store it?



Potassium Iodate (KIO3) 170 mg

Potassium Iodate Anti-Radiation Pills (KIO3) will shield (block) the thyroid and prevent it from absorbing radioactive iodine during a nuclear emergency.

Your thyroid runs on iodine and will absorb all it can until it is full. However, your thyroid does not know the difference between good iodine and bad iodine.

If you are caught downwind from a nuclear reaction and the plume or cloud of fallout reahes you, your thyroid will absorb the bad iodine (I-131). You now have a sunburn in your thyroid, and it is not going to go away. Eventually that sunburn in your thyroid could give you cancer.
-Chuck Fenwick, Medical Corps

For radiation that is not immediately lethal, Potassium Iodate Anti-Radiation Pills (KIO3) will shield (block) the thryoid and prevent it from absorbing radioactive iodine during a nuclear emergency. Each tablet contains 170 mg potassium iodate. 60 tablets to a bottle.

Keep them stocked in your 72-hr kit! KIO3 has a long shelf life when stored in a cool, dry place.

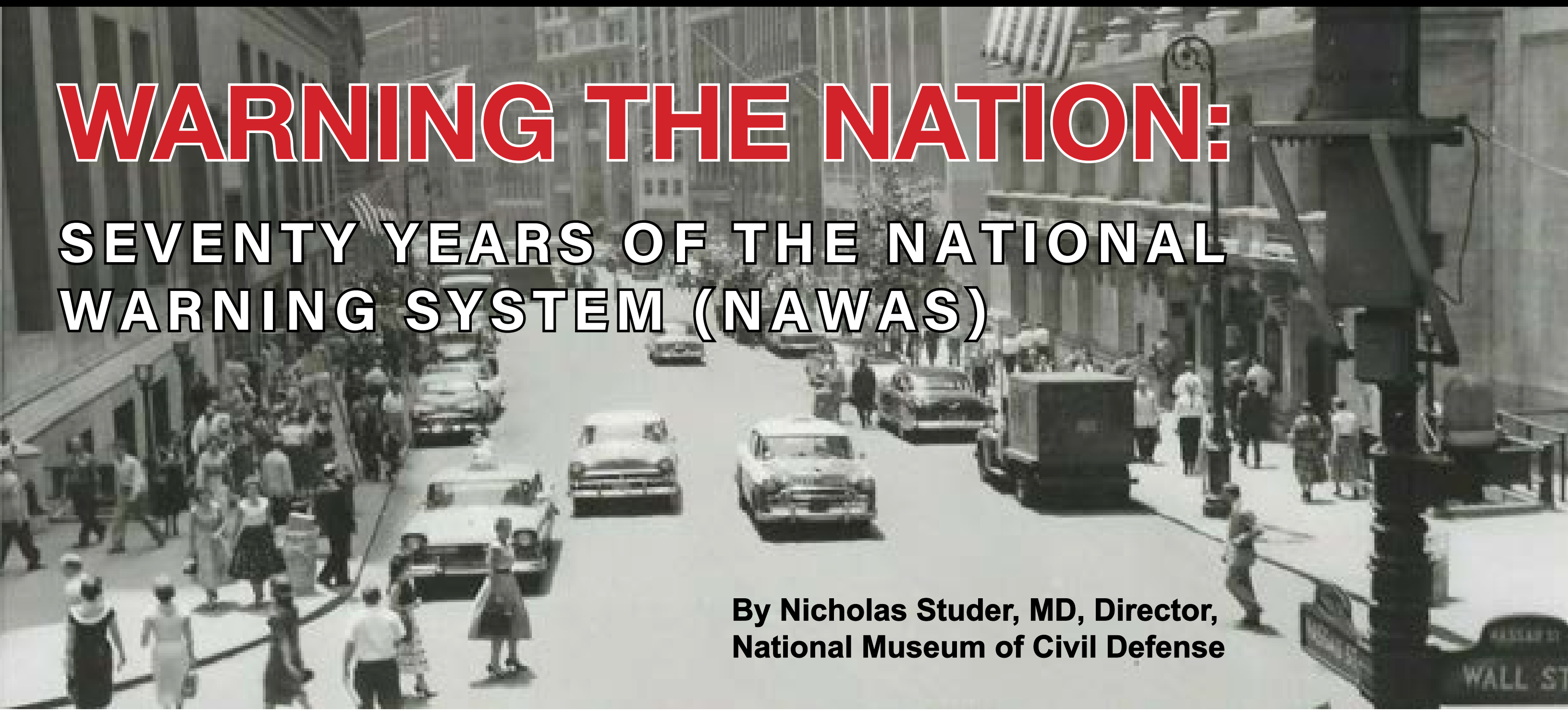
Buy Now! https://tacda.org/product/potassium-iodate-kio3-170mg/

HISTORY OF CIVIL DEFENSE COLUMN

WARNING THE NATION:

SEVENTY YEARS OF THE NATIONAL WARNING SYSTEM (NAWAS)

By Nicholas Studer, MD, Director, National Museum of Civil Defense



"Looking down Broad Street from Nassau and Wall, you see pedestrians hurrying along to air raid shelters before 'Operation Alert - 1957' sounded at 1:45 pm EDT."

> *"This is the FEMA Operations Center with an attack warning notification for all stations. Stations should immediately activate local warning systems and advise residents to take cover and remain alert for further instructions. Consider implementing sheltering in place plans and protective measures."*

Perhaps one of the most essential tasks of civil defense programs is Alert and Warning of senior leaders, state and local government, and the general public to hazards such as attack or natural disasters.

