

# North Carolina State Medical Assistance Team Initial Training



STATE MEDICAL RESPONSE SYSTEM

## Participant Manual



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North Carolina State Medical Assistance Team Initial Training

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**North Carolina**

**State Medical Assistance**

**Team**

**Initial Training**

Participant Manual

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## TABLE of CONTENTS

Module 0: Introduction ..... 1

- About This Course..... 2
- Course Overview ..... 3
- Course Prerequisites ..... 5
- Safety Briefing ..... 7

Module 1: Overview and History ..... 41

- Module Objective ..... 43
- Objectives ..... 43
- History of the North Carolina State Medical Response System (SMRS)..... 46
  - SMAT Integration with Regional Advisory Committee ..... 48
- State Medical Assistance Teams ..... 53
  - North Carolina State Medical Assistance Team (SMAT) Descriptions ..... 54
  - SMRS Levels of SMAT Activation ..... 65
  - Volunteer Registry ..... 71
  - Demonstrating Integration in Medical Reserve Corps ..... 73
- SMAT Legal, Regulatory, and Ethical Issues..... 74
  - SMAT Field Operations and Responder Legal Considerations ..... 77
- Healthcare Infrastructure Planning and Partners ..... 82
  - Healthcare Infrastructure: Community, State, and Federal Disaster Planning ..... 82
  - Healthcare Infrastructure Roles and Responsibilities ..... 83
- North Carolina Office of Emergency Medical Services..... 85
- Specialty Teams ..... 86
  - SORT ..... 86
  - SMORT ..... 87
  - HFRAT ..... 87
- State Medical Asset Resource Tracking Tool (SMARTT) ..... 89
  - State Medical Support Shelter (SMSS) ..... 91
- SMAT Integration with Public Health ..... 93

Emergency Management Assistance Compact (EMAC) .....	94
EMAC Definition and Purpose .....	94
SMAT EMAC Roles and Responsibilities .....	95
EMAC Relevance and Role to SMRS.....	96
Summary .....	97
Module 2: Responder Health and Safety .....	101
Module Objective .....	103
Objectives .....	103
Safety Note .....	105
Introduction.....	106
Individual and Team Considerations For Health and Safety.....	107
Transportation—Health and Safety .....	110
SMAT Vehicle-Related Health and Safety Concerns .....	111
Aviation Transport of SMAT Patients and Staff .....	116
Environmental Factors Related to Health and Safety.....	117
Heat and Humidity .....	118
Cold .....	121
Insects and Animals.....	123
Health and Safety at the Deployment site .....	126
Electrical Safety .....	128
Generator Use .....	128
Electrical Sources & Power Cords.....	128
Mud and Sludge.....	130
Sewage.....	130
Debris and Dislocated Items.....	130
Hazardous Materials Exposures .....	132
Odors .....	132
Materials Lifting and Handling .....	133
Food and Water Safety.....	134
Field Security Health and Safety .....	135

---

Security in the Field Environment .....	135
Field Safety and Security Measures .....	136
SMAT Mental Health and Safety .....	138
The Role of the SMAT Safety Officer .....	139
Primary Functions .....	140
Investigate Concerns or Accidents On-Site .....	141
Radiation Safety .....	142
Fire Safety .....	143
Summary .....	144
Module 3: Infection Control .....	147
Module Objective .....	149
Objectives .....	149
Safety Note .....	151
Overview of Communicable Diseases.....	152
Introduction to Communicable Diseases .....	153
Introduction to Infection Control.....	158
Infection Control Definitions.....	161
Infection Control Concepts .....	163
Infection Control in Clinical Settings.....	170
Infectious Disease Risks for SMAT Personnel .....	170
Routes of Exposure .....	171
Standard Precautions .....	174
Isolation .....	177
Infection Control for SMAT Team Members during Deployment.....	178
Responding to Infectious Disease Emergencies .....	178
SMAT Personal Protective Equipment (PPE).....	178
Prophylactic Medication for SMAT Members.....	179
The Management of Infectious Disease in SMAT Personnel .....	179
Infection Control Considerations by Disaster Phase .....	180
SMAT Infection Control Roles and Responsibilities .....	182

---

SMAT Organization Infection Control Responsibilities .....	183
Integration with Public Health Emergency Response .....	185
Public Health Preparedness and Planning .....	185
Surveillance and Reporting.....	186
Summary .....	187
Module 4: All Hazards.....	191
Module Objective .....	193
Objectives .....	193
Safety Note .....	194
Natural Disasters.....	195
Situational Awareness .....	197
Health Effects Associated with Natural Disasters .....	198
Worker and Public Safety Hazard Management.....	202
Medical Care Concerns during Response to Natural Disasters .....	204
Triage, Evacuation, and Transport of Patients .....	206
Biological Disasters .....	207
Biological Agents Overview .....	208
Situational Awareness .....	214
Adverse Health Effects of Biological Agents.....	220
Worker Safety .....	222
Patient Care in a Field Medical Facility.....	224
Chemical Disasters .....	226
Overview—Acute Chemical Releases .....	227
Chemical Disaster Preparedness and Response .....	229
Situational Awareness .....	231
Adverse Health Effects of Acute Chemical Exposure.....	232
CHEMPACKS .....	235
CHEMPACK Appearance .....	235
Worker Safety .....	237
Selected Issues in Mass Casualty Care of Acute Chemical Exposures .....	238

---

Explosive Disasters .....	240
Overview of Explosive Disasters .....	240
Definition of an Explosion .....	241
Basic Science of a Typical Explosion .....	241
Types of Explosions.....	243
Mechanisms of Injuries from Explosions .....	244
Situational Awareness .....	251
Workforce Protection in Explosive Disasters .....	253
Field Care of Casualties from Explosions.....	255
Nuclear and Radiological Disasters .....	258
Overview of Radiological and Nuclear Disasters.....	259
Key Terms and Units .....	261
Nuclear and Radiological Injuries and Exposures .....	264
Human Health Effects from Acute Radiation Exposure .....	265
Medical Care Priorities for Radiation Patients .....	267
Radiation Exposure Assessments .....	271
Protecting Health Care Personnel from Radiation Exposures .....	273
Psychosocial Impacts .....	274
Summary .....	275
Module 5: Communications .....	283
Prerequisites.....	285
Objectives .....	286
Safety Note .....	288
State Medical Response System Disaster Communications.....	292
Incident Communications .....	293
General Message ICS Form 213 .....	294
Cell Phone/Social Media Use Awareness .....	296
UHF Radios .....	299
UHF/VHF Dual Control Radio.....	300
VMN and NCMCN .....	302
Additional Information .....	306

---

Phonetic Alphabet .....	308
Rules for Communications.....	309
Summary .....	310
Activity: Effective Radio Communications .....	311
Appendix 5.A: VIPER Hand-held controls .....	315
Appendix 5.B: COMMUNICATIONS GLOSSARY .....	316
Module 6: Deployment Readiness .....	318
Module Objective .....	321
Objectives .....	321
Safety Note .....	323
SMAT Pre-Deployment.....	324
Pre-Deployment Readiness.....	324
Family-Home Disaster Planning .....	325
Personal Items for SMAT Deployment Readiness .....	327
Employer Compliance with SMAT Membership .....	330
SMAT Notification Procedures and Mobilization Activities.....	338
SMAT Notification .....	338
SMAT Deployment.....	340
Types of Deployments and Deployment Activities.....	340
Team Logistics.....	341
Deployment in Austere Environments .....	342
Definition of Austere Environments .....	342
Environmental Considerations during Field Deployments .....	344
SMAT Demobilization .....	349
Demobilization Notification .....	349
Demobilization Procedures.....	349
Readiness for Next Deployment .....	350
Activity: Display of Go-Bag and Deployment Pack Contents .....	351
Summary .....	352

---

Items to Consider for Personal "Go-Bag" .....	355
Appendix 2-A: Disaster Supplies Kit Checklist .....	357
Module 7: Mass Casualty .....	360
Module Objective .....	362
Objectives .....	362
Safety Note .....	363
Introduction: Mass Casualty .....	364
Definition of Mass Casualty .....	364
All Hazards Approach to Mass Casualty .....	366
MCI Response Planning.....	377
Planning Elements of an MCI Response .....	377
Healthcare Impact of an MCI Response.....	381
Public Health and Mass Casualty Emergency Response.....	384
Definition of Mass Fatality.....	385
Planning Elements of a Mass Fatality Management.....	386
Health Hazards Associated with Mass Fatalities .....	388
Mass Triage.....	389
Definition of Mass Triage .....	389
Triage History and Overview .....	390
SMART Triage <sup>®</sup> .....	392
Definition of SMART Triage .....	393
SMART Triage Operations .....	394
Contamination Triage .....	397
Sufficiency of Care .....	399
Definition of Sufficiency of Care.....	399
Degradation of Standard of Care Rationale.....	400
Summary .....	402
Activity: Triage Tags .....	403
Module 8: Hazardous Materials.....	416
Module Objective .....	418

---

Objectives .....	418
Safety Note .....	418
Introduction to Hazardous Materials (HAZMAT) .....	419
HAZMAT Chemical Threats and Identification .....	420
Levels of HAZMAT Training .....	426
HAZMAT Information and Training .....	427
Hazardous Materials Level I Responder .....	428
First Receivers (SMAT I) .....	429
Skilled Support Personnel .....	430
Hazardous Materials Level II Responder .....	431
HAZMAT Specialist .....	432
Personal Protective Equipment (PPE) .....	433
Selecting Appropriate Level of PPE .....	433
Levels of Protection .....	434
Level A PPE .....	435
Level B PPE .....	437
Level C PPE .....	437
Level D PPE .....	441
Other Factors Concerning PPE Levels .....	442
Baseline Exposure Data .....	443
Decontamination .....	444
General Decontamination Goals for Pre-Hospital Responders .....	445
Decontamination Factors .....	446
Contamination Zones during Emergency Response .....	447
Stages of Decontamination .....	451
Patient Decontamination Principles .....	455
Decontamination Processes Overview .....	456
Summary .....	460
Activity: Personal Protective Equipment (PPE)/SMAT Decontamination Unit .....	461
Personal Protective Equipment: .....	462

---

Equipment Requirements/Recommendations: .....	463
Activity: Attachment A: Donning of Personal Protective Equipment (PPE).....	468
Activity: Attachment B: Doffing of Personal Protective Equipment (PPE) .....	470
Appendix A: Materials Safety Data Sheet.....	471
Module 9: Base Camp Operations .....	480
Objectives .....	483
Safety Note .....	484
Common Safety Considerations for Base Camp Operations .....	485
Briefing and Introduction to Technical Manuals .....	486
Activity: Western Shelter Base Camp.....	519
Mobile Response Trailer System .....	520
Site Preparation and Safety.....	520
Trailer Overview.....	522
Generator.....	523
On Board Climate Control.....	525
12 Volt DC Compartment.....	526
Lift Gate Overview .....	527
HVAC Stacking and Unstacking .....	530
Slide Out Platforms and Stairs.....	531
Observation Deck .....	532
Command Center .....	533
Cargo Area .....	536
Awnings .....	537
Detailed Instruction for Western Shelter System Deployment.....	539
Full Shelter Strike .....	559
Vestibule Connector .....	575
Electrical System operation.....	582
Electrical System Overview .....	582
Water Handling Operations .....	587
Hygiene Center Shell Assembly .....	587

---

Hygiene Center Frame and Floor .....	588
Shower and Toilet Stall Liner Installation.....	590
Lighting .....	591
Shower.....	592
Commode .....	593
Sink.....	594
Plumbing.....	595
Maintenance and Care part of Hygiene Center Content.....	597
Water Purification Overview .....	599
Description of Arctic Clear® MODEL 201-2.....	600
Set-Up Instructions .....	604
Removing and Reinstalling Unit to Case .....	606
Filter Housings.....	609
Ultraviolet Chamber Assembly .....	610
Water Outlet Hose .....	612
Case .....	613
Troubleshooting Procedures.....	614
Decontamination Procedures .....	615
Maintenance Procedures for the Model 201-2.....	617
Reshipment or Storage of the Model 201-2.....	618



# MODULE 0: INTRODUCTION

## Training Curriculum

Length: 45 Minutes

Audience: North Carolina State Medical Assistance Team personnel

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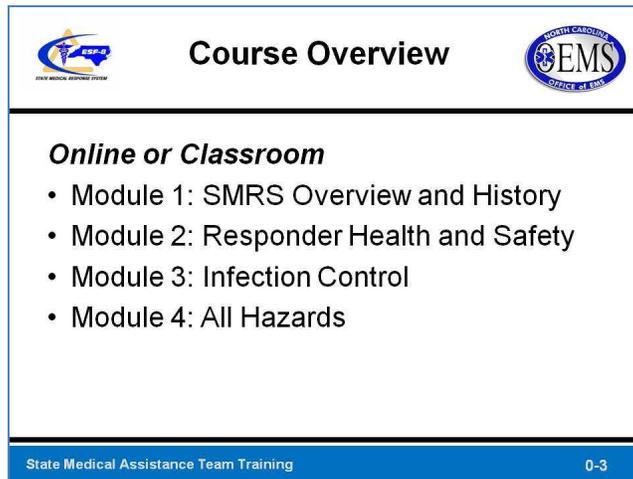
## ABOUT THIS COURSE

### Course Goal

	<b>Course Goal</b>	
<p>Upon the successful completion of this course, you will have the knowledge and skills necessary to participate in appropriate North Carolina State Medical Assistance Team (SMAT) activities.</p>		
State Medical Assistance Team Training		0-2

Upon the successful completion of this course, you will have the knowledge and skills necessary to participate in appropriate North Carolina State Medical Assistance Team (SMAT) activities.

## Course Overview



The slide is titled "Course Overview" and features two logos at the top: the SMRS logo on the left and the North Carolina EMS logo on the right. The main content is a bulleted list under the heading "Online or Classroom". At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "0-3" on the right.

**Course Overview**

**Online or Classroom**

- Module 1: SMRS Overview and History
- Module 2: Responder Health and Safety
- Module 3: Infection Control
- Module 4: All Hazards

State Medical Assistance Team Training 0-3

### Online Modules

Currently all Modules will be completed in the classroom

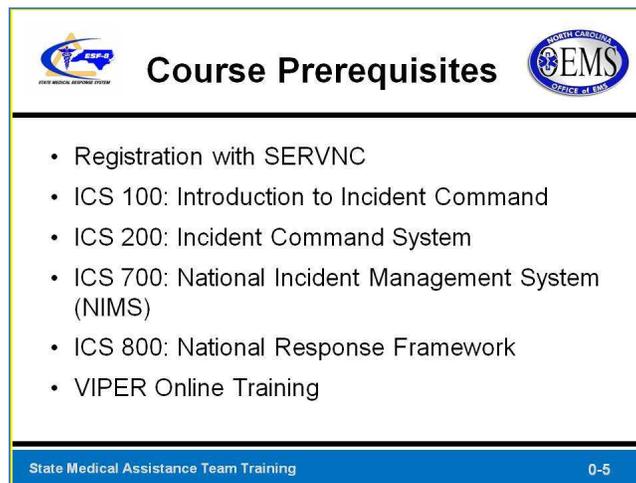
	<h2>Course Overview</h2>	
<p><b><i>Classroom and Activities</i></b></p> <ul style="list-style-type: none"><li>• Module 5: Communications</li><li>• Module 6: Deployment Readiness</li><li>• Module 7: Mass Casualty</li><li>• Module 8: Hazardous Materials Awareness</li><li>• Module 9: Base Camp Operations</li></ul>		
State Medical Assistance Team Training		0-4

### *Classroom Modules*

## Target Audience

This course is designed for prospective North Carolina State Medical Assistance Team personnel.

## Course Prerequisites



The slide features a yellow border and a blue header bar. On the left is the SERVNC logo, and on the right is the North Carolina EMS logo. The title 'Course Prerequisites' is centered in the header. A list of prerequisites is in the main body, and a footer bar contains 'State Medical Assistance Team Training' and '0-5'.

Course Prerequisites	
<ul style="list-style-type: none"><li>• Registration with SERVNC</li><li>• ICS 100: Introduction to Incident Command</li><li>• ICS 200: Incident Command System</li><li>• ICS 700: National Incident Management System (NIMS)</li><li>• ICS 800: National Response Framework</li><li>• VIPER Online Training</li></ul>	
State Medical Assistance Team Training	0-5

- Registration with SERVNC
- ICS 100: Introduction to Incident Command
- ICS 200: Incident Command System
- ICS 700: National Incident Management System (NIMS)
- ICS 800: National Response Framework
- VIPER Medical Communications Network Online Training

## ***Course Length***

2-5 days, contingent on jurisdictional needs.

## ***Registration and Attendance***

In order to receive credit for this course, your attendance is crucial. All participants must complete a registration form at the beginning of the course and sign the attendance roster for each day in order to receive a certificate of completion. You will also have the opportunity to complete an end-of-course evaluation.

## ***Administrative Information***

Instructors will use this portion of the course time to familiarize you with facility safety and convenience features as well as any additional resources or equipment available to you.

## Safety Briefing



### Safety Overview for the Course



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- Rules and protocols to be followed during training
- Emergency exits and procedures
- How to mitigate risks during training
- Adherence to safety requirements

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State Medical Assistance Team Training 0-6

## *Review of Online Modules*

**Will be added when on-line modules are ready.**

**Pages 11 – 40**

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# MODULE 1: OVERVIEW AND HISTORY

Training Curriculum

Length: 45 Minutes

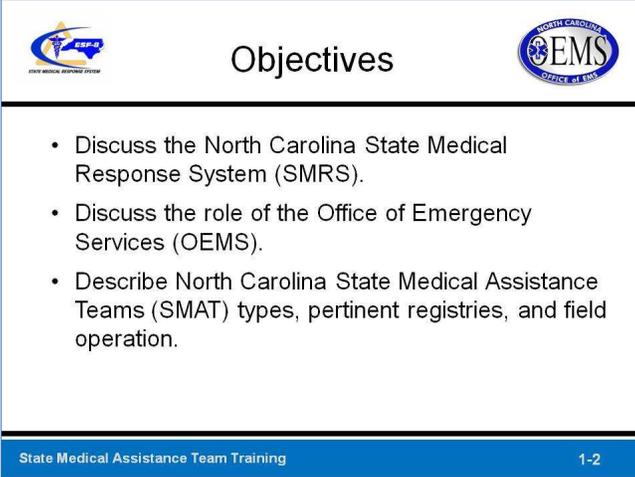
Audience: North Carolina State Medical Assistance Team personnel

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## Module Objective

Review the history of the North Carolina State Medical Response System (SMRS) and the contribution of the North Carolina Office of Emergency Medical Services (OEMS).

## Objectives



The slide is titled "Objectives" and is framed by a blue border. In the top left corner is the SMRS logo, and in the top right corner is the OEMS logo. The main content area contains three bullet points. At the bottom of the slide, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "1-2" on the right.

- Discuss the North Carolina State Medical Response System (SMRS).
- Discuss the role of the Office of Emergency Services (OEMS).
- Describe North Carolina State Medical Assistance Teams (SMAT) types, pertinent registries, and field operation.

- Discuss the North Carolina State Medical Response System (SMRS).
- Discuss the role of the Office of Emergency Services (OEMS).
- Describe North Carolina State Medical Assistance Team (SMAT) types, pertinent registries, and field operation.



## Objectives

- Describe the legal, regulatory, and ethical issues impacting SMAT field operations and personnel duties.
- Identify SMAT healthcare infrastructure key components, planning, roles, and responsibilities.
- Describe the SMAT relationship to public health roles during a disaster.

State Medical Assistance Team Training 1-3

- Describe the legal, regulatory, and ethical issues impacting SMAT field operations and personnel duties.
- Identify SMAT healthcare infrastructure key components, planning, roles, and responsibilities.
- Describe SMAT relationship to public health roles during a disaster.

 **Objectives** 

---

- Define Emergency Management Assistance Compact (EMAC).

  
Photo courtesy of NCCEMS

State Medical Assistance Team Training 1-4

- Define Emergency Management Assistance Compact (EMAC).

## HISTORY OF THE NORTH CAROLINA STATE MEDICAL RESPONSE SYSTEM (SMRS)



### Mission



The mission of SMRS is to ensure the delivery of healthcare services that protect the health and well-being of the residents and guests of North Carolina before, during, and after events that may overwhelm the healthcare system.



Photo courtesy of NCOEMS

State Medical Assistance Team Training1-5

The North Carolina State Medical Response System (SMRS): The mission of SMRS is to ensure the delivery of healthcare services that protect the health and well-being of the residents and guests of North Carolina before, during, and after events that may overwhelm the healthcare system.



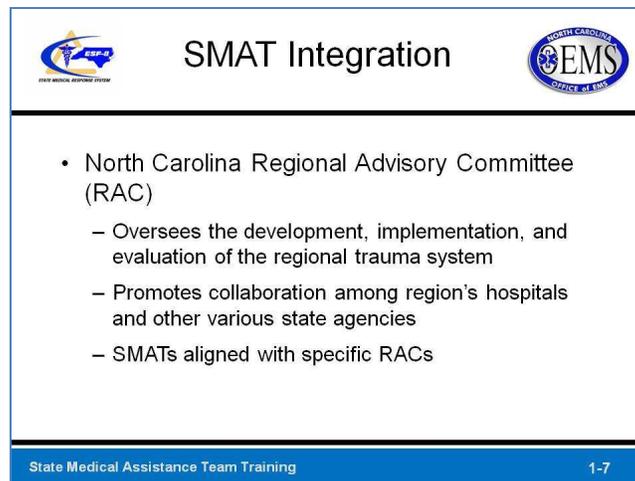
The slide features a blue border and a white background. At the top left is the NCEM logo (North Carolina Emergency Management) and at the top right is the EMS logo (North Carolina Office of EMS). The title 'Initial Partners in Developing SMRS' is centered at the top. Below the title is a bulleted list of three partners. At the bottom of the slide, there is a blue footer bar with the text 'State Medical Assistance Team Training' on the left and '1-6' on the right.

- NC Department of Health and Human Services (DHHS)
- NC Division of Emergency Management (NCEM)
- Special Operations Response Team (SORT)

The initial partners in the development of the NC SMRS were: the NC Department of Health and Human Services (DHHS) and NC Division of Emergency Management (NCEM), the NC Division of Public Health (PH) and Special Operations Response Team (SORT). This is a public – private partnership.

This initial model was based on a tiered design that allowed for a scalable response, similar to the federal National Disaster Medical System (NDMS). The concept of the SMAT was based on the Disaster Medical Assistance Teams (DMAT) of the NDMS.

## SMAT Integration with Regional Advisory Committee



The slide is titled "SMAT Integration" and features logos for the State Medical Assistance Team (SMAT) and the North Carolina Office of EMS. The main content is a bulleted list describing the North Carolina Regional Advisory Committee (RAC). At the bottom of the slide, it says "State Medical Assistance Team Training" and "1-7".

- North Carolina Regional Advisory Committee (RAC)
  - Oversees the development, implementation, and evaluation of the regional trauma system
  - Promotes collaboration among region's hospitals and other various state agencies
  - SMATs aligned with specific RACs

The Trauma Regional Advisory Committees (RACs) were chosen for implementation of key components of the SMRS because of each RACs geographic orientation and medical capabilities. Each RAC is comprised of stakeholders from regional hospitals, EMS systems, local health departments (LHDs), local and regional Emergency Management, community health centers (CHCs), rural health centers (RHCs), long-term care facilities, public health, assisted living facilities, college and university health centers, dialysis centers, and all related emergency response agencies.

The North Carolina Trauma System was created through an act of the North Carolina General Assembly in 1993 (Article 7A - Statewide Trauma System Act of 1993) to facilitate continuous communications involving stakeholder agencies - from the EMS agency to the hospitals and trauma centers.

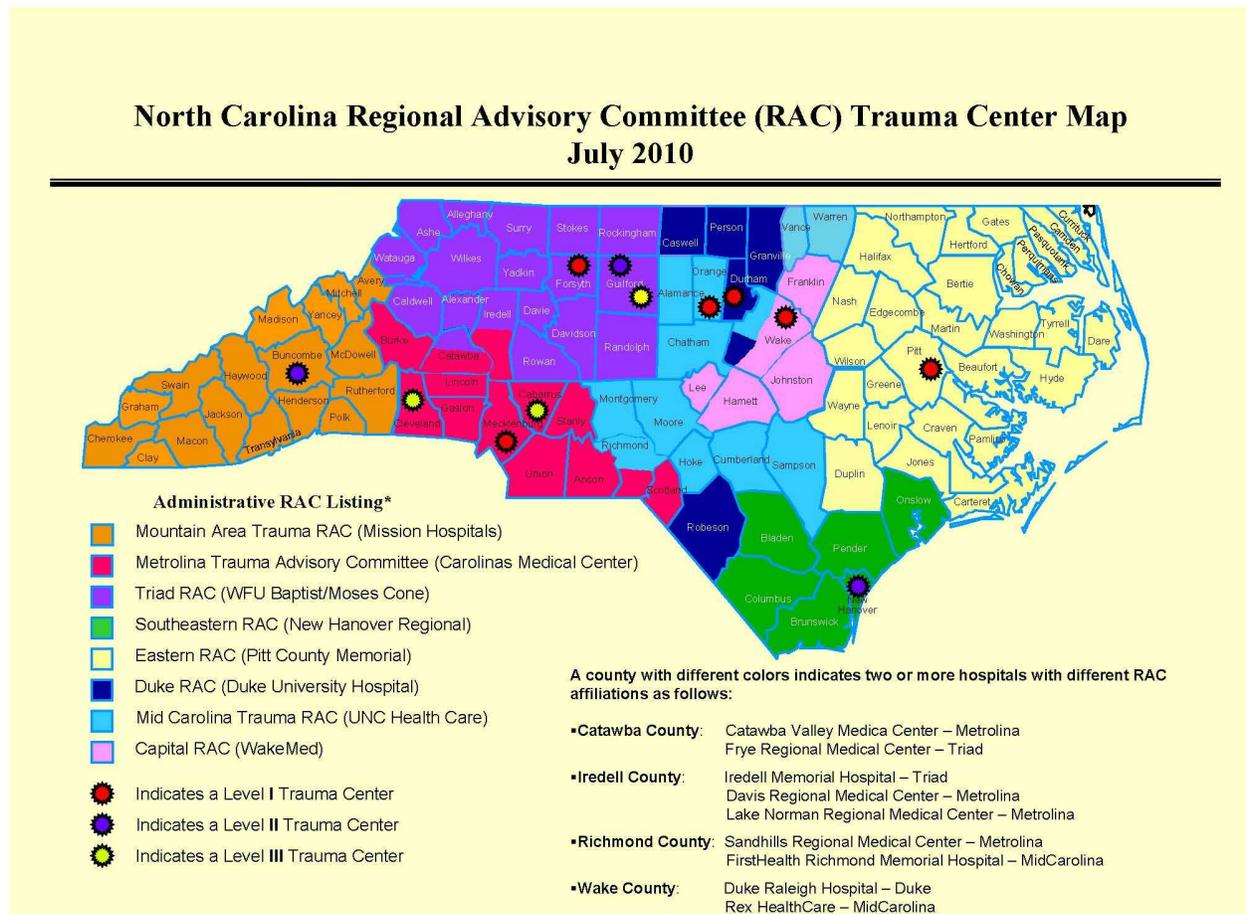
[http://www.ncga.state.nc.us/EnactedLegislation/Statutes/PDF/ByArticle/Chapter\\_131E/Article\\_7A.pdf](http://www.ncga.state.nc.us/EnactedLegislation/Statutes/PDF/ByArticle/Chapter_131E/Article_7A.pdf)

There are eight Trauma RACs in North Carolina. The lead RAC agencies provide trauma education and serve as the coordinating entity for trauma and disaster planning in their region. All hospitals and EMS systems in North Carolina must be members of a RAC. As the lead agency, the RAC oversees the development, implementation, and evaluation of the regional trauma system and promotes collaboration between the region's hospitals, EMS systems, NC Emergency Management, NC Public Health, Law enforcement, and state agencies to provide a regional response in disasters.

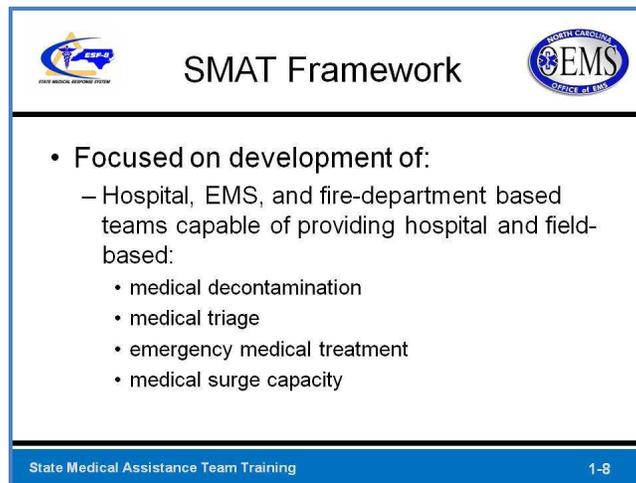
Each RAC, working with state guidance, develops guidelines for dispatch, triage, treatment at the scene and in the emergency department, transport, and transfer agreements. The RAC provides trauma education and prevention, both to the general public and to trauma providers in the region, as well as promotes communication among trauma providers and evaluates the system's progress. One of the primary missions of the RACs is coordination of regional disaster planning between hospitals, EMS, Public Health, Mental Health, and other agencies. Following the September 11, 2001 attacks, a sense of urgency produced additional funding sources that promoted the rapid development of state medical response capacity. Today, each of the SMATs

is aligned with a specific RAC and closely affiliated with the trauma program where the RAC is administratively supported.

In 2002, SMRS developed a system of State Medical Assistance Teams (SMAT). Clinical considerations for patients included the consequences of bioterrorism and weapons of mass destruction (WMD). Recognizing the need to increase medical surge capacity, local, regional, and state agencies in North Carolina concentrated their efforts on developing this important emergency response capacity.



**Figure 1-1: Courtesy of NC Department of Agriculture and Consumer Services**

A presentation slide titled "SMAT Framework". The slide features logos for the State Medical Assistance Team (SMAT) on the left and the North Carolina EMS Office of EMS on the right. The main content is a bulleted list describing the focus of the framework. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "1-8" on the right.

**SMAT Framework**

- Focused on development of:
  - Hospital, EMS, and fire-department based teams capable of providing hospital and field-based:
    - medical decontamination
    - medical triage
    - emergency medical treatment
    - medical surge capacity

State Medical Assistance Team Training 1-8

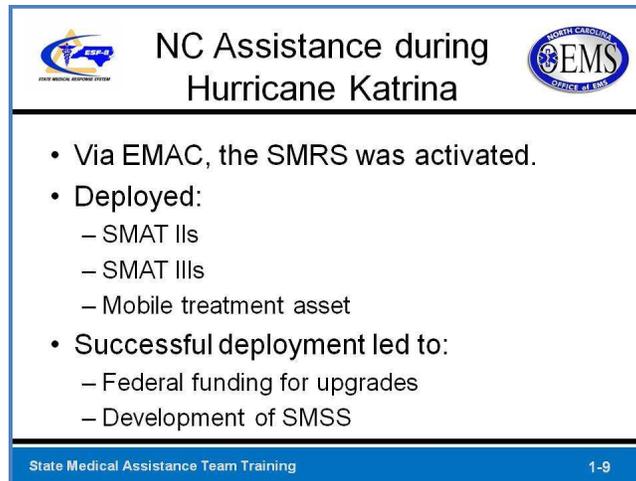
The SMAT framework focused on the development of hospital, EMS, and fire department-based teams capable of providing medical decontamination, medical triage, emergency medical treatment, and medical surge capacity in hospital and field settings. This framework identified three tiers of SMATs. These tiers were identified as SMAT I, SMAT II, and SMAT III.

SMAT I was initially modeled after the federal-based Disaster Medical Assistance Team (DMAT) that was initially based with the SORT.

SMAT II's were developed in each Trauma RAC. Their mission was to provide rapid mass casualty medical management services during human-made or natural disasters.

SMAT III's were developed by county EMS systems and the Charlotte Fire Department with decontamination and triage capability.

Resources of SMRS/SMAT were integrated into the State Emergency Response Team (SERT) to provide early assessment and liaison with Federal, state, and local authorities involved with ESF-8 response.



The slide features a blue border and contains the following text and logos:

-  **NC Assistance during Hurricane Katrina** 
- Via EMAC, the SMRS was activated.
- Deployed:
  - SMAT IIs
  - SMAT IIIs
  - Mobile treatment asset
- Successful deployment led to:
  - Federal funding for upgrades
  - Development of SMSS

At the bottom of the slide, there is a blue bar with the text "State Medical Assistance Team Training" on the left and "1-9" on the right.

During Hurricane Katrina, the state of Mississippi, through the Emergency Management Assistance Compact (EMAC) requested medical assistance from the State of North Carolina. The SMRS was activated and resulted in a multi-tiered emergency medical response. This EMAC response included resources from SMAT II's and SMAT III's from across the state of North Carolina and the deployment of a hospital-owned mobile treatment asset. This mobilization was a success for the new SMRS and demonstrated that in addition to acute medical needs for victims of disasters our nation's emergency health response was also not adequate to address the medical needs of the aging or disabled populations during a disaster.

Following the post-event evaluation of the North Carolina Katrina response, the SMRS broadened its focus to include additional consideration for these populations. Federal funding permitted RACs to substantially upgrade their SMAT mobility and field capabilities, which included the purchase of Western Shelter tents, trailers, and additional specialized medical equipment. During the years that followed, evolution of the SMRS included an expansion of the SMAT concept with additional SMAT III's. In addition, this expansion included the development of State Medical Support Shelters (SMSS) and the acquisition of additional warehouse space to manage large caches of medical equipment.

**Mobile Disaster Hospital (MDH)**

- 2009 – FEMA sends NC first MDH
- Primary mission:
  - Support North Carolina
  - Support FEMA Region IV states

State Medical Assistance Team Training 1-10

In 2009, after years of development, the prototype Mobile Disaster Hospital (MDH) unit was assigned to North Carolina through a memorandum of agreement (MOA) between the Federal Emergency Management Agency (FEMA) and North Carolina. The MDH is an asset that has generally all of the capabilities found in a typical community hospital. The MDH has a primary mission to support North Carolina and FEMA Region IV states.

The SMRS is a multifaceted program with an array of tiered and scalable capabilities and is routinely used in various roles of medical service ranging from mass gathering events to interstate disaster response in support of Emergency Support Function (ESF)-8.

The SMRS continues to evolve to meet new medical and public health challenges. For example, the appearance of SARS (2002-2003) and H1N1 (2010) resulted in the SMRS expanding its focus to assist medical facilities and EMS agencies managing the demands associated with an infectious disease crisis. The SMRS is an example of collaboration between state and local government agencies, the Division of Public Health, and the private sector to meet the health and medical response and recovery needs of our state. The greatest strength of the system is the hundreds of North Carolina personnel who give of their time and the employers who support them.

## STATE MEDICAL ASSISTANCE TEAMS

SMAT

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**Tiered and Scalable**

- SMAT I—State Level
- SMAT II—Regional Level
- SMAT III—Local Level



Photo courtesy of  
NCDHHS

State Medical Assistance Team Training1-11

The SMRS tiered response system was designed to ensure that both treatment and prevention strategies are implemented. The goal of this effort is to assure North Carolina residents and visitors that, when a disaster occurs, they will receive the medical services they need to protect their health and prevent the further spread of disease. Integral to SMRS are three tiers of emergency response teams. They are SMAT I, SMAT II, and SMAT III and are based on resource typing.

## North Carolina State Medical Assistance Team (SMAT) Descriptions

### SMAT I State Level



## SMAT I State Level



---

Mobile Disaster Hospital (MDH)

- Augment or replace a hospital facility
- Up to 234 beds
- Laboratory, X-ray, pharmacy and supply unit

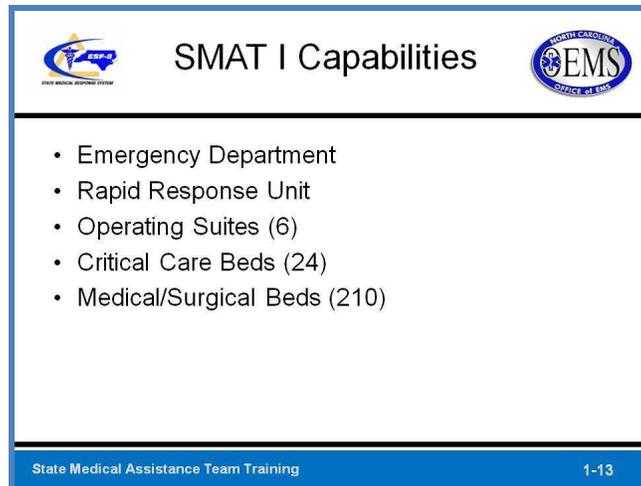


Photo courtesy of FEMA

State Medical Assistance Team Training1-12

The SMAT I is the Mobile Disaster Hospital (MDH) resources with the “team” coming from within the SMRS community. The MDH provides a self-sufficient surge capacity during an emergency by augmenting or replacing a hospital facility. When complete, the MDH can provide services for up to 250 outpatients and inpatient care services.

The MDH facility has the medical equipment and supplies to establish a temporary hospital with up to 234 beds. Support services include central supply, laboratory/blood bank, x-ray, and pharmacy.



The slide features a blue border and a white background. At the top left is the logo for the North Carolina State Medical Assistance Team (SMAT), which includes a caduceus and the text 'SMAT-1' and 'STATE MEDICAL ASSISTANCE TEAM'. At the top right is the logo for the North Carolina EMS Office of EMS, featuring a caduceus and the text 'NORTH CAROLINA EMS OFFICE OF EMS'. The title 'SMAT I Capabilities' is centered at the top. Below the title is a bulleted list of capabilities. At the bottom, there is a blue footer bar with the text 'State Medical Assistance Team Training' on the left and '1-13' on the right.

**SMAT I Capabilities**

- Emergency Department
- Rapid Response Unit
- Operating Suites (6)
- Critical Care Beds (24)
- Medical/Surgical Beds (210)

State Medical Assistance Team Training 1-13

### SMAT I Capabilities:

The MDH allows for a flexible response through its scalable and modular design. The facility can deploy as a whole or in functional units:

- **Emergency Department** (with x-ray, lab/blood bank, supply unit, and pharmacy)  
A 21-bed unit with the capability to evaluate, treat, hold and stabilize adult and pediatric patients (including trauma and burn care)
- **Rapid Response Unit** – 6-bed Emergency Department, 10-bed ICU, 2 Operating rooms, Surgery Processing Unit, Radiology services, central medical supply unit, and a Logistics Support Unit
- **Operating Suites**- 6 operating suites with the capability of 25 operative procedures in a 24 hour period.
- **Critical Care Beds** – (24)
- **Medical/Surgical Beds** – (210)

**Team Composition for the Rapid Response Unit: (SMRS personnel from all teams)**

- 4 ED Physicians
- 2 Physician extenders
- 2 Charge RN
- 20 ED/ICU RNs
- 8 Surgical RNs
- 12 EMT-Ps
- 2 Pharmacists
- 2 Pharmacy Technicians
- 2 X-ray Techs
- 1 Anesthesiologist
- 4 CRNAs
- 4 General Surgeons
- 1 Orthopedic Surgeon
- 2 Surgical Prep Nurses
- 2 Surgical Prep Technicians
- 2 Lab Techs
- 2 Clerks

**= Total 72 Medical Staff**

**Medical Coordination Team – (47):**

- 1 MCT Team Leader
- 1 Safety Officer
- 1 Senior Medical Officer
- 1 MCT Liaison Officer to Host EMA and ESF-8
- 1 Operations Section Chief
- 1 ED Technical Specialist
- 1 OR Technical Specialist
- 1 Radiology Technical Specialist
- 1 Clinical Laboratory Technical Specialist\*
- 1 Planning Section Chief

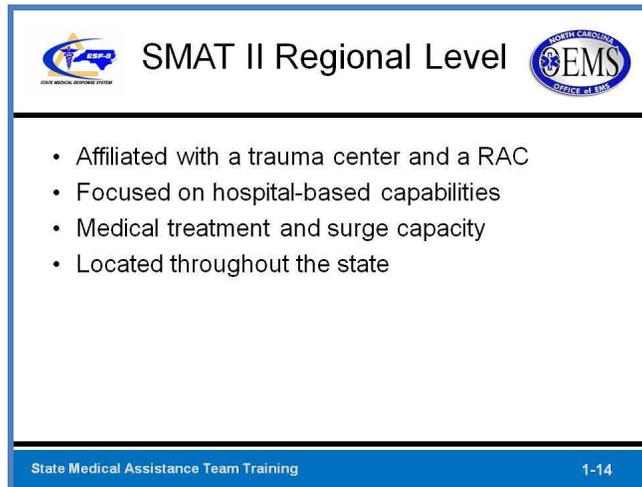
- 1 Logistic Section Chief
- 1 Administrative Section Chief
- 2 Medical Supply Specialists
- 1 Bio-Engineer
- 4 Logistics Technicians
- 26 Logistics Support Staff
- 1 Communication Officer
- 1 Law Enforcement

\*=Optional

**Team Activation:**

- Activation by NCEM to NCOEMS
- Team may be deployed statewide or nationwide through EMAC
- Team is self-sufficient for 72 hours

## SMAT II Regional Level



The slide features a blue border and contains the following elements:

- SMAT II Logo:** Located on the top left, featuring a caduceus and the text "SMAT II" and "STATE MEDICAL ASSISTANCE TEAM".
- North Carolina EMS Logo:** Located on the top right, featuring a blue circle with "NORTH CAROLINA" at the top, "EMS" in the center, and "OFFICE OF EMS" at the bottom.
- Title:** "SMAT II Regional Level" is centered at the top.
- List:** A bulleted list in the center describing the characteristics of SMAT II Regional Level teams.
- Footer:** A blue bar at the bottom with "State Medical Assistance Team Training" on the left and "1-14" on the right.

SMAT IIs are hospital-based teams designed to support hospital-based capabilities by assisting in the provision of victim decontamination, mass medical care, alternate care facilities, and mass drug distribution points. North Carolina currently has eight (8) SMAT IIs. Each SMAT II is affiliated with a Level I or Level II Trauma Center and a RAC.

As part of the SMRS, a SMAT II focuses on hospital-based capabilities, such as emergency care and stabilization, and is responsible for rapid mass casualty medical management services at the local, regional and state levels. It is outlined in existing MOUs between NC Department of Health and Human Services (DHHS), Division of Health Service Regulation (DHSR), Office of Emergency Medical Services (OEMS) and participating hospitals and hospital systems.



The slide is titled "SMAT II Capabilities" and features logos for the State Medical Assistance Team (SMAT) and the North Carolina EMS Office of EMS. The main content lists the minimum capabilities of a SMAT II team:

- At a minimum:
  - Provide assistance
    - Hospitals
    - 40-bed alternate care facility
    - Mass immunization/drug distribution
  - Establish field medical station
  - Responder treatment and rehabilitation
  - Decontamination supplies and equipment

At the bottom of the slide, it reads "State Medical Assistance Team Training" on the left and "1-15" on the right.

### **SMAT II Capabilities:**

- Assist in hospitals and other health care facilities
- Assistance in establishing a 40-bed alternate care site
- Establish mass immunizations/pharmaceutical distribution center
- Provision of responder treatment and rehabilitation
- Establish alternate care centers

### **Team Composition:**

A SMAT II has a standardized “mobile package” that includes basic equipment and shelter for response. This hospital-based team consists of medical professionals (e.g., pharmacists, MDs, RNs, PAs, respiratory therapists), medical support staff (e.g., technicians, administration), mental health professionals (e.g., psychiatrists, licensed clinical social workers), public health professionals, interpreters, and other support staff (e.g., engineers, truck drivers). It is important to note that SMATs seek volunteers from all hospitals and other medical agencies within their RACs.

### **Activation:**

- SMAT II can be activated on a local, regional, or statewide level.
- Response time is within 6 hours in-region, 12-24 hours within the state, and within 12-24 hours out of state and is mission specific.

Note: This information can be found in the new North Carolina Regional Emergency Support Function-8 (ESF-8) Response and Recovery Plans.



## Locations for SMAT IIs



Current locations of SMAT IIs and their affiliated trauma centers and RAC

Team #	County	Medical Facility	RAC
100	Pitt County	Pitt County Memorial	Eastern RAC
200	New Hanover County	New Hanover Regional	Southeastern RAC Medical Center
300	Orange County	University of North Carolina	Mid-Carolina RAC Hospitals
400	Durham County	Duke University Medical	Duke RAC Center
500	Forsyth County	North Carolina Baptist	Triad RAC
600	Buncombe County	Mission Health Systems	Mountain Area Trauma RAC
700	Mecklenburg County	Carolinas Medical Center	Metrolina RAC
800	Wake County	Wake Med Health & Hospitals	Capital RAC

State Medical Assistance Team Training
1-16

**Table 1-1: Current locations of SMAT IIs and their (affiliated trauma centers and RACs**

<b>Team #</b>	<b>County</b>	<b>Medical Facility</b>	<b>RAC</b>
100	Pitt County	Pitt County Memorial	Eastern RAC
200	New Hanover County	New Hanover Regional	Southeastern RAC Med Center
300	Orange County	University of North Carolina	Mid-Carolina RAC Hospitals
400	Durham County	Duke University Medical	Duke RAC Center
500	Forsyth County	North Carolina Baptist	Triad RAC
600	Buncombe County	Mission Health Systems	Mountain Area Trauma RAC
700	Mecklenburg County	Carolinas Medical Center	Metrolina RAC
800	Wake County	Wake Med Health & Hospitals	Capital RAC

Current as of April 2011

## SMAT III Local Level



### SMAT III Local Level

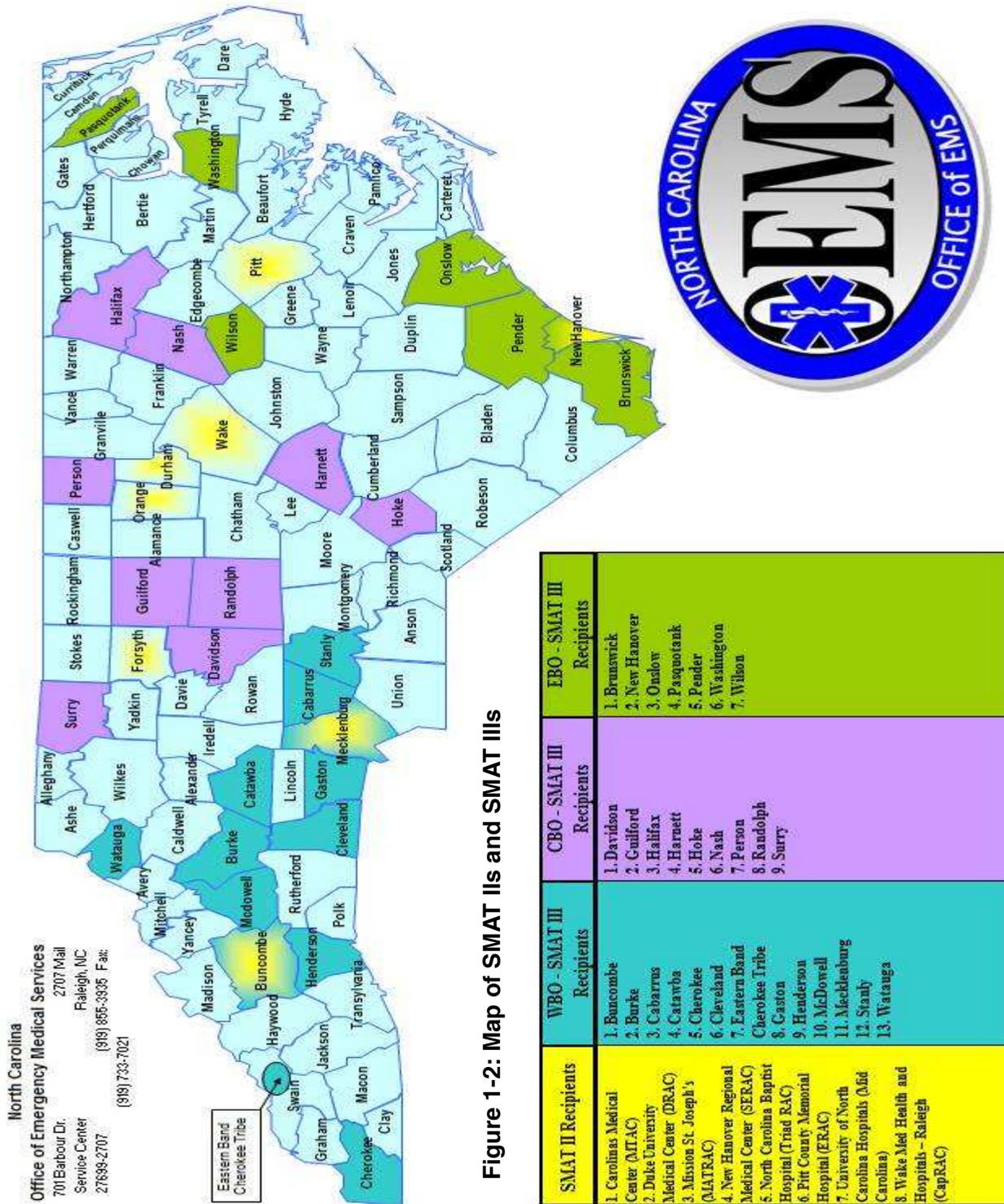


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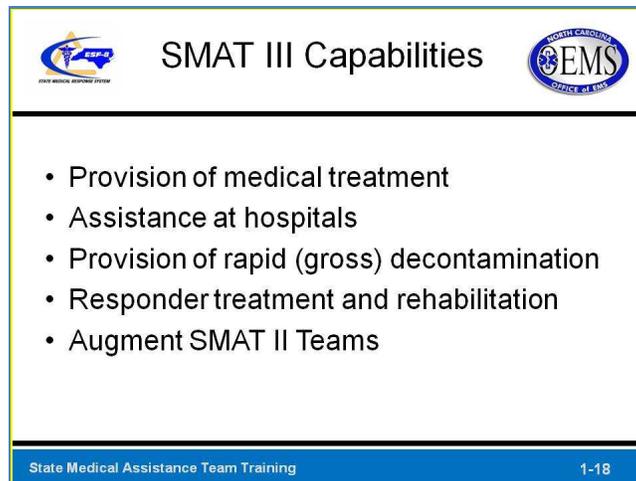
- County-based team designed to be the first line for response for decontamination or mass medical care event
- Affiliated with county EMS, fire, or other county level agency

State Medical Assistance Team Training1-17

Local SMAT IIIs are county-based teams designed to be the first line of response in support of local agencies in the event of a decontamination or mass medical care event. North Carolina currently has 29 SMAT IIIs, and each is affiliated with a county EMS system, fire department, or other county-level emergency response agency.



Current as of July 2010



The slide is titled "SMAT III Capabilities" and features logos for the North Carolina State Medical Assistance Team (SMAT) and the North Carolina EMS Office of the State. The main content is a bulleted list of capabilities. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "1-18" on the right.

- Provision of medical treatment
- Assistance at hospitals
- Provision of rapid (gross) decontamination
- Responder treatment and rehabilitation
- Augment SMAT II Teams

**SMAT III Capabilities:**

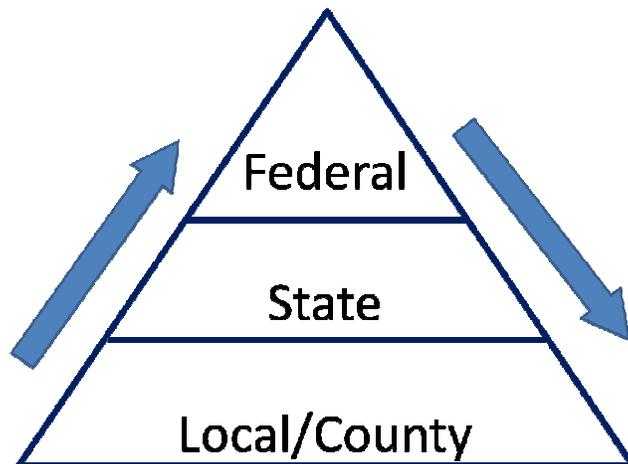
- Provision of medical treatment and triage
- Assistance at hospitals
- Provision of rapid victim decontamination
- Provision of responder treatment and rehabilitation

**Team Composition:**

- Each team should consist of at least seven members during a deployment. At a minimum there must be at least one paramedic and six EMTs or higher on each deployment. Each team should be trained three deep for each position, to provide for three complete shifts.
- Other medical professionals and support staff may be added to support of the team's operation.

**Activation:**

SMAT III can be activated on a local, regional, or statewide level. Response time is mission specific and expected to be 1-6 hours from the time of notification.



***Figure 1-3: SMRS Provides for Integrated Emergency Response throughout all Jurisdictions***

***Every Event Begins Locally and Ends Locally***

## SMRS Levels of SMAT Activation



### SMRS Activation



- Notice Events
- No-Notice Incidents



Photo courtesy of  
NCDHHS

State Medical Assistance Team Training1-19

The levels of SMRS activation will follow the types of event/disaster that necessitate the activation and utilization of the SMRS resources.

Activating SMRS Resources

- Notice Event
  - Advisory
  - Alert
  - Activation
  - Demobilization



Photo courtesy of NCOEMS

State Medical Assistance Team Training 1-20

**Notice Events:** In this type of event the elements of the SMRS are placed on alert status that signal a moderate to high probability of deployment. This might involve the entire system or elements of the system driven by the nature and expected impact of the disaster. Pre-planning in support of a mass gathering event fall into this category of activation. Another variation of a notice event is when a disaster or event (such as a hurricane, earthquake, etc.) occurs in another state and the NC SMRS might be requested under the EMAC for deployment out of State.

**Advisory:** In the Advisory, teams are notified of a potential need. Team Members are to notify family and employer of the team Advisory. At this time SMRS Leadership and Team Command Staff members are briefed. Team Members assess availability, health status and readiness of personal deployment equipment.

**Alert Notification:** In the Alert Phase, messages go out to the responders registered in SERVNC as to an impending deployment. Call down lists (call trees and electronic messaging) are initiated by the NCOEMS to the Regional and Local governing entities. It is expected that responders would then make the necessary arrangements to deploy, initiate their Family Emergency Response Plan (Family Disaster Plan), ensure they had clearance from their employers to deploy, and check their personal equipment. (These topics will be covered in greater detail in *Module 2: Deployment Readiness*).

**Activation Notification:** Once the need is established for various elements or the entire SMRS, the message is generated by way of the same means listed above (SERVNC, call down lists and electronic messaging) notifying team members of activation, rally point, assembly time, departure time, expected deployment location, and expected duration of deployment.

**Demobilization Notification:** Once the mission is complete or the need for the SMRS resources is no longer there, team members will be notified as to striking of base camp operations, loading, departure time and date and subsequent arrival at home station, and the refurbishment and restocking activities following the deployment.

Based on the incident / event and whether it is a notice event or no-notice incident, SMRS members will receive electronic notifications from the SERVNC (discussed in the section about the SERVNC Online Registration System) in the following order:

- Advisory- An event has occurred that COULD require deployment of SMRS resources
- Alert – Information provided that mission and deployment orders are expected
- Activation – Deployment orders given
- Stand down (Demobilization) – Termination of SMRS Alert status

 **Activating  
SMRS Resources** 

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No-Notice Incident

- Advisory
- Alert
- Activation
- Demobilization



State Medical Assistance Team Training 1-21

**No-Notice Incident:** This type of activation is the most difficult. It includes little or no period of lead time to preplan for the response, to include the resources needed, and could result in a more problematic response. Events such as a tornado strike, a catastrophic failure of utilities serving a medical facility, a terrorist event, or large-scale transportation incidents are examples in which a response with little or no warning will press a SMAT team into action. In this case, activation may occur at a local or regional level with NCEM and NCOEMS, or may be triggered by a local request and approval for the mission by the team commander for the specific SMAT team. Lacking state approval for the response could create problems with reimbursement for the related costs of the response or legal protections extended to the team when acting on behalf of the state of North Carolina.

**Table 1.2: Notifications and Actions**

NOTIFICATION	ACTIONS		
	OEMS	Team Leaders	Team Members
<b>Advisory</b>	<p>Advise teams of a potential need</p> <p>Provide SMRS Leadership with known information</p> <p>Monitors situation &amp; updates SMRS Leadership</p>	<p>Notify Team members of Advisory</p> <p>Conduct Team Command Staff briefing</p> <p>Evaluate Team's equipment</p> <p>Identify &amp; address shortfalls</p>	<p>Notify family and employer of the team Advisory &amp; known information</p> <p>Assess availability to deploy; health status</p> <p>Assess readiness of personal deployment equipment</p> <p>Notify Team Leader of availability</p>
<b>Alert</b>	<p>Notify SMRS Leaders that mission orders are expected and known information</p> <p>Develop situation report to be transmitted by SERVNC</p> <p>Request that SMRS teams provide their readiness status and short falls</p> <p>Address SMRS short falls for equipment and personnel</p> <p>Select first out resources and notifies the Team Leaders</p> <p>Activate advance Mission Coordination Team</p> <p>Staff NC EM EOC</p>	<p>Notify team members &amp; employers of imminent mission &amp; known timelines</p> <p>Roster Team</p> <p>Ready requested equipment &amp; supplies for deployment</p> <p>Notify OEMS of any staff, equipment or supply short falls</p>	<p>Notify family &amp; employers of probable deployment &amp; timelines</p> <p>Notify Team Leader of any changes in availability</p> <p>Check operational status of cell phone, email &amp;/or pager</p> <p>Assure personal gear is ready &amp; packed</p> <p>Activate your personal deployment plan</p>

<p><b>Activation</b></p>	<p>Deploy the Advance Mission Coordination Team</p> <p>Issue deployment orders to selected teams &amp; update mission data, travel plan, directions, staging area and reporting information</p> <p>Conduct conference call with non-deployed SMRS Leaders to provide mission briefing and schedule regular updates</p>	<p>Notify team members of time and location to report</p> <p>Complete the convoy plan</p> <p>Assign vehicles</p> <p>Assign drivers</p> <p>Final vehicle &amp; radio checks</p> <p>Provide deploying members with duty roster and ICS chart</p> <p>Confirm Home Station Duty Officer has emergency data on each deployed team member</p>	<p>Report to duty station at least one hour prior to departure time</p> <p>Park private vehicle in designated area, lock and place spare key in Team "lock box"</p> <p>Health check</p> <p>Attend team briefing</p> <p>Final check of "Go Bag"</p> <p>Fill water bottles / camel back</p> <p>Restroom break prior to departure</p> <p><b>FOLLOW ORDERS AT ALL TIMES!</b></p>
<p><b>Demobilization (stand down)</b></p>	<p>Notify all SMRS Team Leaders via SERVNC</p> <p>Notify all SMRS members via SERVNC</p> <p>Schedule After Action Review Conference Call with all SMRS Team Leaders within two weeks</p> <p>Write AAR &amp; disseminate Findings and Any Corrective Actions within one month</p>	<p>Notify all SMRS Team Leaders via SERVNC</p> <p>Notify all SMRS members via SERVNC</p> <p>Schedule After Action Review with all SMRS Team members within two weeks</p> <p>Write AAR &amp; disseminate Findings and any Corrective Action Plans</p>	<p>Attend AAR</p> <p>Replace and restock private "Go-Bag"</p> <p>Ready for next deployment</p> <p>Initiate Corrective Plan</p>

## Volunteer Registry



**SERVNC**

- SERVNC Online Registration System
  - Facilitates inter- and intra-state activities during emergencies
  - <http://www.SERVNC.org>
    - Credentialing
    - Liability
    - Medical Reserve Corp (MRC)

State Medical Assistance Team Training 1-22

A registration process is vital to the operations of any disaster response team. It must share information by providing answers to interested candidates and gather information about potential team member candidates. To be effective, the registration process must address the following important areas:

- **Credentialing:** the process by which volunteers' degrees, certificates, licenses, and training are verified.
- **Liability:** the explanation and legal rights and responsibilities of becoming a SMAT member, including patient care delivery, personal injury or illness, human resource management, etc.

Any person who is willing to volunteer to be deployed locally, regionally, statewide, and/or nationally in the event of a disaster is encouraged to register through an Internet-based registry called SERVNC. In order to practice their skills (healthcare, etc.) they must have current North Carolina credentials in their area of expertise (i.e. a Paramedic living in South Carolina must have current North Carolina credentials in order to function as a Paramedic in North Carolina). Through SERVNC, NCOEMS and other state agencies are able to create a roster of volunteers whose skills meet those identified as needed to respond in any given disaster. SERVNC will help to mobilize needed workforce on short notice.

### SERVNC Online Registration System

SERVNC ([www.SERVNC.org](http://www.SERVNC.org)) is the Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP) (federal system) for North Carolina and is designed to assess and register state Volunteer Health Professionals to facilitate their interstate and intrastate activities during medical, public health, and other emergencies. SERVNC has a wider array of options and meets more of the needs of North Carolina response organizations than the basic system requirements for the federal ESAR-VHP. SERVNC was designed to address this encompassing need of addressing the federal requirement as well as serving as the core function for State Medical Assistance Teams (SMAT) and volunteers who choose to register for a team.

SERVNC is the state registry system portal where all responders who wish to volunteer in a disaster are registered. SMAT members, as well as public health and veterinary responders and Medical Reserve Corps volunteers, are registered through this portal.

The registration process is simple and takes approximately 45 minutes to complete. As a potential or new SMAT member (if you have not already done so) go to [www.SERVNC.org](http://www.SERVNC.org) and register. During registration you will be asked for contact information, deployment preferences, medical history, occupation, and skills. If you are not already assigned to a response team, registrants may request to join a team already listed on SERVNC.

In the event of an emergency, SERVNC will electronically check the volunteers' medical credentials, send a message to the volunteers via e-mail, telephone, and/or pager, and provide notification of all mission-specific information and instructions for accepting or declining the mission. Registration in the SERVNC System as well as the Medical Reserve Corps (MRC) assists with certification and management support.

## Demonstrating Integration in Medical Reserve Corps

Medical Reserve Corps

- Developed post-9/11 attacks
- Provides the structure necessary to:
  - pre-identify,
  - credential,
  - train, and
  - activatemedical and public health volunteers.

State Medical Assistance Team Training1-23

Per the Medical Reserve Corps website <http://medical-reserve-corps.co.tv/>

The Medical Reserve Corps (MRC) is a network of community-based units initiated and established by local organizations to meet the public health needs of their communities. It is sponsored by the Office of the Surgeon General of the United States. It was founded after President Bush's 2002 State of the Union Address, in which he asked all Americans to volunteer in support of their country. The MRC consists of medical and non-medical volunteers such as medical and public health professionals (e.g., physicians, nurses, allied health professionals, pharmacists, dentists, veterinarians, and epidemiologists) as well as other community members (e.g., interpreters, chaplains, office workers, legal advisors) who may fill key support positions. These volunteers may contribute to local health initiatives, such as activities meeting the Office of the Surgeon General priorities for public health, and supplement existing response capabilities in times of emergency.

The MRC is a partner program of Citizen Corps, a national network of volunteers dedicated to ensuring hometown security. Citizen Corps, along with the Corporation for National and Community Service and the Peace Corps are part of the President's USA Freedom Corps, which promotes volunteerism and service nationwide (Drabczyk, 2007).

As stated on the Medical Corps website "The events of September 11, 2001, revealed a deficit in our nation's preparedness when many medical providers who wanted to help alleviate the strain on local medical systems where the terror incidents occurred arrived on their own and at personal risk. Despite their intentions, their presence became problematic for emergency managers due to difficulties that arose surrounding the use of spontaneous, unaffiliated volunteers. Issues such as credentialing, liability, and management rose to the forefront. The MRC provides the structure necessary to pre-identify, credential, train, and activate medical and public health volunteers. In the fall of 2007 the name was modified by the United States Department of Health and Human Services to read "Office of the Civilian Volunteer Medical Reserve Corps" (OCVMRC)."

## SMAT LEGAL, REGULATORY, AND ETHICAL ISSUES



### Legal, Regulatory, & Ethical Issues



- North Carolina Emergency Management Act of 1977—Chapter 166A
  - Capacity and capabilities
  - Judicial boundaries for each county
  - Immunity and exemption issue for responders
  - Defines “emergency management worker”

State Medical Assistance Team Training1-24

### *State Legal and Regulatory Issues in Disasters and Public Health Emergencies*

Neither this module nor the contents throughout this course should be construed as a legal interpretation of federal, state, or local law or regulations or interpreted as allowing any given behavior by a health or medical professional. It is presented for the purpose of topical education and training in order to bring awareness of these important issues to the SMAT members completing the program.

One important piece of legislation and regulation is the North Carolina Emergency Management Act of 1977 – Chapter 166A. The intent of this act is to set forth the authority and responsibility of the governor, state agencies, and local governments in prevention of, preparation for, response to, and recovery from natural or human-made disasters or hostile military or paramilitary action. The provisions of this Act are set in motion after a proclamation of a state of disaster by the governor or by the General Assembly, or upon the activation of the State Emergency Response Team in response to a disaster or emergency.

Within those responsibilities, this act calls upon the governor, General Assembly, state agencies, and local governments to set in place capacity and capabilities to:

- Reduce vulnerability of people and property of this state to damage, injury, and loss of life and property.
- Prepare for prompt and efficient rescue, care, and treatment of threatened or affected persons.
- Provide for the rapid and orderly rehabilitation of persons and the restoration of property.
- Provide for cooperation and coordination of activities relating to emergency and disaster mitigation, preparedness, response, and recovery among agencies and officials of this state and with similar agencies and officials of other states, with local and federal

governments, with interstate organizations, and with other private and quasi-official organizations.

This act also sets the jurisdictional boundaries at the level of the governing body of each individual county. It states that all emergency management efforts within a county are coordinated by the county and follows the axiom that "all disasters are local". This act further directs that the counties will coordinate the voluntary registration of those residents with functional and /or medical needs that place them as more vulnerable to the effects of a disaster. It further states that all information, records, and data concerning those functionally or medically fragile individuals be held confidential but be made available to the County Emergency Management structure.

The NC Emergency Management Act also addresses immunity and exemption issues for those identified as responders and acting in such roles in times of a disaster or state of emergency as declared by the governor or General Assembly. This act states that all functions and activities relating to emergency management are declared to be governmental functions and as such are not liable for the death of or injury to persons or for damage to property as a result of any such activity except in cases of willful misconduct, gross negligence, or bad faith.

Of utmost importance to the SMRS, this act also defines the term "emergency management worker" to include any health care worker performing health care services as a member of a hospital-based or county-based State Medical Assistance Team designated by the North Carolina Office of Emergency Medical Services and any person performing emergency health care services under G.S. 90-12.2.

The act goes further to state that any member of a volunteer fire department, rescue squad, or emergency medical services agency called into service of the state shall have the right to take leave without pay from his or her civilian employment. It further states that no member of a volunteer fire department, rescue squad, or emergency medical services agency shall be forced to use or exhaust his or her vacation or other accrued leave from his or her civilian employment for a period of active service. The choice of leave shall be solely within the discretion of the member. As an SMRS Team member it is incumbent upon the SMAT member to discuss availability with an employer and enlist their support prior to deployment.

## NC Volunteer Health Care Professionals Bill



### NC Senate Bill 160



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- NC Volunteer Health Care Professionals Bill
  - Limitations of liability for anyone who volunteers to provide health care
  - Designed to protect volunteers who treat patients for no payment

State Medical Assistance Team Training1-25

In April 2001, the North Carolina Senate passed a bill (Senate Bill 160 adopted April 2001, re-codified as NC General Statute 90-21.16) also known as Volunteer Health Care Professionals; Liability Limitation. This bill extended the limitations of liability for anyone who “volunteers” to provide health care and emergency services. It also maintains liability insurance covering the acts and omission of the free clinic and any liability pursuant to subsection (a) of this section.

The aim of this revision was to extend protection to those who volunteer their time and expertise rendering aid to the sick and injured for no payment. Nevertheless, this act does not protect against liability of damages from injury or death caused by errors or omissions based on the standard of care for those who function outside the boundary of the standard of care that should have been provided by someone of equal medical credential.

## SMAT Field Operations and Responder Legal Considerations

### Standard of Care and Sufficiency of Care Issues

Standard of Care vs Sufficiency of Care	
<b>Standard of Care</b>	<b>Sufficiency of Care</b>
The Joint Commission (TJC) recommended bed location and spacing	Utilization of non-care areas for patient care (beds in conference rooms, etc.)
Resuscitation of all cardio-pulmonary arrests that present	With overwhelmed resources, no resuscitation of those presenting in CP arrest
Approved hospital beds	Use of non-approved hospital beds (Cots)

State Medical Assistance Team Training 1-26

The objective of the SMAT is to functionally deliver health care during disaster and public health emergencies. To that mission it is important for each SMAT member to have an understanding of the governance, and legal and regulatory issues that affect field operations in the delivery of health and medical services during such times.

As with most medical resources and assets, personnel who hold a medical credential have a general **Duty to Act** when confronted with a medical or traumatic emergency in their particular professional setting. This includes any incident where a medical component includes a response of the SMAT.

A principal umbrella of protection that is afforded a state or governmental agency response is known as **Sovereign Immunity** that can be applied to responders who otherwise act in good faith and provide care that is consistent with the **Standards of Care** for a given professional who holds the same credential, provided the individual is considered acting as an agent of or on behalf of the state or unit of government.

The **Standard of Care** is generally considered that level of care, effort, expertise, etc. which would typically be provided by a reasonable and prudent medical provider holding a similar credential in a similar work environment.

In the disaster medicine environment, there is an often-held notion that altered standards of care or a **Sufficiency of Care** model must be considered when the nature of the disaster rises to such level that resources are unavailable or must be rationed, or caregivers are outnumbered and overwhelmed by the event in terms of the number of patients or the circumstances of the event. While these matters may seem to be readily apparent in the medical community, the aftermath of Hurricane Katrina should remind medical responders that this issue remains in flux in the legal community. Following Hurricane Katrina, several hospitals lost basic utilities and were unable to evacuate patients. There, they were confronted with dire and drastic decisions. Nevertheless, these decisions were questioned and in some cases resulted in legal action

directed against the medical personnel who, despite these conditions, were left in court defending their actions.

Comparisons of Standard of Care vs. Sufficiency of Care	
Standard of Care	Sufficiency of Care
The Joint Commission (TJC) recommended bed location and spacing	Utilization of non-care areas for patient care (beds in conference rooms, etc.)
Resuscitation of all cardio-pulmonary arrests that present	With overwhelmed resources, no resuscitation of those presenting in CP arrest
Approved hospital beds	Use of non-approved hospital beds (Cots)

These issues and the circumstance and actions to be taken when a local standard of care is likely to degrade to a sufficiency of care should be discussed well before the disaster. It should be considered with outlines developed to address generally foreseeable thresholds where a Sufficiency of Care model may be triggered. If available, and where possible, any altered standards of care guidelines should also be reviewed by a medical ethics committee for the sponsor hospital of the specific SMAT or other oversight agency.

Once the Duty to Act is established and the care to be delivered is covered by the Standards of Care, the patient **consent** should be addressed. Consent can be in one of two forms, **Informed or Implied consent**. Informed consent is a legal and binding agreement between the caregiver and the patient for the provision of medical care. The patient **informs** the caregiver of his or her consent and the patient meets standards associated with being able to make this decision (conscious, alert, and of age to grant consent).

Patients who are either unconscious or incapacitated by either an injury or whose decision-making process is compromised by a chronic diminished mental capacity, or an acute diminished mental capacity brought on by either drugs or alcohol or other mind altering influence, may allow for an **implied consent**. However, consent is a very important issue and is complicated by many issues. These issues may include age, power of attorney to legal guardians, religious or cultural preferences, etc. When considering implied consent only actions that clearly are immediately needed to save or sustain a life should be undertaken initially.

Once the consent contract is established, breaching it and leaving the patient without the provision of ongoing care when the provision of ongoing care is indicated, is considered **abandonment**. However, if the patient has a need that can be met by someone of a lesser certification or license, and the person of medical authority deems this care can be transferred to someone of a lesser certification or license, this action is known as **delegated practice**.

Once a contract of care has been established between the caregiver and the patient, actions that are outside the bounds of the standard of care, either acts of commission or omission, may constitute **negligence**. To prove negligence, the patient must not only prove the act was in error but a causal effect must also be established that links the error of omission or commission to the poor outcome that would have otherwise been avoided had the caregiver acted in a manner that was typical with the standards of care. Professional medical negligence is typically referred to as **medical malpractice**.

## Health Information Portability and Accountability Act (HIPAA)

**Health Information Portability  
and Accountability Act (HIPAA)**

- U.S. Secretary of HHS may waive sanctions and penalties related HIPAA in Disasters
  - Providers may share patient information to provide treatment
  - Providers can share an individual's location, condition, or death
  - Providers can share information to lessen threats to health and safety
  - Healthcare facilities may share directory of patients and general condition of patients

State Medical Assistance Team Training1-27

The Health Information Portability and Accountability Act (HIPAA) was created with the intent to ensure an individual's personal health information remains protected and access to it is restricted specifically to those involved in the care of the patient, consulted for care of the patient, or in the conduct of business to bill for the services related to the care of the patient. It further provides options for who, on behalf of the patient, can discuss Protected Healthcare Information (PHI).

The HIPAA Privacy Rule is not suspended during a national or public health emergency. However, certain provisions of the rule can be waived by the US Secretary of the Department of Health and Human Services (HHS) during a national or public health emergency. These provisions of HIPAA may be suspended when and if the President of the US declares an emergency or disaster and concomitantly the Secretary of HHS declares a public health emergency. If the above conditions are met, the Secretary of HHS may waive the sanctions and penalties against a covered healthcare system that does not comply with the following provisions of the HIPAA Privacy Rule:

- The requirements to obtain a patient's agreement to speak with family members or friends involved in the patient's care (45 CFR 164.510(b)).
- The requirement to honor a request to opt out of the facility directory (45 CFR 164.510(a)).
- The requirement to distribute a notice of privacy practices (45 CFR 164.520).
- The patient's right to request privacy restrictions (45 CFR 164.522(a)).
- The patient's right to request confidential communications (45 CFR 164.522(b)).

If the U.S. Secretary of HHS issues such a waiver, it only applies:

- In the emergency area and for the emergency period identified in the public health emergency declaration.
- To hospitals that have instituted a disaster protocol. The waiver would apply to all patients at such hospitals.

- For up to 72 hours from the time the hospital implements its disaster protocol.

When the Presidential or Secretarial declaration terminates, a hospital must then comply with all the requirements of the Privacy Rule for any patient still under its care, even if 72 hours has not elapsed since implementation of its disaster protocol.

Regardless of the activation of an emergency waiver, the HIPAA Privacy Rule permits disclosures for treatment purposes and certain disclosures to chartered disaster relief organizations such as the American Red Cross so it can notify family members of the patient's location. See 45 CFR 164.510(b)(4).

During Hurricane Katrina, HIPAA became a flashpoint in terms of sharing information resulting in the Centers for Medicare and Medicaid Services (CMS) issuing a memorandum that outlined the points noted below:

**Centers for Medicare and Medicaid Services: Key HIPAA Points following Katrina**

**Treatment:** Healthcare providers can share patient information as necessary to provide treatment.

**Notification:** Healthcare providers can share patient information as necessary to identify, locate, and notify family members, guardians, or anyone else responsible for the individual's care, the individual's location, general condition, or death.

**Imminent Danger:** Providers can share patient information with anyone as necessary to prevent or lessen a serious and imminent threat to the health and safety of a person or the public, consistent with applicable law and the provider's standards of ethical conduct.

**Facility Directory:** Healthcare facilities maintaining a directory of patients can tell people who call or ask about individuals whether the individual is at the facility, their location in the facility, and general condition.

# HEALTHCARE INFRASTRUCTURE PLANNING AND PARTNERS

## Healthcare Infrastructure: Community, State, and Federal Disaster Planning



### Healthcare Infrastructure



- Community, state, and federal disaster planning
- Roles and responsibilities
  - Mitigation
  - Preparedness
  - Response
  - Recovery



Photo courtesy of WCCEMS

State Medical Assistance Team Training1-28

Planning at all levels, from local, regional, state, and federal, is necessary to meet the needs and demands a disaster imposes on a location. It is not so much the plan itself but rather the planning process that brings all the community elements together to work toward a common goal that is the core value in this process. All elements of the community healthcare infrastructure have an important role in disaster response and must be involved in this process (RACs greatly facilitate this process). By convention, it is a necessity that all healthcare facilities, public health services, and mental-behavioral facilities and entities have an Emergency Response Plan (e.g., disaster plan). It must be regularly updated and accessible to all relevant agencies and personnel. Training and exercises that focus on activation and implementation of these plans are important. North Carolina Regional ESF-8 Response and Recovery Plans have just been developed for all RAC regions and serve as valuable planning documents and as resource material.

An operational definition of *disaster* is when the healthcare need exceeds the available resources of the healthcare infrastructure. As seen in several past disasters, notably the events of September 11, 2001, and the major hurricanes that have affected our Gulf Coast and Eastern Seaboard, healthcare and public health resources and systems may be quickly overwhelmed either by the direct impact of the event and loss of infrastructure or the sheer volume of casualties requesting services.

Medical supplies may be limited due to damage and loss of infrastructure. Pharmaceuticals, consumable medical supplies, and durable medical equipment will be in short supply due to the

fact that today's economy demands that healthcare facilities maintain only a small inventory to handle their day-to-day short-term patient loads. Dependent on the nature of the event itself there also may be a demand for specialized medications, medical equipment, immunizations, and / or mental health interventions. This increased demand in services and supplies will of necessity involve the entire spectrum of healthcare, public health, and mental healthcare.

### ***Healthcare Infrastructure Roles and Responsibilities***

The major areas of roles and responsibilities to coordinate and provide oversight of operations are the following:

**Mitigation:** Evaluate the community (or jurisdiction) for threats utilizing the Hazard Vulnerability Analysis (HVA) and seek strategies, plans, and projects that would lessen the impact of that hazard on the jurisdiction. Included in this is the participation and facilitation of the jurisdictional planning process, training, and conduct of exercises to evaluate those plans.

**Preparedness:** This involves activities specific for the health sector to prepare for a disaster. This would include planning, the development of protocols to be used in the field, training in the use of equipment and many other activities to ensure that an organization is able to function properly during an emergency.

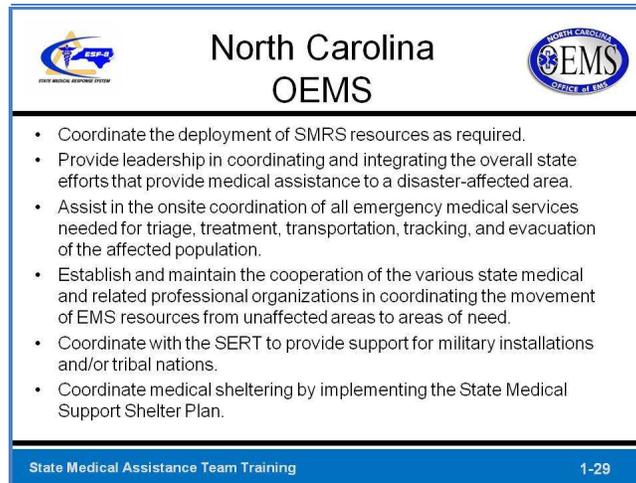
**Response:** Responsible for assigning and sending forth elements to do initial damage surveys and formulate the elements of the agencies, personnel, equipment, and supplies that are needed to effect the initial stabilization of the impacted area and rescue of the victims affected. This would include activating or enlisting the ESF-8 component of the NC Emergency Management Plan to provide for:

- Assessment of medical needs
- Provision of medical care personnel
- Provision of medical equipment and supplies
- Coordination assistance for transportation of medical supplies
- Coordination assistance for transportation of personnel
- Coordination assistance for evacuation of patients
- Provision of emergency responder health and safety
- Provision of medical command and control
- Emergency Medical Services

**Recovery:** Utilizing the information gathered from the initial damage survey and subsequent scene surveys, the coordinator will assist in the formation and coordination of the local, regional, state, and federal programs and assets that will begin the recovery process for the short-term, mid-term, and long-term establishment of the affected area. This may include management of grant programs to bring the community back to the pre-disaster level of function.

