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Pacific Northwest National Laboratory
Operated by Battelle for the
U.S. Department of Energy

Work Scope for Developing Standards for Emergency Preparedness and Response: Fiscal Year 2004 Final Report

R.D. Stenner

September 2005

Prepared for the U.S. Department of Energy
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R.D. Stenner

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Prepared for the Directorate of Science and Technology
of the U.S. Department of Homeland Security
Office of Research and Development

Pacific Northwest National Laboratory
Richland, Washington 99352

Summary

In Fiscal Year 2004, Pacific Northwest National Laboratory conducted a work scope for developing standards for emergency response and preparedness under the U.S. Department of Homeland Security (DHS) *Statement of Work for Standards for Emergency Preparedness and Response* of the Directorate of Science and Technology of the DHS, Office of Research and Development.

The project focused on several tasks, which were designed to initiate and coordinate the development of voluntary consensus standards for hospital preparedness, radiation detection instrumentation, and awareness training for first responder response and recovery. Specific tasks involved the following:

- Fast-track managing of the E54.02 Subcommittee on Emergency Preparedness, Training, and Procedures standards development
- Developing standard guidance for writing emergency response plans to include model templates
- Developing standard guidance for hospital preparedness and decontamination planning that ties in with hospital requirements and applicable community and state emergency plans
- Developing standard guides on various elements of homeland security risk assessment and management methodology to include aspects such as vulnerability risk, dispersion modeling and projected dose (both ambient and building dispersion), health implications and effects, necessary triage operations, and asset protection and economics
- Developing standard guidance for conducting emergency preparedness drills and exercises
- Developing standard guidance for a training certification-accreditation program
- Developing a standard guide for hazardous materials (HAZMAT) team training and certification
- Developing standard guidance for training personnel responding to an emergency, and developing an annex to the standard specifically addressing medical provider training (i.e., physician, dentist, and veterinarian)
- Develop a standard guide for community involvement and public communication following a terrorist event
- Developing standard guidance for establishing event-specific, decontamination-level limits to ensure timely facility restoration following a chemical, biological, radiological, nuclear or explosive (CBRNE) terrorist event

- Identifying, reviewing, updating, and promulgating existing standards by working with standards development organizations (SDOs) and subject matter experts (SMEs) from the national laboratories.

It was recognized from the start that the development of standard guides through the formalized process of an SDO was involved and difficult to control with respect to schedule. Thus, the production of drafts for submittal into a formalized SDO process was the target product. It was also recognized that the various subjects of these standard guides are continuously developing and are being addressed by various DHS work groups, making it important to align the development of the standard guides with this evolving work. Coordination with this evolving work required, in many cases, additional review coordination and scheduling changes not normally associated with the SDO process. As a result, many of the draft standards presented in this report are still in the early review stages before being submitted to the formal SDO process. This report discusses the status and path forward for each standard guide being developed.

Contents

1.0 Background from the U.S. Department of Homeland Security Emergency Preparedness and Response Statement of Work

The U.S. Department of Homeland Security (DHS) is committed to using cutting edge technologies and scientific talent in its quest to protect the United States against the threat of terrorism. The DHS Directorate of Science and Technology (S&T) is tasked with researching and organizing the scientific, engineering, and technological resources of the United States and leveraging these existing resources into technological tools to help protect the homeland.

The Standards Portfolio (research area) of the DHS Office of Research and Development supports this effort by facilitating the development, promulgation, and adoption of standards that address radiation protection for all activities corresponding to the Emergency Preparedness and Response (EP&R) mission. The standards development program of the Standards Portfolio will identify gaps, needs, and corresponding tasks for developing standards for radiation protection for the three identified emergency/consequence management phases[1]: early (hours to days), intermediate (days to months), and late (months to years) responses. Statutory and regulatory requirements and policy considerations (Homeland Security Act, Stafford Act, the Emergency Planning and Community Right-to-Know Act, 29 CFR 1920.1096, PDD-39, etc.) affect emergency responders and the public, primarily through response plans and training programs. Therefore, an immediate goal of the program is to establish guidelines to ensure compliance and adequacy of response plans, training programs, and equipment procurement and distribution programs that involve and impact first responders[2]. This program will address current needs and technologies but will coordinate with the Radiological and Nuclear Portfolio developmental capabilities for consequence management and recovery.

The effectiveness and safety of first responders is ultimately tied to the plans that guide them, as well as the equipment and training they receive. Homeland Security standards for first responders serve two basic functions: 1) facilitate improvements in response capability, and 2) create a national baseline of preparedness that states and localities could use to measure the effectiveness of their capabilities. Unfortunately, the development of consensus standards is slow, and the organizations involved have a very narrow scope. Because the National Technology Transfer Advancement Act instructs federal agencies to participate in standards development activities of standards development organizations (SDO), one of the primary goals of this program is to create a unified standards infrastructure for first responders. The standards that result from this program will cover all phases of the EP&R mission relating to planning, equipment, technologies, training, protective actions, methods of detection, sampling, analysis, clean-up, speciation, forensics, and exercises and will be consistent with the policies articulated in Homeland Security Presidential Directive (HSPD)-5 and HSPD-8.

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1 Terminology is from EPA400-R-92-001. It is assumed to be equivalent to the Federal Emergency Management Agency (FEMA)'s designation: response, short-term recovery and long-term recovery (see FEMA State and Local Guide 101 9/96)

2 The use of term "first responder" is consistent with the definition provided in HSPD-8, which includes the health sector, e.g., hospital staff and allied health professionals. Any deviations from this definition will be made explicit.

2.0 Scope of Work as Specified in the DHS Statement of Work

The primary objective of this DHS plan for implementation of the program is to guide the development of standards for hospital preparedness, radiation detection instrumentation, training for first responders to radiation incidents, and response to and recovery from a radiation event. Subject matter experts (SMEs) from the national laboratories and the established methodology available from the Standards SDOs will be utilized to guide the process. The plan will also direct the efforts of the participants in this program to promulgate existing standards. These standards will address radiation protection for all activities corresponding to the EP&R mission. Other objectives to be addressed include developing policy on radiation protection recommendations for emergency responders, initiating a cooperative interagency effort to develop a protocol for measuring national laboratory emergency response, and assessing laboratory capability and capacity.

Because the development of a single consensus standard takes years, a key objective of the plan will be to outline a process that will significantly reduce development time. In general, the effectiveness of the plan will be measured by the following:

- Adoption of draft guidelines/standards by SDOs
- Requirement by federal grants programs for compliance
- Evaluation of equipment, plans, procedures, and training program based on standards
- Utilization (by state and local jurisdictions) of compliant equipment, plans, procedures, and training programs.

Standards development will continue for several years to anticipate new technologies and products. These standards support the needs of first responders, which will include law enforcement, fire service, hazardous materials (HAZMAT), emergency medical services, and DHS inspection personnel.

This program will require input from multiple-organization participants and require considerable coordination. However, each of the participating national laboratories has been assigned specific and separate tasks based on their expertise and existing capabilities in developing standards for emergency responders in the field of radiation detection. Therefore, the performance of one laboratory does not impact the performance of another. The Environmental Measurement Laboratory (EML) is providing overall project management including American Society for Testing and Materials (ASTM) standards development. The National Institute of Standards and Technology (NIST) will provide overall project management on the American National Standards Institute (ANSI) standards effort.

3.0 Tasks Assigned to the Pacific Northwest National Laboratory

Pacific Northwest National Laboratory (PNNL) was assigned the following specific tasks to initiate and coordinate the development of voluntary consensus standards for hospital preparedness, radiation detection instrumentation, and awareness training for first responder response and recovery:

Task 1 – Fast-track management of the E54.02 Subcommittee on Emergency Preparedness, Training, and Procedures standards development

Task 2 – Develop standard guide for writing emergency response plans to include model templates

Task 3 – Develop standard guide for hospital preparedness and decontamination planning, that ties in with the hospital requirements and applicable community and state emergency plans

Task 4 – Develop standard guides on various elements of homeland security risk assessment and management methodology to include aspects such as vulnerability risk, dispersion modeling and projected dose (both ambient and building dispersion), health implications and effects; necessary triage operations, and asset protection and economics.

Task 5 – Develop standard guide for conducting emergency preparedness drills and exercises

Task 6 – Develop standard guide for developing a training certification-accreditation program to be recognized by DHS

Task 7 – Develop standard guide for HAZMAT Team training and certification

Task 8 – Develop standard guide for training personnel responding to an emergency and develop an annex to the standard specifically addressing medical provider training (i.e., physician, dentist, and veterinarian)

Task 9 – Develop standard guide for community involvement and public communication following a terrorist event

Task 10 – Develop standard guide for establishing event-specific, decontamination-level limits to ensure timely facility restoration following a chemical, biological, radiological, nuclear or explosive (CBRNE) terrorist event, and identify, review, update, and promulgate existing standards by working with SDOs and SMEs from the national laboratories

Task 11 – Provide quarterly program updates and final update.

4.0 Standards Development Activity and Status for Each Task

Developing consensus-based standards through an SDO involves several steps and rounds of peer review, which make it difficult to accurately predict and schedule their completion. Thus, the goal of this fiscal year was to develop initial drafts of the various standards identified under the specific tasks listed in Section 3 and use them as "strawman" drafts to enter the extensive SDO peer review and balloting process. This section discusses the respective initial drafts of the standards developed under each of the tasks.

4.1 Task 1 – Fast-track Management of the E54.02 Subcommittee on Emergency Preparedness, Training, and Procedures standards development

The Principal Investigator (PI) for the PNNL DHS EP&R Standards Development Project, Dr. Robert Stenner, also chairs the ASTM International E54.02 Subcommittee on Emergency Preparedness, Training, and Procedures under the E54 Main Committee on Homeland Security Applications. Thus, this first task focused on the integration and management of the draft standards developed under the other tasks into the E54.02 SDO consensus-based standards development process. As draft standards began to evolve in the process, this task also involved working directly with the Interagency Board (IAB) for coordination and alignment. Likewise, in working aspects of the evolving standards within the ASTM International and IAB systems, it became necessary to integrate and liaise some of the specific standards development activities with the National Fire Protection Association (NFPA) standards development activities. As a result, Dr. Stenner was invited and now also serves on the NFPA 472 Committee.

Appendix A contains a table showing the current E54.02 long-range plan, which is used as a management tool to work the various standards through the ASTM International consensus-based standards development process. This E54.02 long-range plan is very dynamic and updated frequently to be an effective management tool.

4.2 Task 2 – Develop Standard Guide for Writing Emergency Response Plans to Include Model Templates

The focus of this task was to initiate and coordinate the development of a standard guide for the development of emergency operations plans (EOPs).

The E54.02 Task Group Chair for the development of this standard guide is Mr. Tim Dunkle of the Pennsylvania Emergency Management Agency (PEMA). The initial task group involved several of the PEMA staff, who have extensive experience in developing such plans and implementing them under a host of emergency situations that PEMA has experienced over the past few years. Once an initial draft of the standard guide was developed, the task group activity expanded to involve a broader range of people. As part of the EP&R Standards Development Project's Fiscal Year (FY) 2005 activities focused on standards support to the National Incident Management System (NIMS) Integration Center (NIC), further development and process of this draft standard is being coordinated with the NIC. The development of this *Standard Guide for Developing a Model Emergency Operations Plan in Response to All Hazards* *(including CBRNE)* – (ASTM E54.02 Work Item WK 5498), as it is now titled, is proving to be timely for the standards development needs of the NIC. It is also currently being reviewed and further developed with the DHS Office of Domestic Preparedness (ODP) and alignment with the HSPD-8.

Appendix B contains the latest draft of the Standard Guide for Developing a Model Emergency Operations Plan in Response to All Hazards (including CBRNE).

4.3 Task 3 – Develop Standard Guide for Hospital Preparedness and Decontamination Planning

The focus of this task was to initiate and coordinate the development of a voluntary consensus standard on hospital preparedness.

The E54.02 Task Group Chair for the development of this standard guide was Dr. James Augustine, Medical Director for the Atlanta Fire Department. This standard guide is now a published ASTM International standard designated as E2413, *Guide for Hospital Preparedness and Response*. The E54.02 task group for this hospital preparedness and response guide is still active and is now working on updates to the standard.

This standard is currently being updated in conjunction with the ongoing effort within the NFPA 472 Committee to completely rewrite the NFPA 473, *Standard on Competencies for EMS Personnel Responding to Hazardous Materials Incidents* (discussed in more detail under Task 8). Both Drs. Stenner and Augustine are serving on the NFPA 473 Task Group for rewriting the 473 standard. The new NFPA 473 standard will focus on the human medical component of an exposed patient involved in a HAZMAT incident. The intent is a seamless linkage between the NFPA 472 *Standard on Professional Competence of Responders to Hazardous Material Incidents,* the NFPA 473 *Human Medical Aspects of The EMS (First-Receiver of The First-Receivers)* working with contaminated patients, and the ASTM *International E2413 Guide for Hospital Preparedness and Response* (first-receivers).

4.4 Task 4 – Develop Standard Guides on Various Elements of Homeland Security Risk Assessment and Management Methodology

The focus of this task was to initiate and coordinate the development of a standard guides on selected homeland security risk assessment related topics.

Currently, three standard guides are being developed under Task 4: 1) Standard Guide for Building Event Dispersion and Health Assessment Preparedness and Response Planning (ASTM E54.02 Work Item WK 5516), 2) Standard Guide for the Development of a Radiological Dispersal Device (RDD) Playbook (ASTM E54.02 Work Item WK 7020), and 3) Standard Guide for School Preparedness and All Hazard Response (ASTM E54.02 Work Item WK8908).

4.2.1 Standard Guide for Building Event Dispersion and Health Assessment Preparedness and Response Planning

The E54.02 Task Group Co-chairs for the development of this standard guide was Mr. Don Hadley, PNNL Building Science, and Dr. Robert Stenner, PNNL Toxicology. The initial task group involved staff from both PNNL and Battelle Eastern Science and Technology (BEST) Center and drew heavily on modeling and health assessment work conducted over the past several years on the subject. This draft standard has gone through the first round of balloting in the ASTM International E54.02 Subcommittee. It received a couple of negative votes with suggested modifications/additions, which are currently being addressed. It is also currently at the Environmental Protection Agency (EPA) Homeland Security Research Center (HSRC) for review. At the last E54.02 meeting, an interest in its review by the EPA HSRC was expressed, and the E54.02 Chair found the negative votes persuasive, which pulled the draft standard from the balloting process to allow time to work on the modifications suggested with the two negative votes and for the EPA HSRC to review and provide their input on the draft standard. Currently, the modifications associated with the two negative votes have been completed, and we are awaiting a response back from the EPA HSRC. As soon as that is received and processed, the draft standard will be reballoted. Appendix C contains the latest draft of the *Standard Guide for Building Event Dispersion and Health Assessment Preparedness and Response Planning*.

4.2.2 Standard Guide for the Development of a RDD Playbook

The E54.02 Task Group Chair for the development of this standard guide is Dr. Tammy Taylor of Los Alamos National Laboratory. Dr. Taylor is also the PI on a separate project with DHS entitled Radiological Community Preparedness Resources (RadCPR). The initial task group for the development of this project is Dr. Taylor's team on the RadCPR Project. One of the goals of the RadCPR Project is to work directly with the Greater New York City (NYC) area first responder community to establish the resources, methods, and procedures necessary for the development of an RDD Playbook for the NYC/New Jersey Metropolitan Area. In discussions with Dr. Taylor, it was deemed prudent and a next natural step to generalize the resources, methods, processes, and lessons learned in the RadCPR Project and develop a standard guide for the development of an RDD Playbook from the insight and experience gained in the RadCPR Project. The schedule for the development of this standard guide follows directly along with the RadCPR Project schedule, with short extension times to allow for the incorporation of feedback from the RadCPR Project.

4.2.3 Standard Guide for School Preparedness and All Hazard Response

The E54.02 Task Group Chair for the development of this standard guide is Dr. Craig Marks, President of Blue Horizons Consulting, LLC. This is a new standard development activity that was identified by several members of the hospital preparedness task group. The tentative schedule for completing the first draft of this standard guide is April 2006. Appendix D contains a copy of the initial task group write-up on the scope and rationale for the development of the *Standard Guide for School Preparedness and All Hazard Response*.

4.5 Tasks 5 – Develop Standard Guide for Conducting Emergency Preparedness Drills and Exercises

The need for a SDO-generated standard guide on the conducting of emergency preparedness drills and exercises was not found or established. The need for such a standard guide was explored within the ASTM International community, DHS, and the IAB community, and it was determined that, at this time, there was no need for such a standard guide. However, a need was identified for the development of a Standard Guide for Addressing a Mission Essential Task List (METL) for First Responders. Mr. Charlie Brannon, NIST, was assigned as task group chair for the METL standard guide. A key issue identified in the need for the METL standard guide was to ensure it was developed considering the applicability to all disciplines involved in first response. A draft METL for First Responders was developed and circulated for an initial review by selected parties before submitting it into the balloting process. As a result of this initial review, it became apparent that we were covering some of the same ground that the NFPA 472 Committee was covering in their ongoing activity to update and rewrite their NFPA 472 Standard. During one of the IAB meetings, a special meeting was held to discuss and resolve a path forward the METL and 472 rewrite activity. IAB Chair, Mr. Robert Ingram, asked that the two ASTM and NFPA task groups work together to produce one standard that would address the updating needs of the existing 472 standard and address the need to be applicable and acceptable to all first-responder disciplines. At the time, we were also exploring the idea of developing a *Standard Guide for HAZMAT Team Training, Qualification, and Certification*, which was also being addressed by the NFPA 472 Committee in their update activity (discussed further under Task 7). As a result of this meeting at the IAB, we collapsed our two standards development activities into one and agreed to work our material and needs into the 472 update activity. The NFPA 472 Committee invited Mr. Charlie Brannon (METL Task Group Chair) and Dr. Robert Stenner (E54.02 Chair) to serve on the NFPA 472 Committee for liaison and 472 development coordination. The standard being produced from this integrated approach is discussed under Task 7.

4.6 Task 6 – Develop Standard Guide for a Training Certification-Accreditation Program to be Recognized by DHS

The need for a SDO-generated standard guide for developing a training certification-accreditation program is still being explored. The need for such a standard guide was explored within the ASTM International community, DHS, and the IAB community, and a need was partially identified but it was not the correct time for its development. Mr. Mason Diamond, a private consultant, was identified as the Task Group Chair but was asked to hold off on establishing a task group and working on the development of a draft of the standard, pending the identification of a specific need and use for such a standard. The activity remains on hold.

4.7 Task 7 – Develop Standard Guide for HAZMAT Team Training and Certification

The need for a standard guide on HAZMAT training and certification was explored within the ASTM International community, DHS, and the IAB community. There was clearly a need for such a standard that addresses HAZMAT training and certification for all disciplines involved in a first response. It was understood that the NFPA 472 standard clearly addressed this need for the firefighter discipline. A task group Chair and interested members were being sought to serve on the task group when the activity discussed under Task 5 occurred. As a result of the special meeting at the IAB, the work under this task has been rolled up with that of Task 5. The standard that will be developed as a result of efforts on this task is the new (restructured) NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction (WMD) Incidents*. The existing NFPA 472 standard is specifically being rewritten to make it more clearly applicable and acceptable by all disciplines involved in HAZMAT/WMD first response. A draft of the new NFPA 472 standard is complete, with final internal review in process. The new standard will be available for public review and comment in fall 2005.

4.8 Task 8 – Develop Standard Guide for Medical Provider Training

Originally, this task was slated to follow the completion of the hospital preparedness standard guide. Dr. Terri Spear, U.S. Department of Health and Human Services, was selected as task group chair for the production of an "Annex" to the hospital preparedness standard guide addressing these specific medical provider training needs. Thus, this task was put on hold awaiting the completion of the hospital preparedness standard. However, new developments that have spun off from the work discussed under Task 5 and Task 7 have now expanded this effort to also include the needs of the Emergency Medical Service (EMS) community. A new effort was started in July 2005 to completely rewrite the existing NFPA 473, *Standard, Competencies for EMS Personnel Responding to Hazardous Materials Incidents,* and focus it on the human medical aspects of EMS in HAZMAT/WMD response settings. Through Dr. Stenner's NFPA 472 Committee work and liaison for ASTM E54.02 and NFPA 472 activity, Dr. Stenner and Dr. Augustine are both serving on the NFPA 473 Task Group for rewriting the 473 standard. This effort will attempt to link the new NFPA 472 standard on HAZMAT/WMD with the ASTM E2413 (Hospital Preparedness) standard through the new NFPA 473 standard for medical response of contaminated victims by the EMS community, with hand-off to the hospital community. This effort is on a fast track to attempt to get the NFPA 473 standard revised and be available with the new NFPA 472 standard in early 2006.

4.9 Task 9 – Develop Standard Guide for Community Involvement and Public Communication Following a Terrorist Event

The focus of this task was to initiate and coordinate the development of standard guides that would help with community involvement and public communication necessary following an incident for restoration planning and implementation. A standard guide addressing the framework and elements was chosen as the initial effort for this task.

The E54.02 Task Group Co-Chairs for the development of this standard guide are Drs. Jerry Stangeland, and Robert Stenner, both of PNNL. This standard guide is aimed at providing an assessment framework as guidance in the restoration of property contaminated during a terrorist event. It attempts to outline the approach for involving the community in addressing health, economics, environmental, and social issues associated with the restoration of such affected property. Given the subject matter of this standard guide, a considerable amount of review and refinement will be required to align it with the restoration needs from such an event. Drafts of this standard have been developed and reviewed by various parties. It has also been through the first round of balloting at the E54.02 subcommittee level. Comments and negative votes have been resolved. It is currently being reviewed by the EPA HSRC for alignment with their needs and focus. Upon receipt and incorporation of the EPA HSRC comments, it will be re-submitted into the ASTM E54.02 balloting process. Appendix E contains a copy of the latest draft of the *Standard Guide for Stakeholder-Focused, Consensus-Based Event Restoration Process.*

4.10 Task 10 – Develop Standard Guide for Establishing Event-Specific, Decontamination-Level Limits Following a CBRNE Terrorist Event

The focus of this task was to initiate and coordinate the development of a standard guide that would specifically define an acceptable process for establishing restoration cleanup levels for high-value property contaminated during an incident.

The E54.02 Task Group Co-Chairs for the development of this standard guide are Ms. Lissa Staven and Dr. Robert Stenner, both of PNNL. Drafts of this standard have been produced and circulated to various parties for review and modification. Given the subject matter of this standard guide, a considerable amount of review and refinement will be required to align it with the restoration needs from such an event. Drafts of this standard have been developed and reviewed by various parties. Comments and modifications from these reviews have been incorporated. It is currently being reviewed by the EPA HSRC for alignment with their needs and focus. This standard is proving to be quite difficult to develop, and as a result, needs further refinement and development prior to being submitted into the ASTM E54.02 balloting process.

Appendix F contains a copy of the latest draft of the Standard Practice/Guide for Establishing a Health Risk-Based, Event-Specific Process for Deriving Restoration Levels for High-Value Property.

4.11 Task 11 – Provide Quarterly Program Updates and Final Update

As the project evolved, a DHS monthly activity reporting system was put into place. Thus, the quarterly updates became the monthly reports. Monthly reports are made through the Prosight system. This report serves as the final FY 2004 funding scope update for the DHS EP&R Standards Development Project.

5.0 Conclusions

Initially, in the FY 2004 tasks of this PNNL EP&R Standards Development Project, we were asked to find readily available guidance and materials that would serve as “low hanging fruit” for the development of SDO-developed standards needed by the first-responder community. The standards discussed in this report are such “low hanging fruit” standard guides. As the DHS matured and its structure, needs, and working group assignments developed, our PNNL EP&R Standards Development Project needed to align with the various ongoing DHS activities, working group efforts, and specific needs identified by the DHS community. Thus, the FY 2005 efforts of the project will be shifting to provide standards identification, review, and development support for identified program needs. For example, the project will be supporting the FEMA NIMS Integration Center on its standards identification, review, and development needs.

While the focus of the EP&R Standards Development Project is shifting to align more with these changing DHS standards support needs, the work on the standard guides identified in this report will continue through the ASTM International and NFPA SDO processes. New standards development needs, identified under the standards support activities, will be added as the PNNL EP&R Standards Development Project develops over the coming years.

6.0 References

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Appendix A

ASTM International – E54 Committee on Homeland Security Applications, E54.02 Subcommittee on Emergency Preparedness, Training, and Procedures
Long-Range Plan for Standards Development

Appendix A

ASTM International – E54 Committee on Homeland Security Applications *E54.02 Subcommittee on Emergency Preparedness, Training, and Procedures* **Long-Range Plan for Standards Development**				
Standard	**Project Chair**	**Target Completion Date First Draft**	**Target Completion Date Sub-Com. Ballot**	**Target Completion Date Main Comm. & Society Ballot**
E54.02.01 – Emergency Preparedness Planning Task Group ***Standard Guide for Hospital Preparedness** and decontamination planning standard guide that ties in with the hospital requirements and applicable community and state emergency plans. Coordinate with VA hospital work in this arena.* (DHS-ASTM Priority 1) Task Group: James Augustine (Chair); Jeffrey Arnold; Lynne Bergero; Angel Brana; Charlie Brannon; Peter Brewster; Paula Burgess; Kelly Burkholder-Allen; Christopher Cannon; Mary Chaffee; Ronnie Davis; Dobbs, Rebecca A; Dotson, Jay A.; Dotson, Jay A.; Timothy Dunkle; David Eddinger; David Eppler; Laura Harden; Scott Harris; Auf der Heide, Erik; Hemphill, Robin; Ron Hilliard; John Hoyle; Bob Johns; Dennis Jones; Kristi Koenig; LaFon, Lorie; Dawn Mancuso; Thomas Martin; Aileen Marty; Ludlow McKay; Matthew Monetti; Mara Oliveira; Neill Oster; Paul Penn; Peterson, Cindy; Pat A. Picariello; Pullani, Anita (HRSA); Fabien Raccah; Keith Reddick; Kenneth Rhea; Kathy Rinnert; Runyon, Thomas; Frank Schneider; Schulman, Roslyne; Peter Shebell; Henry Siegelson, MD; Teri Spear; Cheryl Starling; Stenner, Robert D; James Stewart; Craig Thorne; Katherine Uraneck; Patrick Young Work Item: **WK4344**	James Augustine (Atlanta Fire), Chair Tel: (404) 486-1157 Fax: (404) 486-1157 Email: jaugus@emory.edu	3-20-2004	6/2004	Completed

Federal Grant Programs Supported: • (DHS-EP&R Directorate) *Metropolitan Medical Response System* directly supported to enhance integrated medical response plans to a WMD terrorist attack • (DHHS) *Public Health and Social Services Emergency Fund* directly supported in preparation of nations public health system and hospitals for possible mass casualty and bioterrorism events • (DHHS-Health Resources and Services Administration) *State Rural Hospital Flexibility Program* directly supported to help with rural community hospital and rural health plans • (DHHS- Health Resources and Services Administration) *EMS for Children* partially supported by children's trauma treatment aspects Mgt. Notes: **Completed – E2413 Standard Guide for Hospital Preparedness and Response** **Standard Guide for School Preparedness and All Hazards Response** covering concepts, principles, and best practices for all-hazards integrated emergency management programs in preparedness, prevention, mitigation, response, and recovery for schools and school districts in preparation and response to a natural or man-caused incident. Task Group: Craig Marks, Chair; Keith Reddick, James Augustine, Patrick Young Work Item: **WK8908** Mtg. Notes: New work item 8-15-05	Craig Marks (Blue Horizons LLC) Chair Tel: 910-893-2556 Fax: 919-632-1633	3-30-2006	4-30-2006	TBD

	E-mail: Craig@BlueHorizonsLLC.com			
E54.02.02 – Emergency Preparedness Training Task Group **Standard guide for addressing Mission Essential Task List (METL) (Mission Essential Task List) for first responders.** (DHS-ASTM Priority 1) Task Group: cbrannon@nist.gov (Chair); pamela.greenlaw@dhs.gov; peter.shebell@eml.doe.gov; Stenner, Robert D; Robert.Johns@dhs.gov; tvoss@lanl.gov; tspear@hrsa.gov; thughes@state.pa.us; tdunkle@state.pa.us; mhoover1@cdc.gov; mvyenielo@state.pa.us; morgancx@swcp.com; christine.vanhorn@ch.doe.gov; walt.chrobak@nnsa.doe.gov; kathleen.higgins@nist.gov; philip.mattson@nist.gov; stephen.clendenin@state.ma.us; siraj.m.khan@dhs.gov; john Nasstrom; john.mercier@us.army.mil; jdimino@mail.montcopa.org; jstraka@doeal.gov; brooke.buddemeier@dhs.gov; BobLINY120@aol.com; gryan@cityofchicago.org; leson@theiacp.org; robert.c.woodard@us.abb.com; rjohnson@radtrain.com; douglas.Minnema@nnsa.doe.gov; ed_Bailor@Cap-Police.Senate.gov; edwin.leidholdt@med.va.gov; eversolejohn@aol.com; ijamesrk@cbirf.usmc.mil; elaine.stewartcraig@us.army.mil; chiefHRM@leo.gov; bteele@nfpa.org; dwolfe@scgov.net; wayne.yoder@dhs.gov; Stevenson.Peter@epamail.epa.gov; wayne.davis@osd.mil; alan.vickery@seattle.gov; wthomas@vil.downers-grove.il.us; karen.hirsch@dtra.mil; dlumpkins@mema.state.md.us; rfraass@crcpd.org; pstan81131@aol.com; greg.komp@us.army.mil; james.lamers@associates.dhs.gov; jjwhicker@lanl.gov; cmilam@landauerinc.com; james.d.jamison@cpmx.mail.saic.com; sperle@globaldosimetry.com; dmancuso@aams.org; kwrisley@titan.com; sobrien@ucsd.edu;	Charlie Brannon (NIST), Chair Tel: (301) 975-3855 Fax: (301) 926-7416 Email: cbrannon@nist.gov Ralph Shenefelt (ASHI) Tel: (800)682-5067 Fax: (727) 943-7460 Email: rshenefelt@ashinstitute.org	5-1-04 (on hold pending ODP updates)	2/2005 (draft submitted for outside review, which resulted in the IAB joint meeting with NFPA 472 and the conclusion to work this together)	Moved into HazMat task E54.02.06 – same Work Item WK 4182

g.janiec@westonsolutions.com; ramosg@tswg.gov; jstewart@sysplan.com; hstearns@iafc.org; Nancy.Suski@dhs.gov; amy.donahue_1@nasa.gov; jbooth@dps.state.la.us; wrolin@idir.net; William.Snelson@usdoj.gov; tmcandrew@ci.las-vegas.nv.us; VJDTY@aol.com; rshenefelt@ashinstitute.org; pilkingtonr@missouri.edu Work Item: **WK4182** Federal Grant Programs Supported: • (DHS-EP&R Directorate) *State and Local Emergency Operations Centers (EOCs)* indirectly supported in that it provides a standardized listing of Mission Essential Tasks for emergency response operations for which an EOC can evaluate and be evaluated to determine deficiencies. • (DHS-EP&R Directorate) *Community Emergency Response Teams* directly supported in that it provides a standardized listing of Mission Essential Tasks for emergency response. • (DHS-EP&R Directorate) *Emergency Management Performance Grants* directly supported by the development of a standardized Mission Essential Task List for emergency response. • (DHS-EP&R Directorate) *State and Local Emergency Operations Planning Grants* directly supported in that it provides a standardized listing of Mission Essential Tasks for emergency response to consider in any updates to emergency operations plans. • (DHS-EP&R Directorate) *Citizen Corps* indirectly supports the formation of Citizen Corps Councils by providing a standardized Mission Essential Task List for emergency response. • (DOT-Research and Special Programs Administration) *Hazardous Materials Emergency Preparedness Training and Planning Grants* indirectly supported by providing a standardized Mission Essential Task List for emergency response.				