CIVIL AIR DEFENSE WARNING SYSTEM

By 1952, the newly formed Federal Civil Defense Administration (FCDA) assumed control of a system of warning transmissions from sixteen U.S. Air Force Air Defense Control Centers to what started as 174 key point centers. Known as the Civil Air Defense Warning System (CADW), the system consisted of leased private telephone circuits from Bell System, with expectation of warning receipt at each key point within two minutes of being issued by the Air Force.[1]

The flaw in this system could be found after the key point had received warning, with the FCDA expecting that state and local authorities would develop effective plans to advance the warning to target areas, and from there to the public. Typical of almost all FCDA efforts, even warning was seen as a shared federal/state responsibility. This decentralized approach resulted in varying success of the total "Attack Warning System" with the CADW equipment fully funded by federal monies and state/local programs eligible for matching funds only. By 1954, FCDA promised that the attack warning would be received by every end point within 15 minutes, adequate when a minimum of one hour's warning of bombers could be expected in coastal areas. In 1954, Pennsylvania installed a statewide "bell and lights warning" throughout six cities in the Southeast (Region III). Others used state police radio, teletype, or telephone to disseminate the message to 3,500 sub-key point centers like police or fire stations, which in turn would be expected to activate outdoor warning sirens or similar equipment to warn the public.[2]

NATIONAL WARNING SYSTEM

During federal fiscal year 1957, FCDA completed the transition from CADW to the National Warning System (NAWAS). NAWAS included a change from sixteen primary warning centers to only three: the National/Central Warning Center at the North American Air Defense

Command (Ent AFB, CO), the Western Warning Center at the Western Continental Air Defense Command Region Headquarters (Hamilton AFB, CA), and the Eastern Warning Center at the Eastern Continental Air Defense Command Region Headquarters (Stewart AFB, NY). Each warning center was primarily responsible for communicating with its assigned area, but if needed, any of the three could transmit messages within the other assigned regions. FCDA also had a central "control net" connecting the warning centers with FCDA Headquarters (Battle Creek, MI) and FCDA Regional Offices. FCDA proudly noted, "The entire federal system consists of full-period, private wire, 2-way circuits which provide a maximum of security and speed of message transmission."[3]

In 1958, NAWAS created a fourth warning center with the central mission being transitioned to the Central NORAD Region Headquarters at Richards-Gebaur AFB, MO. New warning points continued to be added as FCDA and its successor, the Office of Civil & Defense Mobilization (OCDM), planned to increase NAWAS sites in order to improve speed of warning.[4] By 1960, 377 state and other warning points could relay the initial message to over 5,000 local points in seven minutes from time of initial message.[5] In 1961, OCDM added twelve U.S. Coast Guard sites to allow for radio transmission of warning to coastal and inland waterways.[6]

After transition into the Office of Civil Defense (OCD), NAWAS continued to add warning points and adjust its primary warning centers. While the National Warning Center moved into Cheyenne Mountain AFS, CO, alternate facilities expanded yet again in the early 1960s to nine, then contracted again in 1965.[7] The alternates became the then-classified "High Point" at Mount Weather, VA ("Low Point" was FCDA Headquarters at Battle Creek, MI) and first OCD Region 1 in Syracuse, NY and later the OCD Federal Center in Denton, TX. OCD also began studies to ensure facilities with NAWAS lines were sufficiently protected against fallout. With transition from Department of Defense to Department of the Army control in 1964, U.S. Army Strategic Communications Command assumed control of NAWAS operations during 1965. During 1966, the Weather Bureau (later the National Weather Service) was added to NAWAS, with plans to disseminate warning by weather radio.[8] OCD and its successor, the Defense Civil Preparedness Agency, emphasized the role of NAWAS in natural disasters. Indeed, NAWAS was extensively used during the severe October 17, 1989 earthquake in California.[9] NAWAS continued to grow, reaching 986 warning points in mid-1968 (Figure 1) and 1,270 by 1975.[10]

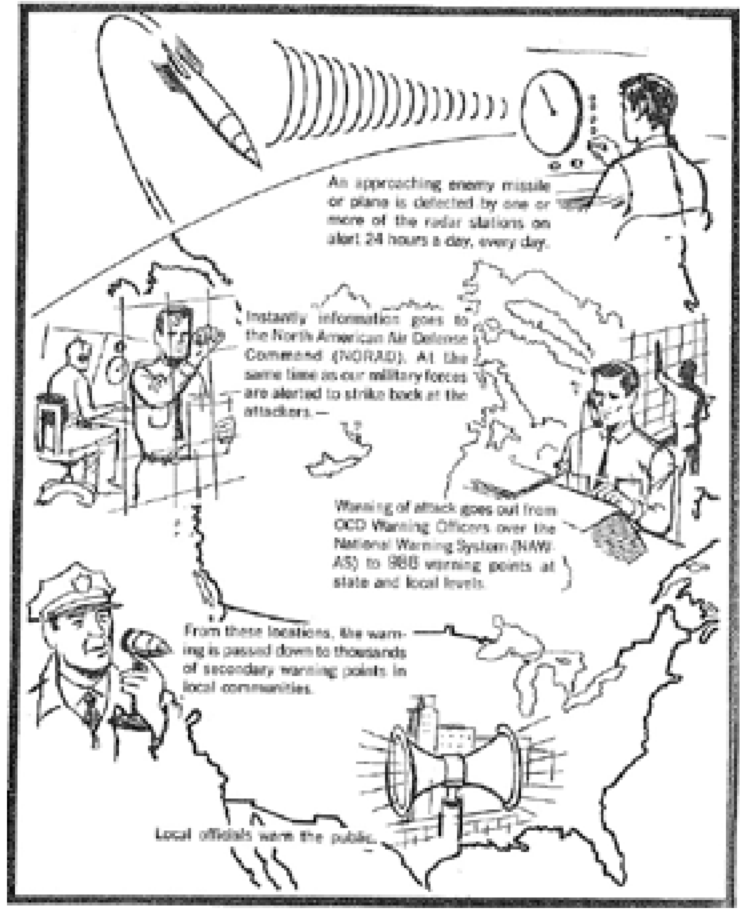


Figure 1. NAWAS diagram

Further upgrades occurred in the early 1990s, with recognition that little had changed since the early 1960s. New 4-wire circuit terminals (Figure 2) from Communications Laboratories (ComLabs) and other modifications enhanced reliability of the system.

Figure 2. ComLabs MCU320N NAWAS Terminal

Today, NAWAS functions in much the same role that it did, with similar procedures and equipment, to seventy years ago. If an attack or other national catastrophe were to occur, NAWAS would be the means that federal authorities would use first to alert the US*. Currently, the system has over 2,000 warning points at federal, state, and local facilities.[11]

Acknowledgments:

The authors would like to thank Mr. Roland Lussier, CEO of ComLabs, for his generosity.

