Water Works in Civil Defense

By G. E. McCALLUM, C.E., MARK D. HOLLIS, C.E.,
and HARVEY F. LUDWIG, M.S.

The basic responsibility for civil defense correctly belongs to local people and local agencies. A philosophy of "self-help" is being forced upon us by the unparalleled seriousness of the world political situation. We realize that in time of disaster remote and higher-level agencies will be able only to help us help ourselves. Our interest here is to evaluate some of the benefits that have resulted from joint local, State, and Federal efforts to develop a water works civil defense program within the framework of the self-help philosophy.

The National Role

The Federal Civil Defense Act of 1950 is the first authorization ever made by the Congress for civil defense in the United States. Prior Federal civil defense activities, including the Office of Civilian Defense of World War II, were implemented only by Executive orders. The act specifically provides that responsibility for civil defense shall be vested primarily in the States and their political subdivisions; the Federal Government shall furnish coordination, guidance, and such other assistance as it is best qualified to furnish, including organization of mobile support and other interstate activities, training of personnel, conduct of research, and procurement and stockpiling of necessary materials and supplies.

In the field of water supply, Federal activities are just beginning. The FCDA (Federal Civil Defense Administration), through its engineering and public health divisions, is in the process of publishing a fairly comprehensive technical manual, "Emergency Repair and Operation of Water Works in Disasters." Substantially a revision of the OCD World War II publication, "Water Works Engineering in Disaster," the new manual is organized into two parts: Part I discusses over-all water works management and the problems of maintaining quantity of supply; part II is concerned with the safety of the supply and considers the possibilities of contamination by special weapons (radiological, biological, and chemical), as well as by sewage. The manual is designed to serve the needs of both large and small water works for peacetime as well as wartime disasters.

Another important activity of the Federal Government is the performing of research to develop information needed to improve water works "defense" against contamination. While most of this work now has a security classification, it is expected that water works officials will be furnished with really pertinent information as it is developed, either by declassification or other mechanism.

Work is also beginning, under the leadership of the Public Health Service, on a national program for internal security for the water works industry, and the FCDA is planning a program for some stockpiling of pipe, chlorinators, and other emergency repair and purification equipment.

Mr. McCallum is chief of health emergency planning and Mr. Hollis, an Assistant Surgeon General, is chief sanitary engineer, Public Health Service. Mr. Ludwig is a sanitary engineer consultant of the Federal Civil Defense Administration. *This paper was presented at the Arkansas Water and Sewage Conference, April 9, 1952.*

Regional Activities

Probably the most important work of the Federal Government awaits the establishment and filling of sanitary engineer positions in the nine FCDA regional offices. The FCDA budget has thus far permitted the employment of only a small sanitary engineer staff at Washington headquarters. This small group has been engaged in such civil defense sanitary engineering activities as water supply, sewerage, refuse disposal, milk and food sanitation, insect and rodent vector control, engineering aspects of emergency welfare services, mortuary services, radiological monitoring and decontamination, and engineering aspects of chemical and biological warfare defense. The appointment of regional sanitary engineers should greatly improve the development of effective collaboration between Federal, State, and local civil defense agencies, especially with respect to mutual aid and mobile support.

The importance of mutual aid and mobile support cannot be overemphasized. They are the basis of the planned pattern for American civil defense. The effectiveness of actual disaster relief operations will be largely determined by the efficiency with which skilled personnel and equipment can be mobilized and deployed on a regional basis. The FCDA regional office engineers, assisted by Public Health Service regional engineers and by key State personnel, such as State sanitary engineers, will be primarily responsible for planning such interstate programs and for exercising leadership in prosecuting them.

Local Activities

The basic civil defense job remains, however, for the individual water works to perform. Only it has the resources needed to achieve improvements in the physical plant, for assembly of necessary maps, tools, equipment, and other facilities needed for making emergency repairs, for organization and training of regular and reserve personnel, for integrating its program with other local civil defense programs, and for conducting test exercises with other communities in the region to check and improve the adequacy of the defense measures.