Mgt. Notes: **[8-16-04]** following up on decision to just go forward with existing draft if the ODP updates and not going to happen soon (decision by end of August 2004) – may want to rearrange current draft before balloting (align by discipline – TBD). **[9-21-04]** decision made to go forward with existing standard; existing draft is being reorganized to present the standard by disciplines; also considering the development of an additional standard that addresses a Universal Task List (UTL); obtaining work from PEMA on the development of a UTL standard**.** **[11-29-04]** An additional short hold was put on this pending some work ODP was thinking needed to be coordinated, but Charlie is now organizing standard by discipline and adding a couple of new sections; projected that the draft will be ready to start in the balloting process by the end of Feb. 2005. **[4/4/05]** Per the results of the joint meeting of E54.02 and NFPA 472 at the IAB meeting, this work is being rolled up under the HAZMAT Team training, qualification, and certification task and is currently being worked jointly between NFPA 472 and ASTM E54.02. As Task Group Chair, Charlie Brannon attended, at the invitation of NFPA 472, their recent task group meeting which is currently working on the updating of NFPA 472 standard. In talking with Dave Trebisacci (NFPA) after this first meeting they were please with the coordination effort ongoing for preparing the joint NFPA/ASTM revision/updating of the 472 standard. Charlie is planning on attending their next task group meeting. ***<u>Standard guide Annex for medical provider training</u>*** *<u>(physician, dentist and veterinarians).</u>* (DHS-ASTM Priority 1) Mtg. Notes: **[4/4/05]** This effort has been place on hold pending the identification of need and how it will need to fit in with the joint work on the 472 update.				

	Terri Spear (DCHEP, HRSA; HHS), Chair Tel: (301) 443-4912 Fax: (301) 443-4922 Email: tspear@hrsa.gov	Hold	Hold	Hold
E54.02.03 – Emergency Preparedness Operations Task Group *Standard guides associated with aspects of health risk assessment to include guides on dispersion modeling and projected dose, health effect, and necessary triage operations. Will coordinate with needs and activities of the several DHS developing DDAPs and other activities. This is a very broad topic, which may be divided into specific areas associated with health risk assessment for more specific standards development.* Specific standard guides: **Standard guide for building event dispersion and health assessment preparedness and response planning** (DHS-ASTM Priority 1)	Robert Stenner (PNNL), Co-Chair Tel: (509) 375-2916 Cell: (509) 531-6438	1/2005	3/2005	TBD

Task Group: Bob Stenner/Don Hadley (Co-Chair); Charlie Brannon; Susan Gaines; Peter Armstrong; Mike Janus, George Fenton. Work Item: **WK5516** Federal Grant Programs Supported: • (DHS-EP&R Directorate) *State and Local Emergency Operation Centers (EOCs)* directly supported via the development of a capability and tool to plan for, assess and monitor the dispersion of an event occurring in a major complex building • (DHS-EP&R Directorate) *Emergency Management Performance Grants* directly supported via a capability to plan for, analyze, and monitor CBRN contamination related events in critical complex buildings • (DHS-Border and Transportation Security Directorate) *State Homeland Security Grant Program* indirectly supported by the indoor air (complex building) modeling standardized guidance that is essential for the placement of such specialized equipment and to evaluate/calibrate the specialized equipment • (DOJ-National Institutes of Justice) Domestic Anti-Terrorism Technology Development Program directly supports for the development of standards for counter terrorism technologies (of which building contaminant dispersion and management models are an example of such technologies) Mgt. Notes: **[8-16-04]** using existing building statistic standards; incorporating DARPA Immune Bldg. Capabilities; blending with urban models/systems (EML) **[9-21-04]** developing outline of standard to be followed by a draft strawman standard; incorporated BEST – DARPA Immune Building Program staff for incorporation their developments, which have been extensive over the past several months; coordinating with the newly formed working group (WG5) on Urban Air Transport Modeling and Its Standard (WG5 will play a significant role in coordinating the indoor modeling with the urban air modeling and the coupling of both with exposure assessment	Fax: (509) 375-2019 Email: robert.stenner@pnl.gov Charlie Brannon (NIST) Tel: (301) 975-3855 Fax: (301) 926-7416 Email: cbrannon@nist.gov Don Hadley (PNNL)(non-ASTM), Co-Chair Tel: (509) 375-3708 Fax: (509) 375-3614 Email: don.hadley@pnl.gov George Fenton (BEST)(non-ASTM) Tel: (410) 306-8539 Fax: (410) 306-8422 Email: fentong@battelle.org			

modeling) **[11-29-04]** Draft of the standard is being developed with George leading development of Sections 7 & 8 and Don leading the other sections. **[4/4/05]** Draft indoor air (complex building) standard guide is in the first-round of E54.02 balloting (i.e., subcommittee level). It was also given to EPA HSRC, ASHRAE, and IAB for initial out-side review.				
E54.02.04 – Emergency Preparedness Training Task Group ***Standard guide for developing a training certification-accreditation program*** *to be recognized by the Department of Homeland Security. Coordination with ODP, FEMA, NFPA, and others will be essential.* (DHS-ASTM Priority 2) Task Group: Work Item: Federal Grant Programs Supported: • (DHS-EP&R Directorate) *National Fire Academy Training Grants* directly supported via standardized training certification and accreditation	Mason Diamond Tel: (508) 333-0108 Cell: (508) 333-0108 Email: MasonWD@aol.com	Hold	Hold	Hold

Mgt. Notes: **[8-16-04]** need METLs standard first, then can work on the certification standards; listed at a priority 2, so hold until METL standard is out of first round ballot. **[9-21-04]** still on hold awaiting the METL standard **[11-29-04]** still on hold awaiting the METL standard. **[4/4/05]** still on hold to see if there is a need for such a standard guide. This subject maybe better addressed as some form of DHS directive, it may fit within the consolidated ASTM/NFPA HazMat related standard development work, or it may be determined that a stand alone guide on the subject is needed. Thus, a place for it is being held awaiting the identification of need.				
E54.02.05 – Eliminated (incorporated into E54.02.06)				
E54.02.06 – Emergency Preparedness HazMat Task Group **Standard guide for HAZMAT Team training, qualification, and certification.** **(DHS-ASTM Priority 1)** Task Group: **Work Item:** WK4182 Federal Grant Programs Supported: • (DHS-B&TS Directorate) *State Homeland Security Grant Program* directly supported with regard to the development and conduct of a state CBRNE Training Program (CBRNE events are simply HazMat events with an attitude) and HazMat Units often receive specialized training and respond to CBRN events; bomb squads respond to E events • (DHS-EP&R Directorate) *Chemical Stockpile Emergency Preparedness Program* indirectly supported in the way of training specifications, qualifications, and certification for HazMat staff responding to events involving such material	Robert Stenner (PNNL) Tel: (509) 375-2916 Cell: (509) 531-6438 Fax: (509) 375-2019 Email: robert.stenner@pnl.gov Charlie Brannon (NIST) Tel: (301) 975-3855 Fax: (301) 926-7416 Email: cbrannon@nist.gov Dave Trebisacci (NFPA) Tel: (617) 984-7420 Email: dtrebisacci@nfpa.org John Eversole (NFPA 472 Chair) Tel: (773) 767-8477	TBD (working with NFPA)	TBD (working with NFPA)	TBD (working with NFPA)

• (DHS-EP&R Directorate) *National Fire Academy Training Grants* indirectly supported in that HazMat units are an integral part of fire departments and the HazMat training standard guides will be coordinated with NFPA information and training requirements • (DOT-*Research Materials Emergency Preparedness Training and Planning Grants* directly supported Mgt. Notes: **[8-16-04]** Charlie talked with Bob Ingram on this standard; ODP has schools (limited availability); what elements would qualify a training institution to meet the ODP certification (for more training programs); Charlie find out the next meeting that both Bob and Gene will be attending together, so we can meet with them there to strategize on the best approach (possible meeting: IAB meeting in Oklahoma City (can also discuss idea of D54.02 meeting in October before/after IAB meeting). Bob talk to Chief Vickery (Seattle) about attending IAB so can do meeting with Bob Ingram and Gene Ryan at IAB meeting in Oklahoma City**. [9-21-04]** a meeting with Bob Ingram, Gene Ryan, etc. is being set up at the IAB meeting in Oklahoma City; considering an annual joint E54.02 meeting with the fall IAB meeting; obtained copies of ODP's chem.-bio and rad training requirements; checking with DOE HAMMER facility for chem.-bio and rad training specs. **[11-29-04]** Several people interested in serving on the task group for hazmat training standards development; will be organizing the task group and conducting a conference call in December '04/early January '05 to get it started, as soon as can tie down task group chair(s). Still looking for a chair; thinking about a co-chair with someone from the New York Fire Department and someone from HAMMER to make sure both the user end and the trainer end are well covered. **[4/4/05]** Per the results of a joint meeting of ASTM E54.02 and NFPA 472 at the San Francisco IAB meeting HazMat training and requirements standards are being pursued as a joint effort. Bob Stenner (E54.02 Chair) agreed to join NFPA 472 and work liaison with E54.02, and Dave Trebisacci (NFPA 472) is a member of E54.02 and will work liaison with NFPA 472. The first effort is the revision of the 472 standard for updating and wording to make acceptable across all first-responder disciplines. **Standard guide for the development of an RDD Playbook (DHS-ASTM Priority 1)**	Email: eversolejohn@aol.com			

Task Group: Tammy Taylor (Chair, LANL), Fabian Raccah (DHS-EML), Steve Musoline (BNL), Don Dale (LANL), Billy Marshal (SNL), Walt McNab (LANL), Sandra Gogol (LANL), John Sullivan (LA Sheriff), Ed Bailor (U.S. Capitol Police), Tom Richardson (Seattle Fire), John Ferris (OSHA), Sam Pitts (U.S. Marines CBIRF), Ed Peterson (Seattle Fire – HazMat), Bob Ingram (NYC Fire – HazMat), Gene Ryan (Chicago Fire), Paul Moskowitz (BNL), Peter Shebell (DHS-NIMS), Charlie Brannon (NIST & Vice Chair E54.02), and Robert Stenner (PNNL & Chair E54.02). Work Item: **WK7020** Federal Grant Programs Supported: • (DHS-B&TS Directorate) *State Homeland Security Grant Program* directly supported for updating and implementing a state's Homeland Security Strategy for RDD events; such events are quite likely to be associated with Border and Transportation Security. • (DHS-EP&R Directorate) *State and Local Emergency Operations (EOCs)* directly supported in that understanding how to sufficiently handle an RDD event tends to be a deficiency for many EOCs. The public fear factor and the technical nature of assessing such an events tend to be beyond normal experience level of many EOCs. • (DHS-EP&R Directorate) *State and Local Emergency Operations Planning Grants* directly supported by a standardized procedure for developing an RDD Playbook to handle RDD events. • (DHHS-CDC) *Surveillance of Hazardous Substance Emergency Events* directly supported as the RDD playbook standard guide will include surveillance aspects of an RDD event. • (DOT-Research and Special Programs Administration) *Hazardous Materials Emergency Preparedness*	Tammy Taylor (LANL)(non-ASTM) Co-Chair Tel: (505) 667-5569 Email: taylort@lanl.gov Robert Stenner (PNNL) Technical Contact Tel: (509) 375-2916 Cell: (509) 531-6438 Fax: (509) 375-2019 Email: robert.stenner@pnl.gov	11/2005	1/2006	6/2006

Training and Planning Grants indirectly supported as responses to an RDD incident will likely have a transportation component directly associated. Thus, the RDD playbook activities need to be integrated into a comprehensive approach to emergency planning and training relative to transportation standards. Mtg. Notes: **[4/4/05]** Tammy and Bob met and organized the approach for the development of the RDD Playbook Standard Guide. Its schedule will follow that of the DHS RDD Playbook development for the Greater NYC area. A presentation on the RDD Playbook Standard Guide is scheduled for the E54.02 June meeting.				

E54.02.07 – Emergency Preparedness Planning Task Group **Standard guide for developing model emergency operations plans in response to all-hazard events including CBRNE.** Plans from all levels should be included in these guides and include all emergency responder levels and disciplines. Coordinate with NFPA 1600 and other NFPA activity. **Workshop** for input from first-responder being planned. (DHS-ASTM Priority 2) Task Group: Tim Dunkle (Chair); Evelyn Fisher; Martin Vyenielo, Work Item: **WK5498** Federal Grant Programs Supported: • (DHS-EP&R Directorate) *State and Local Emergency Operations Planning Grants* directly supported in the form of standardized guidance for the development of such plans • (DHS-EP&R Directorate) *State and Local Emergency Operations Centers (EOC)* directly supported via standardized model emergency operations plans development for all-hazard events • (DHS-EP&R Directorate) *Emergency Management Performance Grants* directly supported in the form of standardized emergency operations plan development guidance • (DOT-Research and Special Programs Administration) *Hazardous Materials Emergency Preparedness Training and Planning Grants* partially supported by transportation accident components of the model emergency operations plan development guidance	Tim Dunkle (PEMA), Chair Tel: (800) 459-4096 ex 107 Or (717) 248-1115 ex 107 Fax: (717) 248-3580 Email: tdunkle@state.pa.us	5/2005	7/2005	TBD

• Dept. of Ed.) *School Emergency Response and Crisis Management Plan Discretionary Grant Programs* partially supported by school emergency components of the model emergency operations plan development guidance Mgt. Notes: **[8-16-04]** ongoing for development (August exercise for Penn, so working on it); incorporates Penn first-responder team. **[9-21-04]** Tim has started the development of the draft; a workshop for input from a broad sampling of the first-responder community is being coordinated with the EPA Region III Emergency Preparedness and Prevention Conference in Philadelphia, PA on December 5-8 – Workshop, coordination is being work through ASTM with EPA; the first strawman draft of the standard is scheduled to be ready in time for the workshop; following the workshop and inclusion of any modifications resulting from the workshop, the standard is expected to be ready for subcommittee balloting**. [11-29-04]** Due to the flooding emergency in PA the draft standard will not be ready for the December 6-9 time frame, so the workshop to be held in conjunction with the EPA Region III conference has been cancelled. The new target for the draft standard is by the end of January 2005. Once the draft is developed, we will find another conference involving a broad section of first-responders to link the workshop.				
E54.02.08 – Emergency Preparedness Logistics Task Group **Standard guide for Stakeholder-Focused Consensus-Based Event Restoration Process.** Addresses framework standards and standard guides that address community involvement and public communication following an event. The standard will integrate concepts from the E47 CBED, Texas Community Shielding, and State of Pennsylvania community involvement processes. Due to the public involvement nature of this standard, the development of the first draft will be closely coordinated the DHS standards development staff. (DHS-ASTM Priority 1) Task Group: Jerry Stangeland (Non-ASTM Co-Chair); Robert Stenner (Chair); Ron Hilliard; Tim Dunkle; Erik Johnson; Becky Dobbs; Bob	Jerry Stangeland (PNNL), Non-ASTM Co-Chair Tel: (509) 372-4111 Email: jerry.stangeland@pnl.gov Robert Stenner (PNNL), Chair Tel: (509) 375-2916 Cell: (509) 531-6438 Fax: (509) 375-2019 Email: robert.stenner@pnl.gov	10/2004	7/2005	TBD

Johns; Sherry Sterling; Keith Reddick; Jack Glass; Peter Shebell; Pam Greenlaw; Charlie Brannon; Mark Cavaleri; Francis Evans; Evelyn Fisher; Laura Harden; Lorie Lafon; Mara Oliveira; Kenneth Rhea; Irene Richardson; Martin Vyenielo; Troy Johnson; Work Item: **WK4455** Federal Grant Programs Supported: • (DHS-EP&R Directorate) *SARA Title III Training Program* directly supported by providing a standardized approach for governments (including Tribal governments) to address the recovery essential elements for events involving hazardous chemicals/materials. • (DOT-Research and Special Programs Administration) *Hazardous Materials Emergency Preparedness Training and Planning Grants* directly supported by providing a standardized approach for planning and recovery from a transportation event involving HazMat/WMD materials. • DHS & EPA-HS response-stabilization-restoration responsibility hand-off. Mgt. Notes: **[8-16-04]** Bob call Tim Dunkle about PEMA Public involvement awareness/management; get community shielding information from Ron Hilliard**. [9-21-04]** prepared strawman draft of the ConTER standard; awaiting some additional information from PEMA to potentially adjust the strawman draft, then send out to task group for comments/revisions prior to submitting to subcommittee ballot. **[11-29-04]** only feed back so far is that the name may need to be changed to not use the word terrorist; the draft standard is now being put in for subcommittee balloting. **[4/4/05]** The draft was completed and submitted to first-round balloting (i.e., subcommittee level). In the process of being reviewed in balloting, it was identified that its scope fit into that of the EPA	Ron Hilliard (Texas CPHPR) Tel: (512) 458-7111 ex 6790 Email: ron.hilliard@tdh.state.tx.us			

HSRC. Thus, upon completion of the balloting process (at the January E54.02 meeting in Atlanta) the couple negatives were found persuasive, so the draft standard could be work further with the EPA HSRC, which is in process.				
E54.02.09 Emergency Preparedness for Event Restoration Decontamination **Standard guide for establishing a health risk-based event-specific process for deriving restoration levels for high-value property.** (DHS-ASTM Priority 1) Task Group: Work Item: **WK5515** Federal Grant Programs Supported: • (DHS-EP&R Directorate) *SARA Title III Training Program* directly supported by providing a standardized approach for governments (including Tribal governments) to address the establishment of health-based restoration levels (first looking for existing levels, followed by a process to establish such a level if none is found) for events involving hazardous chemicals/materials. • (DOT-Research and Special Programs Administration) *Hazardous Materials Emergency Preparedness Training and Planning Grants* directly supported by providing a standardized approach for establishing health-based restoration levels associated with planning and recovery from a transportation event involving HazMat/WMD materials. • DHS & EPA-HS response-stabilization-restoration responsibility hand-off. Mgt. Notes**: [8-16-04]** starting on a strawman for process by PNNL then will open up to full task group**. [9-21-04]** incorporated chem.-bio	Robert Stenner (PNNL), Co-Chair Tel: (509) 375-2916 Cell: (509) 531-6438 Fax: (509) 375-2019 Email: robert.stenner@pnl.gov Lissa Staven (PNNL) (non-ASTM), Co-Chair Tel: (509) 375-2351 Fax: (509) 375-2019 Email: lissa.staven@pnl.gov	6/2005	7/2005	TBD

decontamination expertise from BEST staff to be involved via PNNL ILA; incorporating PNNL radiological decontamination expertise; in the process of establishing a task group. **[11-29-04]** Lissa is working the draft outline with the task group; the new projected draft target date in by the end of January 2005, with a reasonable draft to discuss at the January E54.02 meeting. **[4/4/05]**				

Appendix B

Standard Guide for Developing a Model Emergency Operations Plan in Response to All Hazards (Including CBRNE)

Appendix B

Standard Guide for Developing a Model Emergency Operations Plan in Response to All Hazards (including CBRNE)

This standard is issued under the fixed designation WI-5498; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last re-approval. A superscript epsilon (ε) indicates an editorial change since the last revision or re-approval.

1. Scope

1.1 Standard provides a guide for developing, implementing, testing and maintaining Emergency Operation Plans for Chemical, Biological, Radiological, Nuclear, and Explosive events as well all other natural and man-made hazards.

1.2 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 to determine the applicability of regulatory limitations prior to use.

1.3 This standard guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

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 to determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 Homeland Security Presidential Directive (HSPD) – 5, *Management of Domestic Incidents*, issued by the President on February 28, 2003.

2.2 Homeland Security Presidential Directive – 8 (NEED TITLE AND THEN THE EOP AND CHECKLISTS WILL NEED SOME WORK)

2.3 *National Incident Management System* adopted by the Department of Homeland Security on March 1, 2004.

2.4 *National Response Plan* dated December 2004.

2.5 *Letter from Secretary Ridge to governors* dated September 8, 2004

2.6 *NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs*, 2004 edition – National Fire Protection Association

2.7 *40 CFR 311 Worker Protection Standards for Hazardous Waste Operations and Emergency Response: Final Rule*, Federal Register, Vol. 54, No. 120, June 23, 1989.

2.8 *29 CFR 1910.120 Superfund Amendment and Reauthorization Act – Title III*, Federal Register, 1986

3. Terminology

3.1 Definitions of Terms Specific to This Standard

3.1.1 **Agency**: A division of government with a specific function offering a particular kind of assistance. In NIMS Incident Command System (ICS), agencies are defined as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or assistance).

3.1.2 **Area Command (Unified Command)**: An organization established (1) to oversee the management of multiple incidents that are each being handled by an ICS organization or (2) to oversee the management of large or multiple incidents to which several Incident Management Teams have been assigned. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources according to priorities, ensure that incidents are properly managed, and ensure that objectives are met and strategies followed. Area Command becomes Unified Area Command when incidents are multi-jurisdictional. Area Command may be established at an emergency operations center facility or at some location other than an incident command post.

3.1.3 **Assessment**: The evaluation and interpretation of measurements and other information to provide a basis for decision-making.

3.1.4 **Assistance**: The provision on a humanitarian basis of material aid and services necessary to enable people to meet their basic needs for shelter, clothing, water and food. Assistance is available for extended periods, unlike relief supplies and services that are provided, free of charge, in the period immediately following a crisis.

3.1.5 **Assisting Agency**: An agency or organization providing personnel, services, or other resources to the agency with direct responsibility for incident management. See also supporting Agency.

3.1.6 **Available Resources**: Resources assigned to an incident, checked in, and available for a mission assignment, normally located in a Staging Area.

3.1.7 **Chain of Command**: A series of command, control, executive, or management positions in hierarchical order of authority.

3.1.8 **Chemical, Biological, Radiological, Nuclear or Explosive (CBRNE) Event**: A hazard event that involves the use or suspected use of an agent or device with the intent to harm or cause injury to personnel or to destroy government or state property. CBRNE may also be known as Weapons of Mass Destruction (WMD).

3.1.9 **Command**: The act of directing, ordering, or controlling by virtue of explicit statutory, regulatory, or delegated authority. May also refer to the Incident Commander.

3.1.10 **Command Post:** The location at which the primary command functions are executed. The command post may be collocated in the cold zone with the incident base or other incident facilities.

3.1.11 **Common Operating Picture:** A broad view of the overall situation as reflected by situation reports, aerial photography, and other information or intelligence.

3.1.12 **Cooperating Agency:** An agency supplying assistance other then direct operational or support functions or resources to the incident management effort.

3.1.13 **Coordinate:** To advance systematically an analysis and exchange of information among principals who have or may have a need to know certain information to carry out specific incident management responsibilities.

3.1.14 **Critique:** A meeting or discussion of the pros and cons of how an emergency response incident was conducted by those who participated in the response. This is an element of the termination process of an emergency response that is conducted at the conclusion of the emergency incident's response efforts.

3.1.15 **Dispatch:** The ordered movement of a resource or resources to an assigned operational mission or an administrative move from one location to another.

3.1.16 **Emergency:** Absent a Residentially declared emergency, any incident(s), human-caused or natural, that requires responsive action to protect life and/or property. Under the Robert T. Stafford Relief and Emergency Assistance Act, an emergency means any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.

3.1.17 **Emergency Management:** The organized analysis, planning, decision-making, assignment, and coordination to available resources to the mitigation of, preparedness for, response to, or recovery from emergencies of any kind, whether man-made or natural sources.

3.1.18 **Emergency Management Coordinator (EMC):** The individual within each jurisdiction that is delegated the day-to-day responsibility for the development, testing, exercising and revising the emergency operations plan and maintenance of all emergency management coordination efforts.

3.1.19 **Emergency Operations Center (EOC):** A location from which centralized emergency management can be performed, generally by civil government officials (municipal, county, State and Federal). EOC facilities are established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and to provide support for the control or mitigation of an emergency.

3.1.20 **Emergency Operations Plan (EOP):** A State or local document that describes actions to be taken in the event of natural disasters, technological accidents, or weapons of mass destruction attack. It identifies authorities, relationships, and the actions to be taken by whom, what, when, and where, based on predetermined assumptions, objectives, and existing capabilities.

3.1.21 **Emergency Public Information:** Information that is disseminated primarily in anticipation of an emergency or during an emergency. In addition to providing situational information to the public, it also frequently provides directive actions required to be taken by the general public.

3.1.22 **Emergency Response:** Those organized actions taken by trained people to assist in controlling and/or reducing the level of losses and associated human suffering that has or could have resulted from an emergency incident.

3.1.23 **Emergency Response Provider:** Includes Federal. State, local and tribal emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities. See Section 2 (6), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002). Also known as Emergency Responder.

3.1.24 **Emergency Responders:** Individuals involved with a response to an emergency.

3.1.25 **Emergency Response Plan:** A written document that sets forth the tasks or actions that are to be taken once an emergency incident is reported to have occurred. The emergency response plan will usually contain contingency plans for the various types of emergencies that are anticipated to be encountered.

3.1.26 **Evacuation:** Organized, phased, and supervised withdrawal, dispersal, or removal of civilians from dangerous or potentially dangerous areas, and their reception and care in safe areas.

3.1.27 **Event:** A planned, non-emergency activity. ICS can be used as the management system for a wide range of events, e.g., parades, concerts, or sporting events.

3.1.28 **Federal:** Of or pertaining to the Federal Government of the United States of America.

3.1.29 **Hazard:** Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.

3.1.30 **Incident:** An occurrence or event, natural or human-caused, that requires an emergency response to protect life and/or property. Incidents can, for example, include major disasters, emergencies, terrorist attacks, terrorist threats, wildland and urban fires, floods, hazardous materials spills, nuclear accidents, aircraft accidents, earthquakes, hurricanes, tornadoes, tropical storms, war-related disasters, public health and medical emergencies, and other occurrences requiring an emergency response.

3.1.31 **Incident Action Plan (IAP):** An oral or written plan containing general objectives reflecting the overall strategy for managing an incident. It may include the identification of operational resources and assignments. It may also attachments that provide direction and important information for management of the incident during one or more operational periods.

3.1.32 **Incident Commander (IC):** The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident

3.1.33 **Incident Command Level:** Addresses METL training requirements for officials who are expected to be a part of the leadership and management team within the incident command system that likely will respond to a CBRNE Event.

3.1.34 **Incident Command System (ICS):** A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands or single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating with a common organizational structure, designed to aid in the management of resources during incidents. It is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, to organize field-level incident-management operations,

3.1.35 **Incident Management System:** An incident management system can be any recognized and accepted system including but not limited to the National Incident Management System, the National Response Plan, or other federal contingency plans. Incident management systems address the principles of command and basic functions of planning, operations, logistics, finance and administration. Incident management systems should not be confused with incident command systems

(3.1.34) Incident management systems include incident command systems (ICS), unified command systems (UCS), and multi-agency coordination systems (MACS).

