CONFERENCE ON DISARMAMENT

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Destruction of Chemical Weapons Production Facilities

Introduction

Under a future chemical weapons convention, a State Party must destroy its chemical weapons production facilities in a manner that prevents environmental contamination, provides for the safety of operational and inspection personnel and ensures that neither the equipment nor buildings can be used again. Specific details of the methods and techniques employed for destruction will vary with the configuration of the facility, type(s) of chemicals produced and munitions filled. Details will be specified in detailed arrangements developed by the State Party for each facility and approved by the Executive Council.

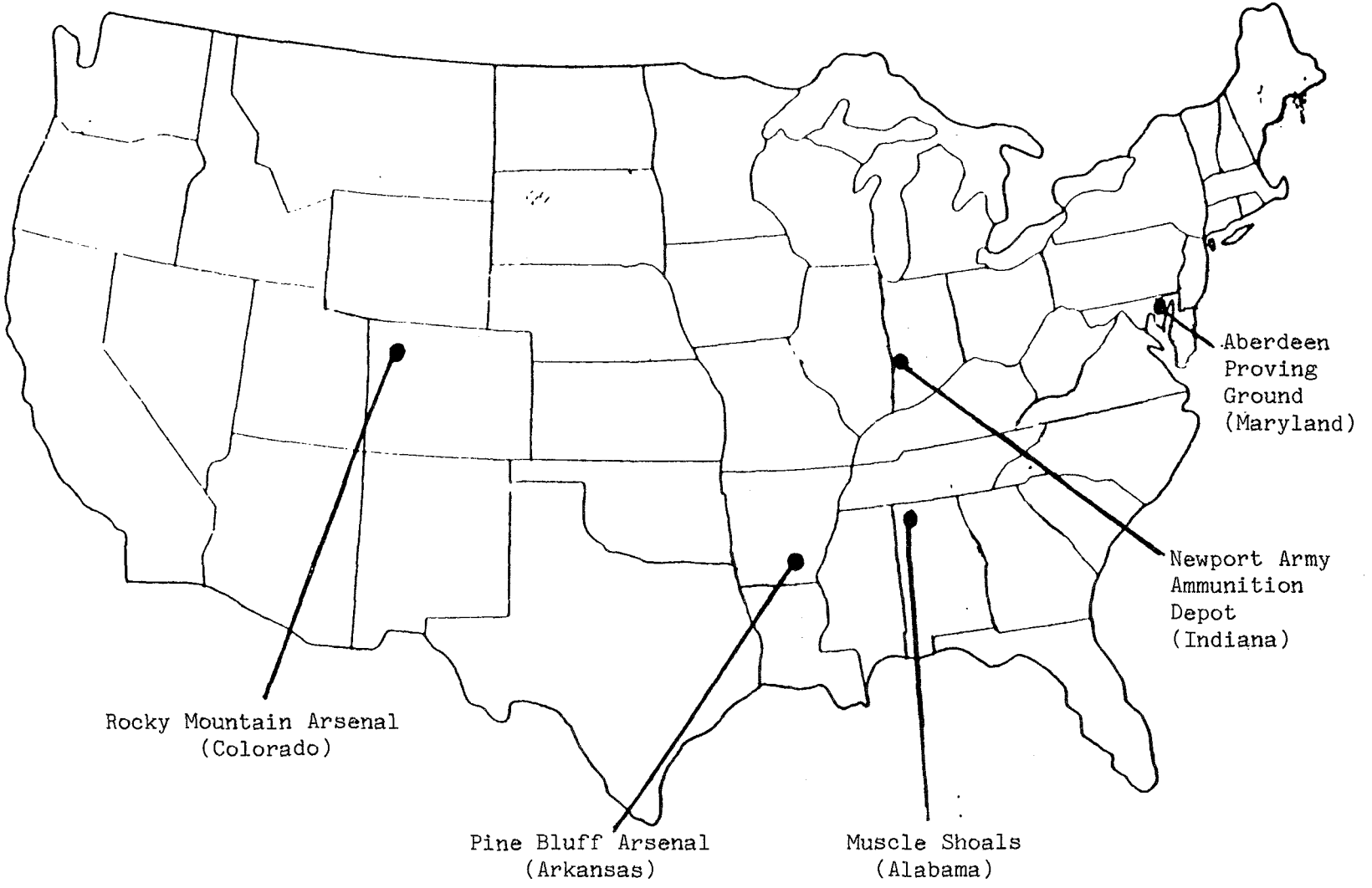
United States' production facilities that would be subject to destruction are shown in Figure 1. They are located at Rocky Mountain Arsenal, Colorado (sarin production); Newport Army Ammunition Plant, Newport, Indiana (VX production); Pine Bluff Arsenal, Pine Bluff, Arkansas (difluoro and QL production); Muscle Shoals, Alabama (dichloro production) and Aberdeen Proving Ground, Maryland (pilot plant). Each presents unique characteristics that must be considered separately and specifically. Both local and national environmental laws and safety regulations must be met. Procedures for doing so must be taken into account in the facility-specific arrangements. Site-specific environmental considerations would include the potential environmental impact of the specific agents or precursors produced at the site and the production and waste disposal processes employed in both the production of the agent and the planned destruction of the facility.