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Dr. Studer is a practicing Emergency Medicine physician and the founding Director of the National Museum of Civil Defense, the only 501(c)(3) nonprofit museum dedicated to the historical preservation and interpretation of the United States Civil Defense program. The terrorist attacks of 9/11 first catalyzed Dr. Studer's interest in the history of our Nation's Civil Defense program, which grew into a desire to share his research with others. He volunteered for the Brevard County (FL) Office of Emergency Management during the early 2000s, and later served at the Florida Department of Health - Bureau of Radiation Control's Radiological Instrument Maintenance & Calibration Laboratory prior to attending medical school at the University of South Florida. Dr. Studer's primary interests within Civil Defense history include the Chemical/Biological Warfare, Radiological Defense, and Packaged Disaster Hospital programs.

Our Vulnerable Breadbasket

By L.B. Baldwin,
written in 1969

Photo by Dan Meyers on Unsplash

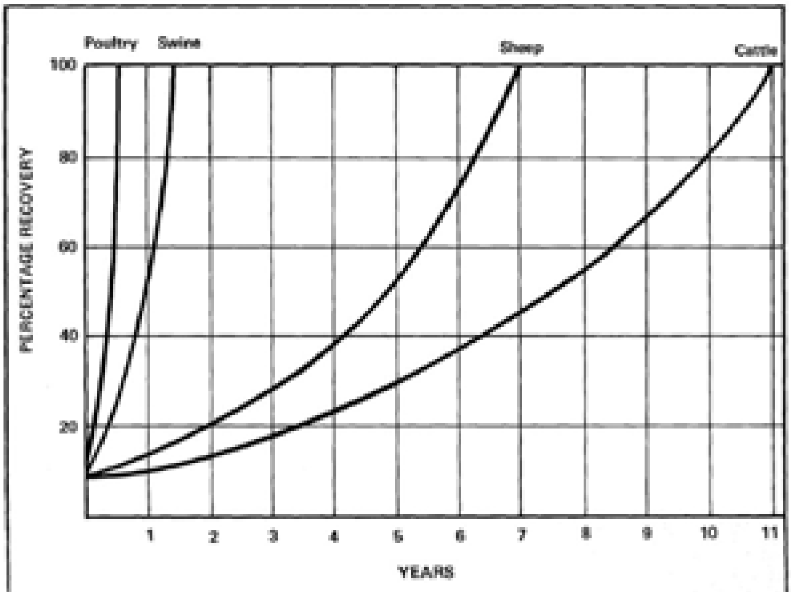
People must eat - particularly nuclear attack survivors. The more numerous the survivors, the greater are the survival and recovery problems in terms of food. Professor L. B. Baldwin, a serious student in both agricultural and nuclear attack fields, throws a revealing light on potential farm production in nuclear post-attack situations.

Livestock tolerance to short-term doses of radiation is quite predictable, as it is with humans. The cumulative dose of gamma radiation received over a period of a few days which would cause death in 50 percent of the irradiated animals is listed below for the more important food animals.

Species	Roentgens
Sheep	350
Swine	450
Cattle	750
Poultry	900

It can be seen from this data that livestock can't tolerate very much more radiation than humans, who have a median lethal dose tolerance of 450 rads. There would be a heavy loss of livestock from fallout following a nuclear attack, and a very substantial portion of the nation's food supply would be curtailed. Presuming a 90 percent loss of female breeding stock, the time required to rebuild the livestock population would be as shown in Figure 1 [right].

It is significant that survival of greater percentages of breeding stock would shorten the rebuilding period sub-



Years Required to Rebuild Livestock Population after 90% Loss of Female Breeding Stock.

Figure 1.

stantially in the cases of sheep and cattle. The survival of cattle, the present most important animal food source, would require more changes in production methods than would be necessary to save swine and poultry. Shelter or prompt decontamination of the immediate environment would be needed, as well as a continuing supply of uncontaminated feed. Further research is needed to develop practical means of decontaminating large land areas for forage crops, as well as for crops to be used for human food.

Livestock serve as a screening agent in the human food chain. Radioactive nuclides ingested while grazing, or from contaminated feeds are not absorbed by livestock to any great degree. Plants grown on contaminated soils will take up only a small percentage of radioactive nuclides, and livestock will absorb only a small portion of the nuclides present in the plant as they utilize these plants for feed. Ingestion of radioactive fallout is damaging to livestock, however, through tissue damage from large quantities of fallout on forage and through longer term cell destruction from strontium isotopes which may be absorbed and utilized in bone growth. Research data is not sufficient to accurately determine levels of feed contamination which can be tolerated by livestock and still not constitute a threat to human health through utilization of animal products for food.

Nuclear attack, and the resultant fallout, would produce an immediate food supply crisis, primarily due to difficulties in harvesting, processing, and transporting available supplies. Many of these difficulties can be overcome by emergency planning and food storage. The long-range problems which must be overcome if famine is to be averted require the knowledge and capability of reestablishing crop acreage and livestock population while at the same time supplying adequate food to the surviving population.

Research and planning must continue toward developing practical methods of restoring food production in an environment contaminated by fallout. In this way recovery from nuclear attack will be accelerated.

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FARM ANIMALS

By Summer A. Griffin,
written in 1984

Photo by Jonathan Borba on Unsplash

Could farm animals be protected from radiation exposures in a nuclear attack?

In the event of a full-scale nuclear attack, highly dangerous levels of fallout could cover large areas of the country, including much of the farmland and grazing areas. Without a practical means for protecting farm animals and reducing their radiation exposures, heavy losses would occur.

Most grazing livestock are located away from the target areas and would not be exposed to initial nuclear radiation (this consists of the neutrons and gamma rays released almost instantaneously at the time of the burst). Livestock could be exposed to the beta and gamma radiation from fallout downwind from surface bursts. Fallout radiation from air bursts or from worldwide fallout would have only minor effects on livestock.

While specialized structures for protection of livestock from fallout do not seem feasible under present conditions, the utilization of existing structures can provide significant differences in numbers of livestock that would be lost during a nuclear attack.