The Response and Recovery Coordinator is responsible for coordinating and providing guidance in these four areas. The mitigation, preparedness, response, and recovery efforts require a large number of personnel and agency prioritization to be effectively operational. This coordinator is the central point of this integration and provides for emergency management coordination of these important phases.

## NORTH CAROLINA OFFICE OF EMERGENCY MEDICAL SERVICES



The image shows a slide titled "North Carolina OEMS". On the left is the logo for the State Medical Assistance Team (SMAT) with the text "STATE MEDICAL ASSISTANCE TEAM". On the right is the logo for the North Carolina Office of EMS with the text "NORTH CAROLINA OFFICE OF EMS". The main content is a bulleted list of seven roles. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "1-29" on the right.

- Coordinate the deployment of SMRS resources as required.
- Provide leadership in coordinating and integrating the overall state efforts that provide medical assistance to a disaster-affected area.
- Assist in the onsite coordination of all emergency medical services needed for triage, treatment, transportation, tracking, and evacuation of the affected population.
- Establish and maintain the cooperation of the various state medical and related professional organizations in coordinating the movement of EMS resources from unaffected areas to areas of need.
- Coordinate with the SERT to provide support for military installations and/or tribal nations.
- Coordinate medical sheltering by implementing the State Medical Support Shelter Plan.

The North Carolina Office of Emergency Medical Services resides with the Division of Health Services Regulation of the North Carolina Department of Health and Human Services.

The mission of the NC Office of Emergency Medical Services (NCOEMS) is to foster emergency medical systems, trauma systems and credentialed EMS personnel to improve in providing responses to emergencies and disasters, which will result in higher quality emergency medical care being delivered to the residents and visitors of North Carolina.

Important roles for NCOEMS are listed below:

- Coordinate the deployment of SMRS resources as required.
- Provide leadership in coordinating and integrating the overall state efforts that provide medical assistance to a disaster-affected area.
- Assist in the onsite coordination of all emergency medical services needed for triage, treatment, transportation, tracking, and evacuation of the affected population.
- Establish and maintain the cooperation of the various state medical and related professional organizations in coordinating the movement of EMS resources from unaffected areas to areas of need.
- Coordinate with the SERT to provide support for military installations and/or tribal nations.
- Coordinate medical sheltering by implementing the State Medical Support Shelter Plan.

## SPECIALTY TEAMS



The slide titled "Specialty Teams" features the NCEM logo on the left and the North Carolina EMS logo on the right. The central text lists three teams: Special Operations Response Team (SORT), State Mortuary Operations Response Team (SMORT), and Healthcare Facility Rapid Assessment Team (HFRAT). The footer contains "State Medical Assistance Team Training" and "1-30".

### **SORT**

The Special Operations Response Team (SORT) is a private, non-profit organization based in Forsyth County (Winston-Salem) consisting primarily of physicians, nurses, paramedics, physician assistants, nurse practitioners, veterinarians, firefighters, and law enforcement officials.

The SORT functions as a rapid medical response team prepared to provide support ranging from an austere medical setup for a natural disaster to a large-scale decontamination area as a result of a HAZMAT incident or terrorist event. As a part of the SMRS, the SORT responds both locally and statewide. Response time is mission specific but no later than six hours from notification.

Specific capabilities of SORT include the following:

Rapid deployment of a medical response team capable of providing medical care in a disaster or special event, including strike teams (four to five person) for medical assistance.

Assistance with the establishment of the following:

- 150-bed alternate care facility
- Special Medical Needs shelter
- Mass immunization/drug distribution center
- Provision of medical treatment and rehabilitation for responders
- Establishment of a field medical station
- Provision of rapid decontamination and specialized medical care

## **SMORT**

The State Mortuary Operations Response Team (SMORT) is a team of professionals established to provide victim identification and mortuary services during an emergency. North Carolina currently has one (1) SMORT based in Buncombe County and affiliated with Buncombe County Emergency Management. As part of the SMRS, the SMORT functions as a rapid mortuary response team that is prepared to augment local mortuary operations during a disaster and other incidents involving mass fatalities. Response time is mission specific. Specific capabilities include the following:

- Initial scene response and evaluation
- Scene processing
- Temporary morgue operation and administration
- Victim identification
- Personal effects collection
- Various forensics roles (e.g., pathology, anthropology, deontology, radiology, fingerprinting, DNA analysis, funeral director)
- Disposition of human remains
- Embalming/casketing

The team operates in cooperation with local medical examiners and the North Carolina Office of the Chief Medical Examiner and is composed of funeral directors, medical examiners/coroners, pathologists, forensic anthropologists, fingerprint specialists, forensic odontologists, dental assistants, radiographers, and other death care professionals and support staff. The SMORT houses a standardized mobile package that includes the basic equipment needed for a response.

## **HFRAT**

Health Facility Rapid Assessment Teams (HFRAT) are state-level teams designed to assess healthcare facilities that have sustained damage that may affect patient services during a disaster or an incident. The HFRATs are constituted and deployed by the North Carolina Division of Health Service Regulation under the direction of the North Carolina Office of Emergency Medical Services. As part of the SMRS, HFRAT can be activated in order to assess the medical infrastructure within a community to determine basic capabilities, otherwise known as Essential Elements of Information (EEI) during local, regional, and/or statewide disasters. Response time is mission specific.

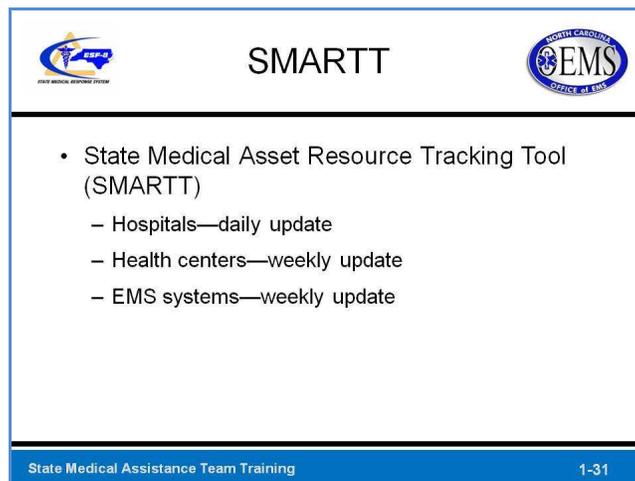
Specific capabilities include the following:

Rapid assessments of hazards, electrical, water, HVAC, communications, pharmaceutical and medical supplies, and staffing

Facilitation of emergency medical decisions regarding healthcare infrastructure

Team members will be categorized by their agency and their skills within their agency. Teams are composed of team leaders, healthcare construction specialists, and long-term care/adult care specialists at a minimum. Health professionals and pharmaceutical specialists may also be included. HFRATs have a standardized mobile package that includes the basic equipment needed for a response.

## STATE MEDICAL ASSET RESOURCE TRACKING TOOL (SMARTT)



The State Medical Asset Resource Tracking Tool (SMARTT) is a web-based tool that is used to monitor hospital, EMS system, and health center resources on a regular basis. SMARTT also serves as a sophisticated communications tool that allows information to be disseminated throughout a state's healthcare system. SMARTT is a multi-state system in use by the states of North Carolina, South Carolina, Mississippi, and West Virginia. Other states are invited to use the system.

North Carolina, through NCOEMS, uses the SMARTT tool on a daily basis. Each hospital provides a daily update of information that includes hospital bed availability, specialty service capability, and disaster resources. Health centers provide information on a weekly basis that identifies clinical services offered, laboratory capabilities, and any inpatient bed capacity. EMS systems provide information on a weekly basis to identify personnel and vehicle availability as well as resource capabilities that may be needed in the event of a disaster. Through the use of SMARTT, resources are quickly identified and made available for use in the event of a local, regional, or statewide disaster.

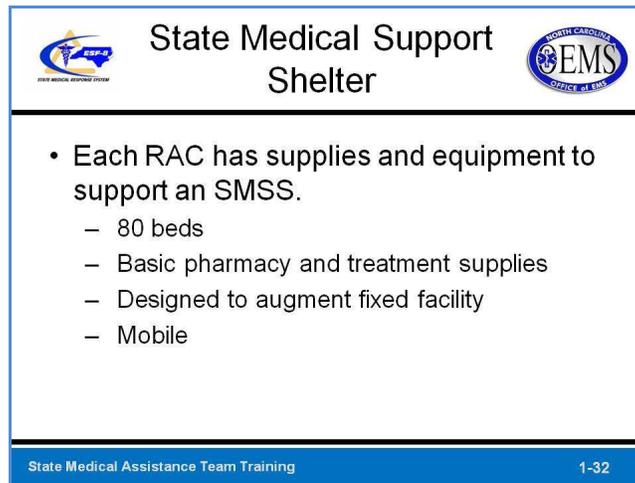


**Figure 1-4: Sample image of NC SMARTT**

While systems like the SMARTT have limitations, such as the time of day the data is collected in terms of discharges and admissions, it can provide general trending data. Furthermore, given the depth and breadth of data from a repository of this size, it can be quite useful in predicting trends, limitations, and availability of resources. Furthermore, the system can produce a report in a given geographical area, or an entire state, for purposes ranging from exercises to real-time needs during a disaster.

Additional information on the SMARTT tool is available at <http://www.emspic.org/?q=node/7>

## State Medical Support Shelter (SMSS)



**State Medical Support Shelter**

- Each RAC has supplies and equipment to support an SMSS.
  - 80 beds
  - Basic pharmacy and treatment supplies
  - Designed to augment fixed facility
  - Mobile

State Medical Assistance Team Training 1-32

In general, State Medical Support Shelter (SMSS) support begins at the local level and transitions to state and federal levels when the capacity to respond at the previous level has been exceeded. It also addresses challenges associated with the care of medical needs patients during a disaster through the location and registration of these citizens before an event.

Patients with functional medical needs include:

- People with minor health/medical conditions that require observation, assessment, and maintenance that exceed the capability of the congregate shelter staff.
- People with chronic conditions who require assistance with activities of daily living, or who need more skilled non-acute nursing care but do not require hospitalization.

The SMSS is modeled after a federal concept, known as the Federal Medical Support Shelter (FMSS). The FMSS concept of operations (CONOPS) includes beds, supplies, and medicine to treat 250 people for up to three days. The FMSS includes base medical support, treatment, and pharmacy.

Each RAC has supplies that includes 80 beds, basic pharmacy and treatment supplies, and is designed to augment more robust mobile or fixed medical facilities. This SMSS equipment cache is contained within a tagalong trailer and a 48-foot refrigerated trailer with supplies and can be deployed to a SMAT.

The SMSS staffing is generally focused on chronic health problems or minimal acute medical needs. These resources are typically coordinated by the NC ESF-8 lead (NCOEMS) and may be used either as a standalone or in support of other similar or complementary assets.

The SMSS needs to be housed in an indoor location. Locations may include (but are not exclusive to) gymnasiums, unoccupied fixed facilities. The typical footprint for a SMSS is a 30,000 square foot enclosed climate controlled space. Additional needs include support

services; communications, information technology, food and water, waste disposal, medical oxygen, laundry, refrigeration and controlled substance storage, bathroom and shower capability, and security.

## SMAT INTEGRATION WITH PUBLIC HEALTH



### SMAT Integration with Public Health



- Medical and public health response must be integrated
- Pre-disaster planning (e.g., pandemic Influenza)
- Post-disaster transition to public health



Photo courtesy of  
NCCEMS

State Medical Assistance Team Training

1-33

Public health plays an integral role in disaster preparedness and response. While the scale of involvement and range of expertise may vary depending on the nature of the disaster, the role of public health in a disaster is essential for disease control, environmental health, and in managing many of the longer-term issues that affect human health. The North Carolina Division of Public Health is an active partner in responding to the health needs of victims. Basic requirements for health such as food, water, shelter, and security must be addressed early in a disaster and often fall to public health authorities. Pre-disaster planning and exercises on the part of public health agencies is paramount in reducing morbidity and mortality to improve the survival of the people affected. Post-disaster elements of the public health response include many of the daily activities they are already involved with, such as food and water safety, sanitation issues, vector control, epidemiological investigations, and disease tracking.

## Emergency Management Assistance Compact (EMAC)

 Emergency Management Assistance Compact (EMAC) 
<b>EMAC Activation Process:</b> <ul style="list-style-type: none"><li>• Pre-Event preparation</li><li>• Activation</li><li>• Request and offer<ul style="list-style-type: none"><li>– Requesting state</li><li>– Assisting state</li></ul></li><li>• Relevance to SMAT</li></ul>
State Medical Assistance Team Training <span style="float: right;">1-34</span>

### EMAC Definition and Purpose

The Emergency Management Assistance Compact, commonly known as EMAC, is a mutual aid agreement and partnership between states and territories of the United States. The 104th U.S. Congress ratified the Compact in 1996. The full text of the resolution can be viewed at [http://biotech.law.lsu.edu/blaw/general/104\\_321.pdf](http://biotech.law.lsu.edu/blaw/general/104_321.pdf).

All U.S. states, the District of Columbia, U.S. Virgin Islands, Puerto Rico, and Guam are members of EMAC. EMAC was borne out of a concept established by the Southern Governors Conference in which the states of FEMA Region IV (North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee and Kentucky) formed a mutual aid alliance in order to effectively and efficiently assist each other in the event of a hurricane or other major disaster.

The main purpose of EMAC is to allow states to share resources during a disaster. It is administered by the National Emergency Management Association (NEMA).

## SMAT EMAC Roles and Responsibilities

	<b>EMAC Roles &amp; Responsibilities</b>	
<ol style="list-style-type: none"><li>1. Governor declares an emergency</li><li>2. State determines needed resources</li><li>3. Offering state commits resources</li><li>4. Offering state sends resources</li><li>5. Return of appropriate resources and personnel</li><li>6. Reimbursement package developed</li></ol>		
State Medical Assistance Team Training		1-35

During a disaster, the governor of the impacted state or territory declares a state of emergency. The impacted state assesses its resource needs and identifies shortfalls for which assistance will be requested. At this point, the state or territory must make a determination if it will request assets from other states, or go directly to the federal government. If the state or territory elects to request assets from other EMAC states or territories, a request is made.

The state offering the resources commits to an agreement to provide resources and then mobilizes the agreed-upon resources (personnel or equipment) to the affected state. Once the mission is completed, the resources are demobilized and redeployed to their home states. Deployed personnel provide receipts and records to their home state to develop a reimbursement package, which is then sent to the affected state, which then reimburses the assisting state.

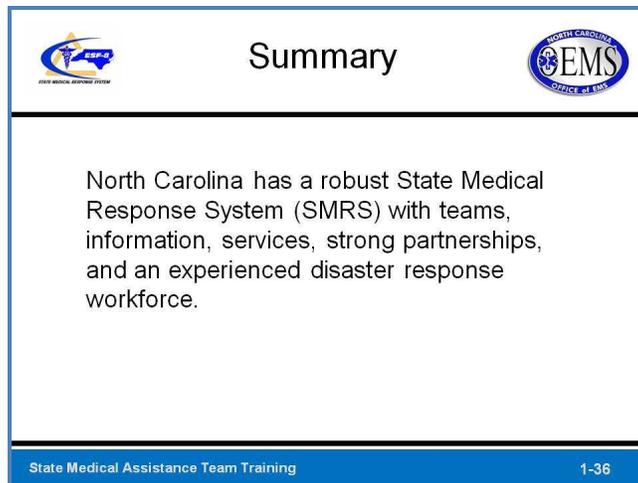
## EMAC Relevance and Role to SMRS

It is through this mechanism that a NC-SMAT could be deployed to other states or territories. This is highly desirable to other states due to several factors. The EMAC process allows for a mechanism to bring in personnel that are well trained and can operate well as a team, as opposed to a large number of volunteers with an unknown level of training. Since each team is deployed as a state resource, the impacted state also can require assurances that each certified or licensed team member is in good standing through their respective state licensing or credentialing mechanisms.

**Table 1-3: Emergency Support Function**

	<b>Emergency Support Function</b>
ESF 1	Transportation
ESF 2	Communication
ESF 3	Public Works – Engineering
ESF 4	Fire Service
ESF 5	Emergency Management
ESF 6	Mass Care, Housing and Human Services
ESF 7	Resource Support
ESF 8	Health and Medical Services
ESF 9	Urban Search and Rescue
ESF 10	Oil and Hazardous Materials Response
ESF 11	Agriculture, Natural Resources
ESF 12	Energy
ESF 13	Public Safety and Security
ESF 14	Recovery and Mitigation
ESF 15	External Affairs

## SUMMARY



The slide is titled "Summary" and features two logos at the top: the NCEM logo on the left and the North Carolina EMS logo on the right. The main text in the center reads: "North Carolina has a robust State Medical Response System (SMRS) with teams, information, services, strong partnerships, and an experienced disaster response workforce." At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "1-36" on the right.

The SMRS history, including OEMS, a clear perspective of the SMAT types, registry, and operations integration has been presented. SMAT members should have a basic understanding of the legal, regulatory, and ethical issues that impact health and medical care delivery in deployed conditions, and how key North Carolina laws and regulations affect such operations. Knowledge of the key components of healthcare infrastructure, and how they impact planning, roles, and responsibilities is important. The concept of casualty management in austere environments was introduced, as well as the key elements of public health in SMAT operations.

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8. U.S. Department of Health and Human Services, Office for Civil Rights. (2005). *Hurricane Katrina bulletin: HIPAA privacy and disclosures in emergency situations*.

## SUPPLEMENTAL MATERIALS

- SMARTT is a web-based tool capable of monitoring hospital, EMS system and health center resources on a regular basis. Through the use of SMARTT, resources are quickly identified and made available for use in the event of a local, regional, or statewide disaster.

<http://www.emspic.org/?q=node/40>

- State Statues and Codes:

[http://www.ncga.state.nc.us/enactedlegislation/statutes/html/bychapter/chapter\\_166a.html](http://www.ncga.state.nc.us/enactedlegislation/statutes/html/bychapter/chapter_166a.html)

[http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter\\_90/GS\\_90-21.16.html](http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_90/GS_90-21.16.html)

- SERVNC SMAT & Volunteer Registry

[http://smrs.emspic.org/index.php?option=com\\_content&task=view&id=58&Itemid=2](http://smrs.emspic.org/index.php?option=com_content&task=view&id=58&Itemid=2)

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# MODULE 2: RESPONDER HEALTH AND SAFETY

Training Curriculum

Length: 1 hour

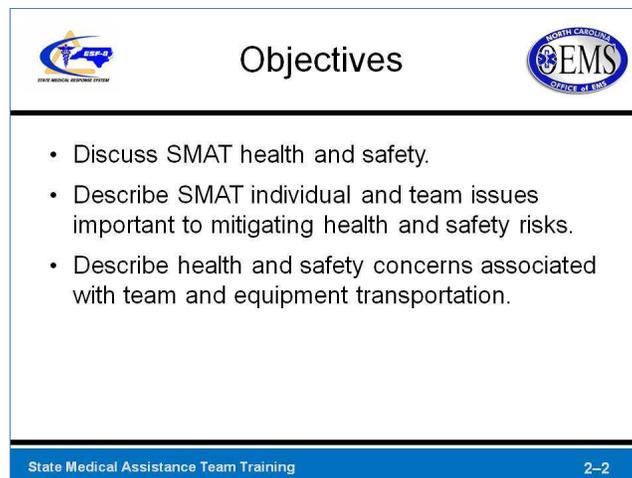
Audience: North Carolina State Medical Assistance Team personnel

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## Module Objective

Identify the hazards to responder health and safety during State Medical Assistance Team (SMAT) deployment and relevant mitigation measures. (C.O.3 Responder Health & Safety).

## Objectives



The slide is titled "Objectives" and features two logos at the top: the NCEM logo on the left and the NCEM EMS logo on the right. The main content is a bulleted list of three objectives. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "2-2" on the right.

- Discuss SMAT health and safety.
- Describe SMAT individual and team issues important to mitigating health and safety risks.
- Describe health and safety concerns associated with team and equipment transportation.

- Discuss SMAT health and safety.
- Describe the SMAT individual and team issues important to mitigating health and safety risks.
- Describe health and safety concerns associated with team and equipment transportation.



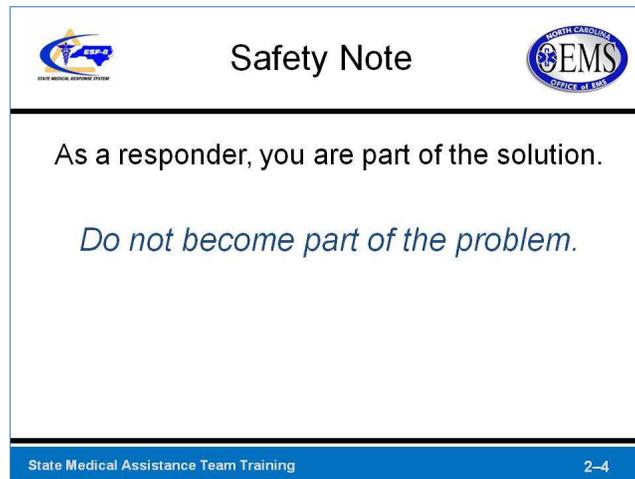
## Objectives

- Describe environmental conditions affecting SMAT health and safety.
- Describe SMAT deployment hazards and mitigation measures to protect health and safety.
- Review SMAT security concerns.
- Describe SMAT member mental health concerns.
- Review roles and responsibilities of the SMAT Safety Officer.

State Medical Assistance Team Training 2-3

- Describe environmental conditions affecting SMAT health and safety.
- Describe SMAT deployment hazards and mitigation measures to protect health and safety.
- Review SMAT security concerns.
- Describe SMAT member mental health concerns.
- Review the roles and responsibilities of the SMAT Safety Officer.

## Safety Note



The slide features a blue border. At the top left is the logo for the State Medical Assistance Team (SMAT) with the text "FIRST MEDICAL RESPONSE SYSTEM". At the top right is the logo for the North Carolina Office of EMS. The title "Safety Note" is centered at the top. The main text reads: "As a responder, you are part of the solution." followed by "*Do not become part of the problem.*". A blue footer bar at the bottom contains the text "State Medical Assistance Team Training" on the left and "2-4" on the right.

As a responder, you are part of the solution.

*Do not become part of the problem.*

## INTRODUCTION



**Introduction**

The Disaster Site

- Highly varied hazards (e.g., debris, flooding)
- Influx of volunteers
- Prolonged response operations
- Damage to vital infrastructure
- Utmost importance = protect yourself

State Medical Assistance Team Training 2-5

The emergency response to disasters is complicated by multiple hazards, damaged infrastructure, and environmental factors such as heat and cold stress. These factors will present unique safety risks and management challenges during State Medical Assistance Team (SMAT) deployments (Jackson, et al, 2004).

While the primary objective of any disaster responder is to provide assistance in times of need, it is imperative that responders understand the importance of protecting their own health and safety as well their team members, so that they do not add to the burden of the disaster or become a casualty.

This module will discuss the types of health and safety concerns that may be present during the various phases (early to late) of a disaster response and will provide guidance designed to manage these risks. The most likely disaster risks to the State of North Carolina are natural risks, such as hurricanes and flooding, and human-made risks such as industrial disasters and terrorism. Such examples have been highlighted throughout this module. However, the health and safety guidance in this module is framed on an all hazards approach to accommodate any type of SMAT deployment.

## INDIVIDUAL AND TEAM CONSIDERATIONS FOR HEALTH AND SAFETY



### Individual and Team Safety



- Adequate preparation
  - Maintain disaster readiness for your family and home environment
- Physical and mental health status
- Policies, procedures, and operational guidelines
  - Workforce protection
  - Personal and team safety
  - Security

State Medical Assistance Team Training2-6

Responder health and safety begins with adequate preparation at home prior to any disaster event. It is critical for responders to maintain disaster readiness for their family and home environment. SMAT members must address the status of their own personal physical and mental health in addition to concerns for SMAT team health and safety. SMAT members should address individual measures to mitigate their own risk during deployment. For example, SMAT members should comply with immunization recommendations and any physical standards recommended for SMAT deployment. There are also recommended packing lists for deployment for individual SMAT members that may relate to health and safety. Many of these measures are described in greater detail in the module devoted to *Deployment Readiness*.



## Individual and Team Safety



- Your health status is important to team performance
- Review medications and have adequate supplies for deployment use (~ 14 days)
- Acute illness and/or exacerbation of a chronic disease is a common reason for early demobilization
- Regular team monitoring will occur during deployments

State Medical Assistance Team Training 2-7

It is important that you as a responder maintain a level of health that enables you to perform the duties of a SMRS/SMAT member. If you are on any type of medication you should ensure that you have an adequate supply with you for the length of deployment. You should carry at a minimum two (2) week supply. Also the potential SMRS/SMAT member should realize that an acute exacerbation of a chronic illness might be a reason for early demobilization. It is imperative that you attend to your individual health needs to ensure you remain an effective and contributing team member. It is strongly recommended that you undergo a physical examination by your primary care physician each year. If you are sick or not fit for deployment – DO NOT DEPLOY.

As a North Carolina (NC) SMAT member each responder must understand policies and procedures regarding SMAT workforce protection, personal and team safety, and security. Each SMAT member must also understand the health and safety measures related to incident command roles and responsibilities (i.e., Safety Officer) and how safety is maintained or enforced in a field environment.



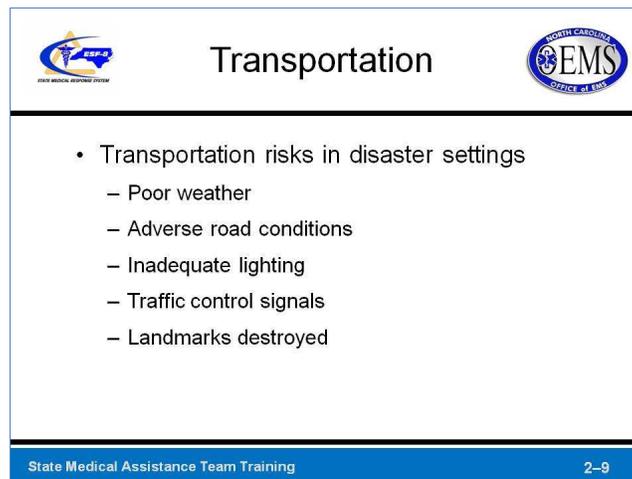
Individual Measures	Team Measures
Home Disaster Plan	Worker safety (e.g., infection control)
Immunizations	Site security
Physical Standards	Safety Officer

State Medical Assistance Team Training 2-8

**Table 2-1: Examples of Individual and Team Health and Safety Measures**

Individual Measures	Team Measures
Home disaster plan	Worker safety (e.g., infection control)
Immunizations	Site security
Physical standards	Safety Officer

## TRANSPORTATION—HEALTH AND SAFETY



 **Transportation** 

- Transportation risks in disaster settings
  - Poor weather
  - Adverse road conditions
  - Inadequate lighting
  - Traffic control signals
  - Landmarks destroyed

State Medical Assistance Team Training 2-9

Responding to a disaster typically involves transportation by vehicle at some point during the disaster. Even in good conditions vehicle travel can be dangerous. In disaster settings, the risks are significantly increased. Beyond concerns for the ambient weather conditions at the time of the response, depending the disaster type, roads may be damaged or missing. If intact, roads may be blocked with debris and downed power lines, flooded, or covered with mud. Street lighting may be damaged or destroyed. Traffic control lights and signage may also be damaged or missing. In extreme cases, key landmarks may be missing, making land navigation extraordinarily difficult. Any of these conditions can make vehicle travel during disaster response hazardous and increase travel times and fuel consumption (UK Foreign, 2011). In addition to risks related to ground transportation, other forms of transportation such as air-evacuation offer unique risks to patients and emergency responders.

## SMAT Vehicle-Related Health and Safety Concerns



### Transportation



**Sample: Pre-Operation Vehicle Safety Checklist**

	Date	Notes
Windshield washers and wipers		
Directional signals		
Power steering		
Fluid reservoir		
Brakes and brake fluid		
Hydraulic system		
Clutch		
Lights		
Tires and tire pressure		
Horn		
Motor oil		
Inspection sticker		

Adopted from:  
 Alexander County,  
 NC

State Medical Assistance Team Training
2-10

Prior to initiating vehicle travel, responders should verify the operable status of the car or truck, as roadside motor assistance may not be readily available within the disaster area. Pay particular attention to tire condition and headlight operability. Appropriate training for each vehicle and its related components (e.g., trailers, storage racks, tire pressure and measuring devices, fuel and fluid level monitoring, etc.) will be required. Vehicle check-lists and tactical (common keys) are frequently used by organizations that operate in the field in austere environments. Policies for the use of privately-owned vehicles during deployment by SMAT members during deployment will be made clear prior to deployment.

SMAT members should check all vehicles prior to operation to ensure they are equipped with required safety features (e.g., spare tire, flares) and are in good working condition. Table 2-2 is an example of a checklist of important features to assess prior to operating a vehicle during deployment. SMAT deployment may involve travel to the disaster site in a convoy and will require substantial operational and logistical coordination.

**Table 2-2: Pre-Operation Vehicle Safety Checklist**

	Date	Notes
Windshield washers and wipers		
Directional signals		
Power steering		
Fuel level		
Brakes and brake fluid		
Hydraulic system		
Clutch		
Lights		
Tires and tire pressure		
Horn		
Motor oil		
Inspection sticker		
Belts, hoses, filters, and general maintenance items		

Adopted from: Alexander County, NC (<http://www.co.alexander.nc.us/pdf/motor-vehicle-policy.pdf> )

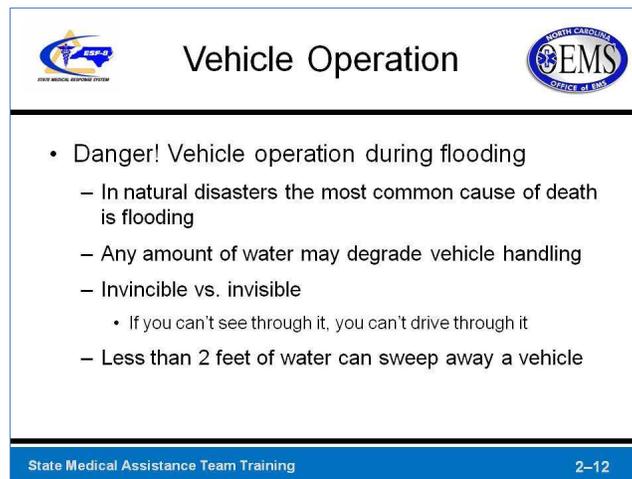
## Vehicle Operation in Disaster Situations

**Vehicle Operation**

- Properly trained and qualified driver
- Second driver should be identified and should be front seat passenger
- Driver must never be under the influence of any substance that impairs vehicle operation
- Use of a spotter for repositioning vehicle or backing up is recommended

State Medical Assistance Team Training 2-11

Disasters may significantly impair road conditions. The issues to consider may include inoperable traffic signals, lights, and uncontrolled intersections; roadway obstructions and damaged roads; and complications related to parking and securing the vehicle. With that in mind, the following recommendations should be implemented. The person designated to drive for the team must be appropriately licensed, and in some cases specifically trained in the use of SMAT emergency vehicles. All applicable State of North Carolina laws and regulations regarding vehicle operations should be followed. A second driver should be assigned to each vehicle and should be equally qualified to operate the vehicle to assist in case of incapacitation of the designated driver, even in cases of simple fatigue. The second driver or other designated person should sit in the front passenger seat to manage navigation and communication with other vehicles. The drivers must never be under the influence of any substance (e.g., medication, supplement, illicit drug, alcohol, etc.) that may impair their ability to safely and properly operate the vehicle. When backing up vehicles, a “spotter” should be used to help direct the driver to back up safely.



The slide is titled "Vehicle Operation" and features two logos at the top: the NCEM logo on the left and the North Carolina EMS logo on the right. The main content is a bulleted list of safety points regarding vehicle operation during flooding. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "2-12" on the right.

- Danger! Vehicle operation during flooding
  - In natural disasters the most common cause of death is flooding
  - Any amount of water may degrade vehicle handling
  - Invincible vs. invisible
    - If you can't see through it, you can't drive through it
  - Less than 2 feet of water can sweep away a vehicle

Disasters involving flooding can cause roadways to be covered with moving water. According to Ashley & Ashley (2007, 2008), when accounting for the three major types of flood (i.e., flash flooding, river flooding, and coastal flooding) a majority of fatalities (63%) in floods occurred while the victims were in vehicles. Even 6 inches of fast-moving flood water can knock you off your feet, and a depth of 2 feet will float your car. Drivers should exercise extreme caution as even a small amount of moving water can cause the vehicle to lose contact with a roadway and move downstream, causing great risk to its occupants. As flooding occurs, the roadbed is obstructed from view, posing potential hidden hazards such as potholes, obstructions, etc. A good general principle to remember while operating a vehicle on flooded roadways is “if you can't see through it, you can't drive through it.”

Cell towers can be damaged by storms or simply overwhelmed by the number of people attempting to use the network (Cigler, 2007) and should not be the only method to ensure communication with vehicle occupants. It is advisable that each vehicle be equipped for mobile communications. While radios may not be helpful if traveling long distances, they are useful in convoy and when traveling close to the base of operations. In many disaster situations, a vehicle radio may also be a fundamental security requirement in that it permits tracking of the vehicle and its occupants.

## Vehicle Seat Restraint and Safety Devices



The slide is titled "Vehicle Operation" and features two logos: the NCEM logo on the left and the North Carolina EMS Office of EMS logo on the right. The main content is a bulleted list of safety guidelines. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "2-13" on the right.

- Vehicle seat restraints
  - Always use per manufacturer guidelines
- Avoid driver distractions
  - Any distraction is hazardous and deadly
    - Mobile phones, GPS, electronics, 2-way radios
  - Abide by state laws and team policies regarding device use

State Medical Assistance Team Training 2-13

Each vehicle must be equipped with factory-installed and functional seat restraints and/or safety devices (e.g., air bags, etc.). While driving, the driver and all passengers must wear their seatbelts and shoulder belt restraints. Current research studies point to the value of these devices for emergency responders such as fire truck and ambulance operators and passengers as well. Vehicle seat restraint or safety devices must never be disabled or altered in any manner.

### Mobile Phones, Electronic or Other Potential Distractions

Distracted drivers put themselves at risk and pose a hazard to others as well. The vehicle operator should not use a phone, mapping system, or any other electronic device while simultaneously operating a vehicle. The front-seat passenger is the best choice to assist the driver with communications and navigation. Drivers should also not be distracted by personal music devices and caution should be exercised to avoid non-electronic activities such as eating, drinking, reading, or any other distracting activities while driving.

## Aviation Transport of SMAT Patients and Staff



### Aviation Transport



- Aviation transport of patients and staff
  - Safely approaching, entering, and exiting any type of aircraft
  - Obey flight crew instructions at all times



Photo courtesy of FEMA

State Medical Assistance Team Training2-14

All SMAT members should be familiar with the basic instructions of safely approaching, entering, and exiting any type of aircraft (e.g., fixed or rotary wing airframes) that is likely to be utilized in SMAT operations.

During routine SMAT deployments, there may be situations when qualified SMAT personnel are required to accompany victims for air evacuation or return to the SMAT deployment site by air ambulance. All SMAT personnel who are assigned to accompany patients during air evacuation should be aware of patient complications that might arise during flight. Ideally, all referring SMAT healthcare providers should at least be aware of medical protocols and guidelines regarding patient selection for air evacuation.

Never approach rotorcraft (helicopters) from the rear. Always approach only when directed to do so by the flight crews, and always from the front. SMAT personnel should obey all flight crew instructions and directions.

## ENVIRONMENTAL FACTORS RELATED TO HEALTH AND SAFETY



### Environmental Factors



- Assess conditions for every deployment
- Geographic variability
- Environmental factors are included in the safety brief, and operations will be adjusted accordingly.

*Situational awareness* is a state of mind with an enhanced focus relative to events

State Medical Assistance Team Training2-15

The anticipated environmental conditions should be assessed for every field deployment site. Situational awareness starts the moment SMAT personnel are alerted of the potential for deployment. Situational awareness is a state of mind. As an SMAT member you should anticipate potential mobilizations and the associated health and safety issues. Upon alert for potential deployment, your attention should turn to the specific event and its specific relevant health and safety issues. As team members perform last minute packing, they should consider factors such as forecast of ambient temperatures, wind conditions, potential for flooding, field sheltering, etc. Selecting environmentally appropriate personal clothing and appropriate equipment is critical to your overall safety and comfort. North Carolina has a wide range of weather conditions and seasonal weather patterns. Due to the geographic variability of the state, from coastal conditions to high elevations, particular attention to environmental factors should be considered during preparations. Expected environmental conditions should be included in the safety briefing pre-deployment and in each daily briefing.

Detailed descriptions and preparedness for environmental conditions (e.g., heat, cold, etc.) are described in detail in the module devoted to *Deployment Readiness*. However, updated information on weather conditions should become a part of the “Incident Status Summary.” This report is an ICS 209 form and offers situational awareness and current operating status to command staff for decision making.

## Heat and Humidity



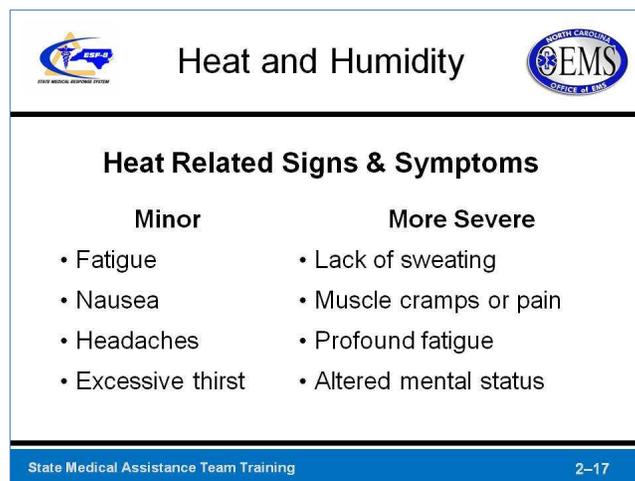
### Heat and Humidity



- Heat related injuries result from the combination of temperature and humidity
- It is important to recognize the signs and symptoms of heat related illness in yourself and your team members

State Medical Assistance Team Training 2-16

North Carolina is hot and humid in the summer, particularly in coastal regions. The general precautions of proper hydration and appropriate barrier from excess sun exposure are important measures to be taken by every SMAT member. Responders are at a high risk for heat-related illnesses. A fluid loss equivalent to 3% of body weight can severely affect performance and well-being (Howe & Boden, 2007). Also consider that a healthy and fit responder will have an easier time acclimating to hot, humid conditions than an unfit responder (Howe & Boden, 2007).



The slide features the logos for the State Medical Assistance Team (SMAT) and the North Carolina EMS Office of EMS. The title is "Heat and Humidity". Below the title, the heading "Heat Related Signs & Symptoms" is centered. The content is organized into two columns: "Minor" and "More Severe".

Minor	More Severe
• Fatigue	• Lack of sweating
• Nausea	• Muscle cramps or pain
• Headaches	• Profound fatigue
• Excessive thirst	• Altered mental status

At the bottom of the slide, the text "State Medical Assistance Team Training" is on the left and "2-17" is on the right.

Recognizing early signs of heat-related illness is the key to preventing or mitigating more serious heat-related injury. The recognition of fatigue, nausea, headaches, excessive thirst, muscle cramps or pain, profound generalized fatigue, etc. is important in the context of a hot and humid environment as they may represent the early signs of a significant heat-related illness. If these symptoms or signs are present, notify the appropriate Command staff immediately. Team safety activities during hot and humid deployments should include ample time for the cooling of staff and patients and for hydration breaks. As a reminder, your PPE may increase risk of heat illness.

Some of the common signs and symptoms of heat-related illness include but are not limited to the following:

- Fatigue
- Nausea
- Headaches
- Excessive thirst
- Lack of sweating
- Muscle cramps
- Profound fatigue
- Altered mental status



## Heat Injury Prevention



- Hydration and barrier protection are the mainstays of prevention
- Begin hydration with water upon notification
- Allow time for cooling and hydration
- Use available resources
  - Cooling vest, misting fans, shade, etc.

State Medical Assistance Team Training

2-18

Prevention of heat injuries is an individual and team function. Individuals should realize that it is important to begin hydration upon receipt of alert and or activation notifications. Another factor to assist in the prevention of heat-related injuries is the appropriate use of barrier methods (sun screen, proper clothing, hats, and sunglasses). During the deployment, attention should be given to proper work-rest cycles to allow for adequate hydration, cooling, and voiding. Other ancillary devices to assist in cooling may include cooling vests, misting fans, shade, etc.

## Cold

	<h3>Cold</h3>	
<ul style="list-style-type: none"><li>• Hypothermia<ul style="list-style-type: none"><li>– Wet, wind, and cold increases hypothermia risk</li><li>– Hypothermia occurs when the body loses too much heat and the core temperature falls below the normal 98.6° F</li></ul></li><li>• Signs of hypothermia<ul style="list-style-type: none"><li>– Impaired motor skills</li><li>– Altered speech</li><li>– Loss of decision-making capabilities</li></ul></li><li>• Be observant of signs and symptoms of frostbite</li></ul>		
State Medical Assistance Team Training		2-19

In some seasons, North Carolina can be quite cold. When cold conditions are combined with dampness, hypothermia can be a serious concern. Hypothermia is a condition that can occur when the body loses too much heat, causing the body's core temperature to fall below the normal 98.6°F. The initial signs of hypothermia include impaired motor skills, speech, and loss of decision-making capabilities. As hypothermia progresses, affected individuals may seem confused or deny that they are cold. They may become weak or tired, breathe more shallowly, and stop shivering. The decreased core temperature affects the victims' mental state and they may behave irrationally. As the body gets colder, muscles become stiff and the heartbeat uneven. Unconsciousness and death can follow.

Hypothermia can develop quickly after exerting effort in the cold because the body's ability to produce heat decreases while the rate of heat loss increases due to the activity performed. To prevent this type of hypothermia, it is important to keep hydrated, dress properly for conditions, and get into a warm environment as soon as possible. For cases of severe hypothermia, immediate medical attention is required.

Direct factors contributing to hypothermia include wind chill, ambient temperature (cold) and wet conditions. Cold water immersion causes a convective heat loss that is 25 times greater than exposure to cold air at an equivalent temperature (Burr, 1991). Changing out of cold and wet gear is a good preventative measure to avoid or lessen the chance of hypothermia and frostbite.

Cold		
Levels of Hypothermia		
Severity	Core Body Temperature	Physiologic Response
Mild	90°F–95°F	Rapid breathing, rapid heartbeat, difficulty speaking, shivering
Moderate	82°F–90°F	Loss of shivering, diminished level of consciousness
Severe	<82°F	Loss of reflexes, coma, irregular heartbeat

State Medical Assistance Team Training 2-20

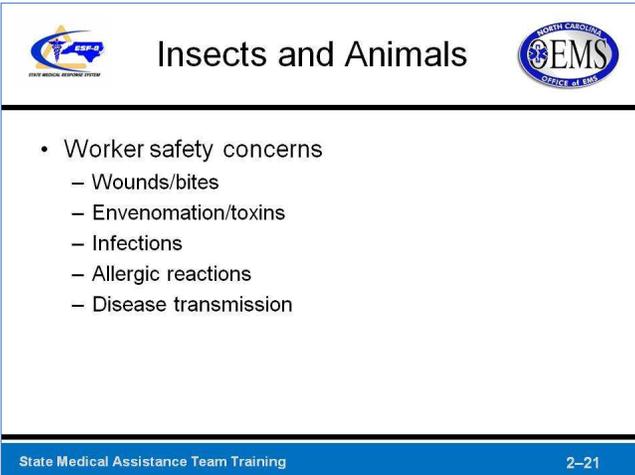
In severe cold weather conditions, frostbite is possible. The extremities most affected by frostbite are the fingers, feet, nose and ears. Symptoms of frostbite include numb, red, and slightly swollen skin. The skin can appear gray or yellowish, becoming red and flaky after thawing. With severe frostbite, blisters often appear along with pale, cold, waxy, and hard skin. Gradual, not sudden, warming is essential for areas affected with frostbite. While rubbing chilled hands, feet, or the face may help with circulation, doing so will only cause more tissue damage if actual frostbite has occurred. In the cold, the arteries in the heart constrict and blood pressure rises, increasing the potential for a heart attack. Those who are unaccustomed to regular physical activity are up to 30 times more likely to suffer a heart attack when they engage in sudden activity or there is great physical exertion, such as moving heavy materials or equipment in a cold environment.

**Table 2-3: Classification of Hypothermia**

Severity	Core Body Temperature	Physiologic Response
Mild	90°F–95°F	Rapid breathing, rapid heartbeat, difficulty speaking shivering
Moderate	82°F–90°F	Loss of shivering, diminished level of consciousness
Severe	<82°F	Loss of reflexes, coma, irregular hear t beat

*Adopted from Jolly BT, Ghezzi KT. Accidental hypothermia. Emerg Med Clin N Am 1992; 10:311–27.*

## Insects and Animals



The slide features a title "Insects and Animals" centered at the top. On the left is the logo for the National Center for Emergency Medical Services (NCEM), and on the right is the logo for the North Carolina Office of EMS. Below the title is a bulleted list of worker safety concerns. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "2-21" on the right.

- Worker safety concerns
  - Wounds/bites
  - Envenomation/toxins
  - Infections
  - Allergic reactions
  - Disease transmission

Another environmental concern that must be considered is insect vectors and animals. For example, floods and other natural disasters can create an optimal environment for the proliferation of mosquitoes (Nasci, 1998). Insects can cause bites and stings that result in wounds, leading to infections; envenomation, leading to toxin-related allergic reactions (e.g., sting from a wasp or bee) or tissue necrosis (e.g. snake bite); leading to localized reactions or life-threatening situations in sensitive individuals; and may be a vector for the transmission of disease (e.g., mosquitoes, which can transmit diseases such as West Nile Virus, and ticks, which can transmit Lyme Disease, Rocky Mountain Spotted Fever, etc.). In the United States, North Carolina has the most cases of Rocky Mountain Spotted Fever each year.

Preventing insect bites and stings involves several considerations: insect repellent (e.g., DEET-containing lotions, sprays, or creams), protective clothing (e.g., use of long sleeves, long pants, enclosed footwear), bed nets for barrier protection; and personal allergy medications for those with severe or known life-threatening allergies (e.g., antihistamines, epinephrine auto-injectors, etc.).



### Insects and Other Threats



Insect Threats	Prevention Measures
Mosquitoes	Bed nets, DEET
Flies	Sanitation
Ticks	Protective clothing, DEET
Scorpions/spiders	Inspect clothing and bedding

State Medical Assistance Team Training 2-22

**Table 2-4: Insects and Other Threats Matched to Prevention Measures**

Insect and Other Threats	Prevention Measures
Mosquitoes	Bed nets, DEET
Flies	Sanitation
Ticks	Protective clothing, DEET
Scorpion / spiders	Inspect clothing and bedding



## Animals



- Released or abandoned animals, as well as local wildlife, can be dangerous
- Do not approach or feed any animal near the deployment area
- Refer to local guidelines for animal management
  - Sheltering, service animals, etc.
- Report bites or scratches to the appropriate authority

State Medical Assistance Team Training 2-23

Depending on the disaster, animals may be present due to release or abandonment. Animals are not immune to the physical and mental stress experienced during disasters. This stress may make animals more aggressive toward people and other animals (Heath, Kass, Beck, & Glickman, 2001). Since, in many cases, these animals are in search of a food source, and perhaps water, special care is needed regarding the management of food supplies and waste disposal, a topic to be discussed later in this module.

The presence of animals in general population shelters amid persons who require medical services is a common concern. It is important to coordinate operational plans with appropriate agencies responsible for animal control. In addition, responders should not approach wild animals, nor should they feed other animals near the deployment area. As a general rule, do not approach or encourage contact with stray animals. The exposure to rabies from certain mammals (e.g., dogs, skunks, foxes, squirrels, raccoons, and bats) continues to be a sporadic problem in North America. Any bites, scratches or injury received from any animal during deployment should be promptly reported to the SMAT Safety Officer and appropriate medical officer.

## HEALTH AND SAFETY AT THE DEPLOYMENT SITE



### Health and Safety on Site



- Situational awareness
  - Issues regarding field based equipment, shelter structures, traffic control, and debris management
- Basic protective equipment
  - Proper use and fitting of clothing, gloves, and footwear
  - Fit testing
- Proper training
  - Follow equipment use guidelines

State Medical Assistance Team Training2-24

Once a deployment site is operational, on-site health and safety risks must be considered. Controlling foot traffic becomes important, as injuries can occur when busy, multitasking responders are distracted and walk or run into poles, walls, stairs, or each other. Strict attention should be paid to walking surfaces, as they can become cluttered with debris, especially mud, and can be “crisscrossed” with power cords. Routine housekeeping by all team members can help keep walkways clear of debris, and power cord management with rugs or tape can minimize trip hazards. Depending on the location and amount of vehicular traffic, responders should be attuned to vehicle movement, both forward and backward, within the field deployment site. In settings where roadways are ill-defined, the travel path of vehicles may be unpredictable. As soon as possible, the site should be organized in such a way that it minimizes pedestrian and vehicle traffic interaction.

Conditions in disaster-impacted areas can be treacherous (Trout, Nimgade, Mueller, & Hall, 2002). Almost any disaster (e.g., hurricanes, tornados, floods, and explosion events) can produce tremendous amounts of debris that can represent a risk to the health and safety of responders. Depending on the situation, responders may be required to navigate a mixture of downed trees and power lines, along with every imaginable industrial and household item. For example, responders at the World Trade Center had to deal with fire, smoke, toxic fumes, and dust clouds (Trout, et al., 2002).

Lack of adequate training and equipment was a key problem for responders at the World Trade Center (Johnson, Langlieb, Teret, Gross, & Schwab, 2005). Responders reported that the lack of training and equipment complicated their response and increased physical illness and injury (Johnson, Langlieb, Teret, Gross, & Schwab, 2005). SMAT members should not operate equipment if they are not appropriately trained in the operation and safety of equipment (e.g., a chainsaw to help clear debris). Even when properly trained to operate a piece of equipment, it should only be done with the proper safety precautions (e.g., head, face, eye protection, hearing protection, protective leg guards, etc).

In addition, it is important for each SMAT member to utilize basic protective equipment for general use during every deployed event. A good pair of properly fitting work boots with reinforced (e.g. steel, plastic) toes and steel shanks can prevent punctures and lacerations from nails, screws, and broken glass, for example. Heavy-duty work gloves and both clear and tinted safety glasses are also invaluable.

Protective eye wear, ear plugs and eye masks for sleeping are recommended to reduce effects of possible high noise levels, blowing debris and continuous or high light conditions.



## Potential Electrical Hazards



- **Electrical safety**
  - Downed utility lines represent a serious electrocution risk
  - Any utility line should be assumed to be “hot”, or actively conducting current
- **Generator use**
  - Represents an electrocution risk
  - Significant source of potential carbon monoxide exposure
  - Loud noise
- **Electrical sources and power cords**
  - Potential for causing electrical injuries and burns
  - Secure power cords to prevent slips, trips, and falls

State Medical Assistance Team Training2-25

### **Electrical Safety**

As mentioned in the section on transportation, a downed power line represents a serious electrocution risk. The SMAT team should work with the local utility representative to ensure that errant electrical lines are disconnected and not reenergized while members are at risk. The SMAT Safety Officer should be made aware of any concerns related to electrical source safety. Any power line or electrical wire found at the disaster site should be assumed to be “hot”—or actively conducting current—and regarded as a potential danger until cleared by a qualified electrical/utility worker!

### **Generator Use**

Gasoline or diesel generators for producing electricity are often present at disaster response sites. In addition to representing an electrocution risk, these devices can be a significant source of carbon monoxide exposure and loud noise. Because of the risks associated with these machines, trained and experienced logistical staff who have been trained and have experience with the necessary tasks should conduct their servicing and operation. Generators should be properly grounded and placed in locations that will minimize the chance of exhaust exposures working and living quarters.

Once started, consideration must be given to the safe refueling of the unit. When refueling is needed, the generator should have its electrical load switched off (or to another generator) and the unit shut down. As refueling is carried out and the unit is re-started, the risk of fire is elevated, so special attention should be given for providing fire protection at these stages.

### **Electrical Sources & Power Cords**

All equipment with a power source or battery has the potential for causing electrical injuries and related burns if misuse or malfunction occurs. Field conditions are often wet and windy and may have limited local visibility. Each of these could contribute to an electrical related mishap. The use and storage of all equipment, especially electrical, should consider the environment and conditions of use. Selection and use of power cords, “extension” cords, and any adapters

placed in any electrical circuit should always comply with manufacturers' instructions and guidelines. All circuits should contain ground fault interrupter devices. These devices help prevent electrocution if the circuit encounters water, which can be a likely event in disaster response situations.



## Environmental Hazards



---

- Mud and sludge
  - Makes walking and driving difficult
  - May contain potentially dangerous contaminants
- Sewage
  - Raw sewage overflow is common
- Debris and dislocated items
  - Collapsed structures, fallen trees, propane tanks, caskets, containers, etc.



Photo courtesy of NCOEMS

State Medical Assistance Team Training

2-26

### **Mud and Sludge**

In heavy rain or flooding conditions, mud or sludge (e.g., a semisolid material from a wide variety of sources, often used interchangeably with “mud”) is everywhere and makes walking and driving difficult. The physical changes in a mud-soaked surface can be life-threatening to walk on and make affected structures unstable. Walking in mud-filled areas can lead to falls or entrapment and may be life-threatening. Entering a building or working near mud-filled hills or slopes can be life-threatening due to movement of the mud (e.g., mudslides) or structural collapse. Driving a vehicle in mud or sludge covered roads is dangerous due to loss of traction, potential for debris, and associated road surface damage.

Mud is a slurry of substances and may contain potentially dangerous contaminants. Skin contact or airborne dust inhalations are two risks associated with mud and the local environment. Prolonged exposure is to be avoided and thorough washing with soap and copious water should be promptly done post-exposure. Appropriate precautions should be used and guidance by the Safety Officer should be sought during these conditions.

### **Sewage**

Exposure to human and animal waste is a concern in field deployment conditions. In addition, particular disasters are prone to disrupt usual waste management containment methods. In flooding situations it is not uncommon for raw sewage to be released from overwhelmed water treatment plants and septic systems. Responders should avoid contact with contaminated water and adhere to strict hygiene practices to avoid inadvertent ingestion via hand-to-mouth transmission.

### **Debris and Dislocated Items**

Every disaster disrupts the local environment to some degree. Collapsed structures, containers, trees, telephone poles, power-line towers, overturned vehicles, along with other items (propane tanks, caskets, etc.) may become dislocated and contribute to debris. Local hazards such as standing water, darkness, etc. may augment such dangers. This may make even a simple,

usually routine, task (e.g., driving a vehicle or even walking) a treacherous undertaking. Situational awareness, route planning, limiting the exposure of team members, and coordination with command staff (e.g., Safety Officer) are important.

## Hazardous Materials Exposures



### HAZMAT Exposure



- Potential hazards (chemical, biological, radiological)
- Intentional or unintentional releases
- Identification and notification
- Odors
  - May help identify particular chemicals, natural gas leaks
  - Odors related to dead animals or human remains are usually not a concern for infectious disease transmission

State Medical Assistance Team Training2-27

The disruption caused by disaster events can also result in responder exposure to potentially hazardous chemical, biological, or radiological materials. Exposures can stem from intentional releases in the form of terrorist attacks. Unintentional or natural disasters resulting in fires, explosions, flooding, etc. may result in the release of dangerous materials from industrial sites, homes, schools, laboratories, or any business site that uses toxic substances.

Determining the presence, threat analysis, and action steps are beyond the typical SMAT member. However, the Command staff should have access to hazardous materials experts. The identification and characterization of the hazardous materials is important in order for responders to be able to take the appropriate protective measures to preserve their health and well-being. SMAT members should notify the Command staff immediately if any suspicion of hazardous material exposure is present. The importance of proper training and the use and the proper fitting of personal protective equipment are important for every SMAT member if there is potential exposure to hazardous materials. Casualty and workforce decontamination in the field deployment setting may be an important part of preparedness and operations. Evacuation planning and route selection, as well as access to appropriate transportation, are important to any field operations where exposure to hazardous materials is a component of the emergency response.

### Odors

A special note is warranted regarding odors. With a loss of power and perhaps water damage, sites of disasters can quickly become malodorous, and may affect SMAT members' duty performance. Odor identification and control measures are important. They may help identify particular chemicals, natural gas leaks, or simply be pungent and limit workforce duties. Of particular note are the noxious smells related to dead animals or human remains. Although very unpleasant, these odors are usually not a health concern for infectious disease transmission.

## Materials Lifting and Handling



### Materials Lifting and Handling



- Lifting and hand protection
  - Risk of injury
  - Seek assistance
  - Proper lifting techniques
  - Use of gloves
  - Appropriate footwear

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Deployments require concern for injury prevention. Lifting and the movement of supplies can pose a significant risk. Responders should follow your teams protocol for equipment movement, seek assistance with loads and adhere to proper lifting technique. Some useful guidance regarding proper lifting technique includes:

- If you must lift objects, do not try to lift objects that are awkward or too heavy to lift by yourself (range 25-75 lbs). Don't hesitate to get assistance.
- Ensure you have a firm footing before lifting a heavy object.
- Keep your back straight and bend at the knees and hips. Do not bend forward at the waist with your knees straight.
- Stand with a wide stance close to the object and lift using your leg muscles. Straighten your knees in a steady motion.
- Avoid lifting heavy objects above your waist.
- Hold objects close to your body and walk in small steps.

The use of work gloves should also be encouraged, as their use can improve grip and minimize pinch injuries that can occur when assembling tent shelters. Sturdy work gloves also provide protection when moving debris that can often contain sharp metal objects like nails, screws, and broken glass.

## Food and Water Safety



### Site Environmental Health Concerns



- Use only designated food and water sources
- Assure safe food and water handling
- Use frequent hand washing
- Management of donated items
  - Do not consume unless Safety Officer clears
  - Proper disposal of non-cleared items should be conducted in a non-offensive manner

State Medical Assistance Team Training2-29

In the midst of a field deployment, team members are naturally focused on the disaster and its effects on the casualties. Significant responder health risks are inherent to field-communal living conditions. Simple but important health and safety measures can decrease the likelihood of significant injury or illness for all SMAT members and casualties.

Strict attention should be paid to the sources of water and food. When possible, bottled water from a known supplier should be used; if unavailable, an accepted technique for purifying water should be employed. If the food source for the SMAT is compromised, a food-borne illness outbreak could render a large portion of the unit inoperable. It is a best practice to use only food designated for deployment and to avoid donated or improperly stored food. It is highly probable that during your deployment well-meaning citizens may bring foods as a token of their appreciation. The consumption of these foods may represent a health risk and should not be consumed unless they are in a commercially sealed package and approved for consumption by the Safety Officer. As a matter of public relations the food should be graciously accepted and, if necessary, later disposed of in a non-offensive and discreet fashion out of site of the donors.

Frequent hand washing is one of the best measures to promote team health. When potable water is available, complete washing with soap for 30 seconds will greatly aid in the reduction of possible disease transmission. When potable water is not available, hand sanitizer gels or wipes can be used. Setting up multiple hand-washing or gel-access stations and signage is helpful. Additional information is described in the *Infection Control* module. Proper solid waste management is also extremely important for ensuring team health. For example, placing discarded food or scraps in sealed containers, trash storage and removal as promptly as the situation allows, and covering all trash receptacles is important. Placing toilet facilities at a safe distance from food service areas is equally important.

## FIELD SECURITY HEALTH AND SAFETY



### Field Security



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- Security in the field environment is a concern and responsibility of all team members
  - Elevated security concerns
  - Law enforcement may be overwhelmed

State Medical Assistance Team Training2-30

### *Security in the Field Environment*

Workforce protection in the field is of paramount importance. The disruption caused by disaster events can result in elevated security concerns as local law enforcement services may be overwhelmed. Displaced persons may reach points of desperation for resources, and some individuals may try to take advantage of the reduced presence of law enforcement. SMAT members should be aware of this risk and should employ common security measures as part of their daily activities. Base Camp security is a function of all team members.

## Field Safety and Security Measures



### Field Security and Safety



- Travel in a convoy when possible
- Buddy system at all times
- Perimeters should be established
  - Unauthorized persons should be reported to security
- Display proper identification at all times

State Medical Assistance Team Training 2-31

There are many important considerations to improve safety and security in the field. The following provides a practical list of items that may improve SMAT member safety and security while in the field.

- When traveling to or from the deployment site, whenever possible travel in a convoy.
- All the vehicles must make every effort to stay in the same sequence throughout the movement of the convoy as to make it easier to account for all vehicles. There should also be a map in each vehicle that has the route and alternate route marked on it.
- Every SMAT member will have a buddy and operate using the buddy system. This will be utilized any time a member leaves the larger group at any time.
- A very well-marked perimeter must be established and anyone that the SMAT member does not recognize will be brought to the attention of the SMAT security staff.
- A daily roll call will be taken at the beginning of each operational period to ensure no one has gone missing since the end of the last period. This may also be referred to as accountability



## Field Security and Safety



- Adhere to monitored entry points and check-in and check-out procedures
- SMAT members will not carry weapons
  - Unless authorized law enforcement personnel
- Information about operations and security measures is highly sensitive
  - **Do not** talk, text, or post to social media
- Supplies must always be secured

State Medical Assistance Team Training 2-32

- SMAT members and visitors will adhere to monitored entry points and comply with check-in and check-out procedures.
- In general, SMAT members must not carry weapons, as the use of deadly potential life-threatening force should be a law-enforcement responsibility. SMAT policies will address under what conditions sworn law enforcement officers may carry weapons.
- Consider all information about the deployment site operations and security measures as highly sensitive information. Do not share sensitive information with people who are not part of the SMAT operation. Refer to the team's social media policy.
- When extra supplies, especially food and water, are not being used they will be stored in the most secure area possible and out of sight of the public.
- As each response is different, the site security staff may implement other measures as they apply to the particular situation. For example, local law enforcement organizations may limit travel outside the SMAT compound due to local curfew laws.

## SMAT MENTAL HEALTH AND SAFETY



### SMAT Mental Health and Safety



- Mental health fitness for duty
- Unsettling events
- Stress
  - Be aware of profound changes in behavior
  - Effects on performance
- Self-awareness
- Contact NC DHHS for resources to assist with stress management

State Medical Assistance Team Training2-33

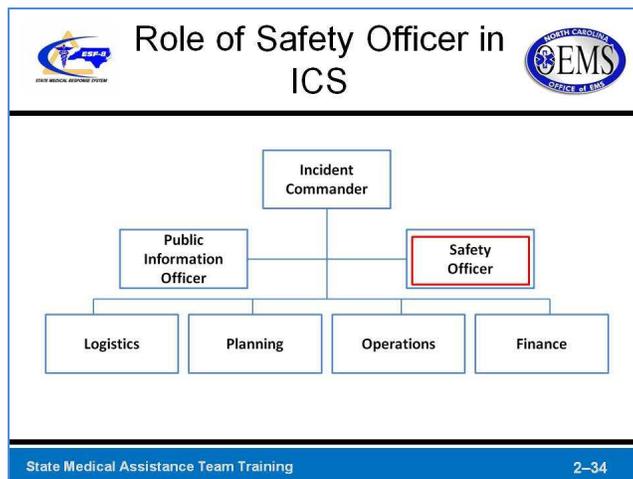
As described in the module, *Deployment Readiness*, an important part of fitness for duty is mental health. While on a SMAT deployment members may be exposed to situations and events that are extremely unsettling such as casualty death, communal field living conditions, climate extremes, etc. Every SMAT member may endure stress as part of deployment. The signs and symptoms of early detrimental effects may be difficult to recognize. They may include changes in eating habits, emotional expression (e.g., crying, anger, etc.), social withdrawal, and/or profound fatigue. Each of these reactions may be an appropriate response to the surrounding field environment, such as witnessing the death of a casualty, discovering human remains, long hours of hard work, limited sleep, and communal living conditions.

It is important to recognize when you or a fellow team member are experiencing signs of stress that are increasing and/or interfere with performance of assigned duties. This may be a sign of a significant or unhealthy stress response or a clinically significant mental health change. Report any concerns to the appropriate personnel (e.g., team leader, Safety Officer, or clinician).

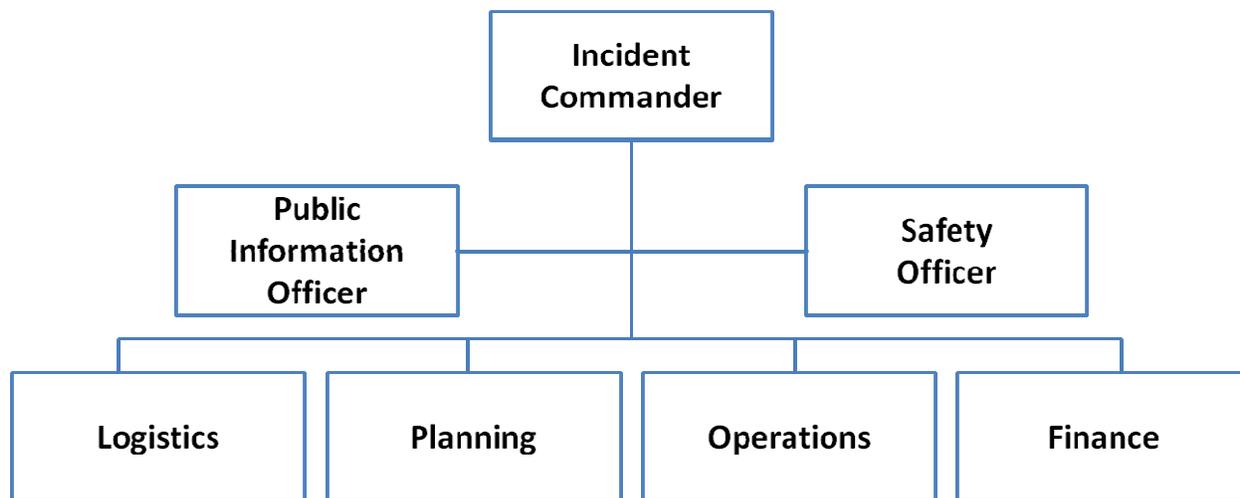
Simple interventions in the field such as providing adequate rest, or temporary removal from the stressful situation are likely to enable a responder to resume duties in a meaningful way.

Away from the field, you may want to contact the North Carolina Department of Health and Human Services, Division of Mental Health, Developmental Disabilities, and Substance Abuse Services. They can be reached through the NC DHHS site at <http://www.ncdhhs.gov/health/index.htm>. One of the services they offer is a critical access behavioral health agency.

## THE ROLE OF THE SMAT SAFETY OFFICER



Within each responding team, an individual should be designated as the Safety Officer. This individual is a member of the Command staff, whose role is to anticipate, recognize, evaluate, and control site health and safety risks. Trained with an understanding of the types of risks described in this module, the Safety Officer should actively be engaged in designing and establishing the field deployment site and providing insights from a safety perspective.



## Primary Functions

	<h3>Primary Functions of Safety Officer</h3>	
<ul style="list-style-type: none"><li>• Anticipate, recognize, evaluate, and control site health and safety risks</li><li>• Actively engage in designing and establishing the field deployment site</li><li>• Provide insights from a safety perspective</li><li>• Exercise emergency authority to stop and prevent unsafe acts</li></ul>		
State Medical Assistance Team Training		2-35

The SMAT safety function is a critical component in all field deployments. This is because field operations are inherently dangerous due to the fact that a SMAT will be part of an ongoing emergency response. In some cases, this work may occur within the disaster site placing responders potentially at risk. In addition to encouraging good safety practices by individual SMAT members, it is critical for the Safety Officer to monitor the overall safety of the team during deployment.

Typical responsibilities of the Safety Officer include:

- Participate in planning meetings.
- Identify hazardous situations associated with field operations.
- Write any needed plans or job safety analyses needed to ensure the safety of the SMAT members (i.e. hazardous weather plan, evacuation plan, etc.).
- Review the Incident Action Plan (IAP) for safety implications.
- Exercise emergency authority to stop and prevent unsafe acts.
- Investigate accidents that have occurred within the incident area. This will also include creating any accident reports or job related illness reports.
- Assign assistants as needed.
- Review and approve the medical plan.
- Maintain Unit Log.
- Maintain the *Hazards Communication Manual*.
- Conduct daily safety briefings.
- Review and approve the radiation plan for on-site x-rays.
- Make sure relevant Material Safety Data Sheets (MSDS) are available.

## ***Investigate Concerns or Accidents On-Site***

The Safety Officer is the key person to report an injury, exposure, or safety concern. The Safety Officer is responsible for prompt investigation and, when necessary, immediate action when safety and security are in jeopardy. The Safety Officer must communicate effectively with the team leader.

***Table 2-5: SMAT Safety Officer Priorities***

<b>SMAT Safety Officer Priorities</b>
Provides safety information to SMAT leadership and members
Ensure overall team safety
Ensure that SMAT team members use good safety practices
Assess developing hazards
Ensure proper follow-up for adverse safety incidents

## Radiation Safety



### Radiation Safety



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- Follow SMAT Safety Officer instructions
- Reduce time of exposure
- Increase distance from exposure
- Use proper shielding from exposure source

State Medical Assistance Team Training
2-36

SMAT units that deploy x-ray equipment will need specific safety planning related to radiation safety and compliance with state laws. A radiation safety plan will cover measures to ensure the safe use of equipment, actions to ensure appropriate shielding (e.g. aprons and personal radiation monitoring devices), and radiation monitoring of staff. The plan will also list steps to manage an incident involving radiation exposure. While a full discussion on radiation safety is beyond the scope of this introductory program, workers who operate x-ray machines will require pertinent training and certification and must be monitored for radiation exposure. Regulatory documents, appropriate quality assurance documents, record keeping information, and the management of reportable incidents should be delineated as part of a radiation safety program. This effort is part of the overall safety requirement for SMAT deployment and may require oversight by individuals with specific expertise in this field. Table 2-6 lists general measures employed to reduce exposure from a radiation source.

**Table 2-6: Effective Measures to Reduce Radiation Exposure**

Follow SMAT Safety Officer instructions
Reduce time of exposure
Increase distance from the exposure
Provide shielding from exposure source

## Fire Safety



### Fire Safety



- All SMAT units have a fire safety plan
- Fire watch is necessary in the field
- All personnel should be trained to use and location of extinguishers (PASS)



Photo courtesy of NCOCEM

State Medical Assistance Team Training2-37

All SMAT units need specific fire safety planning that is in compliance with state laws. A fire safety plan will list specific information about the maximum occupancy of tents or facilities, fire exits and signage, fire alarm systems, fire drills, and hazardous materials that pose a fire risk.

A fire watch is a method of watching for fire when a fire protection system is out of service or in field conditions. The *2000 International Fire Code*, Chapter 9 Section 901.7 details the specific requirements of a fire watch, which are beyond the scope of this introductory program. However, sand buckets and fire extinguishers are two ways that fires can be extinguished. Since the US Fire Administration (USFA) advises that only trained personnel should use a fire extinguisher, this should be done prior to deployment.

Every SMRS/SMAT responder should be trained in the location and proper use of fire extinguishers. All responders should be aware of the P.A.S.S. method of using fire extinguishers.

### **P-A-S-S**

**P**ull

**A**im

**S**queeze

**S**weep

## SUMMARY

	<h3>Summary</h3>	
<ul style="list-style-type: none"><li>• Any deployment site will have risks to SMAT members</li><li>• Members must make health and safety a top priority</li><li>• Responder health and safety<ul style="list-style-type: none"><li>– Begins at home with personal health and safety</li><li>– Continues while deployed with prevention and mitigation</li></ul></li></ul>		
State Medical Assistance Team Training		2-38

In order for SMAT members to fulfill their operational mission they must make personal health and safety a top priority. The protection of responder health and safety begins with adequate preparation at home by maintaining a sound state of physical and mental health. Although many risks may be present during the deployment, an awareness of these risks and the mitigating steps to reduce their potential for causing serious injury or death will increase the overall safety of an SMAT deployment.

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# MODULE 3: INFECTION CONTROL

Training Curriculum

Length: 1 Hour

Audience: North Carolina State Medical Assistance Team personnel

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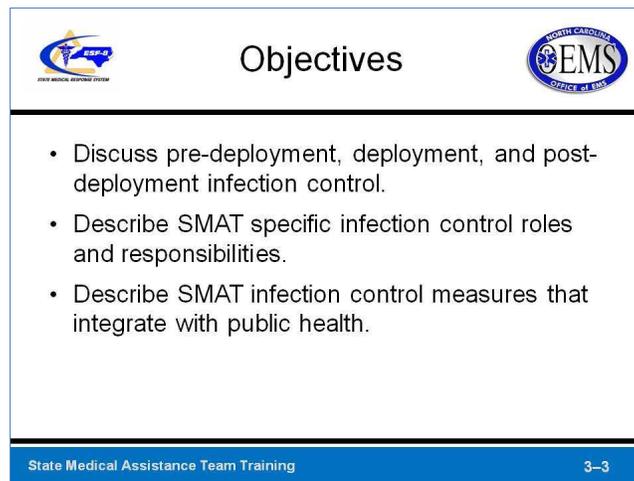
## Module Objective

Describe the basic infection control measures relevant to SMAT deployment and field operations.

## Objectives

	<b>Objectives</b>	
<ul style="list-style-type: none"><li>• Discuss basic infection control definitions and concepts relevant to SMAT operations.</li><li>• Discuss infection control in clinical settings.</li><li>• Describe infection control issues relevant to field operations.</li></ul>		
State Medical Assistance Team Training		3--2

- Discuss basic infection control definitions and concepts relevant to SMAT operations.
- Discuss infection control in clinical settings.
- Describe infection control issues relevant to field operations



The slide is titled "Objectives" and is framed by a blue border. In the top left corner is the logo for the State Medical Assistance Team, featuring a caduceus and the text "STATE MEDICAL ASSISTANCE TEAM". In the top right corner is the logo for the North Carolina EMS Office of Education, featuring a caduceus and the text "NORTH CAROLINA EMS OFFICE OF EDUCATION". The main content of the slide is a bulleted list of three objectives. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "3-3" on the right.

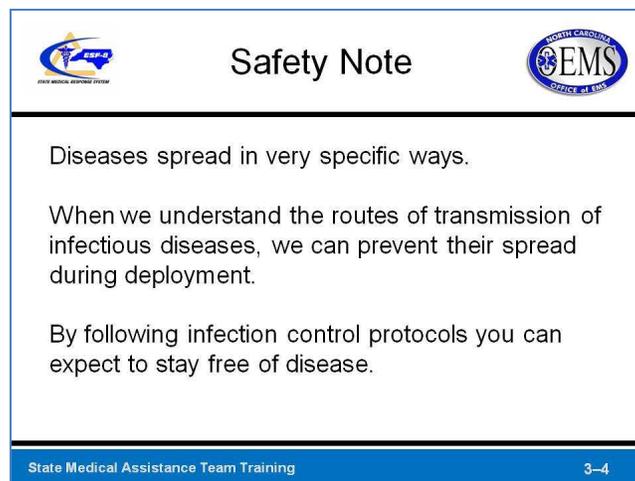
### Objectives

- Discuss pre-deployment, deployment, and post-deployment infection control.
- Describe SMAT specific infection control roles and responsibilities.
- Describe SMAT infection control measures that integrate with public health.

State Medical Assistance Team Training 3-3

- Discuss pre-deployment, deployment, and post-deployment infection control.
- Describe SMAT specific infection control roles and responsibilities.
- Describe SMAT infection control measures that integrate with public health.

## Safety Note



The slide features a blue border and a white background. At the top left is the logo for the State Medical Assistance Team Training, which includes a caduceus and the text "STATE MEDICAL ASSISTANCE TEAM TRAINING". At the top right is the logo for the North Carolina EMS, which includes a caduceus and the text "NORTH CAROLINA EMS OFFICE OF EMS". The title "Safety Note" is centered at the top. The main text is centered and reads: "Diseases spread in very specific ways. When we understand the routes of transmission of infectious diseases, we can prevent their spread during deployment. By following infection control protocols you can expect to stay free of disease." At the bottom left, it says "State Medical Assistance Team Training" and at the bottom right, it says "3-4".

**Safety Note**

Diseases spread in very specific ways.

When we understand the routes of transmission of infectious diseases, we can prevent their spread during deployment.

By following infection control protocols you can expect to stay free of disease.

State Medical Assistance Team Training 3-4

Diseases spread in very specific ways. When we understand the routes of transmission of infectious diseases, we can prevent their spread during deployment. By following infection control protocols you can expect to stay free of disease.

## OVERVIEW OF COMMUNICABLE DISEASES



### Overview



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- Infectious diseases in clinical settings
  - Why is this important?
- Impact of transmission of infectious disease
  - Patients
  - Staff
- Disease outbreaks in field settings

State Medical Assistance Team Training

3-5

## Introduction to Communicable Diseases

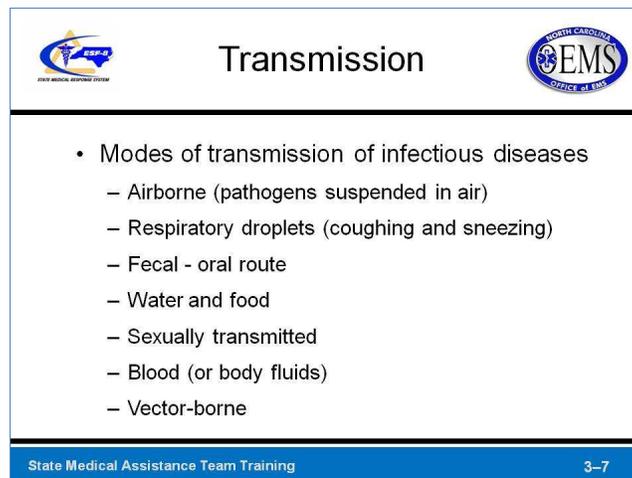
**Bacteria and Viruses**

- Transmission of infectious diseases in clinical settings relate mostly to bacteria and viruses
  - Bacteria (tuberculosis)
  - Virus (influenza)
  - Other (fungus, parasitic disease)

State Medical Assistance Team Training 3-6

In the United States, transmission of infectious diseases to patients and staff in clinical settings is mostly caused by microbial (biological) agents such as bacteria and viruses, and to a lesser extent by fungi, protozoa, parasites, and other rare infectious proteins.

Bacteria are one-celled organisms found in almost any environment. Most have the ability to multiply on their own if given proper nutrients and environmental conditions. Viruses are infectious particles composed of genetic materials that enter a cell and replicate by taking over critical activities of that cell. Bacteria and viruses cause many of the common human infectious diseases in childhood, health care facilities, shelter settings, and following traumatic injuries (Heymann, 2008).

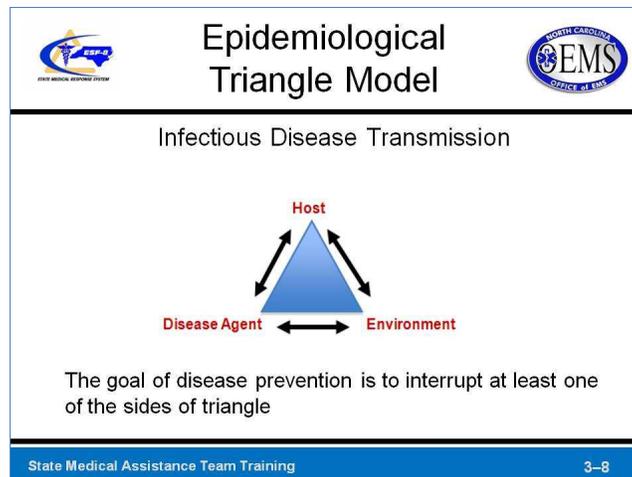


The slide is titled "Transmission" and is framed by a blue border. At the top left is the NCEM logo (North Carolina Emergency Medical Services) and at the top right is the North Carolina EMS logo (Office of EMS). The main content is a bulleted list of transmission modes. At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "3-7" on the right.

