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Standard Guide for Emergency Operations Center (EOC) Development[1]

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1. Scope

1.1 This guide provides general guidelines for the development of an emergency operations center (EOC).

1.2 An EOC may be developed by either the public or private sector in response to the demonstrated or predicted need for a designated facility at which those involved in emergency/disaster management and the coordination of response and recovery efforts work.

1.3 This guide may also serve as a foundation for larger facilities such as a regional operations center (ROC) or state operations center (SOC) with a broader area of responsibility and more extensive needs to communicate and coordinate with others.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *NFPA Standards:*[2]

NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

NFPA 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems

NFPA 110 Standard for Emergency and Standby Power Systems

NFPA 220 Standard on Types of Building Construction

NFPA 1221 Standard for the Installation, Maintenance, and Use of Emergency Services Communication Systems

NFPA 1561 Standard on Emergency Services Incident Management System

NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs

NFPA 5000 Building Construction and Safety Code

2.2 *Other Standards:*

ASCE/SEI 7-05 Minimum Design Loads for Buildings and Other Structures[3]

CPG-101 March 2009 (Developing and Maintaining State, Territorial, Tribal, and Local Government Emergency Plans)

NIMS December 2008 (National Incident Management System)

NRF January 2008 (National Response Framework)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *authority having jurisdiction (AHJ), n*—the organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure. **NFPA 1561**

3.1.2 *entity, n*—governmental agency or jurisdiction, private or public company, partnership, nonprofit organization, or other organization that has emergency management and continuity of operations responsibilities. **NFPA 1600**

3.1.3 *established EOC, n*—facility temporarily created to manage or coordinate emergency operations or like functions.

3.1.4 *standing EOC, n*—existing fixed facility that serves as a location for entities to manage or coordinate emergency operations or like functions.

3.2 *Acronyms:*

3.2.1 *ADA*—American with Disabilities Act

3.2.2 *AHJ*—Authority Having Jurisdiction

3.2.3 *ARC*—American Red Cross

3.2.4 *BCM*—Business Continuity Management

3.2.5 *CERT*—Community Emergency Response Team

3.2.6 *COG*—Continuity of Government

3.2.7 *COOP*—Continuity of Operation

3.2.8 *COTS*—Commercial-Off-The-Shelf

3.2.9 *EOC*—Emergency Operations Center

3.2.10 *FEMA*—Federal Emergency Management Agency

3.2.11 *HVAC*—Heating, Ventilation, and Air Conditioning

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[2] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.

[3] Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, http://www.asce.org.

3.2.12 *ICS*—Incident Command System
3.2.13 *IST*—Incident Support Team
3.2.14 *IT*—Information Technology
3.2.15 *JIC*—Joint Information Center
3.2.16 *JIS*—Joint Information System
3.2.17 *MRC*—Medical Reserve Corps
3.2.18 *NEMA*—National Emergency Management Agency
3.2.19 *PC*—Personal Computer
3.2.20 *PIO*—Public Information Officer
3.2.21 *PSAP*—Public Safety Answering Point
3.2.22 *ROC*—Regional Operations Center
3.2.23 *SAR*—Search and Rescue
3.2.24 *SOC*—State Operations Center
3.2.25 *USAR*—Urban Search and Rescue

4. Summary

4.1 It is recognized that a "one size" approach will not fit all jurisdictions. EOCs need to be developed and maintained based on the risks, vulnerabilities, capabilities, and needs of the entity. For example, some areas do not need to have seismic or hurricane response capability. However, there are common functional elements such as communications and work space that every EOC needs. This standard guide addresses processes and procedures for the development of a new EOC facility or the modification of an existing facility.

4.2 With these considerations in mind, a tiered approach should be taken that allows an entity to develop an EOC based on the particular needs and constraints of that organization and location while considering guidelines necessary for potential growth. It is important to recognize the need for alternative or backup facilities. Thus, this standard guide provides guidance for developing redundant resources.

5. Significance and Use

5.1 A critical part of developing an emergency management capability is establishing and preparing to operate an EOC. A well-designed EOC, coupled with well-trained personnel, will enable the coordination of response and recovery activities. An EOC can serve as an effective and efficient facility for coordinating all emergency response efforts and will optimize emergency communications and information management. This standard guide is intended to provide the emergency management community with practical concepts and approaches to develop an effective EOC.

6. EOC Development

6.1 *Needs Assessment*—Before beginning the planning and development of a new permanent EOC or modification of an existing EOC, a needs assessment should be conducted that includes hazard identification, risk analysis, and capability assessment. The emergency management requirements of the jurisdiction should be based on the identified hazards and the types of incidents that are anticipated for the entity, the severity of the resulting impacts of those incidents, and the possibility of their occurrence. Other important factors are the size and type of the jurisdiction. A highly urbanized area, due to its high volume of commercial and industrial infrastructure, broad spectrum of land uses, and size of potentially-impacted populations, would require greater resources than a small rural area. However, rural areas in which unique industrial or large Federal facility operations are located may have specific risks and hazards that would have a direct impact on the size, scope, and need of an EOC facility. Additionally, a capability assessment is needed for the entity to determine whether locally available resources can respond adequately to the range of specific incidents identified in the hazard and risk assessment. It is extremely important for an entity to know the limits of the resources (personnel and equipment) under its jurisdiction.

6.2 In determining the need for, planning of, and development of an EOC, it is important to review and incorporate the emergency management and response guidance and requirements of NFPA 1600, NFPA 1561, the NIMS December 2008, the NRF January 2008, and CPG-101 that are applicable to an EOC's design and development.

6.2.1 *Hazard/Threat Identification and Assessment*—This reflects a comprehensive analysis of the types of hazards associated with incidents that the jurisdiction might need to manage. It reflects not only the most likely events, but also those that are less likely to occur but would have significant consequences if they occurred.

