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COMMUNICATIONS SUPPORT NETWORK:

SYSTEM DESIGN CRITERIA AND EVALUATION GUIDE

FOR THE

CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM

APPENDIX C

COMMUNICATIONS SUPPORT NETWORK:

SYSTEM DESIGN CRITERIA AND EVALUATION GUIDE

INTRODUCTION

Purpose

This document describes the system design criteria and the evaluation guidelines that the Federal Emergency Management Agency (FEMA) will use to ensure the adequacy and effectiveness of Communications Support Networks for the Chemical Stockpile Emergency Preparedness Program (CSEPP). It is the intent of this guidance to establish **minimally acceptable** criteria for CSEPP Communications Support Networks.

Need for Communications Support Networks

In the event of a chemical emergency that can or will affect areas outside of the Army installation, accurate information must be relayed within predetermined time constraints to identified off-post officials and decision makers.

Very reliable communication systems must be in place to ensure that the notification and subsequent information sharing can occur without delay. At least two independent methods of simultaneous communications must be available to protect against the possibility of equipment failure.

The systems currently available that offer a high degree of reliability include dedicated, non-public switched telephone links and specifically designed two-way radio links.

When properly designed, two-way radio systems can be utilized for many required functions, thereby providing both high reliability and cost effectiveness. These functions include the following considerations:

- initial notification fan out
- continued information exchange
- activation of outdoor warning systems
- activation of indoor warning systems
- routine system testing without activation
- warning systems activation from various locations

A dedicated telephone "hot line" ring-down system provides direct point to point(s) communication paths that are dedicated for a single function. Such a system does not rely on telephone central office switching equipment and offers improved reliability over commercial telephones. Properly designed systems can ring multiple lines to pre-designated locations simultaneously and without requiring dialing.

OPERATIONAL CONCEPTS

This section identifies the need for systems dedicated to the CSEPP and explains the interrelationships of components. Examples include utilization of dedicated non-public telephone systems to support facsimile equipment and the use of dedicated radio systems for activation of outdoor and indoor alert and notification components.

Systems Integration

Highly reliable 24-hour communications links must exist that interconnect the on-post decision makers with the appropriate local and state agencies having CSEPP responsibilities and decision-making authority. The communications links should be designed to integrate with the public alert and warning system (see Appendix F). A properly designed two-way radio system can provide the required interconnect and additionally be used to activate radio controlled sirens, EBS/EAS broadcasts, indoor alerting devices, monitors, pagers, and related hardware. The CSEPP communications support system may be used to link terminals on the CSEPP automation system network, since the automation system will likely link all of the points that must also be linked by the communications support system. However, dual use of the same dedicated telephone lines or radio channels for both voice and automated data transfer is not acceptable. The use of the CSEPP communications support system to link automation system sites must be done on dedicated lines/channels utilized solely for data transfer.

Dedicated Use Requirements

Any communications systems installed for the CSEPP must be available for use in the program on a priority basis. This does not mean that day to day use is discouraged because such use supplies continuous testing. It does however, mean that should a chemical emergency take place the system will be dedicated to the incident for as long as the emergency exists.

Interface with Existing Systems

Exhibit "A" is a generic diagram of a typical system for use in the event of an on-post chemical emergency that might affect areas off post. The diagram represents a combination of dedicated telephone and radio components that may vary from site to site, but indicates

the communication paths that should exist.

There is also a need for each of the identified contact points to communicate with its own field units. In most cases, this need is presently met with existing systems. The proposed systems must be considered as "Command and Control Networks"; however, a need may also exist for some command vehicle mobile and portable units to operate on the proposed radio network. This need should be addressed in very limited situations to avoid overcrowding of the radio frequency.

The CSEPP Communications Support System must also be capable of interfacing with and incorporating existing national and regional emergency communications networks including the National Warning System (NAWAS), the Operation SECURE (State Emergency Communications Using Radio Effectively) radio network, and amateur radio emergency services.

National Warning System (NAWAS)

NAWAS is a nationwide leased dedicated voice warning network with the primary purpose of providing information regarding impending attack to the United States. NAWAS is also used extensively in response to natural and man-made emergencies.

NAWAS is a dedicated 24-hour nationwide party-line type telephone warning system controlled from a National Warning Center (NWC) at Colorado Springs, CO and an Alternate National Warning Center (ANWC) at Olney, MD which are manned continuously by Attack Warning Officers. NAWAS consists of 63 circuits connecting approximately 2,400 terminals across the United States including FEMA Headquarters, FEMA Regional offices, and state, county and municipal warning points. The National Oceanic and Atmospheric Administration is connected to NAWAS for dissemination of warning via the weather network.