- Modes of transmission of infectious diseases
  - Airborne (pathogens suspended in air)
  - Respiratory droplets (coughing and sneezing)
  - Fecal - oral route
  - Water and food
  - Sexually transmitted
  - Blood (or body fluids)
  - Vector-borne

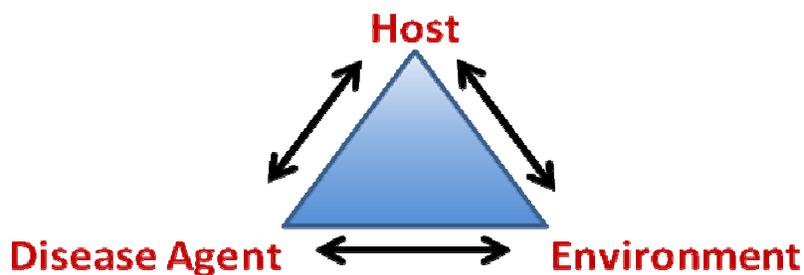
Humans become ill from infectious disease when they come in contact with others who are infected. This may occur through direct contact, exposure to respiratory droplets and aerosols, or contact with body fluids. On occasion, microbes will persist in the environment, food, water, or within the soil and may cause disease in humans when humans come in contact with these materials. Certain infectious diseases, such as rabies, can be spread from animals to humans and some infectious diseases, such as West Nile Virus infection and malaria, are spread by mosquitoes to humans. Infection control practices are designed to interrupt the various ways that infectious diseases are spread to and among humans.

While disease outbreaks have appeared on occasion after natural disasters, new diseases generally do not emerge that were not already present within the population. Although North Carolina has periodically experienced natural disasters like wildfires, winter storms, tornados, and hurricanes, disease outbreaks have rarely followed. By contrast, there was a cholera outbreak following the Haitian Earthquake of 2010 when the lack of sanitation and clean water promoted the explosive spread of cholera. This outbreak is thought by many to have been brought to Haiti by external emergency responders from other geographic areas where cholera is thought to exist (Chin, 2011). In addition, there were frequent methicillin resistant staphylococcus aureus (MRSA) infections that occurred during the hurricane Katrina relief effort. Contaminated food or water may cause disease in emergency responders.



To prevent and control infectious diseases, clinicians and public health workers use infection control measures that target the biological agent (e.g. heat or chemicals, radiation), interventions that assist the host in treating or preventing infection (e.g. antibiotics), or direct a change in the environment that reduces the potential for acquiring an infection (e.g., bandage, mosquito control).

Interrupting the spread of the biological agent usually requires the targeting of at least one of these three interventions. They are often referred to as the communicable disease “triangle” (Gordis, 2009), which is comprised of the agent (bacteria or viruses), the host (humans), and the environment (source of infection).



**Figure 3-1: The Epidemiological Triangle Model for Infectious Disease Transmission**

One of the most common and effective interventions to interrupt the transmission of disease in field settings is simple hand washing with “germicidals.” This reduces contact with biological agents and lessens the likelihood someone will spread disease to others. Friction created with the act of washing lifts biological agents from the surface of the hands. These agents are then washed off with the soap and water.

Dr. Pittet with the World Health Organization (WHO) Global Patient Safety Challenge stated that in their study of evidenced-based models for hand transmission "hand hygiene is considered the most important measure for preventing health care-associated infections and the spread of antimicrobial resistant pathogens" (Pittet, 2006).



### Transmission and Control



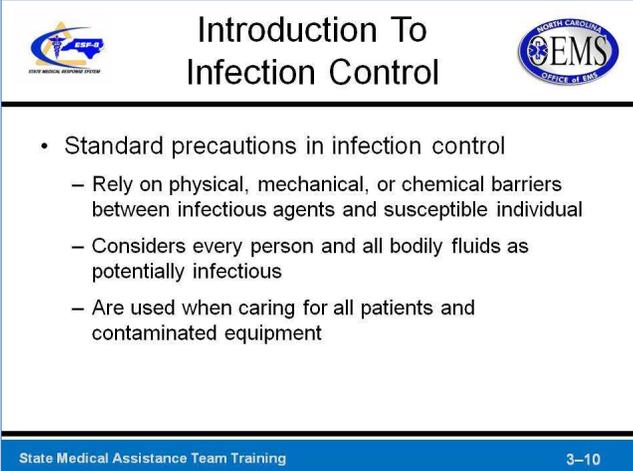
Factors Related to Disease Transmission	Examples of Control Measures
Biological agent	Disinfection
Host factors	Immunizations
Environmental factors	Mosquito control

State Medical Assistance Team Training 3-9

**Table 3-1: Communicable Disease Factors and Control Examples**

Factors Related to Disease Transmission	Examples of Control Measures
Biological agent	Disinfection
Host factors	Immunizations
Environmental factors	Mosquito control

## Introduction to Infection Control



The slide features a title 'Introduction To Infection Control' centered at the top. On the left is the SMAT logo (State Medical Assistance Team) and on the right is the EMS logo (North Carolina EMS Office of EMS). Below the title is a bulleted list of standard precautions. At the bottom, a blue footer bar contains the text 'State Medical Assistance Team Training' on the left and '3-10' on the right.

- Standard precautions in infection control
  - Rely on physical, mechanical, or chemical barriers between infectious agents and susceptible individual
  - Considers every person and all bodily fluids as potentially infectious
  - Are used when caring for all patients and contaminated equipment

Despite differences among types of infectious agents and the risks they pose to humans, a general set of infection control measures is employed in patient care settings to reduce the potential for spread of *any* disease. These measures are based on interrupting the methods by which biological agents are spread and are called “Standard Precautions” (SP) and “Transmission-based Precautions.”

These measures focus on protecting the health care provider and ancillary staff from being exposed to infectious diseases. They also reduce the likelihood that patients or health care providers will transmit infectious diseases to other patients in health care settings.

SPs are followed to prevent the transmission of infectious diseases in health care settings and are used when caring for ALL patients. SPs were adopted in 1996 combining principles from Body Substance Isolation Protocols (BSI) and Universal Precautions (UP) to create a standard system to reduce disease transmission in health care settings involving patients and health care workers (Rebmann, 2008). SPs assume that every person is potentially infectious and/or susceptible to infection. State Medical Assistance Team (SMAT) members should use these precautions when dealing with any patient and wash their hands frequently to reduce the spread of disease among health care workers (Rebmann, 2008).

SPs rely on a physical, mechanical, or chemical barrier between infectious microorganisms and a susceptible individual. The use of SPs is an effective strategy for preventing the spread of infections. Underlying this protocol is the need to consider every person, whether patient or SMAT personnel, as potentially infectious and susceptible to infection. The major components of SPs include: hand hygiene, which includes soap and water and alcohol gel (FDA recommends a concentration of 60% to 95% ethanol or isopropanol per the website at <http://www.cdc.gov/ncidod/EID/vol12no03/05-0955.htm> ); use of Personal Protective Equipment (PPE) depending on the anticipated route exposure; safe injection practices; and proper environmental cleaning.

**Table 3-2: Standard Precautions for SMAT Members**

<b>Types of PPE</b>	<b>Considerations for Use</b>
Gloves	Avoid direct contact with an individual's blood or body fluids, non-intact skin, mucous membranes, or contaminated items Change gloves after providing care to each patient or client Avoid touching surfaces or yourself with contaminated gloves Perform hand hygiene immediately after removing gloves Sterile gloves are not required Change gloves when they become heavily contaminated or to prevent cross-contamination
Goggles, face masks	Protect the mucous membranes of the eyes, nose, and mouth when contact with blood or body fluids is likely
Gowns	Protect from contact with splashing or spraying of blood or body fluids from procedures that involve blood or body fluids

Infection control refers to various measures that are employed in clinical settings to limit the spread of infectious disease. In many situations, infection control attempts to limit the spread of disease from infected patients, the environment, and in some cases, from infected staff. Proper procedures for individuals and organizations are required to reduce the risk of spreading infectious diseases in clinical settings. Infection control measures include the proper cleaning of equipment, proper disposal of medical waste and used needles, the use of proper barriers to prevent health providers from becoming infected, and hand hygiene. In the absence of good infection control practice, health providers and patients may become ill with infectious diseases that could threaten continued SMAT operations.

In field settings following disasters, infection control measures may need to be modified due to limitations in personnel and supplies. In addition, opportunities for personal hygiene among patients and responders may be limited. However, the broad principles related to infection control will remain unchanged and will require that SMATs adapt their practices in order to maintain a high standard of infection control during deployment.

**Table 3-3: Infection Control Precautions in Hospital versus Field Setting**

<b>Standard Precautions</b>	<b>Generally Accepted Standard</b>	<b>Field Application</b>
Hand Hygiene	Wash hands with warm water and soap or a germicidal agent before and after patient contact or contact with PIM.	Use alcohol-based rub of 65% to 95% ethanol or isopropanol if available, if hand hygiene stations are limited. Follow up with soap and water wash as soon as possible.
Personal Protective Equipment (PPE)	Available barrier methods such as gloves, gowns, and respirators.	PPE are articles designed to protect from transmittable pathogens should be employed whenever available. Use barrier methods when available.
Safe Needle Use	Proper disposal in biohazard sharps container	Sharps should not be recapped and should be placed in a two-liter bottle with undiluted bleach if sharps container not available.
Environment	Regular linen service and adequate space or curtains to separate patients	Cough etiquette, patient spacing, and isolation may reduce transmission.

As in hospital-based practice, maintaining proper infection control practice in the field during SMAT deployment will require ongoing training and reinforcement to sustain vigilance related to infection control in order to maintain a high quality of patient care.

SMAT training and on-site reinforcement during clinical operations are required for optimum infection control.

## Infection Control Definitions



### Infection Control Definitions



- Contagious
- Incubation period
- Patient screening
- Isolation
- Quarantine
- Immunization

State Medical Assistance Team Training3-11

An awareness level of knowledge related to SMAT infection control requires familiarization with a few additional key terms that will be useful during deployment. They are listed below:

**Contagious:** A term used to denote the fact someone who is ill is also capable of transmitting their disease to others.

**Incubation Period:** When individuals are exposed to an infectious agent there is a delay between the time of exposure and the time when the patient actually develops the disease. This is called the incubation period. The incubation period of influenza, for example, is usually two days but can range from one day to four.

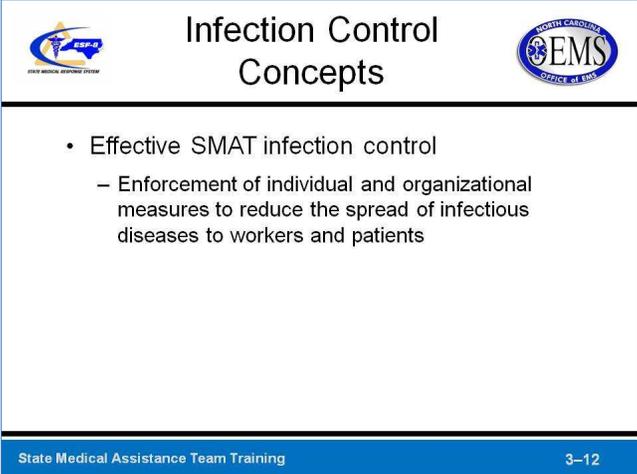
**Patient Screening:** Procedures used in clinical settings to assess patients for their potential to spread a communicable disease before entry into the general population of a health care facility are referred to as patient screening. Patient screening areas were employed at the entrances into clinical facilities and were used extensively during the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2002 and 2003 (Dwosh, Hong, et. al, 2003).

**Isolation:** Patients who are ill from a contagious disease are isolated from other persons who are susceptible. The purpose of isolation is to prevent infected and ill persons from spreading their diseases to others. It is one of the primary strategies for infection control.

**Quarantine:** Quarantine in its most basic public health form seeks to remove people who may be harboring disease, but **who are not yet ill**, from contact with other persons. The purpose of quarantine is to prevent potentially ill persons from spreading disease to others. Generally, persons are placed in quarantine for a period of time exceeding the incubation period of a disease, or until they are deemed to not have the disease or not be contagious.

**Immunization:** Immunization is the act of providing a person with an exposure to a virus or bacteria so the person can develop protective antibodies against the disease. With regard to an infectious disease, this commonly involves receiving an injection, or “shot,” with key components of the infectious disease agent of concern. The purpose of this preventive health strategy is to make the person immune to the disease by helping the body develop protective antibodies against the biological agent.

## Infection Control Concepts



The slide features a title "Infection Control Concepts" centered at the top. To the left is the NREMT logo (National Registry of Emergency Medical Technicians) and to the right is the North Carolina EMS logo (Office of EMS). Below the title, a bulleted list contains two items: "Effective SMAT infection control" and "Enforcement of individual and organizational measures to reduce the spread of infectious diseases to workers and patients". The slide footer includes "State Medical Assistance Team Training" on the left and "3-12" on the right.

- Effective SMAT infection control
  - Enforcement of individual and organizational measures to reduce the spread of infectious diseases to workers and patients

Infection control in SMAT operations falls into two general measures to reduce the spread of disease: a) they target strategies to prevent the spread of infectious disease from one person to others, or b) they reduce environmental exposures that might lead to infectious diseases.

From a SMAT perspective, separating ill team members from others working in the field is extremely important. In camp settings, ill team members should be removed from their duties and isolated from health workers. This may include confining ill team mates to special housing or providing access to designated areas for additional opportunities for personnel hygiene. For example, during the recent Haiti earthquake response, medical teams developed separate toilet facilities for health care workers who suffered from diarrhea as a way to help reduce the transmission of disease (Lichtenberger, Miskin & Dickinson, 2010).



## Infection Control Concepts



- “Individual” infection control strategies
  - Maintain hygiene
  - Self-report illness
  - Follow protocols
- “Organizational” infection control strategies
  - Training
  - Adhere to immunization policy

State Medical Assistance Team Training 3-13

It is important to understand that the mainstay of an effective SMAT Infection Control program will be the enforcement of individual and organizational measures to reduce the spread of infectious diseases to workers and patients (Lichtenberger, Miskin & Dickinson, 2010).

## Food Safety



**Food Safety**

- Safe food-handling practices
  - Symptomatic workers should not prepare/serve food
  - Discard any foods requiring refrigeration if they have been at room temp. for more than 2 hours
  - Discard any foods that have been kept more than 1 hour in a room above 90° F
  - Use prepackaged or approved food and water for field service

State Medical Assistance Team Training 3-14

The Association for Professionals in Infection Control and Epidemiology (APIC) developed a broad set of food handling guidelines for health care workers who are responding to disasters. The key awareness concepts for SMAT members for the safe handling of food are listed below (Rebmann, 2008):

- Symptomatic workers should not prepare or serve food.
- Discard any food that requires refrigeration and has been kept at room temperature for  $\geq$  2 hours.
- Discard any food that has been kept  $\geq$  1 hour in a room above 90°F.
- Prepackaged, freeze-dried foods for field service offer a safe method to feed SMAT members for short periods of time.

SMAT personnel should not consume food or drink that has not been declared safe by the Safety officer or a public health official. This would include gifts of food and drinks brought and/or prepared by persons in the impacted area as one cannot be certain of the water source or the length of time that the food/drink item was not refrigerated.

## Potable Water



### Potable Water



- Potable water is critical to clinical operations
  - Drinking
  - Personal hygiene
  - Required for a medical treatment facility
  
- Measures to increase water safety
  - Short-term (restriction to approved sources)
  - Chemical disinfection
  - Filtration/settling
  - Bottled water

State Medical Assistance Team Training3-15

In disaster situations, identifying water sources for drinking, hygiene, and medical care are of particular importance. For disaster medical teams, having adequate bottled water from safe sources for drinking and medical needs is critical. Team members should only consume water from sources identified by the safety officer or public health personnel as being safe.

In the absence of bottled water, there are several ways to purify the local water supply. The EPA recommends that you boil filtered and settled water vigorously for one minute (at altitudes above one mile, boil for three minutes) to inactivate most harmful bacteria, parasites, and viruses.

Chemical treatment can be added to disinfect water, but it will not necessarily remove or kill all harmful parasites without additional treatment measures. Reverse osmosis alone will not eliminate all disease-causing microorganisms. Treating water with ultraviolet light alone will not necessarily rid the water of all parasites.

The bottom line is that bottled water is your safest bet during short-term deployments.

## Handling of Medical Waste



### Regulated Medical Waste



- Examples of Regulated Medical Waste as defined by the Occupational Safety and Health Administration (OSHA):
  - Blood or other potentially infectious materials
  - Contaminated items that would release potentially infectious materials in a liquid or semi-liquid state if compressed
  - Items caked with potentially infectious materials that are capable of releasing these materials during handling
  - Contaminated sharps
  - Pathological and microbiological wastes containing blood or other potentially infectious materials

State Medical Assistance Team Training3-16

*Medical waste* is defined as all waste materials generated at healthcare facilities.

Regulated Medical Waste is defined by the Occupational Safety and Health Administration (OSHA) as:

- Liquid or semi-liquid blood or other potentially infectious materials.
- Contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed.
- Items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling.
- Contaminated sharps.
- Pathological and microbiological wastes containing blood or other potentially infectious materials.



## Handling Medical Waste



- Body parts, blood, or body fluid and waste should be placed in bags labeled “Regulated Medical Waste” or placed in biohazard bags pending removal.
- Regulated Medical Waste should be stored in an enclosed and secure location while arrangements for proper disposal are made.
- Why the concern?
  - The blood-borne pathogens such as HIV, Hepatitis B, and Hepatitis C.
  - Any exposure to blood or body fluids SMAT personnel requires immediate reporting to the SMAT infection control officer

State Medical Assistance Team Training3-17

The APIC developed a broad set of medical waste guidelines for health care workers responding to disasters. Many key awareness concepts for SMAT members for the safe handling of medical waste are listed below (Rebmann, 2008):

- Body parts, blood, or body fluid and waste should be placed in bags labeled “Regulated Medical Waste” or placed in biohazard bags pending removal.
- Regulated Medical Waste should be stored in an enclosed and secure location while arrangements for proper disposal are made.
- Why the concern?
  - The blood-borne pathogens such as HIV, Hepatitis B, and Hepatitis C.
  - Any exposure to blood or body fluids SMAT personnel requires immediate reporting to the SMAT infection control officer

**Table 3-4: SMAT Infection Risk and Control Measures**

Infection Risks	Infection Control Measures
Patients	Screening Isolation of contagious patients
Food	Limited or no food storage Use of packaged, freeze dried field rations
Water	Bottled water Chemical treatment Filtration and Settling
Medical waste	“Sharps management” Store and secure Proper waste management

# INFECTION CONTROL IN CLINICAL SETTINGS

## *Infectious Disease Risks for SMAT Personnel*

 <b>Infectious Disease Risks</b> 		
Infection Risks	Infection Control Measures	
<b>Patients</b>	Screening	Isolation of contagious patient
<b>Food</b>	Limited or no food storage Packaged, freeze dried field rations	Proper temperature control Proper food handling
<b>Water</b>	Bottled water	Chlorination
<b>Medical Waste</b>	“Sharps management” Stored and secure	Proper waste handling

State Medical Assistance Team Training 3-18

The list of infectious disease challenges for SMAT personnel includes those that are normally present in most clinical settings. Depending on the clinical activities undertaken and the environment of each deployment, these could include respiratory viruses and bacteria such as influenza and tuberculosis, bacterial, viral or parasitic causes of diarrhea, blood-borne pathogens such as hepatitis B, C and HIV, and bacterial and viral causes of meningitis.

## Routes of Exposure

 <span style="margin-left: 100px;">Routes Of Exposure</span> 		
Exposure Risk	Disease	Infection Control Strategy
Airborne	Measles	Isolation, respirators, preventive care such as immunizations
Respiratory droplet	Influenza	Cough etiquette and masks
Fecal – Oral route	Diarrheal illnesses	Hand hygiene after toileting and good personal hygiene
Water-borne and food-borne	Hepatitis A	Prevent contamination and proper storage
Sexually transmitted	Syphilis, Chlamydia	Safe sex practices including condom use
Blood-borne	HIV, Hepatitis C	Use caution when using needles and do not recap
Vector-borne	Lyme Disease (Ticks), Rocky Mountain Spotted Fever	Awareness, prevention, and early treatment
Direct skin contact	Chemical exposures, blood-borne pathogens	Personal protective equipment

State Medical Assistance Team Training 3-19

There are a variety of ways that microbial threats may transmit to SMAT personnel or patients. Transmission-based precautions are designed to interrupt these routes of exposure.

**Airborne:** Infection occurs when the microbe from an infected person becomes suspended in the air in tiny droplet nuclei and is then inhaled by another susceptible individual.

Examples of common diseases spread by this route include tuberculosis, measles, and chickenpox. Infections that are “airborne” can remain in the air for a significant length of time and travel some distance.

**Respiratory droplet:** Infection occurs when the pathogen, normally created as large droplets from coughing or sneezing, from an infected person’s nose or throat comes into direct contact with the mucus membranes (eyes, nose, or mouth) of another susceptible individual. Respiratory droplets travel only a limited distance (2 meters or less) and then fall out of breathing space air. Droplets on hard environmental surfaces can pose a transmission risk as well. Examples of common diseases spread by this route include the common cold (virus), influenza, pertussis, and meningococcal disease.

**Fecal – oral route:** Infection is spread from the fecal matter of an infected person to another person, usually by contaminated hand-to-mouth contact. This usually occurs when effective hand washing is not done after toileting or through poor personal hygiene. Examples of common diseases spread by this route include diarrheal illnesses and Hepatitis A.

**Water-borne and food-borne:** Infection occurs when contaminated water or food that is not properly treated (water) or prepared, stored, served (food) is ingested by a susceptible individual. This often results in diarrheal illness. Examples of common diseases spread by this route include numerous diarrheal illnesses and Hepatitis A.

**Sexually transmitted:** These infections occur when direct contact between an infected person and a susceptible individual occurs during sex. These can result in illnesses that are systemic (HIV, hepatitis B, C, syphilis) or are localized to the contact area (chancroid). Examples of common diseases spread by this route include HIV/AIDS, hepatitis B, C, D, gonorrhea, chlamydia, and syphilis.

**Blood-borne:** Blood-borne infections are spread through close contact with an infected person's body fluids, such as unprotected sexual contact, sharing needles or drug paraphernalia, blood transfusions (rarely), and needle stick injuries in clinical settings.

**Vector-borne:** These infections are spread from an infected person to a susceptible individual through the bite of an infected arthropod or mammal, but most often via mosquitoes or ticks. The pathogens transmitted can include bacteria, viruses, rickettsia, or parasites. Examples of infections spread in this manner include Lyme disease, numerous viral encephalitides, malaria, typhus, dengue and rabies.

**Table 3-5: Routes of Disease Exposure and Control Measures**

<b>Exposure Risk</b>	<b>Example</b>	<b>Infection Control Strategy</b>
Airborne	Measles	Isolation, respirators, preventive care such as immunizations
Respiratory droplet	Influenza	Cough etiquette and masks
Fecal – oral Route	Diarrheal illnesses	Hand hygiene after toileting and good personal hygiene
Water-borne and food-borne	Hepatitis A	Prevent contamination and proper storage
Sexually transmitted	Syphilis, Chlamydia	Safe sex practices including condom use
Blood-borne	HIV	Use caution when using needles and do not recap
Vector-borne	Lyme disease (ticks), Rocky Mountain Spotted Fever	Awareness, prevention, and early treatment
Direct skin contact	Chemical exposures, blood borne pathogens	Personal protective equipment

## Standard Precautions

	<b>Infection Control Precautions</b>	
<ul style="list-style-type: none"><li>• Hand hygiene<ul style="list-style-type: none"><li>– Alcohol hand sanitizer may not be adequate in all situations</li></ul></li><li>• Personal Protective Equipment (PPE)</li><li>• Safe sharps use and disposal</li><li>• Environmental cleaning</li><li>• Immunizations</li><li>• Respiratory hygiene</li></ul>		
State Medical Assistance Team Training		3-20

SMAT personnel must assume that every patient poses an infectious disease risk to self and others in the clinical setting. Therefore, standard precautions are used to control infectious disease risks to SMAT personnel during deployment. They are listed below:

**Hand hygiene:** The single most important measure for preventing the spread of pathogens is effective hand hygiene, which is defined as any method that removes or destroys microbes on the hands. Hand washing with soap and water is the preferred method to remove potentially infectious material from the hands. In field conditions, hand washing stations may not be available or operational. In that case, the use of alcohol-based hand sanitizers of 60% to 95% ethanol or isopropanol (gels, foams, liquids) can be used if the hands are not visibly soiled with contaminated organic material. The physical layout of the SMAT deployment should ensure the easy accessibility of hand hygiene products such as soap, clean water, or alcohol-based (60% to 95% ethanol or isopropanol) hand rubs, ideally at the point of care and immediately after.

**Personal Protective Equipment (PPE):** The use of physical barriers to protect SMAT personnel from splashes and spills is an important part of standard precautions (SP). These barriers can include protective goggles or face shields, gowns, respirators, or gloves. SMAT personnel should choose PPE based on an assessment of the procedure to be performed and the mode of transmission of the potential agents.

**Gloves:** Whenever SMAT personnel expect to touch an individual's blood or body fluids, non-intact skin, mucous membranes, or contaminated items, gloves should be worn. Sterile gloves are not required. Change gloves when they become heavily contaminated or to prevent cross contamination with other body parts or sites. Avoid touching surfaces in the SMAT environment or yourself with contaminated gloves. Change gloves after providing care to each patient or client.

**Goggles, masks, face masks:** Protect the mucous membranes of the eyes, nose, and mouth when contact with blood or body fluids is likely.

**Gowns:** When splashing or spraying with blood or body fluids is possible (based on the procedures planned), an isolation/procedure gown should be used. This helps

protect SMAT persons' skin from blood or body fluid contact and prevents soiling of clothing during procedures that involve blood or body fluids.

**Safe needle use:** Investigations into several outbreaks of blood-borne pathogens (Hepatitis B and C) have indicated several breaches of infection control practice, including reinsertion of used needles into a multiple-dose vial or solution container (e.g., saline bag) and use of a single needle/syringe to administer intravenous medication to multiple patients.

Recommendations to prevent this kind of breach include the use of a sterile, single-use, disposable needle and syringe for each injection given and prevention of contamination of injection equipment and medication. SMAT personnel should be instructed in these methods to prevent spread of blood borne pathogens.

Needles and other sharp instruments (scalpels) pose significant risk of injury and possible transmission of infectious agents to susceptible SMAT personnel. Properly handling, cleaning, and discarding these sharps will greatly reduce the risk of sharps injuries. Used needles should not be recapped, broken, bent, or manipulated by hand. Needles and attached disposable syringes should be discarded as one unit in approved puncture resistant containers. Re-usable sharp instruments should be handled with extra care when cleaning and preparing for reuse.

**Proper environmental cleaning:** Appropriate and safe cleaning of linen, patient care instruments, and environmental surfaces provides protection against disease transmission. Extraordinary measures are generally not required to sufficiently clean linen, equipment, and patient care area furnishings. When cleaning soiled linens, handle them in a way as to avoid letting the linens touch skin. Gloves can be worn when handling such linens. Soiled linens should not be pre-rinsed in patient care areas, but should be transported with as little handling as possible to the laundry area.

Patient care equipment should be cleaned in a way to prevent contact with skin or mucous membranes and to prevent environmental contamination. Reusable equipment should be cleaned prior to reuse. If reuse requires sterile conditions, the equipment should be sterilized before reuse. Environmental surfaces require only routine care and cleaning with available disinfectants.

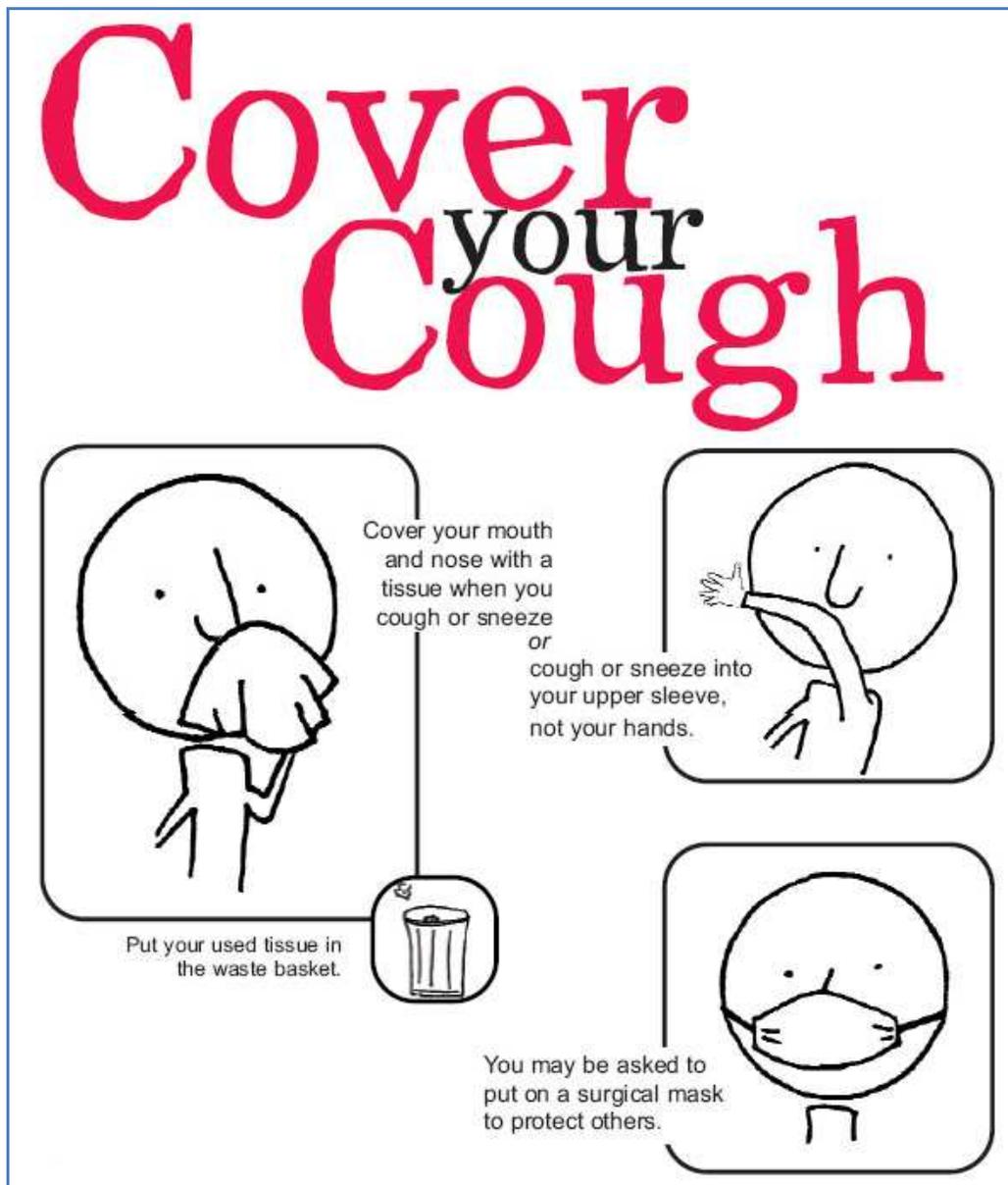
**Immunizations:** All SMAT personnel should have completed all necessary immunizations prior to deployment.

Requirements for immunization are listed in the MOU between NCOEMS and participating hospitals involved in SMRS/SMAT activities. They are listed below:

- o Tetanus vaccination within the last ten years
- o Hepatitis B vaccine (or a positive titer within the last year)
- o Tuberculosis skin test (and a chest x-ray if tuberculosis skin test is positive) within the last year

This applies to all team members for a deployment; however, if there are special circumstances in the deployed setting or additional risks, additional immunizations may be recommended

**Respiratory hygiene:** Also known as cough etiquette, this simple activity may reduce the spread of airborne or respiratory droplets in the SMAT clinical setting. Upon sneezing or coughing, an individual should cover their nose and mouth with a tissue, mask, or their sleeve at the crux of their elbow. Used tissues and masks should be disposed of properly. Hand hygiene should be performed after contact with respiratory secretions. Patients, clients, and others in the SMAT environment should also practice this and instructional posters should be posted in all areas. Tissues and disposal receptacles should be placed throughout the area.



**Figure 3-2: Cover your Cough public awareness campaign**  
(CDC, <http://www.cdc.gov/flu/protect/covercough.htm>)

## ***Isolation***

Isolation refers to the physical separation of persons who are infectious from other patients, staff, and clients. In the field setting where SMAT personnel are deployed, such persons may be best handled by standing hospital accommodations. However, should such facilities be unavailable due to the impact of the disaster, SMAT personnel may need to create an area that is physically isolated from the remainder of the SMAT deployment and operations areas. Should that be required, the Centers for Disease Control and Prevention, Healthcare Infection Control Practices Advisory Committee (HICPAC) document entitled *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings* and available at: <http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf> should be referred to.

## INFECTION CONTROL FOR SMAT TEAM MEMBERS DURING DEPLOYMENT

	<b>Infection Control Considerations</b>	
<ul style="list-style-type: none"><li>• Responding to infectious disease emergencies (epidemics)</li><li>• SMAT Personal Protective Equipment (PPE)</li><li>• Prophylactic medication for SMAT members</li><li>• Management of infectious disease in SMAT personnel</li></ul>		
State Medical Assistance Team Training		3-21

Infectious disease risks that are present in routine clinical care settings are also present in field situations. The special circumstances associated with each SMAT deployment may contribute additional risks related to infection control.

See the Supplemental Materials (items 1 & 2) for infection control protocols as recommended by the Association for Professionals in Infection Control and Epidemiology (APIC) and the Centers for Disease Control and Prevention (CDC).

### ***Responding to Infectious Disease Emergencies***

SMAT operations related to communicable disease emergencies such as pandemic influenza or cholera may pose additional infection control challenges to SMAT deployments. The primary SMAT infectious control objective during these situations is to prevent the transmission of disease to SMAT members and from SMAT members to the community. Intensification and enforcement of infection control measures should be both an administrative and an infection control priority during these deployments.

### ***SMAT Personal Protective Equipment (PPE)***

Extensive discussion on the SMAT use of PPE in deployments was detailed in Table 3.2. These items generally include items such as gowns, gloves, goggles and respirators and may require additional training or fit testing (e.g., respirators).

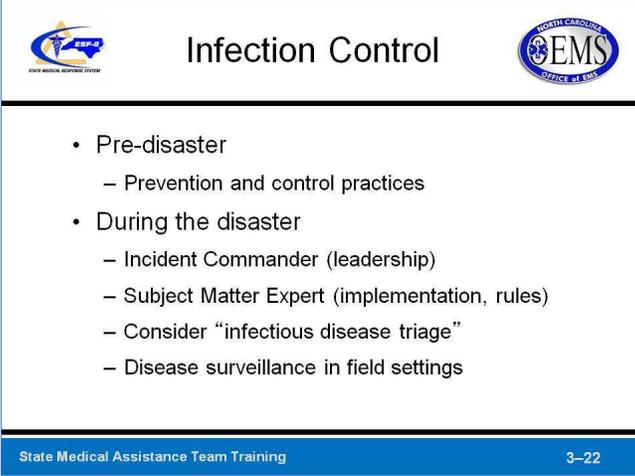
### ***Prophylactic Medication for SMAT Members***

*Prophylaxis* is the use of antibiotics, antiviral agents, or antitoxins to prevent an exposed individual from becoming ill or to mitigate the severity of that infection. For example, during the H1N1 pandemic individuals who were exposed to that virus were given a course of Tamiflu to prevent them from becoming sick. Medical prophylaxis is designed to stave off symptoms by making the host (your body) unattractive to the infectious agent, not provide immunity to disease. If you stop taking the prophylactic medication while still at risk of infection, you may become ill.

### ***The Management of Infectious Disease in SMAT Personnel***

During a SMAT deployment, there should be an organized time when team members can be medically assessed and receive medical services. What may appear to be insignificant illness or injury should be reported to SMAT leadership. This is particularly important if illness or injury requires health providers to be taken out of their clinical deployment duties.

## INFECTION CONTROL CONSIDERATIONS BY DISASTER PHASE



The slide is titled "Infection Control" and features two logos at the top: the NIOSH logo on the left and the North Carolina EMS Office of EMS logo on the right. The main content is a bulleted list of infection control considerations, divided into two categories: "Pre-disaster" and "During the disaster".

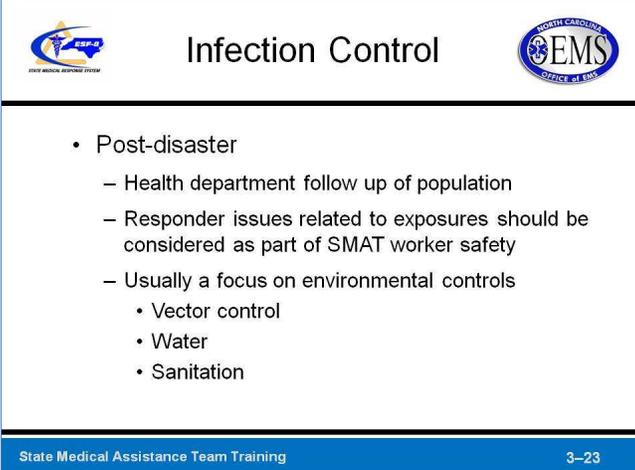
- Pre-disaster
  - Prevention and control practices
- During the disaster
  - Incident Commander (leadership)
  - Subject Matter Expert (implementation, rules)
  - Consider “infectious disease triage”
  - Disease surveillance in field settings

At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "3-22" on the right.

**Pre-Disaster:** Organizations responsible for providing or facilitating public health and medical services in a disaster response (e.g., sheltering, healthcare services) can maximize the protection of its personnel/volunteers and disaster victims by pre-planning. Pre-planning allows for detailed consideration of the infection control practices and the resources/equipment needed to protect both deployed staff/volunteers and community members directly impacted by a disaster. It also allows for partnering, planning, training, and exercising with key governmental agencies (local, regional, state, tribal, federal, as appropriate) and organizations (non-governmental, faith-based, for example) that would be involved in a community disaster response, and “tweaking/improving” disaster response plans.

Pre-deployment health checkups/screenings should include vaccinations as appropriate, and the procedures for evaluating team members who experience a direct exposure to infectious fluids such as hepatitis B, hepatitis C, and HIV should be well-documented and known to team members involved in the health care of disaster victims (Rebmann, 2008).

**During the Disaster:** The first responsibility of the Incident Commander of the SMAT is to ensure the security and safety of response team members. The “health” safety of team members includes the implementation, practice and maintenance of infection prevention and control practices, meant to decrease the likelihood and spread of infectious disease. Public health/health care practitioners such as nurses, physicians, infection control practitioners or epidemiologists generally oversee these practices. These practices generally include screening disaster victims to minimize the exposure of infectious individuals to other victims and responders, and ongoing surveillance (disease reporting systems) in settings such as shelters to identify an infectious disease outbreaks as quickly as possible.



**Infection Control**

- Post-disaster
  - Health department follow up of population
  - Responder issues related to exposures should be considered as part of SMAT worker safety
  - Usually a focus on environmental controls
    - Vector control
    - Water
    - Sanitation

State Medical Assistance Team Training 3-23

**Post-Disaster:** Following a disaster, infection prevention and control practices are maintained until the health department of the jurisdiction determines that specific interventions may be discontinued. Generally this decision is made when disease surveillance data shows that disaster-related infections are consistently decreasing and are no longer a community threat. Tetanus immunizations may be provided to those at risk based on injuries sustained during the disaster. The health department will generally implement disease control measures (e.g., mosquito avoidance recommendations, use of DEET- containing insect repellents, aerial or truck spraying to kill mosquitoes) to prevent potential problems from emerging.

# SMAT INFECTION CONTROL ROLES AND RESPONSIBILITIES

## SMAT Individual Infection Control Responsibilities



### SMAT Individual Infection Control Responsibilities



Individual's Responsibility

- Provide documentation of immunization status
- Participate in team just-in-time or other pre-deployment trainings
- Follow protocols and procedures related to infection prevention and control
- Maintain basic hygiene throughout SMAT deployment
- Self-report any symptoms/conditions while deployed (e.g., fever, vomiting, diarrhea, rashes, injuries – including needle sticks)

State Medical Assistance Team Training
3-24

It is clear that there are infection control roles and responsibilities that need to be undertaken by the individual and those that need to be undertaken by the organization. For example, individuals need to provide documentation of their immunization status prior to deployment, participate in just-in-time training or other training activities of the team, inform SMAT team leaders of any illnesses while deployed (e.g., fever, vomiting, diarrhea, rashes, injuries – including needle sticks), follow protocols and procedures related to infection control, and maintain basic hygiene throughout the SMAT deployment.

**Table 3-6: SMAT Individual Infection Control Responsibilities**

Individual Responsibility	<ul style="list-style-type: none"> <li>Provide documentation of immunization status</li> <li>Participate in team just-in-time or other pre-deployment trainings</li> <li>Follow protocols and procedures related to infection prevention and control</li> <li>Maintain basic hygiene throughout SMAT deployment</li> <li>Self-report any symptoms/conditions while deployed (e.g., fever, vomiting, diarrhea, rashes, injuries – including needle sticks)</li> </ul>
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## SMAT Organization Infection Control Responsibilities



The slide features a blue header with the title "SMAT Organization Infection Control Responsibilities" and logos for the State Medical Assistance Team (SMAT) and the North Carolina EMS Office of EMS. The main content is a table with a blue header "Organization's Responsibility" and a list of responsibilities. The footer contains "State Medical Assistance Team Training" and "3-25".

Organization's Responsibility	Responsibilities
	<ul style="list-style-type: none"><li>• Ensure members get health checkups/screening</li><li>• Confirm member have received appropriate immunizations or provide resource information</li><li>• Implement and maintain infection prevention and control program throughout deployment</li><li>• Ensure environmental health safety, to include:<ul style="list-style-type: none"><li>— Food safety and potable water</li><li>— Limit contact with wild animals, vectors</li><li>— Ensure proper sanitation</li><li>— Limit environmental exposures</li><li>— Medical waste disposal</li></ul></li></ul>

The SMAT as an organization will need to establish protocols for managing the health security and safety of its members and patients during deployment. This is part of the medical and administrative oversight of SMAT programs. Examples include decisions for addressing the evaluation of SMAT team members with serious exposures (e.g., blood product exposure via accidental needle stick from a needle used to draw blood from an ill patient).

When SMAT teams are active in the field, concern for environmental factors related to controlling infection can be critical. For example, ensuring proper access to potable water and proper sanitation are critical to keep a SMAT team disease-free. Other environmental concerns such as vector (flies and mosquitoes) and rodent control can be extremely important in preventing and reducing infectious diseases in SMAT members. This overall environmental health function should be integral to overall SMAT infection prevention and control operations. Additional information can be obtained in *Deployment Readiness/Surviving Austere Environments*.

**Table 3-7: SMAT Organization Infection Control Responsibilities**

Organization's Responsibility	<p>Ensure members get health checkups/screening</p> <p>Confirm members have received appropriate immunizations or provide resource information</p> <p>Implement and maintain infection prevention and control program throughout deployment</p> <p>Ensure environmental health safety, to include:</p> <ul style="list-style-type: none"><li>Food safety and potable water</li><li>Limit contact with wild animals, vectors</li><li>Ensure proper sanitation</li><li>Limit environmental exposures</li><li>Medical waste disposal</li></ul>
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## INTEGRATION WITH PUBLIC HEALTH EMERGENCY RESPONSE



### Integration with Public Health



- SMAT clinicians integrate with Public Health representatives
- Access to public health laboratory confirmation
- North Carolina infectious disease surveillance and reporting programs are managed by public health

State Medical Assistance Team Training3-26

SMAT medical surge deployments will often overlap with public health emergencies and it is best to view clinical care and public health services as a continuum of care for victims of disasters. Infection control usually refers to measures conducted to interrupt the spread of disease from one person to another in a clinical setting. Public health measures usually focus on controlling infectious disease within the population. During pandemic influenza mobilizations, for example, there will be medical surge requirements as well as routine community disease control requirements to address the needs of patients.

If public health interventions (e.g., immunization, social distancing) are not linked with clinical emergency response activity, new patients will continue to overwhelm health care facilities. An example of SMAT integration with public health includes situations where SMAT clinical staff may treat tuberculosis patients who will need community follow up by public health authorities.

### **Public Health Preparedness and Planning**

Information regarding North Carolina's public health preparedness and response planning can be found on the North Carolina Department of Health and Human Services (NCDHHS) website. One website example is:

<http://www.ncdhhs.gov/mhddsas/disasterpreparedness/dmhd-disasterplan-1-10.pdf> ) - *North Carolina Department of Health and Human Services - Disaster Preparedness Response and Recovery Plan for the State of North Carolina* (January, 2010)]. In this document, several examples of North Carolina's disaster risks are noted. The "most likely" disaster risk listed is "weather-related events such as tornadoes, flooding, hurricanes, and severe winter weather that are oftentimes associated with power outages." Additional disaster risks listed include "hazardous materials disasters due to local nuclear power plants, trains that carry and companies that store hazardous materials." Also referenced is the NCDHHS "all hazards" plan that "can also be modified during a pandemic influenza event by activating the Continuity of

Operations Plan (COOP) and using the state web based emergency management communication tool WEB EOC for social distancing during the response phase.”

The NCDHHS has an extensive preparedness and response effort for state, regional and local levels. This effort increasingly involves integration with hospitals and regional trauma entities to participate in integrated training and exercise activities.

SMAT integration with public health in infection prevention and control efforts will reduce the spread of infectious diseases, reduce the number of patients needing care in health care facilities, and shorten the time needed for the community to return to a state of normalcy.

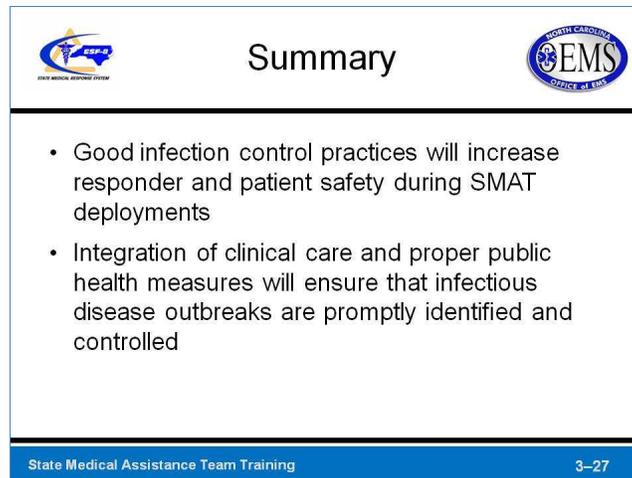
### ***Surveillance and Reporting***

Certain diseases treated by SMAT clinical staff must be reported to public health authorities to ensure proper follow up once patients are discharged from SMAT care. The list of diseases that must be reported to the health department can be found on the NCDHHS website through a link at [www.epi.state.nc.us/epi/gcdc/manual/toc.html](http://www.epi.state.nc.us/epi/gcdc/manual/toc.html) and also on the CDC’s Morbidity and Mortality Weekly Report (MMWR) website at [www.cdc.gov/mmwr](http://www.cdc.gov/mmwr). Among others, this list includes hepatitis A, B, C, meningococcal disease, measles, mumps, and pertussis.

SMAT personnel operating during a deployment may be the first to become aware of an outbreak of diarrhea or respiratory diseases. To prevent and reduce the spread of infectious diseases, SMAT personnel, through the SMAT Incident Command System, have a responsibility to report notifiable diseases to the health department for immediate investigation. Health department personnel will conduct epidemiologic investigations and surveillance to determine cases and contacts, and will implement interventions to prevent the spread of disease.

The North Carolina infection control policy is under the North Carolina Administrative Code 10ANCAC 41A. The statewide program for infection control is the Statewide Program for Infection Control and Epidemiology (SPICE) and is located at the School of Medicine at the University of North Carolina in Chapel Hill.

## SUMMARY



The slide features a blue header with the text "Summary" centered. On the left is the "EMSP-2" logo (Emergency Medical Services - 2nd Edition) and on the right is the "NORTH CAROLINA EMS OFFICE OF EMS" logo. Below the header, two bullet points are listed. At the bottom, a blue footer contains the text "State Medical Assistance Team Training" on the left and "3-27" on the right.

- Good infection control practices will increase responder and patient safety during SMAT deployments
- Integration of clinical care and proper public health measures will ensure that infectious disease outbreaks are promptly identified and controlled

In summary, infection control in SMAT operations involves a basic knowledge of communicable disease and measures designed to interrupt the transmission of infection from one human to another, or from the environment to humans. This is also critical to protecting the health of SMAT personnel.

Standard and transmission-based precautions are used in clinical settings by health care providers to limit the spread of infectious diseases. Training and enforcement of infectious disease practices in clinical settings are keys to the successful mitigation of the risk from infectious disease to SMAT personnel during deployments.

SMAT infection control begins before deployment with proper immunization of staff, training in infection control practices, and other measures to reduce the possibility that personnel may become ill during a deployment.

In addition to operational and administrative integration, SMAT medical surge response should be integrated with the public health emergency response through measures to identify patients with communicable diseases before they are released into the community. SMAT participation in disease surveillance can be critical to identifying, treating, and preventing an epidemic.

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## SUPPLEMENTAL ONLINE MATERIALS

1. Infection Prevention and Control for Shelters during Disasters *APIC Emergency Preparedness Committee* available at:  
[http://www.apic.org/Content/NavigationMenu/EmergencyPreparedness/SurgeCapacity/Shelters\\_Disasters.pdf](http://www.apic.org/Content/NavigationMenu/EmergencyPreparedness/SurgeCapacity/Shelters_Disasters.pdf)
2. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings available at:  
<http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf>
3. North Carolina Department of Health and Human Services - Disaster Preparedness Response and Recovery Plan for the State of North Carolina (January, 2010) available at:  
<http://www.ncdhhs.gov/mhddsas/disasterpreparedness/dmhd-disasterplan-1-10.pdf>
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<http://www.governor.state.nc.us/NewsItems/ProclamationDetail.aspx?newsItemID=464>

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# MODULE 4: ALL HAZARDS

Training Curriculum

Length: 1 hour

Audience: North Carolina State Medical Assistance Team personnel

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## Module Objective

Describe the effects of disasters in an all hazards context along with pertinent health and worker safety issues associated with a State Medical Assistance Team (SMAT) emergency response.

## Objectives

	<h3>Objectives</h3>	
<ul style="list-style-type: none"><li>• Review the history of natural disasters and chemical, biological, radiological, nuclear and explosive incidents.</li><li>• Discuss natural disasters and biological, chemical, explosive, radiological, and nuclear incidents including their health effects, safety measures, and medical care.</li></ul>		
State Medical Assistance Team Training		4-2

- Review the history of natural disasters and chemical, biological, radiological, nuclear and explosive incidents.
- Discuss natural disasters and biological, chemical, explosive, radiological, and nuclear incidents including health effects, safety measures, and medical care.

## Safety Note

In North Carolina, though it is remotely possible, it is unlikely that you will encounter every type of human-made or natural disaster, particularly events like biological or radiological incidents. However, understanding each of these and the challenges they present can be the key to an effective response. Remember, too, that as an emergency responder, it is essential that you keep yourself safe and well so you can help others.

	<h3>Safety Note</h3>	
<p>In North Carolina, though it is remotely possible, it is unlikely that you will encounter every type of human-made or natural disaster, particularly events like biological or radiological incidents.</p> <p>However, understanding each of these and the challenges they present can be the key to an effective response.</p> <p>Remember, too, that as an emergency responder, it is essential that you keep yourself safe and well so you can help others.</p>		
State Medical Assistance Team Training		4-3

# NATURAL DISASTERS

## Overview of Natural Disasters



### Overview Natural Disasters



Classifications of natural disasters

- No-notice Incidents
  - Earthquakes
- Notice Events
  - Hurricanes



Photos courtesy of Nanci Nagel

State Medical Assistance Team Training

4-4

Noji (1997) defines natural disasters as disasters caused by natural forces. These forces can include those that cause earthquakes, volcanic eruptions, hurricanes, floods, tornados and extremes of temperature. These natural disasters can be further classified into notice events or no-notice incidents.

 **Overview**   
**Natural Disasters**

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Photos courtesy of Mike Proctor

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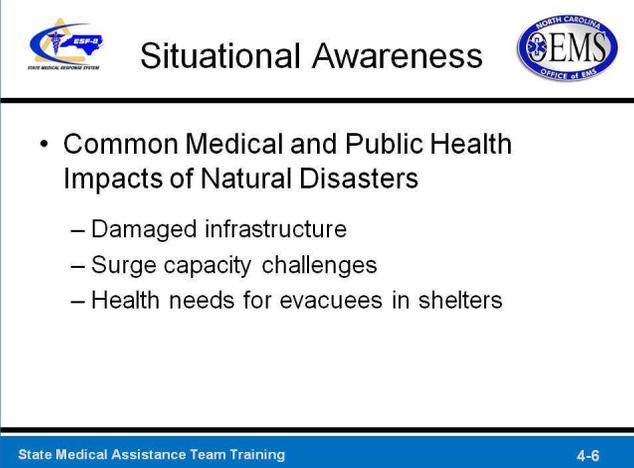
State Medical Assistance Team Training 4-5

Natural disasters that are classified as notice events are generally related to meteorological or geophysical phenomena, both of which are under constant surveillance by weather and geological agencies. Weather patterns for many storms can provide initial warnings up to 5 days prior to expected impact. While the amount of warning that predictive alerts may provide will vary (from minutes to days), our forecasting abilities are not as robust as most would hope for. For example, tornado alerts may provide only minutes of warning prior to touchdown of the characteristic destructive winds (Ashley, 2007), and warnings about impending volcanoes generally cannot provide exact timing of the expected eruption.

Many regions of the world have recurrent patterns of natural disasters such as the earthquakes and tsunamis along the Pacific Rim. Much is known about the conditions necessary for the development of tsunamis, wildfires, avalanches, or landslides; however, our forecasting and warning efforts rely heavily on effectively informing the public about the possibility and probability of these events occurring.

The epidemic spread of communicable diseases can be identified and monitored by disease surveillance efforts in operation at over 80 local North Carolina health departments and the North Carolina Department of Health and Human Services, Division of Public Health. Education of the general public as to the routes of transmission of the epidemic disease may result in limiting the spread of the epidemic, particularly if there are risk factors that will require modifications in behavior to mitigate.

## Situational Awareness



The slide features a blue header with the title "Situational Awareness" in white. On the left is the NCEM logo (North Carolina Emergency Management) and on the right is the EMS logo (North Carolina Office of EMS). The main content area is white with a black border, containing a bulleted list. The footer is a blue bar with white text.

- Common Medical and Public Health Impacts of Natural Disasters
  - Damaged infrastructure
  - Surge capacity challenges
  - Health needs for evacuees in shelters

State Medical Assistance Team Training 4-6

Recognition of the threats posed by no-notice incidents alone is not sufficient to significantly limit injury morbidity or mortality. Each member of the population should understand the nature and severity of the risk and then execute the proper public safety response (e.g. evacuation, shelter-in-place). As part of planning for disasters, emergency response plans in areas at risk for weather or geophysical disasters should be written, exercised, and regularly updated to include pertinent threats. Examples include plans that define and outline response actions for heat waves, extended snowstorms and blizzards, floods and hurricanes.

Some disasters take much longer to develop and are often identified only after the harmful environmental and human health impacts have already begun. The initiating forces are mostly a complex mixture of natural inputs (drought), political or social decisions (damming a vital water source), and the results of human activity (deforestation, global climate change). The results can be seen in environmental degradation (desertification) or significant human life impacts (famine).

In North Carolina, hurricanes, flooding, and tornados represent the most frequent types of risk from natural disasters. Common medical and public health issues would include disruption of regional health services due to damaged infrastructure, shelter health services for evacuees, and injuries to “clean up” workers during the recovery phase of the emergency response.

## Health Effects Associated with Natural Disasters

 <b>Health Effects of Natural Disasters</b> 	
Natural Disaster	Health Effect
Hurricanes	Drowning (tidal surge) Injury
Tornados	Injuries and death
Earthquakes	Crush injuries and death Coexisting Industrial disaster
Blizzards and Ice Storms	Cold injury Cardiovascular stress
Heat wave	Heat exhaustion Cardiovascular stress
Floods	Drowning Disruption of sanitation

State Medical Assistance Team Training 4-7

The health impacts of natural disasters are directly and indirectly related to the physical forces unleashed (flooding, fire, wind, temperature extremes) and the environment in which the population experiences the disaster (low-lying flood plain, mobile home park, coastal community). Additionally, the use of protective or mitigation measures (hand washing in epidemics, storm evacuation, tornado shelters, earthquake resistant buildings and structures, properly constructed levees) may mitigate injury morbidity and mortality from natural disasters. This section will highlight natural disasters that have historically had the greatest relevance to North Carolina in terms of cost and human lives. These are flooding, hurricane, and tornado disasters. With respect to the potential for State Medical Assistance Team (SMAT) deployment, these types of natural disasters have great potential to disrupt the health care infrastructure and have a prolonged recovery period. For health effects associated with natural disasters, see Table 4-1.

### Adverse Health Effects of Flooding

Flooding may occur as a result of significant rain or snow events causing rivers and streams to swell in, or out of, their banks. The results may include river flooding or flash flooding where the flooding occurs rapidly after heavy rains. Additionally, failure of dams or levees may also cause uncontrolled flooding in populated areas.

The most significant health threat from flooding is drowning. Victims may be caught by the rapidly increasing and rising water flow of floodwaters. A significant number of the deaths associated with flash flooding occur when motor vehicles are washed away as they enter high water in roadways. For example, in late September, 2010, rain from a regional storm cell dropped more than 22 inches of water on regions of North Carolina. The resulting flooding claimed seven lives in Bertie County, Dare County, and Pamlico County, NC, most of whom were in their vehicles on flooded roadways (CNN, 2010).

Even a modest amount of flooding may disrupt normal supplies of safe drinking water and the operation of the local sewage disposal system. Concerns about potential outbreaks of communicable diseases (e.g. cholera, typhoid fever) often arise during a disaster. While generalized outbreaks of communicable disease do not occur (CDC, 1993), transmission of water-borne diseases has occurred after flooding (CDC, 1983).

Other health risks arise as a result of flooding. The physical force of rushing floodwaters may damage storage or manufacturing sites and cause the uncontrolled release of hazardous chemicals into the environment where the population may be exposed. Flooding may cause electrical power lines to be down where persons may come into contact with them, causing electrocution. Traumatic injuries (e.g. lacerations, punctures) often occur as residents return to their homes to clean up damage and debris. These wound injuries also increase the risk for infections, including tetanus. The stress of damage removal and recovery has led to excessive cardiac strain and heart attacks.

### **Adverse Health Effects of Hurricanes**

Hurricanes (tropical cyclones) are created by the release of latent heat from warm ocean waters. In the Atlantic Ocean, hurricane season is from June through November, with a peak in late August/early September. The rotating wind system generally forms over warm tropical waters with sustained winds of at least 74 miles per hour. By the time the wind speed reaches hurricane levels, the storm becomes well organized, a large amount of rain is created, wind speeds increase, and a storm surge swells. A storm surge occurs when the winds and low barometric pressure cause the level of the ocean to swell by 1-2 feet. Depending on the storm strength and local ocean floor characteristics, the storm surge may cause the sea to rise 20 feet higher than normal. Damage occurs as a result of wind and the flooding caused by the storm surge and, to a lesser degree, rain.

North Carolina has had more than 110 hurricanes make landfall or travel through the state since statistics were first collected in 1886. Rated by a scoring system that considers wind speeds, storm surge, barometric pressure and damage potential, North Carolina has seen its share of powerful and damaging storms. Most recently, three storms (Charley, 2004, Isabel, 2003 and Floyd, 1999) were all ranked as “very strong” or “devastating” (State Climate Office of North Carolina, 2011), causing extensive damage and dozens of deaths.

While the high velocity winds of a hurricane can cause structural collapse and force even heavy debris to become dangerous airborne projectiles, it is the flooding that accompanies hurricanes that poses the highest mortality risk for persons in the storm’s path. The storm surge is responsible for most of the flooding and drowning risks in a hurricane. The drowning risks in a hurricane are similar to river and flash flooding and are exemplified by the experience in North Carolina during Hurricane Floyd. There were 52 recorded deaths associated with Hurricane Floyd that made landfall on September 16, 1999. Of those fatalities, 69% (n=36) were due to drowning and comprised of 24 who drowned in their motor vehicles, seven victims who drowned in boats, and five victims who perished while on foot or in their home. (CDC, 1999). Other causes of death included myocardial infarction (4), fires (2), and one each by hypothermia, electrocution and fall.

Visits to emergency departments during the first week following Hurricane Floyd uncovered significant increases (compared to same week, one year previously) for suicide attempts, dog bites, febrile illnesses, and filled prescriptions. Emergency department visits one month after Hurricane Floyd showed increases for arthropod bites, diarrhea, violence, (e.g. assault, gunshot, rape) and asthma (CDC, 1999).

## Health Effects of Tornadoes

While the Blue Ridge Mountain range separates North Carolina from the infamous “Tornado Alley” area of the Central US, tornadoes occur almost every year in North Carolina bringing with them risks of injury and property damage. In the 60 years between 1950 and 2010, there have been 1,116 reported tornadoes causing 114 fatalities and injury to more than 2500 people (Tornado History Project).

Tornadoes are rapidly whirling, funnel-shaped air spirals that emerge from a violent thunderstorm, have a wind velocity of up to 200 miles per hour, and can destroy buildings. Severity is rated on the Fujita Scale according to estimated wind speed using a scoring system of F0 (no damage) to F5 (total destruction) (National Weather Service). The extent of damage depends on winds within the tornado funnel, the tornado's differential atmospheric pressure, and the effects of flying debris. While weather centers closely monitor the storm conditions conducive to tornado generation, the amount of response time local communities may be short as tornadoes often occur quickly. Warning and sheltering are the two most important factors in preventing injury and death during a tornado.

Injuries and deaths occur when people are struck by objects thrown by the tornado's violent winds or are themselves thrown. The intensity and duration of the tornado and the population density in the path of the tornado are the major factors that influence injury and death rates associated with tornado disasters (Lillibridge, 1997). Injuries may also occur during rescue and cleanup operations after a tornado has passed.

If hospitals or other health care delivery facilities are damaged by a tornado, the ability to deliver major health and injury care to casualties may be diminished. Rescue and emergency medical response may be hindered or delayed at the damage site due to hazardous conditions, such as downed, energized power lines and debris blocking roadways.

## Health Effects of Other Types of Natural Disasters

It is possible that SMAT deployments will also need to address other types of natural disasters, particularly if SMAT members are deployed to other regions of the United States or abroad. Whatever the cause, it is clear that natural disasters have the capacity to cause a large-scale emergency over a wide geographic region, affecting large numbers of victims. Medical and public health emergency needs of the population will be intertwined. Prevention measures include warning the population of the impending disaster, sheltering of local populations, and/or evacuation. Engineering modalities such as dams (to control flooding) and building codes (to reinforce structures to withstand earthquakes) are important to the overall mitigation strategy to preserve human health.

**Table 4-1: Health Effects of Natural Disasters**

Type of Natural Disaster	Health Effects
Hurricanes	Drowning (tidal surges) Injury
Tornados	Injuries and death
Earthquakes	Crush injury and death Coexisting industrial disaster
Blizzards and Ice Storms	Cold injury Cardiovascular stress
Heat wave	Heat exhaustion Cardiovascular stress
Floods	Drowning Disruption of sanitation

## Worker and Public Safety Hazard Management



### Worker Safety



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#### Hazards

- Injuries
- Chemical spills
- Electrocutions
- Flooding



Photos courtesy of DOE

State Medical Assistance Team Training4-8

Rescue and recovery personnel are at risk for a variety of hazards and health threats before, during, and after natural disasters. Residents who return to their homes after flooding or hurricane damage are exposed to these same threats. Risks include lacerations and puncture wounds, electrocution, falls, falling debris from buildings or structures, heat stress, overexertion and fatigue, insect and animal bites, drowning, motor vehicle crashes, and psychological stress.

Recovery workers, returning residents, volunteers, and the general public need to possess an understanding of the adverse health risks they face by entering an area affected by a natural disaster. Utility companies must assess the risks of downed power lines and work safely and diligently to remove any electrocution threat due to utilities damage. Motor vehicle traffic should be managed so that residents and rescuers including SMAT personnel may safely travel to areas where they are needed.

Proper equipment, supplies, and training are essential for all workers. Operating heavy equipment in a chaotic environment can serve to amplify injury risks. Attention should be given to personal protection including monitoring for heat stress (including sunstroke) and having ample supplies of clean water and food for workers, volunteers, responders, and residents. Up-to-date tetanus immunization is required.

### Personal Protective Equipment (PPE) Selection

The type of Personal Protective Equipment (PPE) will depend on the job tasks and the risks associated with those tasks. More information is available on PPE in the Hazardous Materials module, which deals in great detail with both the matching of risk with approved PPE and decontamination procedures. In addition, specific hazards are addressed related to reducing common environmental exposures.

During a deployment to a natural disaster site, SMAT personnel should be aware of the basic prevention measures necessary to reduce harmful exposures from the environment. For example, during flooding or hurricane events, drowning is a significant threat so proper flotation apparel (e.g. vests) must be worn while water risks are still present or during medical support of search operations. Appropriate respiratory protection, up to and including supplied air

respirators, should be used in closed environments or situations where toxic chemicals could be present in hazardous concentrations. Additionally, hard hat use will provide some protection against head injury and sun exposure. Use of high quality sun protection, such as sunscreen, hat, and sunglasses, is advised during warm weather field operations. In all cases, proper eye protection and impermeable boots that provide foot protection against sharp debris (e.g. nails, glass) should be worn during all field deployments.

## Medical Care Concerns during Response to Natural Disasters



### Medical Care Concerns



- Type of disaster
- Magnitude/severity
- Level of warning
- Density of affected population
- Special needs population
- Environmental exposures



Photo courtesy of FEMA

State Medical Assistance Team Training4-9

The type of disaster (e.g., earthquake, hurricane, flooding), magnitude, or severity of the disaster (e.g., 9.0 magnitude earthquake in Japan - March 2011; Category 3 – Hurricane Fran that hit North Carolina in 1996), level of forewarning provided to populations prior to the disaster, and the density of the affected population are major determining factors of the population impact. In these types of situations, there is an even higher likelihood that community medical facilities such as hospitals, clinics, and physician offices will be rendered non-functioning, either because the facilities suffered major structural damage, are flooded, or lose water and electricity; or the personnel that would staff these facilities are injured or cannot physically get to work because of road conditions. As result, the need for external medical resources to be brought to the disaster site will be increased.

### Illness and Injury Patterns

There are some health impacts that are generally common to all types of disasters and that should be considered in the initial stages of response. Of course, attention should be paid to the specific cause of the disaster as this will guide planners and first responders in determining the most effective and efficient response. One good source of information regarding health impacts that should be anticipated in natural disasters is: ([www.cdc.gov/travel](http://www.cdc.gov/travel)) - Centers for Disease Control and Prevention, *Travelers' Health 2011, Yellow Book*. In Chapter 2, on Natural Disasters and Environmental Hazards, several key points are made including:

- There is a relationship between the type of disaster and its effect on health. This is particularly true of the immediate impact in causing injuries. For example, earthquakes cause many acute crush injuries requiring medical care, while floods and tidal waves cause relatively few but leave ongoing environmental health concerns in their wake.
- Adverse health effects following a natural disaster do not all occur at the same time. For example, many casualties may occur at the time of impact and require immediate medical care, while the health risks associated with crowding in substandard shelters may take longer to develop.

- During natural disasters, technological malfunctions may release hazardous materials (e.g., release of toxic chemicals from a point source displaced by strong winds, seismic motion, or rapidly moving water).

Anticipating the types of health impacts due to specific causes of disasters allows incident commanders and response organizations to organize, coordinate, and provide appropriate support, such as personnel and assets to the field medical facility. Disaster responders should remember that many of the patients they treat, especially after the initial response period, are individuals who are ill from untreated chronic diseases. These chronic diseases may include asthma, hypertension, arthritis, diabetes mellitus, or psychiatric disorders, to name a few. Rapid health assessments within the field medical facility and ongoing surveillance of both staff and disaster victims provide ongoing data on illness and injury patterns and allow for optimal intervention strategies.

## Triage, Evacuation, and Transport of Patients

	<b>Medical Care Roles for SMRS</b>	
<ul style="list-style-type: none"><li>• Triage, evacuation and transport of patients</li><li>• Surge capacity deployments</li><li>• Acute care transitioning into primary care and public health</li></ul>		
State Medical Assistance Team Training		4-10

Disaster victims may present to the field medical facility in a variety of ways, including self-transport, public transportation, if it is available, or by organized disaster response vehicles (ex. buses, ambulances, helicopters). Staff and trained volunteers in field medical facilities must be able to triage disaster victims, i.e., prioritize the severity of injuries of presenting disaster victims in a systematic way, thereby maximizing the allocation of staff and medical resources to those most likely to survive their injuries. Triage is covered in the *Mass Casualty* module and operates under the premise of doing the most benefit for the most patients amid limited resources. It is important to note there will be limited treatment capabilities as well as evacuation capacities in a response to a natural disaster affecting a large population.

An effective disaster plan clearly details evacuation and transport procedures from the field medical facility to a setting, such as a hospital, where better care can be provided to critically ill patients. By evacuating the critically ill patients, more personnel time and resources can be provided to the less critically ill patients in the field medical facility, improving their outcomes.

The evacuation and transport plan should outline all of the logistics involved, including how patients will be evacuated and transported, who will be notified, how they will be notified, which personnel will be involved, safety issues, how ongoing communication and coordination will be handled between the receiving site and the field medical facility, etc. Issues specific to vulnerable populations (pediatric, geriatric, mentally impaired, etc.) should be addressed prior to evacuation and transportation to the receiving site.

## BIOLOGICAL DISASTERS



Biological Disasters



- Naturally occurring (epidemics)
- Intentional release (terrorism)

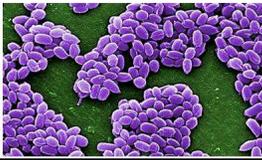


Photo courtesy of CDC

State Medical Assistance Team Training 4-11

Biological disaster can be described as naturally occurring (like epidemics) or intentional release (like acts of terrorism).

## Biological Agents Overview



### Biological Agent Overview



Biological terrorism is the **deliberate** use of any **biological agent against people, animals, or agriculture** to **cause disease, death, destruction, or panic**, for political, (religious), or social gains (AHRQ, 2006)

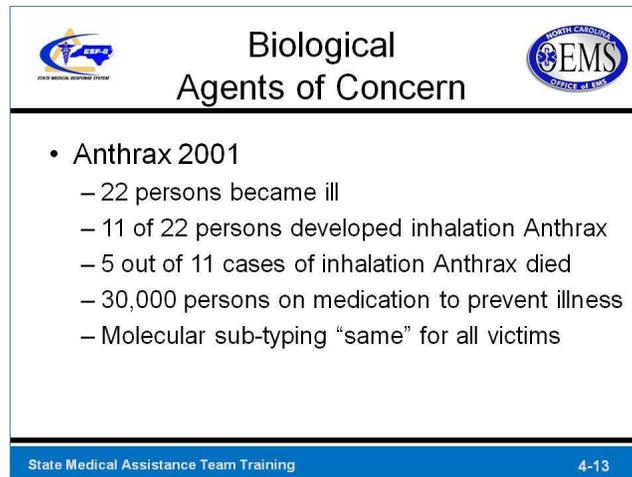
Photo courtesy of CDC

State Medical Assistance Team Training4-12

We can define biological terrorism as the deliberate use of any biological agent against people, animals, or agriculture for the purpose of causing disease, death, destruction, or panic for political or social gains (AHRQ, 2006).

During the late 1960s the United States ended its biological warfare program. Most developed nations signed the Biological Weapons Convention by 1975 to prohibit the development and use of offensive biological weapons. Until the end of the 1990s, domestic interest in biodefense was diminished to the point that critical laboratories for anthrax were closed and vaccines to respond to a smallpox outbreak languished in diminished stocks that were nearly 25 years old. In 1999, due to increasing concern, the Centers for Disease Control and Prevention (CDC) opened the Bioterrorism Preparedness and Response Program, a major public health preparedness initiative. The purpose of this office was to improve disease detection, expand critical laboratory services, to promote clinical awareness, and to develop a national stockpile of critical vaccines and medications that could be used during a biological agent attack.

During the past decade, infectious disease laboratory and surveillance networks for biodefense have been improved throughout our nation's health departments. Biological agent response exercises are part of the preparedness activities of most health departments and hospitals. However, the anthrax attacks of 2001 demonstrate that it is extremely difficult to prevent and provide early detection of a biological agent before large segments of the population are exposed. The first sign that something is wrong may be the sudden appearance of thousands of ill or dying patients at health care facilities. In addition, the new advances in genetic engineering and biotechnology allow even a modest laboratory to develop and prepare potential biological agents. Unlike other types of terrorism events, which tend to target infrastructure or vital services, biological agents directly target the population. Emergency medical and public health strategies to identify and contain disease must work together to mobilize the health system if we are to have success in preventing disease in our population.

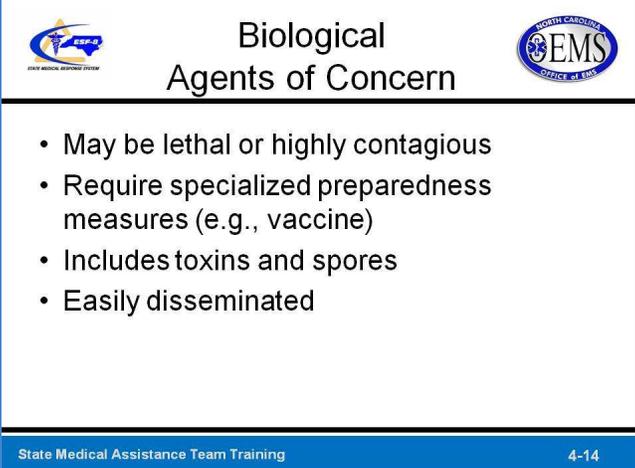


The slide features a title "Biological Agents of Concern" centered at the top. To the left is the logo for the National Center for Emergency Medical Services (NCEM), and to the right is the logo for the North Carolina Office of EMS. Below the title, a bulleted list details the 2001 Anthrax incident. At the bottom of the slide, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "4-13" on the right.

- Anthrax 2001
  - 22 persons became ill
  - 11 of 22 persons developed inhalation Anthrax
  - 5 out of 11 cases of inhalation Anthrax died
  - 30,000 persons on medication to prevent illness
  - Molecular sub-typing “same” for all victims

In 2001, shortly after the World Trade Center attack, persons throughout the United States started to become ill with suspicious cases of anthrax. Within a span of 2 months, more than 22 cases of anthrax were identified. Five people died in Connecticut, New York, Florida, and Virginia from this attack. Prior to 9/11, no cases of pulmonary anthrax had been reported in the United States for nearly two decades. In this attack, letters containing anthrax spores were sent to reporters, congressional offices, and various federal departments. More than 30,000 persons suddenly required vaccine or antibiotics to prevent the illness from a potentially deadly anthrax exposure. Identifying suspects can be difficult following a biological warfare attack.

## Biological Agents of Concern



The slide features a title "Biological Agents of Concern" centered at the top. To the left is the logo for the North Carolina Emergency Medical Services (NCEM) and to the right is the logo for the North Carolina Office of EMS. Below the title, a list of four bullet points describes the characteristics of biological agents of concern. At the bottom of the slide, the text "State Medical Assistance Team Training" is on the left and "4-14" is on the right.

- May be lethal or highly contagious
- Require specialized preparedness measures (e.g., vaccine)
- Includes toxins and spores
- Easily disseminated

Many biological agents pose serious concerns to human health. However, biological agents for preparedness were selected because of the vulnerability of human populations to a deliberate release of certain biological agents or their toxic products. These biological agents include viruses, bacteria, and bacterial toxins. Agents that were highly lethal or contagious, or that required specialized preparedness efforts to treat or prevent disease were designated as the first tier or Category A Biological Agents for public health preparedness (Rotz, et al, 2002) and occupied the bulk of our public health preparedness efforts. Other biological agent threats that were determined to be less of a threat were designated as Category B or C Agents. Public health preparedness for Category A Biological Agents required specialized awareness, specific preparedness activities, stockpiles of medications or vaccines and other activities to mitigate the impact of a release into the population. Table 4-2 lists the biological agents of greatest concern.

**Table 4-2: List of Bioterrorism Agents and Diseases by Category (Rotz, et al, 2002)**

Category A	Category B	Category C
Anthrax	Brucellosis	Emerging Infectious Diseases
Botulism	Epsilon toxin of <i>Clostridium perfringens</i>	Nipah virus
Plague	Glanders	Hantavirus
Smallpox	Melioidosis	
Tularemia	Psittacosis	
Viral hemorrhagic fevers	Q fever	
	Ricin toxin	
	Staphylococcal enterotoxin B	
	Typhus	
	Viral encephalitis	
	Water safety threats	
	Food safety threats	

Critical roles for SMAT personnel in response to a biological agent attack would include mass vaccination and mass prophylaxis to prevent illness in persons who were exposed to the biological agent. In addition, the implementation of medical countermeasures would be expected to reduce the spread of disease throughout the population or lessen its impact within the victims. Table 4-3 lists the six Category A Agents and selected medical countermeasures.

**Table 4-3: Category A Biological Agents Route of Infection and Protective Measures**

<b>Biological Agent</b>	<b>Type of pathogen</b>	<b>Usual Route of exposure in Bioterrorism</b>	<b>Selected Medical Countermeasure (s)</b>
Anthrax	Bacteria	Respiratory	Antibiotics, vaccine
Botulinum toxin	Bacterial toxin	Ingestion	Antitoxin Prevent exposure
Plague	Bacteria	Respiratory	Antibiotics
Smallpox	Virus	Respiratory	Antivirals, vaccine
Tularemia	Bacteria	Respiratory	Antibiotics
Viral hemorrhagic fevers	Virus	Direct contact	Exposure prevention Supportive care

The implication for SMAT members is that an outbreak of infectious disease in the population, whether it is natural or deliberate in origin, will require similar efforts with regard to preparedness and emergency response. More details about individual infection control measures can be found in the *Infection Control* module.

## Emerging Infectious Diseases and Threats to Public Health



### Emerging Infectious Diseases



Influenza	SARS	HIV
Nipah Virus	Hantavirus	Tuberculosis
West Nile Virus	Marburg Virus	Dengue

New diseases occur or emerge naturally. Some diseases re-emerge over time with a greater potential for harm

State Medical Assistance Team Training
4-15

There has been a surge in the appearance of emerging diseases over the past 20 years. See Table 4-4. These diseases were previously unknown in humans and quickly spread, affecting millions of people in just a few decades. Some of these diseases have serious consequences to human health. As an example, Severe Acute Respiratory Syndrome (SARS) appeared suddenly and was highly contagious via person-to-person transmission; however, this disease disappeared as quickly as it emerged.

The parallel between bioterrorism and biological warfare is that both cause disease that presents in the population as a suddenly occurring disease outbreak. New strains of the influenza virus are always emerging. Pandemic influenza (of which we had recent experience in 2010) has been identified by the Institute of Medicine as the "prototype emerging infection" in their 1992 report on Emerging Infections (Lederberg, J., et. al., 1992). The 1918 Influenza Pandemic killed between 50-100 million people worldwide, making it one of the most deadly disasters to date (Morens & Fauci, 2007). This pandemic was different from other pandemics because of the excess mortality and the high attack rates seen in the 20-40 year-old age group.

**Table 4-4: Selected Emerging Infectious Diseases (EID)**

Influenza	SARS	HIV
Nipah Virus	Hantavirus	Tuberculosis
West Nile Virus	Marburg Virus	Dengue

## Situational Awareness



### Situational Awareness



- Difficult to detect release
  - Unexplained illness or deaths
  - Alerting is dependent on early clinical recognition or laboratory detection!