6.2.2 *Risk Analysis*—This is a process in which the hazards identified in 6.2.1 are ranked based on the likelihood that they might occur, as well as the significance of the consequence should they occur. This can be a numeric rating or qualitative rating, such as likely, very likely, or less likely. The highest-scored hazards are addressed first and the lowest-scored addressed last. The degree of impact (that is, consequence) is included in the analysis for each threat. A less likely threat (low frequency of occurrence) may have a higher impact if it were to happen, and that may affect the urgency of response for that threat. The following definitions of likelihood terms can be used as a guide: An incident or event deemed "likely" to occur has a greater than 66 % probability of occurring. A "very likely" result has a greater than 90 % probability. "Extremely likely" means greater than 95 % probability, and "virtually certain" means greater than 99 % probability.

6.2.2.1 *Vulnerability Assessment*—Once hazards are identified, the vulnerability assessment is applied to determine which potential incidents or events need to be considered when establishing an EOC. For example, the Authority Having Jurisdiction (AHJ) would not want to place the EOC in an area where routine flooding occurs when it has identified flooding as a high risk, unless the facility is specifically needed in that location and sufficiently protected from such risk.

6.2.3 *Emergency Management Operations*—Consider the aspects of emergency management operations that help define an AHJ's need for an EOC.

6.2.3.1 *Consequence Management*—Consider the impact or result of an incident, which is the primary focus of EOC activities. Each agency in the jurisdiction determines how each identified incident is addressed and determines what is needed

in terms of space allocation, equipment needs, facility systems, or other requirements of a supporting EOC.

6.2.3.2 *Capability Assessment*—A capability assessment reviews the ability of a government, individual or company to address identified hazards. Such an assessment should review technical ability, financial resources, legal and institutional frameworks and political will. A capability assessment can reveal gaps in existing capability for hazard response and development control, as well as highlight currently functioning mitigation activities. This assessment can help identify policy and structural changes that must be made to institutionalize mitigation. Some mitigation options may be eliminated from consideration due to barriers to implementation identified during the capability assessment. This is the AHJ's determination of its capability to provide actions and resources, and to what level these needs can be addressed by the AHJ. This will help determine the size and scope of the EOC facility.

6.2.3.3 *Legal Responsibility*—Incorporates the AHJ's review of all applicable laws, policies, and procedures that shape the framework of the AHJ's emergency management responsibility. This review should specifically identify any legal aspects required of the jurisdiction,, what equipment is required, and any laws that address construction or facility requirements.

6.2.3.4 *Vision*—This defines the long-term view of what the AHJ believes needs to occur in an ideal setting. Understanding that, the AHJ must be willing to make decisions based on issues such as cost/benefit and overall financial capabilities. A typical EOC organization vision statement addresses topics such as direction and control, situational assessment, coordination, priority establishment, and resource management.

6.2.3.5 *Mission*—This defines what the AHJ believes is the overall purpose of the EOC organization being established.

6.2.3.6 *Facility Occupancy*—Occupancy can vary. The entity's EOC facility could be a stand-alone building or in a shared facility (that is, jointly with a police or fire department or the 911 center) or just a room that has been designated in an existing facility. It can be a dedicated EOC facility (permanently set up for immediate use) or one that has been modified to accept equipment and personnel (for example, prewired for additional phone lines).

6.2.3.7 *Facility Use*—In many cases, the EOC can be designed for multiple uses. This may include a training room, conference room, and storage. Some facilities are dedicated and therefore reserved solely for use as an EOC. The EOC can be located within a larger facility that may include usage by other organizations or departments. Consider that the EOC design plan has the option of converting normal use of space into another type of use during an incident, or as the incident requires more personnel at the facility and more space is needed. Planned use of sliding room divider walls in facility design may provide more flexibility in facility use. Alternate planned space usage during an incident can also impact facility planning regarding changes in levels of security for different areas, space requirements, storage needs, locations and size of restroom facilities, power and other utility needs, communications and other technology, vehicle parking, and other such issues.

6.2.3.8 *Facility Functionality*—The key to functionality is that it works for the organizations using it. Whether the facility is dedicated or multi-use, the objective is to be able to meet the needs of the organization in the role of an EOC. For some, this might be a compromise between what is seen as ideal and what is realistically possible. The AHJ should ensure that all partners who use the facility have the opportunity to provide input.

6.3 *Create an EOC Design Team*—The design team should be inclusive rather then exclusive. The AHJ may want to establish a core team of key individuals who will do most of the groundwork and will have final approval authority, but the overall size of the team should not be limited.

6.3.1 *Identify Team Members*—The team should be comprised of members who may or will participate in operations within the EOC.

6.3.1.1 *Include the Public Sector*—Include the primary public sector agencies and departments within the entity's jurisdiction that would operate in the facility during an emergency. Even if the facility belongs to a private entity, the public sector can provide guidance, input, and possibly a liaison to the entity's facility. Some of the most overlooked public sector representatives are legal counsel and design professionals.

6.3.1.2 *Include the Private Sector*—With the growing emphasis on the essential role of the private sector in a disaster/emergency, it is critical to get the private sector involved. The AHJ may wish to include either a seat for a liaison or, in some cases, a separate room for a private sector operations center (this may be especially important in larger urban or state EOCs). Participation should be limited to private sector entities with mature EOCs and those that can provide needed support to other response entities such as telecom providers, grocery chains, hospitals, and long-term care facilities.

6.3.1.3 *Include Nongovernmental Organizations*—Nongovernmental organizations (NGOs) such as the American Red Cross, licensed and trained amateur radio operators or other such emergency response trained volunteer organizations may need to have a regular seat in the EOC. It is important to address their specific needs to ensure they can operate with maximum efficiency in the EOC facility.

6.3.1.4 *Include Faith-based Organizations*—Many faith-based organizations take a very active role in disaster response and preparedness and may need to be considered in EOC planning.