Operation SECURE

Operation SECURE is a frequency allocation and assignment program initiated by the Federal Communications Commission (FCC) and administered by FEMA. Operation SECURE provides each state emergency management agency the opportunity to obtain an FCC license for emergency management communications in the 2-10 Mhz high frequency

range. Local emergency management agencies may be authorized by states to operate on these state assigned frequencies.

Operation SECURE offers networking capabilities with other state and local emergency management agencies, state National Guard units, FEMA, the U.S. Dept. of Transportation, U.S. military forces, and amateur radio operators. Operation SECURE equipment is available in base station, mobile and portable configurations with voice and data transmission capabilities.

Amateur Radio

The Radio Amateur Civil Emergency Service (RACES) is a part of the amateur service serving civil defense under a separate subpart of the amateur regulations. RACES provides radio communications for civil defense purposes **only** during periods of local, regional or national civil emergencies. These emergencies are not limited to war-related activities, but can include natural disasters such as fires, floods and earthquakes. As defined in the rules, RACES is a radio communication service, conducted by volunteer licensed amateurs, designated to provide emergency radio communication to local, regional or state civil defense organizations. RACES works principally at the local level through local and state civil defense agencies organized by state government to provide emergency communications in the event the FCC authorizes its use. RACES is a separate entity from the Amateur Radio Emergency Service (ARES). ARES is the "emergency" division of the Amateur Radio Relay League (ARRL) Field Organization (Amateur Radio Relay League 1988). It consists of licensed amateurs who have voluntarily registered their qualifications and equipment for communication duty in the event of a disaster. ARES is administered on a local, section-wide and national basis. RACES is sponsored by the federal government and is under the jurisdiction of the FCC. It is intended that RACES, when properly authorized, will remain on the air in the event of any officially declared emergency, although the rest of Amateur Radio may be silenced.

It is important to note that RACES operation is authorized by the FCC upon request of a local, state or federal official, and is strictly limited to official civil defense activities in the event of an emergency communications situation.

Packet technology is a means of digital amateur communications using a computer-to-radio interface with a built-in error checking, "handshake" acknowledgment feature. This is generally written under a protocol referred to as AX.25 which defines the acknowledgment handshake process, length of data stream and number of re-tries prior to "failing" the transmission. This error checking system is ideal for the emergency management communicator since messages may at times become difficult to understand in the voice

mode due to heavy traffic on channels, poor reception and equipment malfunctions. Under the AX.25 protocol, simple multi-word sentences may be transmitted or complex data or text files may be moved about the system. The AX.25 protocol allows for directivity of messages; that is, one message to one receiver (person) or a type of "group message" which is transmitted to multiple reception sites. Priority may be assigned to the transmissions to permit higher priority emergency messages to overtake lower priority messages. Packet technology permits hard copy transmission of messages as well as storage of the messages in the form of magnetic media. Through the use of portable equipment, the computer, packet controller and radio may be configured in a briefcase and carried to a site. Due to the digital nature of the transmissions and the handshake process, it is possible to configure the system to send and receive from a site through a digital repeater which is actually another packet installation. Some systems have portable units communicating with others via a vehicle mounted digital repeater or via a mountain top site. Applications include the forwarding of simple messages as well as the forwarding of entire documents such as lists of individuals registered at a mass care center, passenger lists for modes of transportation, equipment lists and other large data bases. Any file that is capable of being transferred from one computer to another may be transferred via the packet medium.

Extension to the Protective Action Zone

Due to the longer lead time available before a response action must be initiated, extension of the dedicated nonpublic telephone system beyond the IRZ is not required except where necessary to reach IRZ county facilities, IRZ county alternate EOCs, and the state EOC. Notification to other state agencies, other federal agencies, and Protective Action Zone (PAZ) counties may be processed via the state EOC using various existing systems such as the NAWAS, Operation SECURE radio, state computer links, public telephones, state radio systems, and teletypes.

The same criteria apply to any special radio networks implemented in support of the CSEPP. In those cases where sirens or indoor alert monitors are installed beyond the IRZ, it is necessary to ensure that adequate radio coverage exists to activate these devices.

Specific CSEPP communications systems are not **required** for notification to PAZ jurisdictions unless no alternative systems exist.

MINIMUM SYSTEMS REQUIREMENTS

This section specifies operational and technical requirements of the systems to assure a high

degree of reliability and system simplicity to ensure that all equipment is user friendly.