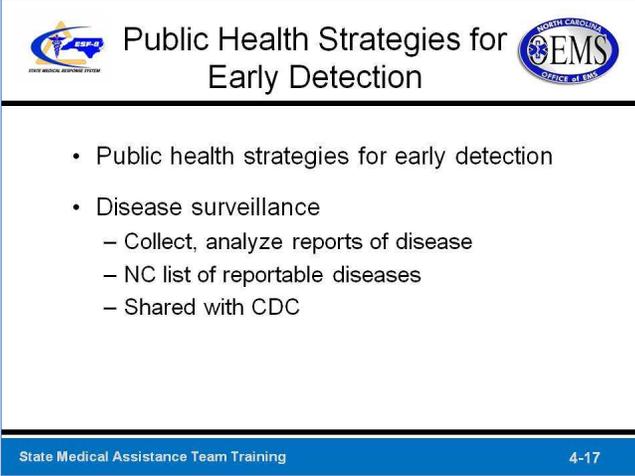


**Biohazard**

State Medical Assistance Team Training4-16

It is important to gain situational awareness during any emergency response. However, unless a biological agent release is announced or is detected by biological sensors, we are left with the likelihood that cases of unexplained illness will appear in physician offices, clinics, and hospitals. At that point we are initially dependent on clinical diagnosis and laboratory confirmation of our suspicions. SMAT personnel during deployments should be vigilant for the appearance of unusual disease clusters in patients presenting for medical treatment and should report their suspicions to pertinent public health authorities at the state and local levels. Such information will usually trigger a public health investigation designed to explain how the disease is being transmitted, what the causative agent is, and what public health measures need to be implemented to control the outbreak. This handoff between clinical care and public health is critical for an effective biological agent emergency response.

## Public Health Strategies for Early Detection



The slide features a title bar with the text "Public Health Strategies for Early Detection" centered between two logos: the NCEM logo on the left and the EMS logo on the right. Below the title bar, a bulleted list is presented. At the bottom of the slide, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "4-17" on the right.

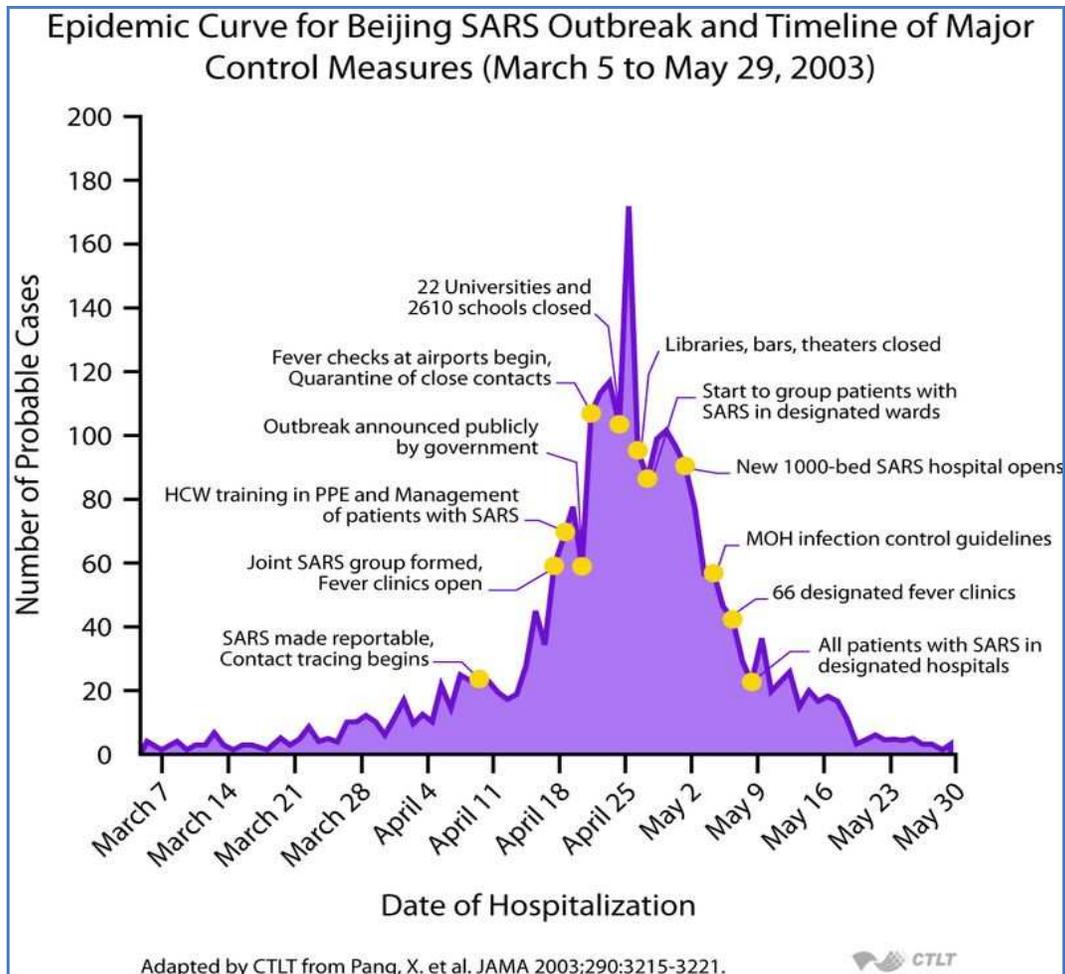
- Public health strategies for early detection
- Disease surveillance
  - Collect, analyze reports of disease
  - NC list of reportable diseases
  - Shared with CDC

The public health system exists to detect, identify, and control/prevent diseases in the population. With regard to infectious diseases, the system attempts to detect new cases of common problems in the community such as tuberculosis. Patients with tuberculosis are followed by many health departments to ensure compliance with medications and that they are no longer contagious and pose a threat to the community. New cases are identified and rapidly referred for evaluation and treatment. A reportable disease is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease. Every jurisdiction has a list of conditions that are required to be reported to the local or state public health authority. The list of reportable conditions in North Carolina can be found at:

[http://www.epi.state.nc.us/epi/gcdc/manual/reportable\\_diseases.html](http://www.epi.state.nc.us/epi/gcdc/manual/reportable_diseases.html)

To aid in the national effort to control infectious diseases, North Carolina and the other 49 states voluntarily share their reportable disease information with the federal government through the Centers for Disease Control and Prevention in Atlanta, GA. The list of nationally reportable conditions can be found at: [http://www.cdc.gov/osels/ph\\_surveillance/nndss/phs/infdis2011.htm](http://www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis2011.htm)

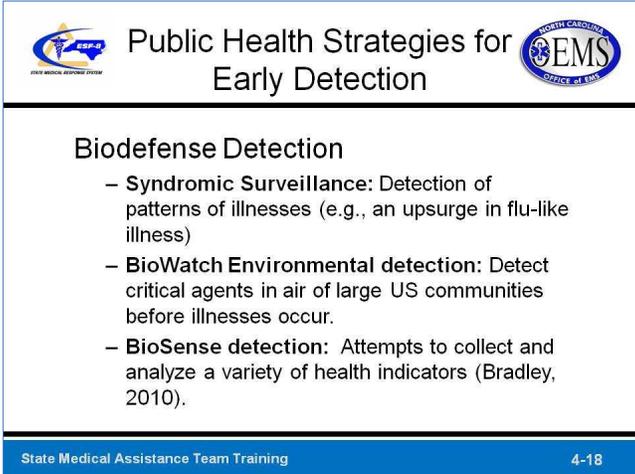
In order to assure the timely detection of diseases important to the public health, a system of disease detection surveillance constantly operates (Birkhead, 2010). Persons who have a disease of public health importance may seek medical attention from their physician, clinic, hospital, or other health care provider. North Carolina state law requires that these (and other) providers inform their local health authority upon suspicion or confirmation of the presence of a reportable condition. These reports can be transmitted to the public health authority by phone, fax, electronic database transfer, email, or letter.



Public health department epidemiologists collect and collate the reports and conduct analyses of patterns in the reports. By searching for clues within the patterns of disease, new clusters of disease or new places where disease hasn't been found previously can be identified. Based on the surveillance information, epidemiologists conduct field investigations in an attempt to find details about how new cases were spread, where the infection came from, and when the outbreak began. These field observations ultimately lead to a more complete understanding of the outbreak and, in turn, lead to execution of control measures to stop or prevent the further spread of disease in the population. Control measures focus on interruption of the means of transmission and could include actions such as restaurant closure, a "boil water" order, immunization or treatment of exposed persons, and identification and treatment of sexual partners, to name just a few.

In the special situation of a release of a biologic agent, such as might occur in biological terrorism, timely detection and identification of the microbe or disease is critical. A potentially large number of individuals may have been exposed, each moving along the spectrum of illness. Ongoing disease surveillance relies on the diagnosis of a reportable illness by a health care provider and the subsequent report of that illness to proper local or state public health authorities. Those steps take time to execute and, while they are occurring, more exposures and illnesses may be occurring. Even before the anthrax attack of 2001, methods aimed at improving our detection capacity were being tested.

While routine disease surveillance remains the backbone of our detection capability, enhancements that focus on earlier detection of the microbe or illness have been implemented. The faster that public health can detect an “unusual” occurrence, the sooner a response can be mounted and people can be treated. Two different approaches have been applied to various parts of the country.



The slide is titled "Public Health Strategies for Early Detection" and features logos for the State Medical Assistance Team and the North Carolina EMS Office of Excellence. It lists three biodefense detection strategies: Syndromic Surveillance, BioWatch Environmental detection, and BioSense detection.

**Public Health Strategies for Early Detection**

**Biodefense Detection**

- **Syndromic Surveillance:** Detection of patterns of illnesses (e.g., an upsurge in flu-like illness)
- **BioWatch Environmental detection:** Detect critical agents in air of large US communities before illnesses occur.
- **BioSense detection:** Attempts to collect and analyze a variety of health indicators (Bradley, 2010).

State Medical Assistance Team Training 4-18

**Syndromic surveillance** attempts to detect illnesses before they become serious enough to drive a person to seek medical care (Henning, 2004). By identifying increases in over-the-counter medicines, for example, we may be able to detect increases in persons in the early stages of illness, where they have symptoms that are not severe enough to seek medical attention. Patterns of usage of medicines for diarrhea, fever, rashes, and other syndromes may provide a sensitive early warning signal that we can investigate to determine whether they are caused by a natural or human-made spread of an infectious agent. Syndromic surveillance signals are not very specific because there can be many reasons why sales of anti-diarrhea medicine, for example, might increase. The sensitivity of syndromic surveillance shows promise, but the time saved by examining the relatively low specificity signals may be offset by the in-depth field investigations that will be necessary to determine the nature of the outbreak. The national syndromic surveillance activity, **BioSense**, attempts to collect and analyze a variety of health indicators (VA hospital discharges, DOD military treatments, LabCorp of America test orders) in search of signals that may indicate a biological release (Bradley, 2010).

Other attempts at earlier detection focus on detection of pathogenic microbes in the environment that can be used as biological weapons. While almost any pathogen can be used as a weapon, there is a relatively small number of microbes that make efficient and effective weapons. These include the Category A Agents tularemia, anthrax, plague, smallpox, botulism, and some viral hemorrhagic fevers. A federally funded, locally operated system known as **BioWatch**, filters and examines air samples in more than 30 major metropolitan areas for these and other microbes. Detection of any of the critical agents requires an immediate and in-depth examination as it may indicate an airborne release of a pathogen as an agent of biological terrorism. Therefore, BioWatch may serve as an early warning detection system for those agents that it was designed to detect (IOM, 2010). These innovative activities should complement, not replace, the standard disease surveillance activities in operation in local and state health departments.

## Threat Identification

It is extremely important to accurately identify the specific biological agent threat as accurately as possible. Only by identifying the biological agent are health authorities able to begin to employ appropriate medical countermeasures. Some diseases, like smallpox, have highly specific clinical manifestations to suggest the cause of the infection. However, this is generally not the case for the vast majority of human illnesses caused by biological threat agents.

Most illnesses begin with non-specific, generalized signs and symptoms like fever, cough, body aches, and fatigue. These symptoms are consistent with a variety of illnesses, such as influenza, anthrax, plague, and tularemia. In these circumstances, to identify the causative agent, access to a first-class public health laboratory is generally required. The laboratory must be able to accurately and rapidly identify and confirm the identity of the microbial agent. In the early stages of an outbreak, identifying the microbial agent is critical. Later, as the number of cases increases, proper diagnosis based on clinical signs and symptoms can then often be made.

Some agents, including some not highly pathogenic to humans, may be targeted against livestock with the intent of disrupting food chain sectors. Naturally-occurring outbreaks of animal diseases, such as hoof-and-mouth disease have led to the loss of millions of animals either to the disease or to the culling of herds that are at risk of being infected (Kitching, 1998). While such outbreaks have not occurred in the US in recent years, North Carolina's significant livestock industry, including pigs, would be at risk if the threat did occur here. Many threats, including hoof-and-mouth disease, are extremely contagious and extraordinary decontamination measures would be necessary to prevent spread throughout the state.

## Adverse Health Effects of Biological Agents

	<b>Adverse Effects of Biological Agents</b>	
<ul style="list-style-type: none"><li>• Cause infection or have toxic effects</li><li>• Many are contagious</li><li>• Associated with mass casualties</li><li>• Require specific medical treatments</li></ul>		
State Medical Assistance Team Training		4-19

Medical and public health issues associated with biological agents include: 1) rapid person-to-person spread, 2) harm to health care workers, and 3) significant disruption of social and economic components of whole regions. For example, the SARS outbreak of 2002-2003 caused various economies to face reductions in their GNP due to the adverse effect on trade and transportation (The World Bank, 2003). In addition, biological terrorism/warfare is extremely cost effective when compared to the investment needed by a nation or terrorist organization to develop a nuclear, conventional, or chemical weapons program (Arora, 2002). In addition to directly affecting humans, biological agents may be developed or released to attack specific non-human targets such as animals or plants with the intent of producing economic harm to a population. Such an example would be a deliberate attempt to spread hoof-and-mouth disease in the cattle-producing areas of the United States.

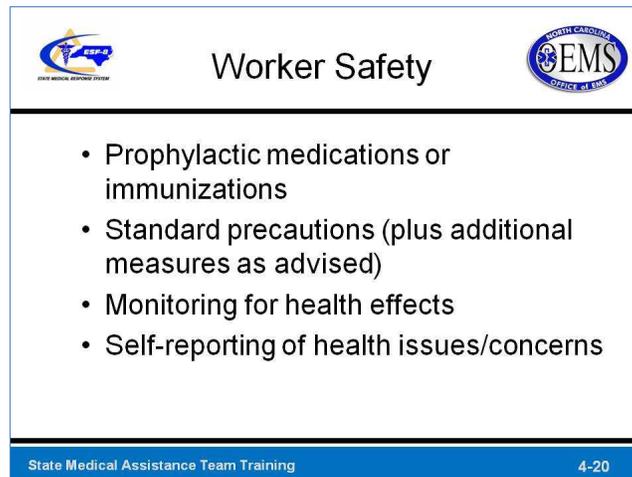
Biological agents affect human health primarily by causing infection in persons who are exposed to the agent, and in some cases, those who come into contact with these victims. The ideal biological agent would cause serious disease within the population and it would also be sufficiently contagious so that it could continue to move throughout the population, from human to human, causing more and more cases. If no medical countermeasures or public health control measure were available, such an epidemic would likely continue to spread through the entire susceptible population with catastrophic results. Health providers would be at risk and health care facilities would be severely overburdened with the sick and dying.

Category A Biological Agent smallpox would be exactly the type of disease to meet such conditions. Smallpox is a virus that is preserved only in a few select research laboratories. The last naturally acquired case of smallpox was reported in Somalia in the late 1970s. The World Health Organization (WHO) Assembly declared smallpox eradicated in 1979 (Breman and Arita, 1980). Smallpox is highly contagious and results in an estimated 30% mortality rate in naturally occurring outbreaks. Routine vaccination against smallpox ended in the United States nearly 40 years ago. As such, most of the population in the United States is currently susceptible to the disease. If this biological agent were released today, in the absence of a rapid and comprehensive immunization campaign (countermeasure) along with proper disease surveillance, there would be little we could do to stop the relentless progress of this disease as it moves throughout the population. Such an outbreak could kill millions of people and would

rapidly spread to all corners of the world. The economic losses related to disruptions in trade and transportation, the loss of skilled workers, and disruptions in manufacturing would be devastating worldwide.

In some cases, toxins produced by the bacteria are used to kill or make people seriously ill in biological terrorism/warfare. For example, one Category A Biological Agent, *C. botulinum* toxin causes a clinical syndrome that is commonly referred to as “botulism.” In this case, the toxin is extracted from the bacterium *Clostridium botulinum* and is the biological agent that is disseminated to cause paralysis and death in victims. This toxin can be aerosolized or put in food for consumption. If it were to be disseminated into the food processing or distribution system, a perpetrator could easily cause botulism cases throughout the United State in only a few days. Specific countermeasures include the provision of *C. botulinum* antitoxin and supportive care to victims.

## Worker Safety



The slide features a blue header with the title "Worker Safety" centered. On the left is the logo for the State Medical Assistance Team (SMAT) and on the right is the logo for the North Carolina Office of EMS. Below the header, a white box contains a bulleted list of safety measures. At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "4-20" on the right.

- Prophylactic medications or immunizations
- Standard precautions (plus additional measures as advised)
- Monitoring for health effects
- Self-reporting of health issues/concerns

Many of issues related to SMAT response to an infectious disease emergency have been covered in the *Responder Health and Safety* module and in the *Infection Control* module. This section will address those issues that are specific to operating in an environment where a biological agent might pose a residual threat as health care workers attempt to deal with victims. Protecting workers with Personal Protective Equipment (PPE) is covered in other sections, including the *Hazardous Materials* module.

It is important to remember there are several noteworthy routes of exposure for most pathogens of which responders during a deployment for an infectious disease emergency should be aware.

Prevention measures should target ways to reduce exposure from the respiratory route. This is important for viruses and bacteria that are transmitted via air-borne or droplet routes of transmission. Secondly, in the potentially chaotic field health care delivery setting, sharps and contaminated needles will pose an additional hazard to SMAT staff if the biological agent is found in patients' blood. Masks, gowns (when appropriate), and eye protection against droplet and splash exposures may be warranted and should be readily available for use. Safe needle disposal containers and training emphasis on needle and sharps safety will be needed to limit injuries caused by potentially infected body fluids (blood).

Since emergency responders are often operating in a hazardous environment, infectious biological agents might be present. Special consideration must be given to providing medicines that might prevent infection, or vaccinations to build immunity to the biological agent. Pre-deployment immunization review could help assure that deployed SMAT staff has the benefit of appropriate vaccinations, depending on the suspected agent and whether an effective immunization is available.

Deploying SMAT personnel should already have been immunized against common threats, such as hepatitis A and B. Should there be medicines that prevent the development of illness if exposed (e.g. Oseltamivir for influenza A, Doxycycline for anthrax), they should be considered for use in SMAT personnel.

The cleaning of environmental surfaces in the field should follow cleaning guidelines generally created for regular health care delivery environments. General cleaning with approved decontamination solutions is usually sufficient except when facing special infection risks such as spores of *Clostridium difficile* or anthrax. These special circumstances may require

decontamination and disinfection protocols and solutions. Fortunately, other more prevalent agents (viruses and toxins) do not persist for long periods of time in the environment.

## Patient Care in a Field Medical Facility



### Patient Care in the Field



- Triage may need to be modified to account for illness, exposure and protection (e.g. prophylaxis or vaccination protected)
- Pharmaceutical stockpiles of critical medications and vaccines may be required for patient care



Photo Courtesy: SHS Centers for Disease Control and Prevention

State Medical Assistance Team Training4-21

### Biological Triage

There are many ways to accomplish medical triage in a disaster setting. In the *Mass Casualty* module, several triage methods were highlighted. However, it is important to consider that there will be modifications for emergencies involving large numbers of victims suffering from an infectious disease and there are many good references that were developed during preparations for pandemic influenza (Burkle, 2006). In large outbreaks, there may be a need for multi-staged triage where people move from self-selection, to clinical second stage triage where persons are triaged into categories that are appropriate for an epidemic. For example, clinical triage issues of specific interest might include such things as: 1) “exposed and well,” 2) “exposed and ill requiring further triage,” and 3) “exposed but protected due to medical prophylaxis or vaccination.” Additional considerations may influence triage, such as the availability of resources such as ventilators or dialysis equipment and may require ethical decision-making for issues of resource management.

### Pharmaceutical Stockpiles of Critical Medication and Vaccines

State and local health departments have the responsibility to prepare for bioterrorism and maintain pharmaceutical stockpiles to augment community response efforts. To improve the response capacity of the United States, a national stockpile of essential pharmaceuticals and medical supplies – the Strategic National Stockpile (SNS) Program is overseen by the Centers for Disease Control and Prevention (CDC). However, the implementation of the pharmaceutical stockpiles will remain a labor-intensive preparedness task for local health responders.

During an emergency response to a biological agent emergency, stockpiles of medicines and vaccines will be extremely important and will require considerable attention during implementation (Plotkin, 2006). Important considerations include: a) gathering a pharmaceutical workforce, b) coordinating a mass response program with multiple agencies and volunteers under disaster conditions, c) ensuring that dispensing services are appropriate, d) ensuring consistency with state and local response plans, and e) maintaining adequate security (Bo-

Hyun, 2011). SMAT members may play a critical role in augmenting the capacity of state and local health departments with mass prophylaxis or vaccination during an emergency.

The SNS serves as a repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items.

In the event of a disaster, these federal assets can be moved to the scene to help responders and victims address medical needs. For additional information on the SNS refer to

<http://www.cdc.gov/phpr/stockpile.htm>

### **Evacuation and Transport of Biological Agent Victims**

The evacuation and transport of biological agent victims may require a few adjustments to standard patient transport procedures. SMAT responders should be aware that certain facilities during an epidemic may be reserved for infectious patients while other health facilities may be reserved for trauma victims and normal hospital services. Practical solutions to limit the spread of infection during patient transport would include the use of dedicated transport staff for medical prophylaxis, vaccination, “reverse isolation” of patients during transport (see Standard Precautions), and the utilization of dedicated vehicles for evacuating patients who share the same disease.

## CHEMICAL DISASTERS

**Chemical Disasters**

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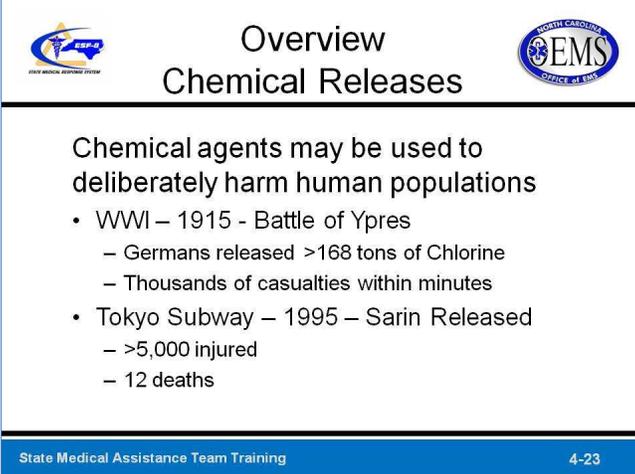
- Chemicals are everywhere
  - Homes, schools, stores, hotels, businesses, industry, on roads and railways being transported
- Human exposure to hazardous chemicals can occur during:
  - Manufacturing, usage, transport or storage, terrorism

State Medical Assistance Team Training 4-22

Chemicals are found everywhere in homes, schools, stores, hotels, businesses, industry, farms and ranches and are being transported in vehicles, trains, planes and water craft.

Human exposure to hazardous chemicals can occur during manufacturing, transport, storage, usage and deliberate acts such as terrorism.

## Overview—Acute Chemical Releases



The slide features a title 'Overview Chemical Releases' centered at the top. On the left is the NCEM logo (North Carolina Emergency Medical Services) and on the right is the EMS logo (North Carolina EMS). The main content area contains a paragraph and a bulleted list. At the bottom, there is a blue footer bar with the text 'State Medical Assistance Team Training' on the left and '4-23' on the right.

Overview  
Chemical Releases

Chemical agents may be used to deliberately harm human populations

- WWI – 1915 - Battle of Ypres
  - Germans released >168 tons of Chlorine
  - Thousands of casualties within minutes
- Tokyo Subway – 1995 – Sarin Released
  - >5,000 injured
  - 12 deaths

State Medical Assistance Team Training 4-23

Historically, our greatest concern to human health related to acute chemical exposure is the risk from military and industrial sources. The use of chemical warfare agents during World War I (WWI) ended the notion that chemical agents could be effectively banned. The first chemical agent used in large quantities was chlorine that was released by the Germans during the battle of Ypres in 1915. More than 168 tons of the chemical was released into the opposing military line causing thousands of casualties within minutes of release. Most chemical agents of this era had localized effects to the skin or toxic effects to the respiratory system with some notable exceptions, such as mustard agent which could also cause wide spread systemic effects to the body in large doses. It is important to note that in WWI the number of non-fatal injuries was extremely high when compared the number of fatalities. This resulted in a tremendous strain upon the medical system (Muskat, 2008).

By World War II (WWII), a German scientist had discovered an effective pesticide, Sarin, the first chemical warfare nerve agent. This class of chemical agents was distinctly different from the earlier generation of chemical warfare agents in that they attacked the nervous system and was capable of causing death or injury at relatively low levels of exposure.

In 1995 members of the AUM Shinrikyo released Sarin gas into five trains of the Tokyo subway system. This resulted in 12 deaths and widely varying injury counts. Reports record between 1000 to 6,000 injuries although most accounts support the higher numbers. Part of the confusion results from problems classifying who was considered a victim of the attack because health effects are dose dependent. Secondary victims were created due to the fact that the Sarin can cling to clothing for around 30 minutes facilitating its spread to others including first responders, and contaminating emergency equipment, emergency vehicles and hospitals.



## Overview Chemical Releases



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### Chemical disaster – Industrial

- Bhopal, India 1984 - methyl-isocyanate
  - >20,000 people affected
  - >2,000 deaths reported



Photo Courtesy: EPA

State Medical Assistance Team Training

4-24

Beyond military or war-related chemical weapons use, there are many additional chemical threats to consider. Acute chemical exposure may also occur as part of an industrial disaster, a terrorism event, a natural disaster, or as the result of a transportation or storage accident (Kales 2004). One of the most serious disasters occurred at the Union Carbide plant in Bhopal, India in 1984 (Dhara, 2002).

During the Bhopal chemical incident, there were multiple failures related to emergency preparedness and response to an acute chemical exposure to a common industrial chemical, methyl-isocyanate (MIC) (Dhara, 2002). MIC is a toxic chemical that causes chemical burns to the skin, respiratory tract, and mucous membrane. Severe exposures can be lethal and moderate exposures can be debilitating.

A combination of plant failure and operator error led to a large quantity of MIC being released into the atmosphere during the night. Because MIC is heavier than air and it was a cold December night, the chemical release moved in the direction of the wind close to the ground and into an adjacent densely populated community. The plant external alarm system (warning siren) was not activated until much later, after the chemical had moved into the community. As a consequence, more than 20,000 people were affected and more than 2,000 deaths were reported. The confusion of night and the lack of warning increased the number of casualties due to the fact that many victims were unsure in which direction to flee from the hazard. An exhaustive review of the event showed there were multiple failures related to plant safety, emergency notification, training, civilian preparedness for acute chemical exposures, a lack of PPE, and a lack of knowledge concerning hazards facing the civilian population.

An all hazards approach to the threat of an acute chemical release begins with proper planning. One important focus of this planning must include the existing industrial chemicals that are stored and transported within our communities. Each of these represents an increased likelihood of unintentional or intentional release, causing injury to the populations close by.

## Chemical Disaster Preparedness and Response



### Chemical Disaster Preparedness



- Critical issues for health care facilities
  - Control access to health care facility
  - Protect health workers (PPE)
  - Decontamination of patients and equipment



State Medical Assistance Team Training4-25

Human exposure to hazardous chemicals can occur during manufacturing, usage, transport, or storage of materials. There have been a number of reports that suggest an increased need for chemical preparedness among health responders. The events during the Sarin attack of the Tokyo subway on March 20, 1995, in which 12 persons were killed and more than 5,000 were injured, highlight many of the challenges facing health care providers when faced with an acute chemical emergency. For SMAT personnel, the issues and challenges identified in this Japan-based incident are the same concerns that will be faced in the field deployment site rendering aid during casualty management after an acute chemical release. This includes surge management, decontamination of the casualties, and Personal Protective Equipment (PPE) use by the SMAT personnel.

First, healthcare facilities, including field-based medical care facilities, may be overwhelmed with chemical casualties after even a modest chemical agent release. For example, following the Tokyo Subway Sarin attack of 1995, St Luke's Hospital in downtown Tokyo saw more than 500 victims within the span of two hours (Okumura, 1996). The majority of victims did not utilize the Emergency Medical Services (EMS) system for transport to healthcare facilities, but rather sought conventional means (e.g., car, bus, ambulatory) to seek health care. The least serious tended to arrive for treatment during the early stages of the emergency response. Estimates are that fewer than 10% of the sarin victims were transported to healthcare facilities by Emergency Medical Services (Okudera, et. al., 1997). There were immediate issues related to chemical identification, activation of the hospital's emergency plan, decontamination, and access to antidotes.

Although more than 15 years have elapsed since the Tokyo subway Sarin incident, a number of important lessons are still valid for health care workers attempting to manage patients suffering acute chemical exposures. First, it remains difficult in the U.S. to prevent casualties who may be contaminated from entering our healthcare facilities prior to decontamination. Secondly, it is critical to protect healthcare staff. Lastly, few health care facilities can decontaminate large populations during surge conditions.

**Table 4-5: Critical Issues**

<b>Critical Issues for Health Care Facility Preparedness for Patients with Acute Chemical Exposures</b>
Control access to health care facility Protect health workers (PPE) Decontamination of patients

A number of planning documents and information are available for healthcare facilities related to chemical preparedness and response to consider. In addition, there are excellent courses related to hazardous materials preparedness in most communities. For more information refer to the *Hazardous Materials* module.

The SNS serves as a repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items.

In the event of a disaster, these federal assets can be moved to the scene to help responders and victims address medical needs. For additional information on the SNS refer to page 4-33 or visit <http://www.cdc.gov/phpr/stockpile.htm>

## Situational Awareness



### Situational Awareness



Factors Affecting Patient Care

- Type of chemical event (e.g., explosion, release, an attack)
- Type and amount of chemical released
- Number of victims exposed and/or injured
- Need for decontamination of victims
- Number of field workforce/responders who may be affected
- PPE requirements
- The need for antidotes for specialized medical care

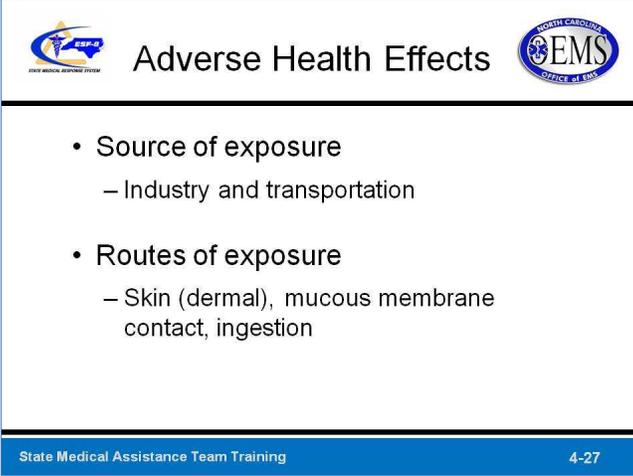
State Medical Assistance Team Training
4-26

Situational awareness of a chemical release may come from many sources, including transportation, law enforcement, and environmental protection services. However, health care providers, including field deployed medical staff will often not be aware there is a problem until chemical casualties begin to appear in their clinical facility. In responding to an acute chemical emergency it is important to rapidly develop information on the type of release, whether victims have been exposed to dangerous chemicals, and whether responders will require specific adjustments to PPE. In addition, staff in receiving facilities will need to know whether they need to activate their emergency response plan, particularly if there is going to be a need for mass patient decontamination. Specific information of interest to health providers attempting to care for victims is as follows:

**Table 4-6: Situational Awareness to an Acute Chemical Release**

<b>Factors Affecting Patient Care</b>
<ul style="list-style-type: none"> <li>• Type of chemical event (e.g., explosion, release, an attack)</li> <li>• Type and amount of chemical released</li> <li>• Number of victims exposed and/or injured</li> <li>• Need for decontamination of victims</li> <li>• Number of field workforce/responders who may be affected</li> <li>• PPE requirements</li> <li>• The need for antidotes for specialized medical care</li> </ul>

## ADVERSE HEALTH EFFECTS OF ACUTE CHEMICAL EXPOSURE



The slide features a title "Adverse Health Effects" centered at the top. To the left is the NREPP logo (National Resource for Environmental and Population Protection) and to the right is the NCEM EMS logo (North Carolina Emergency Medical Services Office of EMS). Below the title, there are two main bullet points: "Source of exposure" and "Routes of exposure". Under "Source of exposure" is a sub-bullet "Industry and transportation". Under "Routes of exposure" are sub-bullets "Skin (dermal), mucous membrane contact, ingestion". At the bottom of the slide, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "4-27" on the right.

- Source of exposure
  - Industry and transportation
- Routes of exposure
  - Skin (dermal), mucous membrane contact, ingestion

There are thousands of different chemicals, each with its own characteristics and capacity to cause adverse health effects in human populations. Rather than list a large number of chemicals with important information about each one, this section will provide an outline that will be useful in understanding and responding to “all chemical hazards.”

A fundamental toxicology principle is that all chemicals are toxic. A chemical’s toxicity is dependent on the concentration of the chemical and the length of time that a person is exposed to that chemical (Kales, 2004).

Individuals who present to health care facilities for medical care related to chemical exposure are likely to be contaminated (Burgess, 1999). EMS ambulances and hospital emergency rooms are at risk of contamination if prior proper decontamination is not conducted. Adverse health effects may be experienced by medical and emergency personnel if contamination occurs. The field deployment site of medical care delivery is at significant risk of contamination. Staff should be monitored for the appropriate signs and symptoms of chemical exposure.

### Source of Exposure

There is a variety of situations that might result in the release of a chemical hazard. These include an industrial mishap, transportation crash, natural disaster, or chemical terrorism/warfare.

### Routes of Exposure

The most common routes for exposure to a chemical are inhalation, skin (dermal) or mucous membrane contact, and ingestion. These are not mutually exclusive categories as persons who might walk through a cloud or plume of a chemical agent would likely be exposed through inhalation as well as skin and mucous membrane contact. It should be remembered that systemic symptoms from dermal exposure and absorption may take a much longer time to

appear than the symptoms seen with inhalation. Ingestion of contaminated food or water would lead to absorption from the gastrointestinal tract.

Kales and Christiani (2004) have developed a framework to simplify our understanding of four clinical syndromes or “toxidromes” that might occur as a result of a chemical exposure, regardless of the source or route of exposure. The chemical classes that make up their framework are asphyxiants (e.g., cyanide), cholinesterase inhibitors (e.g., organophosphate nerve agents), respiratory tract irritants (e.g., chlorine), and vesicants (e.g., mustard). There are countless chemicals that might be unintentionally spilled or intentionally released as chemical weapons and cause injury or death in human populations. The vast majority fit within one of the four categories in the framework highlighted here. Chemicals within the same category are expected to cause injury through the same general toxicology mechanisms and should have the same treatment options, if any exist.

## Chemical Exposure Toxidromes

 <b>Chemical Exposure Toxidromes</b> 				
Clinical Feature	Asphyxiants	"Nerve Agents" Cholinesterase inhibitors (Respiratory Failure)	Respiratory Tract Irritants	Vesicants (Attacks Skin and Mucous Membranes)
Most likely agents in accidental release	Carbon monoxide	Organophosphates pesticides	Chlorine and its derivatives, ammonia	Many classes of chemicals
Most likely agents in act of terrorism	Cyanide	Sarin and VX	Chlorine, phosgene	Sulfur mustard
Mild symptoms	Headache, fatigue, anxiety, irritability, dizziness, nausea	Pinpoint pupils, dim vision, eye pain, rhinorrhea, irritability, headache, chest tightness,	Nose and throat irritation, sore throat, cough, chest tightness, eye irritation	Eye irritation, conjunctivitis, limited erythema, epistaxis, sore throat, cough
Moderate-to-severe symptoms	Dyspnea, altered mental status, cardiac ischemia, syncope, coma, seizure	Salivation, Lacrimation, Urination, Defecation, G.I. cramps, Emesis (SLUDGE), coma, seizure	Laryngitis, wheezing, stridor, laryngeal edema, acute lung injury	Corneal damage, vesicles and bullae, nausea, wheezing, stridor, laryngeal edema, acute lung injury (Kales 2004)

Few chemicals have effective specific treatments, or “antidotes,” that will counteract or diminish the adverse health effects associated with chemical exposure. However, there are no antidotes for the majority of harmful chemicals. The SMAT personnel may only be able to provide supportive care for adverse health outcomes of exposure to chemicals without chemical antidotes (Doyle, 1998).

## **CHEMPACKS**

The CHEMPACK program provides state and local governments a sustainable nerve agent antidote cache that increases their capability to respond quickly to a nerve agent event such as a terrorist attack. These caches are usually placed in local hospitals distributed throughout the state.

The CDC Strategic National Stockpile maintains ownership of the statewide CHEMPACK stockpiles and coordinates this program nationally. The management of CHEMPACK in North Carolina is listed below:

- SERT : direct movement of assets
- OEMS : hospital resource coordination
- Public Health: availability/distribution of CHEMPACK assets, SNS request
- Pre-deployment to high risk events

### **CHEMPACK Appearance**

CHEMPACKs weigh more than 1,100 lbs.

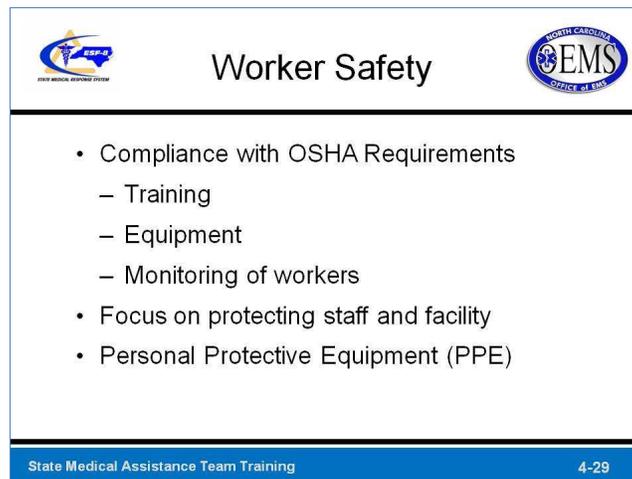


**Table 4-7: Four Chemical Exposure “Toxidromes”**

<b>Feature</b>	<b>Asphyxiants</b>	<b>Nerve Agents Cholinesterase Inhibitors</b>	<b>Respiratory Tract Irritants</b>	<b>Vesicants (Attacks Skin and Mucous Membranes)</b>
Most likely agent in accidental release	Carbon monoxide	Organophosphates pesticides	Chlorine and its derivatives, ammonia	Many classes of chemicals
Most likely agent in act of terrorism	Cyanide	Sarin and VX	Chlorine, phosgene	Sulfur mustard
Mild symptoms	Headache, fatigue, anxiety, irritability, dizziness, nausea	Pinpoint pupils, dim vision, eye pain, rhinorrhea, irritability, headache, chest tightness, sweating	Nose and throat irritation, sore throat, cough, chest tightness eye irritation	Eye irritation, Conjunctivitis, limited erythema, epistaxis, sore throat, cough
Moderate-to-severe symptoms	Dyspnea, altered mental status, cardiac ischemia, syncope, coma, seizure	Salivation, lacrimation, urination, defecation, GI cramps, emesis (SLUDGEM); wheezing, muscle weakness, fasciculations, cognitive impairment, incontinence, coma, seizure	Laryngitis, wheezing, stridor, laryngeal edema, acute lung injury	Corneal damage, vesicles and bullae, nausea, wheezing, stridor, laryngeal edema, acute lung injury

Adapted from Kales, S.N., & Christiani, D.C. (2004). Acute chemical emergencies. *New England Journal of Medicine*;350, p. 800-8.

## Worker Safety



The slide features a blue header with the title "Worker Safety" centered. On the left is the logo for the State Medical Assistance Team (SMAT), and on the right is the logo for the North Carolina EMS Office of EMS. Below the header, a list of bullet points is presented. At the bottom of the slide, a blue footer contains the text "State Medical Assistance Team Training" on the left and "4-29" on the right.

- Compliance with OSHA Requirements
  - Training
  - Equipment
  - Monitoring of workers
- Focus on protecting staff and facility
- Personal Protective Equipment (PPE)

When facing the possibility of acute chemical exposure, workforce protection must be given the highest priority. If workforce protection measures fail, then the number of casualties increases and the response capability and capacity is significantly reduced. The general principles of worker safety must always be implemented and are described in the *Responder Health and Safety* module. PPE and decontamination are described in the *Hazardous Materials* module. In addition to a basic understanding of PPE, it is important to note that operations in conditions requiring PPE are governed by federal regulations such as OSHA 1910.120.

## Selected Issues in Mass Casualty Care of Acute Chemical Exposures

	<h3>Selected Issues</h3>	
<ul style="list-style-type: none"><li>• Basic triage may require modifications<ul style="list-style-type: none"><li>– Most triage systems based on trauma not chemical exposure</li></ul></li><li>• Transportation of patients<ul style="list-style-type: none"><li>– Concerns for contamination of vehicles and exposure of personnel</li></ul></li></ul>		
State Medical Assistance Team Training		4-30

### Triage

The basic principles of patient triage (see *Mass Casualty*) remain in effect for injured persons who are also suffering from an acute chemical exposure. However, the triage of chemical casualties may require some modifications to ensure that victims with serious injuries can be stabilized from immediate life-threats and then re-triaged as soon as decontamination procedures are completed. It is important that some degree of triage and patient decontamination be accomplished at the same time. Triage may have to be altered in a chemical event because many triage systems (e.g., SMART Triage) are based on trauma rather than medical presentation. It should be remembered that treatment of chemical casualties, such as acute organophosphate exposures, can begin before decontamination has taken place. The potential for life-threatening chemical exposure combined with likely acute traumatic injuries resulting from the explosion, associated fall, etc. will add to the complexity and anticipated higher acuity levels of these patients being expected.

## **Casualty Evacuation and Transport**

In acute chemical exposure events, there will be a risk of chemical contamination of patient transport vehicles and crews if patients are not decontaminated prior to transport. If complete decontamination is not possible prior to patient transport, EMS personnel must use appropriate PPE level. The contamination of EMS vehicles and crews is a significant concern as they are leaving the scene and will be arriving at a distant, valuable healthcare facility that may now be placed at risk of contamination. Additionally, contaminating an EMS unit and its crew reduces the capability and capacity of the overall casualty transportation mission as the time and personnel utilized to decontaminate and clean the vehicle and crew for continued use is considerable.

Air transportation (i.e., fixed or rotary wing) should not be used if any risk of contamination may be present that could impair the flight operations and crew members.

## EXPLOSIVE DISASTERS

### *Overview of Explosive Disasters*

Explosions are a common cause of disasters worldwide. An explosion may be the inciting event, or it may be a consequence of another natural or man-made disaster (Glenshaw 2007, 2009). Explosion risks are commonplace within industrialized countries. The transportation of chemicals, fuel, or other dangerous substances on roadways, highways, and railways poses a significant risk to almost every community in our state and throughout the country. Industrial accidents often are associated with explosions due to the hazardous materials used in manufacturing. Earthquakes, tornados, and many other natural disasters often are complicated by explosions from a variety of sources, (e.g., natural gas line disruptions, fires, chemical spills, etc.). Additionally, the field deployment environment may have explosive substances or develop unsafe conditions where an explosive risk is present. It is important for every SMAT member to have a basic awareness of explosions and their association with disasters.

## Definition of an Explosion



### Definition of Explosion



- An explosion is caused by the sudden release of energy
  
- Associated with high temperature, rapid movement of debris, expanding gases and tremendous forces

State Medical Assistance Team Training4-31

An *explosion* is defined as the release of mechanical, chemical, or nuclear energy in a sudden and often violent manner with the generation of high temperature and usually with the release of gases, and rapid movement of the surrounding medium (i.e., air usually) and nearby objects with tremendous force.

## Basic Science of a Typical Explosion

There are many facets to the basic science of explosions. The application of this basic science is important to understanding the injury patterns likely to be encountered in casualties from an explosive event.

A key principle to understanding explosions is the speed of the reaction. For example, a burning log of wood generates heat and releases gases, but because it is occurring relatively slowly during an ordinary combustion reaction no explosion occurs. Rather than explode, the heat and gases dissipate in the local environment or medium, which is usually air. However, if it were possible to release all of the heat and gas-generating potential energy of that same log of wood in one instant, then an explosion would occur. This results because the surrounding medium would be unable to rapidly dissipate the heat and gases, and instead would be forcefully compressed by the tremendous forces generated.

The tremendous and sudden release of energy, or detonation, can cause a near instantaneous rise in pressure (e.g., from a so-called “high explosive”) that generates an invisible “shock” or blast wave transmitted at supersonic (i.e., faster than the speed of sound) speeds. This rapidly occurring “shock” or blast wave has a shattering ability (i.e., brisance). This is quickly followed by a rapid fall in pressure. This fall, or negative pressure, creates a suction-like phase of the blast wave. It is this cycle of rapid tremendous rise (i.e., positive phase) followed by a very rapid fall (i.e., negative phase) in surrounding pressure that gives explosions their severe destructive, shearing force. The force of the explosion is largely determined by the amount of explosive material and the velocity of the reaction. Other factors also play a role.

This blast wave can also reflect off surfaces (i.e., walls, windows, people, body armor, etc.) causing multiple cycles of blast wave shattering and shearing destruction, all of which occurs in

a fraction of a second. This is why an explosion in an enclosed space, such as a building or vehicle, is usually more damaging than the same explosion in an open-air environment. The surrounding medium in the local environment does impact the effects of an explosion. For example, blast waves are magnified in water and will extend much farther than in air. The same size and speed of an explosion occurring underwater is likely to be more damaging compared to if it had occurred in air.

Following the blast wave, the surrounding medium (e.g. air typically, unless occurring underwater) that was compressed by the instantaneous pressure rise now rapidly decompresses and causes a tremendous rush of air that with a force that can be very destructive, literally blowing or propelling nearly any structure or item in its pathway. This can cause significant damage to the local area and any living person or animal in its pathway. The tremendous forces involved in an explosion will cause many items to be fragmented. This fragmentation can send projectiles at body piercing, life-threatening speeds for hundreds or even thousands of feet.

With any significant energy release as noted above, a significant release of heat or thermal energy is also likely to occur. The resulting destruction and potential injuries to people from this heat energy is significant. Burn-related injuries would be expected after explosions.

When a detonation such as the one described here occurs, other chemical or substances in the area may be disrupted because of exposure to the destructive forces caused by the explosion. This could result in another explosion if these substances are susceptible or volatile under these altered conditions. The containers of such chemicals or substances are likely to be damaged. This may result in these substances being dispersed within the air rush or simply a leaking potentially dangerous contaminant.

This brief description of the basic science of explosions is an awareness level introduction only. Interested students are encouraged to review the references or other sources for a more in-depth description.

## Types of Explosions



### Types of Explosions



- Chemical (e.g., TNT)
- Nuclear (e.g., nuclear weapon)
- Mechanical (Boiling Liquid Expanding Vapor Explosion BLEVE)



Photo Courtesy: USAF

State Medical Assistance Team Training4-32

### Chemical Explosions

The most common explosives are chemical explosives. A chemical explosion is usually the rapid chemical conversion of a solid or liquid into a gas with a resultant energy release. Chemical explosives may be categorized by the speed at which they expand. Materials that detonate (i.e., explode faster than the speed of sound) are said to be “high” explosives as described in the basic science section above. Materials that deflagrate (i.e., explode slower than the speed of sound, described as subsonic combustion or burning) are said to be “low” explosives. Low explosives produce less efficient combustion and will often release potentially toxic gases such as carbon monoxide.

### Nuclear Explosions

A nuclear explosion is the most powerful explosion of all the types described. Although potentially naturally occurring (e.g., earth’s collision with a near-earth object such as a large meteor or comet), the most common nuclear explosion threat is a man-made nuclear weapon that releases energy from atomic particles.

As a result, even a nuclear weapon with a small yield is significantly more powerful than the largest conventional explosive available, with a single weapon capable of completely destroying an entire city. A more detailed description of nuclear and radiologic disasters is contained in a separate section of this module.

### Mechanical Explosions

Mechanical explosions are a physical process, as opposed to a chemical or nuclear reaction. They result from the bursting of a sealed or partially sealed container under high internal pressure. It can be the result of simple over-filling of a container with a gas until the internal pressure is greater than the strength of the container (e.g., a common simple example is overinflating a balloon until it pops). If heat is applied to a container of liquids and gases, an

explosion may occur, as the liquids may reach a boiling point and the resulting gases or vapors may expand to the point that the container ruptures.

A particular mechanical explosion is the phenomenon of a *Boiling Liquid Expanding Vapor Explosion* (BLEVE). BLEVE can occur when a vessel containing a pressurized liquid that is substantially above its boiling point is ruptured, thus releasing its contents explosively. Large BLEVEs have produced explosions with enough force to register as large earthquakes and their effects may extend for miles. This is important as it can occur in old or damaged containers that encounter even a small leak. The leak could be due to a container being exposed to flooding or moisture with corrosion, or failure of the container under pressure, for example. If such a leak were to occur in a pressurized container that is partly filled with liquid with vapor above it, the vapor escaping through the leaking area would lower the pressure in container, causing the violent boiling of the previously pressurized liquid, leading to more and more vapor rapidly developing and unable to escape through the leak site causing an explosion of the container. The occurrence of a BLEVE can be compounded if the stored material was a flammable substance or made of toxic materials. The resultant violent release of toxic materials may lead to large area contamination from even a local explosion.

### ***Mechanisms of Injuries from Explosions***

The basic science description of a common explosion introduced several potential mechanisms of injuries and illnesses that could result. An awareness level understanding of the pathophysiology of these injuries and illnesses is important for all SMAT personnel. For discussion, there are four categories of blast related injuries to be considered including: primary, secondary, tertiary, and quaternary. The importance of these categories and an algorithm for improving pre-hospital care from blast injuries due to bombing incidents has been recently published (Kapur, 2010)

## Primary Blast Injuries



### Mechanisms of Injury



- Primary blast injuries
  - Caused by the shock wave associated with high overpressures
  - Amplified in confined spaces
  - Affects hollow organs (e.g., auditory, intestines and lungs)
  - Signs and symptoms can be delayed

State Medical Assistance Team Training4-33

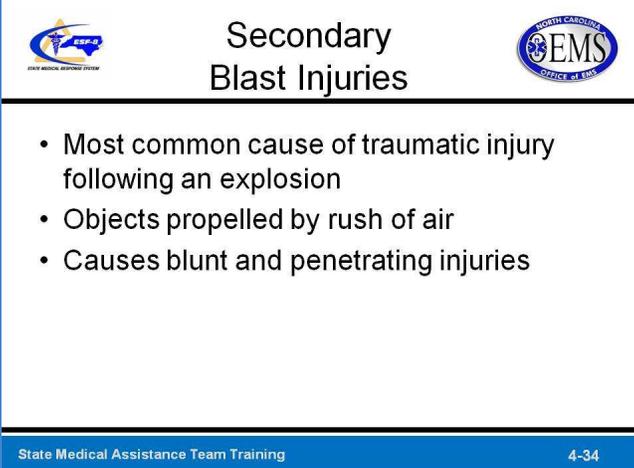
Primary blast injuries are caused by the “shock” or blast wave that nearly instantaneously occurs from tremendous over-pressurization. Injury from blast overpressure is a pressure and time dependent function. Increasing the pressure or its duration will cause the severity of injury to increase. The reflection of the blast wave, allowing for multiple blast waves to strike a person from different directions and angles, such as occurs when an explosion has occurred in a closed space (i.e., indoors vs. outdoors) also may significantly increase the number and severity of injuries. There are many additional factors that interplay to determine the severity of injuries from primary blast waves (e.g., time or duration of exposure, distance from explosion, surrounding medium, etc.).

The injuries commonly seen from primary blast waves are the air-filled areas, or so-called hollow organs, of the body. This includes portions of the auditory, pulmonary, and gastrointestinal tracts. The effects can be immediate or delayed. One of the most common blast injuries is the rupture of the tympanic membranes (i.e., eardrums). The consequences of ruptured eardrums include loss of hearing, ear pain, and balance problems from vertigo and dizziness. This may complicate the hearing of important commands as well as self-evacuation. Triage methods and commands may be less effective if such impairments in hearing or balance are present.

The pulmonary system effects from a primary blast injury are serious and can be life-threatening. The air-filled lungs make them susceptible to the effects of blast waves and their shattering and shearing forces. The term “blast lung” refers to severe pulmonary contusion (e.g. the bruising of the lung tissue), bleeding or swelling with damage to alveoli and blood vessels, or a combination of these. In addition to the pulmonary contusions, other chest injuries may include hemothorax, pneumothorax, traumatic emphysema, subcutaneous air, and even alveolar-venous fistulae leading to air emboli. The onset of difficulty breathing with a variety of associated symptoms such as rapid shallow breathing, chest pain, difficulty speaking complete sentences, decreased breath sounds, wheezing, cough, or hemoptysis, may occur immediately or may develop over the first several hours following a primary blast injury. The pulmonary tract injuries are a common cause of death among people who initially survive an explosion.

Not all of the blast wave injuries may be immediately detected. The damage to the air-filled intestines, as well as their vascular and nervous supply, may not be clinically obvious as it takes time for the signs and symptoms to develop, such as the onset of abdominal pain, distention, nausea, vomiting, etc.

## Secondary Blast Injuries



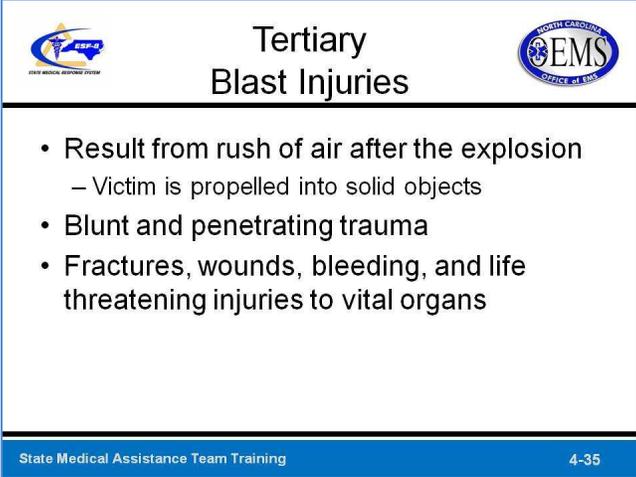
The slide features a title 'Secondary Blast Injuries' centered at the top. To the left is the NCEM logo (North Carolina Emergency Medical Services) and to the right is the North Carolina EMS Office of EMS logo. Below the title is a bulleted list of three points. At the bottom of the slide, there is a footer with the text 'State Medical Assistance Team Training' on the left and '4-34' on the right.

- Most common cause of traumatic injury following an explosion
- Objects propelled by rush of air
- Causes blunt and penetrating injuries

Secondary blast injuries are the most common type of traumatic injury following an explosion. The air rush that follows the blast wave is responsible for causing secondary blast injuries. The air rush propels the bomb fragments (e.g., shrapnel), as well as debris and other objects in the immediate area of the explosion through the air with body-penetrating and life-threatening force and speed. The blunt and penetrating injuries resulting from secondary blast injuries are the most numerous injuries caused by explosions overall. External bleeding from resulting open wounds as well as internal bleeding from disrupted blood vessels can be significant and life threatening. Associated fractures of bones and structural damage to vital organs (i.e., brain, liver, spleen, heart, kidneys, etc.) must also be considered.

It is important to note that improvised explosive devices (IED) are often augmented with additional trauma-causing materials (e.g., nails, screws, bolts, glass, etc.). These are added for the single purpose of causing more severe injuries through the fragmentation and shrapnel caused by the explosion.

## Tertiary Blast Injuries

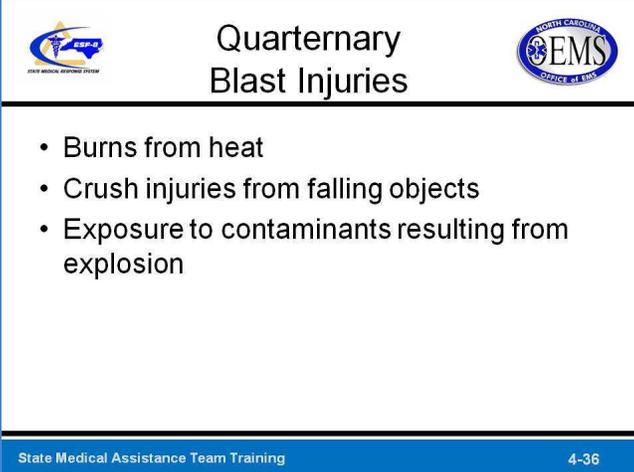


The slide features a title 'Tertiary Blast Injuries' centered at the top. To the left is the NRP-C logo (National Responder Project - Critical Care) and to the right is the North Carolina EMS logo (Office of EMS). Below the title is a bulleted list of injury types. At the bottom, a blue footer bar contains the text 'State Medical Assistance Team Training' on the left and '4-35' on the right.

- Result from rush of air after the explosion
  - Victim is propelled into solid objects
- Blunt and penetrating trauma
- Fractures, wounds, bleeding, and life threatening injuries to vital organs

Tertiary blast injuries result from the air rush after the explosion literally blowing people in its path against solid objects. These casualties suffer blunt and penetrating trauma from being forcefully thrown into the various structures in the area. Fractures, wounds, bleeding, and life-threatening injuries to vital organs can occur.

## Quaternary Blast Injuries



The slide features a blue border and a white background. At the top left is the NCEM logo, and at the top right is the EMS logo. The title 'Quaternary Blast Injuries' is centered at the top. Below the title is a bulleted list of three items. At the bottom, there is a blue footer bar with the text 'State Medical Assistance Team Training' on the left and '4-36' on the right.

- Burns from heat
- Crush injuries from falling objects
- Exposure to contaminants resulting from explosion

In addition to the blast wave and air rush effects as described in the primary, secondary, and tertiary blast injuries, there are additional mechanisms of injury that must be considered. For example, these include burns, crush injuries from falling objects and structural collapse, and exposure to contaminants resulting from the explosion. These are quaternary injuries.

Thermal energy release can be very large and the resulting burns to casualties are an important consideration. Management of burns, including airway and respiratory support, pain control, wound care and fluid management, as well as multi-organ dysfunction when significant large body surface areas are involved may be encountered.

Falling objects and debris may cause a variety of injuries related to crush mechanism of injury. An extremity may be crushed severely, leading to significant bleeding, wounds, or deeper tissue damage. A compartment syndrome in an extremity may developed if a severely crushed area swells to the point that the blood supply and tissues are compromised from the tense edema within the fibrous walls surrounding muscles of a given extremity. This could result in the ischemic and eventual loss of the extremity requiring amputation.

Crush injury sustained against the chest wall (e.g., casualty pinned between immovable objects) can compromise a person's breathing because they cannot expand and contract their chest. This is known as traumatic asphyxia. A crush injury that has involved large area of the body, involving damage to large muscle groups, can cause crush syndrome. Crush syndrome is the result of the body's inability to manage the breakdown products of crushed muscle and related tissues leading to build up of cellular waste products and large shifts in intra- and extra-cellular fluid shifts. This results in systemic acidosis, hypoxia, ischemia, electrolyte imbalance, which leads to multi-organ system failure and death.

Another consideration in the quaternary group of blast injuries is contamination by toxic materials affected by the explosions. Disrupted storage containers, industrial materials, burning plastics or textiles, or intentionally placed chemicals or materials attached to a bomb may cause a wide variety of additional injuries and serious illnesses.

Also the underlying medical condition of the casualty prior to the explosion is a consideration in this group. Someone with underlying asthma or heart disease for example may have an exacerbation of those illnesses as a direct result of the explosion.

## Situational Awareness



### Situational Awareness



- Threat recognition
- Secondary devices
- “Dirty” bombs



Photo Courtesy: US Chemical Safety Board

State Medical Assistance Team Training4-37

### Threat Recognition—General Explosive Events

Explosions can occur in many situations and from a variety of causes. They may be the result of a transportation accident, an industrial accident, or a consequence of a natural disaster as outlined in the introductory section of this module, *Overview in Explosive Disasters*. There may be a single or multiple explosions during a given event. The cause may be accidental or the result of an intentional plan (e.g., terrorist bombing).

The SMAT personnel at the scene or working at the deployment site may be working nearby or have potentially explosive substances in the immediate area. It is important for all SMAT members to recognize such threats and take appropriate actions based on the situational awareness. As a general rule, every SMAT member should consider that if one explosion has occurred, the likelihood of another explosion is a realistic consideration.

### Threat Recognition—Secondary Devices

The term “secondary device” refers to the intentional placement of a pending explosion or other injury/illness-causing mechanism that is meant to occur at some time after the initial event occurred. For example, placing a bomb near the scene where a bombing or other event (e.g., shooting, fire, etc.) has just occurred for the purpose of causing more injuries or deaths is one use of a “secondary device.” Historically, these “secondary devices” are meant for the responders or crowd gathering in the early aftermath of the inciting event. Medical responders, fire personnel, and law enforcement are at risk from such dastardly intentionally planned events. The importance of recognizing a concerning “package” or “device” at the scene as well as utilizing only equipment that is known is important at any scene. Maintaining proper communication with incident command, assessing all casualties for weapons or devices, and knowing immediate evacuation routes are examples of very important action items.

### **Threat Recognition—“Dirty” Bombs**

The term “dirty” bomb is usually applied to an improvised explosive device that has been augmented by adding a dangerous substance, or perceived fear-provoking material to the device. The use of a bomb as a dispersal device to disseminate a substance by the explosive force is the underlying mechanism of injury for a “dirty” bomb.

For example, attaching radioactive material (e.g., medical radioactive waste from a health care facility used in patient care) to a bomb is an example of a “dirty” bomb classically described. The explosion is obvious, but the situational awareness (i.e., alarms of radiation detectors, etc.) may be delayed initially. The presence of a significant contaminant beckons the need for more resources, decontamination measures, and media attention. The radioactive substance utilized in this example may cause actual health concerns or may not. The ensuing panic and fear resulting from such an event may be the greatest actual threat to injury, illness and mental health of those involved.

Although commonly described, radioactive material is only one example of dangerous or attention-gaining materials attached to bombs. The use of infectious material (e.g., HIV patient’s blood, laboratory culture of an organism, etc.) or a particularly toxic chemical are other examples that have been previously utilized as “dirty” bombs.

## Workforce Protection in Explosive Disasters

Workforce Protection

- Security and site safety
- Personal Protective Equipment (PPE)
- History of exposure to an explosion demands close observation (late injuries)
- Decontamination if “dirty bomb” or associated with a chemical release

State Medical Assistance Team Training4-38

Workforce protection in explosive disasters begins with the situational awareness as described in the preceding section heading. Threat recognition is important to the selection of PPE, decontamination needs and methods, and other relevant medical consequence management issues. The general principles and guidelines described in the *Responder Health and Safety* module, should be reviewed and implemented appropriately.

### PPE Selection

Selection of PPE for workers responding to the scene of an explosion will vary with the specifics of the event but at a minimum should provide at least limited protection to emergency response personnel from physical, environmental, thermal, and blood-borne hazards. This should include barrier garments, gloves, steel-toed boots, helmet, eye protection, and respiratory protection. Specific details on requirements for such PPE can be found in *NFPA 1951: Standard on Protective Ensembles for Technical Rescue Incidents* and *NFPA 1999: Standard on Protective Ensembles for Emergency Medical Operations*. The personal protective equipment functions and use as described in the *Hazardous Materials* module should be reviewed and implemented appropriately.

### Decontamination Considerations

Any worker or patient exposed to large amounts of particulate materials, any chemical contaminants, or any radiologic contaminants should undergo some form of decontamination. Decontamination procedures are described under the sections on chemical and radiologic hazards. The decontamination methods described in the *Hazardous Materials* module should be reviewed and implemented appropriately.

### Exposure Management and Prophylactic Care

Any SMAT personnel likely to have been contaminated by any toxic or otherwise concerning substance must be immediately decontaminated and medically managed, including appropriate evacuation for further care as needed. The number of SMAT personnel should always be

included when considering casualty treatment supplies, medications, antidotes, etc. as each worker is a potential casualty in a dangerous environment.

All SMAT members who have been working in an environment involving explosions, contamination risks, etc. must be assessed by appropriate health and medical professionals. This health and medical assessment should include a screening for significant exposure risks through common portals of body entry (e.g., inhaled, ingested, or through open wounds) as well as the need for any prophylactic (i.e., preventive) or illness and injury management.

## Field Care of Casualties from Explosions

	<h3>Field Care</h3>	
<ul style="list-style-type: none"><li>• May involve triage in hazardous conditions</li><li>• High acuity traumatic injuries</li><li>• Triage, evacuation and transport</li></ul>		
State Medical Assistance Team Training		4-39

### Triage Considerations

Triage should focus on identifying the most severely injured patients and prioritizing on-scene life saving interventions and evacuation for the critically ill with the best chances of survival with treatment based on available resources. Implementing triage in the early aftermath of explosion can be challenging for a number of reasons.

The scene of an explosion has many factors that limit the ability to complete the triage of a large number of casualties in a timely and effective manner. The scene safety, security, and assessment of possible hazards must be addressed first as well-meaning responders who ignore these key initial steps may become injured or killed rather than assisting the casualties. Nonetheless these vital first steps do take time and to the untrained observer may appear as misunderstood delays in tending to the casualties.

Triage may be adversely affected by the conditions of the scene, including smoke, loud noises, hysteria, and crowd confusion for example. The value of law enforcement, fire-rescue, and properly trained medical response personnel is a key to controlling such conditions. Also, particular injuries may cause challenges in applying triage methods. For example, patients with ruptured eardrums may not hear or be able to walk effectively or to obey commands that are being given.

## Casualty Injury and Illness Management



### Casualty Injury Management



- Injuries Associated with Explosions
  - Intracranial trauma
  - Burns
  - Crush Syndrome
  - Primary blast injury  
(eardrum injury may indicate more serious injury)
  - Traumatic asphyxia
  - Toxic effects of contaminants (rare)



Photo Courtesy: DOE

State Medical Assistance Team Training4-40

The majority of field medical management will be due to traumatic injuries following an explosion. The pathophysiology section of this module describes the multiple mechanisms of injury that can result in blunt and penetrating injuries. It is important that those SMAT personnel responsible for delivering medical care to the casualties be up to date in the delivery of acute traumatic injuries. The detailed description of all the basic and advanced management for trauma injury management is beyond the scope of this course.

The mainstay of early traumatic injury management must focus, as it should on any patient, upon airway, breathing, and circulation status. The sustainment of vital signs should always be the primary focus of any SMAT personnel providing field medical care. Hemorrhage control measures should be commonplace in the skill set of such SMAT personnel due to the high likelihood of penetrating and blunt trauma leading to significant bleeding. Assuring adequate oxygenation when possible in the field environment is important, using supplemental oxygen and proper delivery devices. Stabilization of fractures with proper splinting is important for hemorrhage control, pain control and functional preservation of the extremities or areas involved. Providing adequate hydration in an appropriate manner (e.g., IV fluids vs. oral fluids) is an important part of managing circulation in the field setting. Again the proper amounts and seriousness of the traumatic injuries will dictate the interventions and should be based on solid-skills and knowledge in current trauma management.

It is important to note that most of the deaths in large-scale explosions are immediate and the most common injuries seen are soft tissue and foreign injuries (Thompson, 2004). In the Nairobi U.S. Embassy terrorist bombing 99% of the nearly 200 deaths occurred on the day of blast and the most common cause of death for that incident was head injury (Kalebi, 2006).

Regarding specific organ systems, some unique characteristics of injuries are recognized based on the type of explosion. For example, the lung injuries noted after terrorist bombings can show unique patterns involving both lung injury caused by the blast wave and penetrating injury caused commonly by metallic fragments or objects (Bala, 2010).

As noted previously, the mechanisms of injury for explosions cause many unique and challenging clinical presentations. Head trauma with immediate or delayed signs of altered mental status may be related to life-threatening intracranial injuries (e.g., subdural hematoma, epidural hematoma, etc.). Spinal injuries may be present and demonstrated by impairment or loss of movement or sensation. Recent literature has noted the complexities of managing burn

patients from explosions due to the other multi-system injuries and has suggested that a burn-specific plan may be important to planning for such disasters (Chim, 2007). The management of these complex traumatic and medical conditions is beyond the scope of this course. However, the awareness of these potential complicated casualties is important for all SMAT personnel.

**Table 4-8: Examples of Challenging Injuries and Illnesses after Explosions**

<ul style="list-style-type: none"><li>• Intracranial trauma, such as subdural or epidural hematomas</li><li>• Spinal cord injuries</li><li>• Burns</li><li>• Compartment syndrome</li><li>• Crush syndrome</li><li>• Traumatic asphyxia</li><li>• Toxic effects of contaminants</li></ul>
---

Close observation for acute exacerbations of underlying chronic illnesses in any casualty should always be done. The clinical management of typical chronic diseases should always be an important part of planning and logistics for the field medical care site.

### **Evacuation and Transport**

After initial stabilization of the injuries and illnesses, the focus must immediately be upon the evacuation and transportation of casualties to an appropriate trauma center or health care facility for definitive care. The likelihood of delayed onset, but nonetheless lethal, injuries is not uncommon in casualties from explosions. The delayed pulmonary, neurologic, and gastrointestinal injuries are important examples of organ systems where life-threatening decompensation may occur. Underlying penetrating or blunt injuries needing timely surgical care, complex fracture management, symptomatic anemia in need of blood products, etc. are just some of the many issues warranting timely disposition to definitive medical care.

# NUCLEAR AND RADIOLOGICAL DISASTERS



## Nuclear and Radiological Disasters





Image Courtesy: DOE

- Radiation is energy in motion in the form of particles or waves
- Radiation comes from natural sources (e.g., uranium) or generated sources (e.g., x-ray)
- Radioactive materials emit radiation (e.g., plutonium, radon)

State Medical Assistance Team Training

4-41

## Overview of Radiological and Nuclear Disasters

Disasters involving sources of radiation can vary widely in terms of source and presentation. They range from cases of nuisance contamination with little potential for harm to events involving catastrophic destruction and radiation exposure to develop a basic understanding of the mechanism of radiation injury and measures to protect responders and victims.

Basic Differences Between Nuclear and Radiological Disasters	
Nuclear Disasters	<ul style="list-style-type: none"> <li>Usually involve the detonation of a nuclear weapon</li> <li>Associated with thermonuclear blast and the subsequent dispersion of radioactive material (s)</li> </ul>
Radiological Disasters	<ul style="list-style-type: none"> <li>Involve the release or dispersion of radiological materials</li> <li>Conventional explosives may be used to disperse radioactive materials</li> </ul>

Radiological disasters can be broadly classified into two main categories: nuclear and radiological. Events that involve the actual detonation of a nuclear weapon are classified as “nuclear disasters,” whereas events that involve the release of radioactive materials, such as industrial accidents or radiological dispersal devices, are classified as “radiological disasters.”

This general classification scheme is necessary because nuclear events are likely to be exponentially larger in scale with regard to numbers of casualties and extent of property destruction and the management of burns would be a major consideration in addition to issues inherent to radiological events. The nuclear detonations in 1945 at Nagasaki and Hiroshima, Japan near the end of WWII would be examples of thermonuclear explosions with attendant radioactive contamination and destruction (Yokoro & Kamada, 2000).

In contrast, an event at a nuclear power plant that results in a release or radioactive materials into the environment would be considered to be a “radiological disaster” or event, as no thermonuclear explosion would be involved. The Three Mile Island disaster would an example of such an event (Renner, 2000). Although the two general types of disasters that involve radiation vary in cause and scope, commonalties in terminology and protective measures exist and can be of great use to responders operating in these environments.

**Table 4-9: Basic Differences Between Nuclear and Radiological Disasters**

Nuclear disasters	Usually involve the detonation of a nuclear weapon Associated with thermonuclear blast and the subsequent dispersion of radioactive material(s)
Radiological disasters	Involve the release or dispersion of radiological materials Conventional explosives may be used to disperse radioactive materials

## Key Terms and Units



### Terms



- Radiation
  - Exposure
  - Contamination
- Radioactivity
- Half-life
- Radiation Dose



Photo Courtesy: DOE

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To operate effectively in a situation that involves sources of radiation, an understanding of some key terms is crucial to convey critical information to others and to provide necessary protections.

**Radiation:** Radiation is best described as energy in motion, either in the form of a particle or a wave. Radiation can stem from natural sources (radon in basements) and from human-made sources (e.g., x-ray machines, nuclear reactor leaks).

**Radioactivity:** Radioactivity refers to the characteristic of certain materials to be able to spontaneously emit radiation. Substances that possess this characteristic are called “radioactive materials.” The radiation emission that stems from radioactive materials can be in a variety of forms.

**Half-life:** Half-life is the amount of time it takes for one half of the amount of radioactivity present in a material to decay. Half-lives can range from milliseconds to thousands of years. An understanding of half-life is important because it provides some indication about how long the radioactive material will persist in the environment. For example, radioactive Iodine -131 (a radioactive isotope of iodine) has a half-life of 8 days, whereas radioactive Cesium -137 (a radioactive isotope of cesium) has a half-life of 30 years.

**Radiation dose:** Radiation dose is the measure of the amount of energy imparted into a material, including human tissue, from a source of radiation. In the US, the unit used to measure dose is called the Rad. The international unit is the Gray (Gy). 1 Gy is equal to 100 Rad and is more commonly used in worldwide disaster response. The concept of dose is important because the biological risk associated with exposure to sources of radiation is driven by the dose delivered.



### Major Types of Radiation

Type of Radiation	Physical Characteristics	Potential for Harm to Humans
Alpha	Particles, localized threat	Potential for ingestion and inhalation causing "internal contamination"
Beta	Particles, can travel some distance	Some penetration of human body
Gamma	Wave form of radiation	Easily penetrates the human body

State Medical Assistance Team Training 4-44

There are three predominant types of radiation that emergency responders are likely to encounter:

**Alpha radiation:** This type of radiation is a particulate emission from radioactive materials. Alpha radiation can pose a serious risk to human health. However, alpha radiation cannot travel very far. In addition, a source of radioactive material that emits an alpha particle external to the human body is not a significant radiological risk because the radiation emission cannot usually penetrate the outer layer of a person's skin. However, if the radioactive material is ingested or inhaled, the alpha particle can be extremely harmful (internal contamination) to biological organisms, and is capable of delivering significant radiation exposure to a victim.

**Beta radiation:** This type of radiation is also particulate in nature. However, in comparison to an alpha particle, it is a much smaller particle. Beta emissions can travel greater distances, much further than alpha particles, and with sufficient energy. Beta radiation can penetrate the dead layer of skin when external to the human body.

**Gamma radiation:** This type of radiation is an energy-wave form of radiation that can travel great distances, and will pass through the human body (such as Cs 137).

**Table 4-10: Major Types of Radiation Emission**

<b>Type of Radiation</b>	<b>Physical Characteristics</b>	<b>Potential for Harm to Humans</b>
Alpha	Particles, localized threat	Potential for ingestion and "internal contamination"
Beta	Particles, can travel some distance	Some penetration of human body
Gamma	Wave form of radiation	Easily penetrates the human body

## Nuclear and Radiological Injuries and Exposures



### Injuries and Exposures



- Radiological threats to human health
  - Improper handling or disposal of radiological materials
  - Unintentional releases
  - Radiological Exposure Device (RED)
  - Radiological Dispersion Device (RDD)

State Medical Assistance Team Training4-45

Within the two main categories of disaster threats that involve sources of radiation, a variety of configurations can exist. This information helps emergency responders identify the ways in which victims may be receiving exposure and steps to protect healthcare workers and victims.

### Nuclear Threats to Human Health

The detonation of nuclear devices, or an improvised nuclear device (IND), would result in the release of energy in the form of blast and fireball, along with a variety of radionuclides in gaseous and particulate forms. Depending on the size of the device and the distance from the point of detonation, casualties could receive injuries from blast effects, propelled debris, thermal heat, and radiation exposure. Survivors may also incorporate radioactive contaminants through injection (via debris), inhalation, or ingestion. While the scenarios of nuclear destructions are quite serious and could affect millions of citizens, they are considered less likely than other radiological threats associated with methods to disperse radioactivity into the environment. Following a thermonuclear detonation, major concerns include injuries and radioactive contamination throughout a wide geographic area. Radioactive contamination into the atmosphere “fallout” may disperse and be detected on other continents.

### Radiological Threats to Human Health

Radiological materials in industry and medicine are part of modern life. These are highly controlled and measurable. Most radiological exposures occur from improper handling or disposal of radiological materials.

**Radiological Exposure Device (RED):** The simplest form of radiological exposure source is called a “radiological exposure device” or RED. This could be in the form of a radioactive source left in a location (intentionally or unintentionally). In this instance people are exposed to radiation but not physically contaminated.

**Radiological Dispersion Device (RDD):** If radiation sources were dispersed directly in some deliberate way in an explosion or a sprayer, it would be termed a “radiological dispersal device” or RDD. In these cases, there is a real possibility for human

contamination of skin and possible incorporation of the radioactive contaminants into the body via ingestion or entrance through wounds with grave consequences to human health.

### ***Human Health Effects from Acute Radiation Exposure***

The health effects of radiation exposure can be broadly categorized into effects that are known to occur at a certain level or radiation dose and are likely to have occurred based on health effects that are present (e.g., burns, low white blood cell counts, seizures).

In North Carolina there is a volunteer organization named The Team of Radiological Emergency Volunteers (TOREV) co-sponsored by the North Carolina Health Physics Society in partnership with the North Carolina Radiation Protection Section which is a part of the North Carolina Division of Health Service Regulation.

TOREV members will support North Carolina in the event of a radiological emergency such as an event at a nuclear power plant or detonation of a radiological dispersal device. The key activities of the TOREV are:

- Using meters to check radiation levels
- Surveying individuals for radiological contamination
- Conduct routine monitoring using gamma spectroscopy and liquid scintillation
- Participate in the logistical planning and processing in a radiological event
- Participation in annual regional radiological exercises

**Table 4-11: Acute Radiation Syndrome (ARS) Onset Times**

	ARS degree and the approximate dose of acute WBE (Gy)				
Symptoms and Medical Response	Mild (1–2 Gy)	Moderate (2–4 Gy)	Severe (4–6 Gy)	Very Severe (6–8 Gy)	Lethal (>8 Gy)*
Vomiting Onset	2h or more	1-2 hr	Before 1 hr	Less than 30 min	Less than 10 min
Diarrhea Onset	None —	None —	Mild 3-8 hr	Heavy 1-3 hr	Heavy Within minutes
Headache Onset	Slight —	Mild —	Moderate 4-24 h	Severe 3-4 h	Severe 1-2 h
Consciousness	Unaffected	Unaffected	Unaffected	May be altered	Unconsciousness
Body Temperature Onset	Normal —	Increased 1-3 h	Fever 1-2 h	High Fever <1 h	High Fever <1 h
Medical Response	Outpatient Observation	Observation in general hospital	Treatment in specialized hospital	Treatment in specialized hospital	Palliative treatment
*With appropriate supportive therapy individuals may survive whole body doses as high as 12 Gy					

Adopted from International Atomic Energy Agency. (1998). *Diagnosis and Treatment of Radiation Injuries, Safety Report Series No. 2*. Vienna, Austria: International Atomic Energy Agency.