6.3.2 *Identify Team Structure*—Identify a team leader early in the process, and establish both a core team and a larger more inclusive review team. Utilize people's strengths and responsibilities using organizational mechanisms such as a steering committee, advisory board, and technical committee.

6.3.3 *Identify Team Support Resources*—Identify resources the team will need. Ensure that the AHJ includes sufficient staff to support the team. The AHJ may wish to hire full-time administrative support staff.

6.3.4 *Create a Meeting Schedule*—Create a timeline for the project and then develop a meeting schedule that will support the timeline but will not become a burden to team participants.

6.4 *Conduct Design Team Planning Meetings*—Every meeting should have an agenda published in advance. Keep the meetings at a reasonable length, and ensure that the right people attend. Avoid scheduling meetings if there is no action or substantive information to report. The number of members with a vote should be designated in advance. Each entity represented should have an odd number of people on the team to avoid deadlock on the resolution of entity specific issues. All potentially interested parties should be aware of the process and be kept informed as the team progresses. It is recommended that an experienced architect with proven experience in EOC design and construction be retained early in the process to be available for design team planning meetings. Strict rules on meeting conduct should be established initially and restated before each meeting. It is recommended that meetings follow *Robert's Rules of Order*.[4]

6.4.1 *Develop the EOC Vision*—Before moving to the design or construction phase, it is essential to determine a consensus vision for the project. This will create the boundaries that will help resolve issues and provide a much clearer understanding of the intended result.

6.4.2 *Continuity of Operations/Continuity of Government*—Because of the nature of the EOC, it is essential to review and incorporate the entity's continuity of operations (COOP) and continuity of government (COG) plans. These plans help delineate the boundaries and requirements of the project. The need for continuity planning for the EOC itself and for consideration of the jurisdiction's COOP plans in the design criteria is essential.

6.4.3 *Identify Services to be Performed at the EOC*—The team should consider carefully what will be done at the EOC and what is required to accomplish the objectives. Some EOCs include a command and control area while others provide coordination services. These may include coordination in logistics, communications, infrastructure, and emergency services. Critical information such as the number of incidents that require (or would have required) activation of the EOC in the last ten years, categories of response levels, number of seats needed for the largest event, and a list of major functional activities expected to be accommodated by the EOC facility provides the design team with invaluable information on the scope of services to be performed.

6.4.4 *Align Hazard/Threat Identification and Assessment*—This review and alignment will aid in the selection of the site for the EOC and help determine any special construction needs that should be included to reduce the facility's susceptibility to hazards and threats unique to the entity's particular geographic area.

6.4.5 *Align Risk Analysis*—This review and alignment will help determine which hazards and threats are likely to occur and will potentially need to be managed at the EOC because of their resulting consequence and probability of occurring. Increased protection against identified risks results in increased costs. Careful consideration of the risk/benefit/cost implications should be part of the design process.

6.4.6 *Space Requirements*—It is difficult to be precise about space requirements; however, it is recommended that the AHJ estimate the minimum, maximum, and average space requirements. This will help determine a size that will not only meet the entity's immediate needs but also provide room for future growth. The space requirement recommendation applies to any space the entity is considering, whether an empty lot for constructing a new facility or an existing facility.

6.4.6.1 *Space for External and Non-jurisdictional Entities*—If the AHJ is a governmental entity, do not forget the private sector. The private sector is a rapidly growing partner in all activities an AHJ undertakes. Space needs to be allocated for this important partner. The AHJ may want to limit participation of private sector partners to those that provide support and have common goals aligned with the EOC vision. However, reviving local economic capabilities is an important part of response and recovery. Therefore, some method of communication between the entity and all private sector entities needs to be included in the planning. Private sector entities need to provide a liaison to the AHJ to keep informed of actions and plans.

6.4.6.2 *Space for Public Information Office/Joint Information Center (PIO/JIC) and Media*—The PIO/JIC is critical during an incident; however, it may not be advisable to have it located immediately within the EOC. If the AHJ has the option, it may be better to have a designated location close by where media activity will not interfere with emergency management operations. The joint information system (JIS) is critical, and the JIC is merely a facility to implement this system.

6.4.6.3 *Space for Working a Virtual EOC System*—As technology evolves and becomes available, the virtual EOC will continue to grow in acceptance and usability. If the AHJ plans on operating a joint EOC, then it should consider space for those who would typically work a Virtual EOC system.

6.4.6.4 *Efficient Use of Space*—The AHJ should ensure the EOC space is used efficiently for both day-to-day and activation activities (with flexibility and commonality to include shifts and overlaps). In many cases, the EOC may be a joint facility with other non-emergency operations. If the EOC space is also used for non-emergency operations, space allocation decisions need to consider the need for these operations to remain functional even during an incident. In such cases, staff surges at shift changes may need to be considered depending on the nature and size of the incident and the function of the non-emergency operations.

6.4.6.5 *Space for Meetings*—Environmentally controlled space should be provided for policy and strategy meetings apart from the EOC. The noisy environment of a functioning EOC is not conducive to such meetings. Also consider space for executive session meetings and tactical response coordination.

6.4.6.6 *Space Required for Equipment*—Provide sufficient space for current and future equipment needs. Technology and software advances are requiring an ever-increasing amount of equipment. As an incident's need for additional management and staff increases, so will the need for additional equipment and space for that equipment. Consider storage space for portable equipment that might be set up in an incident

[4] *Robert's Rules of Order Newly Revised, 10th Edition*2000 Robert, Henry M., William J. Evans, Daniel H. Honemann, and Thomas J. Batch, Perseus Books Group, Cambridge, MA.

expansion area of the facility and used elsewhere to provide "just in time" training, breakout sessions, and additional briefings.