Of great importance is the interest shown by the smaller communities, which might well consider themselves relatively safe from attack and hence not greatly concerned, but which have the reservoirs of personnel and equipment necessary to the success of the mutual aid programs.

Importance of Water Supplies

Although classified as a utility service, a water works differs in important respects from such utilities as communications and power. Water works have two vital roles in disaster relief: Sufficient water must be made available for fire fighting; and, at the same time, a safe water supply must be maintained. Safe water has become so commonplace in our community living that even some of our health officials find themselves guilty of assuming that such safety, once achieved, will always be present. On the contrary, the development of atomic and other special weapons has made it more probable than ever that only extraordinary and carefully planned efforts can maintain the safety of supply in time of disaster.

Another important difference in the water works as a utility is the individual nature of water works systems. They are not so physically connected through a network that a load dispatcher can pool their resources and direct them to a point of need. By contrast, power utilities have virtually region-wide systems of mutual aid. They can very quickly, through prearranged plans, mobilize and apply their resources to a stricken area. In the water works field such collaboration must be developed, as already emphasized, through the mechanisms of mutual aid and mobile support.

Significance of Special Weapons

The continuing development of the ABCR (atomic, biological, chemical, and radiological) weapons imposes a continuing need for evaluating them as possible contaminants of water supplies. Such evaluations are difficult since even possibilities that seem remote must be considered. Radiological contamination of water to any serious degree, for example, is considered by many to be very unlikely; yet, because it is a possibility, much work has had to be done in

developing safe emergency levels of tolerance, quick and accurate methods of detection, and practical means for removing radioactive contaminants.

Of more real concern are the possibilities that biological and chemical agents might be employed to contaminate water supplies. The prospect that contamination of water with these agents might be attempted or accomplished as an act of war is difficult to evaluate, in the sense that there has been no actual use of these agents for this purpose, but in any case the prospect is extremely unpleasant. Continuing research studies must be undertaken to develop means for detecting and otherwise coping with these agents.

Although both chemical and biological agents might be used for contaminating water, the logistic problem may be much simpler with biological agents, such as bacteria. These, of course, are living organisms that can multiply in the body of a victim so that it is not necessary to introduce the total number of bacteria required to kill the host. A single *Brucella* germ may be sufficient to start brucellosis infection that may prove fatal. Thus far the most promising development in the realm of defense against biological contamination of water is the widely publicized membrane filter. In its present stage the membrane filter can scarcely be considered the answer to the problem of rapidly detecting biological warfare agents. It does, however, simplify and minimize the work of routine bacteriological testing, which in itself is of civil defense value, and further research may expand its range of usefulness.

Accrued Benefits

One of the primary results to date of the civil defense program in the local community is a new evaluation of the relative values of the various community services. The water works profession is faring excellently in this new thinking. Water works engineers have always been aware of the importance of their commodity to public living, but an increasing awareness of the enormity of the problem of civil defense is causing others to realize that this service is vitally important—that the lives and safety of thousands of people may rest upon the ability of the water works to maintain an adequate and safe supply.

Such recognition is also, of course, helping to solve peacetime problems in the water works field. It is proving very valuable, for example, in assisting water works officials in obtaining funds and materials for much-needed improvements, especially since it can be shown that most of these improvements have direct civil defense significance. It has a stimulating effect on water works officials themselves, in interesting them to improve their operations to levels of higher efficiency.

Civil defense efforts in the water works field are also doing much to consolidate and improve the traditional relationships between water works officials and State and local health departments. These two groups have basic interests and responsibilities with respect to safety of water supplies, and in the past have satisfactorily managed to coordinate them, each working in its own manner. Now, however, both groups recognize that a more efficient and more intimate relationship must be achieved if their responsibilities are to be properly discharged during the critical period following attack.

Moreover, the concepts of mutual aid and mobile support have actually done much to reverse the attitude of local, State, and Federal officials toward each other. The local officials recognize how vitally important State assistance can be, and the State officials are thinking of Federal assistance in terms of an invited blessing instead of bureaucratic control. The Federal agencies, likewise, have become keenly aware, perhaps for the first time, of their own limitations. The prospect of having to mobilize for a total effort has forced their recognition of the local citizen as the most important cog in the machine.