A cooperative study by the Oak Ridge National Laboratory and the Tennessee Office of the Statistical Reporting Service of the U.S. Department of Agriculture involving two surveys was done in Tennessee to determine what facilities and feed reserves were present on farms (Griffin, 1968; Griffin, 1969a; Griffin, 1969b; Griffin, Bressee and Shinn, 1969). In one survey the number of barns per farm was found to be 1.47, and in the other, 1.85. This indicated that 70 to 80 percent of all cattle could be sheltered indoors. Feed reserves ranging from 70 to 99 days were present, depending on the time of year. Radiation protection factors (PFs) were calculated according to the procedures and supporting data in the Rural Shelter Handbook (Texas A & M, undated). The average PF for the buildings reported in the survey was 1.8. This PF was a minimum value which did not consider ground roughness or the mutual shielding of animals by other animals in the barn. If these additional factors had been taken into account, the calculated PFs could have doubled or tripled.

The value of a PF of 1.8 for cattle under an assumed hypothetical attack of about 3,500 megatons was determined. It was assumed that a gamma radiation exposure of about 550 roentgens over the first four-day period following a nuclear attack would kill about one-half of the cattle so exposed. Using this mid-lethal value of 550 roentgens, it was estimated that 33 percent of the Tennessee cattle would have died by the end of thirty days. When the PF was assumed to be unity (no protection), 60 percent of the animals were calculated to have received lethal exposures.

If farmers have adequate lead time before the arrival of fallout, livestock should be placed in whatever shelter is available. In this situation lactating dairy animals should have first priority for shelter and for feeds that had not been contaminated by fallout. This would minimize


Photo by Oleksandra Bardash on Unsplash

intake of radioisotopes of iodine that are readily accumulated in the milk (Bell and Blake, 1976).

In summary, in the event of a nuclear attack, efforts to protect farm animals could have a high pay off. Due to the rapid decay of early fallout radioactivity, even a few days of minimum protection could make a significant difference between their death and survival.

Would the meat from animals exposed to ionizing radiation resulting from a nuclear attack be safe for human consumption?

In assessing the utility of meat for human consumption from animals exposed to radiation it is useful to look at two different situations:

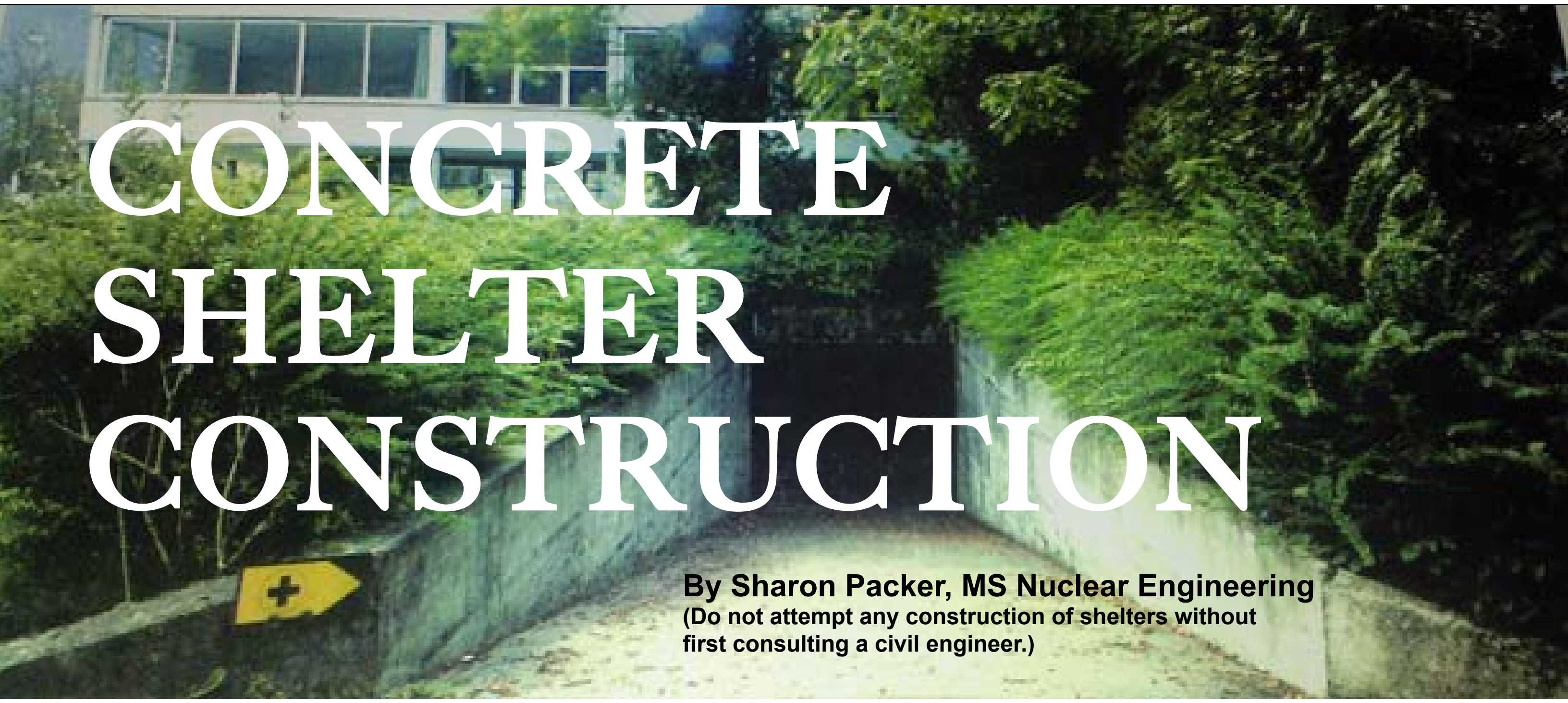
1. The animals receive little or no exposure and signs of radiation sickness do not occur. In this case, the only questions about use of the meat would be those that apply in any other situation such as: Are the animals healthy? Is there adequate refrigeration to preserve the meat?
2. The animals have been exposed to heavy doses of fallout radiation, they show signs of radiation sickness, and their survivability may be in doubt.

Research with laboratory animals exposed to gamma, neutron, gamma plus neutron, or x radiation indicates that the animal exposed to lethal doses of whole body radiation may develop bacteremia (bacterial invasion of the circulatory system). If this occurred in meat animals it could severely limit their use for human consumption. However, in research at Oak Ridge with pigs and beef cattle, bacteremia did not occur as it had in the laboratory animals (Griffin and Eisele, 1971; Eisele and Griffin, 1969; Eisele and Griffin, 1970; Eisele and Bell, 1973).