The purpose of this paper is to present for discussion some general concepts concerning destruction methods.

General procedures

The paper entitled "Chemical Weapons Production Facilities" in Appendix II of CD/831 calls for the physical destruction of all standard and specialized equipment and buildings used for producing chemical weapons. The procedures for destruction of the equipment and buildings must ensure that the components cannot be reassembled. Buildings housing administrative and support services would not have to be destroyed.

FIGURE 1. CHEMICAL WEAPONS PRODUCTION FACILITIES



Specific safety procedures for destruction are governed by the toxicity of the chemicals involved at a particular stage in the process. Areas where supertoxic (Schedule 1) chemicals were handled would present the greatest potential hazard to workers and therefore their destruction would be the most labour intensive and time consuming. Extreme precautions would be required. Less stringent precautions would be needed for the destruction of stages where less toxic precursors (Schedule 2 chemicals) were produced. Within a specific facility, from a practical and safety standpoint, it would be prudent to begin the destruction process with the most hazardous area first.

Destruction of supertoxic chemical facilities

The first step in actual destruction of a supertoxic chemical production facility would be to flush an appropriate decontaminant solution such as aqueous sodium hydroxide through all process equipment and to wash down all equipment surfaces, walls, ceilings, and floors to remove surface contamination. This surface decontamination effort would be slow and labour intensive since personnel will have to be dressed in cumbersome protective clothing.

Once all surface contamination has been removed, actual disassembly and destruction can begin. While much of the equipment can be taken apart by the removal of bolts and fasteners, large pieces of equipment such as reactor vessels and storage tanks would have to be cut into small pieces by acetylene torches. In addition to the large pieces of equipment, all other special and standard equipment, such as valves, gauges, piping, and production control equipment must be destroyed after disassembly by cutting into pieces, crushing, heating or other techniques that would render the equipment irreversibly unuseable.

All personnel conducting disassembly and destruction operations would have to wear protective masks and clothing. Toxic vapours may be generated by heating metal surfaces that retain small quantities of residual agent. Agent also will probably have seeped into areas such as seals, gaskets, and interior joints where surface decontamination efforts cannot reach. Pieces of dismantled metal equipment can be thoroughly decontaminated by heating in a metal parts furnace at 540 degrees Celsius for a minimum of 15 minutes.

During the disassembly of a supertoxic chemical facility, not only must personnel be in protective clothing but the air must be monitored continuously to assess the presence and concentration of any vapour to which workers may be exposed. Liquid waste from the surface decontamination operations must be collected, monitored for the presence of agents and incinerated or, if necessary, further chemically neutralized and disposed of in an environmentally safe manner. Residual salts from either incineration or chemical neutralization must also be disposed of in an acceptable manner. Incineration produces significantly less residue.

Destruction of non-supertoxic chemical facilities

In general, the steps in destruction of non-supertoxic facilities (precursors on Schedule 2) would parallel those for a supertoxic facility, except that operating personnel would not have to be in chemical protective clothing. Standard industrial practices and precautions would be sufficient. As a result, the destruction process would be more rapid and less costly.

Demolition of buildings

Process equipment for low toxicity operations with non-supertoxic precursor chemicals is likely to be located in the open or in buildings of light construction. Demolition could be readily carried out using standard demolition equipment and procedures.

Supertoxic chemicals of low vapour pressure are likely to have been produced and filled into munitions in buildings of light construction. In the United States however, the relatively volatile supertoxic chemical sarin was produced and filled into explosive-containing munitions in massive reinforced concrete structures. These will be considerably more difficult to demolish. Munitions not containing explosive were filled with sarin in a building of light construction.

To destroy any residual toxic chemicals, rubble from demolition operations could be heat treated or incinerated in a high temperature rotary kiln and then buried in an approved landfill. Where required by law, appropriate environmental permits would have to be obtained prior to the final disposal. As an indication of the magnitude of the amount of material that may have to be disposed of, it has been estimated that the demolition of the sarin facilities at Rocky Mountain Arsenal would produce 114,000 tons of rubble.

Demolition of specialized and standard buildings used in the production of chemical weapons would be accomplished and verified in accordance with an approved plan for the specific facility. Verification would be by the on-site presence of international inspectors.