## Medical Care Priorities for Radiation Patients



### Medical Care Priorities



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**Basic Medical Care Priorities for Radiation Victims\***

- Treat life threatening injuries
- Decontaminate (if necessary)
- Estimate radiation exposure (dose)
- Counseling and provision for long term care

\*(Koenig, et al., 2005)

State Medical Assistance Team Training
4-46

Regardless of the configuration of the exposure, responders should always remember that in disaster situations involving sources of radiation, life-threatening injuries and illness are the top priority. Any associated radiological concerns can be addressed after this primary objective is addressed. In some cases, victims may have undergone decontamination at the site of the event. However, experience dictates that self-transport can become an issue, so SMAT teams should consider site access control issues, and ensure that there is a single point of entry when victims (and concerned citizens) can be received and sorted appropriately. Again, it cannot be overemphasized that treatment of life saving issues is the top priority, even in disaster situations involving radioactive materials. Radiological assessments and decontamination should only occur after the victim's primary life-saving needs are addressed.

If, after the removal of the outer layer of clothing, contamination is still detected on an individual, then showering with warm soap and water is warranted. Responders should pay special attention to modesty issues and the proper routing and possible collection of runoff. Means should also be provided for the safe retention of key personal belongings such as wallets, car keys, purse contents, etc. Clear plastic bags with labels can serve well in this regard.

**Table 4-12: Basic Medical Care Priorities for Radiation Patients (Koenig, et al., 2005)**

<ul style="list-style-type: none"> <li>• Treat life-threatening injuries</li> <li>• Decontaminate patients</li> <li>• Estimate radiation exposure (dose)</li> <li>• First Aid and Emergent Stabilization</li> <li>• Prevent external contamination from becoming internal contamination</li> <li>• Patient counseling and provision for long term care</li> </ul>
---

Individuals involved in nuclear events may exhibit burns from either thermal sources or radiological sources. In a disaster response event, the cause of the burns may be indecipherable, but that should not impact critical care decisions. Historically, an adage existed that suggested that victims with burns after a nuclear event were not likely to survive given the radiation doses likely delivered to produce such effects. But this adage is misleading since the cause of the burn could have been thermal, and hence is not indicative of an underlying possibly lethal dose of radiation. Therefore, in nuclear events, the presence of burns should not be used as a sole indicator of radiation dose.

## Specialized Medical Treatment for Radiation Victims



### Specialized Medical Treatment



- No medicine for external exposure
- Treatments to reduce or remove internal radiation contamination
- Treatments to increase white blood cells and fight infection during recovery
- Measures to prevent infection

State Medical Assistance Team Training4-47

There are currently no FDA-approved treatments for victims of external radiation exposure events. Given this, the primary focus is on the symptoms of radiation exposure (nausea, vomiting, diarrhea, and fever) and minimizing the chance of infection due to reductions in lymphocyte count. Neutropenia is a condition that is manifested by an abnormal reduction in the number of white blood cells, which can elevate the risk of infection.

**Treatments to Increase White Blood Cells.** To address the elevated infection risk, cytokines such as granulocyte colony-stimulating factor (G-CSF) and granulocyte macrophage colony-stimulating factor (GM-CSF) are maintained in the Strategic National Stockpile (SNS). Their use would require the issuance of an emergency authorization from the US Department of Health and Human Services and the US Food and Drug Administration (FDA).

**Common Treatments to Reduce or Remove Internal Radiation Contamination.** If victims are determined to have uptakes of radioactive materials, the identification of the radionuclides involved is critical for effective treatment to ensue. There are three predominant treatments that responders should be aware of because in deployment situations they may be involved with large-scale distribution or issuance of these materials.

**Potassium iodide:** Potassium iodide (KI) is used to block the thyroid gland so that if radioactive iodines are encountered, they are not retained by the thyroid. As a protective agent, it is most efficiently used when a release is about to occur.

**Prussian blue:** Prussian blue is a chelating (binding) agent that can be used to accelerate the removal of radioactive Cs-137 from the body. This treatment is important because Cs-137 possesses a 30-year half-life and can accumulate in the muscle.

**Calcium or Zinc Diethylene-triaminepentaacetic acid (DTPA):** DTPA is administered intravenously or by nebulizer in cases of uptake of plutonium, americium or curium. As with Prussian blue, treatment regimens should be accompanied by evaluation of clearance through bioassay.

In summary, many states and federal agencies maintain radiological health programs, often housed within the departments of health. Larger cities also maintain radiological service units.

Responders should be aware of some key national resources that can serve as excellent sources of additional information:

- The Radiation Energy Assistance Center/Training Site (REAC/TS)
- The Centers for Disease Control and Prevention (CDC)
- The Armed Forces Radiobiological Research Institute (AFRRI)
- The Health Physics Society (HPS)

The web pages for these organizations are listed in the reference section of this module.

## Radiation Exposure Assessments



### Exposure Assessments



- Radiation exposure assessments
  - Monitors/measuring devices
  - Clinical estimate of radiation exposure



Photo Courtesy: FEMA

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Ideally, responders would have some radiation dose measurement information from radiation monitors or measuring devices that might aid in estimating the radiation dose received by victims. But this may not always be the case, so responders can leverage their knowledge of known biological responses to estimate the dose delivered. In most cases, emergency responders should be working with a health physicist with experience in radiation exposures and human monitoring. A few common techniques that are used to assess acute radiation exposures in patients are listed below.

### Clinical Measures of Radiation Exposure

**Laboratory Measures:** Because radiation dose can affect the blood system, responders should expect to be involved in a set of serial blood draws when the amount of radiation dose delivered was not quantified in some way. By measuring the depletion of lymphocytes in the blood over a series of draws, perhaps over a 12 to 24 hour period, the plotted declination provides a semi-quantitative estimate of the dose delivered. For example, an absolute lymphocyte count of less than 1,000 at 24 hours post-exposure indicates a dose of about 2 to 6 Sv (200 to 600 rem), which is a serious level of exposure with an expected increase in mortality in exposed populations.

**Clinical Measures:** Another means of estimated radiation dose is recording information provided by the victim on his or her estimated time or onset of a known set of symptoms. Reported time to onset for nausea and vomiting provides a reasonable estimate of the dose delivered. Per Table 4-12: Acute Radiation Syndrome Onset Times, clinical signs and symptoms at certain points in time may provide estimates of the severity of acute radiation exposures.

### Monitoring of Radiation Contamination

After addressing any necessary life-saving issues, victims can be screened using a Geiger detector for the presence of radiological contamination. In cases where a victim arrives wearing normal clothes and is found to be contaminated (typically defined as a level two times the

background level measured by the detector in a non-radiological area), the simplest form of decontamination is the removal of the outer layer of clothing. Experience indicates that the removal of the outer clothing can reduce contamination levels up to 80%.

Because radiation cannot be detected by any of our normal senses, responders must rely on radiation detectors to indicate the presence of radiation. It is therefore crucial that responders gain some experience with their operation before deployment.

### **Special Considerations for the Detection of Alpha Radiation**

The typical radiation detector used in victim screening activities is a Geiger Mueller detector, commonly referred to as a “Geiger counter.” These devices are very useful for detecting the presence of beta and gamma radiation emissions, but they cannot effectively monitor for the presence of alpha radiation. The safety officer, through his or her support with the team health physicists, should be able to assist in this regard.

## Protecting Health Care Personnel from Radiation Exposures



### Protecting Personnel



- Good hygiene practices and PPE
  - Limit secondary contamination
  - Limit exposures
- May be a role for a radiation safety officer or health physicist
- Monitor radiation exposure in staff

State Medical Assistance Team Training4-49

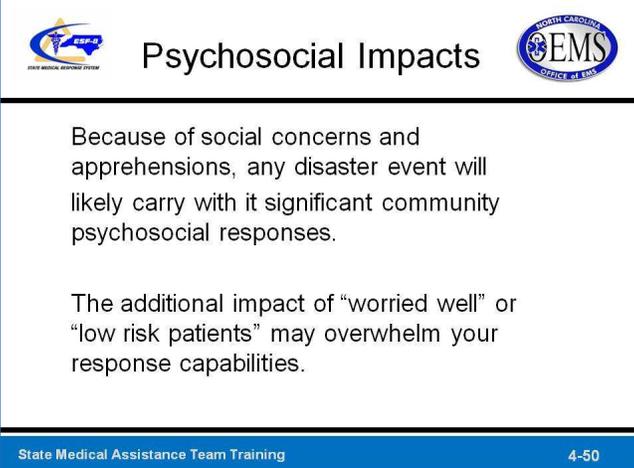
In situations involving possible radiation exposure from external sources only, responder personal protection would center largely on adherence to good hygienic practices (hand washing) and perhaps the use of gloves when performing radiological monitoring of individuals to ensure that no contamination is involved.

In cases where radioactive contamination is involved, the responders who are receiving victims can be afforded protection through the use of a level B protective equipment ensemble, consisting of a full body protective suit (such as Tyvek), booties, gloves, head cover, and respiratory protection. Depending on the extent of the contamination encountered, respiratory protection may take the form of a half-face or a full-face respirator with cartridges appropriate for radionuclides. If these are in short supply, something akin to an N-95 particulate respirator may have to be sufficient.

In cases where radioactive contamination is involved, the responders who are receiving victims can be afforded protection through the use of a level B protective equipment ensemble, consisting of a full body protective suit (such as Tyvek), booties, gloves, head cover, and respiratory protection. Depending on the extent of the contamination encountered, respiratory protection may take the form of a half-face or a full-face respirator with cartridges appropriate for radionuclides. If these are in short supply, something akin to an N-95 particulate respirator may be helpful. In general SMAT workers would not be locating their operation so close to a radiation source that simple PPE would not suffice.

Responders should employ methods to reduce their radiation doses where possible. By taking advantage of measures such as limiting the exposure and shielding responders can reduce their exposure to radiation. Likewise, by placing increased distance between the source of radiation and the responder, doses are reduced exponentially. The site safety officer, with cooperation of radiation safety specialists known as “health physicists” are responsible for assisting responders in monitoring personal radiation dose when possible and employing simple techniques for reducing overall personal exposures.

## Psychosocial Impacts



The slide features a blue header with the title "Psychosocial Impacts" centered. On the left is the logo for the North Carolina Emergency Medical Services (NCEM) with the text "FIRST MEDICAL RESPONSE SYSTEM" below it. On the right is the logo for the North Carolina Office of EMS. The main content area is white with two paragraphs of text. The footer is a blue bar with the text "State Medical Assistance Team Training" on the left and "4-50" on the right.

Psychosocial Impacts

Because of social concerns and apprehensions, any disaster event will likely carry with it significant community psychosocial responses.

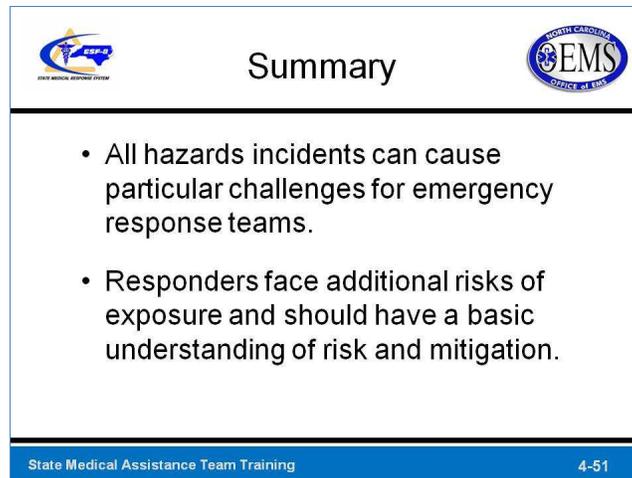
The additional impact of “worried well” or “low risk patients” may overwhelm your response capabilities.

State Medical Assistance Team Training 4-50

Because of particular social concerns and apprehensions about radiation, any disaster event that involves sources of radiation will likely carry with it significant community psychosocial responses.

The additional impact of “worried well” or “low risk patients” may overwhelm your response capabilities.

## SUMMARY



The slide features a blue header with the text "Summary" centered. On the left is the "EMR-2" logo with the tagline "EMR-2 MEDICAL ASSISTANCE SYSTEM". On the right is the "NORTH CAROLINA EMS OFFICE OF EMS" logo. Below the header, two bullet points are listed. At the bottom, a blue footer contains the text "State Medical Assistance Team Training" on the left and "4-51" on the right.

- All hazards incidents can cause particular challenges for emergency response teams.
- Responders face additional risks of exposure and should have a basic understanding of risk and mitigation.

Disasters resulting from intentional or unintentional releases of chemical, biological, radiological, nuclear, or explosive materials can cause particular challenges for emergency response teams. You will face additional risks of exposure to your team and victims. It is essential that you have a basic understanding of risk and mitigation if you are going to be effective.

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## RESOURCES

Medical Management of Radiological Casualties (2<sup>nd</sup> Edition) - <http://www.afri.usuhs.mil>

Radiation Emergencies website - <http://www.bt/cdc.gov/radiation>

Bioterrorism and Drug Preparedness -

<http://www.fda.gov/Drugs/EmergencyPreparedness/BioterrorismandDrugPreparedness/default.htm>

Health Physics Society - <http://www.hps.org>

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# MODULE 5: COMMUNICATIONS

## Training Curriculum

Length: (0.5) hour class and (0.75) hours hands-on activity

Audience: North Carolina State Medical Assistance Team personnel

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## Prerequisites

	<h3>Prerequisites</h3>	
<p>Required:</p> <ul style="list-style-type: none"><li>• On-line pre-module on the VIPER Medical Network (VMN) (VMN 101 &amp; Medical Portable sections) available at <a href="http://www.emspic.org/viper/">http://www.emspic.org/viper/</a></li></ul>		
<p>Recommended:</p> <ul style="list-style-type: none"><li>• Federal Emergency Management Agency (FEMA) Independent Study course 704 available at <a href="http://training.fema.gov/IS/crslist.asp">http://training.fema.gov/IS/crslist.asp</a></li><li>• North Carolina Medical Communications Network available at <a href="http://www.emspic.org/ncmcn/">http://www.emspic.org/ncmcn/</a></li></ul>		
State Medical Assistance Team Training		5-2

### Required:

- On-line pre-module on the VIPER Medical Network (VMN) (VMN 101 & Medical Portable sections) available at <http://smrs.emspic.org/viper/>

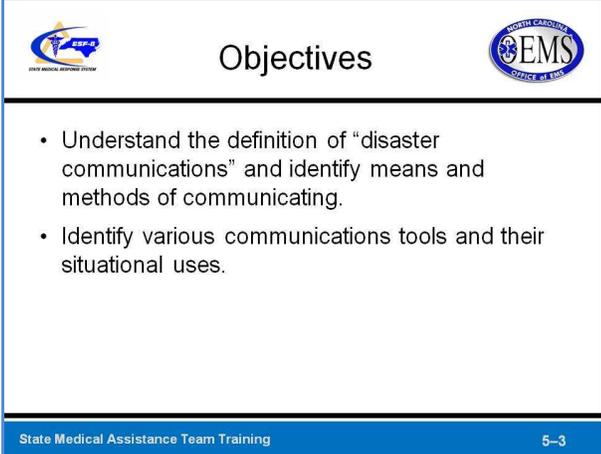
### Recommended:

- Federal Emergency Management Agency (FEMA) Independent Study course 704 available at <http://training.fema.gov/IS/crslist.asp>
- North Carolina Medical Communications Network available at <http://www.emspic.org/ncmcn/>

## Module Objective

Understand the definition of “disaster communications” and identify means and methods of communicating within the North Carolina State Medical Response System.

## Objectives



The slide is titled "Objectives" and features two logos at the top: the NCSMRS logo on the left and the EMS logo on the right. The main content consists of two bullet points. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "5-3" on the right.

- Understand the definition of “disaster communications” and identify means and methods of communicating.
- Identify various communications tools and their situational uses.

- Understand the definition of *disaster communications* and identify methods of communicating.
- Identify various communications tools and their situational uses.

	<h2>Objectives</h2>	
<ul style="list-style-type: none"><li>• Discuss team specific communications devices and when each would be used in an event.</li><li>• Demonstrate ability to place a call via an SMAT radio and use this system to communicate with other responders through hands-on activity.</li><li>• Demonstrate proper language for disaster communications through hands-on activity.</li></ul>		
State Medical Assistance Team Training		5-4

- Discuss team specific communication devices and when each would be used in an event.
- Demonstrate ability to place a call via an SMAT radio and use this system to communicate with other responders through hands-on activity.
- Demonstrate proper language for disaster communications through hands-on activity.

## Safety Note



### Safety Note



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- Radio Frequency (RF) energy dangers
  - serious injury can occur from some exposures
  - definitely can occur with direct contact with any mobile, portable (radio in a box), or fixed location antenna.

State Medical Assistance Team Training5-5

In areas where radio and satellite communications are in use, remain acutely aware of Radio Frequency (RF) Energy Dangers. Serious injury can occur from exposure with direct contact with any Mobile, Pack Radio (radio in a box) or Fixed Location Antenna.

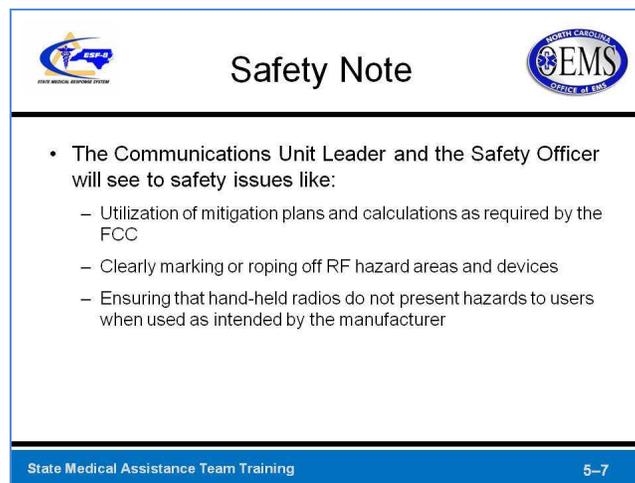
 **Safety Note** 

 **Antenna Hazards** 

 Contact with or exposure to antennas may result in burns or internal injuries

State Medical Assistance Team Training 5-6

Direct contact with fixed or mobile antennas when they are transmitting RF energy may result in severe burns (2<sup>nd</sup> or 3<sup>rd</sup> degree). These antennas also act as lightning rods. Portable satellite antennas such as the one pictured here, may cause direct contact injury or internal injuries by walking closely in front of them while they are transmitting. These are very high gain antennas. At the frequencies they operate, walking in front of one is like walking into a microwave oven on high power.



The slide is titled "Safety Note" and features two logos: the State Medical Assistance Team (SMAT) logo on the left and the North Carolina EMS Office of EMS logo on the right. The main content is a bulleted list of safety issues. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "5-7" on the right.

**Safety Note**

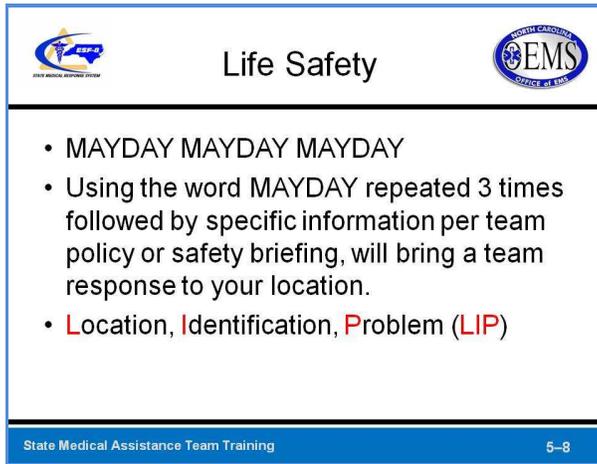
- The Communications Unit Leader and the Safety Officer will see to safety issues like:
  - Utilization of mitigation plans and calculations as required by the FCC
  - Clearly marking or roping off RF hazard areas and devices
  - Ensuring that hand-held radios do not present hazards to users when used as intended by the manufacturer

State Medical Assistance Team Training 5-7

The Communications Unit Leader and the Safety Officer will see to safety issues like:

- Utilization of mitigation plans and calculations as required by the FCC
- Clearly marking or roping off RF hazard areas and devices
- Ensuring that hand-held radios do not present hazards to users when used as intended by the manufacturer

The Communications Unit Leader and the Safety Officer of any event or deployment must initiate mitigation plans and calculations as required by the FCC. RF hazard areas and devices should be clearly marked or roped off from access by passersby for safety reasons. Handheld radios do not present hazards to users when used as intended by the manufacturer.



The slide is titled "Life Safety" and features two logos at the top: the NCEM logo on the left and the NCEM EMS logo on the right. The main content is a bulleted list of protocols for MAYDAY calls. The bottom of the slide has a blue footer with the text "State Medical Assistance Team Training" and "5-8".

- MAYDAY MAYDAY MAYDAY
- Using the word MAYDAY repeated 3 times followed by specific information per team policy or safety briefing, will bring a team response to your location.
- Location, Identification, Problem (LIP)

MAYDAY as defined in Webster's Dictionary: an international radio-telephone signal word used as a distress call.

In any life threatening or serious injury potential situations, emergency calls on radio systems have automatic highest priority.

The MAYDAY call must include:

Location, Identification and Problem (LIP)

MAYDAY 3 times, followed by your location, identification (name), and problem will initiate a response by the team. Your location is a critical piece of information. If you do not state the location, the search team will not know where to start looking. Please be sure to review any policy regarding life safety that your team may have and pay close attention to all safety briefings during an event or deployment.

Generally 3 blasts of an Air Horn or Siren is the universal sign for evacuation. The rally area for accountability should be covered in the Operational period safety briefing.

## STATE MEDICAL RESPONSE SYSTEM DISASTER COMMUNICATIONS



The slide features a blue border and contains the following elements:

- Top Left:** SMRS logo (State Medical Response System)
- Top Center:** Title "Disaster Communications"
- Top Right:** EMS logo (North Carolina EMS)
- Center:** Definition of disaster communications: "Disaster communications is the means and methods of transmitting and receiving information and images vital to the successful management of an event where the communications infrastructure has been impaired or lost\*."
- Bottom Center:** Attribution: "(Courtesy of FEMA DEC; Disaster Emergency Communications)"
- Bottom Left:** "State Medical Assistance Team Training"
- Bottom Right:** "5-9"

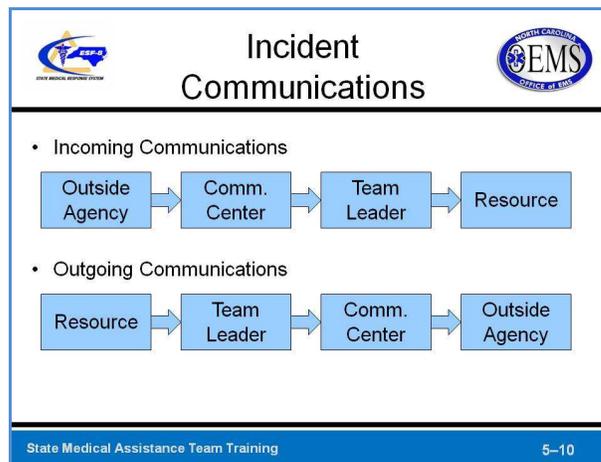
*Disaster communications* is the means and methods of transmitting and receiving information and images vital to the successful management of an event where the communications infrastructure has been impaired or lost. (Courtesy of FEMA DEC; Disaster Emergency Communications Division)

You may see many types of radio and satellite communications being used during a deployment, including Amateur Radio, Military Affiliated Radio Systems Networks, Very Small Aperture Terminal (VSAT is a two-way satellite ground station) & Mobile Satellite (MSAT) Telecommunications.

These are adjunct services that may enhance operations but are not the **primary** radio communications systems for the SMRS. By whom, when, and how these methods are used is determined by Command Staff and coordinated with the Communications Unit Leader, who has responsibility for managing the frequency spectrum for the event.

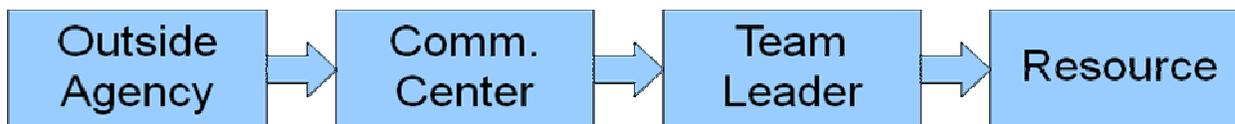
Although they are used frequently in disaster communication, most of us today are familiar with common office communications methods such as fax, phone systems, instant messaging, and Internet. For the purposes of this course we will focus on radio communications and the types of equipment and methods primarily used in the State Medical Response System and the equipment you will use during deployment.

## Incident Communications



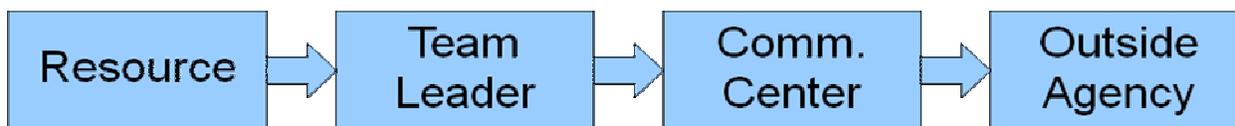
There is a specific flow of information into and out of the deployment site.

**Incoming** communications follow this flow:



1. An outside agency contacts the team via radio/SAT phone/Web EOC/ etc.
2. The information is received at the Incident Communications Center.
3. The communications center sends the information or request to the appropriate team leader via radio or general message.
4. The team leader reviews the information and forwards it to the appropriate resource.

**Outgoing** communications follow this flow:



1. Information or a request is given to a team leader via radio or general message.
2. The team leader reviews the request and passes to the communications center via radio or general message.
3. The Incident Communications Center uses the appropriate method to transmit the request or information.
4. The outside contact confirms receipt of the information or request.

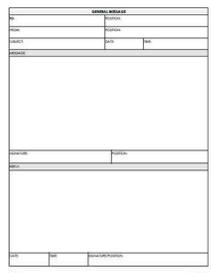
## General Message ICS Form 213



### ICS Form 213



- The General Message Form (ICS 213) is the most frequent method of formal communication
- Message delivery person to person
- Documentation of Message exchanges



State Medical Assistance Team Training5-11

The ICS Form 213, General Message Form, is the most frequent method of formal communication. It is easily used for person to person communication by Messenger delivery. It provides documentation of message exchanges.

<b>GENERAL MESSAGE</b>		
TO:		POSITION:
FROM:		POSITION:
SUBJECT:	DATE:	TIME:
MESSAGE:		
SIGNATURE:		POSITION:
REPLY:		
DATE:	TIME:	SIGNATURE/POSITION:

**Figure 5-1: ICS Form 213**

## Cell Phone/Social Media Use Awareness

	<b>Cell Phone/Social Media</b>	
<ul style="list-style-type: none"><li>• Can create hazards and have an adverse impact on operations</li><li>• Personnel should be aware of their agency policies regarding use</li><li>• Use of these devices may be restricted by Command Staff</li></ul>		
State Medical Assistance Team Training		
5-12		

Cell Phones and Social Media can create hazards and have an adverse impact on operations. Use of these may divert a person's attention in the operational area from tasks at hand and cause accidents or serious injury to occur. Personnel should be aware of their agency policies regarding their use.

Use of these devices may be restricted by Command Staff

## OPERATIONAL COMMUNICATIONS

	<b>Operational Communications</b>	
<ul style="list-style-type: none"><li>• Conducted by UHF Handheld pre-programmed radios</li><li>• Have the frequencies and access tones programmed by channel</li><li>• Used for internal base of operation's (boo) traffic</li><li>• Keeps traffic off the main interoperability Systems</li></ul>		
State Medical Assistance Team Training		5-13

Most operational communications in and around the deployment area will be conducted by means of UHF pre-programmed radios. These are the common walkie-talkie type radios that have the frequencies and access tones programmed by channel. These are used in operational areas for internal and maintenance traffic. Use of these radios for these purposes keeps traffic off the main Interoperability Systems.



## Operational Communications



- Communications Unit Leader will issue the radio to the responder
- Channel assignments will be published in the Incident Radio Communications Plan (ICS Form 205)

State Medical Assistance Team Training5-14

Responders will be assigned the appropriate channel by the Communications Unit Leader for the deployment and published in the Incident Radio Communications Plan (ICS Form 205).

## UHF Radios

Two types of UHF/VHF radios are commonly available within the SMRS for operational communications:



### UHF Radio





Most widely used is the 16 channel pre-programmed SMAT hand-held UHF.

State Medical Assistance Team Training5-15

The most widely used is the 16 channel pre-programmed hand-held UHF. The first 4 channels are SMAT Channels and beginning with Channel 16 and working back 15, 14, 13, etc are corresponding Med 10 channels with pre-programmed (letter designated in the dtmfref) CTCSS Codes which provide for hospital contact by area.



**Figure 5-2: Handheld UHF Radio**

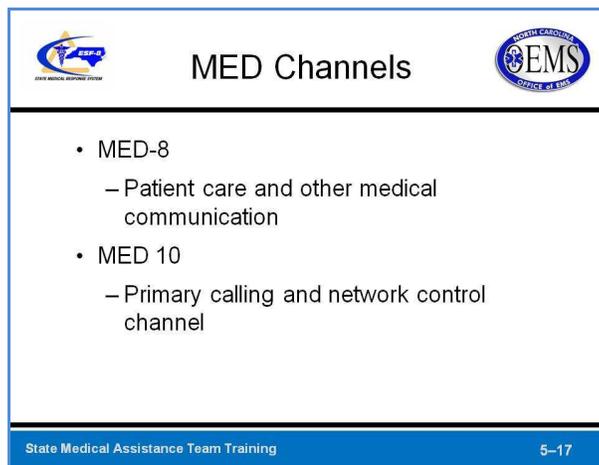
## UHF/VHF Dual Control Radio

	<h3>UHF/VHF Dual-Control Radio</h3>	
<p>Provides access to the MED-8 and MED-10 channels as well as individual VHF or UHF channels available in all 100 counties in North Carolina.</p>		 
State Medical Assistance Team Training		5-16

The “Pack Radio” presently has access to the Med-8 and Med-10 channels available in all 100 counties in the state.



**Figure 5-3: UHF/VHF Dual-control Radio**



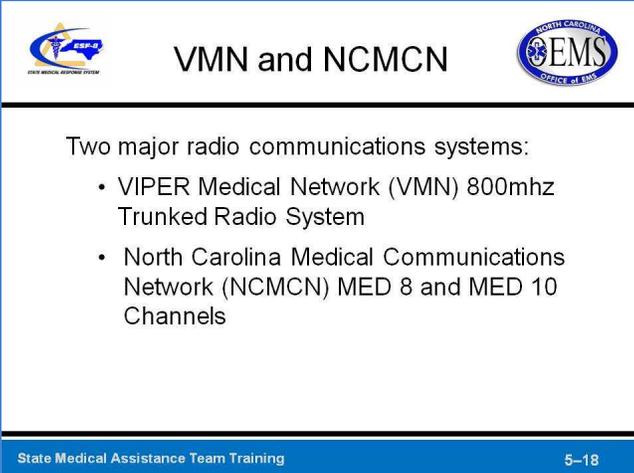
The slide is titled "MED Channels" and is framed by a blue border. In the top left corner is the logo for the State Medical Assistance Team, featuring a stylized figure and the text "STATE MEDICAL ASSISTANCE TEAM". In the top right corner is the logo for the North Carolina Department of Health and Human Services, featuring the letters "EMS" in a circle with "NORTH CAROLINA" above and "DEPARTMENT OF HEALTH AND HUMAN SERVICES" below. The main content of the slide is a bulleted list:

- MED-8
  - Patient care and other medical communication
- MED 10
  - Primary calling and network control channel

At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "5-17" on the right.

MED-8 is used for patient care and other medical communication to a receiving hospital or other medical facility. MED-10 is the primary calling channel between units, hospitals and other medical facilities. It is also the network control channel by which control operators may manage the network.

## VMN and NCMCN



The slide features a blue border and a white background. At the top left is the VIPER logo, and at the top right is the North Carolina EMS logo. The title 'VMN and NCMCN' is centered at the top. Below the title, the text reads: 'Two major radio communications systems:' followed by a bulleted list. At the bottom, a blue footer bar contains the text 'State Medical Assistance Team Training' on the left and '5-18' on the right.

VMN and NCMCN

Two major radio communications systems:

- VIPER Medical Network (VMN) 800mhz Trunked Radio System
- North Carolina Medical Communications Network (NCMCN) MED 8 and MED 10 Channels

State Medical Assistance Team Training 5-18

In the State Medical Response System there are two Major radio communications systems:

1. North Carolina VIPER Medical Network (VMN) using the VIPER 800mhz Trunking Radio System.
2. North Carolina Medical Communications Network (NCMCN) of which we use primarily the MED 8 and MED 10 Channels.

	<h2>VMN and NCMCN</h2>	
<p>During a deployment</p> <ul style="list-style-type: none"><li>• Will be governed by the “Incident Radio Communications Plan” (ICS Form 205)</li><li>• Issued for the event by a Communications Unit Leader</li></ul>		
State Medical Assistance Team Training		5-19

The use of these systems during a deployment will be governed by the “Incident Radio Communications Plan” (ICS Form 205) issued for the event by a Communications Unit Leader.

## VIPER Medical Network (VMN) System

	VMN		
			VIPER radios
State Medical Assistance Team Training			5-20



***VIPER Medical Network Radios***

## Overview of VMN

	<b>VMN</b>	
<p>For interoperability, every radio that functions as part of the VMN must have a common group of channels with standard channel names.</p> <p>The VMN radios must be equipped with a series of "Talk Groups," which are similar to channels in a conventional or "legacy" radio.</p>		
State Medical Assistance Team Training		5-21

For interoperability, every radio that functions as part of the VMN must have a common group of channels with standard channel names. The VMN radios must be equipped with a series of "Talk Groups," which are similar to channels in a conventional or "legacy" radio.

The standardized Talk Groups for the VMN radios are set up in seven classifications:

1. Statewide Medical Talk Groups
2. Statewide Calling Talk Groups
3. Statewide Event Talk Groups
4. State Highway SHP Common and Mutual Aid Talk Groups
5. North Carolina Emergency Management Approved Talk Groups
6. Statewide Roamer Talk Groups
7. Statewide General Pool Talk Groups

## VMN Talk Groups



### VMN Talk Groups



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- The VIPER Medical Network provides a talk group “channel” for each hospital in the state thus enabling VIPER Medical Network users of the VIPER Radio System the ability to contact hospitals for medical or patient care communication.

State Medical Assistance Team Training
5-22

The Viper Medical Network provides a talk group “channel” for each hospital in the state thus enabling Viper Medical Network users of the VIPER Radio System the ability to contact hospitals for medical or patient care communication.

Within the NCSMRS function there are presently eight channels designated for Rescue, EMS and SMAT use located in the VML talk group.

These are found in the VML Zone and are listed as follows:

Rescue, EMS, and SMAT Home – VML 79501	SMRS Transportation – VML 79701
SMRS Command – VML 79600	SMRS Ops 1 – VML 79800
SMRS Logistics – VML 79601	SMRS Ops 2 – VML 79801
SMRS Staging – VML 79700	Air Medical Dispatchers – VML 79805

## Additional Information

**Additional Information**

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For those interested in additional information and course offerings about radio communications contact:

NC Department of Crime Control and Public Safety, Division of Emergency Management, Training and Exercise Registration Management System.

<http://terms.ncem.org/TRS/>

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State Medical Assistance Team Training 5-23

For additional information and course offerings in these areas, contact the NC Department of Crime Control and Public Safety, Division of Emergency Management, Training and Exercise Registration Management System at <http://terms.ncem.org/TRS/>

## PHONETIC ALPHABET

Phonetic Alphabet			
A-Alpha	H-Hotel	O-Oscar	V-Victor
B-Bravo	I-India	P-Papa	W-Whiskey
C-Charlie	J-Juliet	Q-Quebec	X-X-ray
D-Delta	K-Kilo	R-Romeo	Y-Yankee
E-Echo	L-Lima	S-Sierra	Z-Zulu
F-Foxtrot	M-Mike	T-Tango	
G-Golf	N-November	U-Uniform	

To clarify words in communications sometimes they need to be spelled. The use of a phonetic alphabet has been adopted as the accepted method of spelling words to insure accuracy. When spelling a difficult word, using a phonetic alphabet helps eliminate confusion as some letters may sound the same to a person receiving a message. Most radio operators have adopted the military phonetic alphabet as the standard:

A - Alpha	I - India	R - Romeo
B - Bravo	J - Juliet	S - Sierra
C - Charlie	K - Kilo	T - Tango
D - Delta	L - Lima	U - Uniform
E - Echo	M - Mike	V - Victor
F - Foxtrot	N - November	W - Whiskey
G - Golf	O - Oscar	X - X-Ray
H - Hotel	P - Papa	Y - Yankee
	Q - Quebec	Z - Zulu

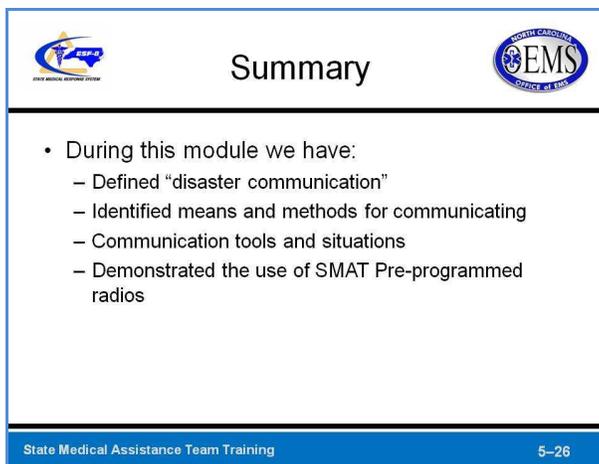
## Rules for Communications

	<h3>Rules</h3>	
<ul style="list-style-type: none"><li>• Use plain language<ul style="list-style-type: none"><li>– Eliminates confusion between disciplines</li><li>– Complies with National Incident Management System (NIMS) concept</li></ul></li><li>• Be courteous<ul style="list-style-type: none"><li>– Listen before you transmit</li><li>– Avoid interrupting another conversation</li><li>– Press PTT to inquire about channel use</li></ul></li></ul>		
State Medical Assistance Team Training		5-25

Communications should be done in plain language. This eliminates confusion between individuals that may come from widely different operational groups or backgrounds and is compliant with the NIMS concept.

Be courteous. Listen before you transmit to avoid interrupting another conversation. If in doubt press the PTT (push to talk button) and ask if the channel/frequency is in use. If it is being used someone will let you know. If not then you may proceed with your call.

## SUMMARY



Summary

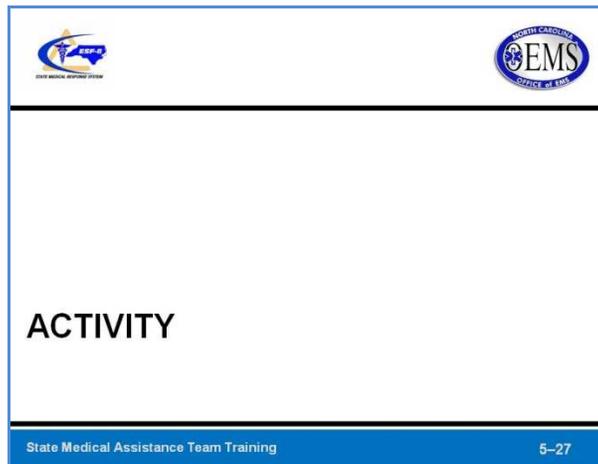
- During this module we have:
  - Defined “disaster communication”
  - Identified means and methods for communicating
  - Communication tools and situations
  - Demonstrated the use of SMAT Pre-programmed radios

State Medical Assistance Team Training 5-26

During this module we have:

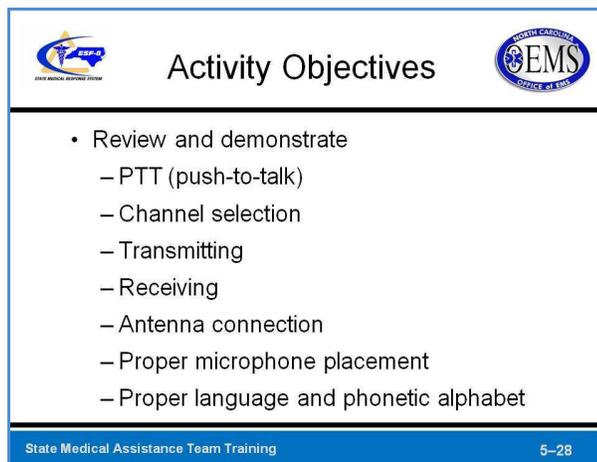
- Defined disaster communications.
- Identified means and methods of communicating commonly used within the NC SMRS during an event or deployment.
- We have explored various communications tools and their situational uses, including proper language used during a disaster.
- We have demonstrated proper use and understanding of the SMAT Communications systems and effectively communicated to other users.

## ACTIVITY: EFFECTIVE RADIO COMMUNICATIONS



**Purpose:** To permit participants to practice the use of NCMCN and VIPER radios.

**Objectives:**



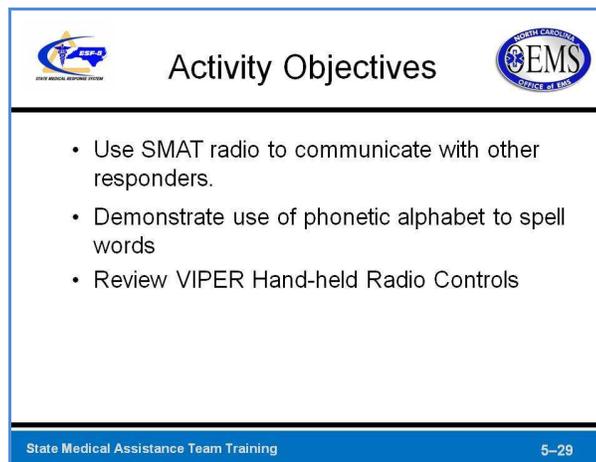
The slide is titled "Activity Objectives" and features two logos: the "2010 MEDICAL ASSISTANCE TEAM" logo on the left and the "NORTH CAROLINA EMS OFFICE of EMS" logo on the right. The main content is a bulleted list of objectives. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "5-28" on the right.

- Review and demonstrate
  - PTT (push-to-talk)
  - Channel selection
  - Transmitting
  - Receiving
  - Antenna connection
  - Proper microphone placement
  - Proper language and phonetic alphabet

State Medical Assistance Team Training 5-28

Review and demonstrate

- PTT (push-to-talk)
- Channel selection
- Transmitting
- Receiving
- Antenna connection
- Proper microphone placement
- Proper language and phonetic alphabet



The slide is titled "Activity Objectives" and is framed by a blue border. In the top left corner is the logo for the State Medical Assistance Team (SMAT), and in the top right corner is the logo for the North Carolina EMS Office of EMS. The main content area contains three bullet points. At the bottom of the slide, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "5-29" on the right.

**Activity Objectives**

- Use SMAT radio to communicate with other responders.
- Demonstrate use of phonetic alphabet to spell words
- Review VIPER Hand-held Radio Controls

State Medical Assistance Team Training 5-29

- Use SMAT radio to communicate with other responders
- Demonstrate use of phonetic alphabet to spell words
- Review VIPER hand-held radio controls

**Time:** 1 hour 15 minutes

**Materials:**

- One Viper Handheld with VMN Template and one UHF SMAT radio for every two students.
- One Skills Checklist for each Student
- Copies of Test booklets from each of the 3 test banks and answer keys for same.
- One test answer sheet for each student.

**Instructor Directions:**

- Demonstrate the use of these communication tools and given the opportunity to practice using the SMAT pre-programmed radios and the phonetic alphabet. A table leader will be assigned for each group.
- Each table will be assigned UHF SMAT Channels for operational communications.
- This structure is NIMS compliant for span of control.
- Students will be assigned radio traffic by the instructors for communication to other elements of the hands on exercise.
- Let them know they will be expected to perform the following skills and their performance will be scored on a skills checklist (see below).

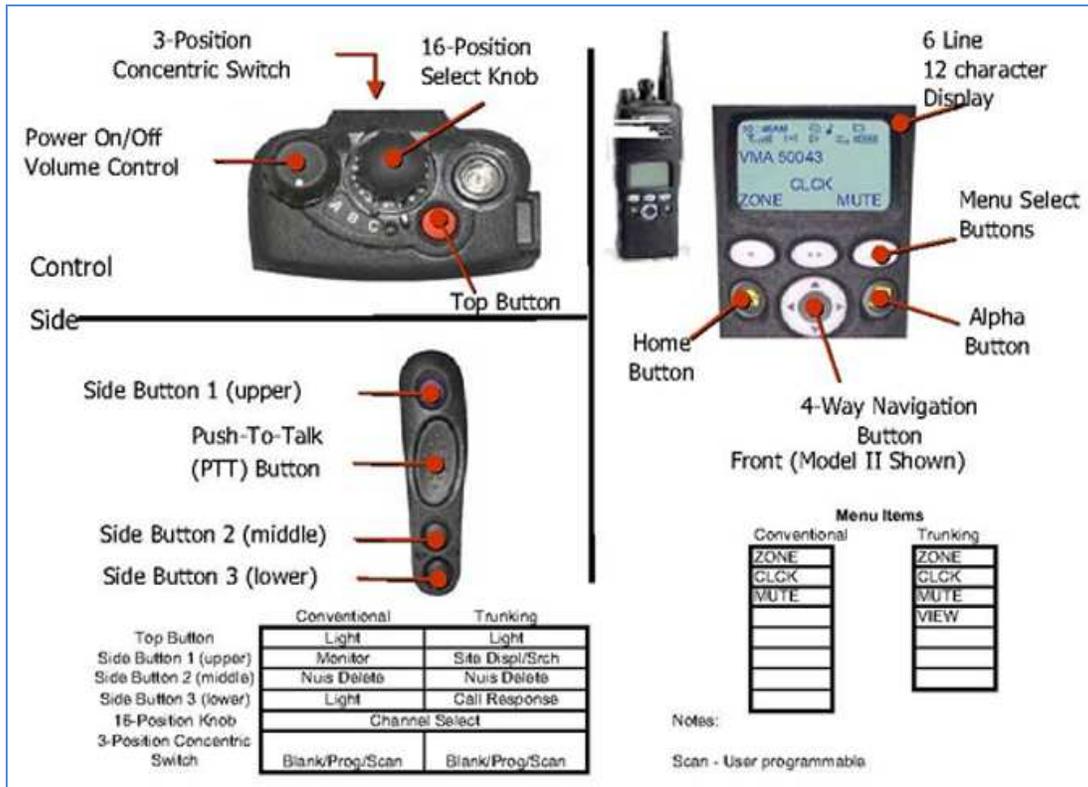
**Student Directions:**

- You will be divided into groups and given the opportunity to practice your use of SMAT radios. A table leader will be assigned.
- You will also be asked to use the phonetic alphabet during at least once during the activity.
- Each table will be assigned one of the UHF SMAT Channels for operational communications.
- You will be assigned radio traffic by the instructors for communication to other elements of the hands on exercise.
- Your performance will be scored on a skills checklist.

***Effective Radio Communications Skills Checklist***

	<b>SKILL</b>	<b>YES</b>	<b>NO</b>
1.	Point out key items on a radio:		
	• Battery		
	• Antenna		
	• Power		
	• Volume		
	• Channel/Zone selectors		
2.	Change radio batteries		
3.	Turn on radio		
4.	Switch to desired channel/talk group		
5.	Switch zones on VIPER radio		
6.	Use PTT on UHF vs VIPER radios		
7.	Use the correct phonetic alphabet to effectively communicate information. Demonstrate proper MAYDAY communication using LIP		

## APPENDIX 5.A: VIPER HAND-HELD CONTROLS



When communicating with a VIPER Radio there is a delay built in to the PTT function. One will hear an audible beep which corresponds to time required for link information to be sent to the network. If a person attempts to speak immediately after pushing the PTT button on these radios, some of your initial words may be cut off. Wait for the tone then speak when using these radios.

### WARNING!!

The Orange Button on VIPER Hand-held radios may be programmed according to your agencies requirements. Some agencies choose to program this button as an emergency button which automatically sets in motion rescue attempts based on agency specific guidelines. Other agencies program this button as a "Back Light" function.

Do not assume the function of this button. KNOW YOUR RADIO.

## APPENDIX 5.B: COMMUNICATIONS GLOSSARY

**Antenna** – A device connected to a radio that allows radio signals to be sent and received through the air

**Battery** – the device that is attached to your portable radio that powers the unit.

**Channel** – is an assigned (usually pre-programmed) frequency you can talk on.

**Control Stations (Base Stations)** - A base station is either a desktop or a mobile radio with the channels for a certain group.

**Coverage** – The area that a repeater site or network of repeaters can effectively cover.

**DTMF** – Dual-Tone Multi-Frequency is an audible tone used to control functions in a radio system.

**Radio Frequency** – the portion of radio spectrum used to transmit and receive signals. Usually programmed in a radio as channels.

**Mobile Radio** – A radio that is able to transmit and receive signals. Usually mounted in a vehicle.

**NCMCN** – North Carolina Medical Communications Network. This network uses the UHF frequency range to communicate on. There are over 250 control stations throughout North Carolina. 36 repeater sites give “95% talk out” coverage.

**NCSMRS** – North Carolina State Medical Response System

**Portable Two Way Radio** – (Hand Held) a two-way radio that is easily carried by someone capable of transmitting and receiving radio signals

**Push To Talk (PTT)** – The side button used on the hand held radio, or the side button on a microphone used to transmit.

**Repeater** – A device that is able to take a signal and re-broadcast it at a higher power level for greater coverage of an area.

**Talk Around (Simplex)** –When you are talking radio to radio without the need to use a repeater

**Talk Group** – Virtual channel in a trunked radio system

**SMAT** – State Medical Assistance Team

**Statewide Talk Groups** – Talk groups that you are able to use statewide to contact various state agencies.

**Statewide Event Channels** – Talk groups that allow multi-agency groups to inter operate on the same talk group. Usually assigned for a particular event or disaster. Must be requested from NCEOC prior to use.

**Statewide Roamer/Pool Talk Groups** – These provide VIPER users a day to day or general use talk group without tying up statewide talk groups.

**Trunked Radio System** – A system that is controlled by a master computer using very few frequencies. It allows you to create basically unlimited talk-groups within the system.

**UHF** – Ultra High Frequency. Provides a wide range of frequencies. Most common UHF is the 406-520 MHz range. This range is higher than VHF

**VHF** - Very high frequency is the radio frequency range that is from lower then UHF. Most common in the VHF range is 136-174 MHz.

**VIPER** – “Voice Interoperability Plan for Emergency Responders” This is North Carolina’s main statewide 800 MHz trunked radio system. It was built with interoperability in mind. This allows users throughout the state to communicate on one communication network.

**VML** – Viper Zone designated as primary for use by the NCSMRS and is available for use by SMAT.

**VMN** – VIPER Medical Network, this is the main medical network in North Carolina and is backed up by the NCMCN network. VMN will enable a VIPER user to contact any hospital in the state of North Carolina. I also provides for interoperability with other agencies in the state.





# MODULE 6: DEPLOYMENT READINESS

Training Curriculum

Length: 1 Hour

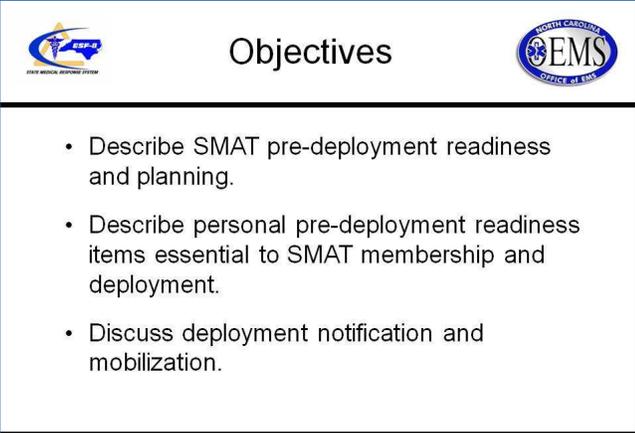
Audience: North Carolina State Medical Assistance Team personnel

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## Module Objective

Describe the essential elements for deployment readiness including surviving austere environments.

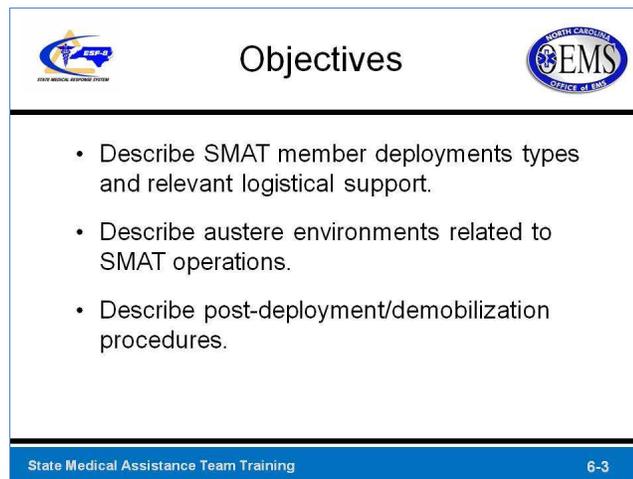
## Objectives



The slide is titled "Objectives" and features two logos at the top: the NREMT logo on the left and the NCEM/EMS logo on the right. The main content consists of three bullet points. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "6-2" on the right.

- Describe SMAT pre-deployment readiness and planning.
- Describe personal pre-deployment readiness items essential to SMAT membership and deployment.
- Discuss deployment notification and mobilization.

- Describe SMAT pre-deployment readiness and planning.
- Describe personal pre-deployment readiness items essential to SMAT membership and deployment.
- Discuss deployment notification and mobilization.



The slide features a blue header with the title "Objectives" centered. On the left is the logo for the State Medical Assistance Team (SMAT), and on the right is the logo for the North Carolina EMS Office of EMS. Below the title, three bullet points are listed. At the bottom of the slide, a blue footer contains the text "State Medical Assistance Team Training" on the left and "6-3" on the right.

**Objectives**

- Describe SMAT member deployments types and relevant logistical support.
- Describe austere environments related to SMAT operations.
- Describe post-deployment/demobilization procedures.

State Medical Assistance Team Training 6-3

- Describe SMAT member deployment types and relevant logistical support.
- Describe austere environments related to SMAT operations.
- Describe post-deployment/demobilization procedures.

## Safety Note

	<b>Safety Note</b>	
<ul style="list-style-type: none"><li>• Prepare for extreme conditions<ul style="list-style-type: none"><li>– Heat, cold, wind, rain</li><li>– Living quarters</li><li>– Lack of supplies and amenities</li></ul></li><li>• Situations may change rapidly</li><li>• North Carolina to ...parts unknown</li></ul>		
State Medical Assistance Team Training		6-4

## SMAT PRE-DEPLOYMENT



### SMAT Pre-Deployment



Pre-Deployment Readiness

- Personal readiness
- Team member readiness



Photo courtesy of NCOEMS

State Medical Assistance Team Training6-5

### *Pre-Deployment Readiness*

#### **Personal Readiness**

This module focuses on preparing SMAT team members for deployment. As a responder, you will have two readiness areas on which to focus your efforts: personal readiness and team member readiness. Personal readiness involves preparing your family for a potential emergency and for your absence.

#### **Team Membership Readiness**

The other area is team membership readiness. This involves ensuring that you are prepared to function effectively as soon as you receive the alert. While many SMAT members will be “emergency response” veterans and will already be aware of the nuances of living and working in a field environment, this module primarily targets those who have never been on a deployment.

## Family-Home Disaster Planning

**Family-Home Disaster Planning**

- Importance of family disaster planning to SMAT readiness
- Developing a family disaster plan
- Common elements of family disaster plan
- Activating the family disaster plan

**Ready Family Emergency Plan**

Make sure your family has a plan in case of an emergency. Before an emergency happens, sit down together and decide how you will get out of your home safely, where you will go and how you will get help. Have copies of this plan in your emergency kit and in the car. Ask your family to keep it in the most of your car.

Get Your Contact Info:

Name:	Telephone Number:
Home/Work/Cell Phone:	Telephone Number:
Emergency Contact:	Telephone Number:
Address:	Emergency Contact:
City:	State:
Zip:	County:
Date of Birth:	Emergency Contact Information:

State Medical Assistance Team Training 6-6

### Importance of Family Disaster Planning to SMAT Readiness

Responders should ensure their own basic needs are addressed before they can be expected to meet the needs of others stricken by disaster. Paramount in meeting these needs is to ensure the health and safety of your family. In the face of a disaster, your family may experience some of the same trials and tribulations as other victims. In order to focus and perform to the best of your abilities, you must first ensure that your family is safe and that their needs are being met during the deployment. One method to assist in ensuring their safety is to develop a family disaster plan.

The web sites [ready.gov](http://ready.gov) and [readyresponders.org](http://readyresponders.org) are available to help responders prepare themselves and their family for deployment.

### Developing a Family Disaster Plan

In formulating a Family Disaster Plan, SMAT members must first identify the risks their communities might face. Second, they must develop plans that specifically address the needs of their family members.

Commonly accepted elements of family disaster planning might include the following:

- Checklists detailing essential tasks, roles, and responsibilities for each family member during a family mobilization to a disaster
- Basic supplies (See Appendix 2-A Disaster Supplies Kit Checklist)
- Food, water, water purification
- Clothing

- Auxiliary power sources
- Supplies (flashlights, batteries, etc.)
- Medications and information on refills, dosing, and storage requirements
- Essential records (insurance policies, etc.)
- Cash, paying the bills
- Familiarity with your community's public warning system
- Animal care issues
- Stocks of food, water, and other critical supplies
- The Post-Katrina Reform Act mandates provisions are made for pet sheltering. However, state or local plans may not address the needs of your particular pet.
- Special needs of elderly or functionally impaired family members
- Special needs of small or school aged children
- Special needs of single parents
- Familiarity with workplace, children's school, or day care center disaster plans

The best preparation for a disaster is to educate yourself and all family members about the potential disruptions caused by a disaster. A family meeting is an excellent way to begin the process and will allow a team approach to the planning process as well as family activity time. Discuss the various dangers your community and your family might face and reinforce the reasons you need to prepare. Develop this plan as a family team and keep the plan as simple as possible. During this time it is important to reassure your family that their safety is paramount and that these planning measures are designed to ensure their safety during a disaster. This is also the time to educate your family on your potential role as an emergency responder and to validate their support for that role during a potential deployment to a disaster.

In our extremely mobile society it is not unusual for family members to be in multiple locations at the same time. One of the key elements of your plan should be to establish a "family rally point" where family members can meet once a disaster occurs. Ideally, each family member will have knowledge of at least two places to assemble that are readily accessible. These sites should also be specified in your family disaster plan along with directions or maps if needed. Planning should start with the basics and focus on issues such as home emergencies (e.g., fires in the family home) and build to more complex situations such as an evacuation of the family during an impending flood. A number of technological solutions may be helpful adjuncts to your family disaster plan. For example, knowledge of evacuation routes and access to map information may be assisted via items such as a global positioning device (GPS) and battery-operated portable radios, which may provide additional information on warnings.

## Activating the Family Disaster Plan

Another key element for family disaster planning is to ensure that you have developed a means for family members to contact each other if they are separated. One method to reconnect family members is to identify an out of town/area family member or friend to be a mutual point of contact for all family members. Make sure all family members have the full contact information (phone numbers, address, email addresses) for this individual, as well as with each other. The American Red Cross offers a program called “Safe and Well” where families can either search for loved ones, or register as “Safe and Well” following a disaster. This can be done online at: <https://safeandwell.communityos.org/cms/index.php> or over the phone at 1-866-GET-INFO. Some GPS-enabled cell phones can transmit locations via free programs such as “Google Latitude” and feature live location updates and messaging.

## Personal Items for SMAT Deployment Readiness

	<b>Personal Items</b>	
<ul style="list-style-type: none"><li>• Personal items for SMAT deployment readiness<ul style="list-style-type: none"><li>– 24 hour Go-bag</li><li>– Deployment bag</li></ul></li><li>• Selection of occupation specific personal equipment for field use<ul style="list-style-type: none"><li>– Equipment should be standardized and pre-approved</li></ul></li></ul>		
State Medical Assistance Team Training		6-7

As a team member you are expected to have ready at all times a “go-bag” that contains your personal equipment, clothing, and personal items you will need for a deployment. An example packing list is contained in the *Supplemental Materials* section of this course manual titled *Personal Items for “Go-Bag.”* While these lists may not be all-inclusive, they serve as a guide to personal items that will help to address your personal needs in a disaster setting and may be modified to meet your personal preferences. Veteran team members may have additional suggestions about additions, deletions, or substitutions for this list and serve as an excellent resource for the novice responder. Ideally, official lists will be developed, refined from field experience, and distributed to SMAT members as part of their orientation. Some SMAT teams have developed such lists and refined them during field deployments.

### **Selection of Occupation-Specific Personal Equipment for Field Use**

The use of occupation-specific personal equipment for SMAT deployment is an important consideration for personnel being deployed. Each SMAT member must inform the team leadership if he or she has special equipment requirements. This is important because team leadership, logistics, and safety personnel must be aware of all equipment required for effective SMAT deployment. Each item will need to be evaluated for deployment and its relationship to safety, the need for service, storage and portability. As a general rule, all SMAT equipment should be standardized and pre-approved prior to deployment. Specific equipment needs should be identified in a timely manner to facilitate processing, approval, and procurement if deemed appropriate.

## Employer Compliance with SMAT Membership



### Employer Compliance



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Employer/occupation compliance with SMAT membership

- Useful information to discuss with employer
  
- Employer approval

State Medical Assistance Team Training6-8

### Useful Information to Discuss with Employer

As discussed in a prior module, the North Carolina Emergency Management Act of 1977 indicates that healthcare workers and EMS are regarded and defined as “Emergency Management Workers” within the provisions of that act and that they are entitled under North Carolina Statute to the right to take leave without pay to assist in a disaster. As a team member it is essential that you have this discussion with your employer prior to any deployment.

### Employer Approval

It is imperative to enlist your employer’s support prior to an actual notification and deployment to allow for cross-coverage and backfill of your position/job. If you are an independent practitioner you must have arrangements made with associates to cover your practice or position.

## PERSONAL PRE-DEPLOYMENT READINESS

Personal Readiness

- Fitness for SMAT duty
- Personal physical health status assessment
- Mental health
  - Human reactions and adaptations to disasters
  - Checklist of behavioral, cognitive and physiological responses

State Medical Assistance Team Training6-9

### *Fitness for SMAT Duty*

For many SMRS/SMAT responders, the operational field environment is foreign to their daily activities. For example, responders who work in health professions may function daily in a climate-controlled environment. These responders are not exposed to a variety of environmental elements and are generally safe, warm, and dry. During a deployment they will be in field conditions that lack many of the comforts generally taken for granted. They will face environmental issues such as heat stress or inclement weather. To that end, it is important that SMAT members maintain an elevated state of physical and mental readiness for duty. SMAT II and III participants have requirements set forth in the respective Memorandum of Understanding (MOU) with NCOEMS and agree to make personnel health and training records of all SMAT II members available for review by the state agency when requested.

### **Personal Physical Health Status Assessment**

Operations in a field environment require both physical and mental stamina. As a SMAT team member you will participate not only in healthcare operations and patient decontamination procedures but also in Base Camp operations. These activities will require the deployment and storage of shelters (e.g. tents) and the movement of materials on and off the M-8 trailer system. These activities require physical exertion and it is important for each emergency responder to be aware of his or her functional limitations.

In preparation for deployment, responders should take all necessary steps to protect themselves from potential illness, injury, and exposures. Responders with prior medical conditions such as diabetes, cardiac issues, or pulmonary disease should be aware that exposure to a field environment may place them at risk for an exacerbation of their underlying medical conditions.

## Mental Health

While there is no educational course or amount of training that can fully prepare the responder for the mental aspects of disaster response, the responder can be aware of some of the physiological, behavioral, and cognitive responses commonly encountered during a disaster response.

A disaster is a form of a traumatic event and is defined by the *Diagnostic and Statistical Manual of Mental Disorders, DSM-IV-TR, 4th edition*, and the American Psychiatric Association as a life-threatening situation that evokes feelings of intense fear, horror, or helplessness (American Psychiatric Association, 2000). All of the elements surrounding a disaster produce stress not only for those directly affected by the disaster but also for the responders. Responders may develop and exhibit many of the same signs and symptoms of stress that the victims exhibit and may experience both the short and long term effects of stress and grief. Consequently, no one (responder or victim) is unaffected by a disaster.

The following human reactions and adaptations to disasters are highlighted on the Centers for Disease Control and Prevention (CDC) website (<http://www.bt.cdc.gov/mentalhealth/primer.asp>) and are reinforced in most responder literature.

### CDC: Common Human Reactions and Adaptations to Disasters

Most people pull together and function during and after a disaster, but their effectiveness is diminished.

Mental health concerns exist in aspects of preparedness, response, and recovery.

Disaster stress and grief reactions are “normal responses to an abnormal situation.”

Survivors respond to active, genuine, interest and concern.

Disaster mental health assistance is often more practical than psychological in nature (e.g., offering a phone, distributing coffee, listening, encouraging, reassuring, comforting).

Disaster relief assistance may be confusing to disaster survivors and they may experience frustration, anger, and feelings of helplessness related to disaster relief programs and may reject disaster assistance of all types.

Stress from a disaster can affect responders in many different ways, and it is not uncommon for responders to experience stress in these ways. It is important to note some of the signs of stress that are commonly seen in disaster responders and to check yourself and teammates for possible signs of concern.

The following is a checklist of behavioral, cognitive, and physiological responses associated with stress, adapted from <http://www.bt.cdc.gov/mentalhealth/responders.asp>. This source shows that the effects of stress on an individual will certainly have some effects on mental health.

**Behavioral and emotional responses/symptoms may include:**

- Anxiety, fear
- Grief, guilt, self-doubt, sadness
- Irritability, anger, resentment, increased conflicts with friends/family
- Hopelessness, despair, depression, or feeling overwhelmed
- Anticipation of harm to self or others; isolation or social withdrawal
- Insomnia
- Gait change
- Hyper-vigilance; startle reactions
- Crying easily
- Gallows humor
- Ritualistic behavior

**Cognitive responses/symptoms may include:**

- Memory loss
- Calculation difficulties, decision-making difficulties
- Confusion in general and/or confusing trivial issues with major issues
- Concentration problems/distractibility
- Reduced attention span and/or preoccupation with disaster
- Recurring dreams or nightmares

**Physiological responses/symptoms may include:**

- Fatigue
- Nausea
- Fine motor tremors
- Tics
- Paresthesia
- Profuse sweating
- Dizziness
- GI upset
- Heart palpitations
- Choking or smothering sensation

Mental health issues in a disaster can affect everyone. For responders, having an awareness of the psychological demands of disasters can improve their ability to deal with the stress. Good coping skills, self-care, and stress management techniques can allow the responder to manage stress and grief from a disaster situation. For team leaders it is important to schedule organized status updates with team members on a regular basis. During these group events, the

opportunity should be taken to discuss new and unexpected events impacting the deployment, identify any responders who may be developing and/or exhibiting signs of stress, and make appropriate arrangements to refer the responder for appropriate debriefing and treatment.



## Personal Readiness



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**Self Care Techniques for Disaster Responders**

<b>Physical</b>	Diet, sleep, relaxation
<b>Emotional</b>	Stay in contact with family when possible
<b>Cognitive</b>	Reading, training
<b>Behavioral</b>	Personal and family preparedness
<b>Spiritual</b>	Meditation, prayer, fellowship

State Medical Assistance Team Training
6-10

**Table 6-1: Self Care Techniques for Disaster Responders**

Physical	Diet, sleep, relaxation
Emotional	Stay in contact with family when possible
Cognitive	Reading, training
Behavioral	Personal and family preparedness
Spiritual	Meditation, prayer, fellowship



Personal Readiness



- Personal medications and durable medical goods
- SMAT medical records
- SMAT immunizations
- Compliance with equipment fit testing, sizing, and maintenance

State Medical Assistance Team Training 6-11

### Personal Medications and Durable Medical Goods

Responders should ensure that they have an ample supply of their current medications and medical supplies should they have underlying medical conditions when they deploy. It is recommended that responders carry at least 7 days' worth of medicines. It is best to carry medications to last at least twice the number of anticipated days of deployment. Responders should also carry copies of medication lists on their persons and in their "go-bags" at all times. They should also make the team leader and safety officer aware of their underlying medical conditions or physical limitations. From a team standpoint it is useful if a team roster containing medical and physical conditions is kept, adhering to the guidelines of the Health Insurance Portability and Accountability Act (HIPAA) and confidentiality rules and regulations.

### SMAT Medical Records

It is important that each SMAT member be compliant with all health and safety records requests by the SMAT leadership and management. They are responsible for workforce protection and may have need to know about the status of SMAT members of their role in maintaining team safety (to the degree of assuring team safety) and maintaining a healthy workforce during field deployments.

### SMAT Immunizations

An important part of workforce protection and personal safety is being current on immunizations. Being current on immunization status as a SMAT member is important for deployment field sites, geographic risks, and disease management situations you will likely encounter. Specific recommendations for SMAT member vaccinations should be discussed with SMAT leadership and management. Prior to receiving any immunization, each should be discussed with your primary care physician, as there are potential contraindications for nearly all vaccines, depending upon an individual's health status and medical history.

Requirements for immunization are listed in the MOU between NCOEMS and participating hospitals involved in SMRS/SMAT activities. They are listed below:

Tetanus vaccination within the last ten years

Hepatitis B vaccine (or a positive titer within the last year)

Tuberculosis skin test (and a chest x-ray if tuberculosis skin test is positive) within the last year

This applies to all team members for a deployment; however, if there are special circumstances in the deployed setting or additional risks, additional immunizations may be required.

### **Compliance with SMAT Requirements**

It is important that each SMAT member complete the requisite training sessions related to equipment fit testing, sizing, and maintenance if Personal Protective Equipment (PPE) is going to be a requirement as part of job performance. The SMAT management and leadership must be assured that SMAT members are ready for operational deployment and have taken reasonable precautions to assure workforce protection. The ability to properly use SMAT equipment is an important part of this operational readiness and will need to be supported by a training and equipment doctrine throughout the duration of the SMAT deployment.

## SMAT NOTIFICATION PROCEDURES AND MOBILIZATION ACTIVITIES



### Notification Procedures



- SMAT notification
  - Advisory
  - Alert phase
  - Activation phase
  - Demobilization phase
- SMAT mobilization activities and authority



Photo courtesy of NCOEMS

State Medical Assistance Team Training6-12

### SMAT Notification

The module devoted to *SMRS Overview and History* depicts SMRS Levels of Activation in detail. It is essential that each SMAT member understands the methods by which notification will occur throughout various levels of SMRS activation.

#### SMAT NOTIFICATION PHASES

*Advisory* sent to Team Leadership

*Alert Phase:* Initial “Alert” messages go out to responders

*Activation Phase:* Message is sent out notifying team members of activation, rally point, assembly time, departure time, expected deployment location, and expected duration of deployment

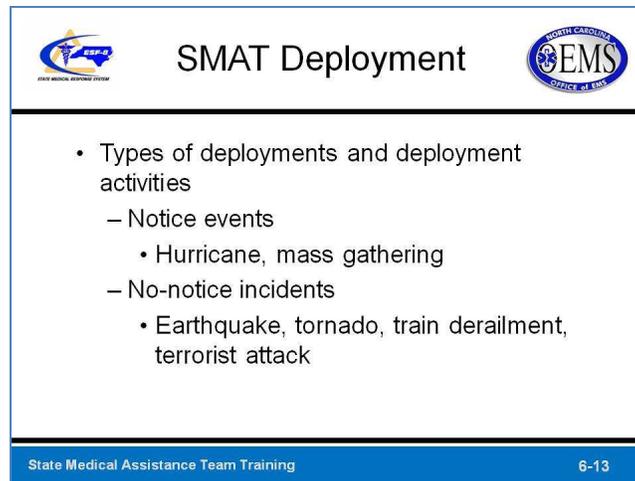
*Demobilization Phase:* Team is notified once the mission is complete and SMRS resources are no longer needed

Typically, SMAT Leadership will receive advisory information detailing a potential deployment and prior to the Alert Phase. The SMRS will have the following phases of activation: Alert Phase (Notification), Activation Phase, and Demobilization Phase. Mobilization may actually be concurrent with the Alert Phase depending on the nature of the emergency response.

As you recall, SERVNC, the online registration system for medical and health responders for the State of North Carolina, may be activated by the NC OEMS at the request of local, regional, or state authorities such as NC Division of Emergency Management. The notification process will

occur through SERVNC, call trees, and electronic notifications inquiring about the responder's availability and will provide the responder with information about the assembly time and place and other pertinent deployment information. The responder should have situational awareness of impending weather events and anticipate the potential for deployment.

## SMAT DEPLOYMENT



The slide is titled "SMAT Deployment" and features two logos at the top: the "EMR-2" logo on the left and the "NORTH CAROLINA EMS OFFICE of EMS" logo on the right. The main content is a bulleted list describing types of deployments and activities. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "6-13" on the right.

- Types of deployments and deployment activities
  - Notice events
    - Hurricane, mass gathering
  - No-notice incidents
    - Earthquake, tornado, train derailment, terrorist attack

State Medical Assistance Team Training 6-13

### *Types of Deployments and Deployment Activities*

Depending on the nature of the event, different levels of response may be anticipated. If this is a Notice Event, the deployment might be to establish and staff a casualty collection point, pre-situate a Mobile Surge facility, or provide triage and medical support to a State Medical Support Shelter (SMSS). The same would hold true of an activation (not a true response) to pre-stage for a planned event. In a No-Notice Incident, the SMRS / SMAT may be called upon to provide the same activities as listed for a Notice Event but also may have to provide a forward decontamination service as well as a forward casualty collection point or scene triage and treatment.

**Notice Events:** Pre-planning in support of a hurricane or mass gathering event with a period of lead time.

**No-Notice Incident:** Includes little or no period of lead time to preplan for the response, to include the resources needed. Such events may include a tornado strike, a catastrophic failure of utilities serving a medical facility, a terrorist event, large scale transportation or an industrial event.

**Table 6-2: Examples of Notice Events and No-Notice Incidents**

Notice Events	Hurricane, mass gathering
No-Notice Incidents	Tornado strike, train derailment, terrorist attack

In a prolonged deployment, SMAT members may be relieved by other SMATs not initially involved in the response, other state-based SMRS units, or by federal teams of the National Disaster Medical System (NDMS).

### **Team Logistics**

SMRS/SMATs are designed to be self-sufficient with logistical supplies (e.g., food, water medications, consumable medical supplies, etc.) for 72 hours. The NC OEMS, working in conjunction with local and NC State Division of Emergency Management, will provide logistical support and re-supply to the deployed units if the deployment lasts for more than 72 hours or if on-hand supplies are expended prior to that 72-hour timeframe. It is important for team members to understand that in an austere environment even the resupply of minor items will require a coordinated logistical response.

Sometimes SMATs are not deployed because the request is for equipment or materiel rather than personnel (Logistical Support Mission). For example, generators, AC or ventilators are warehoused by SMATs may be requested by another facility that has lost power.

## DEPLOYMENT IN AUSTERE ENVIRONMENTS



### Austere Environments



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- Definition of austere environments
- Austere conditions
  - Temporary shelter
  - Lack of privacy
  - Field sanitation
  - Heat and cold stress
  - Pre-packaged meals



Photo courtesy of NCOEMS

State Medical Assistance Team Training6-14

### *Definition of Austere Environments*

The concept of an austere environment was introduced in a prior module where it was noted that providing clinical services in an austere environment is expected of SMAT members. An austere environment, as it relates to SMAT, is akin to working in primitive conditions without the normal supplies or facilities usually available to provide medical services. In other words, the supporting health infrastructure may be severely damaged or destroyed.

Other non-medical factors will present challenges to team members during a deployment. For example, living conditions for team members may be difficult depending on the nature of the event, particularly if vital sectors of the community have been devastated. Rarely would you respond to a devastated region and find an intact motel, hotel, or dormitory. SMRS/SMAT members may find themselves in communal living arrangements located in remaining buildings or in temporary structures such as tents.

Responders should mentally prepare themselves for a general lack of privacy and space to which they are typically accustomed. Part of this type of communal environment may involve the use of field hygiene facilities (e.g., showers and latrines). Restroom facilities may include a portable toilet, an improvised facility, or some other field-expedient arrangement. It is also likely that laundry facilities may not be available.

The responder should most definitely expect challenges from nature—wind, water, heat, cold—and should prepare all personal gear to match the season and expected climate conditions.

**Table 6-3: Austere Conditions Challenging SMAT Members**

Temporary shelter
Lack of privacy
Field sanitation
Heat and cold stress
Meals that are pre-packaged (cold)

## Environmental Considerations during Field Deployments

Environmental Considerations	
<b>Heat</b>	Heat exhaustion, heat stroke, dehydration
<b>Cold</b>	Hypothermia, frostbite
<b>Insects</b>	Disease transmission, nuisance (bites/rash)
<b>Water</b>	Contamination, rash
<b>Wind</b>	Chapped Skin

State Medical Assistance Team Training 6-15

These environmental factors are covered in greater detail in *Responder Health and Safety*. Heat stress is a far more common factor affecting deployments since the majority of FEMA-declared disasters have occurred in the warmer months of the year. During these deployments, responders are particularly prone to heat exhaustion and dehydration and need to be closely monitored. It is important to note that thirst is a poor (and often late) sign of dehydration. Many factors affect a person's recognition of being thirsty, and as heat-related illness progresses, symptoms such as nausea, headache, etc. may actually override the sensation of thirst.

**Table 6-4: Environmental Concerns for SMAT Team Members**

<b>Heat</b>	Heat exhaustion, heat stroke, dehydration
<b>Cold</b>	Hypothermia, frostbite
<b>Insects</b>	Disease transmission, nuisance (bites/rash)
<b>Water</b>	Contamination, rash
<b>Wind</b>	Chapped skin

The body's reaction to heat/cold is controlled by its thermal regulatory mechanisms, such as:

- Vasodilatation
- Vasoconstriction
- Sweating
- Shivering
- Increasing/decreasing activity
- Behavioral responses

See the tables below for examples of heat- and cold-related injuries.

**Table 6-5: Examples of Heat-Related Injury**

Injury/Disease	Signs & Symptoms
Sunburn	Skin redness and pain Possible swelling, blisters, fever, headaches
Heat Cramps	Painful spasms, usually in leg and abdominal muscles Heavy sweating
Heat Exhaustion	Heavy sweating Skin may be cool, pale, or flushed, weak pulse Normal body temperature is possible, but temperature will likely rise Nausea, vomiting, exhaustion, and headaches are possible Fainting
Heat Stroke	Core temperature (105°+) Hot, red, dry skin Rapid, weak pulse Victim probably not sweating unless victim was sweating from recent strenuous activity Altered mental status (Possibly unconsciousness)
Heat Cramps	Painful spasms, usually in leg and abdominal muscles Heavy sweating

**Table 6-6: Examples of Cold-Related Injuries**

<b>Injury / Disease</b>	<b>Signs &amp; Symptoms</b>
Chilblains (Erythema pernio)	Pallor of exposed areas
Immersion foot (trench foot)	Limb will be cold, swollen, and appear waxy-white with cyanotic burgundy-to-blue splotches. The skin is without sensation and deep musculoskeletal sensation is lost.
Snow Blindness	Pain, tearing, injected conjunctiva, swollen lids
First Degree Frostbite	Hyperemia, mild itching, and edema
Second Degree Frostbite	Hyperemia, mild itching, and edema, blistering, desquamation
Third Degree Frostbite	Necrosis of skin and subcutaneous tissue with ulceration
Fourth Degree Frostbite	Destruction of connective tissues and bone, with gangrene
Mild Hypothermia (Core Body temperature 90°-95°F)	Shivering Pale, cold skin Slurred speech Poor muscle coordination Faint pulse
Severe Hypothermia (Core Body temperature 90°F or lower)	Hypoventilation, Dysrhythmia, Hypovolemia, Altered Mental Status, Ice cold skin, Rigid muscles, Glassy eyes

## Risk Factors for Cold Injury

- Age extremes
- Previous cold injury
- Fatigue and exhaustion
- Trauma
- Drugs and other medications
- Nutrition / hydration
- Underlying medical conditions
- Activity level

Tracking how concentrated your urine has become is one method to monitor your fluid status. However, some medications, like multivitamins and diuretics may alter urine color. Know what is normal for you.