6.4.6.7 *Space Optimization*—Efficiency should be key in space planning and allocation. It is essential to be cognizant of size, space, sound, and lighting requirements. Consider utilizing advances in technology. For example, hardened windows can be installed or retrofitted without loss of structural integrity in work areas to contribute to the security and psychological wellbeing of the EOC staff.

6.4.6.8 *Break Area and Recreational Space*—It is essential that EOC personnel have adequate space for recreational breaks and relaxation to foster staff alertness and efficiency and avoid early burnout. The setting and colors used in the design of the break area (also shift change areas, if available) should be calming to help EOC staff relax and decompress before and after a shift.

6.4.6.9 *Space Requirements for Survivability and Operability*—The survivability of the EOC needs to be based on the entity's hazard, threat, and risk analysis. When allocating space provide appropriate standoffs from the building. Avoid public parking areas within proximity of the facility or direct-driven access to the facility. The EOC and associated property should allow for space to perform security checks of people, equipment, and vehicles. Air, water, and fuel systems should be protected from tampering as well as be designed to survive identified hazards and threats. The EOC should be isolated from other non-related uses by a minimum of a two-hour fire separation.

6.4.6.10 *Americans with Disabilities Act (ADA)*—An EOC should be designed for compliance with the Americans with Disabilities Act to accommodate participants who may have disabilities. If the space includes access by the general public, then compliance is mandatory. Any entity creating an EOC should design the facility to meet the needs of physically or mentally challenged individuals. Although the ADA is applicable within the United States, it is a benchmark standard for the disabled community worldwide.

6.4.6.11 *HVAC and Utility Systems*—In today's environment of potential terrorism and hazardous materials, the EOC should be equipped with an efficient HVAC system that can deliver continuous clean conditioned air to the people working in the EOC (that is, a fire-rated, blast resistant closed system capable of supplying continuous clean air). The HVAC system should be adequately designed to protect it from chemical, biological, and radiological hazard attack. Redundant air handling, heating and cooling, electrical, water, and sewer systems capabilities should be addressed. NFPA standards 90A and 90B provide additional guidance and requirements for adequate design of HVAC systems.

6.4.6.12 *Utility Design*—With the growth in new technology, space requirements for utilities such as electrical are growing. A redundant sewer system needs to be considered. Entities typically build EOCs below ground, and if the main utility is taken offline, sewer systems can back up. An emergency electrical power system (fuel and generator) also needs to be considered. Evaluate all utility systems for redundancy to ensure the AHJ can continue to provide services at the EOC under all identified hazard and threat conditions.

6.4.6.13 *Shared Facility Functional Areas*—If the EOC is in a shared facility, ensure that all functional areas are sufficient. Each area will require different equipment. Emergency services areas will need enough space and equipment to accommodate a myriad of portable and tablebased radio systems. Some thought should be given to common requirements such as telephones, dry-erase boards, and computers.

6.4.6.14 *Security Systems and Security Personnel*—It is essential to ensure that the entity's space provides adequate security measures. This includes personnel and equipment as well as hardening efforts that might be required.

6.4.6.15 *Potential Medical Needs*—Injuries and illnesses do occur during incidents. Space needs to be provided where injured or ill individuals can be located until they improve or can be transported elsewhere. Space should also be provided for medical supplies such as a defibrillator and first aid kit. Access to this space should be large enough to accommodate any incoming medical resources to include an ambulance or a wheeled litter.

6.4.6.16 *Personal Hygiene Areas to Include Shower and Laundry Facilities and Basic Related Supplies*—Some incidents may require that staff remain on duty for long periods of time. Shower space should be identified for both men and women, whether it is in the EOC or in a nearby location (for example, at a hotel, dorm facility, or similar off-site facility).

6.4.6.17 *Sleep Areas*—Some incidents may require staff to remain on duty for long periods of time. Sleep areas need to be provided. Sleep areas can be in the EOC itself or in a nearby facility, such as a hotel or shelter. If the AHJ plans on locating sleeping areas in existing rooms designed for other purposes, it should ensure that the sleeping areas have adequate storage space for sleeping supplies as well as proper ingress and egress. Some laws require additional entrances and exits for sleeping areas.

6.4.6.18 *Supplies Adequate for Continual Operations for up to 30 Days*—Adequate storage should be designed into the facility from the beginning. Sufficient storage space needs to be considered to store enough supplies for survival up to 30 days. This includes food storage and preparation space and equipment (for example, refrigerators, freezers, microwaves, and stoves). If nearby facilities are utilized, it should be confirmed that such facilities are appropriately prepared with back-up power, water supply, functional sewer/septic systems, laundry facilities, accessible parking, communications, security, and emergency medical access.

6.4.6.19 *Amateur Radio Considerations*—Designate specific space for amateur radio operations as well as other communications capabilities. Amateur radio operators have access to local and regional telecommunication systems that, in the event of an emergency can be used to supplement and augment government/public-sector radio communication assets. The location of antennas, cables, and power supplies required for amateur radio operations within the EOC must be considered during the initial design stage.

6.4.6.20 *Other Trained Volunteers (for example, American Red Cross [ARC], Community Emergency Response Team*

TABLE 1 Technology Decision Tree

	YES	NO	ACTION
1. Does the entity require submission of disaster reports and requests in a particular format?	See question 2	See question 4	
2. Must its submission be through a particular computer program?	See question 3	See question 4	
3. What is the program? Who supplies the program? How much does it cost? How many computers does it need in the EOC with the program to supply the data?	Take action based on answers to questions.		Use information to determine mandated/ minimum EOC technology needs.
4. Does the entity want to use a computerized reporting system?	See Table 2	See question 5	
5. Are there current paper forms that meet the reporting needs?	Take action	Create forms and take action	Acquire forms, determine copies needed, produce copies as budget allows, and stock the EOC

[CERT], Search and Rescue [SAR], Structural Engineers Emergency Response (SEER) Team, and Medical Reserve Corps [MRC])—With the growing use of volunteer groups, it is important to provide space for these services or at least a liaison from these types of groups.