In summary, we must remember that civil defense activities in the water works field, as in most others, must be accomplished essentially by a shifting of emphasis with respect to our "usual" activities. The maintenance of usual water works services during wartime is the responsibility of existing water works and public health agencies together with individual pro-

fessional experts. The adaptation of water works to serve the extraordinary needs of disasters is the responsibility of civil defense. In view of the technical and professional requirements, the civil defense mesaures and services must continue to be the responsibility of the existing water works and public health agencies and individuals, but these agencies and individuals will perform their wartime disaster relief functions under civil defense rules and regulations.

Civil defense in water works may, therefore, be said to be the job of everybody who is normally concerned with water works. This must not be interpreted as meaning that it is nobody's job. Each of us must do his part. Each of us must make his responsibility a part of his everyday business and affairs.

Relationship Between Inoculations and Poliomyelitis

The possible relationship of various types of inoculations and poliomyelitis has been the topic of much discussion and a number of papers since the 1950 reports from England. Last fall the State and Territorial Health Officers Association asked the Public Health Service of the Federal Security Agency to sponsor a study on the question and issue a clarifying statement. Subsequently, the Public Health Service, on March 14, 1952, sponsored a meeting of 42 poliomyelitis investigators, epidemiologists, pediatricians, allergists, and health officers. The National Foundation for Infantile Paralysis helped plan and participated in the conference.

The conference voted unanimously in favor of the conclusions contained in the following statement which has been accepted by the Public Health Service and is being transmitted to official health agencies, to the medical profession and to the general public.

There is no definite evidence that an increase in the number of cases of poliomyelitis has occurred as a result of injections of vaccines, drugs, and other medicinal agents. There is evidence that injections for the prevention of diphtheria, whooping cough, and possibly tetanus, when given during an epidemic of poliomyelitis, may, on rare occasions, localize the paralysis in the inoculated arm or leg. There is no satisfactory evidence that other types of injections have any effect on the localization, frequency, or severity of poliomyelitic paralysis. In the small number of persons with localization of paralysis in the inoculated limb, the injections, for the most part, were given about 7 to 21 days prior to onset, which corresponds to the usual incubation period of poliomyelitis. This has raised the question as to whether or not inoculated persons have a greater chance of contracting poliomyelitis during an epidemic.

There is as yet no final answer to this question, but it is a fact that, even if there should be an increased chance, it is extremely small. Many thousands of poliomyelitis cases occur every year among children who have not had any injections during the preceding few months, and thousands of children have received injections for whooping cough, diphtheria, and tetanus during poliomyelitis epidemics and have not developed the disease.

Diphtheria, tetanus, and whooping cough are serious diseases which can be prevented by immunization. Unchecked, these diseases present a far greater hazard than poliomyelitis. The benefits derived from immunization against these diseases far outweigh the questionably small increased chance of contracting poliomyelitis. However, even this questionable risk can be avoided by carrying out these immunizations when poliomyelitis is not epidemic in the community. There appears to be no good reason for withholding these immunizations during the summer months in communities that are not having an epidemic of poliomyelitis.

Furthermore, poliomyelitis is at all times so rare in infants under 6 months of age, and the danger from other infectious diseases, particularly whooping cough, is so great, that it is advisable to continue the immunization procedures for this age group even during a poliomyelitis epidemic. In adults also, poliomyelitis is relatively so infrequent, that when there is a need for immunizing or therapeutic injections, such injections should not be withheld.

Certainly no parent should object and no physician should hesitate to administer a needed antibiotic, drug, or other injection for treatment of disease at any time. When there is immediate danger from diphtheria, whooping cough, or tetanus, the preventive inoculations should be given to all threatened age groups even during a poliomyelitis epidemic. In the final analysis the decision as to when an immunizing or therapeutic injection shall be given to an individual patient must rest with the physician.