In the Oak Ridge studies, pigs that had been exposed to gamma radiation and that showed symptoms of radiation sickness were slaughtered. Samples of blood, liver, lymph, heart, and muscle did not show bacterial invasions. The cattle that were irradiated showed some slight bacterial presence. However, this occurred in both the controls and the cattle showing radiation sickness. Bacteremia was not indicated.

Use of the meat from animals that had died from radiation exposures is not recommended. This is because: (1) the animals would not have been bled; (2) there would be uncertainty about how long they had been dead; and (3) it is well known that bacterial activity expands very rapidly in a dead animal.

Editor's note: Radioactive strontium will possibly go to the bones of the animals; therefore, meat should be stripped from bones before cooking. Organs also should not be consumed.



CONCRETE SHELTER CONSTRUCTION

By Sharon Packer, MS Nuclear Engineering

(Do not attempt any construction of shelters without first consulting a civil engineer.)

Thermal	Radiation	Initial Radiation	Blast	Chemical/Biological
Excellent	Excellent	Poor	Good	Excellent

All specifications for concrete shelter construction in this article are made according to the directives of the Swiss Federal Office of Civil Defense. The Swiss use concrete, exclusively, for their public shelters. Public concrete shelters in Switzerland are built to two overpressure standards: 15 pounds per square inch (psi) for home shelters and 45 psi for public shelters.

Shelters should be built to withstand as many threats as practically possible. People living well away from blast targets should still build to the minimum 15-psi standard in order to properly shield against fallout radiation. Eight inches of concrete on the roof of a shelter will NOT provide adequate shielding from the radiation levels resulting from a full-scale nuclear attack in the United States — regardless of location. There are no safe areas! Nuclear attack is not the only reason to build a shelter. Areas of large earthquake or tsunami potential require shelters built to the 45-psi standard.

SPACE REQUIREMENTS

- Each individual must have a minimum of 11 sq. ft. of floor space and 88 cu. ft. of free air space.
- Each shelter must have a minimum of 60 sq. ft. with minimum headroom of 6 ft. 6 in.
- Each air lock must have between 25 and 54 sq. ft. of floor space.

Do not use brittle material such as tile or plaster on interior floors or walls.

AIRLOCKS

Airlocks are interim rooms designed to allow access from the shelter living area to the outside, without contaminating the air for those remaining inside the shelter. All public shelters in Switzerland incorporate airlocks into their shelters.

Airlocks should have two gas-tight doors, which are never to be opened at the same time. One door is the main entrance door from the outside, and the other door leads from the air lock to the shelter. This assures protection of the interior shelter room from radiation, blast pressure, and war gasses. People entering the air lock from the outside must close the outside door and stay in a closed-down condition until the air of the air lock has been purged three times. It is easier and faster to purge a small air lock than a large one, and the area of the airlock should be kept between 27 and 54 sq. ft. Filtered air from the shelter room should be exhausted through a blast valve into the air lock. The air from the airlock should be exhausted through another blast valve to the outside.

The air lock, in small shelters, can also act as the decontamination room. The decontamination room serves as a cleaning and dressing room for people contaminated by poison gas or radioactive dust. The decontamination room should be used to store protective clothing and gas masks, which must be worn at all times by persons leaving the shelter. In larger shelters, the decontamination room should have a shower and toilet area built into the room. For shelters housing more than 100 persons, the decontamination room should be a separate room, having direct access to the airlock.

The airlock and decontamination rooms should be constructed of the same thicknesses of concrete and same protection levels as prescribed for the shelter room.

ENTRANCEWAYS

The outside entranceway for concrete shelters is a protected, open area leading to the shelter entrance. It is usually a partially covered ramp or staircase leading down to the door of the shelter. One purpose of the entranceway is to keep debris away from the door. Ideally, the entranceway should lead to the air lock door, and access to the shelter should come from inside the air lock.

Entranceways (no airlock): When the exterior shelter wall is less than 16-inches thick, and there is no airlock, the protection against radiation must be improved by a reinforced concrete passageway leading to the shelter entrance door. The wall and roof elements of the passageway must be at least 8 inches thick, and the length of the passageway must be at least four times the width (a 4-ft wide entranceway must be 24 feet long). The door to the shelter must be perpendicular to the direction of the entranceway.

Entranceways (with airlock): The entranceway to an airlock should be at least 6 feet long and the door to the shelter should be perpendicular to the direction of the entranceway. If there is no entranceway, an 8-inch-thick, 4 x 6 ft. reinforced concrete debris guard must cantilever over the shelter door. (See figure 2-5 below.)*

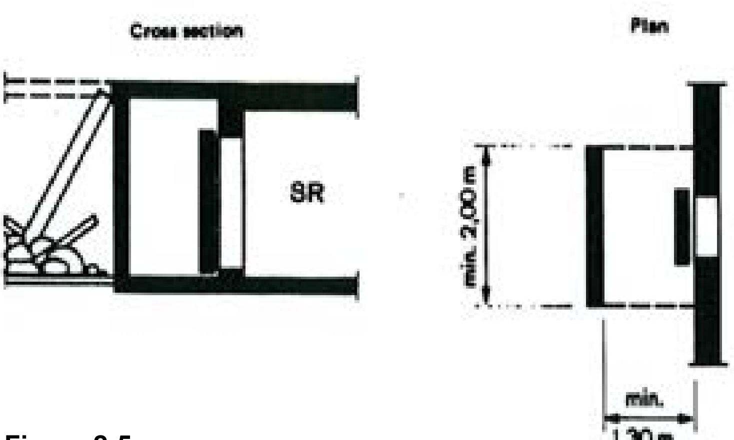


Figure 2-5

DOORS

The entrance door must act as an adequate radiation barrier since even a closed door represents a weak spot in the shelter. Vertical 'walk-in' type entrance doors should be constructed of 8-inch-thick frames filled with concrete. Entrance doors to the shelter and/or air lock must open outward. The positive phase blast protection comes from the door resting against the massive frame that has been poured into the shelter wall. As the positive pressure phase passes over the shelter, a negative phase pulls at the door. The locking mechanism must be able to withstand the 5-psi negative phase pressure. Never use inward opening doors on the exterior of the shelter. Inward opening doors cannot withstand the positive pressure phase and will experience failure. Small (24" x 32" max) emergency exit doors, if placed at the bottom of an escape shaft for blast protection, should open inward. Interior doors may open either direction.