6.4.6.21 *Partners Such as Corporations Aiding Logistics*—Consider space allocation for this critical function. Most entities now use just-in-time delivery processes that require coordination with third-party logistics. Preplan to have space for these partners and adequate space for the equipment they will bring.

6.4.6.22 *Records Retention*—Records retention is another storage issue. The protocol of the entity should include assessment of every piece of paper, including papers to be discarded, to ensure that it does not include critical information. There will be volumes of records that may need to be retained for future reference or as documentation for financial reimbursement.

6.4.6.23 *Facility Logistics*—The entity needs to consider space to perform facility logistics. Space for facility logistics includes space for janitorial closets, loading docks for deliveries, and garbage bins. EOCs require constant upkeep when in use during activation as compared to daily operations. Anticipate the need for the space and services to at least double during an incident because of the high volume of people at the facility.

6.4.6.24 *Laws, Ordinances, Standards, and Operating Procedures Required for Facility*—Various building codes require certain equipment to be installed for entrances and exits. All facilities should have emergency lighting equipment. Planners should review all laws, ordinances, standards, and operating procedures to identify additional equipment requirements. A professional architect can aid in this review process.

6.4.7 *Technology*—Technology trends are toward miniaturization and software-based applications. Technology envisioned now or in the future will more than likely require space and other support. The AHJ should plan for these additional needs, which include sufficient space and size of utilities, HVAC, IT equipment, and cabling and power chases. It is recommended that the AHJ acquire the services of a qualified communications/information technology (IT) consultant to assess and establish equipment requirements. This will determine the space needed for technology. Emergency management is a group approach, and some members may have specialized technology needs that require space and linkage. NFPA 110 provides additional insight and requirements for emergency and standby power systems.

6.4.7.1 *Communications Analysis*—A complete communications analysis should be conducted to help determine space and utility requirements. When reviewing communications, review all applicable laws, ordinances, standards, and procedures. Certain communications equipment, such as secured communications rooms require specialized shielding.

6.4.7.2 *Technology Decision Tree Review*—A technology decision tree (Table 1) is an aid developed to assist emergency managers in determining basic technology needs. The intent is to prompt entities in developing useful systems as well as redundancy.

6.4.7.3 *Computer and Software Checklist*—Once general technology needs have been identified, the entity should look at computers and software in more detail. The computer and software checklist (Table 2) is an aid developed to assist the entity in identifying more specific needs.

6.4.7.4 *Communications Oversight/Control*—To ensure enough space is available for equipment, identify a lead entity that will establish communications and equipment oversight and control. This can be an existing organization or a newly developed subcommittee. Strive for a good balance of functionality and security.

6.4.7.5 *Information Exchange*—Information flows both vertically and horizontally. If everyone on the team is educated about how the information is to flow, he/she can assist the entity in identifying communications media and equipment needs. Information management includes not only formal but also informal communications. Entities also need to consider incorporating soundproof rooms in which critical or secure communications can take place.

6.4.7.6 *Remote Operation*—In a technology-enriched environment, emergency management functions can be conducted in multiple locations. The entity should build in the capability to operate in a remote location virtually as well as at the EOC.

6.4.7.7 *Interoperable and Integrated Communications*—Communication systems need to be interoperable. Interoperability ensures the ability of a system to work with, or use the parts or equipment of, another system. For example, the EOC

TABLE 2 Computer and Software Checklist

The AHJ should answer these questions to make a decision on the software and computer hardware needs for their EOC.
For which EOC functions does the entity want computers?
Does the entity want to purchase a commercial-off-the-shelf (COTS) emergency management software package or use the software already in place in the jurisdiction?
If the entity chooses a COTS emergency management software package, what training and support does the company provide the EOC staff? How easily can staff members make the transition from the software used daily to the special software that is used occasionally?
What are the computer hardware requirements to run the software the entity chooses?
What degree of support does the entity have from the jurisdiction's information technology staff? Is the support on-call 24 hours a day? Does it have EOC support duties defined in its responsibilities?
How can the entity build a backup system for its computers that will keep it operational throughout the disaster? Can the entity make the switch to a fallback server in a few minutes itself, or will it require an extended time for technicians to arrive?
What are the space requirements, environmental requirements, technical requirements, and financial requirements to implement the technology?
When the EOC is "locked down" as a result of disaster, civil unrest, or other similar emergencies, external IT support may be unavailable or unable to respond for an extended period of time. Keeping this in mind, will some EOC staff receive a more advanced level of IT training to provide at least a basic level of support under these conditions?
Will the fallback system automatically activate upon power failure to ensure continuity in IT services? Can the personal computers (PCs) and servers providing IT support at the EOC be configured to switch to a "fallback" server when they sense a hardware failure? An example would be using the concept of server clustering.

needs emergency radio equipment that can effectively communicate with all affected entities and responder organizations. Also, redundancy in communication equipment needs to be considered. For example, if one radio antenna is disabled, the AHJ should be able to run the system on another existing antenna.

6.4.7.8 *Transportable Communications Capability*—The AHJ needs the ability to communicate independently of the EOC as part of continuity planning. For example, the entity may need the technology necessary to switch incoming calls and access records and management software from a remote location.

6.4.7.9 *Laws, Ordinances, Standards, and Operating Procedures for Required Technology*—Laws, ordinances, standards, and internal operating procedures often dictate that the entity should have certain technology in the facility. An example is the legal requirement to have a direct line to the Governor's office or to a nuclear power plant.

6.4.7.10 *Internal/External Warning Systems*—In most cases, EOCs become the main warning focal point for external warning systems such as tornado sirens, amber alerts, emergency alert systems, and warnings from nuclear facilities. The entity's EOC may also house an internal warning system such as one for security, flood, earthquake, and radiation. Adequate technology needs to be provided to support these warning systems.