3.1.36 **Incident Management Team (IMT):** The IC and appropriate Command & General Staff personnel assigned to an incident. There are 5 types of IMTs. Type 1 IMTs are Federal certified and dispatched. Type 2 IMTs are Federal and/or State certified and dispatched respectively. Type 3 IMTs are State organized, certified, and dispatched with in the State or to contiguous States by Agreement between States. Type 4 IMTs are organized at the regional or county level within a State and are dispatched within the State. Type 5 IMTs are organized at the local or tribal level and are dispatched with their county, region, or within their State.

3.1.37 **Job Aid:** A checklist or other aid that is useful in performing or training for a job.

3.1.38 **Joint Information Center (JIC):** A facility established to coordinate all incident-related public information activities. It is the central point of contact for all news media at the scene of the incident. Public information officials from all participating agencies should collocate at the JIC.

3.1.39 **Joint Information System (JIS):** Integrates incident information and public affairs into a cohesive organization designed to provide consistent, coordinated, timely information during crisis or incident operations. The mission of the JIS is to provide a structure and system for developing and delivering coordinated interagency messages; developing, recommending, and executing public affairs issues that could affect a response effort; and controlling rumors and inaccurate information that could undermine public confidence in the emergency response effort.

3.1.40 **Jurisdiction:** A range or sphere of authority. Public agencies have jurisdiction at an incident related to their legal responsibilities and authority. Jurisdictional authority at an incident can be political or geographical (e.g., city, county, tribal, State, or Federal boundary lines) or functional (e.g., law enforcement, public health).

3.1.41 **Local Government:** A county, municipality, city, town, township, borough, local public authority, school district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; an Indian tribe or authorized tribal organization, or in Alaska a Native village or Alaska Regional Native Corporation; a rural community, unincorporated town or village, or other public entity. See Section 2 (10), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

3.1.42 **Major Disaster:** As defined under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5122), a major disaster is any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant disaster assistance under this Act to supplement the efforts and available resources of State, tribes, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.

3.1.43 **Management by Objectives:** A management approach that involves a four-step process for achieving the incident goal. The Management by Objectives approach includes the following: establishing overarching objectives; developing and issuing assignments, plans, procedures, and protocols; establishing specific, measurable objectives for various incident management functional activities and directing efforts to fulfill them, in support of defined strategic objectives; and documenting results to measure performance, and facilitate corrective action.

3.1.44 **Mitigation:** The activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident. Mitigation measures may be implemented prior to, during, or after an incident. Mitigation measures are often informed by lessons learned from prior incidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.

3.1.45 **Mobilization:** The process and procedures used by all organizations (Federal, State, local, and tribal) for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

3.1.46 **Multi-agency Coordination Entity:** A multi-agency coordination entity functions within a broader multi-agency coordination system. It may establish the priorities among incidents and associated resource allocations, deconflict agency policies, and provide strategic guidance and direction to support incident management.

3.1.47 **Multi-agency Coordination System:** Multi-agency coordination systems provide the architecture to support coordination for incident prioritization, critical resource allocation, communications systems integration, and information coordination. The components of multi agency coordination systems include facilities, equipment, emergency operations centers (EOCs), specific multi-agency coordination entities, personnel, procedures, and communications. These systems assist agencies and organizations to fully integrate the subsystems of the NIMS.

3.1.48 **Mutual-Aid Agreement:** A written agreement between agencies and/or jurisdictions that states they will assist one another on request, by furnishing personnel, equipment, and/or expertise in a specific manner.

3.1.49 **National:** Of a nationwide character, including the Federal, State, local, and tribal aspects of governance and polity.

3.1.50 **National Disaster Medical System:** A cooperative, asset sharing partnership between the Department of Health and Human Services, the Department of Veterans Affairs, the Department of Homeland Security, and the Department of Defense. NDMS provides resources for meeting the continuity of care and mental health services requirements of the Emergency Support Function 8 (ESF #8) in the Federal Response Plan.

3.1.51 **National Incident Management System:** A system mandated by HSPD-5 that provides a consistent nationwide approach for Federal, State, tribal, local governments; the private sector, and non-governmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among Federal, State, local, and tribal capabilities, the NIMS includes a core set of concepts, principles, and terminology. HSPD-5 identifies these as the ICS; multi-agency coordination systems; training; identification and management of resources (including systems for classifying types of resources); qualification and certification; and the collection, tracking, and reporting of incident information and incident resources.

3.1.52 **National Response Plan:** A plan mandated by HSPD-5 that integrates Federal domestic prevention, preparedness, response, an recovery plans into one all-discipline, all-hazards plan.

3.1.53 **Non-Governmental Organization (NGO):** An entity with an association that is based on interests of its members, individuals, or institutions and that is not created by a government, but may work cooperatively with government. Such organizations serve a public purpose, not a private benefit. Examples of NGOs include faith-based charity organizations and the American Red Cross.

3.1.54 **Preparedness:** The range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process. Preparedness involves efforts at all levels of government and between government and private-sector and non-governmental organizations to identify threats, determine vulnerabilities, and identify required resources. Within the NIMS, preparedness is operationally focused on establishing guidelines, protocols, and standards for planning, training and exercises, personnel qualification and certification, equipment certification, and publication management.

3.1.55 **Prevention:** Actions to avoid an incident or to intervene to stop an incident from occurring. Prevention involves actions to protect lives and property. It involves applying intelligence and other information to a range of activities that may include such countermeasures as deterrence operations; heightened inspections; improved surveillance and security operations; investigations to determine the full nature and source of the threat; public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and, as appropriate, specific law enforcement operations aimed at deterring, preempting, interdicting, or disrupting illegal activity and apprehending potential perpetrators and bringing them to justice.

3.1.56 **Private Sector:** Organizations and entities that are not part of any governmental structure. It includes for-profit and not-for-profit organizations, formal and informal structures, commerce and industry, and private voluntary organizations (PVO).

3.1.57 **Processes:** Systems of operations that incorporate standardized procedures, methodologies, and functions necessary to provide resources effectively and efficiently. These include resource typing, resource ordering and tracking, and coordination.

3.1.58 **Recovery:** The development, coordination, and execution of service-and site-restoration plans; the reconstitution of government operations and services; individual, private sector, non-governmental and public assistance programs to provide housing and to promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration; evaluation of the incident to identify lessons learned; post-incident reporting; and development of initiatives to mitigate the effects of future incidents.

3.1.59 **Resource Management:** Efficient incident management requires a system for identifying available resources at all jurisdictional levels to enable timely and unimpeded access to resources needed to prepared for, respond to, or recover from an incident. Resource management under the NIMS includes mutual-aid agreements; the use of special Federal State, local, and tribal teams; and resource mobilization protocols.

3.1.60 **Risk Analysis:** A process or methodology used to evaluate the potential harm that may be caused by the inadvertent or purposeful release of a hazardous substance or material outside of its containment. The harm may be to humans, property and/or the environment and determined by and ranked by the use of probabilities.

3.1.61 **Safety Officer:** A member of the Command Staff at the incident or within an EOC responsible for monitoring and assessing safety hazards or unsafe situations and for developing measures for ensuring personnel safety.

3.1.62 **Standard Operating Procedure (SOP) or Operating Manual:** A complete reference document that details the procedures for performing a single function or a number of interdependent functions.

3.1.63 **State:** When capitalized, refers to any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, and any possession of the United States. See Section 2 (14), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

3.1.64 **Terrorism:** Under the Homeland Security Act of 2002, terrorism is defined as activity that involves an act dangerous to human life or potentially destructive of critical infrastructure or key resources and is a violation of the criminal laws of the United States or of any State or other subdivision of the United States in which it occurs and is intended to intimidate or coerce the civilian population or influence a government or affect the conduct of a government by mass destruction, assassination, or kidnapping. See Section 2 (15), Homeland Security Act of 2002, PUB. L. 107-296, 116 Stat. 2135 (2002).

3.1.65 **Threat:** An indication of possible violence, harm, or danger.

3.1.66 **Tribal:** Any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native Village as defined in or established pursuant to the Alaskan Native Claims Settlement Act (85 stat. 688) [43 U.S.C.A. and 1601 et seq.], that is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

3.1.67 **Type:** A classification of resources in the ICS that refers to capability. Type 1 is generally considered to be more capable than Types 2, 3, or 4, respectively, because of size; power; capacity; or, in the case of incident management teams, experience and qualifications.

3.1.68 **Unified Command (UC):** An application of ICS, used when there is more than one agency with incident jurisdiction or when incidents cross political jurisdictions. Agencies work together through the designated members of the UC, often the senior person from agencies and/or disciplines participating in the UC, to establish a common set of objectives and strategies and a single IAP.

3.1.69 **Unity of Command:** The concept by which each person within an organization reports to one and only one designated person. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.

3.1.70 **Volunteer:** For purposes of the NIMS, a volunteer is any individual accepted to perform services by the lead agency, which has authority to accept volunteer services, when the individual performs without promise, expectation, or receipt of compensation for services performed. See, e.g., 16 U.S.C. 742f(c) and 29 CFR 553.101.

3.1.71 **Vulnerability Analysis (Or assessment):** The process of estimating the vulnerability to potential disaster hazards of specified elements at risk. For engineering purposes, vulnerability analysis involves the analysis of theoretical and empirical data concerning the effects of particular phenomena on particular types of structures. For more general socioeconomic purposes, it involves consideration of all significant elements in society, including physical, social and economic considerations (both short- and long-term), and the extent to which essential services (and traditional and local coping mechanisms) are able to continue functioning.

4. Summary of Practice

4.1 This guide is based upon a body of knowledge on the preparation and development of all-hazard and CBRNE emergency operations plans to manage major community incidents, from all causes.

4.2 The body of knowledge on which the guide is based was drawn from a wide Variety of sources, including federal, state, regional, and local organizations.

4.3 The emergency operations plan and operational procedures development process includes all-hazards preparedness, based on a comprehensive hazard vulnerability and capability analysis. The emergency operations plan is intended to enhance the ability of a municipality, emergency response organization, and public and private sector businesses to implement response, recovery, prevention, and business continuity activities.

5. Significance and Use

5.1 This guide is intended to assist community leaders, emergency response entities, and public and private sector businesses in the planning, design, implementation, training and maintenance of an emergency operations plan. It will also assist them in their response to an event that necessitates the activation of the major incident management plan.

5.2 This guide provides procedures and processes for developing emergency operations plans, implementing the plans when a disaster event occurs, training emergency responders and municipal officials to respond to the plan, and providing maintenance of the plan to keep it current and up-to-date.

5.3 This guide provides management tools that can assist in developing emergency operations plans and operational procedures.

6. **The Emergency Operations Plan Development Process**

6.1 The Planning "Process" will be 50% of the time spent on developing an emergency operations plan. It will involve a rather large focus group consisting of, but not limited to, elected officials, emergency responders, target hazard representatives, special interest groups within a community, community members with special needs, private sector, and many volunteer organizations that provide assistance during major emergencies and disasters.

6.1.1 One of the most important actions in the "planning Process" is to select someone to keep detailed notes during all discussion sessions. These notes will be the basis for developing your emergency operations plan as well developing procedures or checklists as the "process" nears completion.

6.1.2 The first step of the Planning Process is to develop a "Hazards Vulnerability Analysis" (HVA) and "Threat Assessment" (TA). The HVA will identify prevalent hazards, vulnerable structures, and special needs populations in your community, business, or facility. You will need to include your local law enforcement agencies in the threat assessment discussion. With their assistance, you should establish the potential threat for all hazards, facilities, and events in your community,

6.1.2.1 Your prevalent hazard list may include the following; hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, flood, explosion, hazardous materials incidents (transportation or fixed facility), terrorism, civil disturbance, and wildland fire.

6.1.2.2 Your vulnerable structures list may include the following; schools, hospitals, government (Federal, State. Local or Tribal) buildings, historical landmarks, day care centers, churches, industrial and business facilities, critical infrastructures (roads, bridges, transmission [gas, electric, water] systems, emergency services), and special event centers [fairgrounds, sports event facilities, etc].

6.1.2.3 Your list of potential threats will vary greatly from community to community and the type of hazards and vulnerable structures in the community. Your local law enforcement agencies will be able to provide you with a threat assessment and the level of potential threat to your community, business, or facility. Possible threats could be hate groups, anti-American organizations, militia groups, environmental groups, and others.

6.1.2.4 The list of special needs populations may include the following; sight impaired, hearing impaired, mobility impaired, medical conditions (persons on respirators, bed-ridden patients at home, dialysis patients at home, etc) as well as hosp[ital patients, prison populations, and many others. In your planning process, you will need to identify methods for notifying these people of emergencies and disasters, evacuation of these special populations, sheltering and caring for the populations, and providing for their special needs.

6.1.3 The second step of the Planning Process the development of a "Capability Assessment" (CA). The Capability Assessment is a discussion of the resources your community, business, or facility has available to respond to the identified threats and hazards you identified in your HVA and TA. This CA needs to be as comprehensive as you can make it and should include both the public and private sector.

6.1.3.1 The resources you identify during your CA may include the following, but is not limited to; Public Sector – law enforcement, fire/rescue, emergency medical, public works, and other public sector agencies and organizations personnel, equipment, and capabilities; Private Sector – all types of contractors, service organizations, industry, and business community personnel, equipment, and capabilities.

6.1.4 The third step of the Planning Process is the identification if resource shortfalls and identified resource needs. This process identifies the resources that you do NOT have, but will need. It will also identify how you will acquire these needed resources when a major emergency or disaster happens.

6.1.5 The fourth step in the Planning Process identifies who will do what when a major emergency or disaster occurs. It will also identify why specific agencies and organizations have the authority and responsibility for performing that duty. This authority may be statutory, assigned by a government entity, or assumed by the organization or agency.

6.2 Assemble Information into the Elements of an Emergency Operations Plan.

6.2.1 The first part of the EOP assembled is the Basic Plan. The information gathered from the Planning Process is the basis for the basic Emergency Operations Plan. The basic EOP will include the following; purpose statement, situation & assumptions, HVA/CA & Resource needs, concept of operations, organization & responsibilities, administration & logistics, plan development, maintenance, & distribution, authorities & references, and definitions and/or acronyms.

6.2.1.1 Emergency Operation Plans set forth the policies and guidelines for a jurisdiction or entity and identifies the responsibilities to prepare for, mitigate against, respond to, and recover from threats the jurisdiction or entity faces.

6.2.2 The Essential Support Function Annexes (ESFs) are the next part of the EOP to be assembled. These annexes are based on the ESF Annexes found in the National Response Plan and are adapted to fit your local situation.

6.2.2.1 Whether in the federal ESF format or the traditional SLG-101 format, ESF Annexes set forth concepts of operations, identify responsible agencies, and describe missions or responsibilities that apply to various areas of hazard response and recovery (i.e. transportation, law enforcement, public warning, mass care, etc.). When applicable, functional annexes describe the role of various support agencies in support of the lead agency representative(s) staffing the EOC.

6.2.3 The next part of the EOP is the checklists for all positions and identified incident response. Much of the information gather during the HVA, TA, and CA will be the basis for these procedures and checklists. These checklists are a list of actions to be accomplished by a specific position given a specific incident that can be checked off as completed. These checklists and procedures act as a reminder of things needing to be accomplished for specific incidents.

6.2.3.1 Standard Operating Procedure (SOP) or Operating Manual is a complete reference document that details the procedures for performing a single function or a number of interdependent functions. This is the manual that describes how something is done. SOPs or Operating Manuals should grow naturally out of the responsibilities identified and described in the EOP, and procedures should be written down, not simply understood by those who typically engage in emergency management activities.

6.2.4 The final section of the EOP will be the hazard specific appendices. Examples of incidents that would have a specific appendix would be Radiological Emergency Response Plan (RERP) for nuclear power plants, Hazardous Materials Transportation Emergencies, Prison Riot, County Fair, July 4th Celebration, etc.

6.2.4.1 Hazard specific appendices describe concepts of operations for specific threats. They identify strategies for detecting, assessing, and controlling the hazard; warning and protecting the public; and returning the area to a state of normalcy. Hazard specific appendices identify mission considerations that will require coordination through the EOC as well as the functional areas involved. They should also identify State and Federal resources should the hazard exceed local capabilities.

7. National Incident Management System (NIMS) Compliance

7.1 In a September 8, 2004, letter to the nation's governors, the Secretary of Homeland Security outlined the minimum requirements for states and territories to comply with the new National Incident Management System (NIMS), a nationwide standardized approach to incident management and response. Developed by the Department of Homeland Security and released in March 2004, it establishes a uniform set of processes and procedures that emergency responders at all levels of government, NGOs and private sector entities will use to conduct response operations.

7.2 Relation to Other Federal Guidance

7.2.1 March 1, 2004 publication of the National Incident Management System (NIMS); Procedures are detailed prominently in this document, and the functionality of EOCs under the NIMS ICS is discussed.

7.2.2 September 8, 2004, letter from Secretary Ridge to governors; This letter outlines minimum compliance requirements for FY 2005. As part of these implementation requirements, three are particularly relevant to the development of operational protocols. The three are 1) adopt NIMS as the incident management system for your organization, 2) institutionalize the use of NIMS ICS/UC in your municipality, organization, agency, association, non-governmental organization, or private sector entity and 3) complete *NIMS: An Introduction IS-700* training – target audiences include anyone with a role in emergency response to or emergency management of incidents.

7.2.3 The National Response Plan (NRP), dated December 2004 was examined to ensure that the Federal coordination aspect of emergency planning is addressed in operating procedures; and, is broad enough to apply to a range of State and local plan formats. Jurisdictions should use the NRP to assist them in revising their EOPs to comply with NIMS. Since procedures are a direct outgrowth of the policies and operational concepts presented in an EOP, it is recommended these issues be need to be addressed prior to reviewing operational procedures for NIMS compliance.

7.3 Formal Adoption of NIMS Principles and Policies

7.3.1 The letter to the governors states the following; "States, territories, tribes and local entities should establish legislation, executive orders, resolutions or ordinances to formally adopt the NIMS." Formal recognition of NIMS should take place at the State and local levels. SOPs, Authorities, and References should be updated to include policy documents, legislation, resolutions, ordinances and executive orders formally adopting NIMS.

7.3.2 Department executives or emergency managers charged with developing and maintaining operational procedures should also formally adopt NIMS. In doing so, procedures need to be reviewed to ensure that they conform with NIMS principles and utilize terms and acronyms according to NIMS standards.

7.3.3 In current SOP guides, jurisdictions and entities should consider replacing the term ICS with NIMS ICS in areas where current language indicates the use of the Incident Command System (ICS). While this change seems minor, it places emphasis on a national incident management and command system.

7.4 Institutionalizing the Incident Command System (ICS)

7.4.1 The letter dated September 8, 2004, from Secretary Ridge states the following: "If State, territorial, tribal, and local entities are not already using ICS, you must institutionalize the use of ICS (consistent with the concepts and principles taught by DHS) across the entire response system. …All Federal, State, territory, tribal, and local jurisdictions will be required to adopt ICS in order to be compliant with the NIMS.

7.4.2 Emergency Operation Centers are an element within a multi-agency coordination system. They are described in NIMS as physical locations where "the coordination of information and resources to support incident management activities" take place. NIMS also indicates that standing EOCs activated to support large or complex events typically possess a high level of organization—usually by major functional disciplines, jurisdiction, or some combination of the two.

7.4.3 NIMS ICS, particularly how incident and area commanders in the field interact with intra-agency coordination centers like EOCs, should be defined in operating procedures to include requests for additional resources, State aid, Federal aid, and other support.

7.4.4 In many state Emergency Operation Plans (EOPs), emergency support functions (ESFs) are addressed in annexes, and the various tasks and responsibilities of these support functions are described. EOPs may also choose to follow the format and layout of State and Local Guide 101 (SLG-101), which addresses functional disciplines in a slightly different manner.

7.4.5 Regardless of the plan format, the overriding principle of NIMS – -limiting span of control, standardizing vocabulary, clarifying roles and responsibilities---should be integrated into EOPs. EOPs form the foundation upon which operating procedures are developed, and without a sound foundation, the procedural framework becomes more difficult to develop. Jurisdictions and local entities can begin a review of their operating procedures by cross walking the tasks and responsibilities contained in the EOPs and supporting annexes, and ensuring that corresponding procedures exist to support them.

8. Writing the Basic Emergency Operations Plan

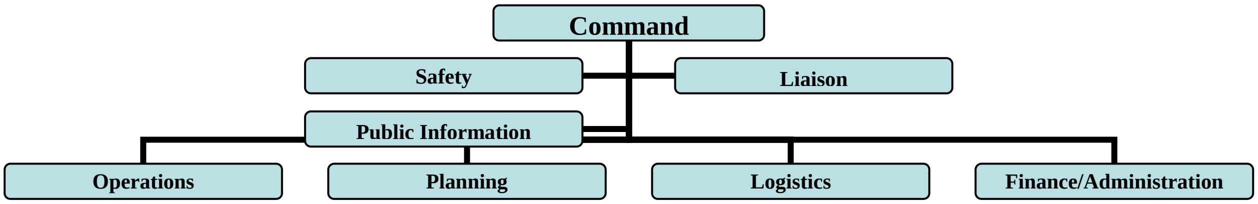
8.1 With all information assembled into a basic plan, function annexes, checklists, and hazard specific annexes, you will start to write and formalize the EOP. The writing the EOP will take about 20% of the time you have allotted for developing an EOP.

8.1.1 The first part of the EOP to be written is the purpose statement. The purpose statement (one sentence) needs to be very clear and concise.

8.1.2 Next, is the writing of the Situation and Assumptions section of the EOP. This section will be just a few paragraphs long and should include demographics of your municipality or organization and hazards/threats effecting your community or organization. This section will also reference ancillary documents such as checklists for specific hazards, positions, and/or teams.

8.1.3 The next section of the EOP will be the Hazard/Vulnerability Analysis and Threat Assessment. You will want to provide a summary of the full-scale analysis your development group conducted during your early work sessions. This will also include a summary of you're the capability assessment identifying common shortfalls.

8.1.4 The Concept of Operations section will identify who has the direction and control or authority to implement the plan. It will describe how communications and notifications will be conducted. This section will also reference the four phases of emergency management; preparedness, response, recovery, and mitigation. It is here that you will add the tenets of the National Incident Management System (NIMS), including the ICS structure that will be used as a minimum:



It should be noted that the Intelligence function can be placed in the ICS structure in four different positions depending upon the role of Intelligence in your incident management activities. The four positions are;

1) As a position in the Command Staff (Intelligence Officer)
2) As a General Staff Position (Intelligence Section)
3) As a branch in the Operations Section
4) As a unit in the Planning Section

8.1.5 The next section of the EOP is the Organization & Responsibilities section. This section will include various organization charts, Incident Command structure for the EOC and response teams (see 8.1.4 above), and specialty teams. This section is where you identify who (organization or position) is responsible for doing specific tasks and actions. This identification and assignment of responsibility needs to be detailed just enough for the reader to understand what critical functions are addressed by whom.

8.1.6 Next the Administration & Logistics section of the EOP is written to review policies established by the municipality, or business entity. These policies might include budget limitations, contracting procedures for services, and activation milestones. This section also discuss all mutual aid policies that are in place and what resources can be expected in times of emergency or disaster.

8.1.7 As you near the end of your EOP, you will write a section on Plan Development, Maintenance & Distribution. This section will identify plans and methods for developing future plans, procedures, and process. Once the EOP is finalized, EOC staff and all those with responsibiolities in the EOP will need to be trained in the EOP and its use. Once training has been completed, the EOP will need to be exercised. Shortfalls and deficiencies will need to be identified and resolved. How this train, exercise, and plan revision is accomplished is part of this section of the EOP. The section will also need to address how the plan will periodically be reviewed and updated to ensure a comprehensive, up-to-date EOP.

8.1.8 The Authorities & References section is a list of laws, statutes, regulations, requirements and guidelines that upon which the EOP is based. These authorities and references give jurisdictions or entities the power and authority to function during emergencies and disasters.

8.1.9 The last section of the EOP is the definitions and/or list of acronyms used within the EOP. This allows readers who are not familiar with specific terms or acronyms to understand what they mean or stand for.

9. Annexes (Emergency Support Functions {ESFs})

9.1 These annexes can be written in either federal ESF format or in the traditional *State and Local Guide 101: Guide for All-Hazard Emergrnc Operations*. If the federal ESF format is used the functional annexes should align with the 15 Emergency Support Functions (ESFs) in the National Response Plan (NRP).

9.1.1 The ESFs are: Transportation (ESF 1), Telecommunications and Information Technology (ESF 2), Public Works and Engineering (ESF 3), Firefighting (ESF 4), Emergency Management (ESF 5), Mass Care, Housing and Human Services (ESF 6), Resource Support (ESF 7), Public Health and Medical Services (ESF 8), Search and Rescue (ESF 9), Oil and Hazardous Materials (ESF 10), Agriculture and Natural Resources (ESF 11), Energy (ESF 12), Public Safety and Security (ESF 13), Long Term Recovery (ESF 14) and Emergency Public Information (ESF 15).

9.2 Many state and local governments, businesses, and organizations will not have a need or capability to plan for all the ESFs. In these cases, it is best to drop the numbering of the ESFs and use the same titles of those kept. This keeps your EOP Annexes in alignment with the National Response Plan.

9.3 Many state and local governments, businesses, and organizations will have a need to add functionality in areas not apparently reflected in the titles of the ESFs. An example of this would be an annex for donations or debris management. In this case, these annexes would be placed in the ESF 5 Annex (Emergency Management) since it is the Annex where these functions fit best. They would be listed as Tab A "Donations Management" and Tab B "Debris Management".

10. Elements of EOP Checklists

10.1 The EOP Checklists are detailed processes, procedures, or functional check-off sheets. Many of these will be developed during the EOP planning process and the many work sessions during the information gathering for the EOP.

10.1.1 Don't try to do them all at once; pick the top two or three hazards or threats or positions (in terms of likelihood and vulnerability or activation). Pull over the details from your planning "process" to go through response action items one by one. As you determine the step by step actions and tasks will be taken to resolve a hazard the checklists will be developed. This requires someone to accurately record the identified steps for resolving response to a particular hazard by a specific position.

10.1.2 Do each position checklist under the proper NIMS category so that if the incident escalates, you are already on a path to expand the ICS structure. For a well- rounded checklist (more than response-oriented) do a set of checklists for each phase of incident management;

prevention, preparedness (these can be combined), response, and recovery. Recovery should include Business Recovery Planning or Continuity of Operations/Government.

11. **Appendices – Explanations and Hazard or Threat Specific Plans**

11.1 Because the complexity of severity of the hazard or threat it may be necessary to develop emergency operation plans to deal specifically with these hazards or threats.

11.1.1 Examples of Hazard or threat specific appendices would include, but are not limited to; Radiological Emergency Response Plans, Hazardous Materials – SARA Plans, High Hazard Dam Plans, Terrorism Response Plans, Special Events Plans, Prison Plans, School Plans, and Continuity of Government Plans .

11.2 There may also be special cases where an emergency operations plan needs appendices to enforce its legal basis. An appendix may also be needed to clarify a chart or picture in the plan. These appendices should be kept brief.

Keyword: KISS. The key to a well-done emergency plan is the ease with which the reader can digest it… so it WILL be read. Keep it as simple and concise as possible.

APPENDIX

Appendix A – Sample of a Generic Basic Emergency Operations Plan (EOP)
Appendix B – EOP Essential Support Function (ESF) Annexes
Appendix C – EOP Checklists and/or Standard Operating Procedures (SOP)
Appendix D – EOP Incident Specific Appendices
Appendix E – National Incident Management System Definitions
Appendix F – National Incident Management System Acronyms

Appendix A
Sample of a Generic Basic Emergency Operations Plan (EOP)

(This Appendix is under development.)

Appendix B
EOP Essential Support Function (ESF) Annexes

(This Appendix is under development.)

Appendix C
EOP Checklists and/or Standard Operating Procedures (SOP)

(This appendix is under development.)

Appendix D
EOP Incident Specific Appendices

(This appendix is under development.)

Appendix E
National Incident Management System Definitions

Agency: A division of government with a specific function offering a particular kind of assistance. In NIMS Incident Command System (ICS), agencies are defined as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or assistance).

Agency Representative: A person assigned by a primary, assisting, or cooperating Federal, State, local, or tribal government agency or private entity that has been delegated authority to make decisions affecting that agency's or organization's participation in incident management activities following appropriate consultation with the leadership of that agency.

Area Command (Unified Command): An organization established (1) to oversee the management of multiple incidents that are each being handled by an ICS organization or (2) to oversee the management of large or multiple incidents to which several Incident Management Teams have been assigned. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources according to priorities, ensure that incidents are properly managed, and ensure that objectives are met and strategies followed. Area Command becomes Unified Area Command when incidents are multi-jurisdictional. Area Command may be established at an emergency operations center facility or at some location other than an incident command post.

Assessment: The evaluation and interpretation of measurements and other information to provide a basis for decision-making.

Assignments: Tasks given to resources to perform within a given operational period that are based on operational objectives defined in the IAP.