Demolition of non-chemical facilities and equipment

Declaration and destruction of facilities used exclusively for the production of non-chemical parts for chemical munitions or special equipment for chemical weapons employment has been proposed (see paragraph 3 of the paper on Chemical Weapons Production Facilities in Appendix II of CD/831). The United States has no such facilities. However, where necessary, destruction of such facilities could be accomplished using the standard industrial procedures used for the destruction of non-supertoxic chemical facilities. Verification would be accomplished by the procedures contained in the Annex to Article V of the draft convention.

In the United States, especially designed equipment for the production of such non-chemical items is located in facilities whose primary purpose is not related to chemical weapons production. Such equipment would be declared in the State Party's initial declaration. It would subsequently be transported to a designated facility for destruction. International inspectors would verify the destruction by direct observation. Specific details of the disassembly, transport to the designated facility and destruction procedures would be specified in the destruction plans approved by the Executive Council.

Time and manpower requirements

Since it is not possible to make any accurate estimate of costs without a specific facility in mind, only a very general estimate of time and manpower requirements and costs for destruction can be made at this time. Generally

speaking, it appears that many hundreds of man-years of effort and tens of millions of dollars will be required to eliminate a large-scale production facility.

The scale of effort required can be illustrated by United States' experience in dismantling equipment at Rocky Mountain Arsenal which was once used to demilitarize the M34 Agent GB (sarin) cluster bomb. This effort involved 350 men working for 2-3 months (50-60 man-years) and cost roughly two million dollars. As a very crude estimate, destruction of the remaining chemical weapons production and filling facilities at Rocky Mountain Arsenal would require an effort at least an order of magnitude greater. At least two years would be required to accomplish such an effort, not including time required for planning, publishing the proposed plan and the public review process may add as much as an additional two to three years to the overall destruction process.

Environmental requirements

The world-wide increased awareness and interest in environmental quality and preservation has a direct impact on the development, selection, and implementation of destruction methods. Approved procedures must assure minimal degradatory impact on the environment. Selection of the optimum methodologies in relation to available resources and ability to meet existing environmental laws and regulations is a critical process that must be recognized and addressed in developing plans and schedules for destruction.

Although environmental laws and regulations will be different in each State Party, for this paper, the environmental laws and regulations of the United States will be used to illustrate a type of an environmental approval process.

The National Environmental Policy Act (NEPA) of 1969 establishes national environmental policy, sets goals and provides the means for implementing the policy. It provides "action forcing" provisions to make sure that all agencies of the Government act in accordance with both the letter and spirit of the law.

One of the most important provisions of NEPA is the requirement for the publication of a detailed analysis of the potential impact of any proposed actions that may significantly affect the quality of the human environment. This documented analysis is called an environmental impact statement (EIS) and is the basis for a formal record of decision of specific approved actions to be accomplished. Appropriate federal, State and local agencies and the general public are key participants in the planning, review and approval of the final environmental impact statement and record of decision. The process starts with the public announcement of a "notice of intent" of an agency of the federal Government to take certain actions (such as the destruction of a chemical weapons production facility). The "notice of intent" would announce the time and place of a public "scoping" meeting where all interested parties, both Government and private, can come together to discuss the proposed action to assure that all pertinent environmental issues and alternatives are analysed in detailed in the draft environmental impact statement (DEIS).

After the draft environmental impact statement is published, another public meeting is scheduled for a public review of the document. All comments received are considered and incorporated into or appended to the final environmental impact statement (FEIS). Based on the final environmental impact statement, a record of decision is published that states the decision to be implemented, identifies all alternatives considered in reaching the decision, and recommends the preferred alternative.

Implementation of the record of decision must be approved by the United States Congress and may require the passage of implementing legislation at the national level. Implementation will also require federal, State and local permits for the safe handling of hazardous waste materials. These permits are required under the Clean Air Act (CAA) and the Resources Conservation and Recovery Act (RCRA). Applications for the required permits must assure the issuing authority that all hazardous materials will be disposed of in an environmentally safe manner which meets the intent of all existing laws and regulations. The process is extremely important, but very time consuming and expensive. Adherence is essential to ensure optimum practical solutions to potentially serious environmental issues.

Monitoring of destruction

Destruction of production facilities would be verified by on-site inspection. Section V of the Annex to Article V of the draft convention (CD/831) provides general provisions for the monitoring and verification of chemical weapons production facilities from initial declaration to final destruction through systematic on-site inspection and continuous monitoring with on-site instruments installed by international inspectors. However, detailed criteria and procedures necessary to implement the general provisions remain to be elaborated. For example, the types of monitoring instruments to be installed, their operation and maintenance and detailed inspection procedures for on-site inspections that would be specified in agreements on subsidiary arrangements for each facility are yet unknown. Also, criteria must be developed that can be used to define the level of transformation and disposition of equipment and buildings that constitutes destruction in terms of the convention.

The general provisions in the current draft convention will, when the required detailed procedures and criteria are developed and agreed upon, provide an effective mechanism for confidence building and verification.