### Urine Color Chart



**AM I HYDRATED?**  
Urine Color Chart

1		
2		If your urine matches the colors 1, 2, or 3, you are properly hydrated.
3		Continue to consume fluids at the recommended amounts.
4		If your urine color is below the <b>RED</b> line, you are
5		<b>DEHYDRATED</b> and at risk for cramping and/or a heat illness!
6		<b>YOU NEED TO DRINK MORE WATER!</b>
7		
8		

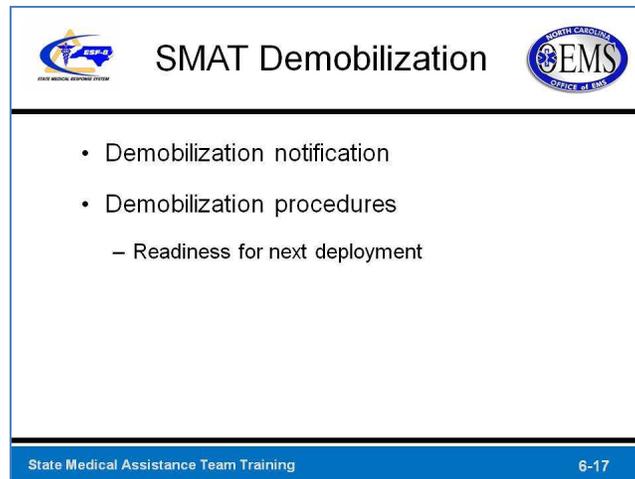
*Urine Color Chart courtesy of University of Maryland*

State Medical Assistance Team Training
6-16

<h1 style="text-align: center;">AM I HYDRATED?</h1> <h2 style="text-align: center;">Urine Color Chart</h2>		
1		
2		If your urine matches the colors 1, 2, or 3, you are properly hydrated.
3		Continue to consume fluids at the recommended amounts.
4		If your urine color is below the <b>RED</b> line, you are
5		<b>DEHYDRATED</b> and at risk for cramping and/or a heat illness!!
6		<b><u>YOU NEED TO DRINK MORE WATER!</u></b>
7		
8		

Figure 6-1: Urine Color Chart courtesy of University of Maryland

## SMAT DEMOBILIZATION



The slide is titled "SMAT Demobilization" and features logos for "EMR-2" (State Medical Assistance Team) and "NORTH CAROLINA EMS" (Office of EMS). The main content is a bulleted list:

- Demobilization notification
- Demobilization procedures
  - Readiness for next deployment

At the bottom, it says "State Medical Assistance Team Training" on the left and "6-17" on the right.

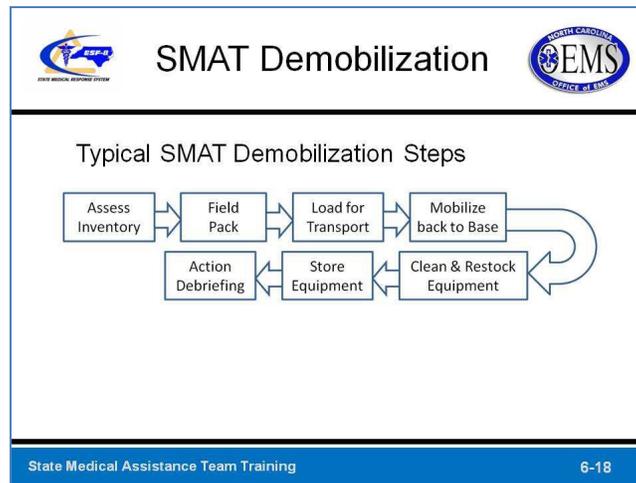
### *Demobilization Notification*

Typically, the deployed SMRS/SMAT team will perform its mission for up to seven days. However, there are exceptions and the assignment could be lengthened or shortened depending on the mission and availability of personnel. The Team Commander will receive official notification from NC OEMS and will begin the operation to end the deployment and to leave the assets for use by a replacement unit if the mission has not been completed. Team members will be notified on-site at a daily briefing and informed of the withdrawal plan so they may begin preparations.

### *Demobilization Procedures*

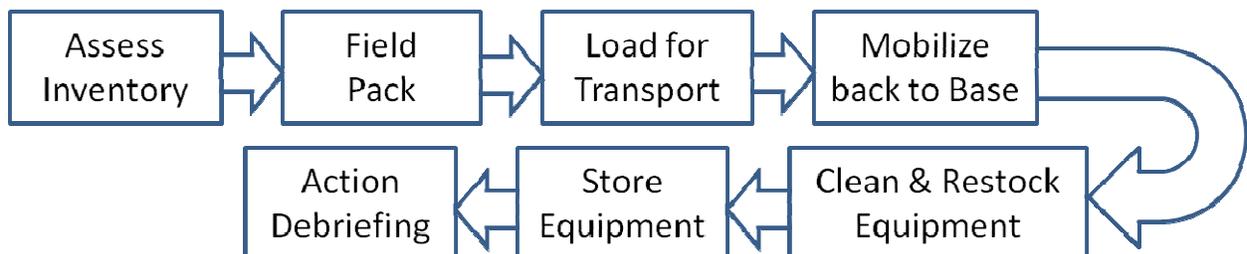
Demobilization is the process in which the team that has completed its mission is being recalled from the mission. This process accounts for all personnel and resources and may involve additional planning to effectively get the team and assets to the home base. This process involves safety concerns, logistics, planning, and the Command Staff. An ICS form 221, *Demobilization Check-Out*, may be a useful document to help guide the process.

## Readiness for Next Deployment



At the time of the official notice of demobilization, the team will begin the process of ending the mission by striking the base camp, inventorying and packing the equipment, and traveling back to home station for debriefing. Generally, the team will demobilize and travel to the home station together. After arrival at home station the team will re-supply and repair or replace any non-operational equipment and make ready for another deployment.

A key element to deployment is to conduct an after-action debriefing to discuss any issues that were encountered during the deployment, create a corrective action plan, and execute the plan.



**Figure 6.2: Typical SMAT Demobilization Steps**

## **ACTIVITY: DISPLAY OF GO-BAG AND DEPLOYMENT PACK CONTENTS**

**Purpose:** To let participants gain a clear idea of what should go into the go-bag and deployment pack.

**Time:** 20 minutes

**Materials:**

- 1 packed go-bag to keep with you
- 1 packed deployment pack

**Instructor Directions:**

1. Have participants turn to the Supplemental Materials *Items Considered for Personal "Go-Bag"* in their workbooks.
2. Empty your go-bag so they can see what goes into it.
3. Empty your deployment pack so they can see what goes into it.
4. Respond to any questions the participants may ask about personal readiness and their bags and packs.

**Participant Directions:**

1. Your facilitator will show you the contents of a Go-Bag and a Deployment Pack. This is to enable you to see what goes into them and how they are packed for best efficiency.
2. Be prepared to ask any questions you may have about the contents or process.

## SUMMARY



Summary



- Summary
- Supplemental materials



*Photo courtesy of NCOEMS*

State Medical Assistance Team Training 6-19

This module focused on many essential elements for deployment readiness. This includes action items relevant to pre-deployment, deployment, and post-deployment. It includes consideration for personal readiness including physical, mental, and emotional preparedness, and the development of a home disaster plan. Team members should be aware of the challenges of working in an austere environment. Demobilization will include such tasks as maintenance, repair, restocking, and replacement of all field-deployed equipment and is vital to continued SMAT readiness. Lastly, SMAT members need to be aware that a call-to-duty may involve austere environments and exposure to types of disasters that are not common to North Carolina.

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<http://www.emacweb.org/>

<http://bt.cdc.gov/mentalhealth/primer.asp>

<http://www.bt.cdc.gov/mentalhealth/responders.asp>

<http://www.princeton.edu/~oa/safety/hypocold.shtml>

## SUPPLEMENTAL MATERIALS

### *Miscellaneous Resources*

1. **American Red Cross Safe and Well Program:**  
<https://safeandwell.communityos.org/cms/index.php>
2. **Deployment readiness:**  
<http://readyresponders.org/>  
<http://www.ready.gov>

## *Items to Consider for Personal "Go-Bag"*

Responders will be responsible for carrying their own personal gear and equipment.

Uniforms / Team shirts / BDUs (Battle Dress Uniforms)	Insect repellent
Pants	Shaving kit
Underwear	Soap, bar
Socks	Toothbrush / paste
Boots (preferably steel toed)	Floss
Sleeping clothing	Deodorant
Poncho / rain gear	Mirror / comb
Work gloves	Eye Mask and Ear Plugs for sleeping
Safety Goggles	Safety pins
Headlamp and spare bulb	Toilet Paper
Hat	Facial tissue travel size
Handkerchiefs	Feminine hygiene – As indicated
Flip-flops or shower sandals	Pre-moistened towelettes
Closed toe tennis or walking shoes	2 towels / wash cloth
Casual wear (no team logo)	Sheet / pillow case
Swimwear (summer)	Fleece throw
Winter gear as appropriate (coats, thicker socks, long underwear)	Sleeping pad / camping pad
Hand towel / camp towel	Foot powder
Wash cloth	Soap / shampoo
Team roster	No rinse body wash / shampoo
Cell phone and charger	Reading material
Snacks	Sunscreen / insect repellent
Personal entertainment device: e.g. radio/iPod/MP3 player	Matches
Business cards	Hand sanitizer
Flashlight	Over-the-counter medications
Mini-mag light	Acetaminophen / non-steroidal anti-inflammatory
Spare batteries	Decongestant / antihistamine / cough drops
	Antacid

Gerber tool / Leatherman

Knife

Pens / Sharpies

Water flavoring: e.g. Crystal Light

Roll of quarters

Personal first aid kit

Stethoscope / trauma shears / pen light

Plastic bags e.g. garbage / kitchen bags

50' Rope

Small screwdriver/tool kit

Clothespins / sewing kit

Laundry detergent – low suds

Duct tape

Playing cards

## APPENDIX 2-A: DISASTER SUPPLIES KIT CHECKLIST

Item	Quantity	Date
Portable, battery-powered radio or television and extra batteries.		
Flashlight and extra batteries.		
First aid kit and first aid manual		
Supply of prescription/non-prescription medications		
Credit card and cash		
Personal identification		
An extra set of car keys		
Matches in a waterproof container		
Signal flare		
Map of the area and phone numbers of places you could go		
Special needs( diapers or formula, prescription medicines and copies of prescriptions, hearing aid batteries, spare wheelchair battery, spare eyeglasses, or other physical needs)		
Three to 21 gallons of water per person (3 to 7 days)		
Three to seven day supply of nonperishable food		
Kitchen accessories: manual can opener; mess kits or paper cups, plates, and plastic/disposable utensils; utility knife; a can of cooking fuel if food must be cooked; household liquid bleach to treat drinking water; sugar, salt, pepper; aluminum foil; plastic re-sealable bags.		
One complete change of clothing and footwear for each family member, sturdy shoes or work boots, raingear, hat and gloves, thermal underwear, sunglasses.		
Tools and other accessories: paper, pencil; needles and thread; pliers, shut-off wrench, shovels, and other useful tools; tape; medicine dropper; whistle; plastic sheeting; small canister, A-B-C-type fire extinguisher; emergency preparedness manual; tube tent; compass.		

Item	Quantity	Date
Blankets or sleeping bag for each family member		
Sanitation and hygiene items: toilet paper, towelettes; soap, hand sanitizer, liquid detergent; feminine supplies; personal items such as shampoo, deodorant, toothpaste, toothbrushes, comb and brush, lip balm; plastic garbage bags (heavy-duty) and ties (for personal sanitation uses); medium-sized plastic bucket with tight lid; disinfectant; household chlorine bleach; small shovel for digging an expedient latrine.		
Entertainment, such as games and books		
Pet Supplies (proper identification / immunization records / medications, collars and leashes, carriers, food, water, sanitary supplies, toys)		
Important Documents: {Will, insurance policies, contracts, deeds, stocks and bonds, Passports, social security cards, immunization records, Bank account numbers, Credit card account numbers and companies, Inventory of valuable household goods, important telephone numbers, Family records (birth, marriage, death certificates) }		
Hard drive backup of all computers		

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# MODULE 7: MASS CASUALTY

## Training Curriculum

Length: 1 Hour, 30 Minutes (Lecture and Skills Station)

Audience: North Carolina State Medical Assistance Team personnel

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## Module Objective

Describe essential mass casualty care components to include mass casualty incidents (MCI), triage methodologies, mass fatality, and resource utilization.

## Objectives

	<b>Objectives Mass Casualty</b>	
<ul style="list-style-type: none"><li>• Discuss Mass Casualty Incidents (MCI)</li><li>• Review planning for a MCI</li><li>• Describe mass fatality planning</li><li>• Review mass triage terminology</li><li>• Describe SMART Triage®</li><li>• Discuss the difference between “sufficiency of care” and “standard of care”</li></ul>		
State Medical Assistance Team Training		7-2

- Discuss Mass Casualty Incidents (MCI).
- Review planning for a MCI.
- Describe mass fatality planning.
- Review mass triage terminology, history, and utilization.
- Describe SMART Triage®.
- Discuss the difference between “sufficiency of care” and “standard of care.”

## Safety Note

While your natural tendency as a first responder will be to focus on individuals and their injuries, a mass casualty response requires that you maintain situational awareness as you attempt to do the most good for the most victims.

	<b>Safety Note</b>	
<p>While your natural tendency as a first responder will be to focus on individuals and their injuries, a mass casualty response requires that you maintain situational awareness as you attempt to do the most good for the most victims.</p>		
State Medical Assistance Team Training		7-3

## INTRODUCTION: MASS CASUALTY



### Introduction to Mass Casualty



- Mass Casualty Incident
  - Number and/or severity likely to overwhelm local resources
  - Medical demands exceed the clinical capacity
- Examples
  - Small-scale MCI
  - Large-scale MCI

State Medical Assistance Team Training7-4

### *Definition of Mass Casualty*

A Mass Casualty Incident (MCI) is a descriptive term used to characterize any situation in which the number and/or severity of victims is large enough to disrupt routine emergency and healthcare services. Stated differently, it means that medical personnel and equipment are overwhelmed by the medical needs of the casualties.



**Figure 7-1: Ambulance courtesy of FEMA**

This may occur at any level of the healthcare delivery system from the local Emergency Management System (EMS) jurisdiction or during a regional event such a flood. For the purposes of this module, the definition of “casualty” is a person who is ill, injured, missing, or killed directly or indirectly as a result of an event that is usually relegated to a specific geographic region (e.g., train derailment, industrial explosion).

For example, if a Basic Life Support (BLS) ambulance unit were to respond to a five-vehicle collision, the two-person crew would be facing a potential MCI because one ambulance may not be able to treat all persons injured on scene. Furthermore, because that ambulance is a BLS

unit, they may not have the medical expertise or equipment available to treat life-threatening injuries. Obviously, State Medical Assistant Teams (SMAT) would not be responding to this type of incident: however, this example demonstrates the fundamental premise of needs overwhelming resources.

When the general public thinks about large-scale emergencies such as MCIs, they are most likely going to think of the attack on the World Trade Center on September 11, 2001. This was an example of emergency medical service needs overwhelming resources, but on a very large scale. After the terrorist events in 2001, the US Department of Homeland Security analyzed 15 national planning scenarios for various disasters. The evaluation predicted that 11 of the 15 scenarios could involve a large number (hundreds to tens of thousands) of critically ill patients in a metropolitan area (Homeland Security Presidential Directive-21, 2007).

## All Hazards Approach to Mass Casualty



### All Hazards Approach



The “All Hazards” approach allows agencies and communities to prepare for disasters by generalizing some of the resources and components of emergency response.



Photo: Courtesy NCOEMS

State Medical Assistance Team Training7-5

There are many types of MCIs, and an all hazards concept of emergency preparedness and response is required. This disaster management approach to preparedness and response incorporates the fundamental premise that basic principles will apply collectively to any natural or human-made mass casualty incident (Born, Briggs, Ciraulo, Frykberg, Hammond, Hirshberg, et al., 2007). The all hazards approach allows agencies and communities to prepare for disasters by generalizing some of the resources and components of emergency response. Further information is available in the *All Hazards* module.

## Natural Events



### Natural Events



- Financial losses
- Examples
  - Hurricanes
  - Flood
  - Tornado
  - Earthquake
  - Ice storms



Photo courtesy of FEMA

State Medical Assistance Team Training7-6

According to the Swiss Reinsurance Company (2010), the financial losses for natural disasters in 2008 were close to \$259 billion (USD). Catastrophic events involving atmospheric, geologic, or hydrologic changes are considered to be natural disasters. These mass casualty incidents include, but are not limited to, floods, tsunamis, hurricanes, tornadoes, wildfires, drought, earthquakes, landslides, and volcanic eruptions. Just in the past 20 years, millions of people have lost their lives to natural disasters, and another one billion have been adversely affected. The resulting damages, economically and socially, can reveal themselves immediately or have a slow, progressive effect on a community (Watson, Gayer, & Connolly, 2007)..

Natural disasters are common in North Carolina. Table 7-1 provides an overview of the North Carolina FEMA major disaster declarations and FEMA emergency declarations history from 2000 to 2011. This table illustrates that significant natural disasters, requiring a federal declaration, occur nearly annually and affect many counties throughout the state. This information came from FEMA via: [http://www.fema.gov/news/disasters\\_state.fema?id=37](http://www.fema.gov/news/disasters_state.fema?id=37).

For more information on the disasters listed in Table 7-1, as well as disasters occurring prior to 2000 in North Carolina, this website is extremely helpful. Entering the FEMA Disaster Declaration Number (e.g. DR-1969) listed in Table 7-1 in the search area of the FEMA home page will provide easy access to a larger amount of event specific information.

**Table 7-1: North Carolina Disaster History**  
**Major Disaster Declarations (DR) and Emergency Declarations (EM), 2000 to 2011**

<b>Year</b>	<b>Incident Description</b>	<b>Date of Declaration</b>	<b>Disaster Type and Number</b>
2011	Severe Storms, Tornadoes, and Flooding	16 April 2011	DR-1969
2010	Severe Storms, Flooding, and Straight-line Winds, associated with Tropical Storm Nicole	14 October 2010	DR-1942
2010	Hurricane Earl	01 September 2010	EM-3314
2010	Severe Winter Storms and Flooding	02 February 2010	DR-1871
2008	Tropical Storm Hanna	08 October 2008	DR-1801
2005	Hurricane Ophelia	07 October 2005	DR-1608 EM-3254
2005	Hurricane Katrina Evacuation	05 September 2005	EM-3222
2004	Hurricane Ivan	18 September 2004	DR-1553
2004	Tropical Storm Frances	10 September 2004	DR-1546
2003	Hurricane Isabel	18 September 2003	DR-1490
2003	Ice Storm	27 March 2003	DR-1457
2002	Severe Ice Storm	12 December 2002	DR-1448
2000	Winter Storm	31 January 2000	DR-1312

Data obtained from [http://www.fema.gov/news/disasters\\_state.fema?id=37](http://www.fema.gov/news/disasters_state.fema?id=37) website

 **Haiti Earthquake 2010** 

- 7.0 magnitude quake's epicenter hit just 10 miles west of Port-au-Prince
- Estimated 3 million people in need of emergency aid after the earthquake



Photo by Nanci Nagel

State Medical Assistance Team Training 7-7

As responders deploy to a natural disaster, SMRS/SMAT personnel must be prepared to face the elements of the primary natural disaster as well as any number of secondary complications. Contaminated water supplies; displacement of the affected population; the destruction of vital infrastructure assets, including the medical infrastructure; the increase in the number of disease carrying vectors; and a myriad of other scenarios could change the direction of the response at any time (Klein & Nagel, 2007). Furthermore, responders must be aware of the possibility of overlapping disasters. A prime example of this would be the earthquake, subsequent tsunami, and associated radiation crisis in Japan that occurred in March of 2011.

## Human-Caused MCIs



### Human-Caused Incidents





- Industrial fire
- HAZMAT release
- Nuclear reactor meltdown
- Bombing

Photo: Los Alamos National Lab

State Medical Assistance Team Training

7-8

Human-caused MCIs can wreak havoc in an isolated community or have regional ramifications. As new technologies and sciences prevail, certain risks are inevitable. A refinery explosion or a mine collapse could result in multiple injuries or deaths in a matter of seconds. A local community could be greatly affected by such an incident, resulting in a need for evacuation, treatment for chemical inhalation, decontamination, or support for the victims. Table 7-2 provides some examples of human-caused disasters with the potential for causing MCIs.

**Table 7-2: Human-Caused Mass Casualty Incidents**

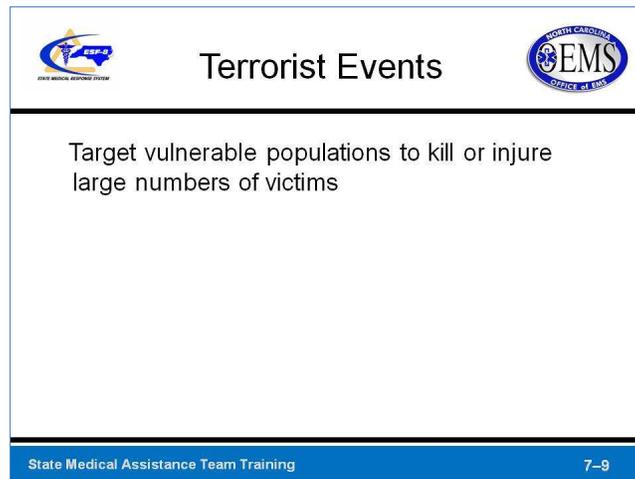
<p>Explosion at an oil refinery</p> <p>Chemical release</p> <p>Nuclear reactor melt-down</p> <p>Bombing</p> <p>Train derailment</p> <p>Mine collapse</p>
--

The Gulf Oil Release of 2010 had an enormous impact on the entire Gulf Region. The explosion on the *Deepwater Horizon* drilling platform took the lives of 11 men and resulted in a massive response to extinguish the blaze and stop crude oil from streaming into the Gulf. The spill subsequently caused millions of dollars in damages in the entire Gulf Region, affecting the lives and health of entire regions in the path of the oil. The environmental impact will be felt by the Gulf Region for decades.

While trying to preserve lives of others, first responders to human-made events must always take safety precautions. These types of incidents prove to be treacherous for responders due to chemical, biological, or other dangers. In most cases, pre-hospital treatment may include decontamination for patients BEFORE entering into any treatment facility. Fumes, chemicals, or

irritants can not only be harmful to the victims, but can easily injure care providers and responders. Regardless of the type of human-made disaster, two additional factors are important to consider in managing the health needs of victims. They are: 1) efforts to reduce exposure from toxic products or compounds associated with the disaster, and 2) increased concern for worker safety for emergency responders.

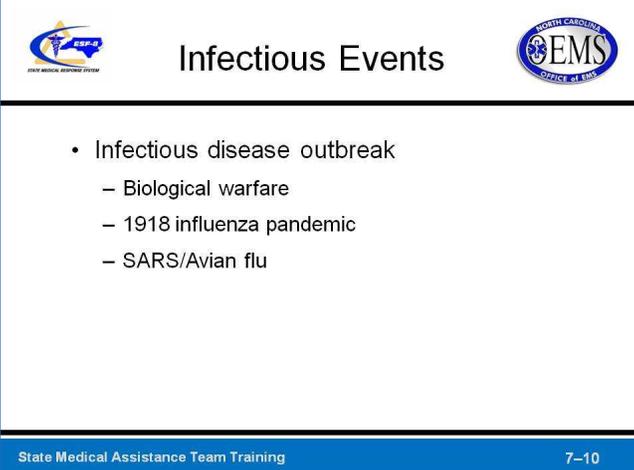
## Terrorist Events



The slide features a blue header with the text "Terrorist Events" centered. On the left is the logo for the State Medical Assistance Team Training, and on the right is the logo for the North Carolina EMS Office. The main content area is white with a black border, containing the text: "Target vulnerable populations to kill or injure large numbers of victims". A blue footer bar at the bottom contains the text "State Medical Assistance Team Training" on the left and "7-9" on the right.

When discussing terrorist events, there is no more pressing example to Americans than the World Trade Center attack on September 11, 2001. The tactics of terrorism often target vulnerable sites or circumstances that are likely to kill or injure many people. This is also a challenge for law enforcement and first responders. All responders to a terrorist event should remain vigilant due to the possibility of a secondary attack specifically designed to harm responders and bystanders as they gather at the scene. An illustration of this type of danger is the 1996 Olympic Village bombing in Atlanta, Georgia. It was discovered, only after the fact, that the terrorist had placed a second device aimed directly to injure and kill responders.

## Infectious Events



The slide features a blue header with the title "Infectious Events" centered. On the left is the NCEM logo (North Carolina Emergency Management) and on the right is the EMS logo (North Carolina Office of EMS). Below the header, a list of infectious disease outbreaks is presented. At the bottom of the slide, a blue footer contains the text "State Medical Assistance Team Training" on the left and "7-10" on the right.

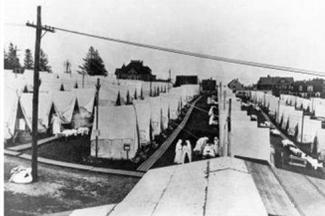
- Infectious disease outbreak
  - Biological warfare
  - 1918 influenza pandemic
  - SARS/Avian flu

According to Osterholm (2005), infectious diseases have historically been the top killers of human beings. The potential for a severe pandemic is always close at hand (Arnold, 2002). Furthermore, whether the infectious process originated from a natural source or was intentionally released as a biological warfare agent (BWA), an infectious disease outbreak in a community will stress the existing infrastructure, fabric of public health, pre-hospital, and medical surge capabilities (especially critical care) (Parker, 2006).



## Infectious Events 1918 Pandemic Influenza





- Total deaths worldwide
  - 50-100 million
- Pandemic flu in the US
  - 28% of population affected
  - Over 500,000 deaths
- Seasonal US influenza mortality near 40,000

Photo: National Archives

State Medical Assistance Team Training

7-11

The most sobering example is the influenza pandemic of 1918. It was responsible for 50-100 million deaths worldwide in just a matter of a few months. Doctors, hospitals, and responders of all kinds found themselves ill-prepared.



## Infectious Events 1918 Pandemic Influenza



- 1.7 million persons in the US would die from an equally severe strain of influenza
  - An estimated 9.9 million persons would require hospitalization in the US
  - Worldwide death estimates vary between 180-360 million
- The H1N1 pandemic of 2009 affected thousands of North Carolinians and caused 107 deaths.

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Through mathematical analysis, using the data from the 1918 pandemic and applying it to the United States (US) population in 2005, researchers project that 1.7 million persons in the US would die from an equally severe strain of influenza (Osterholm, 2005). An estimated 9.9 million persons would require hospitalization (Levin, Cadigan, Biddinger, Condon & Koh, 2009). Additionally, worldwide death estimates vary between 180-360 million, with 50% of these deaths affecting persons between the ages of 18 and 40 years (Osterholm, 2005).

With the ease and frequency of international travel, an influenza epidemic in one country can quickly spread to become a global problem. For example, Severe Acute Respiratory Syndrome (SARS) originated in rural China. Once it reached urban areas it spread to five different countries within 24 hours and to 30 countries within a few months (Osterholm, 2005). Healthcare workers are at greater risk for infection due to their higher exposure (Parker, 2006).

In planning for an infectious disease outbreak, pre-hospital triage, patient isolation, and quarantine measures should be thoughtfully considered. An overwhelming number of victims amid limited medical surge capacity (e.g., personnel and equipment) may require an alteration in the standard of care.

## Mass Gatherings



### Mass Gatherings



- Involves staging of medical assets for potential MCI
  - National conventions
  - Sporting events
  - Religious events
  - Political events
- Issues
  - Terrorism
  - Structural collapse
  - Crowd movement



Photo courtesy DHS TSA

State Medical Assistance Team Training7-13

It is also important to consider mass gatherings and their potential to become MCIs. When preparing for mass gathering events, planners must consider the possibility of a terrorist attack, structural collapse, or massive crowd surge causing injuries or deaths. During these events, additional emergency resources are staged to be ready to respond in the event there is an MCI. Some planning committees use the same incident command structure for event planning to decrease confusion and speed the response time, should the event turn from a mass gathering event into a mass casualty incident. SMATs may find themselves staged and on alert or deployed to these events.

## MCI RESPONSE PLANNING



### Mass Casualty Response Planning



- MCI plan components
  - Risk assessment
  - Organizational structure
  - Communications
  - MCI declaration
  - MCI response protocols
  - Mutual aid
  - Plan evaluation



Photo courtesy of FEMA

State Medical Assistance Team Training 7-14

### *Planning Elements of an MCI Response*

MCI's present some of the most challenging types of emergency situations for responders. Listed below are some of the common elements involved in an MCI response. The role of Incident Command at the local level, and the integration with regional, state, and federal levels are very important. Addressing issues related to communication, incident command, and operational decision-making are essential to an effective response to an MCI.

### **Incident Command**

In most cases, the establishment of Incident Command initially occurs on scene. Incident Command has the responsibility for directing the response. It should happen as soon as initial size-up suggests the possibility of an MCI. Effective leadership during MCIs depends on an established functional structure with clear organizational responsibilities (NCIPC, 2010). In the United States, response agencies use the Incident Command System (ICS), which is a component of the National Incident Management System (NIMS), as the primary functional structure for incident command.

ICS has been developed to allow for expansion or collapse of the command structure (resources and personnel) depending on the needs and size of the incident. For example, in larger incidents, the emergency operations area, as well as staging, triage, treatment, transport, and morgue areas would be established and modified to accommodate the changing operational needs of the incident. In general, the essential components of ICS are: 1) operations, 2) planning, 3) logistics, and 4) finance/administration. When responding to a large event with mass casualties, the response may be managed at two different levels: 1) a unified area command for all responders and 2) a component medical command focused on casualties.

## Communication

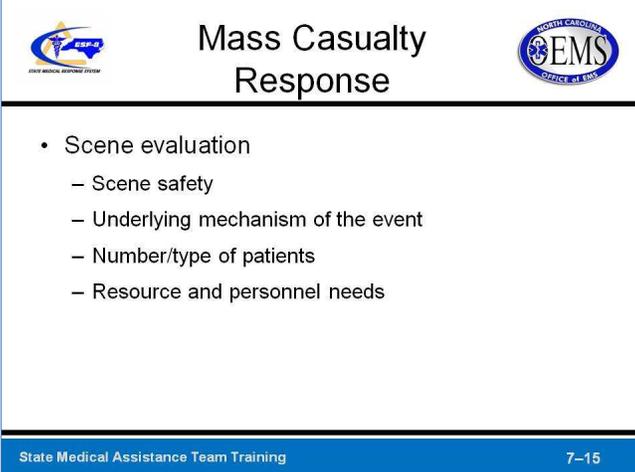
Communication can easily be considered the most crucial element in an incident response (NCIPS, 2010). Clear, effective communication is necessary in all levels of an MCI response including the planning stage. The response communication should be compliant with federal standards regarding both equipment and language (NCIPS, 2010). Lack of effective communication will compound confusion and complicate the response efforts. Due to the myriad factors that can complicate communication activities, it is important that a resilient communication plan is developed prior to the event. With a focus on interoperability, email, phones (mobile and landlines), radios, and text messaging should be considered when developing the plan.

## MCI Protocols

MCI protocols address possible variations in routine operations when responding to an MCI situation. Activation of MCI protocols should be written into the emergency response plan prior to the MCI. The creation of these protocols should occur during the planning phase to allow time to explore legal, ethical, and operational issues since these protocols may expand personnel and equipment capabilities beyond the daily routine (Courtney, Morhard, Bouri, & Cicero, 2010). For example, in many states, EMT-basics cannot give injections. However, during a declared epidemic, there are provisions for just-in-time training that expands their scope of practice for that specific crisis.

Lynn, Gurr, Memon, & Kaliff (2006) addressed issues that should be considered when developing medical MCI protocols. Some of these issues were: surge capability calculations, the number and distribution of critical personnel, planning for necessary equipment and supplies, planning for triage areas and stretcher routes, and creating a family assistance area. The authors go on to suggest that MCI protocols should be versatile, flexible, and universally adaptable.

## Scene Evaluation



The slide features a title "Mass Casualty Response" centered at the top. On the left is the logo for the National Council of Emergency Medical Services (NCEM), and on the right is the logo for the North Carolina Office of EMS. Below the title, a bulleted list outlines the components of scene evaluation. At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "7-15" on the right.

- Scene evaluation
  - Scene safety
  - Underlying mechanism of the event
  - Number/type of patients
  - Resource and personnel needs

Situational awareness by the initial responders should include a “scene size-up.” During this “size-up,” they evaluate to determine whether the situation is an MCI, whether the scene is safe, and what resources should be requested. There are five widely accepted components that should be considered during the scene evaluation. First responders need to consider scene safety, the underlying mechanism of the event, the number/type of patients, potential resource needs, and personnel needs (Limmer, Mistovich, & Krost, 2006). As the incident evolves, additional information may include the need for HAZMAT operations, a revised estimate of the number/type of casualties, and any other information that may affect initial on-scene operations. The safety consideration in size-up should also determine whether or not medical responders should establish operations at the scene. For example, in hazardous materials (HAZMAT) situations, medical operations will occur in the cold zone, which would be located a safe distance from the actual scene.

## Scene Safety

Scene safety, an important part of situational awareness, is paramount during any MCI response. First responders should perform an initial scene assessment upon arrival; however, the Incident Commander (IC) should assess the safety of operations throughout the entire event (Bates, 2009). Remember that a variety of disciplines (law enforcement, fire service, EMS, search and rescue, media, etc.) may respond to the incident. All responders should collectively cultivate an attitude of situational awareness. They need to continually assess the scene and the immediate area for safety and safety concerns (Bates, 2009). Prior to searching for casualties or treating injuries, the incident command should clear any on-scene activities (NCIPS, 2010). In larger events, there is often a dedicated Safety Officer as part of the incident command staff. A dedicated safety officer can provide the necessary focus to ensure that safety and safe operations remain a priority (Bates, 2009). However, every responder must participate in safety activities and command must enforce safe practices. Furthermore, ICs and responders should use caution and refrain from declaring the "scene is safe." This phrase may give a false sense of security when operating at a scene that is actually still vulnerable to hazards (Bates, 2009). There are many considerations when addressing scene safety that are addressed in detail in the module dedicated to *Responder Health and Safety Concerns*.

## Healthcare Impact of an MCI Response



### Healthcare Impact of MCI



Most healthcare systems are already functioning at near capacity during routine operations.



Photo Courtesy of TEEEX

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7-16

Unfortunately, most healthcare systems in the US are already functioning at a near-maximal capacity during normal daily routine operations. An MCI could easily overwhelm the existing infrastructure due to the lack of appropriate personnel, coordinating resources, equipment, facilities, and training. As a result, local community resources will be stressed by a surge of people seeking medical services during a disaster (AMA/APHA, 2007). This could potentially occur even if the local hospitals or clinics are not physically damaged due to effects of the disaster.

 Healthcare Impact of MCI 

- Patient surge capacity planning must be included in the overall MCI plan.



Photo Courtesy of USCG

State Medical Assistance Team Training 7-17

According to the Homeland Security Presidential Directive-21 (2007), the previous supposition that the established healthcare system can function effectively during catastrophic events has been proven to be incorrect by events like Hurricane Katrina and the terrorist attacks of September 11, 2001. In 2007, a consensus report published after the American Medical Association/American Public Health Association Linkages Leadership Summit conveyed that the health system infrastructure in the United States is not prepared to manage the number of casualties that would occur in a large-scale MCI.

Even though an area is not impacted by a disaster directly, it may be affected by the event through utilization of its communities and resources for sheltering or other mutual aid activities.

Currently, many health and medical preparedness plans include the concept of "surge capacity" to potentially manage a large number of victims. *Surge capacity* can be defined in several different ways depending on the situation; however, a basic definition would include a hospital, healthcare system, or a community's ability to obtain appropriate personnel, supplies/equipment, infrastructure, and support systems to provide sufficient care to a large influx of patients presenting as a result of a large-scale incident, epidemic, or disaster.



## Healthcare Impact of MCI



- Surge capacity is the ability to rapidly expand capabilities in response to overwhelmed resources due to increased demand.
- Surge capacity includes
  - Available space and patient beds
  - Personnel
  - Supplies, medications, and equipment

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Simply put, surge capacity is the ability to expand healthcare capabilities in response to a disaster. Surge capacity incorporates a complex variety of elements such as available space, patient beds, personnel (professional and non-professional), supplies, medications, and equipment (AMA/APHA, 2007). It is important to remember that adequate medical surge capacity is required, particularly for trauma patients, for the proper management of an MCI.

## Public Health and Mass Casualty Emergency Response

Public Health and MCI

---

- SMAT and Public Health must work together on mass casualty incidents.
  
- The agency/entity with responsibility for lead may change as the incident evolves.
  
- Public Health will be critical to the recovery phase.

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The public health impact of an MCI can be tremendous. Specific population-based health consequences can evolve from the disruption in societal norms, competition for scarce resources, changes in illness patterns, and increased presence of disease vectors (Fielding, Teutsch, & Breslow, 2010). The demand for services can overwhelm many local public health systems in the US. Like the healthcare system in general, the public health system is operating routinely at near capacity levels. The potential effects of civil unrest, armed conflict, population migration, housing, sanitation, water supplies, communicable diseases, and economic collapse all serve to demonstrate areas where a surge in public health needs may arise (Noji, 2005). Inadequate hygiene and sanitation caused by the disaster itself or shelter and camp overcrowding can contaminate water supplies and increase the incidence of diarrhea, respiratory infections, and other communicable diseases (Noji, 2005).

In the event of a pandemic or the emergence of a deadly new strain of influenza, the public health authorities may have to intervene with methods that have not been seen by the general public in over half a century. In 2006, Wu, Riley, Fraser and Lueng designed a study to examine the potential measures to reduce the impact of pandemic flu. The data revealed that voluntary household-based quarantine could theoretically be an effective intervention to decrease morbidity and mortality from an influenza pandemic. However, this type of intervention could be complicated by factors such as providing food and water to those in household quarantine or staffing community isolation centers (Wu, Riley, Fraser, & Leung, 2010).

# MASS FATALITY

## Definition of Mass Fatality

	<h3>Mass Fatality</h3>	
<ul style="list-style-type: none"><li>• Mass Fatality Incident: any incident involving more fatalities and/or remains than can be located, identified, and processed by available local resources</li><li>• Morgue operations<ul style="list-style-type: none"><li>– Specialized personnel</li><li>– Secure temporary morgues</li></ul></li><li>• Family Assistance Centers<ul style="list-style-type: none"><li>– Primary location for assistance and information</li><li>– Information is confidential</li></ul></li></ul>		
State Medical Assistance Team Training		7-20

*Mass Fatality Incident* (MFI) is a term used to identify any incident involving more deceased and/or human remains than can be located, identified, and processed for final disposition by available local response resources (Ropollo, 2005). An MFI occurs when there is a surge in the number of deaths, which subsequently overwhelms the resources of a medical examiner's routine operation. The number of deaths that it takes to overwhelm the medical examiner's operation will vary from community to community depending on the capacity of that operation and the number of fatalities involved.

During the initial response to Hurricane Katrina, it was assumed that the New Orleans medical examiner office was destroyed. One Disaster Medical Assistance Team (DMAT) initiated the use of its refrigerated truck to serve as a cold storage facility until additional resources arrived (Klein & Nagel, 2007).

MFI's may or may not be a result of an MCI. For example, a commercial plane crash with no survivors would be an MFI versus an MCI and it would require different resources. However, an MFI and an MCI could occur at the same time or an MCI could evolve into an MFI. Hurricane Katrina would be an example of an MFI and an MCI occurring simultaneously.

## Planning Elements of a Mass Fatality Management

	<b>Mass Fatality</b>	
<ul style="list-style-type: none"><li>• Deceased patients and remains should only be moved<ul style="list-style-type: none"><li>– Under clear direction from law enforcement</li><li>– If remains block access to live casualties</li></ul></li><li>• All remains must be treated with dignity<ul style="list-style-type: none"><li>– Block remains from public view</li><li>– Follow guidance of local law enforcement</li></ul></li></ul>		
State Medical Assistance Team Training		7-21

When mass fatality management is necessary during a disaster, the plan should be incorporated into an established Emergency Response Plan. The MFI section should outline the actions to be taken by the medical examiner and the cooperative interaction between local, public health, law enforcement, fire, HAZMAT, and federal agencies such as the Centers for Disease Control and Prevention (CDC) and Disaster Mortuary Operational Response Teams (DMORT). Any personnel or equipment resources brought in to assist with management of a mass fatality is utilized under the jurisdiction of the supervising medical examiner because the medical examiner is legally responsible for victim recovery and identification (NTSB, 2008). It is worth mentioning that traditional mass fatality management will not provide sufficient response in the event of a pandemic. In this situation, the entire nation would be affected and specific federal fatality assistance may not be available.

### Scene Operations

Scene operations at an MFI are essentially a search and recovery procedure. Victims and human remains must be recovered and tagged for identification. Initial evidence recovery also occurs at this point. When responding to MCIs, it is important for responders to realize that the deceased and/or any remains are potential evidence of criminal or negligent activity (Ropollo, 2005). In a terrorist attack, this notion may be fairly obvious; however, even during natural disasters the deceased are potential crime scene components.

### Morgue Operations

Morgues have specialized personnel who focus on the cause of death, identification, and processing of the human remains. The following morgue operational design is based on fatality management section of the emergency operations plan for Person County, NC (Person County, 2008). The mass fatality plan should be activated if the number of dead exceeds the resources of the county. When the plan is activated, the county medical examiner should immediately contact the state Funeral Directors Association. The association will subsequently notify the appropriate members of the state Funeral Directors Association. The mortuary response team is

expected to integrate operational procedures to provide sensitive, respectful, care and handling of the human remains.

A secure temporary morgue (or morgues if warranted) should be located as near as possible to the incident area. There are many factors involved in the site selection for the morgue. These include site security, the decision to place it in a remote location or hidden from public view, and sufficient space for identification procedures. Showers, hot and cold water, heat or air conditioning (depending on climate), electricity, drainage, ventilation, restrooms, parking areas, communication capabilities, and rest areas should be available. The need for special functions such as x-ray, autopsy, records maintenance, and interviewing will be driven by the incident and circumstances.

Once the temporary site has been selected, the medical examiner or mortuary response team coordinator will assign personnel to some or all of the following jobs: security, data collection/entry, counselors, interviewers, telephone communicators, general supervisor, identification personnel, personal effects custodians, embalmers, secretaries, property inventory clerks, and distribution clerks. As human remains are recovered and relocated to the temporary morgue, vital victim information will be collected and processed for the medical examiner. When authorized, mass fatality teams shall prepare, process, and release the remains for final disposition.

If the MFI overwhelms local and state resources, a Federal Disaster Mortuary Operational Response Team (DMORT) may be requested. These teams are offered through the National Disaster Medical System. The DMORTs consist of intermittent federal employees who are activated when requested. They include funeral directors, medical examiners, coroners, pathologists, forensic anthropologists, fingerprint specialists, forensic deontologists, dental assistants, radiographers, data collections and entry specialists, mental health personnel, computer specialists, administrative support staff, and security and investigative personnel. Along with personnel, the DMORTs offer access to Disaster Portable Morgue Units (DPMU). These units include a cache of equipment and supplies that DMORT personnel require to operate a temporary morgue for processing, identification, and secure storage. In addition to assisting with the processing of the deceased, the DMORTs can also provide liaison assistance to facilitate and support the family notification process (NTSB, 2008). The NC Special Mortuary Operations Response Team (SMORT) is similar to the NDMS related DMORTs. However, over time as North Carolina develops its team, there will be more emphasis on search and rescue activities.

### **Family Assistance Centers**

Family Assistance Centers (FAC) are established at nearby hotels or similar facilities. The FAC should be the primary location for any assistance and information family members will receive during the initial phases of the disaster response. Mental health and crisis specialists work with morgue personnel for notification and support of family members. Personnel who staff FACs should have technical expertise and special training in crisis response. Personal information provided by family members and victims is considered confidential and cannot be used for litigation purposes after the disaster (NTSB, 2008).

The Red Cross often offers family assistance centers. See <http://www.redcross.org>

## Health Hazards Associated with Mass Fatalities



**Health Hazards  
Fatalities**



“The presence of corpses plays a  
negligible role in the spread of infectious  
diseases”

*De Ville de Goyet , C. (PAHO, 2004)*

State Medical Assistance Team Training 7-22

There is a commonly believed myth that human and animal remains present a public health threat. However, the reality is that human remains usually do not pose a significant threat to public health. Authors from the Water, Engineering and Development Centre (WEDC) argue that the relationship between human remains and epidemics has never been scientifically demonstrated and that corpses rarely contaminate nearby water sources. Finally, the experience of the World Health Organization and the WEDC in managing incidents with large numbers of victims provides additional evidence that the presence of human remains plays a negligible role in the spread of infectious diseases (Management of the dead, 2006).

Responders handling human remains do retain a small health risk through contact with blood and body fluids (e.g., leaking feces), (Management of the dead, 2006). As such, it is important to remember that appropriate blood and bodily fluid precautions should be used when assisting with the mass fatalities management of the remains. Unique considerations could be encountered such as contamination of the scene or remains resulting from an obvious lethal substance. Procedures in this case will be guided by Incident Command in coordination with local HAZMAT and other subject matter experts available for consultation.

## MASS TRIAGE



The slide features a white background with a blue border. At the top left is the NCEM logo (North Carolina Emergency Medical Services). At the top right is the NCEM EMS logo (North Carolina Office of EMS). The word "Triage" is centered at the top. Below it, the text "Triage defined:" is followed by the definition: "Medically sorting and prioritizing patients based on need for treatment and resources available". At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "7-23" on the right.

### *Definition of Mass Triage*

The principles of mass casualty triage differ from those that are used to triage patients on a day-to-day basis. Triage is derived from the French word *trier*, which means “to sort” (Hughes, 1976). In healthcare, it refers to medically sorting and prioritizing patients based on their need for treatment and the resources that are available. It also applies to mass casualty situations when conventional standards of medical care cannot be delivered to all victims (Pesik, Keim & Iserson, 2001).

Triage Comparison	
<b>Conventional Triage</b>	<b>Mass Casualty Triage</b>
Best care for each individual	Best care for greatest number
Based on assumptions: <ul style="list-style-type: none"> <li>• Unlimited resources</li> <li>• Sickest take first priority</li> </ul>	Based on assumptions: <ul style="list-style-type: none"> <li>• Limited resources</li> <li>• Those most apt to recover are treated first</li> </ul>
Individual decision-making	Population-based decision-making

State Medical Assistance Team Training 7-24

## Triage History and Overview

### Mass Triage

Mass triage for MCIs evolved from the military's use of wartime triage. If one takes the time to consider it, the very nature of war creates conditions in which available resources are limited. The earliest known use for this type of military triage comes from the chief surgeon in Napoleon's army. Interestingly, Baron Dominique Jean Larrey was one of the first surgeons to prioritize treatment based on injury severity versus military rank (Richardson, 1974). Larrey used triage to sort which injured soldiers could be evacuated and treated quickly; these soldiers received the highest priority and were treated first, thus expediting their return to the battlefield (Richardson, 1974). As wars progressed through the years, triage and triage systems also evolved. The four-tiered triage system (i.e., minimal, delayed, immediate, and expectant) that is often used today was actually developed during the Korean War (Hughes, 1976).

Although the use of triage techniques evolved in the military setting, triage algorithms have been adopted and modified for use in the civilian situations such as the MCI. As discussed earlier in this module, the basic premise of an MCI is that the need outweighs the available resources. For this reason alone, mass casualty triage differs from that which is used to triage patients on a day-to-day basis. During an MCI situation, resource limitations force responders to change the method in which treatment is allotted. In civilian mass casualty triage, the objective is to distribute medical resources in such a way that the greatest good occurs for the greatest number of people (Pesik, Keim & Iserson, 2001). Using this concept as the guide, the treatment is directed towards those most likely to survive. Responders who are tasked with triage must sort through the victims and quickly decide which victims will benefit from immediate treatment, which victims will not, and which victims likely will die despite intervention.

## Conventional Triage

Conventional triage is the type of triage that is used on a routine basis. The basic premise of conventional triage is to provide the best care for each patient as an individual (Cone & Koenig, 2005). It is based on two vital assumptions: 1) unlimited resources and 2) that the most critically ill take first priority. Patients who require minimal care will receive treatment after those with worse illness or injury. However, everyone will eventually receive the standard of care that is expected during routine operations.

## **SMART TRIAGE<sup>®</sup>**

The following triage-related subsections and examples used throughout this module identify principles and issues faced when doing triage. However, these examples and descriptions are in no manner designed to replace the need for formal training and appropriate course completion verification regarding SMART or other triage methods utilized as a SMAT member.

## Definition of SMART Triage



### SMART Triage



- SMART Triage® is North Carolina's mandated triage package system
  - Based on START triage procedures for adults
  - Based on JumpSTART triage procedures for children generally less than 12 years of age.



State Medical Assistance Team Training7-25

SMART triage is North Carolina's preferred triage package system. It is based on START (Simple Triage and Rapid Treatment) triage procedures for adults and includes JumpSTART triage procedures for pediatrics. This provides responders with a simple, clear, and concise approach to performing triage in an MCI setting. When using this rapid triage algorithm, the responder assigns treatment priority based on the following: the ability of the patient to walk, mental status, airway patency, breathing rate, and presence of radial pulse or capillary refill. Note that JumpSTART will not be covered in this module.

Proper utilization of the SMART system helps prevent victims from being over- or under-prioritized based on visible injuries instead of actual conditions (Hill, 2010).

One key feature of SMART triage is the use of a special triage tag system. SMART triage tags allow responders to upgrade or downgrade the priority without using a new tag (Hill, 2010). It is important to continually reassess victims who have been triaged to determine whether their status has changed.

## SMART Triage Operations



### SMART Triage Elements



---

SMART Triage Identification of Victims

- Each triage category is uniformly correlated with a color:

Category	Color
Minor	Green
Delayed	Yellow
Immediate	Red
Deceased	Black



Blue corner down = Expectant

State Medical Assistance Team Training

7-26

The SMART triage system allows a limited number of responders to quickly triage a large number of casualties. It is important to recognize that responders who are tasked with triage need to focus on the rapid assessment of the number and type of casualties (immediate, delayed, minor, and deceased). Each triage category is uniformly correlated with a color: red/immediate, yellow/delayed, minor/green, expectant/red with a blue corner and black/dead. See Table 7-3, below.

**Table 7-3: Triage Tag Colors**

Category	Color
Minor	Green
Delayed	Yellow
Immediate	Red
Expectant (may not be available on some tags)	Red with blue fold-over corner
Deceased	Black

To assist with the process of sorting, each triage victim should receive a triage tag. The SMART tags should be folded in such a way that the appropriate color code appears face-up in the tag's plastic envelope. This flags the patient for priority reassessment if conditions improve and additional resources arrive. **Always note time of triage assessment on the tag.**



**Figure 7-2: Smart Triage Tag**

*TSG Associates Ltd of England. [http://en.wikipedia.org/wiki/File:SmartTag\\_TriageTag.jpg](http://en.wikipedia.org/wiki/File:SmartTag_TriageTag.jpg)*

When triaging a patient, the responder will fold the tag until they get to the color that matches the patient's triage category, and then the tag is placed into the clear plastic envelope with the appropriate color displayed. This identifies into which triage/treatment category the patient falls. Once the tag has been "readied" the responder will secure the tag on the victim where it can be seen by other responders. This tag will alert other responders and medical professionals to the triage priority of each victim. Furthermore, the presence of the tag will ensure that victims are not accidentally re-triaged by other responders performing the same task.

In addition to the color strips, triage tags have space to record additional information such as vital signs or treatment received. The person performing initial scene triage should not be filling in any of the information. Remember, the task of initial triage is to perform a quick, 30-second assessment on each victim. Detailed information can be added to the tag when the patient reaches a treatment or transport area.

The idea is to perform a quick assessment and then move on to the next victim. To perform this effectively and efficiently medical responders will utilize the mnemonic "RPM." These letters represent ® respiration, (P) perfusion, or pulse, and (M) mental status. The following diagram illustrates the clinical decision-making pathways of medical responders.

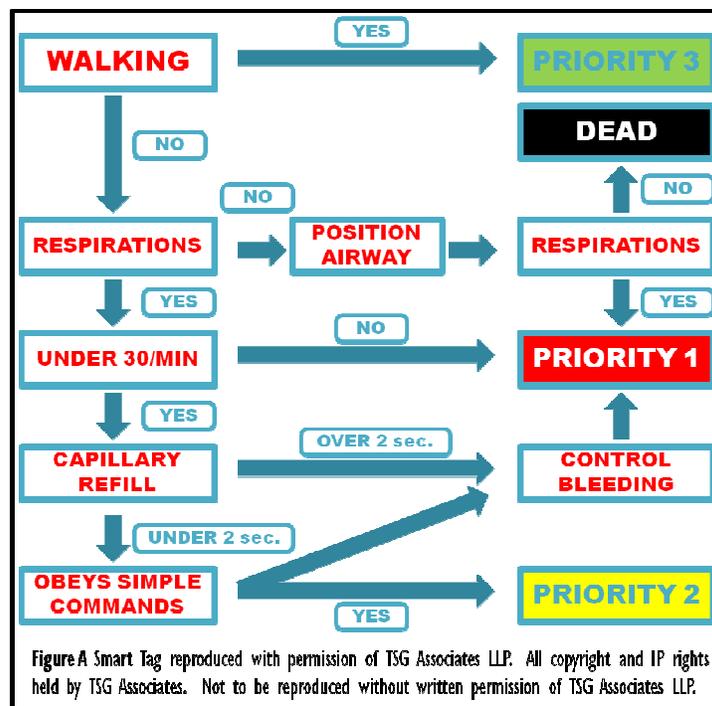
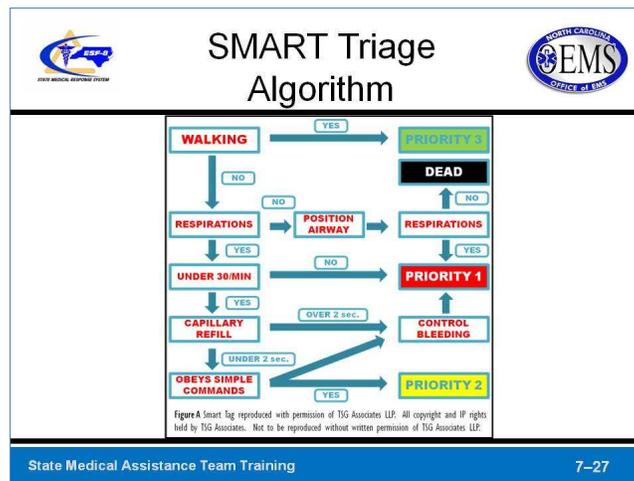
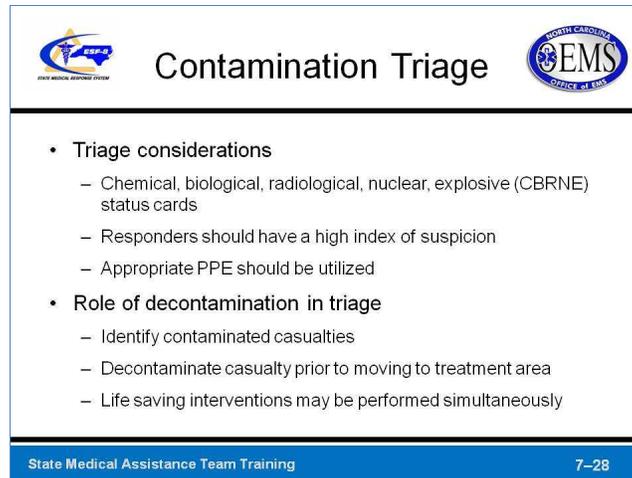


Figure 7-3 SMART Triage Algorithm

## Contamination Triage



The slide features a header with the NREPP logo on the left and the North Carolina EMS logo on the right. The title "Contamination Triage" is centered. Below the title, there are two main bullet points: "Triage considerations" and "Role of decontamination in triage". Each has three sub-bullets. At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "7-28" on the right.

**Contamination Triage**

- Triage considerations
  - Chemical, biological, radiological, nuclear, explosive (CBRNE) status cards
  - Responders should have a high index of suspicion
  - Appropriate PPE should be utilized
- Role of decontamination in triage
  - Identify contaminated casualties
  - Decontaminate casualty prior to moving to treatment area
  - Life saving interventions may be performed simultaneously

State Medical Assistance Team Training 7-28

Chemical, biological, radiological, nuclear, and explosive (CBRNE) MCI events can complicate triage and response activities. For example, when approaching any scene that may involve CBRNE agents, responders must have a high index of suspicion and be aware that the presence, identification, and verification of chemical, biological, or radiological agents may not be obvious. Until the proper authorities declare otherwise, protective clothing and respiratory protection at the appropriate level of safety must be used (Heyer, 2003).

### Initial Triage Modifications

The SMART triage tags system also addresses triage during these types of events by including CBRNE status cards to alert responders of hazards such as chemical, radiological, and biological contamination. These tags are usually very similar to primary triage tags. They can be folded and placed in the accompanying clear plastic tag envelope in such a way as to indicate that the patient is potentially contaminated. The primary information that should be displayed is contaminated/decontaminated in addition to the type of exposure. Only responders with proper training and protective gear should triage these patients.

### **Role of Decontamination in Triage**

Once the triage has taken place, if the agent has been identified it can be documented on the agent tag. If possible, the documentation should include the agent, specific signs and symptoms, and any treatments that have been administered in the field. These patients should be decontaminated prior to being moved to any treatment areas to prevent unprotected healthcare treatment teams and support personnel from exposure to the agent. When a patient has been decontaminated, the triage tag should be updated to show the change in status.

## SUFFICIENCY OF CARE

### *Definition of Sufficiency of Care*



### Sufficiency of Care

- During an MCI, the allocation of resources may be directed towards treating the largest number of persons to maximize the number of lives saved.



Courtesy of Nanci Nagel RN TX-4 DMAT

State Medical Assistance Team Training 7-29

In mass casualty triage, the focus switches from the individual to the group or population. The premise is to provide best care for the greatest number of patients. As such, responders must prioritize their decisions based on who will benefit most from the fewest resources (Pesik, Keim & Iserson, 2001). For this reason, mass casualty triage differs from conventional triage. A patient with major injuries, who concurrently has a higher possibility of survival with the least expenditure of resources, will receive first priority (Cone & Koenig, 2005). On the other hand, a patient who may die despite maximal care, may be triaged as “expectant” and not receive any treatment to save the resources for patients that have been deemed more salvageable (Klein, Pepe, Burkle, Nagel & Swienton, 2008). Making effective decisions during MCI triage will ultimately affect the degree to which the healthcare infrastructure will continue to function during and after a disaster (Jenkins, McCarthy, Saur, Green & Stuart, 2008).

## **Changes in Standard of Care Rationale**

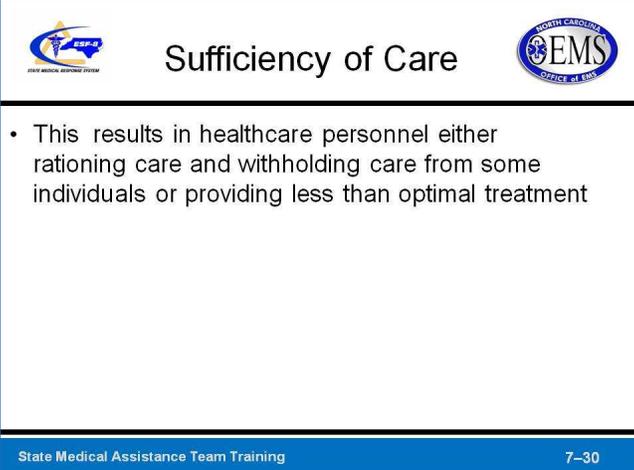
As stated throughout this module, when MCI situations overwhelm available healthcare resources, the focus for saving lives moves from the individual to the entire population. While the hope is to avoid such situations, large scale MCIs can impact existing infrastructure and reduce the ability to maintain the accepted standard of care. An example would include a disaster in which an austere environment is created. In this situation, one can easily see where providing the conventional standard of care may be impossible. Lack of sufficient power disables many of the standard diagnostic capabilities that we use today and treatment options become very limited, if not impossible (DeBoisblanc, 2005). Many medicines will be unusable due to heat or water damage and the re-supply of consumable medical products such as bandages, IV fluid, and medicine may not occur in an efficient manner (Klein & Nagel, 2007).

Practitioners may find themselves suturing lacerations while an assistant holds a flashlight or they may find themselves choosing a less than optimal antibiotic because it is the only one available. Chronic vent patients may require “hand-bagging” because there is no back-up electricity to run a mechanical vent or mechanical vents are unavailable in sufficient numbers (Klein & Nagel, 2007).

To provide the greatest good to the greatest number of victims, the standard of care is altered. This changes the allocation of medication, equipment, and other medical resources (Levin, et. Al, 2009).

To address this possibility, many states now have provisions to expand the scope of practice for various levels of healthcare personnel during disaster situations. However, it must be understood that returning to normal operations as soon as possible should remain a paramount goal during any disaster in which degradation of the standard care has occurred. It must also be understood that whether operating under the normal standard of care or sufficiency of care, the approach to patient care should be ethical and equitable.

Always remember when providing medical care in an altered environment the goal is to return to the usual expected level of care as soon as possible.

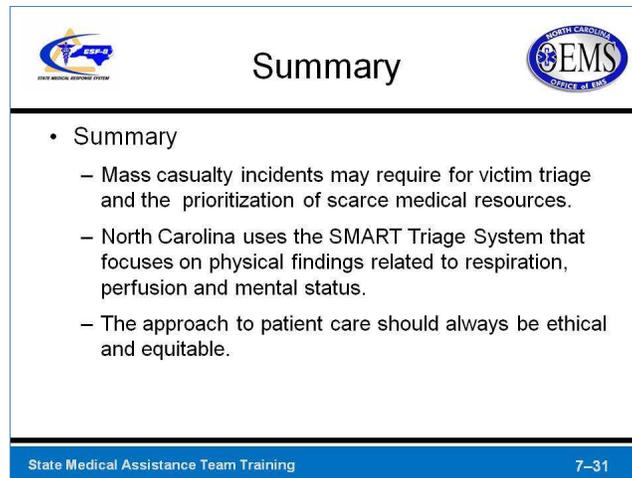


The slide features a title "Sufficiency of Care" centered at the top. To the left is the NCEM logo (National Council of Emergency Medical Services) and to the right is the North Carolina EMS logo (North Carolina Office of EMS). Below the title is a single bullet point: "• This results in healthcare personnel either rationing care and withholding care from some individuals or providing less than optimal treatment". At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "7-30" on the right.

In MCIs, when a healthcare system is overwhelmed, allocation of resources is realigned to focus on treating a large number of individuals while maximizing resources.

In this situation, the threshold for providing care, or the amount of care, changes. This results in healthcare personnel either rationing care and withholding care from some individuals or providing less than optimal treatment based on limited or non-existent resources.

## SUMMARY



The slide features a blue header with the word "Summary" in white. On the left is the "EMR-2" logo, and on the right is the "NORTH CAROLINA EMS OFFICE OF EMS" logo. Below the header, a white box contains a bulleted list. At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "7-31" on the right.

- Summary
  - Mass casualty incidents may require for victim triage and the prioritization of scarce medical resources.
  - North Carolina uses the SMART Triage System that focuses on physical findings related to respiration, perfusion and mental status.
  - The approach to patient care should always be ethical and equitable.

In summary, an MCI will occur in any situation in which the number and/or severity of victims is large enough to disrupt routine emergency and healthcare services. The very nature of an MCI in these situations forces responders to change the way treatment is allocated. This is to allow efficient use of resources for the greater good of the many versus the few. SMART and JumpSTART are types of triage used in MCI situations. Victims are prioritized into categories: red/immediate, yellow/delayed, green/minor, and black/dead or expectant. Patients should be re-triaged when they are transported from the scene to the treatment area. In the treatment area, they will receive initial intervention and a more thorough assessment. When the MCI involves chemical, biological, or radiological agents, specialized triage cards are used to provide additional information such as the specific agent and whether or not decontamination has occurred.

## **ACTIVITY: TRIAGE TAGS**

**Purpose:** The purpose of this activity is to provide SMAT class participants with a facilitated discussion and facilitator-led demonstration of the proper use of SMART Triage – Triage Tags.

**Objectives:**

Discuss mass triage terminology, including population-based decision-making in contrast to conventional triage.

Discuss casualty assignment into groups (i.e., Immediate, Delayed, Minor, Expectant and Dead categories).

Utilize SMART Triage – triage tag to properly display an assigned triage category during a facilitated discussion / demonstration.

**Time:** 30 minutes

**Materials:**

One, SMART Triage System – Triage Tag per student in attendance.

Activity PowerPoint slides listed below are to be used in sequence and will occur at the end of the lecture after the activity is introduced and the objectives explained.

**Instructor Directions:**

Ensure that each student has a SMART Triage card set.

Review the difference between conventional triage and mass triage

Present multiple simulated casualty descriptions including “RPM” (Respiration-Perfusion-Mental Status) information and injury / illness findings.

Clearly state a particular triage category (i.e., immediate) and then demonstrate the actual process leading to successfully displaying the correct category.

Demonstrate on a student volunteer or another faculty member proper attachment of the triage tag.

Read the casualty description including explaining the illness and injuries, as well as the “RPM” information to facilitate the students understanding and decision-making.

**Student Directions:**

Discuss the difference between conventional triage and mass triage

Review multiple simulated casualty descriptions including “RPM” information and injury / illness findings.

Read the casualty description including explaining the illness and injuries, as well as the “RPM” information and determine the triage category that applies.

Fold the SMART Triage card and insert into pouch.



**Module 7:**  
**MASS CASUALTY**  
**SMART Triage Tag Activity**

State Medical Assistance Team Training 7-32



## Mass Casualty Exercise



- The training with regards to SMART triage will be re-enforced with a hands-on triage exercise
- There will also be a review of the triage system to include:
  - Use of the SMART tags
  - Triage priorities
  - Triage categories



## Mass Triage



- Population-based decision making
- Prioritization grouping into categories:

Category	Color
Minor	Green
Delayed	Yellow
Immediate	Red
Deceased	Black



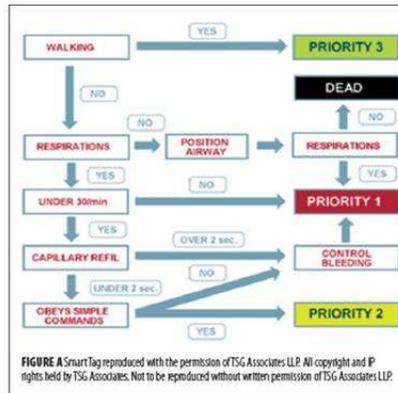
Blue corner down =  
Expectant



# Triage Decision Making



- Category Assignment:
  - illness and injury severity
  - “RPM” Assessment
    - R – Respiration
    - P – Perfusion
    - M – Mental Status



# SMART Triage Tag





## Casualty #1



- Description:
  - 18 yo F with left arm pain and is ambulatory
- Respiration:
  - 16 breaths per minute and shallow
- Perfusion:
  - Capillary refill is less than 2 seconds
- Mental Status
  - Awake, alert and follows commands



## Casualty #2



- Description:
  - 63 yo F who is non-ambulatory
- Respiration:
  - 0 breaths per minute even after airway positioning
- Perfusion:
  - Capillary refill is non-detectable
- Mental Status
  - Unresponsive



## Casualty #3



- Description:
  - 49 yo M with difficulty breathing and non-ambulatory
- Respiration:
  - 30 breaths per minute and shallow
- Perfusion:
  - Capillary refill is 2 seconds
- Mental Status
  - Awake and confused



## Casualty #4



- Description:
  - 28 yo M with chest pain and non-ambulatory
- Respiration:
  - 14 breaths per minute and shallow
- Perfusion:
  - Capillary refill is 1 second
- Mental Status
  - Awake, alert and follows commands



## Expectant Casualty



- Triage Category



- Some casualty tag systems have an expectant category for victims unlikely to survive given the available care.



## Summary



- The proper use of SMART Triage tags is an important task for every SMAT member to perform.
- Correctly displaying the assigned triage category tag is vital.
- Noting the time of each assessment on the triage tag is essential.

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# MODULE 8: HAZARDOUS MATERIALS

Training Curriculum

Length: 4 Hours (Lecture and Skills Station)

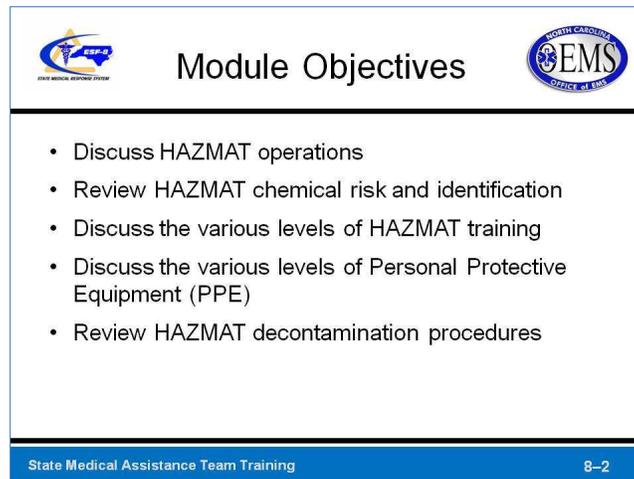
Audience: North Carolina State Medical Assistance Team personnel

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## Module Objective

To describe hazardous materials (HAZMAT) at a basic knowledge level as part of the State Medical Assistance Team (SMAT) Initial Training Program.

## Objectives



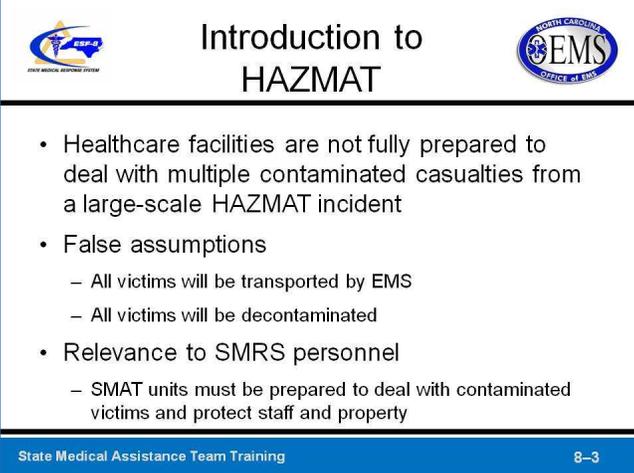
The slide is titled "Module Objectives" and features two logos at the top: the "State Medical Assistance Team" logo on the left and the "North Carolina EMS Office of EMS" logo on the right. The main content is a bulleted list of five objectives. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "8-2" on the right.

- Discuss HAZMAT operations.
- Review HAZMAT chemical risk and identification.
- Discuss the various levels of HAZMAT operations and levels of training.
- Discuss the various levels of Personal Protective Equipment (PPE).
- Review HAZMAT decontamination procedures.

## Safety Note

Hazardous materials are everywhere in our environment. They are manufactured, transported, stored and utilized in our communities on a daily basis. Safety measures will include situational awareness, the proper use of personal protective equipment and measures to prevent exposure.

## INTRODUCTION TO HAZARDOUS MATERIALS (HAZMAT)



The slide features a title 'Introduction to HAZMAT' centered at the top. On the left is the NCEM logo (North Carolina Emergency Medical Services) and on the right is the EMS logo (North Carolina Office of EMS). Below the title is a bulleted list of points. At the bottom of the slide, there is a blue footer bar containing the text 'State Medical Assistance Team Training' on the left and '8-3' on the right.

- Healthcare facilities are not fully prepared to deal with multiple contaminated casualties from a large-scale HAZMAT incident
- False assumptions
  - All victims will be transported by EMS
  - All victims will be decontaminated
- Relevance to SMRS personnel
  - SMAT units must be prepared to deal with contaminated victims and protect staff and property

Unfortunately, many communities are not prepared to handle a large number of hazardous materials (HAZMAT) casualties that might present to their hospitals (McIsaac, 2006). In 2005, despite the availability of federal guidance and funding for the implementation of HAZMAT First Receiver decontamination programs, most hospitals did not have a decontamination plan (Freyberg, Arguilla, Fertet, et al, 2008). To further complicate the situation, in many disaster planning scenarios, there has been a false expectation that victims would arrive at the emergency department via emergency medical services (EMS), fully decontaminated. While the 1995 Tokyo sarin attack was not an accidental chemical release, one of the many lessons learned from this incident was that approximately 85% of the victims self-transported to the hospital without notification (Freyberg, Arguilla, Fertel, et al, 2008). During a SMRS Deployment responders should be mindful that chemical threats may exist as a result of the damage caused by the disaster.

## HAZMAT CHEMICAL THREATS AND IDENTIFICATION



### HAZMAT Chemical Threats

- A hazardous material is any substance that is classified as flammable, combustible, explosive, toxic, noxious, corrosive, oxidizable, radioactive or irritant.
  - Typically are human-made (e.g., industrial)
  - A hazardous material spill or release can threaten health and property.
  - May require evacuation or “sheltering in place”

State Medical Assistance Team Training 8-4

A hazardous material (HAZMAT) is any substance that is classified as flammable, combustible, explosive, toxic, noxious, corrosive, oxidizable, radioactive, or irritant. Most hazardous materials are typically man-made and are released either accidentally or intentionally. A hazardous material spill or release can threaten life, health, or property. Any HAZMAT spill can potentially result in the evacuation of a few people, a section of a facility, or an entire neighborhood depending on the substance involved. In this section, we will also review various industrial hazards.

## Toxic Industrial Chemicals

	<h3>Toxic Industrial Chemicals (TICs)</h3>	
<ul style="list-style-type: none"><li>• Wide range of Toxic Industrial Chemicals (TIC)<ul style="list-style-type: none"><li>– TICs are highly regulated</li><li>– TICs are shipped throughout the US</li><li>– TICs frequently associated transportation accidents</li></ul></li><li>• Chlorine, anhydrous ammonia, and cyanide are some of the most commonly manufactured, utilized, and transported chemicals in the US</li></ul>		
State Medical Assistance Team Training		8-5

There is a wide range of toxic industrial chemicals used throughout industry. Chlorine, ammonia, and cyanides are examples of such toxic chemicals. These substances are frequently used in industry and stored throughout many communities. Although they are highly regulated, these chemicals are shipped throughout the US and present a significant transportation risk.

Many laypersons are unaware of the types and properties of the industrial chemicals that are stored or transported through their neighborhoods. Many communities are also not prepared to handle the number of victims that would be expected to present to their hospital should there be a major chemical release (Mclsaac, 2006).

	<h2>Toxic Industrial Chemicals (TICs)</h2>	
<p>Chlorine:</p> <ul style="list-style-type: none"><li>• Green-yellow pungent gas, 2 ½ times heavier than air</li><li>• Used in the municipal treatment of drinking water</li><li>• 15 million tons manufactured per year and frequently transported in large quantities</li></ul>		
		
State Medical Assistance Team Training		8-6

For example, in January of 2005, a misplaced railroad track switch led to one of the worst chlorine accidents in recent times. That event resulted from a collision of a moving train into a stationary train and subsequent derailment of 14 rail cars including one tank car carrying chlorine. Ninety tons of chlorine gas were released and vented into the surrounding area of Graniteville, South Carolina, population 7,000. As a result of the chemical release, 8 people died immediately of asphyxiation and another died while receiving hospital care. The incident also resulted in 520 recorded visits to the local Emergency Department (ED) or primary care clinic (Jones, Wills and Kang, 2010). Although chlorine production only occurs in 20 states, it is frequently transported in large quantities across the nation (Jones, Wills and Kang, 2010). Chlorine is a chemical that is commonly used in municipal treatment of sewage and drinking water. Private consumers often use the chemical in backyard pools. The US production of chlorine exceeds 15 million tons per year (Jones, Wills and Kang, 2010). It was used as a chemical warfare agent in World War I.



## Toxic Industrial Chemicals (TICs)



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Anhydrous Ammonia:

- Strong Base, pH > 12
- Common uses include: as a refrigerant, fertilizer, multiple manufacturing processes
- Used to produce plastics, synthetic fibers and resins, explosives, and numerous other chemical compounds



State Medical Assistance Team Training8-7

Ammonia is another everyday chemical used throughout the US. It has become a byproduct of human activity related to organic decomposition, run-off from fields and feedlots, waste treatment plants, and refinery/chemical manufacturing processes. Ammonia is commonly used as a fertilizer and as a household and industrial cleaner (Environmental Protection Agency, 2010). The hazards associated with ammonia include irritation of the lungs, nose, mouth, and permanent damage to eyes (Environmental Protection Agency, 2010).



## Toxic Industrial Chemicals (TICs)



Cyanide:

- Both HCN & CLCN are colorless-to-pale yellow liquids that will change into a gas at room temperature.
- Used extensively in the chemical industry
  - Low dose exposure to cyanide may produce nausea, vomiting, palpitations, confusion, and hyperventilation
  - At high doses, cyanides cause immediate collapse

State Medical Assistance Team Training 8-8

Cyanide salts are white-to-pale yellow and are used extensively within the chemical industry. However, related products can easily be used to poison food or drinks. Throughout the years, they have intermittently been used by various military and terrorist organizations and can be delivered in oral form via sodium cyanide and potassium cyanide salt or in a gaseous form such as hydrogen cyanide (HCN) and cyanogen chloride (CLCN) (Baskin, & Brewer, 2007). Both HCN and CLCN are colorless-to-pale yellow liquids that will change into a gas at room temperature. HCN has been noted to have a characteristic odor of bitter almonds, whereas CLCN causes burning pain in the victim's eyes and has an acrid choking odor. If these signs are present, they may provide enough warning to evacuate or ventilate because both chemicals need to be present in high concentration to be effective (Baskin, & Brewer, 2007). Exposure to cyanide may produce nausea, vomiting, palpitations, confusion, hyperventilation, anxiety, and vertigo. If the exposure is great enough or long enough, the previous symptoms may progress to agitation, stupor, coma, and death. At high doses, cyanides cause immediate collapse. Medical treatments do exist, but they need to be used immediately and they are somewhat complicated to use (Baskin, & Brewer, 2007).

The list of chemicals used in any given locality can be accessed via the Environmental Protection Agency (EPA) website: <http://www.epa.gov/tri/> by entering the area zip code. As an example, when the zip-code for the city of Graniteville, South Carolina, was input, the total number of on- and off-site disposals and releases was 198,169 lbs.

While it is impossible to address all the chemical risks throughout the US, this training module will provide general information and procedures for the management of these hazardous materials.

## Chemical Identification



### Aids in Chemical Identification



- Indications of a chemical release
  - Obvious spillage
  - Multiple victims
    - Exhibiting the same symptoms
    - Sudden onset of symptoms
- Material Safety Data Sheets (MSDS)
- Emergency Response Guidebook (ERG, 2008)  
<http://www.phmsa.dot.gov/hazmat/library/erg>

State Medical Assistance Team Training8-9

The first step that any first responder must perform is to quickly and accurately identify and assess field conditions to determine the proper emergency actions to employ. The primary concern for any HAZMAT response should be the safety of victims, responders, the public at large, and the environment. Early identification of the presence of potentially harmful materials is paramount to a successful response.

The US Department of Transportation (DOT) mandates strict guidelines on the proper labeling, marking, and placarding of hazardous materials used for transport through the *Emergency Response Guidebook* (ERG, 2008) <http://www.phmsa.dot.gov/hazmat/library/erg>. HAZMAT information obtained from packaging, container types, vehicle shape, labels, and placards, can help receiver/responders determine a safe response plan. Advance HAZMAT teams at the state and local level may have specific chemical agent identification equipment.