Assistant: Title for subordinates of principal Command Staff positions. The title indicates a level of technical capability, qualifications, and responsibility subordinate to the primary positions. Assistants may also be assigned to unit leader.

Assisting Agency: An agency or organization providing personnel, services, or other resources to the agency with direct responsibility for incident management. See also Supporting Agency.

Available Resources: Resources assigned to an incident, checked in, and available for a mission assignment, normally located in a Staging Area.

Branch: The organizational level having functional or geographical responsibility for major aspects of incident operations. A branch is organizationally situated between the section and the division or group in the Operations Section, and between the section and units in the Logistics Section. Branches are identified by the use of Roman numerals or by functional area.

Chain of Command: A series of command, control, executive, or management positions in hierarchical order of authority.

Check-In: The process through which resources first report to an incident.

Check-in locations include the incident command post, Resources Unit, incident base, camps, staging areas, or directly on the site.

Chief: The ICS title for individuals responsible for management of functional sections; Operations, Planning, Logistics, Finance/Administration, and Intelligence (if established as a separate section).

Command: The act of directing, ordering, or controlling by virtue of explicit statutory, regulatory, or delegated authority.

Command Staff: In an incident management organization, the Command Staff consists of the Incident Command and the specials staff positions of Public Information Officer, Safety Officer, Liaison Officer, and other positions as required, who report directly to the Incident Commander. They only have an assistant or assistants, as needed.

Common Operating Picture: A broad view of the overall situation as reflected by situation reports, aerial photography, and other information or intelligence.

Communications Unit: An organizational unit in the Logistics Section responsible for providing communication services at an incident or an EOC. A Communications Unit may also be a facility (e.g. a trailer or mobile van) used to support an Incident Communications Center.

Cooperating Agency: An agency supplying assistance other than direct operational or support functions or resources to the incident management effort.

Coordinate: To advance systematically an analysis and exchange of information among principals who have or may have a need to know certain information to carry out specific incident management responsibilities.

Deputy: A fully qualified individual who, in the absence of a superior, can be delegated the authority to manage a functional operation or perform a specific task. In some cases, a deputy can act as relief for a superior and, therefore, must be fully qualified in the position. Deputies can be assigned to the Incident Commander, General Staff, and Branch Directors.

Dispatch: The ordered movement of a resource or resources to an assigned operational mission or an administrative move from one location to another.

Division: The partition of an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the manageable span of control of the Operations Chief. A division is located within the ICS organization between the branch and resources in the Operations Branch.

Emergency: Absent a Residentially declared emergency, any incident(s), human-caused or natural, that requires responsive action to protect life and/or property. Under the Robert T. Stafford Relief and Emergency Assistance Act, an emergency means any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.

Emergency Operations Center (EOCs): The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. EOCs may be organized by major functional disciplines (e.g. fire, law enforcement, and medical services), by jurisdiction (e.g., Federal, State, regional, county, city, tribal), or some combination thereof.

Emergency Operations Plan (EOP): The "steady-state" plan maintained by various jurisdictional levels for responding to a wide variety of potential hazards.

Emergency Public Information: Information that is disseminated primarily in anticipation of an emergency or during an emergency. In addition to providing situational information to the public, it also frequently provides directive actions required to be taken by the general public.

Emergency Response Provider: Includes Federal. State, local and tribal emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities. See Section 2 (6), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002). Also known as Emergency Responder.

Evacuation: Organized, phased, and supervised withdrawal, dispersal, or removal of civilians from dangerous or potentially dangerous areas, and their reception and care in safe areas.

Event: A planned, non-emergency activity. ICS can be used as the management system for a wide range of events, e.g., parades, concerts, or sporting events.

Federal: Of or pertaining to the Federal Government of the United States of America.

Field Operations Guide (FOG) or Handbook: A durable pocket or desk guide that contains essential information required to perform specific assignments or functions.

Function: Function refers to the five major activities in ICS; Command, Operations, Planning, Logistics, and Finance/Administration. The term function is also used when describing the activity involved, e.g., the planning function. A sixth function, Intelligence, may be established, if required, to meet incident management needs.

General Staff: A group of incident management personnel organized according to function and reporting to the Incident Commander. The General Staff normally consists of the Operations Section Chief, Planning Section Chief, Logistics Section Chief, and Finance/Administration Section Chief.

Group: Established to divide the incident management structure into functional areas of operation. Groups are composed of resources assembled to perform a special function not necessarily within a single geographic division. Groups, when activated, are located between branches and resources in the Operations Section. (See Division)

Hazard: Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.

Incident: An occurrence or event, natural or human-caused, that requires an emergency response to protect life and/or property. Incidents can, for example, include major disasters, emergencies, terrorist attacks, terrorist threats, wildland and urban fires, floods, hazardous materials spills, nuclear accidents, aircraft accidents, earthquakes, hurricanes, tornadoes, tropical storms, war-related disasters, public health and medical emergencies, and other occurrences requiring an emergency response.

Incident Action Plan (IAP): An oral or written plan containing general objectives reflecting the overall strategy for managing an incident. It may include the identification of operational resources and assignments. It may also attachments that provide direction and important information for management of the incident during one or more operational periods.

Incident Command Post (ICP): The field location at which the primary tactical-level, on-scene incident command functions are performed. The ICP may be collocated with the incident base or other incident facilities and is normally identified by a green rotating or flashing light.

Incident Command System (ICS): A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands or single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating with a common organizational structure, designed to aid in the management of resources during incidents. It is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, to organize field-level incident-management operations,

Incident Commander (IC): The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident

Incident Management Team (IMT): The IC and appropriate Command & General Staff personnel assigned to an incident.

Incident Objectives: Statements of guidance and direction necessary for selecting appropriate strategy(s) and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow strategic and tactical alternatives.

Initial Action: The actions taken by those responders first to arrive at an incident site.

Initial Response: Resources initially committed to an incident.

Intelligence Officer: The intelligence officer is responsible for managing internal information, intelligence, and operational security requirements supporting incident management activities. These may include information security and operational security activities, as well as the complex task of ensuring that sensitive information of all types (e.g., classified information, law enforcement sensitive information, proprietary information. Or export controlled information) is handled in a way that not only safeguards the information, but also ensures that it gets to those who need access to it to perform their missions effectively and safely.

Job Aid: A checklist or other aid that is useful in performing or training for a job.

Joint Information Center (JIC): A facility established to coordinate all incident-related public information activities. It is the central point of contact for all news media at the scene of the incident. Public information officials from all participating agencies should collocate at the JIC.

Joint Information System (JIS): Integrates incident information and public affairs into a cohesive organization designed to provide consistent, coordinated, timely information during crisis or incident operations. The mission of the JIS is to provide a structure and system for developing and delivering coordinated interagency messages; developing, recommending, and executing public affairs issues that could affect a response effort; and controlling rumors and inaccurate information that could undermine public confidence in the emergency response effort.

Jurisdiction: A range or sphere of authority. Public agencies have jurisdiction at an incident related to their legal responsibilities and authority. Jurisdictional authority at an incident can be political or geographical (e.g., city, county, tribal, State, or Federal boundary lines) or functional (e.g., law enforcement, public health).

Liaison: A form of communication for establishing and maintaining mutual understanding and cooperation.

Liaison Officer: A member of the Command Staff responsible for coordinating with representatives from cooperating and assisting agencies.

Local Government: A county, municipality, city, town, township, borough, local public authority, school district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; an Indian tribe or authorized tribal organization, or in Alaska a Native village or Alaska Regional Native Corporation; a rural community, unincorporated town or village, or other public entity. See Section 2 (10), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

Logistics: Providing resources and other services to support incident management.

Logistics Section: The section responsible for providing facilities, services, and material support for the incident.

Major Disaster: As defined under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5122), a major disaster is any natural catastrophe (including any hurricane, tornado, storm, high water, wind driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant disaster assistance under this Act to supplement the efforts and available resources of State, tribes, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.

Management by Objectives: A management approach that involves a four-step process for achieving the incident goal. The Management by Objectives approach includes the following: establishing overarching objectives; developing and issuing assignments, plans, procedures, and protocols; establishing specific, measurable objectives for various incident management functional activities and directing efforts to fulfill them, in support of defined strategic objectives; and documenting results to measure performance and facilitate corrective action.

Mitigation: The activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident. Mitigation measures may be implemented prior to, during, or after an incident. Mitigation measures are often informed by lessons learned from prior incidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.

Mobilization: The process and procedures used by all organizations (Federal, State, local, and tribal) for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

Multi-agency Coordination Entity: A multi-agency coordination entity functions within a broader multi-agency coordination system. It may establish the priorities among incidents and associated resource allocations, deconflict agency policies, and provide strategic guidance and direction to support incident management.

Multi-agency Coordination System: Multi-agency coordination systems provide the architecture to support coordination for incident prioritization, critical resource allocation, communications systems integration, and information coordination. The components of multi-agency coordination systems include facilities, equipment, emergency operations centers (EOCs), specific multi-agency coordination entities, personnel, procedures, and communications. These systems assist agencies and organizations to fully integrate the subsystems of the NIMS.

Multi-jurisdictional Incident: An incident requiring action from multiple agencies that each have jurisdiction to manage certain aspects of an Incident. In ICS, these incidents will be managed under Unified Command.

Mutual-Aid Agreement: A written agreement between agencies and/or jurisdictions that states they will assist one another on request, by furnishing personnel, equipment, and/or expertise in a specific manner.

National: Of a nationwide character, including the Federal, State, local, and tribal aspects of governance and polity.

National Disaster Medical System: A cooperative, asset sharing partnership between the Department of Health and Human Services, the Department of Veterans Affairs, the Department of Homeland Security, and the Department of Defense. NDMS provides resources for meeting the continuity of care and mental health services requirements of the Emergency Support Function 8 (ESF #8) in the Federal Response Plan.

National Incident Management System: A system mandated by HSPD-5 that provides a consistent nationwide approach for Federal, State, tribal, local governments; the private sector, and nongovernmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among Federal, State, local, and tribal capabilities, the NIMS includes a core set of concepts, principles, and terminology. HSPD-5 identifies these as the ICS; multi-agency coordination systems; training; identification and management of resources (including systems for classifying types of resources); qualification and certification; and the collection, tracking, and reporting of incident information and incident resources.

National Response Plan: A plan mandated by HSPD-5 that integrates Federal domestic prevention, preparedness, response, an recovery plans into one all-discipline, all-hazards plan.

Nongovernmental Organization (NGO): An entity with an association that is based on interests of its members, individuals, or institutions and that is not created by a government, but may work cooperatively with government. Such organizations serve a public purpose, not a private benefit. Examples of NGOs include faith-based charity organizations and the American Red Cross.

Operational Period: The time scheduled for executing a given set of operation actions, as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not over 24 hours.

Operations Section: The section responsible for all tactical incident operations. In ICS, it normally includes subordinate branches, divisions, and/or groups.

Overview Document: An overview document is a brief concept summary of an incident-related function, team, or capability.

Personnel Accountability: The ability to account for the location and welfare of incident personnel. It is accomplished when supervisors ensure that ICS principles and processes are functional and that personnel are working within established incident management guidelines.

Planning Meeting: A meeting held as needed prior to and throughout the duration of an incident to select specific strategies and tactics for incident control operations and for service and support planning. For larger incidents, the planning meeting is a major element in the development of the Incident Action Plan (IAP).

Planning Section: Responsible for the collection, evaluation, and dissemination of operational information related to the incident, and for the preparation and documentation of the IAP. This section also maintains information on the current and forecasted situation and on the status of resources assigned to the incident.

Preparedness: The range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process. Preparedness involves efforts at all levels of government and between government and private-sector and nongovernmental organizations to identify threats, determine vulnerabilities, and identify required resources. Within the NIMS, preparedness is operationally focused on establishing guidelines, protocols, and standards for planning, training and exercises, personnel qualification and certification, equipment certification, and publication management.

Preparedness Organizations: The groups that provide interagency coordination for domestic incident management activities in a non-emergency context. Preparedness organizations can include a;; agencies with a role in incident management, for prevention, preparedness, response, or recovery activities. They rep[resent a wide variety of committees, planning groups, and other organizations that meet and coordinate to ensure the proper level of planning, training, equipping, and other preparedness requirements within a jurisdiction or area.

Prevention: Actions to avoid an incident or to intervene to stop an incident from occurring. Prevention involves actions to protect lives and property. It involves applying intelligence and other information to a range of activities that may include such countermeasures as deterrence operations; heightened inspections; improved surveillance and security operations; investigations to determine the full nature and source of the threat; public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and, as appropriate, specific law enforcement operations aimed at deterring, preempting, interdicting, or disrupting illegal activity and apprehending potential perpetrators and bringing them to justice.

Private Sector: Organizations and entities that are not part of any governmental structure. It includes for-profit and not-for-profit organizations, formal and informal structures, commerce and industry, and private voluntary organizations (PVO).

Processes: Systems of operations that incorporate standardized procedures, methodologies, and functions necessary to provide resources effectively and efficiently. These include resource typing, resource ordering and tracking, and coordination.

Public Information Officer: A member of the Command Staff responsible for interfacing with the public and media or with other agencies with incident-related information requirements.

Publication Management: The publications management subsystem includes materials development, publication control, publication supply, and distribution. The development and distribution of NIMS materials is managed through this subsystem. Consistent documentation is critical to success, because it ensures that all responders are familiar with the documentation used in a particular incident regardless of the location or the responding agencies involved.

Qualifications and Certification: This subsystem provides recommended qualification and certification standards for emergency responder and incident management personnel. It also allows the development of minimum standards for resources expected to have an interstate application. Standards typically include training, currency, experience, and physical and medical fitness,

Reception Area: This refers to a location separate from staging areas, where resources report in for processing and out-processing. Reception Areas provide accountability, security, situational awareness briefings, safety awareness, distribution of IAPs, supplies and equipment, feeding, and bed down.

Recovery: The development, coordination, and execution of service-and site restoration plans; the reconstitution of government operations and services; individual, private sector, non-governmental and public assistance programs to provide housing and to promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration; evaluation of the incident to identify lessons learned; post-incident reporting; and development of initiatives to mitigate the effects of future incidents.

Recovery Plan: A plan developed by a State, local, or tribal jurisdictions with assistance from responding Federal agencies to restore the affected area.

Resources: Personnel and major items of equipment, supplies, and facilities available or potentially available for assignment to incident operations and for which status is maintained. Resources are described by king and type and may be used in operational support and supervisory capacities at an incident or at an EOC.

Resource Management: Efficient incident management requires a system for identifying available resources at all jurisdictional levels to enable timely and unimpeded access to resources needed to prepared for, respond to, or recover from an incident. Resource management under the NIMS includes mutual-aid agreements; the use of special Federal State, local, and tribal teams; and resource mobilization protocols.

Resource Unit: Functional unit within the Planning Section responsible for recording the status of resources committed to the incident. This unit also evaluates resources currently committed to the incident, the effects additional responding resources will have on the incident, and anticipated resource needs.

Response: Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes. As indicated by the situation, response activities include applying intelligence and other information to lessen the effects or consequences of an incident; increased security operations; continuing investigation into nature and source of the threat; ongoing public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and specific law enforcement operations aimed at preempting, interdicting, or disrupting illegal activity, and apprehending actual perpetrators and bringing them to justice.

Safety Officer: A member of the Command Staff responsible for monitoring and assessing safety hazards or unsafe situations and for developing measures for ensuring personnel safety.

Section: The organizational level having responsibility for a major functional area of incident management, e.g., Operations, Planning, Logistics, Finance/Administration, and Intelligence (if established). The section is organizationally situated between the branch and the Incident Command.

Span of Control: The number of individuals a supervisor is responsible for, usually expressed as the ration of supervisors to individuals. (Under the NIMS, an appropriate span of control is between 1:3 and 1:7.)

Staging Area: Location established where resources can be placed while awaiting a tactical assignment. The Operations Section manages the Staging Areas.

Standard Operating Procedure (SOP) or Operating Manual: A complete reference document that details the procedures for performing a single function or a number of interdependent functions.

State: When capitalized, refers to any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, and any possession of the United States. See Section 2 (14), Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135 (2002).

Strategic: Strategic elements of incident management are characterized by continuous long-term, high-level planning by organizations headed by elected or other senior officials. These elements involve the adoption of long-range goals and objectives, the setting of priorities; the establishment of budgets and other fiscal decisions, policy development, and the application of measures of performance or effectiveness.

Strike Team: A set number of resources of the same kind and type that have an established minimum number of personnel.

Strategy: The general direction selected to accomplish incident objectives set by the IC.

Supporting Technologies: Any technology that may be used to support the NIMS is included in this subsystem. These technologies include orthophoto mapping, remote automatic weather stations, infrared technology, and communications, among various others.

Task Force: Any combination of resources assembled to support a specific mission or operational need. All resource elements within a Task Force must have common communications and a designated leader.

Technical Assistance: Support provided to State, local, and tribal jurisdictions when they have the resources but lack the complete knowledge and skills needed to perform a required activity (such as mobile-home park design and hazardous material assessments).

Terrorism: Under the Homeland Security Act of 2002, terrorism is defined as activity that involves an act dangerous to human life or potentially destructive of critical infrastructure or key resources and is a violation of the criminal laws of the United States or of any State or other subdivision of the United States in which it occurs and is intended to intimidate or coerce the civilian population or influence a government or affect the conduct of a government by mass destruction, assassination, or kidnapping. See Section 2 (15), Homeland Security Act of 2002, PUB. L. 107-296, 116 Stat. 2135 (2002).

Threat: An indication of possible violence, harm, or danger.

Tools: Those instruments and capabilities that allow for the professional performance of tasks, such as information systems, agreements, doctrine, capabilities, and legislative authorities.

Tribal: Any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native Village as defined in or established pursuant to the Alaskan Native Claims Settlement Act (85 stat. 688) [43 U.S.C.A. and 1601 et seq.], that is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

Type: A classification of resources in the ICS that refers to capability. Type 1 is generally considered to be more capable than Types 2, 3, or 4, respectively, because of size; power; capacity; or, in the case of incident management teams, experience and qualifications.

Unified Area Command: A Unified Area Command is established when incidents under an Area Command are multi-jurisdictional. (See Area Command)

Unified Command (UC): An application of ICS, used when there is more than one agency with incident jurisdiction or when incidents cross political jurisdictions. Agencies work together through the designated members of the UC, often the senior person from agencies and/or disciplines participating in the UC, to establish a common set of objectives and strategies and a single IAP.

Unit: The organizational element having functional responsibility for a specific incident planning, logistics, or Finance/Administration activity.

Unity of Command: The concept by which each person within an organization reports to one and only one designated person. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.

Volunteer: For purposes of the NIMS, a volunteer is any individual accepted to perform services by the lead agency, which has authority to accept volunteer services, when the individual performs without promise, expectation, or receipt of compensation for services performed. See, e.g., 16 U.S.C. 742f(c) and 29 CFR 553.101.

Appendix F
National Incident Management System Acronyms

AC	Area Command
ACP	Area Command Post
ALS	Advanced Life Support
DOC	Department Operations Center
EMAC	Emergency Management Assistance Compact
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FOG	Field Operations Guide
FSC	Finance/Administration Section Chief
GIS	Geographic Information System
HAZMAT	Hazardous Material
HSPD-5	Homeland Security Presidential Directive – 5
IAP	Incident Action Plan
IC	Incident Commander
IC	Incident Command
ICP	Incident Command Post
ICS	Incident Command System
IMT	Incident Management Team
JIS	Joint Information System
JIC	Joint Information Center
LNO	Liaison Officer
LO	Logistics Section Chief
MACS	Multi-Agency Coordination System
NDMS	National Disaster Medical System
NGO	Nongovernmental Organization
NIMS	National Incident Management System
NRP	National Response Plan
OSC	Operations Section Chief
PSC	Plans Section Chief
PIO	Public Information Officer
POLREP	Pollution Report
PVO	Private Voluntary Organizations
R&D	Research & Development
RESTAT	Resources Status
ROSS	Resource Ordering and Status System
SDO	Standards Development Organizations
SITREP	Situation Report
SO	Safety Officer
SOP	Standard Operating Procedure
UC	Unified Command
US&R	Urban Search & Rescue

Appendix C

Standard Guide for Building Event Dispersion and Health Assessment Preparedness and Response Planning

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Standard Guide for Building Event Dispersion and Health Assessment Preparedness and Response Planning[3]

This standard is issued under the fixed designation X XXXX; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide describes a general approach for determining the health effects of the occupants of mechanically-ventilated structures exposed to the release of airborne chemical or biological (C/B) agents, or toxic industrial chemicals or materials (TIC/TIM) in or near a building. This guide will aid first responders and emergency managers in identifying areas and occupants in a building at risk for purposes of evacuation, sheltering, treatment and recovery. This requires an understanding of building air flow characteristics and processes to calculate the agent concentration profiles throughout a structure, based upon agent fate and transport. This may take the form of an equation, algorithm, combinations of equations/algorithms, or a fully developed building model to calculate inter-zonal airflow, contaminant concentration, and exposure.

1.2 This guide is intended to provide the user with guidelines to prepare for, respond to and/or recover from an incident involving the overt or covert release of a chemical or biological (C/B) agent in or near a building with subsequent dispersion of that agent throughout the building. Preparation may include threat vulnerability and protection assessments, and emergency response planning and training. Response can include decision aids to first responders. Recovery would include occupant treatment, prosecution and remediation.

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[3] This Practice/Guide is under the jurisdiction of ASTM Committee and is the direct responsibility of Subcommittee .

1.3

1.4 This guide describes a series of options the user may select that best addresses their specific application and capabilities. It does not recommend a specific course of action. This guide cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances.

1.5 This guide is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should it be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this guide means only that the document has been approved through the ASTM consensus process.

1.6 The intended users of the guide are Architecture and Engineering (A&E) firms, test and balance engineers, facility operators, building/property managers, regulatory agencies and first responders.

1.7 This guide applies to airborne C/B agents delivered to the building indoor environment. It does not address the delivery of C/B agents by other means such as the domestic water system.

1.8 It is not appropriate to apply this guide to large, single-zone buildings, such as theaters, convention centers, or enclosed sports arenas. It is also not appropriate for partially enclosed outdoor stadiums or any outdoor venue. Complexes of buildings may require assessment of each individual structure, contingent upon overall scale of the complex.

1.9 This guide does not address the issue of model validation. It is assumed that the models used in carrying out this guide have been previously validated by the model developers.

1.10 This guide 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 to determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 Suggested Reading

Current edition approved XXX. XX, XXXX. Published XX XXXX.

D5157-97e1 Standard Guide for Statistical Evaluation of Indoor Air Quality Models

D1356-00a Standard Terminology Relating to Sampling and Analysis of Atmospheres

D1357-95 Standard Practice for Planning the Sampling of the Ambient Atmosphere

D5111-99 Standard Guide for Choosing Locations and Sampling Methods to Monitor Atmospheric Deposition at Non-Urban Locations

D6245-98 Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation

D3249-95 Standard Practice for General Ambient Air Analyzer Procedures

E741-00 Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution

E1554-03 Standard Test Methods for Determining External Air Leakage of Air Distribution Systems by Fan Pressurization

E1186-03 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems

E779-03 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization

E1258-88 Standard Test Method for Airflow Calibration of Fan Pressurization Devices

E2267-03 Standard Guide for Specifying and Evaluating Performance of Single Family Attached and Detached Dwellings-Indoor Air Quality

Airflow Performance of Building Envelopes, Components, and Systems ASTM STP 1255, Mark P. Modera and Andrew K. Persily, Eds., American Society for Testing and Materials, Philadelphia, 1995.

Air change Rate and Airtightness in Buildings ASTM STP 1067, M. H. Sherman, Ed., American Society for Testing and Materials, Philadelphia, 1990.

Measured Air Leakage of Buildings ASTM STP 904, H.R. Trechsel and P.L. Lagus, Ed., American Society for Testing and Materials, Philadelphia, 1984.

3. Terminology

2.1 *Definitions:* For definitions of terms used in this standard, refer to Terminology D 1356

2.2 Definitions of Terms Specific to this Standard:

2.2.1 *active protection* – a mitigation measure that requires positive action by automatic systems, manual intervention, or both. (see Passive Protection)

2.2.2 *adsorption* – the process by which a layer of atoms, ions, or molecules of a gas, liquid, or solid is formed on the surface of a solid or liquid.

2.2.3 *AHU zone* – that portion of a building space served by a single air handling unit (AHU).

2.2.4 *air change rate (ACH)* – the volumetric airflow rate into a zone divided by the zone volume; may refer to outdoor air or supply air. In h^{-1}, air changes per hour.

2.2.5 *air leakage rate* – the volumetric airflow rate through wall/floor/ceiling joints, cracks, and porous surfaces, or combination thereof.

3.2.6 *airflow path* – a building element that allows air to move from one zone to another, such as cracks in interior/exterior walls, open doorways, stairwells, and mechanical ventilation systems.

3.2.7 *attack* – a act directed against an entity that, when successful, will result in injury or death to persons or damage to property, the environment, economy, reputation, or any combination thereof.

3.2.8 *biological agent* – Living organisms, or the materials derived from them (bacteria, virus, or toxin) that cause disease in, or harm to humans, animals, or plants, or cause deterioration of material.

3.2.9 *building envelope* – the exterior shell of a building enclosing the indoor space

3.2.10 *mulitzone* building *model* – an idealization of building air flow physics to calculate or conceptualize the infiltration, exfiltration, room-to-room air flows, and pollutant concentrations based on fate and transport.

Discussion: This may take the form of an equation, algorithm, or series of equations/algorithms used to calculate average or time-varying agent concentration, exposure, and dose for health risk assessment. The model may involve numerical methods for solution.

3.2.11

3.2.12 *chemical agent* – a compound intended to kill, seriously injure, or incapacitate humans (see weapons of mass destruction). May include individual or combinations of known or unknown chemicals including toxic industrial chemicals (TICs).

3.2.13 *C/B* – general acronym referring to chemical and/or biological agents.

3.2.14 *contaminant concentration* – the quantity of noxious agent in a defined airspace, expressed in *units* characteristics to the contaminant (for example, mg/m^3, ppm, Bq/m^3, $area/m^3$, or colony forming units per cubic meter).

3.2.15 *decontamination* – removal (by accepted and appropriate means) of contaminants to a specified *and* measured level of safety for resuming normal use, activity, or state of health.

3.2.16 *exfiltration* – air leakage out of a building through penetrations of the building envelope (see Infiltration).

3.2.17 *fate* – the destiny of a chemical or biological pollutant after release into the environment.

3.2.18 *HVAC* – Heating, Ventilation, and Air Conditioning.

3.2.19 indoor *space* – the volume of a building inside the building envelope (see Building Envelope).

3.2.20 *infiltration* – air leakage into a building through penetrations of the building envelope (see Exfiltration).

3.2.21 *mixed-zone (well mixed) assumption* – a fundamental assumption of multizone airflow models that at each time-step, each zone has homogeneous (well-mixed) conditions throughout that zone, including temperature, pressure, and contaminant concentrations.

3.2.22 *model evaluation* – a series of steps by which a model is assessed to meet the purpose for which it is intended.

3.2.23 *model validation* – a series of steps by which a model is determined to be empirically predictive for its intended use.

3.2.24 *passive protection* – a mitigation or defensive measure continuously in place that requires no intervention to perform its function.

3.2.25 *source term* – the amount of a specific pollutant emitted or discharged to a particular medium, such as the air or water, from a particular source.

3.2.26 *TIC* – toxic industrial chemical

3.2.27 *toxin* – a noxious product of microorganisms, animals, or plants.

3.2.28 *weapons of mass destruction or WMD* – any weapon or device that is intended, or has the capability, to cause death or serious bodily injury to people through the release, dissemination, or impact of (a) toxic or poisonous chemicals or their precursors; (b) a disease organisms; (c) radiation or radioactivity (see Attack)

3.2.29 *zone* –a *homogeneous* space in a building defined by its parameters (pressure, temperature, and contaminant levels, etc.).

4. Summary of Guide

A building event dispersion and health assessment preparedness and planning guide can consist of a fully integrated suite of modeling tools, data bases, analytical tools and assessment guidelines, or individual components operating independent of each other. It can be applied to three distinct types of activities associated with an incident: pre-event planning, event management, and post-event assessment.