Dedicated Telephone Systems

C.1 The system must operate independently of the public switched telephone system.

C.2 The system must permit simultaneous activation of all stations, as well as selected groups of stations within time frames suitable for the range of chemical agent events considered feasible at the site.

C.3 True conferencing must be possible with sufficient ringing current and amplification to permit all stations to be signaled simultaneously and to speak/listen with all instruments on line.

C.4 The system must be equipped with a means to priority rank instruments (stations), as well as to permit the on-post EOC to signal users if off-hook (call waiting) and/or to "barge-in".

C.5 Each station must have the ability to signal any other station on the system and conduct a two-way conversation provided the called party is not using the instrument.

C.6 Multiple call group telephone systems should be considered. Options that should be evaluated include

a. One group dedicated to connection of all on-post and IRZ and state off-post EOCs.

b. One group dedicated to selective conferencing among fewer than all parties.

c. One group for coordination of emergency public information/public affairs.

d. One group dedicated to hard copy (facsimile) and/or computer data transmission.

Arrangements should be made for the inclusion of "extension" lines and instruments at the same address to permit use of the same line both at the 24-hour dispatch console and the EOC operations room (when activated).

C.7 The entire system must have stand-by power in the form of batteries which will operate the system for a minimum of eight (8) hours on a thirty (30) percent transmit, one hundred (100) percent receive duty cycle. Additionally, the system must have an alternate power source for maintaining the batteries in a charged state for no less than seven (7) days at the 30/100 percent duty cycle should commercial power be interrupted. This alternate source may be in the form of solar cells, generator, etc.; however, it must be a proven demonstrated method.

C.8 The system should employ only high quality voice grade circuits and 56 kbps data circuits as appropriate.

C.9 Selection of cable/communication locations should consider path reliability.

C.10 Alternate paths must be included in the system to permit two-hour maximum return to service should a primary path be removed from service for any reason.

C.11 The system must contain status monitoring equipment to assure on-post personnel that power, alternate power and communications pathways are operational. The system must report, via a visual display, loss of commercial power and the switch over to battery. The length of time on standby power must also be displayed to on-post staff. Communications pathways may be monitored by means of the presence of a sub-audible pilot tone applied to all paths. Absence of the tone or interruption of the tone will signal staff of a problem similar to supervised alarm circuits used by financial institutions.

C.12 Communications plans must address the integration of the CSEPP

telephone communication systems with existing telephone based communication systems such as NAWAS.

Radio Systems

C.13 The system linking the on-post EOC and IRZ off-post EOCs should operate independently of the existing public-safety systems in use in the area. That is, the primary CSEPP Command and Control radio link should not share a common frequency with any other public safety function.

C.14 The specific area of the radio spectrum in which the system operates should be determined by local availability, propagation requirements, and type of system.

C.15 Systems utilizing multiple base stations or a repeater and control stations are acceptable. The system must be "user friendly" utilizing off-the-shelf, commercial grade equipment and components. The equipment and components must be type accepted only if type acceptance is required under FCC licensing regulations authorizing transmission.

C.16 Encryption is not required; however, if this option is included it should be factory preset to avoid operational mistakes that could delay message receipt.

C.17 Base station or control station equipment must be installed and tested with back-up power systems for continued operation in the event of loss of commercial power.

C.18 Written protocols must be developed that identify radio network control and priorities.

C.19 Mobile units assigned to operate on the radio network should be limited to agency(s) command vehicles with specific responsibility to the CSEPP.

C.20 The on-post EOC and each off-post warning system activation point must be equipped with tone or digital signaling (encoding/decoding) for use in activating outdoor sirens, indoor alert monitors, pagers, etc. The encoding/decoding devices must be capable of selective signaling for use in signaling individual addresses or zones.

C.21 The system must be capable of integration with existing radio emergency communication systems including Operation SECURE and amateur radio emergency services (RACES and ARES).

Systems Operability

C.22 A program should be implemented that regularly tests both the human and hardware aspects of the communications support systems. At a minimum, the hard wire non-public telephone system should be tested daily, with the on-post EOC conducting a system roll call at a predesignated time. Additionally, a point to point roll call on the special radio network should be conducted at the same time.

C.23 A full scale test of the communication systems, outdoor and indoor alert systems and notification systems should be conducted at least every month, with detailed records made of component failures. Any component determined inoperative should be repaired and placed back in service within 12 hours. The system tests of the communications and warning systems should be conducted simultaneously because of the integration of the warning system activation hardware into the communications support network.