6.4.7.11 *Technology Support Vendors*—Once the entity has identified technology needs, it should look for vendors needed to support the design, installation, operation, and/or maintenance of such technology. Necessary service contracts for equipment calibration, maintenance, repair and replacement may need to be prearranged. In shared use facilities, some entities may have their own equipment and support infrastructure. Enough space will need to be provided to colocate their resources within the EOC. There may also be efficiency opportunities to couple vendor support.

6.4.7.12 *Additional Equipment*—Conducting emergency management requires a great deal of equipment that can range from furniture and projection screens to radiological monitoring devices and automatic external defibrillators (AEDs). The AHJ will have previously identified space requirements for most equipment. The entity should evaluate whether there is a need for additional items such as maps, copiers, printers, seating, radiological detectors, public address systems, and battery chargers. An EOC is designed to be a self-contained facility that can remain fully functional and survivable without any outside assistance or access for days or even weeks, so it must have all necessary equipment and supplies stored onsite. If the EOC design includes storage of equipment for distribution for use elsewhere, issues such as security, space requirements and accessibility should be addressed.

6.4.8 *Site*—A site can be an empty lot, field, or existing structure. It may require new construction or retrofitting. The key to site selection is to identify whether it will meet the previously identified needs of the AHJ . Site selection is critical, and the entity's decision should be based on the following factors:

6.4.8.1 Easily accessible, yet secure.

6.4.8.2 Large enough for the anticipated incident/event needs.

6.4.8.3 Capable of handling growth as a result of an incident/event.

6.4.8.4 Coordinated with the hazard/threat assessment and risk analysis.

6.4.8.5 Noise analysis to determine if noise reduction devices are needed.

6.4.8.6 Utility surveys for survivability. For example: Will the sewer or septic system adequately support the EOC? Will the EOC have continuous water services, should it have space for substantial water storage, or have an independent water system? Is there adequate power provided? Are redundant power systems available?

6.4.8.7 HVAC system adequacy for the facility/site.

6.4.8.8 Site accessibility to emergency services personnel (police, fire, and medical) during time of need.

6.4.8.9 Adequate atmospheric ventilation at the site.

6.4.8.10 Ample lighted parking available at the site. The site should accommodate redundant systems to include electrical power for mobile units. Site parking should be secure enough to protect vital equipment such as response and command vehicles onsite, including buses and large commercial trucks used by the fire department and USAR teams.

6.4.8.11 Accommodate adequate garbage removal.

6.4.8.12 Accessible from multiple points.

6.4.8.13 Accommodate a rotary wing landing zone nearby.

6.4.8.14 ADA-compliant to accommodate physically or mentally challenged individuals.

6.4.8.15 Site building elements:

(1) Shelter-in-place functionality including main-floor HVAC controls and fire alarm control panel;

(2) Noncombustible construction where possible; and

(3) Sprinkler system that covers the entire EOC that can be shut off at multiple points, segregating the system as necessary to prevent water damage to the whole.

6.4.9 *Fiscal:*

6.4.9.1 *Budgets*—It is crucial for the entity to develop adequate budgets. Include the development of budgets that address items such as construction, information technology, communications, equipment, furniture, feasibility studies, geotechnical reports, and certification costs that are focused on the identified needs. The AHJ may need to revisit initial EOC requirements to scale back overall costs and make the project financially viable.

6.4.9.2 *Educate All on Financial Needs*—Once the AHJ has identified a budget, it should educate the EOC design team on the financial needs and constraints. The team and outside authorities should be an integral part of the design process and understand the costs for the EOC.

6.4.9.3 *Design EOC Within Budget*—Once the AHJ has a budget and its general needs and constraints established, it can start designing the EOC. The AHJ needs to consider the EOC cost and weigh it against the identified need for the EOC and make adjustments as needed.

6.4.9.4 *Cost/Benefit Analysis*—There are many models available for conducting a cost/benefit analysis. The AHJ should look at the EOC cost and weigh whether or not the plan justifies the cost. If it is justified, the entity should continue as planned; if not, the budget and need should be re-examined.

6.4.9.5 *Identify Funding Sources*—Many funding sources are available. The most important funding source is the AHJ. The AHJ should have buy-in from key participants to fund the EOC project and can look to external sources such as civic organizations, private sector partners, nonprofit groups, voter referendums (or bonds), and grants from local, State, and Federal government for additional funding.

6.4.9.6 *Evaluate and Select Funding Sources*—Once funding sources are identified, the AHJ should compare what the sources have to offer, what the AHJ can offer them, and any conditions attached to the funding. The AHJ should rank the funding sources in terms of what is provided, what is required, and how it enables the objectives of the EOC project. Once the funding sources are ranked, the AHJ selects the funding sources to use.

6.4.10 *Identify Existing Sites*—Once the AHJ has determined the EOC needs, it can proceed to identify sites that meet those needs. A rule of thumb is to anticipate reviewing only two sites per day because of the need for completeness of the review and travel constraints. The findings of each site should be documented separately. The review should consider the impact on the neighborhood, as well as the potential acceptance by the community on use of a site for an EOC. Structures should have a certificate of occupancy and should be reviewed for their ability to withstand foreseeable emergency events, such as earthquakes and hurricanes. Structures should be in compliance with applicable structural building codes. Where applicable, structures should be reviewed for ASCE-7 certification or other such structural certification processes. As a general rule of thumb, a building used for an EOC should not have open roof spans greater than 40 ft (12 m), should not be a pre-engineered structure built before 1990, should not be exposed to the full force of hurricane winds, should not be constructed of unreinforced masonry, and should be less than 60 ft (18 m) high (that is, practical constraint criteria offered by the American Red Cross).