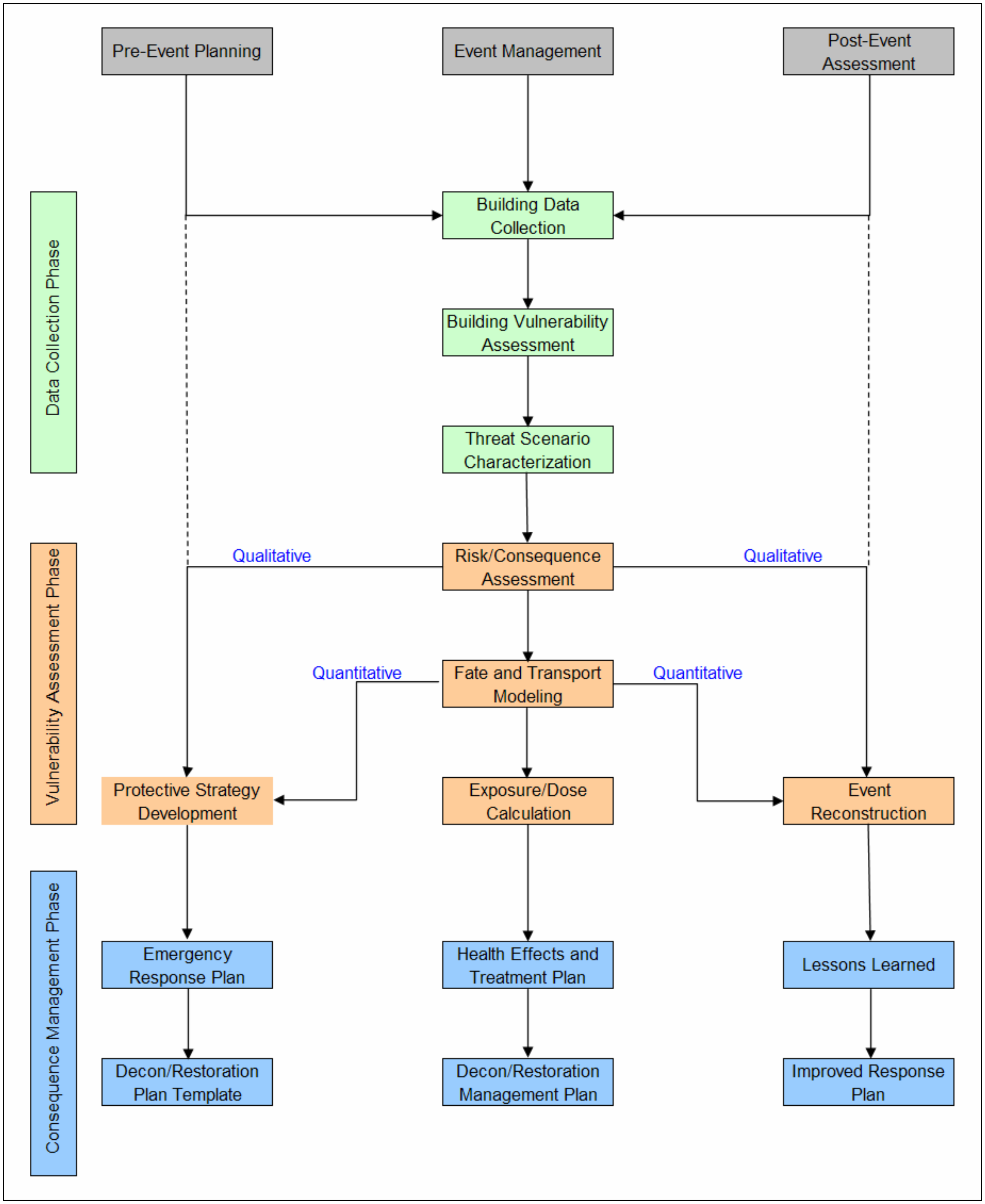
4.1 The sequence of events for each of these activities is shown in Figure 1. The three phases to the approach are: (1) a data collection phase during which sufficient background information regarding the building and sequence of events is collected, (2) a vulnerability assessment phase when credible threats and realistic consequences are identified, and various mitigation strategies are evaluated based on the threats, and (3) a consequence management phase during which various plans of action are formalized to mitigate the impact of a event.

5. Significance and Use

5.1 A standard guideline is needed to assist emergency managers and first responders in preparing for, or responding to a C/B incident impacting a building. The preparation for, response to, and recovery from such an incident using clearly defined assessment methodologies, analysis tools, and decision aids will result in credible conclusions.

5.2 This guide offers alternative approaches for conducting a building indoor contaminant dispersion analysis and health effects assessment based on a wide range of data fidelity and resultant accuracy and resolution. Current multi-zone building dispersion models require the input of thousands of flow path parameters (area, turbulent and laminar flow coefficients, elevation, to-zone and from-zone for each and every path), zone parameters (elevation, area, floor-to-ceiling height, temperature), and equipment parameters (duct network topology and leakiness, supply and return register sizes and locations, duct flow characteristics, fan flow-pressure characteristics), and ambient environmental conditions (wind speed profile, wind direction, temperature, humidity). Existing test methods for determining these parameters are tedious and labor intensive, but are essential to reliable compilation of an accurate building-specific dispersion/transport model.

Figure 1: Building Analysis, Modeling, and Health Effects Assessment Flow Chart.


Pre-Event Planning
Event Management
Post-Event Assessment
Data Collection Phase
Building Data Collection
Building Vulnerability Assessment
Threat Scenario Characterization
Vulnerability Assessment Phase
Qualitative
Risk/Consequence Assessment
Qualitative
Quantitative
Fate and Transport Modeling
Quantitative
Protective Strategy Development
Exposure/Dose Calculation
Event Reconstruction
Consequence Management Phase
Emergency Response Plan
Health Effects and Treatment Plan
Lessons Learned
Decon/Restoration Plan Template
Decon/Restoration Management Plan
Improved Response Plan

5.3 This guide can be applied to the three distinct activities related to a C/B event. The purpose of the pre-event planning application is to evaluate building vulnerabilities against credible threats, assess the risk and consequences of such an event happening, and to develop appropriate emergency response plans. In this phase the tool can also be used as an integral part of a realistic training exercise. At the end of this process will be a building specific emergency response plan and a general decontamination and restoration plan.

5.4 In an event management application, the tool can be used by emergency planners to identify contaminated areas prioritize operations, assess potential impact to human health and environment, identify proper medical treatment, and to coordinate consequence management activities, including decontamination and restoration of the building to full operation. In this application time is critical and the tool can be used to select correct response options. The end product of this application will be a site and event specific health effects and treatment plan, and a management plan for decontamination and restoration.

5.5 In the post-event assessment application, the tool can be used to reconstruct the sequence of events, provide lessons learned, and to assist in the forensic and attribution effort. The end product becomes an improved emergency response plan.

6. Qualitative versus Quantitative Approaches

The levels of assessment of these phases also vary from qualitative, reliant upon assumptions with inherent uncertainty, to quantitative, reliant upon thorough definition of the building and event with potentially more accurate results and less uncertainty. Table 1 identifies the relationship between model fidelity and model application.

6.1 A qualitative approach relies more on subjective information and general assumptions about the building and events and therefore has much greater uncertainty in the results and conclusions. Examples of limiting assumptions that may yield qualitative results are; modeling gross ventilation parameters such as air change rates and percentage of fresh air, occupant exposure may be a representative average for a zone or a probability of exposure, which assumes occupants remain within the zone for the full duration of exposure, exposures may be determined utilizing a spreadsheet, a simple algorithm with grossly representative analogs and parameterizations, or even a decision tree process, there is little or no verifiable data (i.e. measurements) for analytical input. Although qualitative methods have inherent high uncertainty, they can be made to be conservative and they require very little processing time, thus making them most suitable for response purposes.

6.2 The uncertainty of qualitative methods may be reduced by utilizing more rigorous, higher accuracy analyses as the basis for the qualitative methods. A quantitative approach relies upon thorough definition of the building and event with potentially more accurate results and less uncertainty. Table 2 identifies common sources of uncertainty in model development. Model parameters that require accurate, quantitative inputs include; flow paths and corresponding airflows as a function of building state, source term, agent physics, building volumes, turbulence, deposition, agent decay and interactions, occupant activities, etc. In addition, incorporating specific C/B agent properties, such as interaction of agents with building materials, or particle size distribution would reduce the uncertainties and improve the usefulness of the model results.

6.3 The actual modeling or analysis employed is likely to blend qualitative and quantitative methods, particularly since there is no absolute quantitative methodology, since some assumptions or unknowns will always exist with any modeling application. For example, little is known about the interaction of chemical warfare agents with building materials, wall/floor coverings or typical office furniture, although there is currently on-going research by a number of different agencies, such as the U.S. Army.

Since determining the risk or consequence of human exposure is the ultimate goal of modeling, understanding the uncertainty of exposure results for a chosen modeling or analysis method is critical. In theory, quantitative methods should have lower uncertainty than qualitative methods, but that is only valid if the inputs into a quantitative method have lower uncertainty than those associated with qualitative assumptions and approximations. Also, quantitative systems tend to have much greater complexity (i.e. algorithms, variables, etc.) than qualitative methods, so the final result from a quantitative approach has the potential for significant error or uncertainty. It is often stated with many models that the results are intended to provide guidance for decision making and should not be taken as absolute representations of the scenario(s) being considered. User interpretation and judgment of the results is always as valuable as the process.

6.3.1 Qualitative methods will have greater uncertainty than quantitative methods, due to the simplifying and approximating assumptions they rely upon. Since the qualitative approach will primarily characterize a building HVAC zone, the primary agent transport mechanism, the greatest uncertainty in characterizing building occupant exposure and risk, will be due to lack of resolution of the secondary and tertiary transport mechanisms in the building, as well as the exposure error (variation) throughout a zone that an average does not represent. If approximations are used, they will have an inherent uncertainty. If a simplified mathematical relationship is used to express the exposure throughout the building as a function of several critical variables, the total uncertainty (ω_t) of the result may be estimated by performing the derivative method for calculating total uncertainty,

Table 1. Model Fidelity and Application Relationships

Level	Assumptions	Inputs	Model	Flow	Spatial Resolution	Temporal Resolution	Agent	Occupants	Exposure	Processing Time	Application
Quantitative	Minimal	Most inputs measured/known	CFD	HVAC to Turbulent Mixing	Defined volume/ flowpath geomtries	<< 1 second, supports active response modeling	Full Physics	Transient	Throughout Rooms	Days/Weeks	***Planning***
Quantitative/ Qualitative	Moderate	Primary inputs known (or averaged)/ Secondary inputs approximated/ assumed	Nodal	HVAC to Leakage Rates	Room volumes	10's seconds to minutes, may support active response modeling depending upon spatial resolution	Partial Physics	Fixed/Room	Average per Room	Hours/Days	***Planning/ Response/ Recovery***
Qualitative	Heavy	Most inputs approximated or assumed	Analytical/ Parametrization	HVAC zone rates	HVAC Zone volumes	Averaged over release duration, not likely to support active response modeling	No Physics	Fixed/Zone	Zone Probability	Minutes/Hours	***Response***

Table 2. Sources of uncertainty in the formulation and application of transport/transformation models4

Model Formulation Uncertainty (Structural Uncertainty)	Model Application Uncertainty (Data/Parametric Uncertainty)
Simplification Relationship Idealization Spatial/Temporal Averaging Approximations Discretization/Grouping	Parameter Selection Source Data Interpretation

4 Isukapalli, S. 'Uncertainty Analysis of Transport-Transformation Models', PhD Dissertation, Rutgers, The State University of New Jersey, New Brunswick, New Jersey, January 1999.

$$\omega_t = \sqrt{[\delta Model/\delta a * \omega_a]^2 + ... + [\delta Model/\delta z * \omega_z]^2} \qquad (1)$$

Note that the derivative equation cannot be practically applied to most complex computational fluid dynamic (CFD) models or even nodal models.

7. Data Collection Phase

7.1 Background Environmental/Building Data Collection

7.1.1 The most critical information required for successful indoor dispersion model development and characterization is an adequate description of the building topology, HVAC system design and operational specifications, and flow path characterization. The goal of this information/data collection activity is to obtain sufficient knowledge of the building design, how it is operated, and major flow paths in the building.

7.1.2 Much of this information may be found on the building's architectural and mechanical system plans. Depending on the age of the building, the extent of remodeling or other structural changes over time, existing plans may not show actual conditions in the building. Paper copies of the plans are sufficient, but electronic AutoCAD files are preferred.

7.1.3 A physical inspection of the building is required to verify the validity of the existing building plans and to identify primary and secondary flow paths (see Section 0). Discussions with the building's mechanical system operators are another good source of information on the building operation.

7.1.4 Contaminant dispersion modeling in the indoor environment is a complex process requiring extensive building specific data. In order to develop a robust building model, it is necessary to explicitly define each of the zones in the building, flow path characteristics, and agent fate and transport process in the building. In many cases this information will not be available and anecdotal or default assumptions will be the primary data input. Under this condition, the modeling approach is less stringent and follows the qualitative approach described above. If a significant amount of building specific information is available or derivable, then the more quantitative approach can be followed.

7.1.5 The size and complexity of the building, and the available data will determine the level of fidelity achievable. At one end of the scale is a small building with a single open space served by a single air handling unit. At the other end of the spectrum, are large, complex multistory buildings with tens of air handling units, hundreds of individual rooms and tens of thousands of flow paths. The building dispersion modeling and health assessment system must be able to cover full range of building types, size, and complexity. In the process of constructing the building model, some simplifying assumptions can be made to reduce the effort yet will not significantly affect the model results. Key building variables are described in the sections that follow.

7.1.6 In order to characterize the dispersion of a C/B agent in a building, it is first necessary to understand the building topology, starting with the building architecture. The best source for this information will be the floor plans for the building, either the original "as-built" architectural plans, or modified plans if the building has been changed since initial construction. Older buildings may not have reliable floor plans. Building facility managers will likely have this information. Existing floor plans will need to be verified during a building walk-through audit. Using available information, the building will need to be divided into a set of zones. A zone can be an individual room, a collection of rooms, or all rooms in a ventilation zone served by the same air handling unit. In addition, large spaces, such as an atrium, or long hallways may need to be subdivided into smaller zones because of the well-mixed assumption of multi-zone models. Zones are interconnected by airflow paths.

7.1.7 Based on the results of the analysis of the physical layout of the building and discussions with building operators and managers, all zones with public access need to be identified. These zones are key building vulnerabilities and potential release points for the C/B agent.

7.1.8 The type of information needed to characterize the building's mechanical systems can be obtained from building mechanical plans or from name plate data collected during an audit of the building systems. The type of information to be collected is listed below:

(a) equipment/systems, capacities, etc

(b) type and capability of energy management system to initiate automated response

I outside air fraction

(d) air intake locations

(e) AHU zones – building zones/volume served by each AHU and the relationship to other AHUs

(f) air distribution system type (variable air volume, or constant volume) supply and return flow rates, rated fan capacity

(g) dedicated exhaust fan flow rates

(h) filtration – location and collection efficiency, extent of filter by-pass leakage.

(i) schedule of operation

(j) extent of physical protection for all ground level air intakes

7.1.9 Identifying and documenting the characteristics of the many airflow paths in the building is a critical element in determining the dispersion of an agent released in the building. The level of details that can be specified for each path will determine the fidelity of the results and dictates the best approach to follow. Extensive documentation on the various flow paths and quantifying the path characteristics of each path is necessary for the quantitative approach described in Section 8. In the absence of definitive information on the flow path characteristics, assumed default values from sources such as those published by the American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc.[5] may be substituted and the approach described in Section 7 is recommended.

7.1.10 While the building's HVAC system is operating, the primary transport mechanism (flow path) is via the AHU distribution system. Estimates of the air flow at each of the supply/return registers can be obtained from the design specifications and/or mechanical plans, or directly measured using a calibrated flow hood on a sample of registers within each AHU zone. Data on the type and collection efficiency of existing air filters can be obtained from the building maintenance staff.

7.1.11 The secondary transport mechanism in the building is pressure driven air movement through hallways, stairwells, elevator shafts, plenums, open doorways, windows, and utility penetrations. These pressure differences can be from either an imbalance of the mechanical ventilation system, zone-to-zone temperature differences, or wind pressure acting on the building exterior. These flows can be obtained from direct flow measurements using devices such as handheld flow meters, or approximated using default values.

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[5] American Society of Heating, Ventilation, Refrigerating, and Air-Conditioning Engineers, *2001 ASHRAE Handbook of Fundamentals*, 2001.

7.1.12 Tertiary transport mechanisms include pressure driven air flow through unintentional cracks and utility penetrations in walls (interior and exterior), floors, and ceilings. Blower door testing and/or tracer gas experiments can be used to obtain these values. In the absence of measured data, default flows can be estimated using default characteristics published by ASHRAE.

7.1.13 Air leakage across the building envelope can be a significant mechanism for transporting outdoor released C/B agents into the building, and it can aid in the dilution of indoor released agents with fresh outside air. A typically "tight" multistory office building would have ACH values generally less than 1 ACH. A "leaky" building would have values greater than 2 ACH. Typical values for an "average" building would be in the range of 1 ACH to 2 ACH, depending on building state and ambient conditions. Extreme values of more than 10 ACH have been documented [6]. ASTM publication STP 1067 (1990), and ASTM Standards E741-00, E1544-03, and E779-03 describes several approaches for obtaining this information.

7.2 **Occupant Characterization**

7.2.1 Since the ultimate goal of this activity is to identify threats to and subsequent protection of the building/facility occupants, it is necessary to understand the occupancy patterns in the building – primarily how many people by time of day and zone, and their movement throughout the structure. This information generally can be obtained from the building or property managers, and from interview of a sample of people in the building to understand their activities and movements.

8. **Onsite Inspection**

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[6] Persily, A, and Gorfan, J., "Analysis of Ventilation Data from the U.S. Environmental Protection Agency Building Assessment Survey and Evaluation (BASE) Study," National Institute of Standards and Testing NISTIR 7145, 2004

8.1 The site assessment team should consist of people with subject matter expertise in conducting vulnerability assessments, chemical/biological dispersal techniques, HVAC system design and operation, and building protection strategies. The purpose of this on-site inspection is to validate the information collected from the background data collection activities (see Section 7) and to locate and document specific vulnerabilities of the building.

8.2 Certain features in the design of a building, and/or the way the mechanical systems have been maintained and operated facilitate or even exacerbate a potential C/B attack on the building. Some of the key building vulnerabilities include, but are not necessarily limited to:

- Publicly accessible ground-level air intakes
- Slow responding and leaky dampers
- Lack of a single point of control for all HVAC systems and supply/exhaust systems
- Leaky building envelopes
- Poor isolation of ventilation zones
- Failure to maintain proper building zone air balance
- Inefficient air filtration and significant filter bypass in air handling units
- Unrestricted access to all areas of the building and into sensitive areas such as mechanical rooms or to roof top mechanical systems.

8.3 Since the events of September 11, numerous guidelines have been published to assist in conducting building vulnerability assessments. Two of these are listed below:

- HVAC Building Vulnerability Assessment Tool, Rhode Island Department of Health, (www.health.ri.gov/environmental/bvat.pdf)

- Building Vulnerability Assessment and Mitigation Program, Lawrence Berkeley National Laboratory (securebuildings.lbl.gov/BVAMP.html)

9. Credible Threat Scenario Characterization

9.1 Based on the results of the vulnerability assessment, it is then necessary to identify plausible threat scenarios. Plausible threat scenarios are technically feasible, operationally achievable, and politically desirable. The scenarios are conservative, but describe a realistic sequence of events that identify the specific agent, the amount and duration of release, and the release mechanism that are reasonable for the release point and building conditions. Qualitative methods can serve to identify significant versus less significant threat scenarios, particularly when assessing protection/response costs versus probability of occurrence and consequence of occurrence. Definition of specific threat variables is plausible for qualitative analyses since the values are hypothetical but based upon reasonable assumptions. More rigorous definition of agent properties and release characteristics (i.e. specific location within a room) would be used in a quantitative model analysis.

9.2 An integral part of the indoor dispersion modeling is to characterize the threat scenario. Namely, identify the type of threat and amount of agent, location of the release, and the release mechanism. If the analysis is being conducted as a pre-incident planning activity, then the threat characterization is based on a set of plausible threat scenarios developed from a building vulnerability assessment. Plausible threats are conservative, but realistic, with agents, mass released, rate of release and release mechanism reasonable for the release point, for the building function and for building and ambient conditions.

9.3 If the analysis is being conducted as an incident or post-incident assessment, then the threat characterization is based on the actual threat conditions.

9.4 The release mechanism determines how much agent is released into the air and at what rate. Some chemical agents are a vapor at normal room temperatures, but most are a liquid. The liquids may be disseminated by spontaneous evaporation from a free surface (typically a slow process), accelerated evaporation by external heating, mechanical spraying as liquid droplets with subsequent evaporation into a respirable vapor, explosive dispersion, or occupant vector.

9.5 Biological agents can be either liquid or dry powder form that can readily be aerosolized using a wide variety of commercially available equipment, including 2-gallon garden sprayers or disguised spray cans of typical household products (e.g. underarm deodorant, or insect spray)

9.5.1 Identification of the source location is an important element in this assessment. For a biological release in the absence of direct observation of the release (i.e. observed white powder in an envelope), the point of release may be difficult to determine. For a chemical release, the source location can usually be determined quickly. For an internal release, mailrooms, delivery areas such as loading docks, public access areas, and ground level air intakes are the most likely locations for introduction of a C/B agent into the building. Other areas may be identified, depending on the type of building, building occupants, and other unique considerations.

9.5.2 It is also important to understand the release mechanism. C/B agents can be released into the environment by an aerosolized spray, evaporative spill, explosive discharge, or in the case of infectious disease, by plants, food, animals, or human vector.

10. Ambient Weather Conditions

10.1 Ambient weather conditions can significantly affect the success or failure of a chemical attack on a building. If the release location is exterior to the building, temperature, relative humidity and the occurrence of precipitation will alter the effectiveness of the attack. For example, higher wind speeds will more rapidly disperse the agent and narrow the target area, thus reducing the public's exposure.

10.2 Even if the release location is interior to the building, ambient temperature and wind speed will have an affect on the dispersion of the agent in the building. Indoor/outdoor temperature differences and wind pressures on the upwind face of the building can be a significant driver for air infiltration across the building envelope. In addition, the buoyancy effect from the indoor/outdoor temperature difference is a significant driver for vertical transport in multistory the buildings via stairwells and elevator shafts.

10.3 The primary source of ambient weather data is the National Climatic Data Center, but local sources might also be available and more appropriate.

11. Assessment Phase

11.1. Risk/Consequence Assessment

11.1.1. After the building vulnerability assessment has been completed and the credible threat scenario characterization has been completed, the next step is to complete the building risk consequence assessment. It is important that it be done at this time in the process as the results will determine the robustness of the steps that follow. For buildings that are determined to have relatively low risk and low consequences, a minimal, qualitative approach can be justified, based on subjective information and general assumptions about the building and events. This approach has a greater uncertainty in the results and conclusions.

11.1.2. For high risk and high consequence buildings or facilities, a more rigorous, qualitative approach can be justified. This approach relies on a thorough definition of the building and event with potentially more accurate results and less uncertainty.

11.1.3. The final level of acceptable vulnerability and risk is a judgment decision to be made by the building owner/manager using the best available information at the time of the assessment.

11.1.4. There are a number of documents and guides available for risk assessment methodologies. It is not the intent of this guideline to detail those methodologies, but only to identify them for the reader. A partial list of available guidelines are listed below:

- ASME Guidance of Risk Analysis and Management for Critical Asset Protection
- AS/NZA 4360:1999 – Risk Management
- ASHRAE Risk Management Guidance for Health, Safety and Environmental Security under Extraordinary Incidents

12. Fate and Transport Modeling

The key steps in the fate and transport modeling are:

- Select model/analytical method appropriate to structure/threat/capabilities
- Gather data necessary to support approach (see Section 7 through Section 11)
- Construct model or analysis
- Building Model Calibration & Parameterizations
- Results Validation
- Results interpretation

12.1. The modeling or analytical tool selected to model a building in preparation for an event is dictated by the resources available to the user as well as the quality of data available to characterize the building and its threats. CFD modeling, ideally can provide rigorous, quantitative results, but requires a significant cost and time investment, as well as accurate data representing the building and its flow environment. Nodal models require less of a commitment of resources, with a corresponding compromise in resolution of results. Analytical or parametric methods may require the least resource commitment, unless significant building characterization (testing) is needed for parameterization, and such qualitative approaches may be valid for initial estimation of building vulnerabilities.

12.2. Qualitative characterization could be performed utilizing analytical methods or simplified models. Analytical methods would represent the building transport environment in a rudimentary form, primarily assuming homogeneity and conservation of mass and volume. Time to mix into the volume versus the rate that the contaminated air is diluted and/or replaced is the primary transport process that can be considered qualitatively. Agent properties, such as deposition, volatility, reactivity may be considered, but only as a generalized approximation to the AHU zone level at best. If test data, such as blower door or fan pressurization data is available, it may be incorporated parametrically into the qualitative representation of the building transport environment. For stand-off threats to a building, simple Gaussian plume modeling can provide an approximation of the ambient agent concentrations for consideration, suitable for qualitative assessment of the stand-off threat vulnerability and consequence. More rigorous, quantitative methods would consider building wake interactions for a stand-off threat.

13. Protection Strategy Identification and Selection

13.1. Modeling or analyses can be used (1) to identify the vulnerabilities of a building, (2) to evaluate the potential consequences of threats, and (3) to assess the efficacy of potential active and passive protection measures to mitigate the potential threats. Active measures include evacuation or changing HVAC conditions. Passive measures include filtration or threat reduction. Qualitative methods may yield results applicable to a whole building assessment, while quantitative methods will yield results applicable to rooms and even parts of a room within a building. In particular, this activity can be used for the following:

- Define the building vulnerabilities
- Evaluate active protection strategies
- Identify detection approaches
- Identify AHU operation options
- Evacuation/sheltering-in-place
- Evaluate passive protection strategies
- Filtration
- Vestibules
- Evaluate combined architectures
- Strategy selection
- Metrics for comparison

14. Exposure/Dose Calculation

14.1. Qualitative assessment of building occupant exposure will simply consider an average building zone concentration times the averaging period to determine the occupant dose. Such an approach cannot consider exposure sensitivities that vary with time due to human metabolism and activity rates. Thus general guidelines or ranges relevant to agent exposure effects should be used to provide a qualitative estimate of release consequence. General categories that can be considered would be no-effect, impaired, incapacitated and lethal, dependent upon the intent of the modeling/analysis being performed. These categories can be broad and overlapping, thus there may be an associated probability of the effects categories suggested.

14.2. There are a number of regulatory entities (i.e. EPA, NIOSH, etc.) that have prescribed thresholds for exposure to typical C/B agents. Levels of exposure are categorized as:

- No-Effect
- Injury
- Incapacitation
- Lethality
- Infection
- Contamination

15. Event Reconstruction and Evaluation

15.1. In the post-event reconstruction application of this tool, the focus of activity will be on collecting sufficient data to understand the sequence of events; what happened, what was released, how much was released, where was it released, and what were the operating parameter of the building during the event. The emphasis should be on defining how it happened, not just what happened. The results can be used to assess what went right and what went wrong. Using these results, building emergency response plans should be modified as necessary.

16. Consequence Management Phase

16.1. In the consequence management phase, specific reports should be generated that document results and conclusions of the vulnerability assessment and site analysis phases of the activity. The specific reports will be different depending on the intended application of the methodology. For the pre-event application of the methodology, the primary objective of the effort is to better understand the sequence of events and anticipate response actions to reduce the impact of the event should it occur. For the event/consequence management application, the need is to quickly develop and health effects and treatment plan, and a decontamination/restoration plan. In a post-event assessment/evaluation, the need is to evaluate the sequence of events and responses to better understand how the event progressed and to improve the process.

17. Pre-Event Planning

17.1. Building Protective Measures

17.1.1. A key outcome of the pre-event planning activity is the identification of building specific protection measures that will reduce the vulnerability of the building and reduce the risk to building occupants. The objective of building protection measures for a single building or facility-wide can be summarized as:

- reduce the building's vulnerability to the release of an airborne C/B hazard, whether released internal or external to the building, and whether intentionally or accidentally;
- protect the building occupants in the event a release; and
- restore the building to full function as quickly as possible.

17.1.2. Protective measures for buildings will, out of necessity, employ a number of strategies, none of which is perfectly effective by itself. A combination of options integrated as a single protective system provides the greatest degree of defense within the constraints identified by the individual building managers and the particular circumstances of each facility. Designing the system to achieve complete protection against any, and all possible threats is cost-prohibitive in all but a few limited exceptions, and a comprehensive suite of measures are likely not justified for most facilities with low to moderate risk and low to moderate consequences. The key is to implement a system that provides an appropriate level of protection at a reasonable cost that is customized to the unique condition of each individual building and risk environment.

18. Emergency Plan

18.1. Most building should have an existing emergency response plan for traditional emergencies. Using the results of the vulnerability assessment and site analysis, this plan should be updated to include responses to a chemical or biological threat to the building and occupants.

19. Restoration Plan Template

19.1. In addition to the need for an emergency plan, development of a building- or facility-specific decontamination and restoration plan template is equally critical for a rapid return to normal operations after an event. This plan should be an operational template for event characterization, sampling/monitoring, decontamination, and clearance documentation.

19.2. At a minimum, the restoration plan template should include the following key information:

- Identification and description of credible threat scenarios;
- Restoration command structure;
- Chemical or other hazard sampling methods;
- Statistical and judgmental sampling protocols;
- C/B hazard decontamination efficiency (e.g., how clean is clean enough);
- Identification of commercially available decontamination methods for the credible threat scenarios, including capabilities and equipment needed for decontamination;
- Selection of the most appropriate decontamination technologies for surfaces, ‘hard to reach’ areas, and sensitive equipment;
- Procedures for handling decontamination waste, including quality control requirements, and personal protective equipment; and
- Selection and implementation of appropriate clean-up guidelines;
- Identification and application of contaminant characterization tools and methods;

- Identification and application of rapid decontamination verification tools and methods;
- Identification and application of clearance sampling tools and methods;

20. Event Management

20.1. Health Effects and Treatment Plan

20.1.1. It is also important to understand the health effects associated with the potential agent(s) that might be released in such an event. The health effect information coupled with the agent characterization and dispersion information provides the "first responder" with essential information to determine the critical areas for evacuation and/or immediate medical assistance response actions. If characterization of the agent(s) released becomes difficult and cannot be readily determined, the "first responder" can assume a worst case agent and consider its dispersion to assess the most critical areas for evacuation and assistance.