A sample MSDS for Chlorine can be found in the appendices of this module.

## LEVELS OF HAZMAT TRAINING



### Levels of HAZMAT Training



- First responders likely to witness or discover a hazardous substance release.
- First responders trained to initiate an emergency response sequence.
  - Notify the proper authorities of the release.
  - Take no further action beyond notifying the authorities of the release
- First responders with sufficient training or sufficient experience to:
  - Understand what hazardous substances are;
  - Identify the risks associated with them in an incident.

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## HAZMAT Information and Training



### HAZMAT Information

- North Carolina recognizes three levels of HAZMAT Responders
- Based on NFPA 472: Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents Current Edition: 2008
- These levels meet or exceed OSHA 29 CFR 1910.120
- Designated as Level I, II & III
  - Level I = HAZMAT Awareness & Operations
  - Level II = Technician
  - Level III = Specialist

State Medical Assistance Team Training 8-11

On a national level, various levels of training concerning HAZMAT are defined by the Occupational Safety and Health Administration (OSHA), (OSHA 29 CFR 1910.120) and are widely used throughout the United States.

The State of North Carolina recognizes three levels of HAZMAT Responders based on *National Fire Protection Association (NFPA) 472: Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents Current Edition: 2008* **that meet or exceed OSHA 29 CFR 1910.120 and that are designated as Level I, II & III.**

Level I Responder includes Awareness and Operations training (Awareness/Operations)

Level II Responder includes Operations plus advanced HAZMAT training (Technician)

Level III Responder includes above plus specialized HAZMAT training (Specialist)

If HAZMAT response is to be part of someone's official duties, they must be specifically trained and equipped for the hazards they are likely to encounter. These training requirements may include recognizing hazardous materials and knowing their respective risks, knowing how to select and use appropriate personal protective equipment (PPE), and knowing the appropriate control, containment, or confinement procedures as well as how to implement them.

## Hazardous Materials Level I Responder



### NC Level I Responder (Awareness/Operations)



- First responders who respond to releases or potential releases
- They are trained to respond in a defensive fashion
- Functions are to:
  - Contain the release from a safe distance
  - Keep it from spreading
  - Prevent exposures

State Medical Assistance Team Training8-12

North Carolina Level I responders are able to respond to hazardous material releases. They are trained to protect victims and the environment. Their actions are defensive in nature and are not directed towards technical actions designed to stop the release. North Carolina Level I responders receive a minimum of forty (40) hours of HAZMAT training, including the proper use of PPE.

## First Receivers (SMAT I)

	<h3>First Receiver Considerations</h3>	
<ul style="list-style-type: none"><li>• Healthcare workers may receive contaminated victims for treatment</li><li>• Assumes the healthcare facility is not the primary incident site</li><li>• Potential exposure of first receivers is limited to the quantity of substance arriving at the hospital as a contaminant on victims, their clothing, or personal effects</li></ul>		
State Medical Assistance Team Training		8-13

First receiver considerations (e.g., health providers at receiving hospitals) include the fact that victims transported to health care facilities may be contaminated. Hospital staff will be required to triage, decontaminate and provide medical treatment even though the healthcare facility is not the primary incident site.

## Skilled Support Personnel



### Skilled Support

- Staff who may be called on to assist contaminated victims or perform other work as a receiver in the hospital's decontamination zone
  - Examples include medical specialists or professional persons, such as engineers, custodial, or administrative.
  - Individuals receive appropriate “just-in-time training” (JIT) immediately prior to providing such services (OSHA, 1997).

State Medical Assistance Team Training 8-14

Members of the staff who have not been designated, but are unexpectedly called upon to assist a contaminated victim, or perform other work as a receiver in the hospital’s decontamination zone, are considered to be skilled support personnel. Examples include medical specialists or professional persons, such as engineers, custodial, or administrative staff. These individuals must receive “just-in-time training” (JIT) to site operations immediately prior to providing such services (OSHA, 1997).

## Hazardous Materials Level II Responder



### Level II Responder (Technician)



- More aggressive role than a responder at Level I
- Typically tasked to approach the point of release in order to stop the release of a hazardous substance



Photo courtesy of DOD

State Medical Assistance Team Training8-15

North Carolina Level II Response (Technicians) are individuals who respond to releases or potential releases for the purpose of stopping the release. These individuals assume a more aggressive role than a first responder at the operations level. They can be tasked to approach the point of release in order to stop the release of a hazardous substance.

## HAZMAT Specialist



### Level III Responder (Specialist)



- Individuals who respond with and provide technical support to Level II
- Responders possess specific knowledge of the substances they may be called upon to contain



Photo courtesy of DoD

State Medical Assistance Team Training

8-16

HAZMAT specialists are individuals who respond with and provide support to HAZMAT technicians. Their duties parallel those of the HAZMAT Level II; however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain.

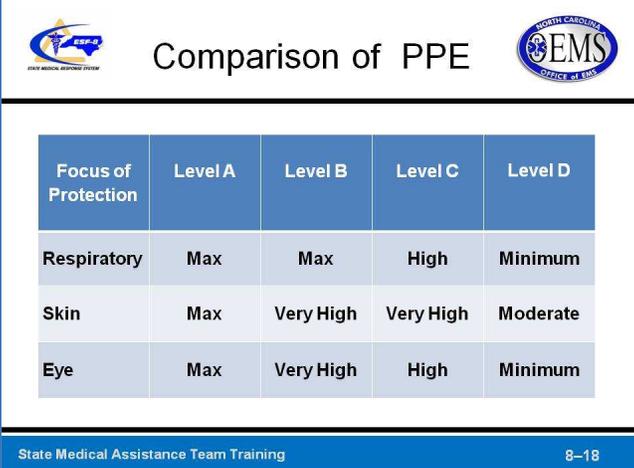
## PERSONAL PROTECTIVE EQUIPMENT (PPE)

	<b>Levels PPE</b>	
<ul style="list-style-type: none"><li>• Levels of PPE Protection<ul style="list-style-type: none"><li>– <u>Level A</u> - highest available level of respiratory, skin and eye protection</li><li>– <u>Level B</u> - require a high level of respiratory protection, but less skin protection</li><li>– <u>Level C</u> - lower level of respiratory protection and same level of skin protection as level B</li><li>– <u>Level D</u> - typical level of Universal precautions utilized on a daily basis</li></ul></li></ul>		
State Medical Assistance Team Training		8-17

### *Selecting Appropriate Level of PPE*

The individual components of clothing and equipment must be assembled into a full protective ensemble of PPE that protects first receivers or responders from the site-specific hazards.

## Levels of Protection



The chart is titled "Comparison of PPE" and features logos for the North Carolina Emergency Medical Services (NCEM) and the North Carolina Office of EMS. The chart compares four levels of protection (Level A, Level B, Level C, and Level D) across three focus areas: Respiratory, Skin, and Eye. The protection levels are: Level A (Max), Level B (Max/Very High), Level C (High/Very High), and Level D (Minimum/Moderate/Minimum).

Focus of Protection	Level A	Level B	Level C	Level D
Respiratory	Max	Max	High	Minimum
Skin	Max	Very High	Very High	Moderate
Eye	Max	Very High	High	Minimum

State Medical Assistance Team Training 8-18

Levels of PPE to use to prevent exposure to hazardous materials have been established depending upon the threat. There are four levels of PPE for HAZMAT operations: Level A, Level B, Level C, and Level D that are highlighted below.

**Table 8-1: Comparison Chart for Types of Protection by Level of PPE**

Types	Level A	Level B	Level C	Level D
Respiratory	Max	Max	High	Minimum
Skin	Max	Very High	Very High	Moderate
Eye	Max	Very High	High	Minimum

## Level A PPE



### Level A



- Pressure-demand, full face piece self-contained breathing apparatus (SCBA) or pressure demand supplied air respirator with escape SCBA
- Fully-encapsulating, chemical resistant suit
- Inner chemical-resistant gloves
- Chemical-resistant safety boots/shoes



Photo courtesy of DoD

State Medical Assistance Team Training8-19

OSHA Level A PPE provides the following:

Pressure-demand, full-face piece (self-contained breathing apparatus)SCBA or pressure-demand supplied air respirator with escape SCBA

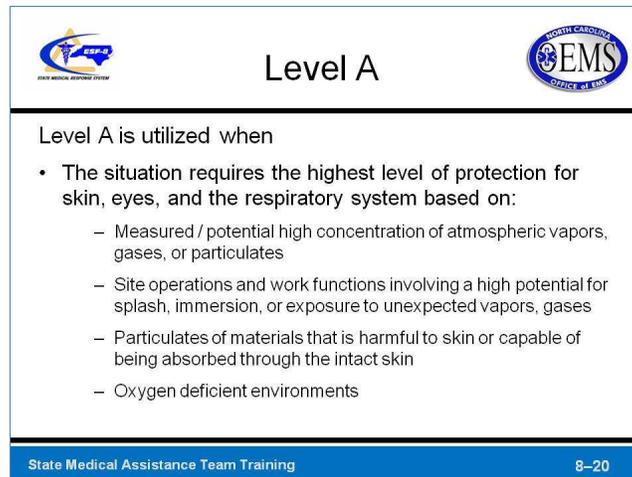
Fully-encapsulating, chemical resistant suit

Inner chemical-resistant gloves

Chemical-resistant safety boots/shoes



**Figure 8-1: Example of Level A PPE**



The slide is titled "Level A" and is framed by a blue border. At the top left is the NCEM logo (North Carolina Emergency Medical Services) and at the top right is the EMS logo (North Carolina Office of EMS). The main content area is white with a black border. Below the title, it states "Level A is utilized when" followed by a bulleted list of conditions. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "8-20" on the right.

Level A

Level A is utilized when

- The situation requires the highest level of protection for skin, eyes, and the respiratory system based on:
  - Measured / potential high concentration of atmospheric vapors, gases, or particulates
  - Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases
  - Particulates of materials that is harmful to skin or capable of being absorbed through the intact skin
  - Oxygen deficient environments

State Medical Assistance Team Training 8-20

Level A PPE provides the highest available level of respiratory, skin and eye protection. Descriptive features of situations likely to require this level of protection are listed below:

A chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on:

- Measured (or potential for) high concentration of atmospheric vapors, gases, or particulates
- Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases
- Particulates of materials that are harmful to skin or capable of being absorbed through the intact skin
- Oxygen deficient environments

## Level B PPE



### Level B



- Pressure-demand, full face piece SCBA or pressure-demand supplied-air respirator with escape SCBA
- Suit: Chemical-resistant clothing (one- or two piece disposable chemical splash suit)
- Inner and outer chemical resistant gloves
- Chemical-resistant safety boots/shoes



Photo courtesy of Aislinn DEC

State Medical Assistance Team Training8-21

OSHA Level B PPE requirements consist of the following:

- Pressure-demand, full-face piece self-contained breathing apparatus (SCBA) or pressure- demand supplied-air respirator with escape SCBA
- Suit: Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit disposable chemical-resistant one-piece suit)
- Inner and outer chemical resistant gloves
- Chemical-resistant safety boots/shoes



**Figure 8-2: Example of Level B PPE**

	<h2>Level B</h2>	
<p>When Level B is utilized</p> <ul style="list-style-type: none"><li>• The chemical type and atmospheric concentration of substances have been identified:<ul style="list-style-type: none"><li>– Requires a high level of respiratory protection</li><li>– Less skin protection (does not represent a severe skin hazard)</li><li>– Environments that do not meet the criteria for use of air purifying respirators.</li></ul></li><li>• Use when it is highly unlikely that the work being done will generate:<ul style="list-style-type: none"><li>– High concentrations of vapors, gases, or particulates</li><li>– Splashes of material that will affect exposed skin.</li></ul></li></ul>		
State Medical Assistance Team Training		8-22

Level B PPE descriptive features of situations likely to require this level of protection are listed below:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection but less skin protection and do not represent a severe skin hazard or that do not meet the criteria for use of air purifying respirators.
- Use only when the vapor or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin.
- Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates, or splashes of material that will affect exposed skin.

## Level C PPE



### Level C



- Full-face piece, air-purifying, canister-equipped respirator
  - Powered Air Purifying Respirator (PAPR)
  - Negative Pressure Fitted Respirator
- Suit: Chemical-resistant clothing (hooded, one- or two piece chemical splash suit)
- Inner and outer chemical resistant gloves
- Chemical-resistant safety boots/shoes



Photo courtesy of U.S. FHS

*Level C affords the same level of skin protection as level B, but a lower level of respiratory protection*

State Medical Assistance Team Training8-23

OSHA Level C PPE requirements consist of the following:

- Full-face piece, air-purifying, canister-equipped respirator
  - Powered Air Purifying Respirator (PAPR)
  - Negative Pressure Fitted Respirator
- Suit: Chemical-resistant clothing (hooded, one- or two piece chemical splash suit)
- Inner and outer chemical resistant gloves
- Chemical-resistant safety boots/shoes
- Level C PPE affords the same level of skin protection as level B PPE, but a lower level of respiratory protection

 **Level C** 

**Full-face piece, air-purifying, canister-equipped respirator**

<b>Powered Air-Purifying Respirator (PAPR)</b>	<b>Negative Pressure Fitted respirator</b>
	

Photos courtesy of CDC

State Medical Assistance Team Training 8-24



**Figure 8-3: Example of Level C PPE**

## Level D PPE



### Level D



- Coveralls or gown, typically regarded as a duty uniform
- Safety glasses, face shield, or chemical splash goggles
- Affords limited respiratory and skin protection
- Gloves



Public domain.

**This is the typical level of Universal precautions utilized by healthcare workers on a daily basis.**

State Medical Assistance Team Training8-25

OSHA Level D PPE consists of the following:

- Coveralls or gown, typically regarded as a duty uniform
- Safety glasses, face shield, or chemical splash goggles
- Affords limited respiratory and skin protection
- Gloves

This is the typical level of protection used in Standard Precautions by healthcare workers on a daily basis.

## Other Factors Concerning PPE Levels



### Factors Concerning PPE Levels



Physiological factors that affect the ability to wear PPE include:

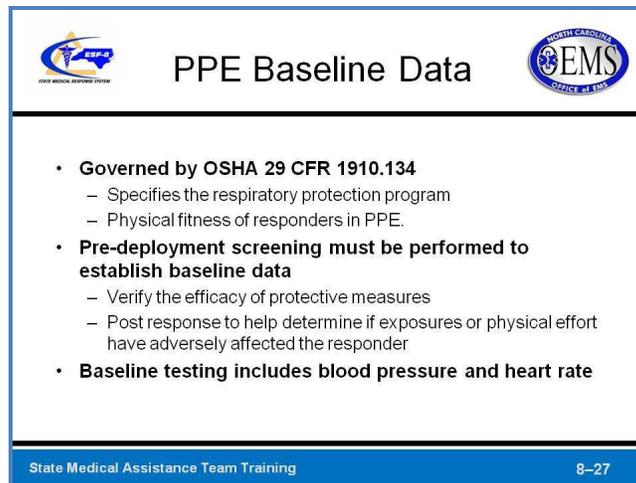
- Physical condition
- Level of acclimatization
- Age
- Weight
- Pre-existing health conditions

State Medical Assistance Team Training8-26

PPE decreases operator performance. The magnitude of this effect varies considerably, depending on the individual and the PPE ensemble used. In addition, physiological factors may affect the responder's ability to function using PPE and may include:

- Physical condition
- Level of acclimatization
- Age
- Weight
- Pre-existing health conditions

## Baseline Exposure Data



The slide is titled "PPE Baseline Data" and features logos for NIOSH (National Institute for Occupational Safety and Health) on the left and the North Carolina Office of EMS on the right. The main content is a bulleted list of requirements. At the bottom, it includes the text "State Medical Assistance Team Training" and the slide number "8-27".

- **Governed by OSHA 29 CFR 1910.134**
  - Specifies the respiratory protection program
  - Physical fitness of responders in PPE.
- **Pre-deployment screening must be performed to establish baseline data**
  - Verify the efficacy of protective measures
  - Post response to help determine if exposures or physical effort have adversely affected the responder
- **Baseline testing includes blood pressure and heart rate**

Pre-deployment screening can be used to establish baseline data and to subsequently verify the efficacy of protective measures and to later determine if exposures have occurred. Baseline testing typically includes blood pressure and heart rate.

OSHA has significant medical requirements for employers who require employees to work in hazardous environments.

## DECONTAMINATION



The slide features a blue header with the text "Decontamination" centered. On the left is the logo for the State Medical Assistance Team (SMAT), and on the right is the logo for the North Carolina Office of EMS. Below the header, a list of bullet points is presented. At the bottom of the slide, a blue footer contains the text "State Medical Assistance Team Training" on the left and "8-28" on the right.

- System for physical removal, adsorption, and neutralization of contaminants
- The decision to decontaminate
  - Based on the nature of the contaminant
  - The type/severity of the illness or injury incurred
- Immediate decontamination may be an essential part of life-saving
- Decontamination may aggravate the injury or delay definitive care
- Decontamination at some level should be performed prior to victims being transported

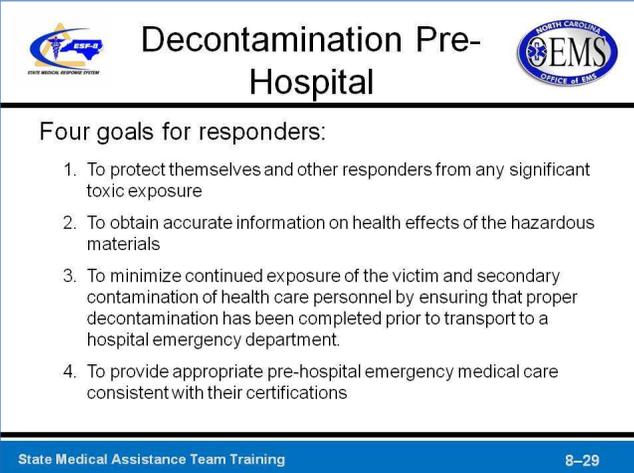
As a first receiver or responder of patients who may have been exposed to hazardous materials, you will need to have some knowledge of proper decontamination procedures and techniques. Formal awareness level and operator level courses exist to address these training needs.

When planning for decontamination in medical emergencies, procedures should be developed for decontaminating the victim, protecting medical personnel, and disposing of contaminated protective equipment and wash solutions. The decision whether or not to decontaminate a victim should be based on the nature of the contaminant and the type/severity of the illness or injury incurred. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay definitive care. In general, if decontamination does not interfere with essential treatment, it should be performed prior to victims being transported.

### *Decontamination Procedures*

Decontamination procedures are an integral part of any site-specific safety and health plan. These procedures must be developed, communicated to all workers, and implemented prior to entering the hazardous site. Personnel designated for these roles should have appropriate awareness and operator level training and equipment.

## General Decontamination Goals for Pre-Hospital Responders



**Decontamination Pre-Hospital**

Four goals for responders:

1. To protect themselves and other responders from any significant toxic exposure
2. To obtain accurate information on health effects of the hazardous materials
3. To minimize continued exposure of the victim and secondary contamination of health care personnel by ensuring that proper decontamination has been completed prior to transport to a hospital emergency department.
4. To provide appropriate pre-hospital emergency medical care consistent with their certifications

State Medical Assistance Team Training 8-29

The emergency medical services pre-hospital personnel responding to a hazardous materials incident have four main goals:

- To protect themselves and other pre-hospital receivers from any significant toxic exposure.
- To obtain accurate information on health effects of the hazardous materials.
- To minimize continued exposure of the victim and secondary contamination of health care personnel by ensuring that proper decontamination has been completed prior to transport to a hospital emergency department.
- To provide appropriate pre-hospital emergency medical care consistent with their certifications.

## Decontamination Factors



### Decontamination Factors



- The number of victims
- Toxicity and amount of material on victim
- Length of time victim exposed to the material
- Concentration of hazardous material
- Physical properties of the hazardous material
- Ambient temperatures



Photos courtesy  
of NEMA

State Medical Assistance Team Training

8-30

Decontamination is the process of removing or neutralizing contaminants that have accumulated on victims, patients, responders, personnel, and/or equipment. It is critical to health and safety at response facilities. Decontamination protects responders from hazardous substances that may contaminate victims exposed on a HAZMAT site. It protects all personnel by minimizing the transfer of harmful materials into clean areas; it helps prevent mixing of incompatible chemicals, and it protects the community by preventing uncontrolled transportation of contaminants.

Factors that relate to the degree and difficulty of the decontamination process are listed below:

- The number of victims
- Toxicity and amount of material on each victim
- Length of time victim was exposed to the material
- Concentration of hazardous material
- Physical properties of the hazardous material
- Ambient temperatures

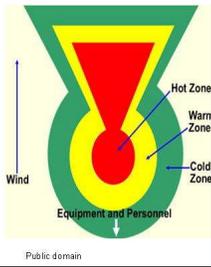
## Contamination Zones during Emergency Response



### Contamination Zones



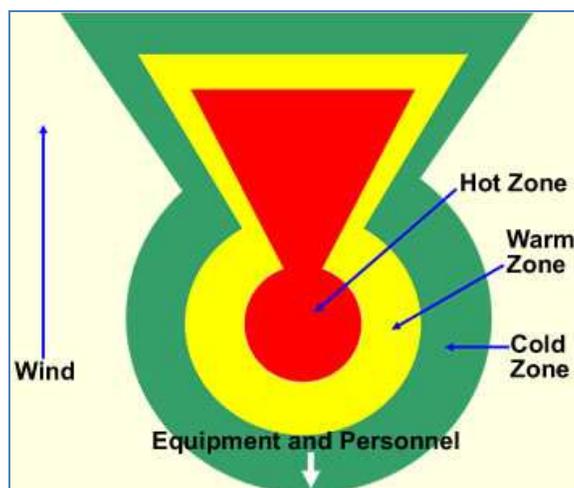
- At the release site areas called Zones are delineated depending on the concentration of the chemical released
- Entry and exit strictly controlled
- Typically there are three (3) zones identified
  - Exclusion Zone (Hot Zone)
  - Contamination Reduction Zone (Warm Zone)
  - Cold Zone



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8-31

To reduce the unintended spread of hazardous substances by responders and patients returning from the contaminated area to the clean area, specific geographic zones related to the degree of contamination risk should be delineated. The establishment of these zones will help ensure that personnel are properly protected against hazardous materials.

During HAZMAT operations the geographic area is typically organized into three zones of operation.



**Figure 8-4: Contamination Zones during Emergency Response**



## Contamination Zones



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### Exclusion Zone (Hot Zone)

- Area surrounding a hazardous materials incident and the involved material itself
  - Extends far enough away from the material to prevent further exposure and adverse effects to personnel outside the zone
  - The concentration of the material is at or near the Immediate Danger to Life and Health (IDLH) level
  - Only entered by HAZMAT Level II responders and/or Specialists with the appropriate level of PPE

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State Medical Assistance Team Training 8-32

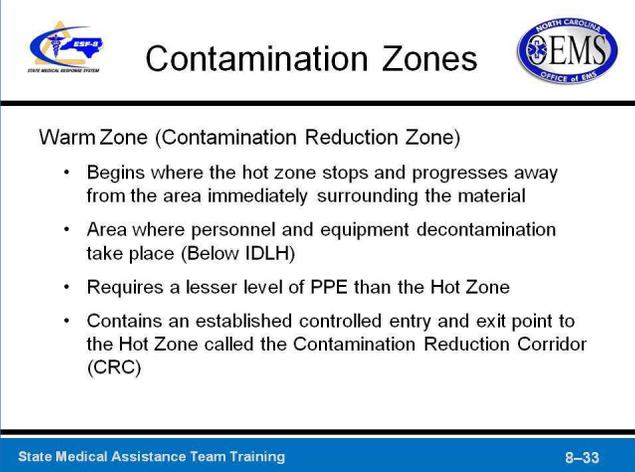
An **Exclusion Zone** (e.g. Red Zone or Hot Zone) is where the chemical release occurs and the chemical concentration is the highest and may pose immediate danger to life and health.

It is an area surrounding a hazardous materials incident and includes the involved material itself.

It extends far enough away from the material to prevent further exposure and adverse effects to personnel outside the zone.

The concentration of the material is at or near the Immediate Danger to Life and Health (IDLH) level.

It is only entered by HAZMAT Level II responders and/or Specialists with the appropriate level of PPE.



The slide is titled "Contamination Zones" and features two logos at the top: the NCEM logo on the left and the North Carolina EMS logo on the right. The main content describes the "Warm Zone (Contamination Reduction Zone)" with a bulleted list of characteristics. At the bottom, there is a blue footer bar with the text "State Medical Assistance Team Training" on the left and "8-33" on the right.

### Contamination Zones

Warm Zone (Contamination Reduction Zone)

- Begins where the hot zone stops and progresses away from the area immediately surrounding the material
- Area where personnel and equipment decontamination take place (Below IDLH)
- Requires a lesser level of PPE than the Hot Zone
- Contains an established controlled entry and exit point to the Hot Zone called the Contamination Reduction Corridor (CRC)

State Medical Assistance Team Training 8-33

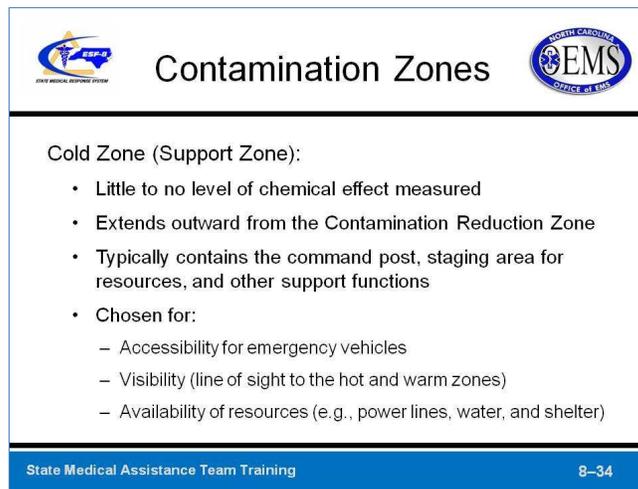
The **Contamination Reduction Zone** (e.g., Yellow Zone or Warm Zone) is an area where the chemical threat has been reduced and where decontamination will generally occur with appropriate PPE.

This zone begins where the hot zone stops and progresses away from the area immediately surrounding the material.

It is the area where personnel and equipment decontamination take place. (Below IDLH)

It requires a lesser level of PPE than the Hot Zone.

It contains an established controlled entry and exit point to the Hot Zone called the Contamination Reduction Corridor (CRC).



The slide features a title 'Contamination Zones' centered at the top. On the left is the EMSA logo (Emergency Medical Assistance) and on the right is the NCEM logo (North Carolina EMS Office of EMS). Below the title, the text describes the 'Cold Zone (Support Zone)' with a bulleted list of characteristics and selection criteria. The slide footer contains 'State Medical Assistance Team Training' on the left and '8-34' on the right.

## Contamination Zones

Cold Zone (Support Zone):

- Little to no level of chemical effect measured
- Extends outward from the Contamination Reduction Zone
- Typically contains the command post, staging area for resources, and other support functions
- Chosen for:
  - Accessibility for emergency vehicles
  - Visibility (line of sight to the hot and warm zones)
  - Availability of resources (e.g., power lines, water, and shelter)

State Medical Assistance Team Training 8-34

The **Support Zone** (e.g., Green Zone or Cold Zone) is the uncontaminated area where workers should not be exposed to hazardous conditions and decontaminated victims are transferred for medical treatment. The movement of personnel and equipment among these zones should be minimized and restricted to specific access control points to prevent cross-contamination from contaminated areas to clean areas.

Here, there is little to no level of chemical effect measured.

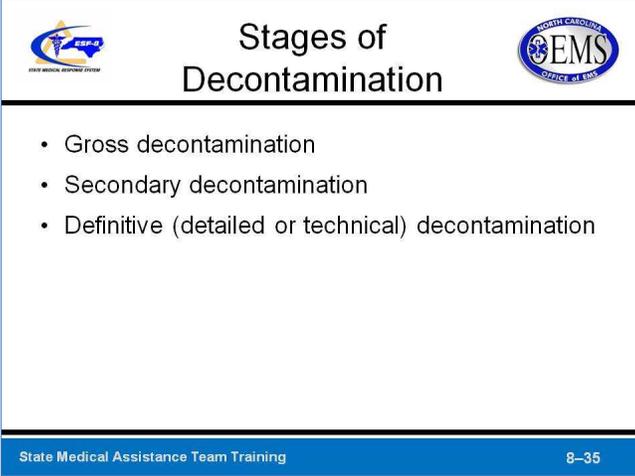
It extends outward from the Contamination Reduction Zone

It typically contains the command post, staging area for resources, and other support functions.

It is chosen for:

- Accessibility for emergency vehicles
- Visibility (line of sight to the hot and warm zones)
- Availability of resources (e.g., power lines, water, and shelter)

## Stages of Decontamination



The slide features a title "Stages of Decontamination" centered at the top. To the left is the logo for the North Carolina Emergency Medical Services (NCEM) with the text "NORTH CAROLINA EMERGENCY MEDICAL SERVICES" below it. To the right is the logo for the North Carolina Office of EMS with the text "NORTH CAROLINA OFFICE OF EMS" below it. The main content area contains a bulleted list of three stages. At the bottom, a blue footer bar contains the text "State Medical Assistance Team Training" on the left and "8-35" on the right.

Stages of Decontamination

- Gross decontamination
- Secondary decontamination
- Definitive (detailed or technical) decontamination

State Medical Assistance Team Training 8-35

Generally, the decontamination process involves three stages: gross, secondary, and definitive (detailed or technical) decontamination.

## Gross Decontamination



### Stages of Decontamination



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Gross Decontamination

- Evacuate victims from the high-risk area
- Remove the victim's clothing
  - Dry decontamination
  - Removes 80%-90% of contaminants
- Consider a one-minute head-to-toe rinse with water (hasty decon)
- *Try and contain the runoff*



Photo courtesy of NCEMMS

State Medical Assistance Team Training

8-36

Evacuate victims from the high-risk area.

Remove the victim's clothing.

- Dry decontamination
- Removes 80% - 90% of contaminants

Consider a one-minute head-to-toe rinse with water (hasty decon).

*Effort should be made to contain the runoff.*

## Secondary Decontamination



### Stages of Decontamination



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#### Secondary Decontamination

- Perform a quick full-body rinse with water
- Wash rapidly with soap and water from head to toe
- Rinse with water from head to toe



Photos courtesy of EMSA

State Medical Assistance Team Training

8-37

Perform a quick full-body rinse with water.

Wash rapidly with soap and water from head to toe.

Rinse with water from head to toe.



**Figure 8-5: Secondary Decontamination**

In the absence of a rapidly accessible warm water decontamination capability, one option would be to provide a sheltered area for patients to undress and remove potentially contaminated clothing. This may also be a good solution for victims who are thought to be potentially contaminated and health care professionals who are waiting for the decontamination capability to be deployed

## Definitive (Detailed or Technical) Decontamination



### Stages of Decontamination



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Definitive (Technical) Decontamination

- Decontamination of suited personnel
- Decontamination of equipment
  - Bleach (household bleach solution—for equipment only)



Photo courtesy of FEMA

State Medical Assistance Team Training

8-38

Definitive decontamination involves decontamination of suited personnel and equipment. To decontaminate equipment, use a solution of household bleach and water.



**Figure 8-6: Definitive Decontamination**

## Patient Decontamination Principles

	<h3>Decontamination Principles</h3>	
<ul style="list-style-type: none"><li>• Respect modesty</li><li>• Keep children with parents if possible</li><li>• Decon team assists victims as needed</li><li>• Tracking system should exist to follow victim and belongings through the process.</li><li>• Belongings may not be returned to victim if they are considered dangerous or may be used for evidence.</li></ul>		
State Medical Assistance Team Training		8-39

- Respect modesty.
- Keep children with parents if possible.
- Decon Team assists victims as needed.
- Tracking system should exist to follow victim and belongings through the process.
- Belongings may not be returned to the victim or family if they are considered to be dangerous or must be held as evidence.

## Decontamination Processes Overview

	<h3>Decontamination Processes</h3>	
<p>Dry decontamination is:</p> <ul style="list-style-type: none"><li>• A system for the physical removal, adsorption, and neutralization of contaminants</li><li>• Ideal for victims with vapor exposure only</li><li>• Used as a precursor to wet decontamination</li><li>• Remove clothing and moving victims to safe treatment area</li><li>• Usually suitable for most victims</li></ul>		
State Medical Assistance Team Training		8-40

### Dry Decontamination

A system for the physical removal, adsorption, and neutralization

Ideal for victims with vapor exposure only

Used as a precursor to wet decontamination

Remove clothing and move victims to safe treatment area.

Usually suitable for most victims



**Figure 8-7: Dry Decontamination**



## Decontamination Processes



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**Wet Decontamination**

- Symptomatic or visibly contaminated victims should have wet decontamination
- Water and soap/detergent
  - Recommended solution for victims
  - Others are available but are generally expensive or impractical
  - Not too hot or too cold! (recommend 90° F)



Photo courtesy of FEMA

State Medical Assistance Team Training

8-41

### Wet Decontamination

Symptomatic or visibly contaminated victims should have wet decontamination

#### Water and Soap/Detergent

Recommended solution for victims

Others are available but are generally expensive or impractical

Not too hot or too cold! (recommend 90° F to keep skin pores from opening)



**8-8: Wet Decontamination**

 **Decontamination Processes** 

**Ambulatory Victims**

Receivers/responders in Level C PPE

- Dry decontamination then:
  - Rinse from head to toe
  - Wash with soapy water for 3-5 minutes
  - Clean open wounds first
  - Then head to toe
- Rinse and dry off
- Monitor for completeness

  
Photo courtesy of FEMA

State Medical Assistance Team Training 8-42

### Ambulatory Victims

Receivers/responders in Level C PPE:

- Dry Decontamination first, then
  - Rinse from head to toe.
  - Wash with soapy water for 3-5 minutes.
  - Clean open wounds first
  - Then head to toe
- Rinse and dry off
- Monitor for completeness



## Decontamination Processes



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Non-ambulatory Victims

- Level C PPE
- Resource intensive
  - Lifting
  - Moving
  - Washing
- Safety issues
  - Slips and falls
  - Lifting



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8-43

### Non-ambulatory Victims

<b>LEVEL C PPE</b>	
<ul style="list-style-type: none"> <li>• Resource intensive                             <ul style="list-style-type: none"> <li>- Lifting</li> <li>- Moving</li> <li>- Washing</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Safety issues                             <ul style="list-style-type: none"> <li>- Slips and falls</li> <li>- Lifting</li> </ul> </li> </ul>



**Figure 8-9: Decontamination Non-ambulatory Victims**

## SUMMARY

	<h3>SUMMARY</h3>	
<ul style="list-style-type: none"><li>• New SMAT decon members may choose to work towards NC HAZMAT Level I certification.</li><li>• Recognition of hazardous materials</li><li>• Identification of levels of PPE</li><li>• Use of various processes involved in patient decontamination</li></ul>		
State Medical Assistance Team Training		8-44

With completion of this module, new SMAT decon members may choose to work toward NC HAZMAT Level I certification. This includes knowledge of hazardous risks, recognition of hazardous materials and incidents, the levels of PPE required, and setting up a basic decontamination operation. Understanding emergency decontamination principles, organizational structure, and key roles and responsibilities related to hazardous materials is important for the safety of each SMAT member.



**Figure 8-10: Typical SMAT III Decontamination Setup**

**This module provided minimal awareness training.**

**It does not certify you, nor does it qualify you to wear Level A, B, or C PPE.**

<http://www.nfpa.org/> About the codes

<http://www.teex.org> Hazardous materials and WMD awareness course URO6OR

<http://www.ncdoi.com/osfm/> NC Hazardous Materials Responder Certification

## ACTIVITY: PERSONAL PROTECTIVE EQUIPMENT (PPE)/SMAT DECONTAMINATION UNIT

 <b>Hands On Skill Station - PPE</b> 
<ul style="list-style-type: none"> <li>• Demonstration and practice of:             <ul style="list-style-type: none"> <li>– Donning PPE</li> </ul> </li> <li>• Performance of tasks             <ul style="list-style-type: none"> <li>– Walking</li> <li>– Talking</li> <li>– Litter carry</li> </ul> </li> <li>• Demonstration and practice of:             <ul style="list-style-type: none"> <li>– Doffing of Level C PPE</li> </ul> </li> </ul>
<small>State Medical Assistance Team Training</small> <span style="float: right;"><small>8-45</small></span>

 <b>Hands On Skill Station- Decon</b> 
<ul style="list-style-type: none"> <li>• Set up the Reeves System</li> <li>• Demonstration and practice of wet decontamination of patients on litters</li> </ul>
<small>State Medical Assistance Team Training</small> <span style="float: right;"><small>8-46</small></span>

**Purpose:** The HAZMAT“hands on” activity was designed to provide an opportunity for SMAT/SMRS personnel to observed and participate in the use of PPE and decontamination activities. This field activity will also introduce the SMRS/SMAT Responder to the typical elements of an SMAT III Decontamination Unit. This activity is not an approved awareness or operator level instruction and should not be construed as preparing the responder at the OSHA HAZMAT Operator Level.

The intended use of this learning activity is to provide basic foundation knowledge of Personal Protective Equipment (PPE) and decontamination procedures affiliated with the State of North Carolina State Medical Response System (SMRS) and State Medical Assistance Teams (SMATs). As a team member of the SMRS / SMAT the response may be to a site where a CBERNE or Hazardous Material release has occurred and it is imperative that all Responders who anticipate being active in potentially hazardous environments must be equipped with the recommended PPE and trained in its proper use. This activity does not and is not intended to provide that level of expertise in the utilization of PPE and decontamination procedures but rather to serve as an introduction to basic tenants of PPE and decontamination. This activity will provide a foundation of knowledge on PPE and decontamination procedures to build upon and through further training and exercise lead the SMRS / SMAT team member to that level of knowledge, skills and abilities. It is only by attending formal OSHA approved level courses, recurrent training and practice will the SMRS /SMAT Responder be at the requisite level of expertise to perform these skills in an actual response.

This activity is also suitable for the familiarization of all levels of First Responders as to the basic fundamentals of the utilization of Personal Protective Equipment (PPE) and the essential tenants of decontamination procedures. It is in no way intended to imply this training activity will prepare the SMRS/SMAT Responder to the level of North Carolina or OSHA certification of an Operations Level Responder.

## REEVES system overview

Following is a formal link to the Reeves site for specific manuals that describe in detail each of the components of the Reeves Decontamination System.

<http://www.reevesems.com/Supportandhelpdesk/SupportManuals.aspx>

### Objectives:

- Review the proper donning and doffing procedures for PPE.
- Develop familiarity with the equipment of OSHA Level C PPE.
- Don and doff PPE under the supervision of trained instructors and technicians.
- Remove potentially contaminated PPE.
- Discuss limitations of PPE in the context of the field activity.
- Demonstrate the setting up and taking down of a Reeves Decontamination Shelter (SMAT III Decontamination Unit).
- Discuss the elements of typical SMAT III Decontamination Trailer.
- Discuss Ambulatory and perform Non-Ambulatory (litter) decontamination procedures.

**Time:** 3 hours

### Materials:

- Student Manual
- Student Handout (read-ahead material) that describes proper sequencing of Donning and Doffing of PPE

## Personal Protective Equipment:

The following list implies that each article of equipment is provided for each student or pairs of students.

### Respiratory Protection:

- NIOSH approved Powered Air Purifying Respirator (PAPR) or
- NIOSH approved Negative Pressure Respirator
  - Requires Fit-testing
  - Requires Strict adherence to OSHA 29 CFR 1910.134
  - Requires a formal heat stress program

### Protective Suits:

- Tyvek or equivalent splash resistant chemical suit (OSHA Level B / C)
  - For training a paper / Mylar disposable suit may be more cost-effective
  - Tyvek suits used for training **MAY NOT** be utilized for response
  - Response suits are single use ONLY!

- Multiple manufactures of suit (DuPont, Kappler, North, etc.)

**Gloves:** Impermeable and protect against liquid chemical agents and vapor hazards

- Inner gloves
  - Cotton inner liners, or
  - Latex, or
  - Nitrile
- Outer Gloves –Must protect against liquid chemical agents and vapor hazards
  - Butyl Rubber 7 or 14 mm thickness
  - Silver Shields™ or equivalent

**Boots / Vinyl Overshoes:** Protect feet from contamination by all known agents for up to 24 hours following contamination; for up to 14 days if not contaminated

- Black or Green Vinyl Over boots
- Specifically designed chemical boots
- **Chemical or Duct Tape**

### **Equipment Requirements/Recommendations:**

- Backboards or litters (4 to 8)
  - Number depends on number of substations you desire and have equipment for.
  - Need one simulated contaminated (“dirty”) backboard and one “clean” to transfer decontaminated “clean” victim too.
- Sawhorses or stanchions for litters or backboards
  - One pair per substation, decon line
- Buckets
  - Two to four per decon substation
- Soft sponges
  - Four to eight per substation
- Soft brushes
  - Two to four per substation
- Water hose
  - Length dependant on water source
  - May simulate water if none available at training site
- Soap
  - Mild household dish detergent, minimal perfume or additives.
- Manikins (2 to 4) suitable for decontamination

- Rescue Randy or equivalent that will withstand hard use and water
- Trauma Shears (6 to 12 pairs)
- Paper gowns or old clothing to dress manikins
- Large Trash Bags
  - Large plastic garbage cans -30 gallon plus
- Number is personal preference
- SMAT III Trailer and Equipment

### **Instructor Directions:**

1. The recommendation is a maximum of 20 SMAT students for each rotation of this skills station.
2. Use approximately one instructor for every 4-6 students
3. Management of the Field Activity:
  - a. The limiting factors for the activity training are the number of students and the amount of equipment available for training. For example if you only have 10 respirators you can only have 10 students donning and doffing at one time. Ideally you will have a group size and the required equipment to don and doff the entire group or one-half the group at a time and run two sessions, i.e. Group A performs the don and doff procedures and Group B assists as helpers. Then you would reverse roles and Group B would don and doff with Group A assisting them. (Demonstrates the Buddy System).
  - b. After the first group dons their PPE you may move into the non-ambulatory decontamination portion of the activity to allow the students the feel of performing this activity while in PPE as they would be if this were an actual event. This is valuable as it demonstrates the limited dexterity and stresses encountered while in PPE. An alternative is to allow the groups to don and doff and then move to the decontamination skills without PPE.
  - c. For the decontamination portion, ideally the group will be subdivided into smaller groups (decon teams) of four to six persons. Depending on the availability of equipment (especially the number of manikins or live victims) and the number of instructors, all decon teams may perform the process at the same time. In most cases you will in all likelihood have two teams performing at the same time. The remaining teams will observe and provide critique of the process while awaiting their turn to perform.
  - d. A visual measurement of the effectiveness of the decontamination procedure may be obtained by applying a fluorescent dye (such as fluorescein) to the manikin (out of sight of the students) and after the students decontaminate expose the manikin to an Ultra Violet (Wood's Light, black light) source.

- e. For the Set-up and Take Down of the Reeves Decontamination System (SMAT III Unit) the Instructor will discuss each of the elements of the Trailer (Shelter, Generator, Water Heater, etc.). Following is a formal link to the Reeves site for specific manuals that describe in detail each of the components of the Reeves Decontamination System.  
<http://www.reevesems.com/Supportandhelpdesk/SupportManuals.aspx>
4. Activity lesson plan

### **Student Directions:**

1. Use the buddy system!
2. Follow all directions from your instructor(s).
3. See additional instructions on following pages.

<b>Personal Protection Equipment and Decontamination Field Activity Overview</b>		
<b>Timeline (hrs)</b>	<b>Activity</b>	<b>Duration</b>
0:00 – 0:30	Setting up a Reeves Decontamination Unit	30 minutes
0:30 – 0:45	Overview of Personal Protection Equipment Rational for utilization of equipment. Overview of decontamination and rational of usage.	15 minutes
0:45 – 1:00	Level C Demonstration of Negative Pressure respirators Brief Demo of PAPR (more in depth during actual Donning) Level D Discussion of nature of Level D Point out that in all likelihood they are wearing level D (uniform)	15 minutes
1:00 – 1:45	Donning of PPE Ensemble Divide Class into pairs (Buddy System) Suit-up Respiratory protection Body Protection (Suit) Hand Protection Foot Protection Skills Walking Communications Simple hand tasks (picking up objects) Four (4) person litter carry with dummy	45 Minutes
1:45 - 2:15	Litter Decontamination Soap and water only for humans and animals Start at the face and wipe central to peripheral, around the eyes, nose and mouth Cut clothing from victim	30 Minutes

	<p>Head to toe</p> <p>Cut clothing joint to joint</p> <p>Dip scissors in decon solution after each cut</p> <p>Remove clothing</p> <p>Roll clothing central to peripheral</p> <p>Log roll patient to remove clothing</p> <p>Place all clothing in contaminated bag / container</p> <p>Wash victim with sponges / soft bristle brush central to peripheral</p> <p>Log Roll victim, wash back, remove “dirty” backboard and move victim to “clean” backboard</p>	
2:15 – 2:30	Doffing of PPE Ensemble	15 minutes
2:30 – 3:00	Take down of a Reeves Decontamination Unit	30 minutes

## **ACTIVITY: ATTACHMENT A: DONNING OF PERSONAL PROTECTIVE EQUIPMENT (PPE)**

### **LOOSE-FITTING PAPR WITH TYVEK SUIT**

Industry accepted procedures developed by the US Military, OSHA, NIOSH and the Civilian Community exist for donning of PPE.

While there are incorrect procedures, there are also multiple variations of acceptable procedures. The following checklist is an example of a widely accepted procedure.

***Use of the buddy system is mandatory!***

1. Wear underclothing as a minimum.
  - a. It is recommended to wear either a long sleeve shirt and long pants or
  - b. Long underwear under the suit.
2. If regular clothing is worn under the suit, empty pockets of all personal effects that could damage the suit.
3. Tuck pants legs into socks to make it easier to put on the suit legs.
4. Wear shoes.
  - a. If donning a suit with booties, wear a lightweight shoe under the bootie
  - b. This is dependent on what Boot / Over Boot is utilized
5. Place both legs into the suit.
  - a. more easily done while seated
6. Don the vinyl overshoes or Protective Boot
  - a. Place both feet, with shoes on, into the overshoes.
  - b. Button the overshoes.
  - c. Pull down the splashguards over the tops of the overshoes or boots.
  - d. On suits without booties, tape the pant legs to the overshoes.

- i. A folded-over tab on the tape end will help when removing the tape later
7. Stand up and pull the suit up to facilitate putting on the motor-blower.
8. Place the motor-blower back cover against the lower back with
  - a. the breathing tube (hose) extended upward
  - b. Filters pointing downward.
9. Fasten the belt with the motor-blower around the waist.
10. Turn on the battery.
11. Verify air flow to the hood.
12. Don cooling vests or communication equipment
13. Don the gloves.
  - a. Remove the arms from the suit.
  - b. Put on the inner glove (cotton glove liners, latex or nitrile) then the outer glove (Butyl Rubber gloves or Sliver Shields™.)
  - c. Insert the arms into the suit, leaving the suit open.
  - d. Tape suit cuffs to the outside of the gloves
    - i. Take care not to tape so tightly as to restrict arm movement.
14. Pull the hooded respirator over the head.
15. Adjust the headband wraps. (if present on your model)
16. Adjust the elastic neck seal so it fits under the chin
17. Fully zip up the suit
  - a. Make sure the Velcro flap or adhesive strip over the zipper is sealed or
  - b. Tape the suit seam if so desired or if local protocol requires

## **ACTIVITY: ATTACHMENT B: DOFFING OF PERSONAL PROTECTIVE EQUIPMENT (PPE)**

### **LOOSE-FITTING PAPR WITH TYVEK SUIT**

Industry accepted procedures developed by the US Military, OSHA, NIOSH and the Civilian Community exist for doffing PPE.

While there are incorrect procedures, there are also multiple variations of acceptable procedures. The following checklist is an example of a widely accepted procedure.

***Use of the buddy system is mandatory!***

1. Decontaminate (Technical Decon) if the suit has been exposed to a chemical agent. (wet exposure)
2. Remove the hooded PAPR, turning the hood inside out while touching only its **outside** surface.
3. Remove the motor-blower unit.
4. Unbuckle the overshoes.
5. With the rubber gloves on, unseal and unfasten the front of the suit, touching only the **outside** of the suit.
6. Remove one arm from the rubber gloves through the sleeve, touching only the inside of the suit. The inner gloves (white glove liners or latex / nitrile) may be left on but should never touch the outside of the suit.
7. Remove the other arm in the same manner.
8. Roll the suit down your body from the **inside** out to the ankles, touching only the **inside** of the suit.
9. Remove one foot from the suit and overshoe and place the foot in a **clean** area.
10. Remove the other overshoe and step into the clean area.
11. Remove the glove liners and toss them back out of the **clean** area.
12. If the suit has been exposed to a chemical agent, ensure that it is bagged for proper disposal. (Even if decontaminated)
13. Shower, making sure that all skin crevices and hair are cleaned thoroughly.

## APPENDIX A: MATERIALS SAFETY DATA SHEET

### SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

SUBSTANCE: CHLORINE

MTG MSDS 22; CHLORINE MOLECULAR; DIATOMIC CHLORINE; DICHLORINE;  
MOLECULAR

TRADE NAMES/SYNONYMS:

CHLORINE; UN 1017; Cl<sub>2</sub>; MAT04600; RTECS FO2100000

CHEMICAL FAMILY: Halogens: gas

### SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

CAS NUMBER: 7782-50-5

COMPONENT: CHLORINE

PERCENTAGE: 100.0

### SECTION 3 HAZARDS IDENTIFICATION

NFPA 704 RATING:

HEALTH=4

FIRE=0

REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: yellow or green

PHYSICAL FORM: gas

ODOR: distinct odor, irritating odor

MAJOR HEALTH HAZARDS: harmful if inhaled, respiratory tract burns, skin burns, eye burns

PHYSICAL HAZARDS: Containers may rupture or explode if exposed to heat. May ignite combustibles.

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: burns, chest pain, difficulty breathing, headache, dizziness, hyperactivity, emotional disturbances, bluish skin color, lung damage, death

LONG TERM EXPOSURE: burns, skin disorders, lack of sense of smell, lung damage

SKIN CONTACT:

SHORT TERM EXPOSURE: burns

LONG TERM EXPOSURE: burns

EYE CONTACT:

ACME Corp:

1313 Mocking Bird Lane

SHORT TERM EXPOSURE: Redness, burns

LONG TERM EXPOSURE: buns, scarring

SHORT TERM EXPOSURE: ingestion of harmful amounts is unlikely

LONG TERM EXPOSURE: ingestion of harmful amounts is unlikely

#### **SECTION 4 FIRST AID MEASURES**

**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

**SKIN CONTACT:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

**EYE CONTACT:** Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**INGESTION:** Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. Give large amounts of water or milk. Allow vomiting to occur. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

**NOTE TO PHYSICIAN:** For inhalation, consider oxygen. Avoid gastric lavage or emesis.

#### **SECTION 5 FIRE FIGHTING MEASURES**

**FIRE AND EXPLOSION HAZARDS:** Negligible fire hazard. Oxidizer. May ignite or explode on contact with combustible materials.

**EXTINGUISHING MEDIA:** water

Do not use dry chemicals, carbon dioxide or halogenated extinguishing agents. Large fires: Flood with fine water spray.

**FIRE FIGHTING:** Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. For small fires, contain and let burn. Use extinguishing agents appropriate for surrounding fire. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuation radius: 800 meters (1/2 mile).

## **SECTION 6 ACCIDENTAL RELEASE MEASURES**

**AIR RELEASE:** Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste.

**SOIL RELEASE:** Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Absorb with sand or other non-combustible material. Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash).

**WATER RELEASE:** Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash). Absorb with activated carbon. Collect spilled material using mechanical equipment.

**OCCUPATIONAL RELEASE:** Stop leak if possible without personal risk. Avoid contact with combustible materials. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

## **SECTION 7 HANDLING AND STORAGE**

**STORAGE:** Store and handle in accordance with all current regulations and standards. Protect from physical damage. Keep separated from incompatible substances. Store outside or in a detached building.

Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

## **SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION**

**EXPOSURE LIMITS:**

**CHLORINE:**

1 ppm (3 mg/m<sup>3</sup>) OSHA ceiling

0.5 ppm (1.5 mg/m<sup>3</sup>) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)

1 ppm (3 mg/m<sup>3</sup>) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)

0.5 ppm ACGIH TWA

1 ppm ACGIH STEL

0.5 ppm (1.45 mg/m<sup>3</sup>) NIOSH recommended ceiling 15 minute(s)

**VENTILATION:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**EYE PROTECTION:** Wear splash resistant safety goggles with a faceshield. Provide an

emergency eye wash fountain and quick drench shower in the immediate work area.

**CLOTHING:** Wear appropriate chemical resistant clothing.

**GLOVES:** Wear appropriate chemical resistant gloves.

**RESPIRATOR:** The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

5 ppm

Any chemical cartridge respirator with cartridge(s) providing protection against this substance.

Any supplied-air respirator.

10 ppm

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with cartridge(s) providing protection against this substance.

Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against this substance.

Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

Escape -

Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

## **SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL STATE:** gas

**COLOR:** yellow or green

**ODOR:** distinct odor, irritating odor

**MOLECULAR WEIGHT:** 70.906

**MOLECULAR FORMULA:** Cl<sub>2</sub>

**BOILING POINT:** -31 F (-35 C)

**FREEZING POINT:** -150 F (-101 C)

VAPOR PRESSURE: 5168 mmHg @ 21 C

VAPOR DENSITY (air=1): 2.49

SPECIFIC GRAVITY: Not applicable

DENSITY: 3.214 g/L @ 0 C

WATER SOLUBILITY: 1.46% @ 0 C

PH: Not applicable

VOLATILITY: Not applicable

ODOR THRESHOLD: 0.01 ppm

EVAPORATION RATE: Not applicable

VISCOSITY: 0.01327 cP @ 20 C

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable

SOLVENT SOLUBILITY: Soluble: alkali

### **SECTION 10 STABILITY AND REACTIVITY**

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid contact with combustible materials. Minimize contact with material.

Avoid inhalation of material or combustion by-products. Keep out of water supplies and sewers.

INCOMPATIBILITIES: combustible materials, bases, metals, halogens, metal salts, reducing agents, amines, metal carbide, metal oxides, oxidizing materials, halo carbons, acids

HAZARDOUS DECOMPOSITION: Thermal decomposition products: chlorine

POLYMERIZATION: Will not polymerize.

### **SECTION 11 TOXICOLOGICAL INFORMATION**

CHLORINE:

TOXICITY DATA:

293 ppm/1 hour(s) inhalation-rat LC50

CARCINOGEN STATUS: ACGIH: A4 -Not Classifiable as a Human Carcinogen

LOCAL EFFECTS:

Corrosive: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Toxic: inhalation

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: heart problems

TUMORIGENIC DATA: Available.

MUTAGENIC DATA: Available.

REPRODUCTIVE EFFECTS DATA: Available.

## **SECTION 12 ECOLOGICAL INFORMATION**

ECOTOXICITY DATA:

FISH TOXICITY: 390 ug/L 96 hour(s) LC50 (Mortality) Orangethroat darter (*Etheostoma spectabile*)

INVERTEBRATE TOXICITY: 637.5 ug/L 1 hour(s) LC50 (Mortality) Pacific oyster (*Crassostrea gigas*)

ALGAL TOXICITY: 50-1000 ug/L 23 hour(s) (Population) Algae, phytoplankton, algal mat (Algae)

PHYTOTOXICITY: 20 ug/L 96 day(s) (Growth) Water-milfoil (*Myriophyllum spicatum*)

## **SECTION 13 DISPOSAL CONSIDERATIONS**

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

## **SECTION 14 TRANSPORT INFORMATION**

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Chlorine

ID NUMBER: UN1017

HAZARD CLASS OR DIVISION: 2.3

LABELING REQUIREMENTS: 2.3; 8

ADDITIONAL SHIPPING DESCRIPTION: Toxic-Inhalation Hazard Zone B

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME: Chlorine

ID NUMBER: UN1017

CLASSIFICATION: 2.3, 8

## **SECTION 15 REGULATORY INFORMATION**

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):

CHLORINE: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):

CHLORINE: 100 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):

CHLORINE: 10 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes  
CHRONIC: No  
FIRE: No  
REACTIVE: No  
SUDDEN RELEASE: Yes  
SARA TITLE III SECTION 313 (40 CFR 372.65):  
CHLORINE  
OSHA PROCESS SAFETY (29CFR1910.119):  
CHLORINE: 1500 LBS TQ  
STATE REGULATIONS:  
California Proposition 65: Not regulated.  
CANADIAN REGULATIONS:  
WHMIS CLASSIFICATION: ACD1E  
NATIONAL INVENTORY STATUS:  
U.S. INVENTORY (TSCA): Listed on inventory.  
TSCA 12(b) EXPORT NOTIFICATION: Not listed.  
CANADA INVENTORY (DSL/NDSL): Not determined.

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# MODULE 9: BASE CAMP OPERATIONS

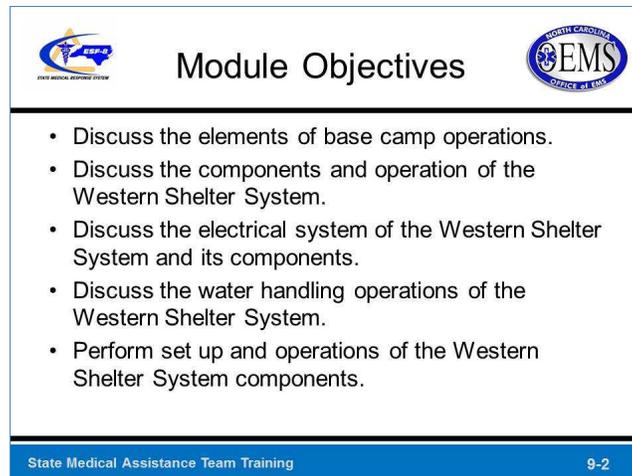
Training Curriculum

Length: 4 Hours (Lecture and Skills Station)

Audience: North Carolina State Medical Assistance Team personnel

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## Objectives



The slide is titled "Module Objectives" and features two logos at the top: the "EMT-A" logo on the left and the "NORTH CAROLINA EMS" logo on the right. The main content is a bulleted list of five objectives. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "9-2" on the right.

- Discuss the elements of base camp operations.
- Discuss the components and operation of the Western Shelter System.
- Discuss the electrical system of the Western Shelter System and its components.
- Discuss the water handling operations of the Western Shelter System.
- Perform set up and operations of the Western Shelter System components.

- Discuss the elements of base camp operations.
- Discuss the components and operation of the Western Shelter System.
- Discuss the electrical system of the Western Shelter System and its components.
- Discuss the water handling operations of the Western Shelter System.
- Perform set up and operations of the Western Shelter System components.

Note: This module is a “hands-on” skills station guide that is designed to facilitate the linear flow of instructional materials (Linear Operations Training) and practice specific skills under the direct supervision of instructors.

## Safety Note



### Safety Note



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Be constantly aware of multiple hazards.

- **Shelter setup:** pinch points, heavy items, and moving pieces while using proper lifting techniques
- **Electrical system:** electrocution, heat injury, or even death
- **General hazards:** trip and fall hazards such as power cords and rescue equipment
- **Water hazards:** water purification and water temperature

State Medical Assistance Team Training9-3

Throughout the deployment, team members will need to be aware of multiple hazards when moving around the base camp. When setting up the shelter system or moving heavy equipment, it is important to be aware of pinch points, heavy items, and moving pieces while using proper lifting techniques. The electrical system requires attention to the risk of electrocution, heat injury, or even death. Other hazards may provide trip and fall hazards such as power cords and rescue equipment. The water handling system will require that the team regularly inspect the quality of water to assure that its potable status is maintained. There is also a risk of scalding water temperatures, so it is important to only adjust the water heater temperature controls if properly trained.

## ***Common Safety Considerations for Base Camp Operations***

- Never approach a helicopter from the rear (tail) section.
- Do not approach aircraft while propellers are still in motion.
- Do not approach or use lift gates until authorized by the load master.
- Use proper body mechanics and lifting techniques at all times.
- Use additional team member(s) to help move heavy objects.
- Coordinate all lifts and moves with other lift team members by using counts such as “lift on 3.”
- Wear safety gloves to protect hands from pinch points.
- Avoid wearing loose clothing or articles that can catch on equipment or projections.
- Use “break-away” safety lanyards for badges and personal items.
- Clear pathways when possible when moving large or heavy objects.
- Avoid walking backwards with load when possible, or use a spotter.
- Secure all ground lines, cords, hoses to walking surface, cover or locate out of pathways.
- Avoid stringing any elevated line, cords, hoses, etc. below head level.
- Avoid placing any equipment or objects in pathways.
- In dim light situations, walk in lighted areas when possible or use personal lighting equipment.
- Use safety off switches before attempting to plug/unplug electrical equipment.
- Never unplug electrical equipment by pulling on the electrical cord.
- Test water temperature for safety before entering shower.
- Do not adjust water heater temperature unless properly trained and authorized to do so.
- Use a buddy system or contact system when in field or away from Base Camp.

## BRIEFING AND INTRODUCTION TO TECHNICAL MANUALS



Base Camp Operations



Effective base camp operations are the backbone of field medical operations.



Photo Courtesy of NCOEMS

State Medical Assistance Team Training 9-4

Living and working in a base camp under field conditions presents many challenges in an already difficult mission to provide clinical services at the disaster site. The base camp must meet the many needs for all the missions it serves. It also needs to be a safe and comfortable living environment for responders. While some deployments last only a couple of days, other mobilizations may last months and require the rotation of staff. Effective base camp deployment and ongoing operations will be important to every member of SMRS/SMAT who might be deployed during an emergency. The medical care mission must be superimposed on a foundation of effective base camp operations to provide medical services in an austere environment.



## Base Camp Transportation Issues



- Designated drivers
- Ensure communication with each vehicle in convoy
- Pre-determined route, fuel points, rest areas, road load limits, bridges, etc.



State Medical Assistance Team Training9-5

Ensure that those chosen as designated drivers are experienced, and hold the appropriate drivers license endorsements (i.e., M-8 requires a CDL).

Prior to departure, ensure all in the convoy are familiar with radio operation and that all radios are all on the selected channels/frequencies.

**SAFETY NOTE:** The drivers should not be operating the radio while driving so it is imperative that each vehicle has a co-driver/navigator who is responsible for operating the radio/communication.

Pre-planning is the key to every operation. Determine the safest most direct route. Consider road limits, road closure or impassable roads. Ensure that all in the convoy maintain safe distances and speed. If at all possible try to pre-determine fuel points, rest breaks and bathroom breaks.

Drivers are responsible for the safety and accountability of all in their vehicle.



## Base Camp Site Selection





- Ease of Ingress/Egress
- Uphill, upwind, upstream, etc.
- Level terrain
- Ensure proper drainage
- Proper lighting
- Free of hazards

Photo Courtesy of Western Shelter

State Medical Assistance Team Training9-6

Selecting the location for your base camp is the first step in creating a safe and secure work area for both responders and patients. You will need an area capable of facilitating the deployment of the shelter system along with the ability to handle patient movement. This area's size and shape will dictate how many shelters will be set up, how team members and patients will move around, and how well the site can be secured. The site selection will also need to address environmental impacts such as water drainage, surrounding hazards, and terrain types.



## Base Camp Organization



- Incident Command System (ICS)
  - Operations section
    - SMAT leadership
  - Planning section
  - Finance section
  - Logistics section



Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-7

A base camp is like a small city in that it must accommodate the feeding, security, sleeping, sanitation, and transportation needs of all its residents. There must be an orderly process to accommodate all of these activities and integrate into the overall emergency response. Consequently, base camp operations are usually managed along Incident Command Structure (ICS) guidelines. Medical care activities generally fall under Operations section as one of the critical activities. Resupply and the management of equipment are overseen by the Logistics section. The Finance section will manage financial resources and ensure accountability while the Planning section works to ensure that plans are properly developed and resourced. The Safety Officer reports directly to the Incident Commander.

The main purpose of the Module 9 – Base Camp Operations is to make prospective SMRS/SMAT personnel aware of the essential equipment and systems that SMAT uses to support its mission in the field.

In addition, a range of skills in support of Base Camp implementation skills are considered an important foundation for all personnel. These include setting up the shelter, along with its lighting fixtures and showers. This training will be conducted as a hands-on activity, along with striking the shelter and proper storage of the equipment. Below is a list and a brief of description of the critical equipment that will be used to support this SMAT instruction:

**M-8 Trailer System:** The M-8 Mobile Response Trailer System provides for the transport of shelters, generator, fuel, and the HVAC system. It requires a level area, preferably a hard surface, with vehicle accessibility for refueling the trailer. The generator will need to be grounded. This is best done by installing a grounding rod in soft terrain (grass or dirt). With the size of the M-8 trailer (55 feet), you will need to be certain that it can maneuver safely without impacting tree branches, power lines, or other hazards. It is capable of transporting many of the essential items for base camp operations. Lift gate operations and electrical set-up requires specific training.

**Shelter System:** These shelters can be deployed on most terrains. Proximity to the M-8 trailer is also important to accommodate the electrical distribution system. Each of the shelter systems comes completely packaged within one of the storage cases and requires one (1) trained person with 4-6 team members and usually takes between 45-60 minutes to

completely erect. It is best to use the one (1) trained person as the team leader who then directs the other members of the team through the shelter set up steps. This person should also be responsible for inventory management to make sure that all items are accounted for during the set-up and take-down. As each shelter is completed, installation of the light and electrical accessories can begin. HVAC units and main electrical distribution is normally handled by the Logistics Officer or designate team member.

**Electrical System:** The M-8 trailer is equipped with an electrical generator that is intended to supply power to the entire base camp. This electrical system is installed and managed by the Logistic Team. It is important to be aware of the electrical system and the multiple supply cables to avoid trip hazards, electrical hazards and exhaust hazards.

**Water Handling System:** The system includes the necessary items for showering and toilet needs. The intended use of this system is to connect the Hygiene Center to the shelter and create a showering and toilet area for patient and team use. It begins with a Water Purification unit that will provide clean, potable water to the 150-gallon potable water storage bladder. From the potable water bladder, the water is pumped to the propane water heater through the supplied (on demand) pump assembly. This pump is activated whenever a faucet or shower is activated. Once a faucet or shower is activated the pump pushes water to the water heater, which turns on and off automatically. Once the water has been used, it is pumped into a 150-gallon gray-water storage bladder. The gray-water storage bladder will need to be emptied once full. In some locations, the bladder can be drained into a local storm drain but most areas require the gray-water storage bladder to be emptied by a septic company.



## Base Camp General Considerations



- Security
- Access
- Safety
- Communications
- Environmental health
- Water supply
- Food service
- Living/Sleeping area
- Waste Water disposal

Among the general considerations as you decide where to set up your base camp and how to organize it, are:

- Security
- Access
- Safety
- Communications
- Environmental health
- Water supply
- Food service
- Living/sleeping arrangements
- Waste water disposal

 **Base Camp Security** 

**Perimeters & Control Zones**

- Ensure safety and isolation
- Control the scene
- Limit entry
- ID check point, badges
- Allow for safe working area



Photo Courtesy of NCOEMS

State Medical Assistance Team Training 9-9

### Perimeters & Control Zones

- Ensure safety and isolation of the base camp
- Control the scene
- Limit entry of unwanted or unauthorized personnel
- ID check point, badges, accountability, credentials, etc.
- Allow for safe working area



## Base Camp Access



- Identify Ingress
  - Number and location of entry points
- Identify Egress
  - Number and location of exit points
- Vehicle Staging
- Evacuation Route
  - Evacuation rally point

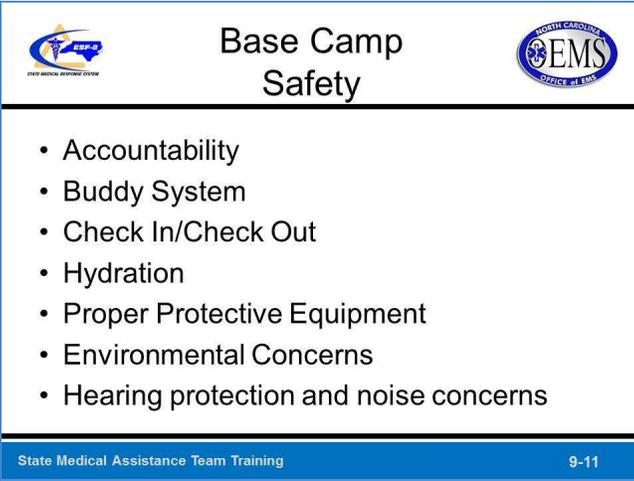


Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-10

As you consider base camp access, there are a number of factors to include:

- Identify the ingress (how are you going to get in?)
  - Number and location of entry points
- Identify the egress (how are you going to get out?)
  - Number and location of exit points
- Evacuation route
  - Evacuation rally point



The slide features a blue header with the title "Base Camp Safety" centered. On the left is the NRP-2 logo (North Carolina Paramedic) and on the right is the NCEM EMS logo (North Carolina Emergency Medical Services). Below the title is a list of seven safety items. At the bottom of the slide, a blue bar contains the text "State Medical Assistance Team Training" on the left and "9-11" on the right.

### Base Camp Safety

- Accountability
- Buddy System
- Check In/Check Out
- Hydration
- Proper Protective Equipment
- Environmental Concerns
- Hearing protection and noise concerns

State Medical Assistance Team Training 9-11

- Accountability is imperative. We must always be aware of the whereabouts of our team members.
- Never enter/leave the base camp without signing in or out.
- Ensure you are well hydrated at all times.
- Always ensure that you use the buddy system.
- Take precautions and wear the appropriate PPE when the need arises.
- Use safety equipment when necessary.



## Base Camp Safety



- Fire safety
  - CO detectors
  - Smoke detectors
  - Extinguishers
- Trip hazards
- Scene lighting



Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-12

Some additional aspects of base camp safety are:

- Fire safety
  - CO<sub>2</sub> detectors
  - Smoke detectors
  - Fire extinguishers
- Trip hazards
- Scene lighting



## Base Camp Communications



- Ensure communication checks between base and field operators
- Pre-determine radio frequencies for base and field operations
- Situational Awareness
  - Command
  - Control
  - Communications
  - Intelligence



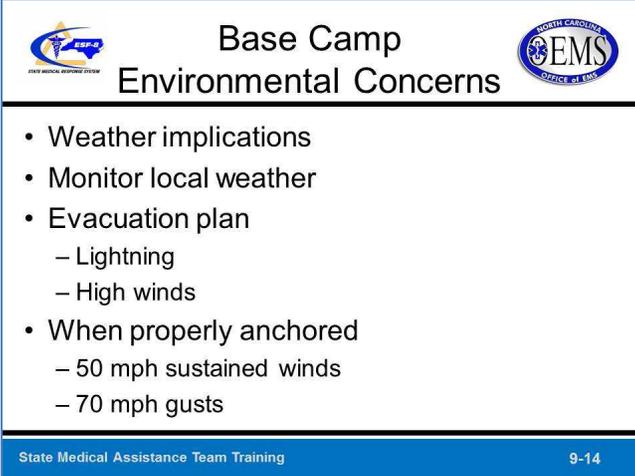
Photo Courtesy of NCOEMS

State Medical Assistance Team Training

9-13

As you arrange base camp communications, be aware of the following needs:

- Ensure communication checks between base and field operators
- Pre-determine radio frequencies for base and field operations
- Maintain situational awareness
  - Command
  - Control
  - Communications
  - Intelligence



The slide features a blue header with the title "Base Camp Environmental Concerns" in white. On the left is the logo for the State Medical Assistance Team, and on the right is the logo for the North Carolina EMS Office. The main content area is white with a blue border, containing a bulleted list of environmental concerns. The footer is a solid blue bar with white text.

- Weather implications
- Monitor local weather
- Evacuation plan
  - Lightning
  - High winds
- When properly anchored
  - 50 mph sustained winds
  - 70 mph gusts

State Medical Assistance Team Training 9-14

Daily monitoring of the local weather is a must for any base camp operation. Severe weather such as lightning, high winds, and floods can pose the risk of injury, even death, to responders.

It can also have severe consequence to the base camp. Ensure all equipment and shelters are secured properly to prevent flying debris and catastrophic collapse of the shelters.



## Base Camp Environmental Concerns



---

- Vector Control
  - Flies
    - Screens, proper sanitation
  - Mosquito Control
    - Netting, DEET, spraying
  - Tick Control
    - Clear tall grass, check yourself
- Rodents, Snakes
- No pets or stray animals



Photo Courtesy of CDC

State Medical Assistance Team Training9-15

Some tips to maintain vector and animal control are:

- If possible, no untreated water within 1000 feet of living and work areas for mosquito control.
- No grass/shrubbery taller than 6 feet within 10 feet of tents, camp, work area, or pathways.
- Check that no members are affected by ticks.
- No piles of trash or rubbish within 600 feet of the site.



**Base Camp  
Solid Waste Disposal**

- Garbage should be placed in plastic bags and containers should have lids
- Keep food out of work/sleeping areas
- Food debris around trash containers should be removed immediately
- Design camp sanitation to keep flies, rodents, and odor to a minimum

State Medical Assistance Team Training 9-16

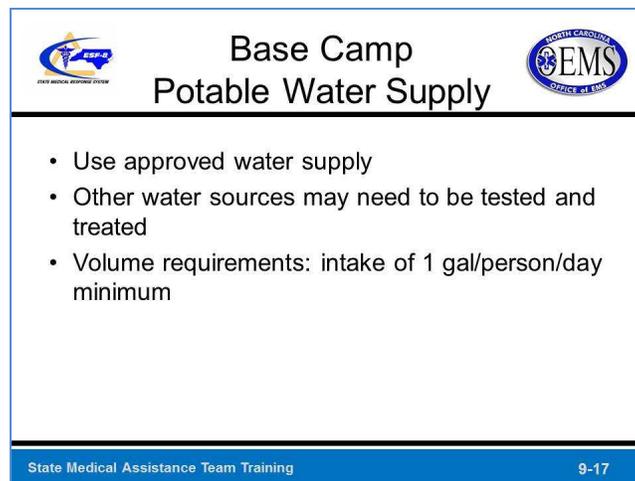
It is vital that you make every effort to maintain a clean base camp.

Garbage should be placed in plastic bags and containers should have lids.

Keep food out of work/sleeping areas.

Food debris around trash containers should be removed immediately.

Design camp sanitation to keep flies, rodents, and odor to a minimum.

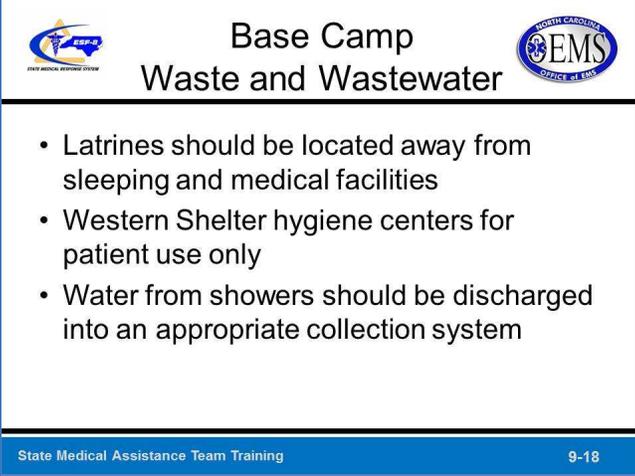


The slide features a blue header with the title "Base Camp Potable Water Supply" in white. On the left is the logo for the State Medical Assistance Team, and on the right is the logo for the North Carolina EMS Office. Below the title, three bullet points are listed in black text. At the bottom of the slide, a blue footer contains the text "State Medical Assistance Team Training" on the left and "9-17" on the right.

- Use approved water supply
- Other water sources may need to be tested and treated
- Volume requirements: intake of 1 gal/person/day minimum

One of the best ways to prevent illness among responders is to ensure that only approved water supplies are used. The use of bottled water reduces the likelihood of disease among responders.

1 gallon of water/day should be the minimum amount of water consumed by each responder. In a particularly hot or humid climate, more may be needed.



The slide features a blue header with the title "Base Camp Waste and Wastewater" centered. On the left is the NRP-2 logo (National Response Plan) and on the right is the EMS logo (Emergency Medical Services). Below the title is a list of three bullet points. At the bottom of the slide, a blue bar contains the text "State Medical Assistance Team Training" on the left and "9-18" on the right.

- Latrines should be located away from sleeping and medical facilities
- Western Shelter hygiene centers for patient use only
- Water from showers should be discharged into an appropriate collection system

Latrines should be located away from sleeping and medical facilities.

Western Shelter hygiene centers are intended for patient use **only**.

Water from showers should be discharged into an appropriate collection system or away from base camp.



## Food Service



- Rations for 3 days
- Arrange for re-supply
- Pre-packaged meals for initial deployment



Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-19

For each deployment, you should have rations for 3 days.

SMRS will arrange for re-supply.

For the initial deployment, you may be eating pre-packaged meals.



## Base Camp Living





- Personal space and living quarters
  - Shared living space
  - Limited personal space
  - Limited privacy
  - Hot racking
- Rest based on operational period

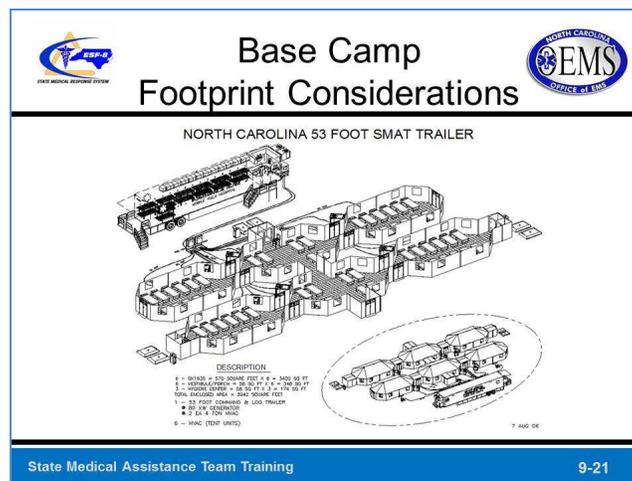
Photo Courtesy of Western Shelter

State Medical Assistance Team Training9-20

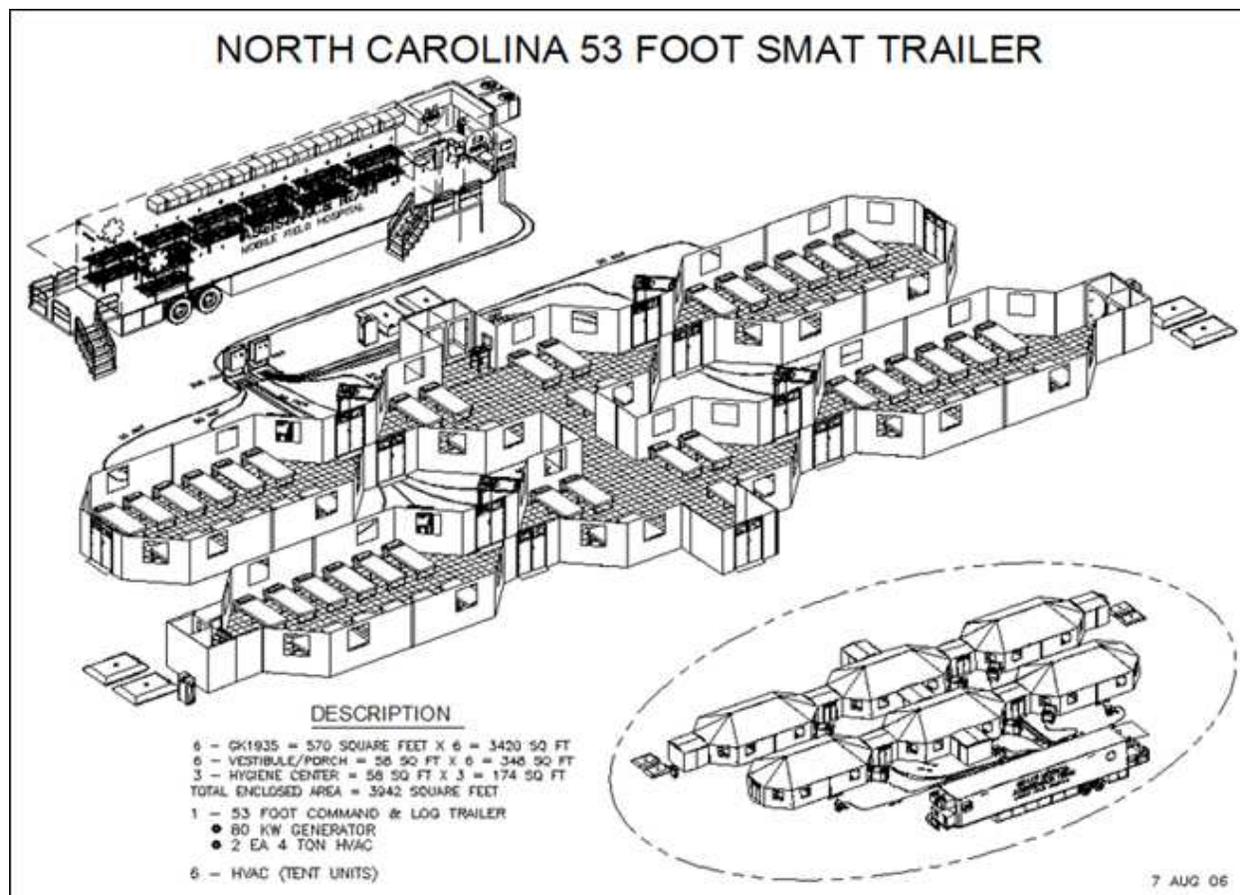
Personal space and living quarters will be a premium so responders may have to share living space.