C.24 Maintenance agreements must be in place that require at least quarterly preventative maintenance inspections for all components of the communications systems. The agreements should also provide for response, repair and return to service within designated times for each system component, but in no case longer than 12 hours.

SYSTEMS EVALUATION

The design of the communications support network for each CSEPP location is critical not

only to the communications function but also in support of the CSEPP public alert and notification function. The design of the communications support network at each location is the determinant to the successful integration of each public alert and notification system, in that the communications support system must be capable of activating both indoor and outdoor warning systems.

During procurement, installation, and integration of the CSEPP communications support network, FEMA will continue to provide technical support as needed by the states. Specifically, FEMA will review the vendor proposals selected by state and local governments and must approve the proposals before the states are authorized to expend procurement funds. Upon completion of the installation of the CSEPP communications support network and public alert and notification system at each location, FEMA will evaluate the integrated system including communications, outdoor warning devices, and indoor warning devices.

Further evaluation of the communication support systems will be accomplished through FEMA's evaluation of emergency drills and exercises.

REFERENCES

Amateur Radio Relay League 1988. *The FCC Rule Book*.

Argonne National Laboratory March 1990. *Chemical Stockpile Emergency Preparedness Program: Management Plan*.

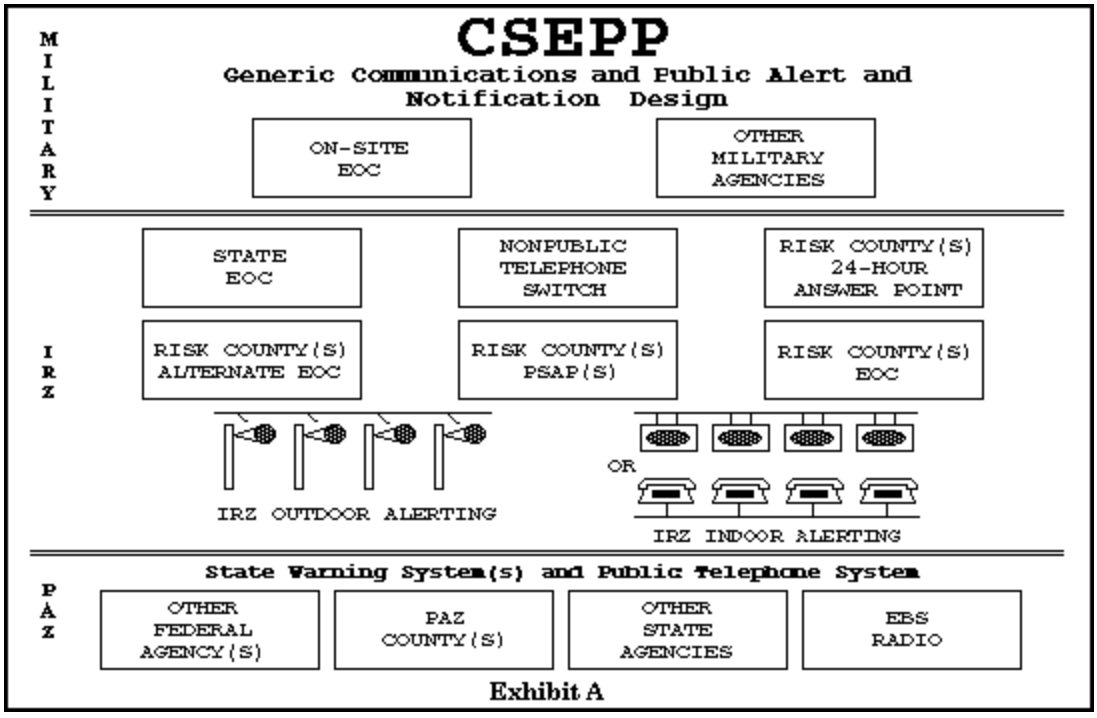
CSEPP
Generic Communications and Public Alert and Notification Design
MILITARY
ON-SITE EOC
OTHER MILITARY AGENCIES
IRZ
STATE EOC
NONPUBLIC TELEPHONE SWITCH
RISK COUNTY(S) 24-HOUR ANSWER POINT
RISK COUNTY(S) ALTERNATE EOC
RISK COUNTY(S) PSAP(S)
RISK COUNTY(S) EOC
IRZ OUTDOOR ALERTING
OR
IRZ INDOOR ALERTING
State Warning System(s) and Public Telephone System
PAZ
OTHER FEDERAL AGENCY(S)
PAZ COUNTY(S)
OTHER STATE AGENCIES
EBS RADIO

Exhibit A