6.4.11 *Identify Potential Mobile Sites*—No facility is ever guaranteed to be operational all the time. Thus, the AHJ needs to look at potential sites where an EOC can be established for either alternate COOP/COG purposes or to place the entity closer to the incident or event. Alternate facilities should be located far enough away from each other so that they are not affected by the same event.[5] In planning for the use of alternate facilities, it should be confirmed that such facilities are appropriately prepared with back-up power, water supply, functional sewer/septic systems, laundry facilities, accessible parking, communications, security, and emergency medical access.

6.4.12 *Select Primary Site*—The AHJ should review the findings of each site and rank them in order of how the sites meet the entity's needs. The entity should apply a cost/benefit analysis to the ranking. The entity should then select a primary site that will meet its needs and be cost beneficial.

6.4.13 *Select Alternate Site*—Always select an alternative site. Facility and land acquisition is a fluid process. The primary site the AHJ wishes to acquire may no longer be available. Alternate sites should be readily secured in the time of need with items such as chain link fences, guarded gates, and barriers provided.

6.4.14 *Conduct Physical Configuration Site Meetings*—The AHJ should review the design team composition. More partners may need to be added to the team at this stage. The entity should have the team as a whole configure the site to where it best meets the mission and needs. For example, it makes sense to put all of logistics in one area and emergency services near communications.

6.4.14.1 *Layout Conducive to Interoperable Communications*—The AHJ should apply the equipment and

[5] NFPA 1600 and National Emergency Management Association (NEMA), *Emergency Management Accreditation Program (EMAP)*, 2007 edition.

technology needs from previous steps. It is important to ensure that the layout will not only meet those communications needs but also allow interoperability to be built into the communication system. The entity may need to move some EOC functions to accommodate outside access to cabling. NFPA 1221 provides additional insight and requirements for emergency services communication systems.

6.4.14.2 *Layout Incorporates Security Systems and Personnel*—Safety of the EOC and its occupants is paramount. To manage situations where citizens being served become dissatisfied and irritated with the process or progress, the AHJ should incorporate security stations and systems into the EOC to ensure maximum security while still keeping EOC operations flexible.

6.5 *Identify and Secure Architecture/Engineering Firms*—Whether the AHJ is building a new site or retrofitting an existing site, it is strongly recommended that an architecture and engineering firm be involved in the planning process from the beginning to ensure sufficient work space is allocated and size of utilities [for example, HVAC, sewer systems, cabling and power systems (both primary and back-up)] is adequate in the design. The AHJ staff may not know all the required building codes and other requirements that must be met when developing an EOC. These firms can assist the entity in developing a facility that meets its needs and has the least impact on the site, community, and environment.

6.6 *Consult with Architects, Engineers, and Other Subject Matter Experts as Needed to Identify Methods to Design or Retrofit the EOC to Address the following:*

6.6.1 Structure type, design, and site layout vulnerability to physical damage caused by hazards common to the area (for example, fires, weather, and earthquakes);

6.6.2 Structure and site layout includes devices and design to increase security and safety against attack;

6.6.3 Use of energy-efficient design and materials;

6.6.4 Reduction of the potential for external eavesdropping; and

6.6.5 EOC meets immediate needs and can be expanded in the future. Incremental development may offer a short-term solution affordable with the current budget, with a longterm plan addressing anticipated growth. NFPA 220 provides additional insight and requirement on specific building types. NFPA 5000 provides additional insight and requirements for building construction and safety.

6.7 *Construction Bid for EOC*—To realize cost savings, the entity may wish to bid out the construction of the EOC. For public entities, bidding is almost always regulated by law. When bidding out construction, the AHJ should ensure that the developed specifications address its needs. The AHJ should also include a rating factor that can be applied to address contractor performance. Performance-based rating may help the entity get the project finished sooner and allow the entity to review the bidder's previous work history.

6.8 *Build EOC*—Once a construction contractor has been selected and funding is secured, the AHJ can begin to build the EOC. Review of the architectural design plans should be conducted one last time before the groundbreaking. The entity may need to be flexible to achieve the end result. Ensure any adjustments still meet the entity's mission. For example, the entity may have to reduce a room's size to make room for a redundant HVAC system.

6.9 *Test EOC*—When the EOC is completed and set up, the AHJ should review all of its procedures and develop any additional procedures necessary. The entity should then test the EOC by having all partners come to the EOC and engage in at least a three hour simulation. This allows the entity to simulate a real activation and monitor items such as noise tolerances, temperature control, and space functionality.

6.10 *Maintain EOC*—Once the EOC is developed and put into operation, the AHJ needs to maintain it. Routine preventive maintenance should be performed on equipment and systems. The EOC needs to be kept adequately stocked and prepared. The entity should have plans established to evacuate the EOC quickly to go to an alternate EOC if the facility is compromised.

7. Keywords

7.1 emergency operations center; EOC; EOC design; EOC development

APPENDIXES

(Nonmandatory Information)