20.1.2. *Persistence Determination* - this component includes understanding the potential agents involved and the conditions for which they thrive or are active. For example, temperature and humidity are very important for understanding the behavior of biological agents. Physical conditions (e.g., area ventilation exchange rate and density of the agent) are important for understanding the behavior of chemical agents. This assessment component is agent specific, and data can be collected from and/or tied in from general databases containing information on the specific agents.

20.1.3. *Exposure Evaluation* - this component includes understanding "who is exposed", "how long were they exposed", "what is the delivered dose", "what is the effective dose", "what are the exposure settings", etc. As part of preparedness activities, it is important to know the expected locations of groups of people and the expected response time for evacuation; coupling this assessment with dispersion information allows one to project delivered doses, and, for agents such as toxins and chemicals, determine the effective dose to targeted organs (if data on the compound are available). This assessment is very building specific and to some degree agent specific.

20.1.4. Health Effects Analysis - this component includes determining the health effects of potential chemical and biological agents involved in a terrorist attack. This involves agent specific data that can potentially be collected from and/or tied in from general health effect databases. It is expected that most of the agents-of-choice by terrorists have fairly well known health effects.

20.1.5. *Exposure Management* - this component involves emergency treatment vaccines, antidotes, etc. that could be stored on site and made readily available upon demand. This component tiers off all the other components to help manage the threat.

20.2. Decontamination and Restoration Management Plan

20.2.1. The preliminary decontamination/restoration plan template developed during the pre-event planning should be updated to reflect the actual conditions of the event. While the preliminary plan can identify a generic approach based on a limited number of threat scenarios, the actual event can be significantly different to require updating to the specifics of the incident.

20.2.2. The best available technologies for statistical sampling methods for contamination characterization of a facility contaminated with CW agents using risk assessment methods should be employed. Statistical sampling methods should be based on mathematical models. The validity of such methods is based, therefore, on two criteria: (1) whether or not the mathematics is sound, and (2) whether the model is a good fit to reality. For example, if a statistical method assumes there is no spatial correlation in contaminant levels, then results based on that method will be inaccurate if there is in fact spatial correlation, i.e., the assumption is wrong. Statistical methods and visualization tools for determining magnitude and extent of contamination should be used.

20.2.3. A second key element of the decontamination/restoration plan is the identification of validated methods to perform clearance sampling in order to demonstrate to the appropriate regulatory agencies, and the public in general, that a decontaminated facility has been cleaned to a safe level. The objective is to minimize the number of samples required (which effects both time and cost) to clear a facility for re-use while maintaining 'buy-in' from the regulatory agencies and the retuning occupants or users of the facility. This component is similar to objectives and requirements identified for contaminant characterization. The difference is that meeting regulatory approval and verifying the site is ready for release are primary requirements.

21. Post-Event Assessment

21.1. The outcome of the post-event assessment should be a report describing the sequence of events and a "lessons learned" document. Existing emergency response plans should be revised to reflect the knowledge gained during the event management and decontamination/restoration activities.

21.1.1. Interaction with Urban and Wide Area Atmospheric Fate and Transport Models

21.1.1.1. Although this guide addresses the fate and transport of C/B agents inside a building, the building exists as one element in the overall urban environment. As such, the building should not be treated in isolation from what happens in the urban environment. A comprehensive assessment should include the interaction of the building with the urban environment.

21.1.1.2. In typical building operation, there is a continuous exchange of air between the building and the outside. The primary mechanism is mechanical ventilation (supply and exhaust air systems), although a significant amount of air exchange occurs from open windows and doors, and infiltration/exfiltration through the building shell.

21.1.1.3. For events with a C/B release inside the building the building acts as a source to the urban environment. For events with a C/B agent release into the outdoor environment, the outdoor air becomes the source to the building when the C/B agent is entrained into the building.

21.1.1.4. Ambient modeling must be used to assess the effect of a stand-off agent release upon a building. Most ambient dispersion models do not correct for agent plumes interacting with a structure, an inherently complex dynamic. For a qualitative approach, a simple Gaussian model is suitable for approximating the ambient concentration around the structure. Building wake will alter free stream plume concentrations by an order of magnitude as well as alter the time history of ambient concentrations, particularly in building wake cavities where ambient air tends to eddy and linger. Qualitatively, the ambient exposure of the building to a stand-off release will have a duration roughly equivalent to the duration of the release (for volatile agents). For particulates, modeling will provide an approximation of the surface deposition (contamination) outside the building following plume passage.

21.1.1.5. Parametric or CFD corrections to standard Gaussian plume ambient dispersion models to account for the interaction of a stand-off release plume and the building wake are needed to more accurately determine the rate of agent entrainment into the building.

Appendix D

Standard Guide for School Preparedness
and All Hazard Response

Appendix D

ASTM E-54.02 Task Group on School Preparedness

TITLE: Standard Guide for School Preparedness and All Hazard Response

SCOPE:

1.1 The guide covers concepts, principles and best practices for all-hazards integrated emergency management programs in preparedness, prevention, mitigation, response, and recovery for schools and school districts in preparation and response to a natural or man-caused incident.

1.2 The guide addresses the essential elements of the scope, planning, structure, application and integration of federal, state, local volunteer and non-governmental organizations and resources necessary to facilitate interoperability and seamless participation by response agencies both inside and outside the school/district.

1.3 The guide provides a common operating terminology for the school environment in both emergency management (EM) and continuity of operations planning (COOP).

1.4 The guide provides a framework for school/district leadership that is consistent with the National Incident Management System (NIMS), the National Response Plan (NRP) and provides guidance for the synchronization with the local county and state emergency operations plans (EOP).

1.5 *This guide does not attempt to address all of the safety concerns, unique situations, and individual threats/remedies. It is the responsibility of the user of this standard to establish appropriate safety and health practices in accordance with applicable state law, and to determine the applicability of regulatory requirements for their individual circumstances prior to use.*

RATIONALE: Incidents happen daily in schools around our country that involve violence and disaster of natural or man-made cause. Our national psyche does not, for the most part, extensively plan for such occurrences since, we, as a society abhor such acts perpetrated upon our young.

With Columbine as a catalyst, and almost quarterly major events in the news involving schools, and with the post-9-11 mindset of government, there is a movement ongoing to establish more secure school environments. This standard, when implemented, will not only help schools and school districts prepare and mitigate against disaster, but also harden their installations to crime and violence that already occur but on an act by act basis are not considered “a disaster.”

The NIMS Integration Center of the Department of Homeland Security is taking the lead in developing programs for various sectors of the government and private enterprises to make them more disaster resilient. This standard, in concert with their efforts, is timely and needed.

Appendix E

Standard Guide for Stakeholder-Focused, Consensus-Based Event Restoration Process

Appendix E

Standard Guide for Stakeholder-Focused, Consensus-Based Event Restoration Process[7]

This standard guide is issued under the fixed designation X XXXX; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1. To ensure publicly acceptable and timely restoration of an asset contaminated as a result of a terrorist event, it is essential to have a pre-planned strategy developed and tailored at the community level and facilitated by the government which advocates the support and involvement of the affected community during such a crisis period. This pre-planned strategy for restoration will need to be seamlessly incorporated into an overall emergency preparedness community involvement and preparation program. This guide presents a framework (i.e., strategy) for involving the public in a stakeholder-focused consensus-based terrorist event restoration process, which is designed to be an event-specific and community-specific process to help prioritize and consider actions necessary to optimize the restoration of a high-value asset contaminated as the result of a terrorist event.

1.2. This guide is intended to describe a highly flexible restoration planning process, and therefore does not specify or recommend a specific course of action for this activity.

1.3. This guide is intended to assist in the implementation of a restoration planning process, which allows for a holistic assessment and balancing of the impacts associated with

7 This Guide is under the jurisdiction of ASTM Committee *E54 Homeland Security Applications* and is the direct responsibility of Subcommittee *E54.02 Emergency Preparedness, Training, and Procedures*.
Current edition approved XXX. XX, XXXX. Published XX XXXX.

human health, ecology, socio-cultural values, and economic implications. This guide can be used with other guides and agency procedures and requirements to address specific stakeholder issues and concerns.

1.4. The user should consult other restoration-related standards, regulations, and sources for the specific methods in the utilization of predictive models or other analysis tools that may be required under a restoration planning assessment.

1.5. This standard guide 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 guide to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

1.6. Although this restoration planning process is intended for implementation after a terrorist event occurs as part of restoration of a high-value asset, consideration should also be given to its application in certain planning activities before any event in which stakeholder involvement would be beneficial or obligatory. In addition, use of this process should be addressed in appropriate response plans.

2. Referenced Documents

2.1. *ASTM Standards*:

E 1739-95 2002) Standard Guide for Risk-based Corrective Action Applied at Petroleum Release Sites
E 1984-98 Standard Guide for Process of Sustainable Brownfields Redevelopment
E xxxx-xx Standard Guide for a Framework for a Consensus-based Environmental Decision-making (CBED) Process) (under development in E47.05 Subcommittee)

2.2. Other Documents:

Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (SARA Title III, 42 U.S.C. §11001 et seq.)
Hazardous Material Emergency Planning and Response Act (Act 1990-165, 35 P.S. \§6022.101 et seq.)
National Response Plan (NRP) Emergency Support Function #10 (Oil and Hazardous Materials Response Annex)
P/CCRARM (The Presidential/Congressional Commission on Risk Assessment and Risk Management). 1977a. Risk Assessment and Risk Management in Regulatory Decision Making. Volume II, Washington, D.C.
P/CCRAM (The Presidential/Congressional Commission on Risk Assessment and Risk Management). 1997b. Framework for Environmental Health Risk Management. Final Report. Volume I, Washington, D.C.

3. Terminology

3.1. Definitions:

3.1.1. *Affected Stakeholder* – any individual, group, company, organization, government, tribe, or other entity which may be directly affected by the outcome of the specific restoration planning process.

3.1.2. *Community* – a group or groups of individuals, who live or work in specific neighborhoods, areas, or regions.

3.1.3. *Informed Consent* – agreement reached between the responsible party(ies) and the affected stakeholders, which is obtained by a process by which affected stakeholders (1) are informed about the issues, concerns and priorities of all other affected stakeholders; (2) are directly involved in developing criteria for selecting solution(s); and, (3) consider the balancing of trade-offs to achieve procedurally defined consensus on specific initiatives and actions identified through the restoration planning process.

3.1.4. *Interested Party* - any individual, group, company, organization or other entity which is not an "affected stakeholder" but which is interested in the outcome of the particular restoration planning process.

3.1.5. *Regulator* - a local, regional, state/provincial or federal government agency or person employed therein for the purpose of administering or enforcing compliance with laws and regulations, which may be a stakeholder, a decision-maker, or an advisor to the responsible party(ies) lead Stakeholder Committee.

3.1.6. *Responsible Party(ies)* – the specific Federal, State, local, or tribal government, private sector or non-governmental organization(s) designated to be responsible for the restoration of a high-value asset that was contaminated in a terrorist event.

3.1.7. *Stakeholder Committee* - The entity lead by the responsible party(ies) which is directly involved in the decisions made within the restoration planning process; it is composed of representative(s) selected from each group of affected stakeholders. Members of the Stakeholder Committee are responsible to act as liaisons with their respective stakeholder groups.

3.1.8. *Stakeholder Consensus On Terrorist Event Restoration Planning Process* - a responsible party(ies) lead and stakeholder-involved, community-specific process to help assess, prioritize and select restoration actions to be implemented with the goal of optimizing the restoration of an affected high-value asset following a terrorist event, which considers and balances the full spectrum of human health, ecological, socio-cultural, and economic impacts.

4. Summary of Guide

4.1. The Stakeholder–Focused Consensus-Based Event Restoration Process is a responsible party(ies) lead, stakeholder-focused, event-specific, and community-specific process established to help assess, prioritize and select optimized and timely actions to effect the efficient restoration of the asset to its original or agreed upon aspects of its original use. The restoration planning process is designed to holistically consider and balance the event's implications on human health, ecology, socio-cultural values, and economic impacts. The responsible party(ies) lead Stakeholder Committee will consider issues related to environmental justice, which relates to the fair treatment and meaningful involvement of all people, regardless of race, ethnicity, income, national origin or education level. The restoration planning process is an iterative process comprised of five main steps: (1) affected stakeholder identification and formation of the Stakeholder Committee; (2) information gathering; (3) forecasting; (4) establishment of informed consent; and (5) implementation and evaluation of initiatives.

4.2. The restoration planning process focuses on the holistic assessment of the impacts of any event restoration project- or issue-related decision. By utilizing effective, science-based tools and active involvement of affected stakeholders, the responsible party(ies) (with assistance from the affected stakeholders) can readily identify and manage the most important issues related to the timely restoration of the affected asset, and use the analytic tools best suited to an acceptable restoration of the asset.

4.3. There is no specific path that has to be followed when initiating and/or participating in the restoration planning process. Depending on the needs and priorities dictated by the specifics of the terrorist event, different analysis tools may be used for each issue or concern.

5. Significance and Use

5.1 The understanding and management of the interrelationship between human health, ecological condition, socio-cultural values, and economic well-being is essential to the timely and acceptable restoration of a high-value asset. This standard guide is designed to help responsible party(ies) with the identification and integration of affected stakeholders and the establishment of a process to identify and work through all the key questions and answers essential to a satisfactory restoration. The standard guide is presented herein at the “framework” level to help ensure that all the restoration planning process components (i.e., human health, ecological condition, socio-cultural values and economic well-being) are considered; however, it is designed to allow the user to interpret which components of the process are applicable to the restoration problem being addressed. It also provides general guidance to help with the selection of approaches and methods for specific analyses of each of the major restoration planning components (i.e., human health, ecological condition, socio-cultural values, and economic well-being).

5.2. Involving affected stakeholders actively in the restoration decision-making process helps orient the process to prioritize and holistically consider the most important issues of those who lives are most directly impacted by the consequences of the decision. This not only greatly increases the chances of a successful and acceptable restoration, but also helps promote public trust in responsible party(ies) and its ability to rapidly restore high-values assets to its original or agreed upon modified use, following a terrorist event.

6. Consensus-based Terrorist Event Restoration Decision-making Framework

6.1. Identification of Affected Stakeholders and Formation of a Stakeholder Committee.

6.1.1. Stakeholders are at the center of the restoration planning process, and are involved from at the earliest issue identification stage possible through the decision-making and restoration stages. The affected stakeholders contribute to decision-making, rather than just providing feedback about decisions made by others.

6.1.2. Among the first choices to be made is what level of participation is desired for the particular restoration planning process; the focus may be on individuals (as in a participatory democracy), on groups (as in a representative democracy), or a combination of the two. Serious, active management of two-way communication is essential and required to identify the appropriate parties early in the process.

6.1.3. Affected stakeholders generally fall into three broad categories: 1) the community (e.g., the occupants of the building(s)/ asset(s), localized general public, non-governmental organizations with a direct stake, investors and investor organizations), 2) government (e.g., municipal, regional, tribal, state/provincial and/or federal responsible agencies and regulatory agencies), and 3) commercial (e.g., private owners, local businesses and industry). It is necessary to both identify and involve the affected stakeholders and interested parties. These groups should be invited to select (a) representative(s) to participate on the Stakeholder Committee; the most effective representatives are those selected by the group or organization to be represented. There may be (a) representative(s) of several organizations within each category (e.g., there may be two main owners or organizations with the most at stake; there may be three government agencies which require representation; there may be two primary regulatory agencies with direct responsibility, etc.). Each member of the Stakeholder Committee is responsible to act as liaison with their respective stakeholder group.

6.1.4. Construction of a "stakeholder map" is one effective technique to guide the stakeholder identification process (e.g., Figure 1). The map for a particular restoration planning process should be tailored to the specific features of the process, which requires broad insights into the local and regional values and cultures that may be affected by the process. Most importantly, the map should be recognized as a "living" entity, subject to amendments as needed throughout the life of the process. Delineations of different spokes of the map are not intended to infer or anticipate "camps of different opinion" regarding potential issues related to the process; but rather to guide all participants toward ensuring completeness in representation of stakeholder groups. Refinements to the map should be made as participants identify different relationships or additional individuals or groups.

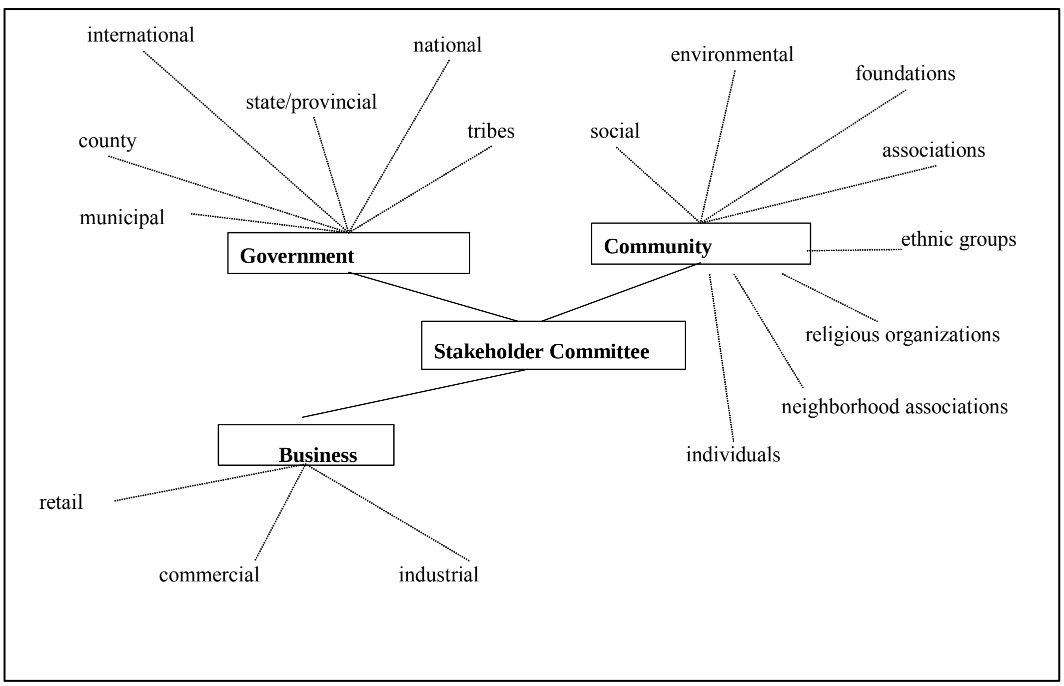

Figure 1: Example of stakeholder map intended to guide identification and notification of all appropriate participants.

6.1.5. Responsible party(ies) should designate a dedicated chairperson for the Stakeholder Committee. The Chairperson should be provided with the necessary resources and authority to effectively manage and work the issues of the committee. The Chairperson also should possess sufficient skill in facilitation of group interactions.

6.1.6. In order for the Stakeholder Committee to function optimally, it should establish ground rules for its operations and its members. The basic ground rules are honesty of communication, clear understanding of how informed consent will be reached, and clear delineation of their role in the decision-making process. Ground rules will be needed for: how communications will be dealt with; how information and decisions will be documented; how to deal with a deadlock on an issue; and how responsible party(ies) will control the data and information generated after the restoration planning process is completed.

6.1.7. The restoration planning process should proceed once the initial affected stakeholders have been identified and contacted, and the Stakeholder Committee has been formed with sufficient representation from each affected stakeholder group (Figure 2).

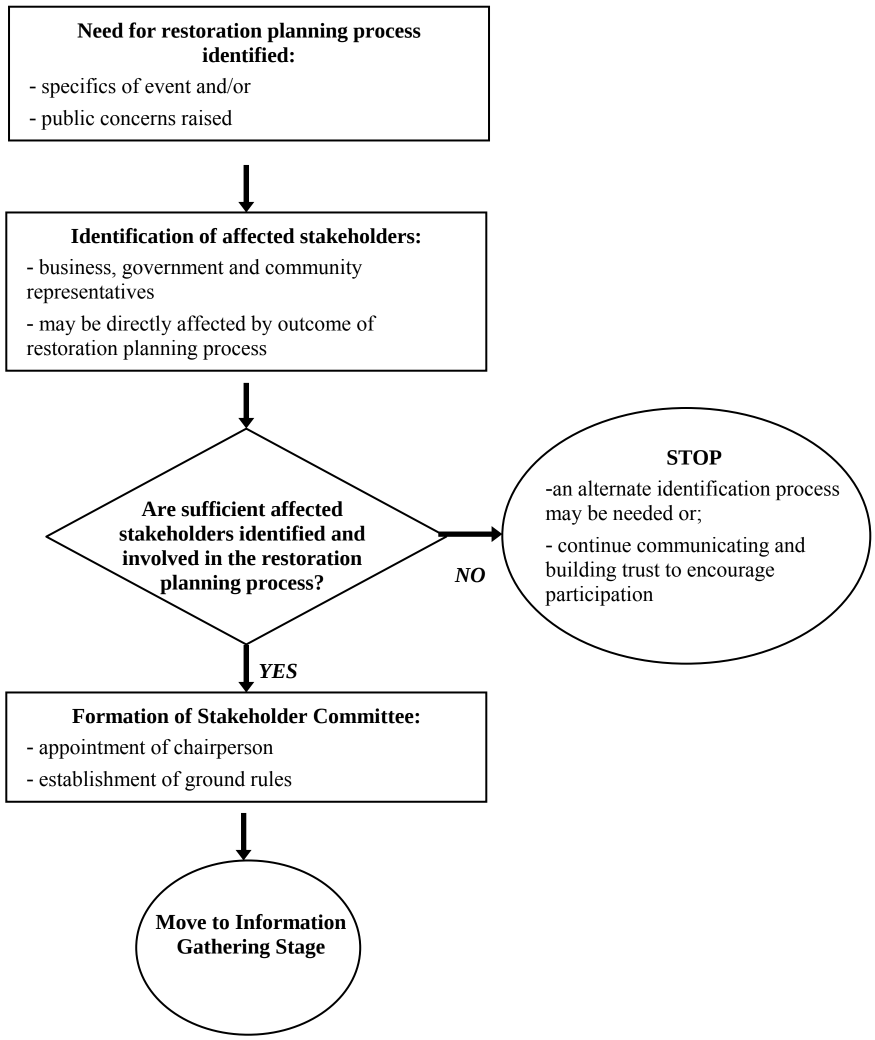

Figure 2: Stakeholder Committee Formation

6.2. Information Gathering.

6.2.1. Once the Stakeholder Committee has been formed, the restoration planning process continues with the Information Gathering Step. In this step, information is gathered on the event, status of the asset, extent of contamination, stakeholder issues, perceptions, preferences and constraints. Information hand-off from the first-responder and event stabilization activities will serve as the initial information base from which to work. It will be important to discover, gather and manage specific stakeholder issues and concerns. Information is compiled on issues relevant to the specific restoration planning process (e.g., current health status, contamination status and issues, social issues, cultural factors, economic status and well-being at stake, or other event-specific factors, as appropriate to the terrorist event). Identification of issues is critical as this information will form the basis of the modeling and assessment effort within the Forecasting step of the framework.

6.2.2. It is important to discover what the present condition of the asset is in relation to the local economy, human health, the effected ecology, and the socio-cultural issues associated with the event and specifically the asset in question. If adequate information/data do not exist regarding the above aspects, then focused data collection might be necessary at this point in the process. If it is determined that data cannot be gathered for a certain area of emphasis, then it might be necessary to reassess the stakeholders' priorities to find another method in which to capture this information.

6.2.3. The restoration planning process may proceed once sufficient information has been gathered to allow the Forecasting stage to proceed (Figure 3). The Stakeholder Committee may wish to define more clearly the criteria it will use to make this determination to proceed.

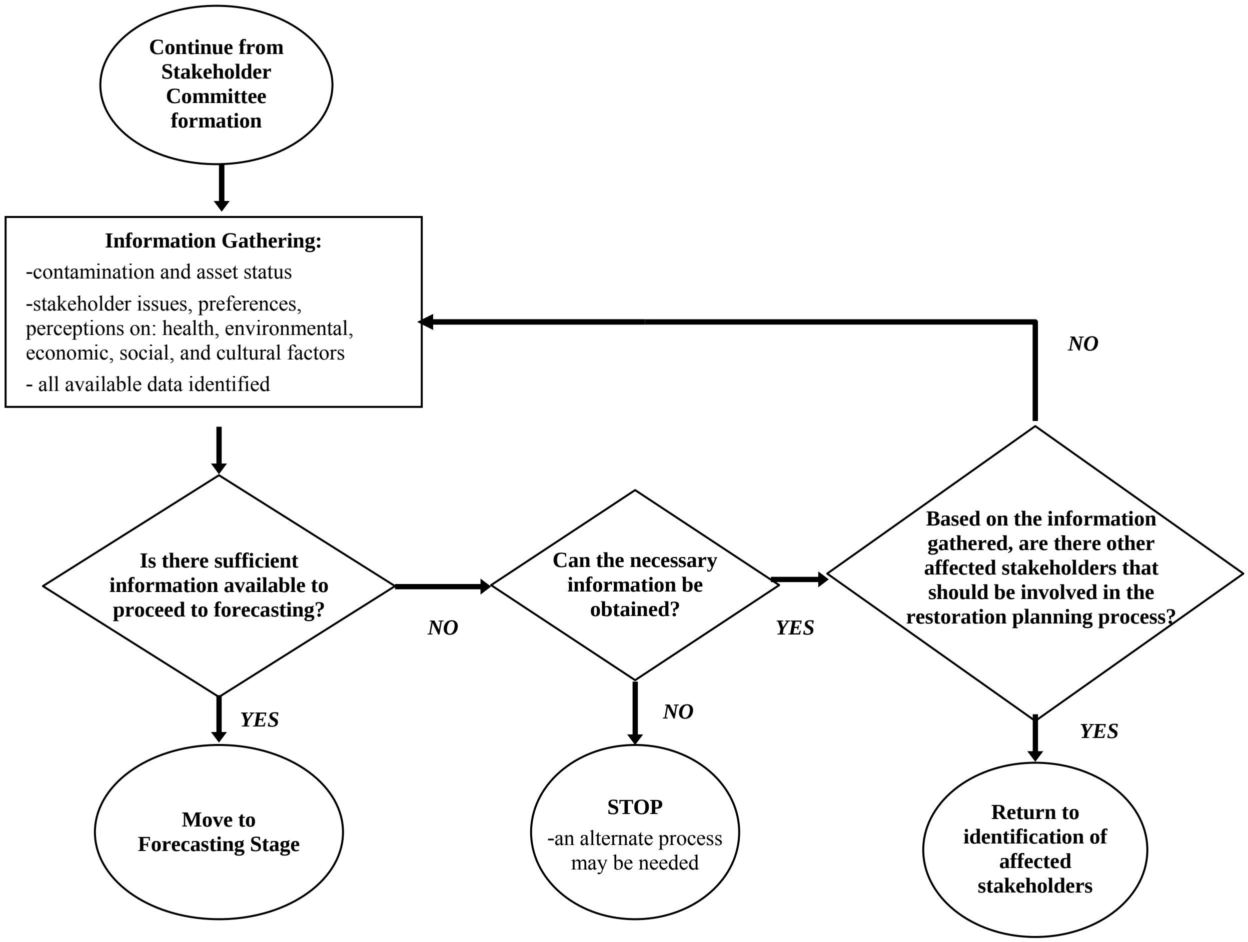

Figure 3: Information Gathering Stage

6.3. Forecasting.

6.3.1. The initial information gathered to identify asset condition status and stakeholder priorities and values forms the basis for Forecasting. Forecasting uses predictive methods and models to describe ranges of possible outcomes. Specific methods and models may be used to predict human health risks (e.g., selected ambient dispersion and risk assessment models, selected building dispersion and health impact models, ASTM Standard Guide E 1739-95 (2002), U.S. responsible party(ies) risk assessment methods and models), ecological effects, economic impacts, cultural impacts, social effects or other impacts. Equally valid alternative paths may be followed when performing these analyses.

6.3.2. The responsible party(ies), in consultation with the Stakeholder Committee, will likely want to hire technical experts to develop and utilize the specific assessment methods and models. Presentation and interpretation of the resulting technical reports may be done by (a) technical facilitator(s) for the Stakeholder Committee.

6.3.3. Criteria are then developed by the responsible party(ies), in consultation with the Stakeholder Committee, to allow for an evaluation of the various impacts and identification and evaluation of affected stakeholder priorities relative to these impacts.

6.3.4. The restoration planning process may proceed once possible outcomes are identified and impacts evaluated (Figure 4). Responsible party(ies) and the Stakeholder Committee may wish to define more clearly the criteria it will use to make this determination to proceed.