EMERGENCY EXITS

All shelters must be designed with an emergency escape exit. There are several acceptable designs for emergency exits, but escape tunnels are the most effective means for escape without outside help. Corrugated steel is significantly less expensive than concrete and, in some situations, can be used in place of concrete for the construction of the escape tunnels.

Option 1: The horizontal length of the escape tunnel must be a minimum of one-half the height of the building (measured from ground level to height of eaves). The tunnel should have a minimum diameter of 36 inches (or a minimum rectangular area of 7 sq. ft.). The tunnel should slope away from the shelter with a minimum grade of 1% and a maximum grade of 15%. The tunnel must have an 8-inch-thick concrete door on the wall opening at the shelter end. The door must open to the inside of the shelter. The vertical shaft must have a pressure resistant cover at the top. The vertical shaft must be open at the bottom to allow for drainage. Embedded rungs or a fixed metal ladder must be placed at one-foot intervals for all shafts over 5 ft. high. If the shaft rises more than 15 ft., intermediate landings should be built, and the cross section must be increased to 2 ft. 8 in. by 4 ft. (See figure 2-18, next page.)

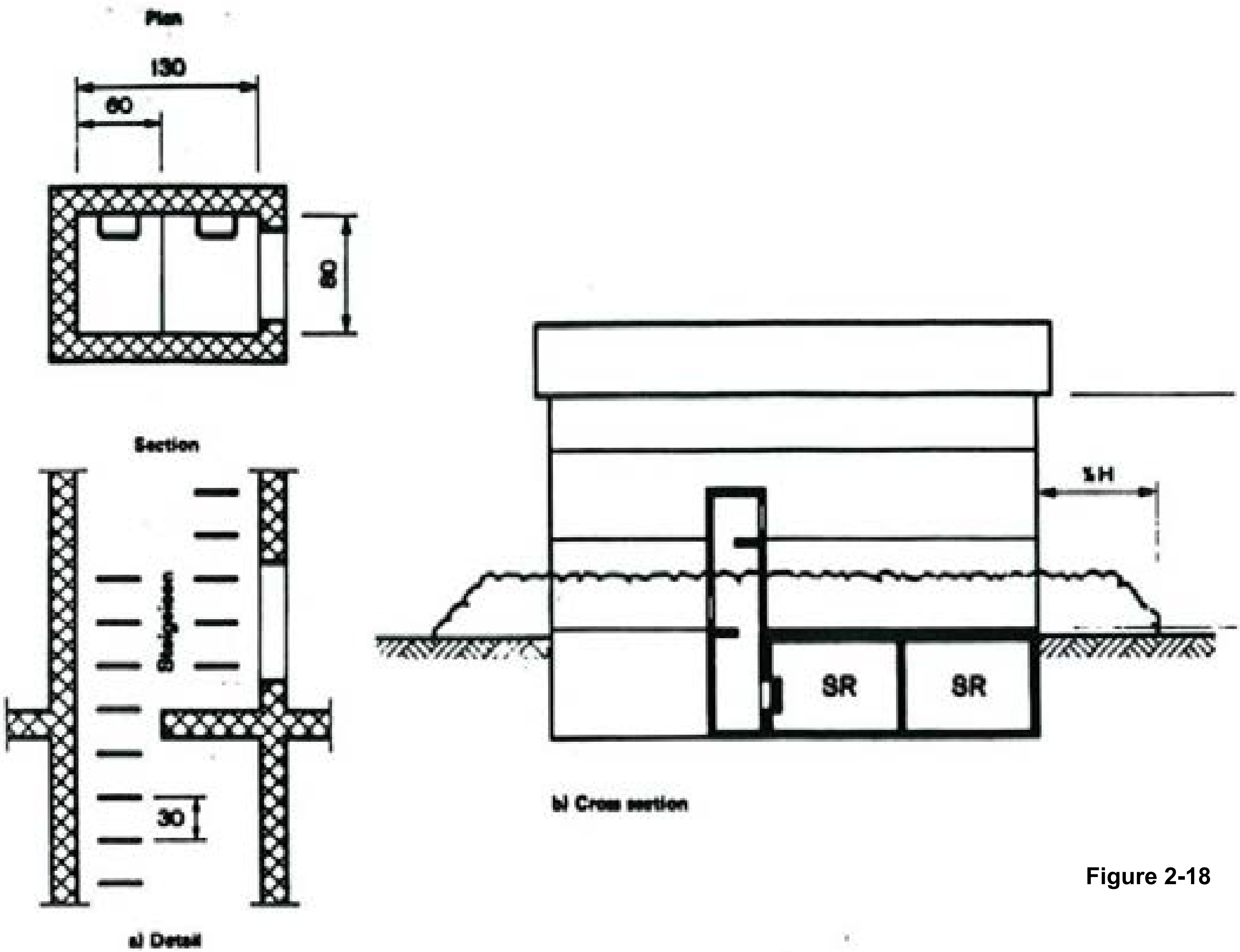


Figure 2-18

<u>Option 2</u>: The concrete door at the shelter end of the tunnel may be eliminated if the tunnel diameter is no more than 48 inches and the length of the tunnel plus the length of the vertical shaft is a minimum of 22 ft. (in order to clear the debris field, the length of the horizontal run of the tunnel must still be at least one-half the height of the building). A steel, blast proof door must be placed at the top of the vertical shaft. The blast door at the top of the shaft must open to the outside and be equipped with an emergency jack in case debris covers the door. This alternate design must also include an exhaust pipe under the door, near the top of the shaft, with a blast valve attached to the inside of the vertical shaft. (See figure 2-8(b) right.)