X1. EOC DEVELOPMENT CHECKLIST

TABLE X1.1 Emergency Operations Center Development Checklist

STEP TO BE PERFORMED
6.1 Needs Assessment
6.2.1 Hazard/threat identification and assessment
6.2.2 Risk analysis
6.2.2.1 Vulnerability assessment
6.2.3 Emergency management operations considerations
6.2.3.1 Consequence management
6.2.3.2 Capability assessment
6.2.3.3 Legal responsibility
6.2.3.4 Vision
6.2.3.5 Mission
6.2.3.6 Facility occupancy
6.2.3.7 Facility use
6.2.3.8 Facility functionality
6.3 Create a Design Team
6.3.1 Identify Team Members
6.3.1.1 Include the public sector
6.3.1.2 Include the private sector
6.3.1.3 Include nongovernmental organizations
6.3.1.4 Include faith-based organizations
6.3.2 Identify Team Structure
6.3.3 Identify Team Support Resources
6.3.4 Create Meeting Schedule
6.4 Conduct Design Team Meetings
6.4.1 Develop the EOC Vision
6.4.2 Continuity of Operations/Continuity of Government
6.4.3 Identify Services to be Provided at EOC
6.4.4 Align Hazard/Threat Identification and Assessment
6.4.5 Align Risk Analysis
6.4.6 Space Requirements
6.4.6.1 Space for external and non-jurisdictional entities
6.4.6.2 Space for Public Information Officer/Joint Information Center and media
6.4.6.3 Space for working virtual EOC system
6.4.6.4 Efficient use of space
6.4.6.5 Space for meetings
6.4.6.6 Space for required equipment
6.4.6.7 Space Optimization
6.4.6.8 Break and recreational space
6.4.6.9 Space Required for Survivability and Operability
6.4.6.10 Americans with Disabilities
6.4.6.11 HVAC system
6.4.6.12 Utility design
6.4.6.13 Shared facility functional areas
6.4.6.14 Security systems and personnel
6.4.6.15 Potential medical needs
6.4.6.16 Personal hygiene areas
6.4.6.17 Sleep areas
6.4.6.18 Supplies and space adequate for continual operations for up to 30 days; includes adequate food preparation and dining supplies and space
6.4.6.19 Amateur radio/communications
6.4.6.20 Other trained volunteers
6.4.6.21 Partners Such as Corporations Aiding Logistics
6.4.6.22 Records retention
6.4.6.23 Facility logistics
6.4.7 Technology

TABLE X1.1 *Continued*

STEP TO BE PERFORMED
6.4.7.1 Communications
6.4.7.2 Technology decision tree
6.4.7.3 Computers and software
6.4.7.4 Communication oversight and control
6.4.7.5 Information exchange
6.4.7.6 Remote operations
6.4.7.7 Interoperable and integrated communications
6.4.7.8 Transportable communications capability
6.4.7.9 Laws, ordinances, standards, and operating procedures for required technology
6.4.7.10 Internal/External warning systems
6.4.7.11 Technology support vendors
6.4.7.12 Additional Equipment
6.4.8 Site
6.4.8.1 Site is easily accessible, yet secure
6.4.8.2 Site is big enough for expected incident/event needs
6.4.8.3 Site is capable of handling growth as a result of incident/event
6.4.8.4 Site reviews are conducted and compared to the hazard/threat assessment and risk analysis
6.4.8.5 Noise analysis is conducted to determine whether noise reduction devices are needed
6.4.8.6 Utilities are surveyed for survivability
6.4.8.7 Assess HVAC system
6.4.8.8 Site is accessible to emergency services personnel (police, fire, and medical) during time of need
6.4.8.9 Site includes adequate atmospheric ventilation
6.4.8.10 Site includes ample parking that is lighted and has redundant systems to include electrical for mobile units
6.4.8.11 Site includes space adequate enough to address garbage removal requirements
6.4.8.12 Site is accessible from multiple points
6.4.8.13 Site includes a rotary wing landing zone nearby
6.4.8.14 Site is compliant with ADA or can accommodate those that are physically or mentally impaired
6.4.8.15 Site building elements that need to be addressed
6.4.8.15(1) Basic shelter-in-place functionality including main-floor HVAC controls and fire alarm control panel
6.4.8.15(2) Use noncombustible construction materials
6.4.8.15(3) Sprinkler systems
6.4.9 Fiscal
6.4.9.1 Develop budget
6.4.9.2 Educate all on financial needs
6.4.9.3 EOC design within budget
6.4.9.4 Conduct cost/benefit analysis
6.4.9.5 Identify funding sources
6.4.9.6 Evaluate and select funding sources
6.4.10 Identify Existing Sites
6.4.11 Identify Potential Mobile Sites
6.4.12 Select Primary Site
6.4.13 Select Alternate Site
6.4.14 Conduct Site Physical Configuration Meeting
6.4.14.1 Insure layout is conducive to interoperable communications
6.4.14.2 Insure layout incorporates security systems and personnel
6.5 Identify and Secure Architecture/Engineering Firms
6.6 Consult with Architects, Engineers, and Other Subject Matter Experts to Identify Methods to Design or Retrofit the EOC
6.6.1 Structure Type and Site Layout Designed to be Less Vulnerable to Physical Damage Caused by Hazards Common to Area
6.6.2 Structure and Site Layout Includes Devices and Design to Increase Security and Safety Against Attack

TABLE X1.1 *Continued*

STEP TO BE PERFORMED
6.6.3 Reduce Reliance on External Sources and Backup Systems with Energy Efficient Design and Materials
6.6.4 Use Methods to Reduce Potential for External Eavesdropping
6.6.5 Consider Immediate Needs and the Potential to Expand in the Future
6.7 Construction Bid for EOC
6.8 Build EOC
6.9 Test EOC
6.10 Maintain EOC

X2. RATIONALE

X2.1 This EOC development standard guide is intended to provide an entity with practical concepts and approaches to use in designing and developing an effective EOC. The guidance is designed to serve both public and private sector entities that may need to develop an EOC. Thus, concepts and approaches were generalized, as much as possible, to acknowledge that private sector needs are not often driven by statutes or regulations, as is often the case for public sector entities.

X2.2 Whether the EOC is a dedicated or multi-use facility, the objective is for it to meet the specific needs of the entity. In some cases, the resulting EOC might be a compromise between what would be considered an ideal EOC for the entity and what is realistically possible to develop, based upon financial and other constraints.

X2.3 In developing the guidance, it was recognized that a "one size fits all" approach does not work for all entities developing an EOC. An EOC needs to be developed based on the specific risks, vulnerabilities, capabilities and emergency management needs of the entity, considering the underlying constraints of the entity.

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