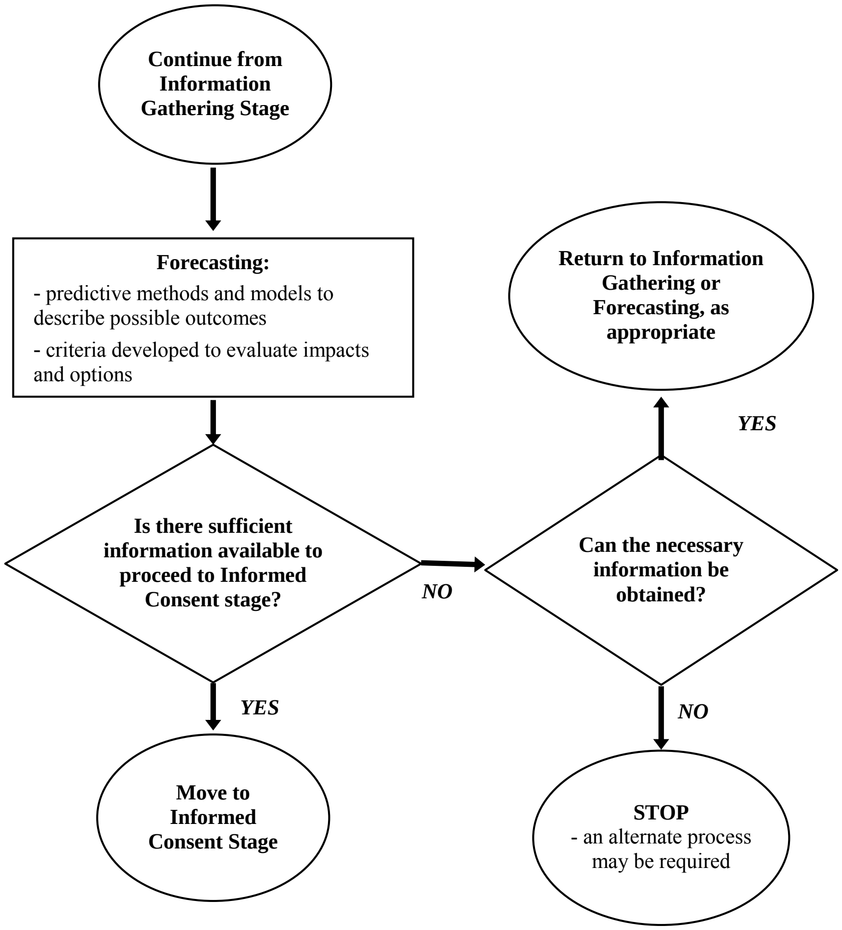

Figure 4: Forecasting Stage

6.4. Obtaining Informed Consent.

6.4.1. Once the necessary analyses have been completed, it is time for responsible party(ies) to work with the Stakeholder Committee to select a solution or series of solutions. Some of the potential outcomes predicted in the Forecasting step may be mutually exclusive or conflict with other potential outcomes or priorities of other stakeholders. It is necessary to have a shared understanding of the issues and then to develop the Informed Consent of the Committee. Because honesty is a ground rule of the Committee, the issues and priorities of all stakeholders must be transparent. Therefore, allowing responsible party(ies) and stakeholders to be able to develop solution-selection criteria and agree to trade-offs is necessary in order to achieve the timely and acceptable restoration of the asset. Decision-assessment tools can be used at this point to prioritize stakeholder concerns and to help analyze the trade-offs that will be made depending on the solution(s) that are chosen. All potential plans and associated outcomes should be available for consideration.

6.4.2. The restoration planning process may proceed once an informed consensus is reached on prioritization of solutions (Figure 5).

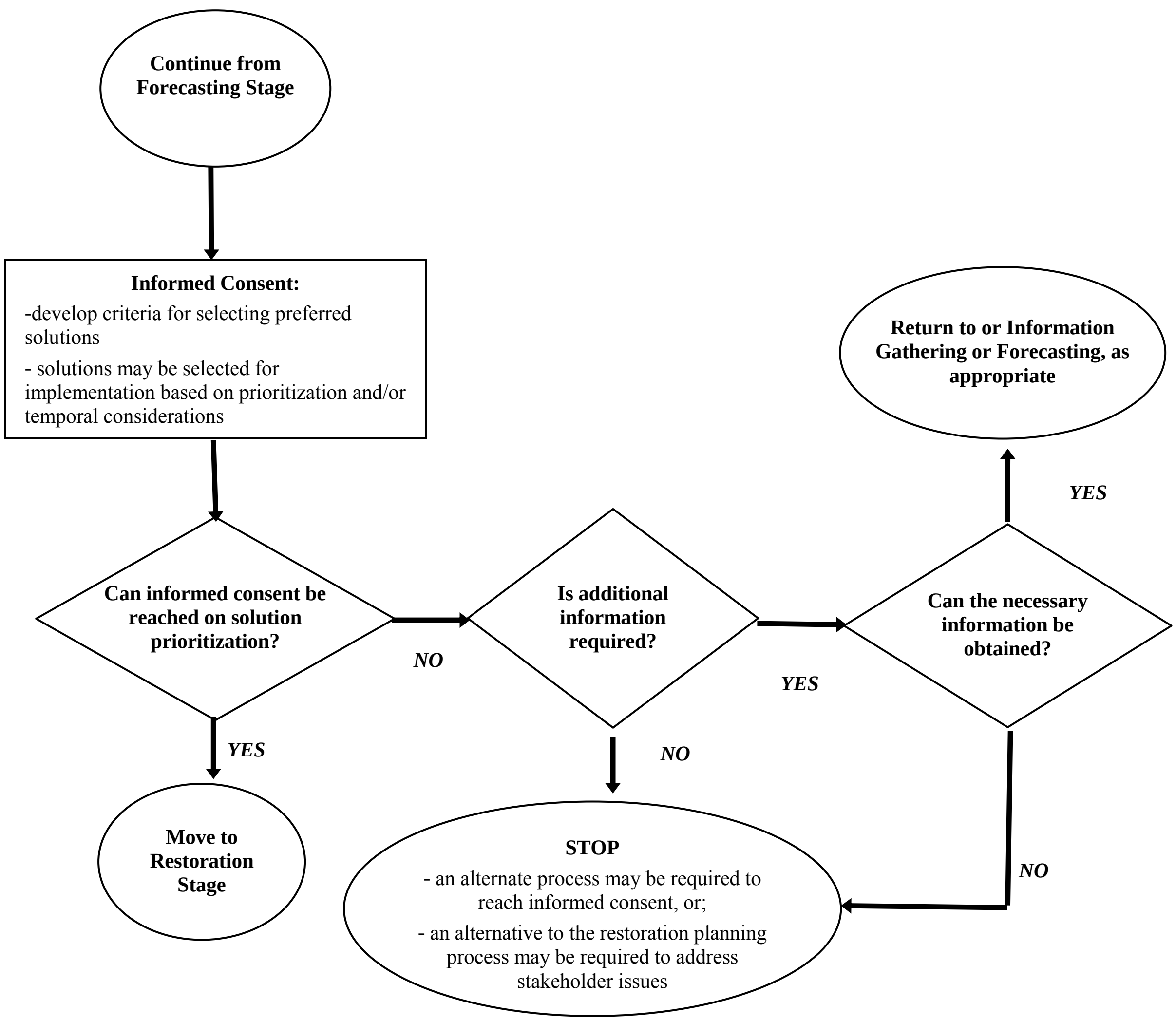

Figure 5: Informed Consent Stage

6.4.3. Implementation and Evaluation of Restoration Activities. The preferred restoration solutions identified in the Informed Consent Step should be implemented and evaluated. This may involve cost-benefit analysis or other evaluation tools and may need to utilize the expertise of technical and business experts and consultants. The solutions also may require fine-tuning or modification to meet their objectives (Figure 6).

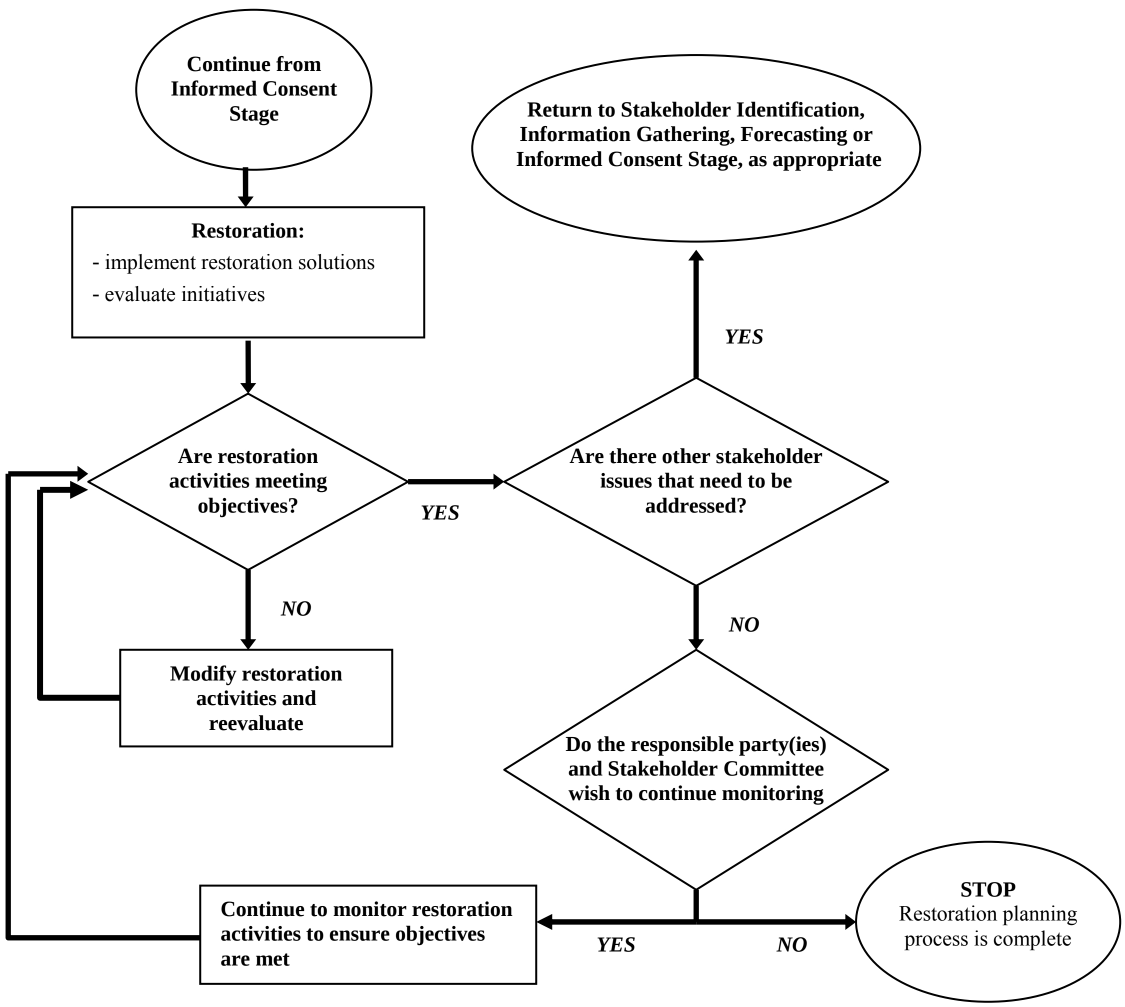

Figure 6: Restoration Stage

6.4.4. Completion of the Restoration Planning Process. The restoration planning process may be completed and closed with the implementation and evaluation of restoration. The responsible party(ies), in consultation with the Stakeholder Committee, will make the determination of when this will occur. In some cases, the responsible party(ies) and Stakeholder Committee may decide to continue, although at a reduced level of activity, to follow the restoration and evaluate future issues that may be of concern.

6.4.5. Reiteration of the Process. The framework is designed to allow the process to be iteratively revisited if new issues or situations arise. For example, if certain stakeholder values were not fully accounted for, then it will be necessary to gather more information and perform more analyses before making and implementing a decision. That is, the process can undergo any number of iterations, giving the flexibility to revisit earlier stages of the process when new findings are available or new issues arise.

7. Keywords

Asset Restoration, Stakeholder Involvement, Consensus-based Event Restoration, Public Communication, Public Consultation

Appendix F

Standard Practice/Guide for Establishing a Health Risk-Based, Event-Specific Process for Deriving Restoration Levels for High-Value Property

Appendix F

Standard Practice/Guide for Establishing a Health Risk-Based, Event-Specific Process For Deriving Restoration Levels For High-Value Property[8]

This standard is issued under the fixed designation X XXXX; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

NOTE: It is the intention of the authors of this guide to coordinate with EPA's working group 5 (WG5).

1. Scope

1.1. It is imperative to get high-value property back into use in a timely manner following a chemical, biological or radiological terrorist event. High-value property and assets must be cleaned and decontaminated to a level that allows release for human occupancy and economic production. These restoration levels for clean-up can be developed using health risk-based models for biological, chemical or radiological contaminants. Models based on correlating health effects with contamination are widely used throughout the federal and state government and private sector environmental programs. Coordination of these models with event specific scenarios will provide clean-up levels that can be evaluated against economic criteria for restoration of assets.

1.2. Decontamination and restoration can be performed in a phased manner so that uncontaminated or restored portions of properties can be returned to operations before the rest of the property is completely decontaminated and restored. Using a phased approach in conjunction with health risk-based and economic models, high-value properties can be returned to public use, section by section, as separate features of properties are restored to normal or to levels previously agreed upon as acceptable amounts of contamination.

1.3. To ensure publicly acceptable and timely restoration of an asset contaminated as a result of a chemical/biological or radiological terrorist event, it is essential to have a pre-planned strategy developed and tailored at the community level and facilitated by the government which advocates the support and involvement of the affected community during such a crisis period. This pre-planned strategy for restoration will need to be seamlessly incorporated into an overall emergency preparedness community involvement and preparation program. One component of this plan is to have a process to return high-value properties to economic production based on the health of and risks to users of the property. This guide presents the framework (i.e., strategy) for prioritizing and deciding restoration techniques for decontamination based on specific

[8] This Practice/Guide is under the jurisdiction of ASTM Committee *E54 on Homeland Security Applications* and is the direct responsibility of Subcommittee *E54.02 Emergency Preparedness, Training, and Procedures*.
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events. This relies on cleanup conducted in a phased approach with staged release for occupancy based on incremental attainment of clean-up levels.

1.4.This guide is intended to be used in conjunction with the National Response Plan, Department of Homeland Security, and other guides that describe the consensus-based terrorist event resolution (ConTER) guides. It is designed to be used as a tool to establish health risk-based restoration or clean-up levels for high-value properties, and therefore does not specify or recommend a specific course of action for this activity.

1.5.This guide is intended to assist in the implementation of the ConTER restoration process which allows for a holistic assessment and balancing of impacts associated with human health, ecology, socio-cultural values, and economic implications. This guide can be used with other guides and agency procedures and requirements to address specific stakeholder issues and concerns.

1.6.The user should consult other restoration-related standards, regulations and sources for public involvement, or the specific methods in the utilization of predictive models or other analysis tools that may be required under a ConTER assessment.

1.7. *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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1. *ASTM Standards*:

ConTER Standard

Urban Air modeling, microscale

Indoor air modeling

2.2.Other Documents:

Hawley, R.J. and J.P. Kozlovac, "Decontamination"; In *Infectious Diseases: Biological Weapons Defense: Infectious Diseases and Counterterrorism,* L.E. Lindler,, F.J. Lebeda, and G. W. Korch, eds.; Humana Press, Totowa, NJ, 2005, pp 333-348.

U.S. Department of Homeland Security, National Response Plan, Washington, D.C., 2004.

Federal Radiological Monitoring and Assessment Center

Approaches to Risk Management in Remediation of Radioactively Contaminated Sites (NCRP 146, 2004)

Management of Terrorist Events Involving Radioactive Material (NCRP 138, 2001)

Risk Assessment Guidance for Superfund (RAGS)

MARSSIM

NUREG/CR-5512

RESRAD

CFR

32 CFR627 (Department of the Army Pamphlet 385-69) The Biological Defense Safety Program

Atomic Energy Act

Uranium Mill Tailings Radiation Control Act

Comprehensive Environmental Response Compensation and Liability Act

Safe Drinking Water Act

Executive Orders and NRC Appropriations Act

3. Terminology

3.1. *Definitions:*

3.1.1 .atmospheric dispersion model, n—an equation, algorithm or series of equations/algorithms used to calculate pollutant concentration at locations away from a source as a function of time and distance.

3.1.2 .contaminant, n—any biological, chemical or radiological substance that may have an adverse effect on environmental air, water, or soil, or may affect the health of animal or human populations.

3.1.3. decontamination, n—the act of removing or neutralizing a contaminant from a location, soil or building, making it safe for handing, use or disposal.

3.1.4 .exposure, n—a measurement of magnitude and duration of an individual's or population's proximity to or contact with a contaminant.

3.1.5 .fate and transport media, n—how a contaminant is moved through the environment and its final location before individuals are exposed. The most common transport media that move contaminants are air, soil, and water.

3.1.6.health risk-based, adj—Using anticipated health effects of contaminant on a maximally exposed individual or across a population to determine criteria.

3.1.7. high value property, n— property or facility which is unique, not easily replaced, or for which the cost of decontamination and restoration is less than the value of the property.

3.1.8. model, n—a set of mathematical equations or algorithms designed to calculate values of specific outcomes based on input parameters that describe a known or assumed scenario.

3.1.9. receptor, n—the individual or population that may be exposed to contaminants.

3.1.10. restoration, n—to return a property back to "normal" so that it is once again economically productive.

3.1.11. scenario, n—the credible outline of a set of circumstances that describe how exposure of individuals and populations may occur. Several different scenarios may be evaluated when assessing the cost of restoration.

3.1.12. stakeholder, n—someone who has an interest in the outcome of a decisions. Stakeholders are those individuals, groups or businesses as well as governmental agencies who have a vested interest in or who perceive themselves as directly or indirectly affected by the outcome of restoration.

3.1.13. threshold, n—a level of contamination below which no adverse health effects are observed

3.1.14. uncertainty, n—a measure of the variability in estimates around the true value. It comes from the lack of knowledge of the true value of parameters in a model, but can be quantified and reported along with estimated values.

3.1.15. variability, n—a measure of the spread of the dispersion of a distribution of values of a parameter. It cannot be eliminated, but it can be studied and well characterized to reduce the uncertainty of the true value.

4. Summary of Guide

4.1. Evaluate and characterize property contamination

4.2. Model clean-up levels using health risk-based criteria and specific event parameters

4.3. Model economic analyses of clean-up levels

4.4. Decide and implement event-specific clean-up level with phased restoration and release approach

5. **Significance and Use**

5.1. Relevance and meaning of guide This guide is to be used as a roadmap through a process that will help for the restoration of property. It is not meant to establish the criteria for cleanup, but is meant to be a resource that will help with recovery. It is widely recognized that current cleanup criteria require large amounts of time, resources and funding. Society may not have these luxuries in the event of a terrorist event that shuts down high value assets. It may be more economically vital to get these assets back into economic production than to wait until current cleanup criteria can be met. By establishing health risk-based criteria for each event, the health of the public is evaluated and protected, while at the same time, the economic health of the location/region/nation is taken into consideration. This guide will serve to show the stakeholders what process will lead to recovery while protecting the health of the population.

5.2. Establish guidance before event to facilitate recovery As difficult as this topic is to consider, it is prudent to develop this guide before it is needed. The ideal will be that this guide is never called upon, but in the event that it is needed, it will provide a series of actions to be followed. A desired outcome, on the part of terrorists is as much disruption as possible. By having this guide established before any event, the extent of chaos will be limited when stakeholders can immediately start recovery efforts.

5.3. Coordinate with ConTER's public involvement and awareness programs to facilitate public understanding of process. Having stakeholders understand the process required to restore the assets will make the restoration process go more smoothly. If the ConTER standard is followed, the public will have initial understanding of the requirements for restoration.

5.3.1. Multi-agency effort (see National Response Plan) – cite other guides in place or coordinate with what others are developing

5.3.2. EPA has established a variety of environmental protection standards for which it currently has primary responsibility for regulating. With respect to radiation standards, the primary ones to reference would be the Uranium Mill Tailings Restoration Act (UMTRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Safe Drinking Water Act, and any Protective Action Guides (PAGs) currently in place at the time of a terrorist event.

5.3.3. NRC has responsibility for licensing civilian sites, and setting standards for license termination. It enforces NRC and EPA standards, such as 10 CFR Part 20 Standards for the protection against radiation, using the principle of ALARA, and tools such as MARSSIM.

5.3.4. DOE establishes DOE standards and orders for weapons and research laboratories. It enforces DOE and EPA standards and orders such as DOE Order 5400.5, Radiation protection of the public and the environment, Proposed 10 CFR 834 Protection of the public and the environment, Guidance & Draft Guidance on the control/release of property with residual radioactive material.

5.3.5. FEMA coordinates federal response under 44 CFR 351, the radiological planning and preparedness directive, using EPA's established PAGs for evacuation purposes and release criteria.

5.3.6. Department of Homeland Security responds to and establishes guidelines for RDD attacks under the authority of the Homeland Security Act. At this time, no guidelines have been established, but may be in place at the time of an attack.

5.3.7. The National Nuclear Security Administration (NNSA) is developing standards for RDD cleanup. At this time, no standards have been published, but may be in place at the time of a attack.

5.4. Return high-value property to working condition with phased approach

5.5. Limitations of the guide and where not applicable

5.6. Comparison to other procedures

5.6.1. Applicable or Relevant and Appropriate Requirements (ARARs)

6. Decontamination basic approach for RDD, chemical or biological event restoration

6.1. Characterization of Contamination

6.1.1. Identification of contaminant

Chemical Contamination:

As part of the incident response process, chemical agent sampling is done to assess the suspected chemical by identifying the agent used in order to effectively begin medical treatment, conduct a hazard analysis, and facilitate requests for support personnel. The initial sampling involves field detection systems operated by first responders, HAZMAT personnel, or other field response units such as National Guard Civil Support Teams, that can identify the contaminant but will not necessarily provide the information needed to effectively conduct restoration operations.

Follow on sampling will also likely be conducted as part of the forensic analysis by local, state, or federal law enforcement officials. Conducted at greater levels of detail than the initial field detection, this too may provide valuable information on the nature of the contaminant. Using the results provided from the field and forensic sampling and analysis, a thorough sampling plan must be developed to determine the extent of contamination within the affected space and develop a decontamination strategy to restore the space to economic utility..

For chemical agents, this will require surface sampling to identify liquid agent and vapor monitoring to identify resident vapor hazards.

Biological agent sampling is likely to require more time in the laboratory. This will commence during the initial and intermediate response periods. Biological sampling will include surface swabs from the area, may include sampling from sentinel animals found within the area, and may require aerosol sampling in an attempt to draw samples from hard to reach areas such as building duct work. Hospital and veterinary surveillance data should be monitored.

Sampling of radiological contaminants is relatively straight forward due to the unique characteristics of each isotope, i.e., emission type, energy and half-life. Isotopes are identifiable via standard sampling techniques including, but not limited to swipe samples, grab samples, and air samples. Gamma emitters can be detected and analyzed remotely by detection of energy and half life.

6.1.2. Persistency of the contamination

Chemical Contamination:

Traditionally, chemical agents have been categorized as either persistent or non-persistent when assessing whether decontamination is required. Persistent agents are those with long durations that require decontamination in order to reuse the material or space. In order to increase the persistency of chemical agents, the agents may be thickened using commercial polymer compounds or impregnated onto solid carriers creating a “dusty” agent.

Although physical properties such as volatility greatly influence the persistency of the agent, surface interactions, droplet size, and environmental factors can also influence the persistency of the agent. One can argue that interaction of the agent with a surface may present the greatest challenge to decontamination processes.

Although the degree of surface interaction varies from material to material and agent to agent, the type of interaction can be grouped into three major classes; deposited surface, adsorbed surface, and absorbed subsurface. Deposited surface contamination is easily removed with mechanical shear and passive decontaminants (e.g. the traditional hot soapy water wash). Adsorbed surface contamination involves a physical interaction between the agent and the surface and the agent is removable with mechanical shear and easily destroyed with active decontaminants such as strong solvents, reactive chemicals, or combinations of both. Absorbed subsurface contamination consists of agent that has penetrated deep into the material matrix and is difficult to remove or destroy without damaging the material even with aggressive reactive, solvent-based systems.

In the vegetative state most bacterial agents are vulnerable to desiccation and ultraviolet light unless the organism finds suitable hosts in which to propagate. However, some organisms such as anthrax which forms spores which are very environmentally resistant and can persist for decades in the environment or some of the rickettsial agents such as Q fever which forms an environmentally stable form that can persist for months. For many bacterial agents surface contamination is easily removed with passive decontaminants (e.g. the traditional hot soapy water wash) and/or decontamination with dilute sodium hypocholorite solutions. The objective is to obtain a six-fold reduction in the concentration of the organism. However, for the more environmentally resistant and publicly sensitive organisms the public buy-in will have to be obtained for a clean up level. The public perception of the risk may drive more extensive clean-up. Anthrax is widely spread in the environment and generally has a fairly low pathogenicity. For an organism such as anthrax that is environmentally resistant, but is also fairly ubiquitously present in the environment it maybe difficult to assure zero contamination. Rigorous testing with sophisticated diagnostic such as polymerase chain reaction (PCR) may show a positive for the presence of the spores which could be an environmental contaminate already present. Good communication with the public may help set clean-up standards. For a highly contagious organism such as small pox multiple negative tests should be the ultimate goal. Public communication and involvement is important so that the people may accept some level of risk.

Half live of contaminant, ease of cleanup.

6.1.3. Spatial extent of contamination

Chemical Contamination: To effectively understand the extent of contamination to plan for a restoration operation, it is important to understand the type of chemical agent release and the space requiring decontamination. Typically, agent releases can be categorized as either internal or external. Internal releases typically result in large amounts of contamination at the release point and lower levels of contamination throughout the space that came in contact with the aerosol and/or vapor cloud that migrated through the space.

External releases consist of an agent release outside the defined space with the intent of having the agent migrate into space. External release may be proximal (close to the space) or stand off (a fixed distance away). For external releases, decontamination operations must take into consideration the release point so as to eliminate the source even though it is outside the space of interest.

In addition to the method of agent release, the architecture of the space involved can greatly influence the extent of contamination. Buildings in particular pose potential problems due to a variety of factors such as the design of the HVAC system, the building floor plan, and the configuration of the internal space.

In addition to the above comments for chemical agent releases biological agents may be disseminated via vectors and/or secondary transmission may occur via vectors. Further for an agent for which secondary spread is a concern , such as plague or small pox then people who were exposed could spread the organism. Therefore bacterial agents may be spread far beyond the original release site. Surveillance, reporting and tracking are imperative potentially as well as vector control.

6.1.4. Magnitude or degree of contamination

As most biological agents can replicate following release, provided suitable hosts are present, the magnitude of the contamination may be of lesser concern.

6.2. Evaluate economic effectiveness of techniques and equipment available to decontaminate

6.2.1. Conventional practices to evaluate methods and equipment

6.2.2. Commercial off-the-shelf (COTS) methods and equipment

6.2.3. State-of-the-art (SOTA) demonstrated methods and equipment

6.24. Other standards and guides from programs such as DARPA, BEST, Immune Buildings

6.3. Method to assess potential decontamination end levels and criteria

End levels and criteria for decontamination are discussed thoroughly by the Department of Army and USACHPPM. Other government agencies tend to use the same logic for determining their levels due to the protective nature of the DA level development.

Table a.   Classification Levels for Chemical Agent Exposure.

Classification Level	Decontamination Criteria	Vapor Screening Level (concentration value – mg/m^3)	Health Based/Risk Analysis
Contaminated – Do Not Release; specific safeguards required	X	≥ STEL	No
Release to Agent Workers Clean – Restricted	XXX	< STEL	Yes
Release to Non-agent Workers Clean – Restricted	XXXX	< WPL	Yes
Unrestricted release to Public (Clean – Unrestricted)	XXXXX	< GPL	Yes
Never contaminated (Clean)	0	N/A	Yes

6.3.1. Establish basis for levels

Airborne exposure limits (AEL) are developed from available toxicological data to be protective of human health. Both the concentration of a chemical and the duration of exposure determine the dose and therefore the health effect on the worker, so there are different exposure limits based on the duration of exposure. Sensitivity of the population also has an effect so general population limits (GPL) are lower then worker limits.

Four general types of AEL are used for chemical agents: worker population limits (WPLs), short-term exposure limits (STELs), immediately dangerous to life or health (IDLH) values, and GPL. Each of these AEL values is protective of human health and is used for the following purposes.

The WPLs represent the 8-hour time weighted average (TWA) concentration, measured in milligrams per cubic meter (mg/m3), to which nearly all unprotected personnel may be repeatedly exposed for up to 8 hours per day, 40 hours per week, for a working lifetime, without adverse health effects.

The STELs are the concentration to which unprotected personnel can be exposed continuously for a short period of time (that is, up to 15 minutes) without suffering from irritation, chronic or irreversible tissue damage, or narcosis of a sufficient degree to increase the likelihood of accidental injury or impaired self rescue. This concentration should not be exceeded at anytime during the work shift, even if the 8-hour TWA WPLs are not exceeded. Exposures above the WPLs and up to the STELs should be no longer than 15 minutes and should not occur more than four times per day, with at least 60 minutes between successive exposures in this range to protect against accumulative affects.

The IDLH values are the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape impairment or irreversible health effects. Therefore, operational concentration above which the use of a self-contained breathing apparatus (or a combination airline respirator with an auxiliary self-contained breathing apparatus) is required.