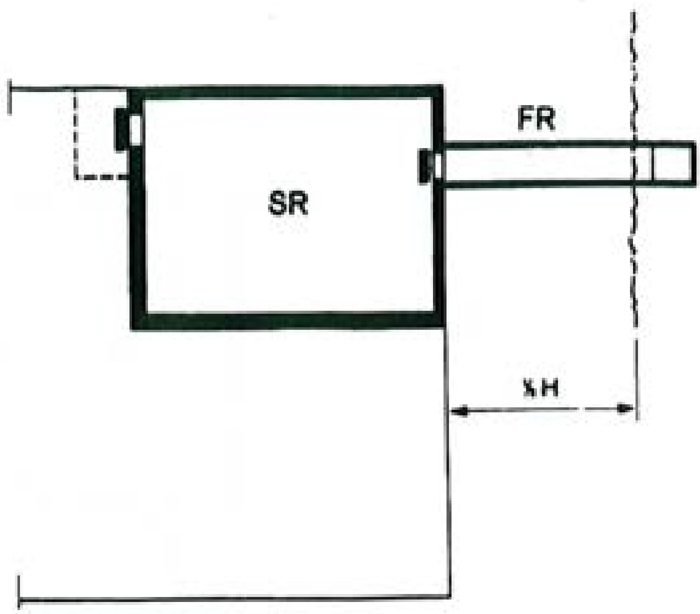


Figure 2-8(b)

THICKNESS OF CONCRETE FOR ROOF SLABS

Roof slabs (not under building):

Earth cover	Concrete (15 psi)	Concrete (45 psi)
0”	22”	34”
12”	14”	26”
20”	12”	20”

(See figure 3-1(b) below.)

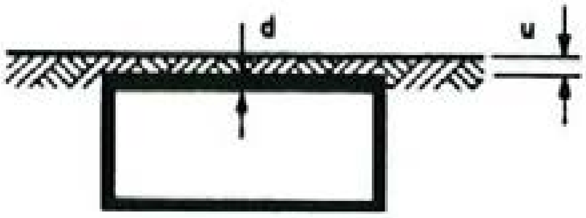


Figure 3-1(b)

Roof slabs (under building):

	Concrete (15 psi)	Concrete (45 psi)
Single story	22”	22”
Multi-story	14”	14”

(See figure 3-1(c) below.)

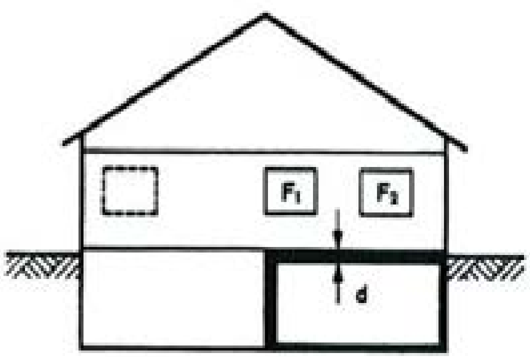


Figure 3-1(c)

When the room above the shelter has windows and doors involving more than 50% of the wall area, the above roof slab thicknesses should be increased by 2 in.

THICKNESS OF CONCRETE FOR WALL SLABS

Thickness of interior shelter walls adjacent to an open basement room:

Concrete (15 psi)	Concrete (45 psi)
20”	26”

(See figure 3-1(d) top right.)

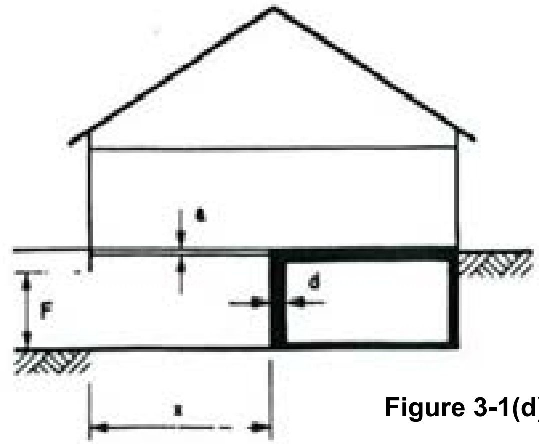


Figure 3-1(d)

Thickness of exterior shelter walls completely underground:

Concrete (15 psi)	Concrete (45 psi)
10”	10”

(See figure 3-1(d_1) below.)

Figure 3-1(d_1)

Thickness of exterior shelter walls partially underground (ground surface not more than 2 ft. below the underside of the shelter roof slab):

Concrete (15 psi)	Concrete (45 psi)
20”	28”

(See figure 3-1(d_2) below.)

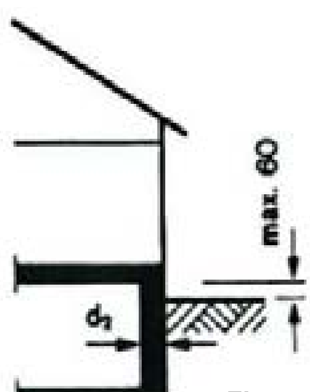


Figure 3-1(d_2)

Thickness of above-ground shelters and uncovered walls (ground surface more than 2 ft. below the shelter roof slab):

Concrete (15 psi)	Concrete (45 psi)
32"	48"

(See figure 3-1(d_3) below.)

Figure 3-1(d_3)

STEEL REINFORCEMENT

All walls and roof slabs must have a minimum of two curtains of reinforcement steel rebar. This minimum reinforcement should be at least 0.2% of the concrete cross section, with the exception of the undersurface of the floor. All rebar must overlap on the earth side of the wall by one inch and on the building interior side by ½ inch. For further details, see page 37 of "TECHNICAL DIRECTIVES for the CONSTRUCTION of PRIVATE AIR RAID SHELTERS", for sale on tacda.org.

ABOVE-GROUND CONCRETE SHELTERS

High water tables, permafrost, rock, and other such conditions may dictate the construction of an above-ground concrete shelter (AGCS). The walls and ceilings of above-ground shelters must be thicker to compensate for the radiation attenuating factors of the soil cover in below-ground shelters.

Rain occurring shortly after fallout begins will wash early fallout from the troposphere and cause higher levels of radiation to be deposited in the direct vicinity. Choose a location for your shelter that will allow the drainage of rainwater away from the outside walls. It is advantageous to add a sloped concrete apron near the bottom of all outside walls. If possible, slope the roof of the shelter to allow for drainage of the rainwater.

The shelter shell should be constructed of reinforced concrete. Do not use light density materials such as cinder block, isolating concrete forms (ICF), or blown shock-crete in an ACGS. The shielding capability of the shelter is dependent upon the weight of the material used. (See figure 3-1(a) below.)

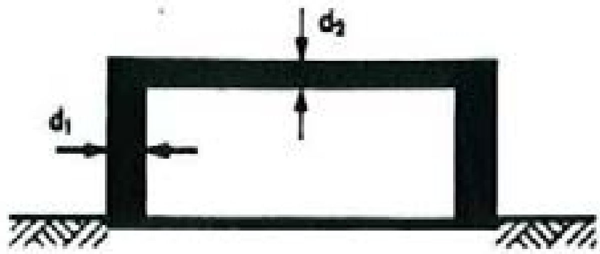


Figure 3-1(a)

15-psi shelter: All walls must have a minimum thickness of 31 in. The ceiling must have a minimum thickness of 22 in.

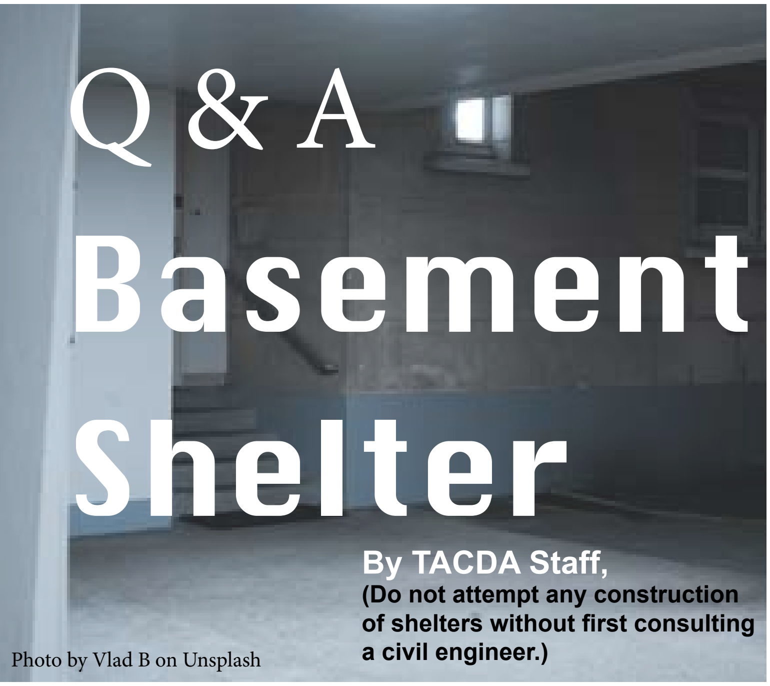
45-psi shelter: All walls must have a minimum thickness of 48 in. The ceiling must have a minimum thickness of 34 in.

One obvious disadvantage to an AGCS is its high-visibility profile. You can easily disguise its intended function. Frame in fake windows and put a false cover on the outside such as logs, paint, or siding materials. Fake shelves or furniture can easily disguise the entrance door to the shelter. Your AGCS can easily be turned to multi-function use. Depending on the size and placement, it could be used as a child's playhouse, garden or tool shed, doghouse, safe, home theatre, game room, gym, etc.

You may want to build your AGCS inside a barn or even in an interior location of your home. Heating, cooling, and accessibility become less of a problem. The shelter must be built in such a manner that it is independent of the outside structure (structural element). These other structural elements may be attached monolithically or fixed rigidly to the shelter shell; however, they must be fashioned in such a manner that their collapse does not destroy the shelter shell. The weight of the outside structural element must be considered when designing the interior shelter.

**References for this article: Nuclear Weapons Effects; Technical Swiss Civil Defense Directives for the Construction of Private Air Raid Shelters (both for sale on tacda.org).*

Sharon Packer has a Bachelor's degree in Mathematics with a minor in Physics, and a Master's degree in Nuclear Engineering. She has served on the TACDA board of directors for over 20 years in several different capacities. Sharon is an expert in civil defense and in NBC shelter design.



Q & A
Basement Shelter

By TACDA Staff,

(Do not attempt any construction of shelters without first consulting a civil engineer.)

Photo by Vlad B on Unsplash

Question from a TACDA member:

Can I shelter from the fallout in a room in my basement? I have a regular, stick-framed ceiling. My outside dirt level is about a foot below the basement ceiling.

Answer:

We are concerned about the amount of radiation you would get without adding more shielding. The protection factor (PF) of your basement room is between 5 and 10. Every four inches of heavy shielding will multiply that PF by a factor of two. With 16 to 20 inches of additional heavy shielding, you could create a very good protection factor.

You should either add shielding to the floor of the room above or add more shielding in the basement. If you are far enough away from the blast area, you could upgrade your basement to a fairly decent fallout shelter. Radiation decays very quickly. In two days, it should be only 1/100th of the original value. After two weeks, the radiation levels, if there are no additional nuclear bursts, should decay to 1/1000th of the original value.

- Choose a space in a corner that is farthest away from windows or staircases. If possible, add dirt to the foundation outside, to a level that reaches the top of your basement.
- If you have a VERY sturdy table with heavy legs, such as a pool table, you could place it in the corner and add shielding to the top and other two sides of the table. Place a couple of feet of bricks, sandbags, and other heavy items on top and at the sides of the table.
- If you don't have a heavy table, make one out of solid core doors. Many people donate such doors to restoration-type businesses, and you can purchase them very inexpensively. Use solid cinder blocks or other solid items for legs and open sides. Leave a small opening and plan to stay in that area for several days.
- Keep drinking water nearby. Stock the area with canned foods. Keep a chemical toilet inside or near the area. Put two lined garbage cans next to the opening to the sheltered area. Use one for human waste and one for other garbage. Keep them covered.
- If unable to make a table, lean the doors against the walls at about 45 degrees (Figure 1). Nail something to the floor to keep the doors from slipping. Add as much shielding as possible to the top of the doors and plan to stay inside the shielded area.
- If you have window wells, put lumber in front of the windows to keep them from breaking and fill the wells with sandbags. Stay away from the windows, as the glass could break during an attack.
- If you are tightly covering the space, and the basement is small, you may need to slightly open a door to the upstairs to get proper ventilation.
- Make sure you have two ways to enter the basement area (at least one to the outside), so you can escape if the home should fall or catch fire.

Other fallout shelter plans:

https://www.shtfblog.com/download-free-pdf-fallout-shelter-designs/

http://civildefensemuseum.com/index.html

Figure 1

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