The GPLs represent the concentration to which nearly all unprotected members of the general population may be exposed indefinitely, 24 hours per day, 7 days a week, for a lifetime, without experiencing adverse health effects.

Table b. Existing toxicological data.

Agent	GPL	WPL	STEL	IDLH
GA,GB	0.000001	0.00003	0.0001	0.1
GF	0.000001	0.00003	0.00005	0.05
GD	0.000001	0.00003	0.00005	0.05
V	0.0000006	0.000001	0.00001	0.003
H, HD	0.00002	0.0004	0.003	0.7

In deriving exposure criteria for the nerve agents, data from human short-term nerve agent GB vapor exposures (single as well as repeated) and chronic nerve agent GB vapor exposures in animals were compared. The Center's for Disease Control took human inhalation exposure data from a study to derive the AEL for nerve agent GB. This study was selected as the "critical study" for deriving the STEL, WPL, and GPL, because mild effects (miosis) did not occur until repeated exposures occurred in humans, indicating a cumulative effect of the exposures. The IDLH value was based on an acute human exposure study, which estimated a critical concentration for borderline incapacitation. Specific calculations were applied to the data to derive the specific AEL. Due to data limitations and property similarities, derivation of criteria for nerve agents GA, GD, and GF were based upon relative potencies of these agents versus the ability to induce, as with nerve agent GB, mild effects (for example, miosis) in humans. Nerve agents GA and GB are considered equipotent in this regard and half as potent as nerve agents GD and GF. Although some studies of VX were evaluated, study limitations led to derivation of criteria for VX from the estimated relative potency of this agent versus nerve agent GB's ability for inducing mild effects (for example, miosis) in humans. Nerve agent VX is considered to be 10 times more potent than GB in this regard.

6.3.2. Search & collect all potential applicable environmental clean-up levels for set of contaminant materials & conditions.

Chemicals: The General Population Limit (GPL) is a highly protective vapor exposure criterion (mg/m^3) for 24-hour/daily, lifetime exposure of the general population including those more susceptible individuals: a no observed adverse effect level (NOAEL) – represents an exposure at or below which there are no anticipated adverse health effects from either short or long-term repeated exposures (i.e., that occur 24 hours daily for up to 70 years). The GPL may be used with appropriate sampling (i.e., item is contained, with proper heating/temperature to facilitate off-gassing and collection of potential contaminant release to air) to demonstrate no risk of a continued (daily, multiple year) release of agent at levels of public health concern. This may be particularly useful if there is a concern that a matrix/item of porous/semi porous material that may (theoretically) contain absorbed residual agent that could "off-gas" over time at low concentrations. Also, if item or equipment includes complex surface or construction (composites, different parts with crevices, etc.) that may at least theoretically contain residual agent deposits.

The Acute Exposure Guideline Level – 1 (AEGL Level 1) – 8 hour is a protective vapor exposure criterion (mg/m^3) for a one-time exposure of the general population including those more susceptible individuals: based on estimate of no observed effect level (NOEL) or threshold at or below which there are no anticipated noticeable effects. The AEGL may be used with appropriate sampling (i.e., item is contained, with proper heating/temperature to facilitate off-gassing and collection of potential contaminant release to air) to demonstrate unlikelihood of chemical agent being released from item at levels of public health concern. This can be an appropriately protective health based vapor screening criteria for releasing items/equipment/facilities that have not been contaminated by liquid/aerosol agent or which includes simple non-porous items/surfaces that have undergone decontamination. Based on material/construction, such decontaminated items would not be expected to have absorbed significant agent that would pose contact hazard or would be continuously released over period of time.

The Health-Based Environmental Screening Level – residential (HBESL[3]) is a highly protective soil/solid matrix exposure criterion (mg/kg) for 24-hour/daily, lifetime exposure of the general population including those more susceptible individuals: a no observed adverse effect level (NOAEL) – represents an exposure at or below which there are no anticipated adverse health effects from either short or long-term repeated exposures (i.e., that occur 24 hours daily for up to 70 years). The HBSEL[3] may be used alone or in conjunction with vapor exposure criteria (GPL or AEGL-1) to assess possible existence of residual agent in semi-porous or porous media and demonstrate unlikelihood of chemical agent being present in/on an item/material at levels of public health concern. This may be particularly useful if vapor off-gassing is not considered adequate or appropriate. Sampling should include procedures to ensure "representative" samples of media are obtained from specific media/area of concern. This approach also allows assessment of potential breakdown products.

Although biological toxins, which are chemical products of biological organisms, microbiological, plant or animal, are classified as biological agents they are chemicals and thus some of the principals above for chemicals would apply. Biological toxins generally are large molecules and are not readily aerosolized. For the infectious agents the host's immune or general body defense mechanism are important. Thus healthy adults who are not immunocompromised are more likely to ward off an infection. Young children, particularly those that are less than 2 years of age and the elderly are more susceptible to disease. Further those that are immunocompromised; have diseases of the immune system such as aids, on immunosuppressive therapy, this would include those taking immunosuppressive steroid including some of the pulmonary inhalers, and pregnant women are more susceptible and should be protected from unnecessary exposure.

6.3.3. Select & qualify standards to use for event decontamination

6.3.4. Determine applicability to decontamination

6.3.5. Method to establish health risk-based decontamination levels where there are no applicable cleanup standards

Chemical: Currently, there are not comprehensive standards to address chemical agent remediation in the public sector. Potential starting points are the Department of Army (DA) AEL guidelines. DA approaches to manage chemical agent contaminated items, equipment, facilities and waste have provided adequate and effective protection to workers and the public. In addition, the Army has taken steps to expand the mechanisms for ensuring the protection of public health to address evolving concerns and alternative decontamination management practices. However, Federal, State, and local regulators as well as the public are not generally familiar with DA safety procedures, as these do not always parallel activities associated with toxic industrial compounds.

Current radiological cleanup criteria are based on dose or risk, and sometimes on level of detection.

6.3.6. Evaluate economic cost of compliance with potential cleanup level

6.3.7. Select levels that make sense on economic and health risk basis

Chemical: The "5X" level has historically been the criteria cited for determining suitability for public/unrestricted release. Meeting this criterion was essentially defined as a specific procedure involving high-temperature incineration to achieve complete decontamination. Incineration was chosen, in part, as the lowest risk alternative for decontamination since reliable 5X verification methods do not exist. As a result, 5X decontamination criteria are not practical.

6.3.8. Implement phased approach to clean up portions of property as economically feasible

Chemical: The basic goal of remediation operations is to return the site to a condition where it may be releasable for unrestricted use. The determination of remediation goals may be accomplished in two distinct phases. Initially, decontamination operations must be completed using a suite of technologies that provide the best chance of success. For most scenarios physical and/or chemical techniques, coupled with removal of hard to decontaminate items, will be required. As part of this effort, detection and monitoring operations may be employed using field deployable system may be employed to measure success of the decontamination process and aid in determination of hot spots requiring subsequent treatment.

Once decontamination is complete, the second phase of the process, comprehensive site-sampling and monitoring is required. Data may be compared to the health-based environmental screening levels such as those endorsed by HQDA. These criteria have been developed using relatively conservative exposure assumptions for several common exposure scenarios, and may be used to screen site sampling data to discern the need for further decontamination, analysis, or assessment. The values presented are based on the most current toxicological information available and may be periodically updated with the advent of additional data.

Post-CAI monitoring should be conducted using equipment capable of measuring the chemical agent level in real-time or near-real time to the level necessary. There are many difficulties associated with long-term monitoring after a CAI. The technology currently available is developed primarily to monitor to levels associated with government/military chemical agent workers and may not meet the sensitivity requirements for general population exposure levels. In lieu of real time detector sensitivity, time phased monitoring may be required to establish reliable time weighted averages.

6.4. Model requirements

In modeling the potential exposures and subsequent risk calculations, the chosen model should take into account the source term characteristics (e.g., identification, quantity, persistence, particle size, half times, and media in which it is found). Some models also include a mass balance so that once the contaminant is gone, it is no longer posing risk to the public. The model should adequately represent the range of media where the contaminant is, or will be transported by (e.g., indoor or outdoor air, soil, groundwater, surface water, sanitary system).
The hypothetical receptors who carry the surrogate risk calculation can be modeled as the maximally exposed individual or average individuals in population calculations. The maximally exposed individuals are those persons who are the closest to the source contamination, in the area with the highest concentration, or who consume food products produced solely in the contaminated zone. It is all dependent on the scale of the contamination as to which scenarios are the most appropriate to choose. Affected population receptors are usually made up of average individual, since it is highly unlikely that entire populations will have lifestyles that give everyone maximum exposure.

It is necessary to establish contamination scenarios and exposure setting s for the ranges of events to be considered . By producing phased restoration scenarios, the decision makers will be able to approve restoration alternatives based on the use of the property, (i.e., cleanup levels for an area used for future residences would have to be much lower than those where the land will be used for low occupancy facilities such as roads, storage or industry). The end use will determine the restoration level. It may also be possible to use interim restoration levels so that portions of a facility can be occupied while leaving other parts for continued restoration. This would be dependent on how dispersible the contaminant is, and how likely use of an asset would be to spread the contamination, and what the health effects of the contaminant are with respect to the use of the asset.

Decision makers will also want to decide if they will analyze the highly sensitive population, such as youth at a school setting, or the elderly or infirm.
Exposure routes for any receptor should evaluate inhalation, ingestion of contaminated food stuffs, dermal exposure for chemical or biological contamination, as well as external exposure for radiological contaminants.

6.5. Establish contamination scenarios and exposure settings for range of events to be considered

Once the scenarios have been determined, the analysts will need to use appropriate models for indoor air dispersion, urban air dispersion, atmospheric transport, area dispersion or leak path analyses as appropriate. These models will result in exposure to individuals and populations. These results must then be compared to established toxicological bench markers relating exposure to risk. One such tool is the set of EPA slope factors that give risk of cancer based on amount of exposure. For a given acceptable risk level, the clean up criteria will be established based on the calculated level of risk for each scenario.

6.6. Compare the economics

Restoration levels for high value property have large impacts on the cost of their implementation. Regardless of the restoration levels chosen, cost estimates are complex and highly uncertain. Cost estimates for restoring high-value property are dependent on a large number of variables, some of which are described below:

- Type of weapon. The type of weapon used in the terrorist event, including the agent used (chemical, biological, or radiological) and magnitude of any explosive devices used, affect restoration costs. The agent or contaminant also impacts the type of protective equipment that would be used by restoration workers which affect their productivity and ultimately the restoration costs. The type of weapon also affects the time required to restore the property, and thus affects the costs for denial of use of the contaminated land or interdiction of crops and other consumables.
- Type of property affected. The type of property affected by a terrorist event has a direct impact on restoration costs. High-value commercial and industrial areas have different restoration costs than residential areas. Areas used primarily for recreation will cost

differently to restore than a transportation center or hub. Thus, prior usage of the property has a major influence on decisions about restoration levels and subsequent costs.

- Population density. Areas with high population densities will cost more to restore than low-density areas.
- Building construction. Restoration costs are dependent on the types of buildings requiring restoration. The types of construction also affect decisions about restoration techniques used. For example, it may be simpler and less costly to decontaminate some types of construction than others. Residential wood-framed housing is more easily demolished and removed than a concrete-and-reinforced-steel building.
- Weather conditions at time of event. Weather affects the dispersion of the contaminant and could significantly increase or decrease the affected area, and thus affect cleanup costs. Weather also affects the concentrations of the contaminant deposited in the affected area.
- Proximity to surface water and groundwater. Contaminated water supplies may require decontamination and restoration. Initial efforts involving contaminated water will most likely focus on preventing their use for domestic consumption, irrigation, and use by businesses and industries in or near the affected area. It may be necessary to provide alternative water supplies for residents, restoration workers, and affected businesses for a relatively long period of time.
- Proximity to infrastructure. Electricity, communications, travel, and other utility infrastructures are likely to be severely impacted by a terrorist event. The costs to restore this infrastructure are widely variable depending on the size, throughput, number of customers, complexity, and location.

For this standard, restoration costs are divided into four categories; site characterization, loss of productivity, physical restoration, and long-term monitoring. Site characterization costs are those for determining the extent of the contamination (locations and concentrations) in the affected areas. The costs for loss of productivity capture the economic impacts associated with denial of land use until restoration activities return the land to productive use. The costs for physical restoration activities are those associated with decontamination, demolition, waste disposal, and other cost elements needed to physically remove and isolate the contaminant from the affected area. Finally, long-term monitoring is assumed to be required for an indefinite period. Additional information about these four cost categories are provided below.

Site Characterization

Initial activities following the event and subsequent response will consist of sampling and analytical activities to determine the extent and locations of contamination. This information will be used to support decisions that affect the other three cost categories. For example, characterization efforts may find large areas that need no decontamination or restoration to restore to productive use. Others may be determined to be so extensively contaminated that decontamination is not an option; either the structure must be completely demolished and removed or permanently abandoned.

This work is accomplished by restoration workers that will be provided with protective equipment and tools appropriate for the type and estimated levels of contamination in the affected area. For example, some areas may require simple filtered respiratory protection while other may require self-contained fresh air systems. Some areas may be completely off limits due to residual contamination, such as highly radioactive areas or may require use of remote-operated equipment. Characterization activities will support decisions about isolation of highly contaminated areas, protection of restoration workers, restoration technologies to be utilized, and goals for future land use.

Loss of Productivity

The area affected by a terrorist event is likely to be prevented from use until restoration is complete. In other words, the government is likely to deny property and business owners use of the area for a period of time. Thus, part of the restoration costs will include loss of the land, water, and buildings for productive use while physical restoration occurs. There are both direct and indirect effects of land use denial. Direct effects include loss of agriculture, business, and manufacturing capability until these areas can be released for further use. Insurance claims will make up a portion of the direct cost. The value of the land prior to the event influences the direct costs. Indirect impacts include the costs of increased unemployment of people who work in the affected area and costs associated with inefficiencies resulting from loss of infrastructure (e.g., increased commute time to avoid affected areas, cost of replacement utilities). Some of the indirect cost elements are difficult to quantify as they depend somewhat on public perception and attitudes. For example, denial of use of tourist and recreation facilities has both direct and indirect components. While the economic impacts of denying the use of a tourist attraction until it is cleaned up can be determined directly, the public opinion about visiting the attraction in the future may be affected by perceptions about residual risks. Similarly, public perceptions about crops grown in the affected areas will affect post-restoration land values and productivity.

Cost of Physical Restoration

The costs of physical restoration of contaminated areas are those costs incurred to return the contaminated area to productive use. These costs include labor, materials, and equipment needed to decontaminate property and contaminated water supplies or to demolish and replace, if warranted, the contaminated structures. Costs to treat, transport, and dispose of waste generated during physical restoration activities are also included in this category. There may also be costs associated with temporary infrastructure improvements required to support restoration, such as temporary installation of portable electric generators, water lines, and roads to support restoration work.

The costs of physical restoration are a function of the assumed future land use for the site. Future land use affects the required cleanup levels or the residual contamination levels allowed to remain after restoration is complete. This, in turn, affects the cleanup technologies deployed and level of effort required to implement restoration. An extreme example would be a terrorist event that releases a biological agent such as anthrax. Experience indicates that residual anthrax levels allowed at a restored site might be at or near zero concentration whereas a small residual concentration might be allowed after a radioactive or chemical attack. Restoration costs are highly-dependent on allowable residual contamination levels, as discussed elsewhere in this standard, and are affected by predicted future land use. Until site characterization activities are conducted and future land uses are decided, physical restoration cost estimates will be highly uncertain.

Long-Term Monitoring

Following restoration of a contaminated area, long-term monitoring will be required to ensure continued protection of people and the environment. Long-term monitoring costs include both monitoring of the affected environment to ensure residual contamination levels are stable or decreasing and monitoring the health of people that survived the terrorist event. Environmental monitoring would include installation and operation of air monitoring units and wells or other equipment to monitor contaminant concentrations in ground and surface water. Public health monitoring is necessary to address the potential long-term health impacts of the released contaminants. For example, some of the contaminants may have health impacts that do not appear for several years or even decades, such as a carcinogenic effect. Long-term monitoring is necessary to prevent or mitigate future public health or environmental impacts.

6.6.1. Cost of complete decontamination

Complete decontamination refers to removal of contaminants from affected areas to allow future use. Techniques employed might include concrete scabbling to remove contamination from external surfaces, washing with a decontaminant to kill biological agents or neutralize chemical agents, washing with a mobilizing agent to remove the contaminant from a surface and then collecting and disposing the mobilized material as waste, or fixing the contamination such that it cannot become mobile. Assuming complete decontamination is feasible, it is possible to restore the property to its use before the event. However, public perceptions and attitudes may affect productivity and property values, most likely leading to economic loss even after the property is released for future use. These losses may be reduced as time passes and memories fade.

6.6.2. Cost of phased implementation of restoration

Complete decontamination refers to removal of contaminants from affected areas to allow future use. Techniques employed might include concrete scabbling to remove contamination from external surfaces, washing with a decontaminant to kill biological agents or neutralize chemical agents, washing with a mobilizing agent to remove the contaminant from a surface and then collecting and disposing the mobilized material as waste, or fixing the contamination such that it cannot become mobile. Assuming complete decontamination is feasible, it is possible to restore the property to its use before the event. However, public perceptions and attitudes may affect productivity and property values, most likely leading to economic loss even after the property is released for future use. These losses may be reduced as time passes and memories fade.

6.6.3. Value of property compared with cost to replace property

Property values are strongly influenced by perceptions and attitudes. Property values in areas affected by a terrorist event will plummet and may never be restored to pre-event levels due to the stigma attached to residual contamination. Property owners, both private and public, will be faced with a decision to continue to use the property and the structures placed on them as they were used before (after restoration), sell the property and attempt to build elsewhere (i.e., replace the property), sell the property and not rebuild, or elect another economic pathway such as bankruptcy. The decision is influenced heavily by pure economic forces, such as interest rates, availability of capital, bankruptcy provisions, and taxation rates, but is also influenced by perceptions about the risks associated with future use of the property and structures. Because of this perception element, any decisions about property replacement will be faced with large uncertainties.

6.6.4. Cost of demolition without restoration

A technically feasible approach to restoring contaminated property following a terrorist event would be to completely demolish contaminated structures, and package and transport the debris to an acceptable disposal facility. However, this may be a more costly approach than decontamination and restoration and is dependent on the type, level, and extent of contamination as well as future land use decisions. The type of contamination in a building, such as anthrax, may render decontamination to safe levels technically infeasible. It may also prove to be impossible to decontaminate a building to safe levels due to non-technical reasons, such as public perception. The level and extent of contamination and land use decisions may also eliminate decontamination and restoration approaches on a technical basis. Consequently, demolition and removal of contaminated structures and soil may be only feasible and publicly-acceptable alternative. Finally, some areas may prove infeasible to decontaminate or demolish for health, economic, or environmental concerns. A means of isolating such areas for the foreseeable future may be required. For example, some areas may need to be isolated to allow radioactive decay processes to reduce the residual radioactivity in a building or contaminated ground to a level where restoration or demolition can be conducted safely. This has the effect of increasing costs due to the additional costs for implementation and operation of isolation systems, increased long-term monitoring, increased length of time that land use is denied, and possibly having to relocate utilities and other infrastructure that traverse the area.

6.6.5. Recommended Cost Analysis Approach

Following a terrorist event, it may take years or even decades to complete cleanup and restoration. Long-term monitoring will continue even longer. Because the costs of restoration and monitoring will continue for many years, the time value of money should be addressed in the restoration cost estimates. The principle behind the time value of money is that a dollar today is worth more than a dollar one year from now. Because the value of money evolves over time and because investments in cleanup and restoration projects will occur over time, a method that accounts for the time value of money should be used when estimating restoration costs. Net present value (NPV) analysis is recommended. There are many textbooks and reports that describe the approach and formulas for estimating NPV.

The key is that NPV analysis accounts for difference in the value of the dollar over time. NPV analyses tend to favor near-term allocation of resources because the same amount of work can be accomplished in the near term for fewer dollars than would have to be allocated in the future to accomplish the same amount of work. This is consistent with the desire for cleanup and restoration to be accompanied by a rapid near-term risk reduction.

6.7. Decision management

Decision management is, in general, the process of considering the merits and disadvantages of alternative decision outcomes in order to arrive at the best possible decision. In the context of this Standard, decision management refers to the process by which decision-makers will choose among potential alternative restoration options by considering a wide variety of economic, health, safety, social, regulatory, and political attributes associated with each restoration option. With respect to restoration of high value property after a contamination event, decisions-makers will be faced with many complex technical issues, competing objectives among stakeholders, large uncertainties, and a variety of constraints (e.g., funding limits). Often, the impacts of decisions are highly uncertain and, depending on the importance of the decision attribute, the best possible outcome could be altered if one end of the uncertainty range is used rather than the other. Consequently, structured, formal decision analysis/decision management approaches and tools are needed to assist decision-makers in selecting alternatives for restoration of high value properties contaminated by terrorist events.

Multiattribute utility analysis (MUA) is a decision analysis technique that explicitly addresses value judgments associated with multiple, competing objectives. The following definitions are important in the discussion of decision analysis and MUA:

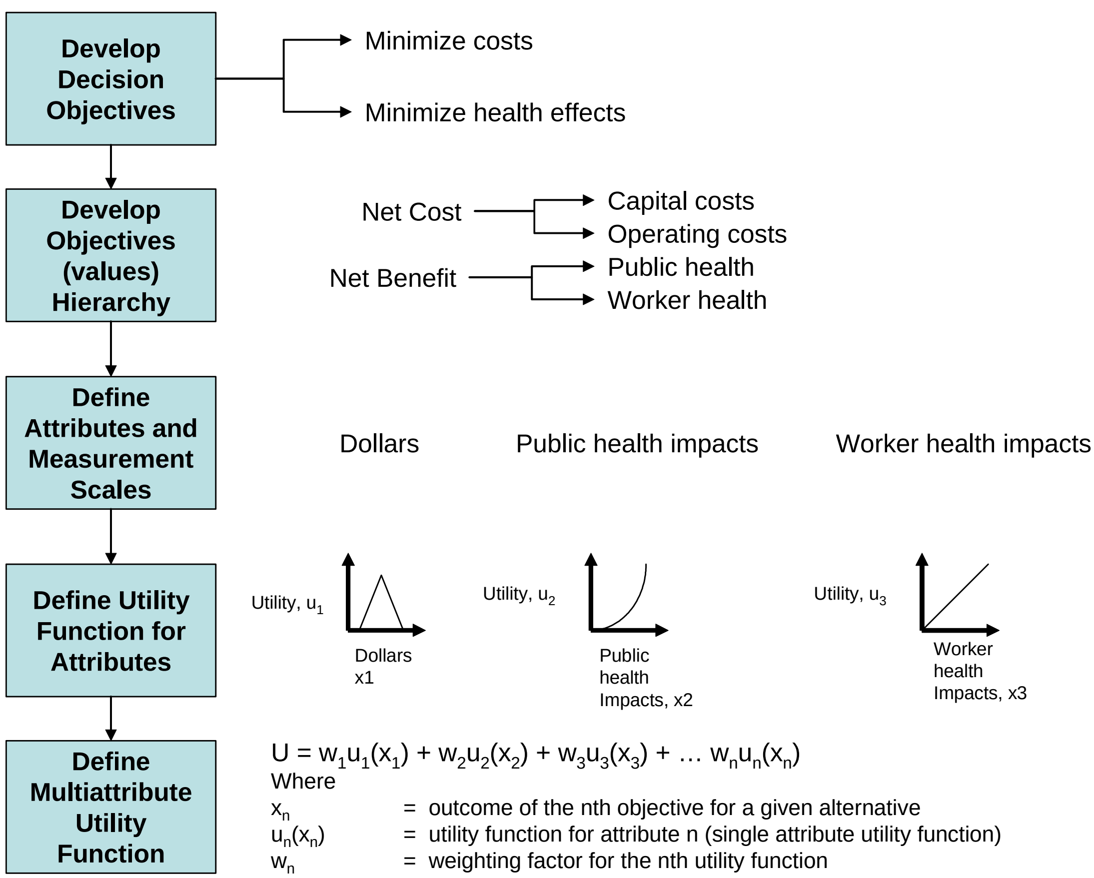
- A *decision* is a choice among alternatives.
- An *attribute* is a characteristic of a decision that can be measured. Attributes are measures of the extent to which an alternative accomplishes an objective
- An *uncertainty* is something that is unknown or not perfectly known.
- *Values* are what decision-makers view as important to the desirability of the potential outcomes of a decision.
- *Utility* is a quantity that expresses the relative strength of preference.

MUA is a well-accepted approach that integrates alternatives, uncertainties, and values into a quantitative analysis. MUA provides the logical and mathematical foundation for combining different value measures (e.g., cost, health effects, property value) into a single value measure. MUA mathematically combines two or more values of measure into a single measure, thus facilitating direct comparisons among alternatives. This allows an open, transparent, and defensible basis for decision-making that is needed when dealing with multiple stakeholders and competing value tradeoffs. MUA is also an effective tool for modeling sequential decisions, such as phased decontamination and restoration decisions, as well as determining the value of collecting additional information before making a decision. Consequently, MUA is the recommended approach for making decisions about cleanup and restoration following a chemical, biological, or radiological terrorist attack.

Decision analysis and MUA consist of four basic steps. First, the decision problem is defined and scoped. Second, a decision model is developed. Decision models describe the relationships between alternatives, decision outcomes, and values. An event tree approach is usually used to display these relationships and also form the basis for quantifying the utility. This step is referred to in MUA space as defining the multiattribute utility function. It involves developing the decision objectives and associated objective (or value) hierarchy, defining decision attributes and measurement scales for each attribute, and defining a utility function for each attribute. This allows the multiattribute utility function to be defined. Third, uncertainties and associated probability distributions are incorporated into the decision model. Fourth, the decision model is mathematically evaluated to determine the best possible decision. The value of gathering additional information before making the decision may also be determined. A fifth step, communication, is not addressed here.

Figure 1 shows the key steps in defining a multiattribute utility function and provided examples that illustrate the terms used above. Additional information about these steps is provided in the following sections.

Figure 1. Steps Used to Define the Multiattribute Utility Function



Develop Decision Objectives

Decision objectives should represent goals that may be achieved by making the decision. In the cleanup and restoration context, examples include minimize cleanup costs, minimize health effects, or maximize regulatory acceptance. The decision objectives should be complete, non-redundant, and include all objectives relevant to decision stakeholders. Ensure that the same objective is not counted twice.

Develop Objective Hierarchy

Often the decision objectives are broad statements that incorporate several components. For example, the objective "minimize health impacts" may consist of two components; 1) minimize public health impacts and 2) minimize worker health impacts. The objective "maximize regulatory acceptance" may be subdivided into separate objectives for maximizing acceptance by potentially-involved Federal and State regulatory agencies. The hierarchy illustrates how specific objectives contribute towards fulfillment of the more broad objectives and helps to ensure that all relevant objects are addressed.

Define an Attribute and Measurement Scale for Each Objective

Attributes are simply indicators or units that will be used to measure the degree to which each objective will be satisfied. For example, health impacts may be measured in deaths, latent cancer fatalities, acute injuries, or population dose. Costs are measured in dollars. Each objective must have an assigned attribute for it to be incorporated into the MUA function. The same attribute may be assigned to more than one objective; for example, dollars may be used to measure capital costs and operating costs, which may be different attributes. For some objectives, no obvious attribute exists. For example, regulatory acceptance, public acceptance, visual impacts, and other less tangible objectives have no obvious, quantifiable attributes. For these cases, constructed scales may be used to measure the performance of each alternative on each objective.

Define Utility Function for Each Attribute

Utility functions express a decision-makers preference about the potential outcomes or possible results for an attribute. In an MUA, the preferences within an attribute must be addressed as well as tradeoffs among attributes. For example, a decision-maker may be ambivalent to cleanup costs up to $10M, begin feeling anxious when cleanup costs are in the range $10 to 20M, and feel that cleanup costs over $20M are completely unacceptable. The form of the utility function (see Figure 1 for some examples) is determined based on the decision-makers preferences.

Define Multiattribute Utility Function

The multiattribute utility function is determined by combining the attribute utility functions with tradeoff (or value) weights. As shown in Figure 1, the form of the multiattribute utility functions is as follows:

$$U = \sum_{n} w_n u_n(x_n) = w_1 u_1(x_1) + w_2 u_2(x_2) + ... + w_n u_n(x_n)$$

Where:

x_n = outcome of the n^{th} objective for a given alternative

$u_n(x_n)$ = utility function for attribute n (single attribute utility function)

w_n = weighting factor for the n^{th} utility function

Value weights, w, represent the decision-makers preference among the different objectives. For example, the weighting factors describe the relationships between importance of each attribute (e.g., minimizing public health impacts is a factor of "X" more important than minimizing costs). The multiattribute utility function shown above is an example of additive utility function. Another form that is sometimes used is a multiplicative utility function in which the single-attribute terms are multiplied together.

6.7.1. Integrate decontamination techniques and methods findings with clean-up level setting in performance assessment to determine and balance cost effectiveness with standards.

7. Keywords

Terrorism, decontamination, restoration, model, clean-up criteria, decision level, urban air,

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