There will be limited personal space, limited privacy, and responders may have to hot rack/bunk (as one responder leaves their bunk another responder will be occupying it).

Remember to be courteous to those sleeping after working odd shifts.



Considering the footprint of your base camp, if at all possible, should be done prior to deployment. You may find Google Maps useful for this. This planning will need to be refined once on site. Remember to leave room to grow your operation if the need arises.



**Figure 9-1: SMAT 53-foot trailer**



## Base Camp Layout





- Design and mapping
- Shelter selection and mission type
- Additional layout equipment and labor

Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-22

Once a footprint has been determined mapping should be done.

This gives all involved in the set-up a visual of what the command staff is expecting the camp to look like when complete, and eliminates the duplication of efforts or having to move shelters once erected.



# BASE CAMP SUPPORT FOR FIELD MEDICAL OPERATIONS



State Medical Assistance Team Training

9-23



The slide features a title "Base Camp Typical SMAT Missions" centered at the top. To the left is the NCEM logo (North Carolina Emergency Medical Services) and to the right is the North Carolina EMS Office of EMS logo. Below the title is a bulleted list of six mission types. At the bottom of the slide, there is a blue footer bar containing the text "State Medical Assistance Team Training" on the left and "9-24" on the right.

- Providing medical care in a disaster or for a planned event
- Establish an alternate care facility
- Assist with pharmaceutical distribution and immunization sites
- Establish a field medical aid station
- Responder “rehab”
- Support NC Mobile Disaster Hospital (MDH)

There is probably no such thing as a “typical” mission. However, there are some types of missions that occur more frequently than others. Among them:

- Providing medical care in a disaster or for a planned event
- Establishing an alternate care facility
- Assisting with pharmaceutical distribution and immunization sites
- Establishing a field medical aid station
- Offering responder rehabilitation
- Supporting the North Carolina Mobile Disaster Hospital (MDH)



The slide is titled "Base Camp Medical Planning Items" and features two logos: the NREMT logo on the left and the North Carolina EMS logo on the right. The content is organized into two columns of bullet points. The left column lists: Staffing (with sub-bullet: Operational periods), Required medical capabilities, Medical Equipment (with sub-bullet: Digital x-ray), and Pharmacy (with sub-bullets: Controlled substances and Dispensing). The right column lists: Laboratory needs, Medical records, Re-supply (with sub-bullet: Medical logistics), and Housekeeping. At the bottom, a blue bar contains the text "State Medical Assistance Team Training" on the left and "9-25" on the right.

Base Camp Medical Planning Items	
• Staffing <ul style="list-style-type: none"><li>– Operational periods</li></ul>	• Laboratory needs
• Required medical capabilities	• Medical records
• Medical Equipment <ul style="list-style-type: none"><li>– Digital x-ray</li></ul>	• Re-supply <ul style="list-style-type: none"><li>– Medical logistics</li></ul>
• Pharmacy <ul style="list-style-type: none"><li>– Controlled substances</li><li>– Dispensing</li></ul>	• Housekeeping

State Medical Assistance Team Training 9-25

As you plan for your deployment, there are many things to keep in mind:

- Staffing
  - Operational periods
- Required medical capabilities
- Medical equipment
  - Digital x-ray
- Pharmacy
  - Controlled substances
  - Dispensing
- Laboratory needs
- Medical records
- Re-supply
  - Medical logistics
- Housekeeping



## Base Camp Medical Field Operations



- Receive, evaluate, treat, hold, and discharge
- Field operations providing medical services have planning, financial, logistical, and training implications



Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-26

Your role will be to receive, evaluate, treat, hold, and discharge patients.

Field operations that provide medical services have financial, logistical, administrative and training implications.



## Base Camp Summary



- Field medical activities are superimposed on effective base camp operations
- Responders will deal with elements of ICS, communal living, and safety policies while providing health services



Photo Courtesy of NCOEMS

State Medical Assistance Team Training9-27

Field medical activities are superimposed on effective base camp operations.

Responders will deal with elements of ICS, communal living, and safety restrictions.



## Base Camp Hands-On Field Activities



These activities are designed to familiarize students with base camp deployment and provide an opportunity for hands on participation in setting up key components of a base camp.

State Medical Assistance Team Training 9-28

Today's hand-on activities are designed to familiarize you with base camp deployment.

You will deploy the major components of a base camp and discuss field operations.

	<h2>Mobile Response Trailer System</h2>		
			<p>Students will review the operation and contents of the Western Shelter Mobile Response Trailer System (M-8)</p>
<small>Photo Courtesy of Western Shelter</small>			
<small>State Medical Assistance Team Training</small>		<small>9-29</small>	

The mobile response trailer system (M8) is a large and complex piece of equipment.

You will learn its basic operations, including turning on the power, managing the control panel, and operating the lift gate.



## Shelter System Operation





- Students will set up two shelter units
  
- Discussions will include base camp layout and shelter options

Photo Courtesy of Western Shelter

State Medical Assistance Team Training9-30

You will then deploy a shelter unit, including electrical and lighting components.

You will connect two shelter units using the vestibule.

As we work, we will continue our discussion of base camp layout and shelter options.

 **Electrical System Operation** 



- Students will review the electrical distribution system
- Students will review the deployment of heating and air conditioning systems (HVAC)

Photo Courtesy of Western Shelter

State Medical Assistance Team Training 9-31

Temperature control is an important element of base camp operations.

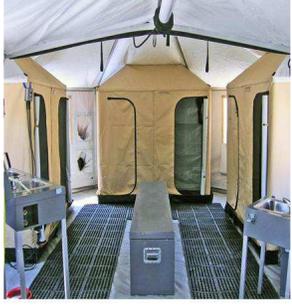
You will review the deployment of heating and air conditioning systems (HVAC).

You will also review the electrical distribution system.



## Water Handling Operations



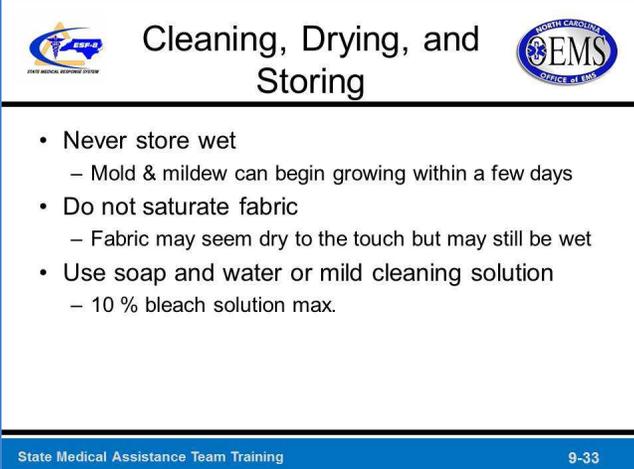


Students will participate in a hands-on demonstration dealing with water and sanitation units.

Photo Courtesy of Western Shelter

State Medical Assistance Team Training9-32

Water and sanitation units will also be discussed.



**Cleaning, Drying, and Storing**

- Never store wet
  - Mold & mildew can begin growing within a few days
- Do not saturate fabric
  - Fabric may seem dry to the touch but may still be wet
- Use soap and water or mild cleaning solution
  - 10 % bleach solution max.

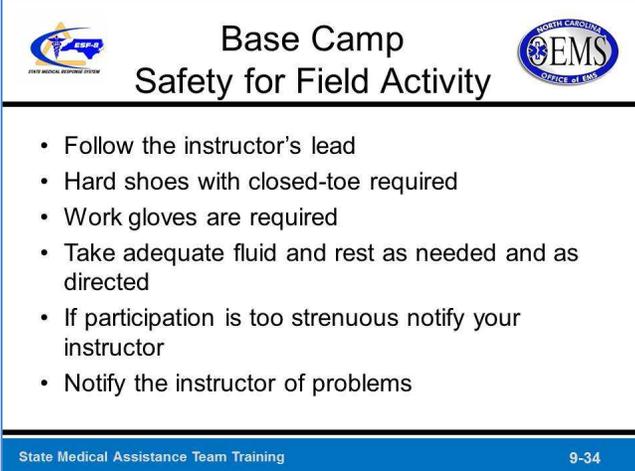
State Medical Assistance Team Training 9-33

The importance of proper storage of your Western Shelter cannot be overstated.

**Never** store any of the fabric while it is wet or mold & mildew can begin growing within a few days.

**Do not** saturate fabric. Fabric that seems dry to the touch but may still be wet.

Use soap and water or mild cleaning solution. 10% bleach solution max.



The slide features a blue border and contains the following text:

**Base Camp  
Safety for Field Activity**

- Follow the instructor's lead
- Hard shoes with closed-toe required
- Work gloves are required
- Take adequate fluid and rest as needed and as directed
- If participation is too strenuous notify your instructor
- Notify the instructor of problems

State Medical Assistance Team Training 9-34

As we work today, follow your instructor's lead.

In order to participate in this activity you must be wearing hard shoes with closed-toes (steel toed boots are preferred).

You must also be wearing work gloves.

Be sure to take adequate fluids and to rest as needed or as directed.

If the participation becomes too strenuous, notify your instructor.

If there are other problems, notify your instructor.

	<h2>Module Summary</h2>	
<ul style="list-style-type: none"><li>• Review the elements of Base Camp Operations</li><li>• Discuss planning for field medical missions</li><li>• Identify the overlap between base camp operations and the provision of medical support</li><li>• Review pertinent safety measures for students prior to “hands-on” field activities</li></ul>		
State Medical Assistance Team Training		9-35

When we have completed this activity, you should:

- Have a rudimentary understanding of Base Camp Operations
- Be able to discuss the planning for field medical missions
- Identify the overlap between base camp operations and the provision of medical support
- Be aware of pertinent safety measures for students prior to “hands-on” field activities

## **ACTIVITY: WESTERN SHELTER BASE CAMP**

**Purpose:** The purpose of this activity is to provide SMAT Initial-Training personnel an opportunity to participate in base camp operations set-up.

### **Objectives:**

- Review the operation of the of the Western System M-8 Trailer system and its components
- Under instructor guidance, assemble and disassemble the Western Shelter System including the shower, plenum, lighting systems and vestibule
- Review the operation of the HVAC system for Western Shelter Systems
- Review the operation of the Western Shelter Hygiene Center

**Time:** 4 Hours

### **Materials:**

- Western Shelter M-8 Mobile Response Trailer System
- Western Shelter Tent System
- Western Shelter Electrical, Heating, and Cooling System
- Western Shelter Hygiene Center
- One Western Shelter System Instructor per 10 students
- Western Shelter/Gatekeeper All Weather Handout for each student

### **Instructor Directions:**

- Ensure each student has a copy of the Western Shelter/GateKeeper all weather handout
- Review safety measures related to falls related to climbing on the Western Shelter M-8 Mobile Response Trailer System and trips related to the power cords or other materials used during assembly and disassembly of the Western Shelter System
- Divide students into groups of 10 students per instructor and for each shelter to be assembled
- Students will participate in an instructor led walk-through of the Western Shelter M-8 Mobile Response Trailer. The Powerpoint presentation begins on page 538.
- Students will participate in the assembly of a Western Shelter System
- Instructors will have a second GK20/1935 shelter pre-deployed (Frame and Skin ONLY) to save time
- Students will participate in the assembly of the plenum, lighting, GateKeeper and shower equipment for the Western Shelter
- Students will review the operation of the Western Shelter System HVAC, Electrical, and Hygiene Center

### **Student Directions:**

- Read through the Western Shelter/GateKeeper all-weather handout. Sign your name to this document and keep it for reference
- Follow the lead of the Western Shelter Instructor
- Students will be required to wear hard shoes
- Observe if the activity is too strenuous
- Notify the instructor if problems arise

# MOBILE RESPONSE TRAILER SYSTEM

## *Site Preparation and Safety*

In order to successfully erect a Western Shelter System, certain guidelines need to be followed to maintain the safety of both the shelter and the team involved. Before any bags or cases are opened and unpacked, preparation of the site and safety guidelines need to be discussed with the team.

### *Site Preparation*

- Determine the complex configuration and measure the area in which the shelter will be located to ensure adequate space for the entire complex.
- The Gatekeeper 1935 Shelter measures approximately 19' wide by 35' in length (stretched octagon shape)
- The Gatekeeper 20 Shelter measures approximately 20' wide by 20' in length (octagon shape)
- The Vestibule Connector measures approximately 8' wide by 8' in length
- Perform a FOD search (Foreign Objects or Debris) and clear any objects from the designated shelter location.
- Evaluate the terrain-type as staking options may change depending on landscape (asphalt, grass, sand, gravel, etc.)
- Ensure that the ground is level. This will ensure easy shelter connections and will also prevent water from flowing into/around the shelter. Do not set-up shelter near water drainage system as there is a risk of getting water inside the shelter.
- Discuss weather conditions and how they will affect the set-up. For example, wind direction can alter where and how the shelter will be erected.
- Check for possible obstructions (trees, power lines, underground plumbing).
- Site Preparation Kits are available for purchase and contain a drill for staking down the shelter, caution tape, concrete and asphalt repair kits, and more.

**ALWAYS STAKE DOWN THE SHELTER!!**

### *Safety Procedures*

- Always use common sense safety procedures during the entire set-up and striking process of the shelter system.
- Use protective clothing where necessary to defend against the elements and gloves may be used to protect from pinch points.
- Hydration is important! Always have water close at hand to avoid dehydration and fatigue.

- Be conscious of others and their actions.
- Do only as your body will physically allow and do not overexert. Each bag and case has a label with the contents and weight, use two-to-six persons depending, on bag and case scheme.
- Proceed with caution if previous health issues are of concern.
- DO NOT climb onto the roof of the shelter or complex.
- Do not hammer or force fits of the components as it may damage the parts of the shelter.
- Be aware of moving parts and **pinch points** of the shelter (Shown Below). Note the absence of gloves. The use of work gloves can minimize pinch risk.



## Trailer Overview

This turn-key system comes contained within a 53-foot mobile response trailer with a command center and includes a complete tent system, climate control, and many additional components to create 3,826 useable square feet for the mission at hand. Whether it is used for mass casualty triage, staff billeting, command center, or surge field hospital, this fully supported and climate controlled system can support any all-hazard mission.

The MRTS GateKeeper system combines GateKeeper shelters with the storage capacity and instant mobility of a climate-controlled 53-foot trailer. Each GK 1935 is erected and connected to the complex with its own Vestibule Connector. Because all Federal Emergency Management Agency (FEMA), Urban Search and Rescue (USAR), and National Disaster Medical System (NDMS) Disaster Medical Assistance Team (DMAT) teams (and most state and local teams) respond with Western Shelters, your shelters can be connected directly to most subsequent responders to create an ever-enlarging weatherproof complex.

A trailer mounted generator powers all MRTS components and shelters with an integrated 200-gallon fuel tank. When emptied of its shelters, support equipment, and supplies, the MRTS trailer converts to billeting space with bunk beds for up to 24 people. The onboard 8.5' x 11' Command Center and the 8.5' x 40' cargo/billeting space are completely climate controlled. When deployed in support of any all-hazard mission, the Command Center in the nose of the trailer is operational as soon as the on-board generator is started.

### Capacity

- Dry weight: 36,000 pounds
- Full weight: 50,000 pounds
- Length: exterior - 56' interior - 52' 6'
- Width: exterior - 102" interior - 99"
- Height: exterior - 13' 6" interior- 110" with 102" finish liner-to-liner
- Capacity: 65,000 GVWR
- Interior volume: 3976 cubic feet
- Axles: two 5-inch round, 22,500 pound minimum rating

### Tow vehicle

- Tractor with 110" clearance between King Pin location and vehicle body to provide adequate clearance for turning radius
- Standard King Pin required

## Generator

The tongue-mounted 100 KW diesel generator is supplied to provide complete electrical distribution to both the trailer system and the Western Shelter Base of Operation. Coupled with the supplied Electrical Distribution components it allows for safe and rapid connection by any team member. The design uses both color coded connections and specific fittings to assure that the correct connections are made.

- 100 Kilo Watt (KW) Diesel Generator
- 200 gallon Fuel Tank mounted beneath trailer for up to 72 hours of operations
- Integrated trailer electrical system with 100 Amp Circuit Breaker Panel (located within Command Center)
- 200 amp three phase Shore Power service connection
- 100 amp three phase Shelter Electrical Distribution connection
- Battery disconnect switch to protect from battery draining

### Generator Start Up

The generator is usually the first component of the system to be operated. Since the generator supplies power to the entire trailer, it is important to start the generator prior to deploying the Shelter System. This is accomplished by following the steps indicated below.

1. Grounding the generator is an important first step in the initial start up. Western Shelter recommends using an 8' x 3/4" copper grounding rod with a #10 copper wire for proper grounding. It is important, however, to check with local jurisdictions to determine proper grounding methods for the deployment region. Proper grounding is accomplished by driving the 8' grounding rod into the ground (making sure that you are clear of underground utilities such as sprinkler systems, electrical and gas lines, and anything else that the grounding rod make come in contact with. Once the grounding rod is set, attach the #10 wire to the rod by clamping the wire to the rod using a rod clamp. Then connect the other end of the #10 grounding wire to the Generator Grounding Lug.
2. Assure that the Main Transfer Switch (located within the Command Center) is in the off position to protect the electrical components inside the trailer from voltage variations during start up.
3. Check all of the fluid level on the generator, including coolant, oil, and fuel levels.
4. Inspect the generator housing. Check for debris, loose hoses or wires, and anything that may otherwise impede operations.
5. Turn on the Generator Battery Switch.
6. Connect the three phase High Amp Distribution Panel to the generator.
  - a. Place the three phase High Amp Distribution Panel in the desired location (keeping in mind the length of cables, proximity to potential hazards and site mobility issues).
  - b. Connect the High Amp Distribution Cable to the generator then to the 3 phase High Amp Distribution Panel.
  - c. Make sure that all Circuit Breakers on the three phase High Amp Distribution panel are in the OFF position.
7. To start the generator, move the Toggle Switch, located on the Generator Operation Panel, to the position marked AUTO. The generator will start within a few seconds.

8. Let the generator run for at least 5 minutes to allow for proper warm up period.
9. At this point, the 3 phase High Amp Distribution Panel is energized but the trailer electrical system is not.
10. After the 5 minute warm up period, turn the Main Transfer Switch to the position marked Generator.
11. You can utilize all of the trailer's electrical systems and the batteries for the lift Gate to be charged.

### *Generator Shut Down*

Before shutting down the generator it is important that **ALL** electrical equipment is properly powered down to protect them from potentially damaging voltage variances. Start powering down **ALL** equipment, beginning with the equipment inside the shelters and trailer and working back to the generator. Once the auxiliary equipment inside the shelters and trailer has properly been shut down, follow the steps below to shut down the generator.

1. Turn OFF all Circuit Breakers on the three Phase High Amp Distribution Panel.
2. Turn OFF the trailer HVAC units using the Trailer HVAC Control Panel. Depress the ON/OFF button to shut down.
3. Turn the Main Transfer Switch to the OFF position.
4. Allow the generator to run for 5 minutes with no load to cool down.
5. Switch the Generator Toggle Switch, located on the Generator Control Panel to the OFF position.
6. Wait for the generator to come to a complete stop before disconnecting the three Phase High Amp Distribution Cables.
7. Turn OFF the Generator Battery Switch.

### *Generator Maintenance*

While some basic maintenance can be performed by basic team members, major maintenance should be performed by authorized personnel only. Basic maintenance includes visual inspections, changing air filters, and checking fluid levels. It is highly recommended that the generator be serviced at least twice a year, or more frequently as needed, by authorized personnel, normal service cycles range between 100 and 200 hours. While on deployment, it may be necessary to have the generator serviced for optimum performance. It is important to note that this servicing will require the generator to be shut down for up to three hours. The electrical system is designed to quickly be reconnected to a standby or backup generator for this service but a temporary loss of electricity should be expected in this event.

## *On Board Climate Control*

Conveniently mounted on the nose of the trailer are two each 4-ton Climate Control units. Together these units will control the climate within the trailer via the Climate Control Panel. The Climate Control Panel is located on the front wall of the cargo area. The Climate Control Panel is used to adjust the temperature settings and Heat/Cool setting for the interior of the trailer. The system is designed to operate one unit as the Lead while the second unit is dormant. It is programmed to switch between climate control units in order to equal out run times and can be manually switched if one unit fails. There are filters located in the Command Center roof near the nose of the trailer that will need to be cleaned periodically. These filters are a cleanable foam and do not normally need to be replaced.

### *On Board Climate Control Operation*

The operating instruction for the climate control units is printed on the Climate Control Panel.

There are many options for operating the climate control units but the basic operation should be as follows.

1. Turn on the climate control units by pressing the On/Off button on the Climate Control Panel.
2. Select Heat or Cool as desired (factory settings are 70° for cooling and 72° for heating).
3. Adjusting the temperature settings should be done by qualified personnel.
4. To turn OFF the climate control units, press the On/Off button.

### *On Board Climate Control Maintenance*

Other than cleaning the filters, all other maintenance should be performed by qualified personnel.

## 12 Volt DC Compartment

Located on the rear curbside of the trailer, the 12 Volt Compartment houses the power supply and controls for all of the 12 Volt DC components.

These components include the lift gate controls, emergency and scene lighting as well as the 12 volt interior lights.

There are two deep cell batteries located in the back of the compartment that are wired to the control panel. These batteries are charged by the onboard generator. The charger/inverter is located in the same compartment and stays plugged into a dedicated circuit.

The 12 Volt Control Panel includes switches for all of the 12 volt lights as well as the Fuse Panels for the 12 volt lights. While spare fuses are not provided with the trailer system, it is a good idea to have some on hand.

Also located on the 12 Volt Control Panel is the fuel gauge for the on board 200-gallon fuel tank. The fuel gauge is operated in conjunction with the panel light and is operational only when the panel light is switched on.

There also three battery control switches mounted on the 12 volt control panel. The main battery switch is the red switch and the two other switches are added to further isolate the batteries for storage.

When operating any of the 12 volt components, all three switches need to be in the ON position. When operating the lift gate, it is recommended to turn the main battery switch to the position marked 1 & 2 for full power.

When the trailer is being stored or otherwise not in use, it is important that all three switches be turned to the OFF position. However, the batteries will only charge when these switches are in the ON position.

## *Lift Gate Overview*

This Lift Gate System is designed to provide safe and smooth loading and off-loading operations (i.e., wheeled boxes, HVAC units) and function as an entry/exit platform for the trailer System.

The lift gate has a working payload of 5,500 lbs and includes integrated foot operated “Stops” to help secure the load during operations. The lift gate also incorporates a Self-Leveling program that allows the lift gate to raise and lower at a level position and tilt downward only upon reaching the ground. This function provides a large measure of safety so that the wheeled case/equipment stays stationary during the cycle.

There are three individual control points for operating the lift gate safely. There is the Main Lift Gate Control Box located inside the 12 Volt Compartment, a hand held pendant located inside the rear of the trailer and the integrated foot operated controls located on the lift gate itself. Each of these controls operates the up and down motion of the lift gate but the Main Lift Gate Control Box and the Hand Held Pendant exclusively operates the opening and closing of the lift gate.

## *Lift Gate Operations*

Using the lift gate to off-load the equipment requires at least four persons to safely handle the wheeled equipment and operate the lift gate’s up and down motion. The following procedures will outline the correct operation of the lift gate.

1. Turn on the Main Battery Switch for the lift gate located within the 12 Volt Compartment on the curbside rear of the trailer.
  - a. Turn the Red Switch to the position marked “1 & 2.” This position utilizes both of the Deep Cell batteries for optimal power.
  - b. Turn the two Battery Isolation Switches to the ON position. These switches are installed to further isolate the batteries during storage to prevent the batteries from draining
2. Turn on the Lift Gate Main Power Switch located on the Lift Gate Control Box. This switch is located on the bottom left hand side of the Lift Gate Control Box.
3. Position one person at the rear of the trailer to keep the area clear while operating the lift gate.
4. Toggle the Tilt Control Switch down, located on the top left hand side of the Lift Gate Control Box. This will begin the tilting of the lift gate.
5. Continue holding the Tilt Control Switch until the lift gate is level with the ground and then release the switch.
6. Toggle the Lift Control Switch down, located on the bottom left hand side of the Lift Gate Control Box. Continue holding the Lift Control Switch until the lift gate makes contact with the ground and continue until the lift gate tilts completely to the ground.
7. When the lift gate is completely on the ground, open both of the Main Rear Doors completely. (Make sure that the awning is retracted completely before opening the Main Rear Doors to avoid potential damage.)
8. Secure both Main Rear Doors in the open position using the hooks on the sides of

- the trailer.
9. The Hand Held Pendant is located on the Curb Side Main Rear Door in its bracket.
  10. At this point any of the three Lift Gate Controls can be used to raise and lower the lift gate.
  11. For safety reasons, Western Shelter recommends that the Hand Held Pendant Control is used for operating the lift gate. When using the Hand Held Pendant from the ground level, the operator can visual confirm that the area around the lift gate is secured and clear before any lift gate movement.
  12. Using the Hand Held Pendant, depress the UP button to raise the lift gate until it comes in contact with the trailer body.
  13. Using the foot of person inside the trailer, activate the Safety Stops prior to moving any equipment onto the lift gate
  14. Roll one Wheel Cart/HVAC onto the lift gate slowly until the wheels contacts the Safety Stops.
  15. With at least two people securing the load, lower the lift gate completely, making sure that the lift gate tilts completely to the ground.
  16. Push the Wheeled Cart/HVAC up the lift gate and use a foot to lower the Safety Stops.
  17. Roll the Wheeled Cart/HVAC off of the lift gate and repeat as necessary.

### *Using the Lift Gate as a Stationary Platform*

The lift gate is designed to also be used as stationary platform to be used as an entry/exit area for the rear of the trailer. Once the trailer has been unloaded of equipment, the Rear Main Doors can be closed completely, the lift gate is raised and level, and then the hand rails and stairs can be added. The following procedures are to be followed to set up the Stationary Platform.

1. Close the Rear Main Doors completely.
2. Using either the Hand Held Pendant or the Main Lift Gate Control Box to raise the lift gate until it contacts the trailer body.
3. Verify that the lift gate is level with the ground.
4. It is important that the lift gate is turned OFF when using it as a Stationary Platform. Turn OFF the lift gate using the Main Lift Gate Control Box. The Power Switch for the lift gate is located on the bottom right hand side of the Main Lift Gate Control Box and should be switched to the down position.
5. With the lift gate turned OFF, remove the hand rails marked for the Rear Deck from the Belly Box and install in the Brackets located on the lift gate.
6. Once the hand rails are installed on the lift gate, tighten the Thumbscrews to apply tension to the hand rails.
7. Remove the stairs marked for the rear deck from the Belly Box and install them on the side of the lift gate by securing them to the Brackets mounted on the side of the lift gate. It may be necessary to adjust the adjustable feet on the stairs to level the staircase.
8. With the stairs installed, install the hand rails marked for the rear stairs; these are located in the Belly Box as well.
9. Tighten the screws on the stair to secure the hand rails.

### *Lift Gate Maintenance*

The majority of the maintenance for the lift gate can be performed by most team members. The maintenance required is mostly visual inspection and lubrication.

The visual inspections should be performed before and after exercise or deployment. It is important to look for loose or damaged wires and hydraulic hoses. Most of the wires and hoses can be seen at the rear of the trailer with the lift gate in either the closed or down position. Inspect to ensure that the wires and hoses are not snagging or excessively rubbing on any component.

Also, inspect for leaks and any debris that may impede the operation of the lift gate. It is a good idea to operate the lift gate completely a few times while watching the wires and hoses to ensure smooth operations. Lubricating the lift gate mechanisms is a simple task that should be performed after each exercise or deployment. Using a grease gun and heavy duty bearing grease, apply grease to each of the grease fittings.

Any further maintenance should be performed by qualified personnel.

## *HVAC Stacking and Unstacking*

In a unique space saving technique, Western Shelter has designed the HVAC system to be stored in a stacked fashion. To this regard, we have developed a method to safely off-load the stacked HVAC using the lift gate. The following method should be implemented when off-loading and loading the HVAC system. You will use the same lift gate operations as listed above with the addition of a few extra steps.

1. Follow steps 9 through 17 from the Lift Gate Operations section.
2. After the HVAC stack has been removed from the lift gate, rotate the HVAC stack 180° so that the nonswivel wheels are facing the lift gate.
3. Position the HVAC stack about 1' away from the lift gate.
4. Raise the lift gate to the height of the wheels of the upper HVAC unit.
5. Push the HVAC stack towards the lift gate until it makes contact.
6. Lock the swivel wheels on the lower HVAC unit.
7. Release the Ratchet Strap securing the upper HVAC unit but do not remove the strap.
8. Loosen the Ratchet Strap enough to be able to pull enough slack from the nonswivel wheels of the upper HVAC unit.
9. Unlock the swivel wheels on the upper HVAC unit.
10. With two persons standing on the lift gate and one securing the lower HVAC unit, roll the upper HVAC unit onto the lift gate.
11. Using a foot, activate the Safety Stops on the lift gate and position the upper HVAC unit against the Safety Stops.
12. Unlock the swivel wheels on the lower HVAC unit and roll it away from the lift gate.
13. Once the area is clear and safe, use the Hand Held Pendant to lower the lift gate.
14. With the lift gate completely on the ground, push the HVAC unit towards the trailer until the Safety Stops can be released.
15. Roll the HVAC unit off of the lift gate.

## *Slide Out Platforms and Stairs*

The trailer is equipped with a set of platforms/stairs that allow entry/exit to both the Command Center and Rear Cargo Area. The platforms are built into the trailer directly below each of the Man Doors on the side of the trailer. These platforms slide out to create the base for the stairs and hand rails. The stairs and hand rails are stored inside of the Belly Boxes. This platform is designed to assemble the stairs perpendicular or parallel to the trailer, giving you more deployment options.

The following steps are used for erecting the Slide-Out Platforms and stairs for both the Command Center and Side cargo area.

1. Unlock the platforms and rotate the Platform Locking Handle down to free the platform.
2. Slide out the platform until it stops and rotate the Platform Locking Handle up to lock the platform in the extended position.
3. **Do Not** stand on extended platform without Platform Legs in place.
4. Remove the hand rails marked Side Command or Side Cargo and place onto the platform. Place the hand rails into the holes on each side of the platform.
5. Locate the Hand Screws in the Belly Box and install them into the hand rails by screwing them in from the bottom of the platform until hand tight.
6. Remove the Platform Legs from the Belly Box and install them into the outside edge of the platform by screwing them into the base of the hand rails.
7. Have one person lift up the platform to a level position and adjust the height of the Platform Legs to contact the ground and maintain a level platform.
8. Remove the stairs and install onto the platform by attaching the stairs to the Slots provided on the platform.
9. It may be necessary to adjust the Adjustable Feet on the stairs to level the Staircase.
10. With the stairs installed, install the hand rails marked for the Command Center or Rear Cargo; these are located in the Belly Box as well.
11. Tighten the screws on the stair to secure the hand rails.
12. Double check that all hand rails are secured and that the platform is locked in the extended position before using.

## *Slide Out Platforms and Stairs Maintenance*

While there is no required maintenance on the operation of the platforms and stairs it is important to note the keeping the components clean and free of ice is critical. Also, the hand rails can be damaged by dropping them, causing assembly to be difficult. Over tightening of the Thumbscrews can also damage the hand rails and also cause the fixture to have the threads stripped. Take care when tightening the thumbscrews to avoid this result.

## Observation Deck

The observation deck is designed to provide a bird's eye view of the deployment site. The roof of the trailer is reinforced in the observation deck area to allow for occupancy of six people. The hand rails are permanently installed on the roof of the trailer and the access ladder is stored inside the cargo area of the trailer. The storage position of the ladder is located under the Overhead Storage Shelves and secured with the Ladder Mounting Pin. While working in the trailer, it is important to be aware of the stored ladder and to avoid injury from impacting it with your head. It is best to remove the ladder as soon as possible in the unloading stage to avoid such impact. The following steps should be followed to erect the Observation Deck.

1. Remove the ladder from its storage position using two people. One person will support each end of the ladder.
2. While supporting the ladder, remove the Ladder Mounting Pin and slide the ladder to the rear of the trailer, keeping it level until it clears the Mounting Bracket.
3. Lower the ladder to a comfortable carrying position and remove from trailer. (Note: it is best to remove the ladder with the lift gate in operation mode and Rear Main Doors opened.)
4. Carry the ladder to the Ladder Mount Bracket on the outside of the trailer, located above the 12 Volt Compartment.
5. Raise the ladder with two people and align the wheels with the ladder Mounting Brackets towards the top of the trailer.
6. Carefully lift the ladder and insert the wheels into the Ladder Mounting Bracket.
7. Continue to lift the ladder until the bottom of the ladder is level with the lower Ladder Mounting Brackets.
8. Align the Mounting holes of both the ladder and the lower Ladder Mounting Bracket and install the two Ladder Mounting Pins.
9. The lower section of the ladder is located inside the third Belly Box.
10. Install the lower ladder section by aligning it with the Ladder Mounting Brackets and inserting the four Ladder Mounting Pins.
11. Ascend the ladder carefully to the top of the trailer.
12. Great care must be taken once on top of the trailers until the hand rails are erected.
13. Erect the hand rails on the outside edges of the trailer first to provide immediate fall protection.
14. Remove the Hand Rail Pins on one section and raise the hand rail completely.
15. Reinstall the Hand Rail Pins to secure the Hand Rail. (If the Pin does not insert easily, rock the Hand Rail back and forth to assist in aligning the holes.)
16. Continue until all hand rails are erected and secured.
17. The Safety Chain should always be secured when the observation deck is used and only briefly removed for access.
18. Follow instruction in reverse order for take down of the observation deck.

## *Command Center*

The Command Center was designed to provide a base level room for the addition of communication equipment or any equipment deemed necessary for the mission. Integrated Raised Flooring allows hidden cable routing beneath the floor. The Command Center includes a lockable refrigerator for pharmaceuticals, a microwave, plasma TV/monitor with integrated Touch Screen, and Dry Erase wall and cabinet coverings. All of the cabinets are designed with retractable doors to help protect against injuries. Behind the walls are two cable routing channels to allow for cable routing either into the false ceiling or below the flooring system. Data connection and electrical connections are supplied throughout the Command Center to allow multiple work stations.

### *Plasma TV/Monitor Touch Screen Operation*

A laptop or computer will be needed to operate the Touch Screen and TV/monitor. Software is provided with the trailer to be installed on the dedicated computer. Once the software is installed, the Touch screen needs to be calibrated. Follow the provided instructions to calibrate the Touch Screen.

## ***Raised Flooring Operation***

Custom fit hard-flooring is included to provide a clean and stable platform for all operations within the trailer.

1. Peel up Carpet Tiles start from a corner. The Carpet Tiles have a reusable adhesive that secures them to the flooring
2. Remove the four #1 Phillips head screws from the Floor Tile
3. Use the suction device to lift the Floor Tile from its position
4. Remove as many Floor Tiles as necessary for cable routing
5. Replace the Floor Tiles in reverse order

## ***Trailer Belly Boxes***

The Belly Boxes are provided to further storage options and add flexibility to the trailer. These storage compartments can be operated from either side of the trailer and slide out for accessibility.

The Belly Boxes have a payload rating of 1,000 lbs. They are operated by pushing down the securing latch and slowly sliding the tray out to access the stored equipment.

Starting from the front of the trailer, the first two Belly Boxes house the stair and hand rails for the two platforms on the side of the trailer and the set for the lift gate.

The third Belly Box houses the Electrical Distribution and Spares Kit. The fourth Belly Box houses some of the Water Handling equipment. Integrated Straps are provided to secure the loads during transit. Care must be taken when moving or loading the Belly Box Trays as there is a potential for personal injury.

**Do Not** overload the Belly Box Trays!

## Cargo Area

The cargo area is a multipurpose area with the priority on securing the equipment during transit. Special care must be taken to make sure that the loaded equipment stays in place while transporting the trailer.

Logistics tracks have been installed throughout the cargo area to allow for multi and flexible tie down points. Provided with the trailer are the Ratchet Strap and D-rings required to secure the load. The original load plan has been modified many times by each team so it is difficult to provide a specific plan.

Once unloaded, the cargo area can be used as staff sleeping quarters or as additional space to expand the command center. It can also be used to store equipment during a deployment. The integrated shelving system provides secure, easily accessible storage for miscellaneous equipment.

Each section of shelving can support up to 100 lbs. The storage bins provided can be used to store medical supplies or other equipment.

## *Awnings*

The awnings can be positioned over each of the door ways to provide shade on sunny days. These awnings are intended to be used on days with minimal wind and **NOT** intended to be used when snowing. Each awning is equipped with its own wind speed meter to help prevent accidental damage caused by wind. These Wind Speed Meters are factory set to automatically retract the awnings at wind speeds of 20 MPH. Strong gusts can cause severe damage to the awnings! Awnings are not to be used in gusty or high wind situations. The awnings can also be partially deployed for use near potential obstruction. There are two Control Points for each awning. There are wall mounted switches mounted near each of the doors that operate the awning's extension and retraction. There are also Hand Held Remotes that operate the awnings as well.

### *Awning Operations*

1. Wall Mounted Switch
  - a. Press the bottom of the switch to Extend the awning
  - b. Press the top of the switch to Retract the awning
  
2. Hand Held Remote
  - a. Press the bottom of the button to Extend the awning
  - b. Press the top of the button to Retract the awning
  - c. Press the center button to stop the movement for partial deployment

### *Awning Maintenance*

In the event that the awnings do not retract (loss of power or malfunction) they can manually be retracted using the supplied hand crank. Simply insert the hand crank end into the fitting and turn to retract or extend. Further maintenance should be performed by qualified personnel.

## Scene Lights

Two 500 watt Halogen Scene Lights are mounted on the generator housing and can be removed and deployed as needed. Each Scene Light has an integrated tripod that is collapsed during storage. The Scene Lights can be operated in the mounted position or remove and place where needed.

To use the Scene Lights, remove them from the Scene Light Mounting Bracket by releasing the upper brackets lever and pulling the Light away from the bracket. Loosen the tension knob on the light body and extend the handle downward to form the tripod legs. Plug in the Scene Light to the power supply and turn on the Toggle Switch at the bottom of the Light Head.

**Caution!** The Light Head will be hot during operation.

## Detailed Instruction for Western Shelter System Deployment



# Gatekeeper 1935 Series



**ALWAYS wear gloves when erecting**



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## a. Site Evaluation / Preparation



- FOD search (Foreign Objects or Debris)
- Possible obstructions/hazards- i.e. trees, power lines, underground plumbing, etc.
- Terrain type- i.e. grass, sand, gravel, concrete, asphalt, etc.
  - Anchoring needs vary depending on terrain
- Shelter configuration
- Repeat weather



## b. Equipment Positioning



- Layout cases/bags in kit form
  - Stage close to set up location
  - Do not stage within designated set up location
  - Case=kit form
  - No cases? Bags=kit form
- Organize equipment accordingly



## c. Frame



1. Layout Mainframe Assembly
2. Stand up one of the two mainframes and remove the bottom strap
3. Using 3 people, expand the mainframe with the **key flange** facing the center where the structure will be located



## c. Frame Continued...



4. Extend roof truss assemblies
5. Connect Eave Bars (Velcro OUT)
  - **Caution! Pinch Point**
  - Keep Eave Bars **parallel** to the ground for easier installation
6. Repeat (2-5) with other mainframe until all Eave Bars are installed



### c. Frame Continued...



7. Position both mainframes together so all Eave Bars are connected
- Importance of mainframe connection before center section installation



8. Install Center Section frame at Key Flanges



- Only use 2 people for ease of installation
- Do not force the fit



### c. Frame Continued...



9. Connect Center Section Roof Trusses to Eave Bars



- Compress button, position lower bracket over button, and squeeze Eave Bars together to release button





## c. Frame Continued...



### 10. Lock the Center Section Assembly into place

- Demonstrate the weakness without the buttons locked
- **Lift Center Section Assembly** from the middle until all four buttons have locked
- Demonstrate the strength with the buttons locked

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9-43



## c. Frame Continued...



### 11. Lower leg assemblies

- **Squeeze two bars together** about 1 foot up the Eave Bar and pull pin out, lower the leg slowly

**\*\*Note:** Some accessories can be pre-attached to the roof truss at this point. (Divider Walls, Plenum, Lights, Exhaust fans, and CO/smoke detectors)

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9-44



## d. Roof Fabric



1. Place the folded Insulation Roof Panel on top of the center of the frame assembly



2. Partially unfold the fabric onto the frame assembly, leaving room to gain access to the top of the center of the frame assembly to later attach the vent cap



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9-45



## d. Roof Fabric Continued...



3. Place Vinyl Roof Panel on top of the center of the frame assembly



4. Partially unfold the fabric onto the frame assembly, leaving room to gain access to the top of the center of the frame assembly to later attach the vent cap

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9-46



## d. Roof Fabric Continued...



5. Remove the **protective pieces of fabric** and place them into the corresponding storage bag



6. Locate the Vinyl Roof Panel Cones over the Key Flanges

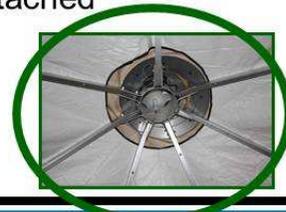


## d. Roof Fabric Continued...



7. Install Vent Cap(s)

- Locate Vent Cap hole
- Pull pin and connect to Vent Cap hole
- Clear out all fabric between Key Flange and Cones
- Assure that the Vent Cap is securely attached





## e. Raising the Shelter Frame



Wind



1. 4 people lift one side of shelter
  - Caution! Always make first lift facing INTO wind
  - Position each person at the 4 legs
  - Lift until legs are fully extended
    - **Caution! Pinch Point**
  - Rest frame on 4 extended legs and install pins into top most outside hole on the frame

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9-49



## e. Raising the Shelter Frame Continued...



2. Repeat on opposing side of shelter



3. Finish by lifting the two ends and installing the pins into the top most outside hole



4. When leg is lifted, it drops into it's natural place

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9-50



## f. Insulation Roof Panel



1. Locate the **center seam** on the Insulation Roof Panel
2. Locate the **center mark** on the Eave Bars (metal screw)
3. Ensure center seam of Insulation Panel matches with the center of the Eave Bar
  - Vertically center the two strips of Velcro

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## f. Insulation Roof Panel Continued...



4. Start at the center and work out towards the legs



5. Do not attach **Vinyl Roof Panel** at this time

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## g. Flooring Installation



1. Place Floor Fabric in the center of the shelter



2. Unfold the Floor Fabric completely

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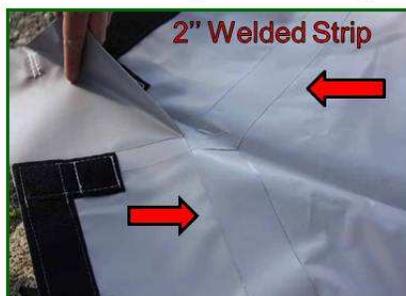
9-53



## g. Flooring Installation Continued...



3. Place Legs onto Floor Fabric
  - Lift each Leg and place on the **2" welded strip** located on the floor
  - Pull both the Floor Fabric and Leg until the Leg is vertically square and the floor is tight



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9-54



## g. Flooring Installation Continued...



### 4. Install all Base Bars

- **Caution! Pinch Point**
- Keep Base Bars parallel to the ground for easier installation



**\*\*Note:** If it is determined that a vestibule is to be installed and one shelter is already standing, now is the recommended time to start the installation.



## h. Door Installation



### 1. Decide Door location(s)

- Discuss various options



### 2. Peel back the Insulation Roof Panel at the Door location only



### 3. Remove the Door from the bag



## h. Door Installation Continued...



4. Leaving the Door folded, install over the Eave Bar
  - Align the center hinge of the Door along with the center of the Eave Bar (metal screw)
5. Unfold Door while guiding the Door frame over the Eave Bar

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9-57



## h. Door Installation Continued...



6. From the inside, use the center mark on the Eave Bar to ensure the Door is centered
7. Lift the Door and guide it over the Base Bar
8. Ensure that the Door is securely in place and centered
9. Reattach **ONLY** the Insulation Roof Panel over the Door

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9-58



## h. Door Installation Continued...



10. Insert Door Ramp directly after installing the Door
  - Open doors fully
  - Insert Door Ramp slots into door gussets

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9-59



## i. Insulation Wall Panels



1. Review label on inside of Insulation Wall (“Left of Door” and “Right of Door”)
2. Align Velcro along the Door hinge
3. Attach completely along the Door before continuing onto the rest of the shelter

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### i. Insulation Wall Panels Continued...



4. Unroll and place loosely on the Insulation Roof Panel Velcro



5. Go around the shelter for a second time and attach the Wall Panel to the Roof, **stretching** as tightly as possible



6. Repeat with remaining Insulation Wall Panels



### i. Insulation Wall Panels Continued...



7. Connect Insulation Wall Panels

- Use the left hand on the inside and the right hand on the outside to stretch and attach the two panels



**\*\*Note:** It may be necessary to stretch the Insulation Wall Panels a second time to achieve a complete connection. Expansion Strips can be used if the Fabric does not connect.



## j. Vinyl Wall Panels



1. Review label on the Vinyl Wall Panel. If folded correctly, the label will be on the outside of the Wall Panel (“Left of Door” and “Right of Door”)
2. Align Velcro along the Door hinge
3. Attach completely down the side of the Door before continuing along the Insulation Wall Panel

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9-63



## j. Vinyl Wall Panels Continued...



4. Unroll and place loosely on the Insulation Roof Panel Velcro
5. Go around the shelter for a second time and attach the Wall Panel to the Roof, stretching as tightly as possible
6. Repeat with remaining Vinyl Wall Panels

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9-64



## j. Vinyl Wall Panels Continued...



### 7. Connect the Vinyl Wall Panels

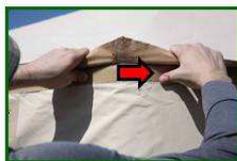
- Use the left hand on the inside and the right hand on the outside to stretch and attach the two panels together
- It is very important to ensure no blue Velcro is showing, and if there is, go back a third time and stretch again



\*\* It may be necessary to stretch the insulation wall panels a second time to achieve a complete connection. Use expansion strips if fabric doesn't connect.



## k. Attach Vinyl Roof Panel



1. Align the middle welded seam on the Vinyl Roof Panel with the Roof
2. Para star pattern, stretch one corner then move to the opposing corner and stretch it to the Vinyl Wall Panel Velcro. Do this on all corners before attaching the Vinyl between the corners.
  - Tip: **Use thumbs as leverage** and rotate wrists backward to stretch over the corner
3. DO NOT pull too much!



## k. Attach Vinyl Roof Panel Continued...



4. Attach remaining Roof Panel to Wall Panels by starting in the center of each section and working out toward the corners
  - Tip: Use **thumbs as leverage** and rotate wrists backward to stretch over the corner



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## I. Wall to Floor Connection



### 1. Connect Wall Straps

- Disconnect buckle from Wall Panel
- Feed the strap under the Base Bar
- Reconnect the buckle to Wall Panel
- Slightly tighten by pulling the adjustment strap
  - DO NOT over tighten!
- Do this throughout the entire shelter



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## I. Wall to Floor Connection Continued...



### 2. Door Strap

- Feed strap from Vinyl Wall Panel under the Base Bar
- Feed the strap through the double D'rings and pull through to create tension



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## I. Wall to Floor Connection Continued...



### 3. Create the Berm

- From the outside, lift the skirt to expose the floor beneath
- Detach the black Velcro strap from the Floor Panel
- Fold the left side (with the D-Ring) toward the black Velcro Strap
  - Ensure the Floor fabric is **folded inward** toward the interior of the tent
- Weave the black Velcro strap through the D-Rings and tighten
  - DO NOT over tighten
- Reattach black Velcro strap to Floor



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## I. Wall to Floor Connection Continued...



### 4. Create the Berm by the Door

- Fold the Floor next to the Door Ramp upward
- **Tuck the floor upward** under the Door Ramp
- Reconnect the Wall Panel along the Door hinge
- Connect the Wall Panel Velcro to the Floor Velcro
- Ensure the Wall skirt is covering the newly created Berm

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## I. Wall to Floor Connection Continued...



### 5. Velcro Connection

- Lift outside skirt to expose Velcro flap
- Pull Vinyl Floor snugly and attach the Velcro to the Wall Panel
- Pull Vinyl Wall skirt over the connection
- Continue around entire shelter

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## m. Accessory Set Up



1. Interior
  - Wiring Harness
  - Lights
  - Plenum
  - Desk Sets
  - Thermostats
  - CO / Smoke Alarm
2. Exterior
  - Stake Kit
  - Generator / Electrical Distribution
  - Climate Control



## n. Complete Shelter Overview



1. Interior
  - Floor Buckles
  - Floor Velcro
  - Door to Wall Connection
  - Lighting
2. Exterior
  - Roof Connection
  - Skirting placement
  - Anchoring
  - Electrical cables
  - Vestibules

## Full Shelter Strike



### o. Accessory Strike



1. Interior
  - Wiring Harness
  - Lights
  - Plenum
  - Desk Sets
  - Thermostats
  - CO / Smoke Alarm
2. Exterior
  - Stake Kit
  - Generator / Electrical Distribution
  - Climate Control

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### p. Accessory Inventory



1. Importance of Inventory
  - Match label with equipment
  - Assure correct quantity

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## q. Accessory Repackaging



### 1. The Importance of Cleaning

- Clean with a mild cleansing solution
- Dry completely
- Fold or package as directed
- Set aside for further packaging

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## SHELTER STRIKE, FOLDING, AND REPACKING

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## a. Vinyl Walls



1. Disconnect buckles from floor to wall connection



2. Close all window and duct openings

3. Peel back Roof Fabric and remove walls in individual pieces



4. Lay walls flat on clean surface (preferably shelter floor) with the outer side of the fabric facing upwards

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## a. Vinyl Walls Continued...



5. Clean the Wall Panels with a mild solution and let dry completely



6. Fold the BOTTOM edge **1/3 of the way** toward the top edge



7. Fold again from the BOTTOM **the rest of the way** to the top

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9-80



## a. Vinyl Walls Continued...



8. Roll TOWARDS the end with the Wall Panel label
  - If rolled correctly, the Vinyl Wall label will be on the top of the roll



9. Roll tightly as to fit the Wall Panel back in the bag
10. Put immediately into the corresponding bag

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9-81



## b. Insulation Walls



1. Remove walls in individual pieces
2. Lay the Insulation Walls on a clean surface (preferably the shelter floor) with the inside (WHITE) of the fabric facing up



3. Clean the Insulation Walls with a mild solution and let dry completely
  - DO NOT spray cleaner directly onto the Insulation fabric as it could lead to mold/mildew

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## b. Insulation Walls Continued...



4. Fold the BOTTOM edge **1/3 of the way** toward the top edge



5. Fold again from the BOTTOM **the rest of the way** to the top



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9-83



## b. Insulation Walls Continued...



6. Roll TOWARDS the end with the Wall Panel label
  - If rolled correctly, the Insulation Wall **label will be on the top of the roll**



7. Roll tightly as to fit the Wall Panel back in the bag



8. Put immediately into the corresponding bag

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9-84



## c. Doors



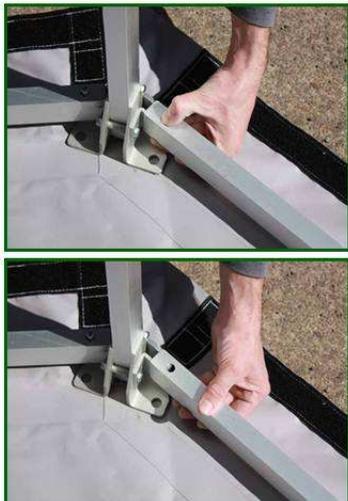
1. Reattach the door strap and close the window material
2. Lock the upper barrel bolt
3. Lift and remove the door completely and fold in half
4. Clean the Door and dry completely as needed
5. Put immediately in the corresponding bag

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9-85



## d. Base Bars



1. Remove all Base Bars
2. Put immediately in corresponding bag or case

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9-86



## e. Flooring



1. Unfasten the berm straps at each corner of the floor so it lays flat



2. Lift each leg of the shelter to remove the floor from underneath
3. Clean the floor panel with a mild solution and let dry completely

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9-87



## e. Flooring Continued...



4. Fold each end of the floor toward the middle to make the floor a rectangle



5. Take one side and fold to the middle weld-line **3 times**



6. Repeat on the other side

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9-88



## e. Flooring Continued...



7. Fold the two halves together



8. Take each end and fold to meet in the middle



9. Fold one end on top of the other

10. Place immediately in the corresponding bag or case



## f. Lowering the Shelter



1. Lift up and **lock** into place the 2 opposing sets of legs on the narrow ends of the shelter



2. Using 4 people, lift up the 4 legs on one side of the shelter and lower down slowly

- Make sure not to lock into place!



3. Lift up remaining 4 legs on other side and lower shelter down slowly

- Make sure not to lock into place!



## f. Lowering the Shelter Continued...



4. Peel back the Insulation and Vinyl material to gain access to the Vent Cap



5. Pull the pin on the Vent Cap and lift to remove



6. Put immediately in the corresponding bag or case

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9-91



## f. Lowering the Shelter Continued...



7. Assure that the protective pieces of fabric for the cones are installed prior to folding



8. Clean the Roof Panel with a mild solution and let dry completely

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9-92



## f. Fold and Repackage Roof Panels



1. Fold both ends upward and **over the vent cap** to form a rectangle



2. Fold the ends one more time (2 total folds)

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9-93



## f. Fold and Repackage Roof Panels Continued...



3. Fold one side approximately 6 inches **over the centerline** of the Mainframe



4. Fold the other side up to **meet with the first fold**

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9-94



## f. Fold and Repackage Roof Panels Continued...



5. Fold each side **in half TWO more times**



6. Fold the one side (that was NOT folded over the centerline) on top of the opposing side to rest on centerline of the Mainframe

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9-95



## f. Fold and Repackage Roof Panels Continued...



7. Fold each end over the vent cap



8. Don't forget to reinsert the **protective piece of vinyl!**

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9-96



## f. Fold and Repackage Roof Panels Continued...



9. Continue folding both ends to meet in the center of the Mainframe



10. Finish by folding one end over the other

11. Place immediately in corresponding bag or case

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9-97



## f. Fold and Repackage Roof Panels Continued...



12. Clean the Insulation Roof Panel with a mild solution and let dry completely

13. Fold the end **over the Vent Cap** a total of **TWO** times



14. Do this for each side to create a rectangle

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9-98



## f. Fold and Repackage Roof Panels Continued...



15. Fold one side approximately 6 inches over the **centerline** of the Mainframe

16. Fold the other side up to **meet with the first fold**

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9-99



## f. Fold and Repackage Roof Panels Continued...



17. Fold each side **in half TWO** more times



18. Fold the one side (that was NOT folded over the centerline) on top of the opposing side to **rest on centerline of the Mainframe**

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9-100



## f. Fold and Repackage Roof Panels Continued...



19. Fold each end over the vent cap (Vinyl Roof illustrated here)



20. Continue folding both ends to meet in the center of the Mainframe



21. Finish by folding one end over the other

22. Place immediately in corresponding bag or case

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9-101



## f. Repackaging the Frame



1. Lock remaining legs into storage position



2. Remove the Center Section Trusses from the Eave Bars



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9-102



## f. Repackaging the Frame Continued...



3. Remove the Center Section Trusses from the Key Flanges



4. Bundle the Center Section and fasten the frame strap
5. Put immediately into the corresponding bag or case

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9-103



## f. Repackaging the Frame Continued...



6. Remove all Eave Bars



7. Depress the button and slide the Roof Truss assembly into storage position on all legs



8. Bundle the frame and fasten the frame strap
9. Put all pieces immediately into the corresponding bag or case

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9-104



## Shelter Inventory



- a. Bags
  - Use bag labels to inventory shelter components
- b. Cases
  - Use case labels to inventory shelter components

## Vestibule Connector

 **VESTIBULE CONNECTOR** 



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## Full Set-Up



### a. Connection Points



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1. Two types of connection points are located on each shelter

- **Door Split Connections** are the connection where the wall fabric connects to the door
- **Wall Split Connection** is the connection where the wall fabric connects to the opposite wall fabric (Blue Hook & Loop)



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## b. Inventory



- Assure that you have all the components located within the Vestibule Bag
- Separate the different types of material (Fabric and Metal)

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9-108



## c. Alignment



1. Open the connection point on the completed shelter to expose the connection point legs
  - From the interior, unfasten the buckles and straps located at the floor connection
  - Peel back Insulation and Vinyl Roof panels
  - Remove door if necessary

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9-109



## c. Alignment Continued...



1. Roughly align the shelters with a standard eave or base bar
2. Place two bars on the ground at a perpendicular angle to the connection point
3. Visually square the two bars so that they are also parallel to each other
4. Move partially completed shelter to align with the alignment bars on the connection point

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9-110



## d. Flooring Installation



1. Lay out the shelter floor and position to line up with the vestibule floor
2. Match the alignment arrows on both floor
3. **Fold the shelter floor under** and attach to the vestibule floor matching up the Hook and Loop Fastener
4. Continue the connection along the entire section

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9-111



## d. Installation Continued...



5. Fold over the Caution flap to cover connection point and stretch the floor so there are no wrinkles



6. Place shelter legs on 2" weld along the floor



7. Create vestibule berm by attaching the velcro flaps on either end of the vestibule floor to the perspective shelter floor

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9-112



## e. Vestibule Framework



1. Replace eave bars on the two shelters with arched eave bars from vestibule kit



2. Connect the eave bars that were removed to the outside of the vestibule connection



3. Connect the center arched bar

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9-113



## e. Vestibule Framework Continued...



4. Connect the telescoping base bars



5. Attach Shelter Doors to each side of the Vestibule



6. Stretch the existing shelter walls to attach along the side of the door

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9-114



## f. Vestibule Roof Panel



1. Drape the roof over center arched bar and align with center screw on arched Eave Bar



2. Match up and attach the Hook and Loop Fastener to the arched eave bar

- Ensure the **center weld line** matches with the center arched eave bar



3. Continue to outsides of section

- Do not attach exterior of vestibule roof

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9-115



## f. Vestibule Roof Panel Continued...



1. Connect the Shelter Insulation and Vinyl Roof Panels
  - Center the two seams, and set back the Insulation Roof Panel  $\frac{1}{2}$  to  $\frac{3}{4}$  inches
2. Pull black strap on vestibule roof to the inside of the shelter and stretch the shelter roof panel over top of vestibule roof and attach Velcro
  - Tip: Press on inside of shelter and go outside of the shelter to ensure the connection is sealed

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9-116



## f. Vestibule Roof Panel Continued...



1. From the outside, continue to attach the shelter roof panel to outside edge, taking special care to ensure the corner of the vestibule is completely sealed
  - We recommend the karate-chop method
2. Repeat on other shelter

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9-117

# ELECTRICAL SYSTEM OPERATION

## *Electrical System Overview*

Electrical distribution can be a frightening concept for people. The potential risk involved with handling the high voltage, and an often confusing electrical system for a Base Camp can quickly overwhelm most people. The SMAT electrical distribution system was designed with this in mind. Safety and ease of use were the top priorities when this system was designed. The components chosen make incorrect connections virtually impossible. We have also taken most of the calculations out of the operation of the equipment. Likewise, with the intended purpose of this system to be utilized in potentially foul weather, the system has been rated for such use.

When connecting this electrical system, it all begins with the power source. The generator is the building block for the system and will be the starting point for all electrical connections. The generator will supply power to both the trailer system and the Shelter Base Camp. The trailer's electrical system is fully connected to the generator and only requires switching the Main Transfer Switch to operate. The Shelter Base Camp, however, requires a more lengthy procedure.

The generator connection to the Shelter Base Camp begins with the Three Phase High amp Panel. This Three Phase High amp Panel takes a direct connection from the generator and divides it up into a more useable 50 amp 125/250 volt connection. Each of the ten 50 amp 125/250 volt circuits created by the Three Phase High amp Panel has a dedicated 50 amp Circuit Breaker for added protection. This panel also equally breaks up the Three Phase current from the generator to supply Single Phase distribution to the Shelter Base Camp.

In the event that the trailer generator is not operational or Shore Power is being used, a backup or standby generator can be connected to the Three Phase High amp Panel. All of the Shelter Base Camp electrical distribution will be the same from the Three Phase High amp Panel to the Shelters Kits.

Each Shelter Kit has its own Electrical Distribution Kit that includes a 50 amp 125/250 Volt Distribution Box, two each 50' 50 amp 125/ 250 Volt Cords, and six each 50' 20 amp 120 Volt 12 / 3 Extension Cords. Each shelter will be connected to its own electrical circuit from the 3 Phase High amp Panel using one or both of the 50' 50 amp 125/250 Volt Cords connected to the 50 amp 125/250 Volt Distribution Box. The Distribution Box houses six each 15 amp 120 Volt GFCI protected receptacles, one each 30 amp 230 volt connection for the HVAC units, and one each 50 amp 125/250 volt feed through receptacle. The 50 amp 125/250 volt feed through receptacle can be used to connect up to two Shelter Kits to a single 50 amp circuit to help limit cord run lengths. It is important to know that ONLY two Shelter Kits can be connected on one 50 amp circuit. Ideally, each Shelter Kit is connected to its own 50 amp circuit to help isolate potential problems. If two Shelter Kits are connected to one circuit and it overloads the circuit, you will lose power to both Shelter Kits. Also, if more than two Shelter Kits are connected to the same 50 amp circuit, the risk of tripping the circuit breakers is greatly increased.

Inside each shelter is the Internal Wiring Harnesses. There are four individual sections that make up one Wiring Harness. The Wiring Harness can be connected together to create one 15 amp circuit or separated to allow for up to four individual 15 amp circuits for higher current consumption shelter such as communications.

## Generator

1. Grounding the generator is an important first step in the initial start up. Western Shelter recommends using an 8' x 3/4" copper grounding rod with a #10 copper wire for proper grounding. It is important, however, to check with local jurisdictions to determine proper grounding methods for the deployment region. Proper grounding is accomplished by driving the 8' grounding rod into the ground (making sure that you are clear of underground utilities such as sprinkler systems, electrical and gas lines, and anything else that the grounding rod make come in contact with. Once the grounding rod is set, attach the #10 wire to the rod by clamping the wire to the rod using a rod clamp. Then connect the other end of the #10 grounding wire to the Generator Grounding Lug.
2. Assure that the Main Transfer Switch (located within the Command Center) is in the off position to protect the electrical components inside the trailer from voltage variations during start up.
3. Check all of the fluid level on the generator, including Coolant, Oil, and Fuel levels.
4. Inspect the generator housing. Check for debris, loose hoses or wires, and anything that may otherwise impede operations.
5. Turn on the Generator Battery Switch.
6. Connect the three phase High Amp Distribution Panel to the generator.
  - a. Place the three phase High Amp Distribution Panel in the desired location (keeping in mind the length of cables, proximity to potential hazards, and site mobility issues).
  - b. Connect the High Amp Distribution Cable to the generator then to the three phase High Amp Distribution Panel.
  - c. Make sure that all Circuit Breakers on the three phase High Amp Distribution panel are in the OFF position.
7. To start the generator, move the Toggle Switch, located on the Generator Operation Panel, to the position marked AUTO. The generator will start within a few seconds.
8. Let the generator run for at least 5 minutes to allow for proper warm-up period.
9. At this point, the three phase High Amp Distribution Panel is energized but the trailer electrical system is not.
10. After the 5 minute warm-up period, turn the Main Transfer Switch to the marked Generator.
11. Remove the 50 Amp Distribution Cord sets from the Shelter Kits and plug the male end into the three phase High Amp Panel starting at the bottom most circuit and alternating sides of the Panel. (This method helps to balance the load on the Electrical Circuits).
12. The connection is made by first aligning the fitting until it can be completely inserted and then twisting the fitting to lock it into place. It is a good idea to slightly pull on the connection to test whether it is locked completely.
13. Each Shelter Kit includes two each 50 amp 125/250 Volt Cord Sets. Some of the Shelters may only require the use of one Cord Set while others may require more. It is important to connect no more than four of the 50 amp 125/250 Volt Cord Sets together as the Cord Sets are not rated for such use.
14. Place the 50 Amp Distribution Boxes near each of the Shelter Kit locations. (Take care to position the Distribution Box away from low lying areas where water could accumulate.)
15. Make sure that all of the Circuit Breakers on the Distribution Box are in the OFF position by lifting the cover and performing a visual inspection.
16. Connect the 50 amp 125/250 Volt Cord to the Distribution Box's INLET using the method above.

17. With the Distribution Boxes in place, you can now connect the HVAC units to the specified 30 amp 230 Volt Connection and the Shelter Wiring System to any of the 15 amp 120 Volt Connections.
18. When all connections are made, turn on the Circuit Breaker on the three phase High Amp Distribution Panel that corresponds to the Circuit being used. This will energize the 50 Amp Distribution Box.
19. Turn ON only the Circuit Breakers to be used on the 50 Amp Distribution Box.
20. Disassemble in reverse order.

### *HVAC Units*

Providing climate control on a deployment or exercise can make a measurable difference in the morale and health of the responder. With this in mind, six each 3.5 ton combination heat pumps with 10.5 KW auxiliary heat strips have been included with the system. These HVAC units are sized to provide adequate heating/cooling capacity for the shelters at temperatures ranging from 15°-110°F. However, there two different heating systems in each unit, first is the heat pump, followed by the Auxiliary Heat Strip. The heat pump is intended to provide cooling and heating in the range of 40°-110°F. While the Auxiliary Heat Strip is intended to be used in combination with the heat pump from 15°-40°F.

The design of the electrical system is not intended to operate all six HVAC units and six Auxiliary Heat Strips. It is designed around the most likely scenarios of warm weather climates and to only operate the heat pump and cooling systems. In the event of temperatures below 40°, a few of the Auxiliary Heat Strips can be used in critical shelter to assist in maintaining shelter temperatures.

The electrical connections for the HVAC units are permanently wired to the unit with a 50' Cord Set and are intended to connect to the 50 amp Distribution Box using the 30 amp 230 volt receptacle. The Auxiliary Heat Strip Connection is mounted on the side of the HVAC unit and requires the use of one of the 50' 50 amp 125/250 Volt Cord Sets. The connection is intended to be directly connected back to the three Phase High Amp Panel and not to the 50 amp Distribution Box.

Operating amperages for the HVAC unit range from 16-18 amps when operating in heat or cooling modes. The use of the Auxiliary Heat Strip requires 42 amps; this is in addition to the 16-18 amps consumed by the HVAC units. Therefore, the combined potential amperage for each shelter's heating is roughly 60 amps.

### *HVAC Unit Installation*

1. Determine best location at any of the four Ducting Connections on the Shelter. It is important to consider, terrain, drainage, service access, and other site hazards when positioning the HVAC units.
2. Roll the HVAC unit close to the Ducting Connection and lock the Swivel Wheels.
3. Remove the two Ducting Connection Covers from the Shelter and keep them with the HVAC unit. If using the Insulation Wall Panels, remove the two Ducting Connection Covers also and keep them with the HVAC unit.

4. Install the Air Plenum per instructions.
5. Remove the Duct Boots from the HVAC Duct Boot Storage Bag.
6. Install the lower Duct Boot (Straight Duct Boot) to the Shelters lower Duct Connection.
7. Install the upper Duct Boot (Angled Duct Boot) to the Shelters upper Duct Connection
8. Release the locks on the Swivel Wheels and align the HVAC unit with the Duct Boots to allow for connection.
9. Attach both Duct Boots to the HVAC units Ducting Rings making sure that they are securely attached.
10. Lock the Swivel Wheels.
11. Place the Remove Ducting Covers in to the Duct Boot Storage Bag.
12. Remove the Thermostat from the HVAC Thermostat Storage Bag and route it into the Shelter between the Skirt and Wall Panel Connection near the bottom of the Shelter.
13. The Thermostat can be routed over each Roof Truss Bar and should be positioned as far away from the Air Plenum as possible.
14. Hang the Thermostat using the 2 Straps located on the Thermostat Pouch.
15. Connect HVAC Cord Set to the 30 amp Receptacle on the 50 Amp Distribution Box
16. Turn on the 30 Amp Circuit Breaker located on the 50 Amp Distribution Box
17. The HVAC's internal fan will operate when electrical power is provided. The Compressor Fan will not operate until the thermostat is switch to heat or cool modes.
18. Set the thermostat to heat or cool as desired and adjust the temperature to desired setting.
19. Remove the HVAC in reverse order.

### *Shelter Electrical System*

Internal electricity is supplied to operate a wide range of equipment including lights, computers, medical, and many other necessities. Like the rest of the electrical system, it is important to consider the electrical load being put on the Shelter Wiring Harnesses. The Wiring Harness is designed to allow for up to four each 15 amp GFCI protected circuits and can be combined to only utilize one 15 amp circuit depending on need. If the shelter requires a large electrical load, such as communications or ICU ward, then it is advisable to split up the load to avoid overloading any one circuit. This method also helps to maintain internal electricity if a piece of equipment overloads one circuit. If one circuit is overloaded then you can move the equipment on that circuit to another in the same shelter. The Wiring Harness will connect to the 50 amp Distribution Box using the provided 50' 20 amp 12/3 Extension Cords from the Shelter Kits.

### *Shelter Electrical System Installation*

1. Remove the Wiring Harness Bag from the Shelter Kit and place inside the Shelter.
2. Remove one Wiring Harness Section and begin installing near one of the Shelter Doors.
3. Starting at the left side of the Shelter Door, install the GFCI protected junction box.
4. Align the Junction Box Bracket inside of the Leg Bracket and insert the Pull Pin to secure the Junction Box in place.
5. Continue with the remaining Junction Boxes on that section.
6. Secure the Wiring Harness Mid Point Brackets to the Eave Bars in between each Leg Bar.
7. Continue with remaining Wiring Harness Sections.
8. Remove in reverse order.

### *Cable Ramps*

Cable ramps are provided to protect the Cord Runs from foot and vehicle traffic. These high visibility cable ramps are very durable and very easy to see in most situations. It is very important to not drive any vehicle over any of the cords used during a deployment or exercise. The cable ramps are stored in one of the Belly Boxes.

### *Electrical Spares Kit*

Located within one of the Belly Boxes, in its own case is the Electrical Spares Kit. This kit is designed to provide replacement parts and/or extra cord sets in case of accidental damage or misplacement. Included in the kit are one each 50' 50 amp 125/250 Volt Cord Set, one each Wiring Harness Section, and 1 each 50' 20 amp 12/3 Extension Cord.

### *Maintenance*

Maintenance for the Electrical System requires daily visual inspections of all Cord Sets for damage and a physical inspection of the connections point. Damage to Cord Sets or poor connections can cause multiple safety hazards. It is very important that all connections are kept out of standing water.

## WATER HANDLING OPERATIONS

### *Hygiene Center Shell Assembly*

The Hygiene Center shell can be attached to any Western Shelter Systems GK20 or GK1935 shelter at a wall seam connection point. It consists of an aluminum framework, supporting vinyl floor, wall, and roof sets. A vinyl double stall assembly, with zippered privacy doors, mounts securely in the rear of the shell. Each shell assembly contains and requires the following components:

- Arched eave bar, 1 ea.
- Arched ridge bar, 1 ea.
- End frame assembly, 1 ea.
- Hygiene Base bars, 2 ea.
- Eave bar, 1 ea.
- Wall panel, 1 ea.
- Roof panel w/ insulation, 1 ea.
- Vented end cover, 1ea.
- Floor panel, 1 ea.
- Shower and toilet stall liner, 1 ea.
- Privacy curtain, 1 ea.

## Hygiene Center Frame and Floor

The following are the steps to initiate the deployment the Hygiene Center, beginning with the frame and floor.

1. On the shelter wall segment where your Hygiene Center is to be installed, roll back the wall, roof, and floor panels far enough to expose the aluminum frame on all four sides of that segment.
2. Unbuckle the web straps on the floor at either end of the wall segment, allowing that section of the floor to lay flat.
3. Remove the eave bar from the wall segment and set it aside. (It will be used in step i.) Replace the eave bar with the Arched Eave Bar. The black fastening strip on the Arch Bar should face back into the shelter.
4. Remove the base bar from the shelter wall section and set it aside. (It will be used in step j.)
5. Lay the Hygiene Center floor panel on the ground in front of the wall segment. The end attaching to the shelter is clearly labeled “Watch your step” in red.
6. To connect the floors, fold back the ends of the Hygiene Center floor panel to expose its tan fastening strip. Connect this to the tan fastening strip on the GateKeeper shelter floor starting at center arrows.
7. Once the two fastening strips are connected, fold the floor panel back over the shelter floor, and tuck the edges under the frame.
8. Unfold the end frame assembly so both leg bars are in their full down position.
9. Lock the leg bars into place, using their captive locking pins.
10. Connect the Hygiene Center base bar between the leg bars of the end frame assembly.
11. Connect two straight eave bars (one from the Hygiene Center kit and one removed in step c) between the lower ends of the shelter arch bar and the end frame assembly. The black fastening strips should face out.
  - a. **NOTE:** Keep eave bars supported at all times during installation. Allowing eave bars to hang from one connection point may cause irreparable damage to the frame
12. With at least one person supporting the end frame assembly, connect the two Hygiene Center base bars between the end frame assembly and the shelter frame.
13. Connect the arched ridge bar between the shelter arch bar and end frame assembly. Again, keep the eave bar supported at all times during installation.
14. Make sure the floor is centered under the shelter frame. If necessary, lift the frame to reposition the floor panel.
15. At each of the outside corners, thread the black web strap through its D-ring and pull snug to form a berm around the frame.
16. When properly fitted, the floor panel should wrap around the frame to a uniform height of 6”.

## *Walls and Roof*

The following are the steps to installing the walls and roof of the Hygiene Center. Remember, the Hygiene Center must be connected at a wall seam on the shelter.

### *Walls and Roof Installation*

1. Unroll the shelter wall panels along the Hygiene Center frame.
2. Be sure the wall panels do not gap in the corner where the Hygiene Center meets the shelter. They should fit snugly against the frame.
3. Starting at either shelter wall segment, attach the Hygiene Center wall panel
4. Inside the Hygiene Center, attach the floor to the weather flap running along the base of each wall panel.
5. A series of web straps are attached to the weather flap on each wall panel. Working inside the Hygiene Center, thread these straps under the nearest base bar, snap the connectors together and lightly snug the strap. To insure a proper seal, make sure the floor is securely attached to the walls and the walls are securely attached to the frame.
6. Drape the roof panel over the arched ridge bar, with the middle seam of the panel running along the top of the bar.
7. The roof panel must be centered for a proper fit. Use the black web strap on top of either end of the roof panel to center it on an arched eave bar. Starting in the middle and working out toward the ends, fasten the roof panel to the arched eave bars at either end of the Hygiene Center.
8. Line up the center seam in the Hygiene Center roof panel with the middle seam in the shelter roof. Attach the panels at this point. It is easiest to do this from inside the Hygiene Center
9. Working outward from the center, connect the shelter and Hygiene Center roof panels.
10. When connecting roof panels, make sure the fastening strips seal completely in the corners where the Hygiene Center meets the shelter.
11. Working out from the shelter, connect the Hygiene Center roof and wall panels.
12. Attach the vented end cover panel to the roof panel. Start at the center seam and work your way out to the ends.
13. After the vented end cover has been attached to the roof, attach the bottom of the vent panel to the wall.
14. Make sure the corners of the vented end cover completely cover the junction of the wall and roof panels.

## **Shower and Toilet Stall Liner Installation**

1. Inside the Hygiene Center, unfold the shower and toilet stall liner. Locate the two suspension straps at the front and rear of the central dividing wall of the liner.
2. Tuck the rear suspension strap over the arched ridge bar, near the back of the shelter. Buckle the strap, but do not tighten it at this time.
3. Tuck the front suspension strap over the arched ridge bar, near the middle of the shelter. Buckle the strap, but do not tighten it at this time.
4. Locate the flapped fastening strips in the upper rear corners of both side walls.
5. While holding the flap up out of the way, attach the sides of the stall to the inside walls.
6. Fold the flaps back down over the stall sides.
7. At the top of the divider wall between the stalls is a translucent panel. Feed this panel over the top of the center ridge bar.
8. Pull the translucent panel down over the lamp and secure it to the divider wall.
9. Adjust the suspension straps on either end of the divider wall so the front and back walls of the stall hang even with the divider wall.
10. The physical structure of the Hygiene Center is now complete.

## *Lighting*

Each GateKeeper shelter ships with one extra WS-T12 fluorescent lamp, for use in a Vestibule Connector, Entryway, or Hygiene Center. The following are steps to install this lamp to provide light for the Hygiene Center.

### *Lighting Installation*

1. Feed the fluorescent lamp fixture through the gap in the top center of the hanging shower and toilet stall liner.
2. Inside the stall, feed the lamp's bungee cord over the center ridge bar and hook it back on itself.
3. Feed the bungee cord on the other end of the lamp over the center ridge bar and hook it back on itself. Position the lamp so that half its length is inside the stall and half outside.

## Shower

Either side of the Hygiene Center can be plumbed for use as a 1-person shower unit. Configuring the stall for shower use requires the following components:

- 3' x 3' shower floor mat (1 ea.)
- Shower manifold assembly (1 ea.)
- Sump strainer. (Located in the **DDP-550PCSB** kit, 1 ea.)

## Shower Installation

To install the shower plumbing, perform the following steps.

1. The shower mat is pre-installed in the center of the stall floor.
2. Hook the shower manifold assembly to the metal D-ring at the top of the divider wall, near the rear of the stall.
3. Hang the spray nozzle on the black plastic D-ring on the divider wall, below the manifold.
4. Thread the sump strainer onto the brass strainer in the base of the stall. It is not necessary to tighten the fittings more than finger tight.
5. Orient the strainer so the open end is pressed against the stall floor.
6. The shower kit includes one mesh shower caddy and one waterproof vinyl dry bag. Hang these accessories in the shower as desired.

## Commode

Either stall of the Hygiene Center is designed to also accommodate one Western Shelter Systems Toilet-in-a-Box personal commode kit. This system is its own self-contained storage and transport case with the following components:

- External lid (1 ea.)
- Internal lid with hinged seat (1 ea.)
- Receptacle buckets with lids (2 ea.)
- Rubberized gasket (1 ea.)
- Personal Relief caddy (1 ea.)
- Brief Relief liquid waste pouches (12 ea.)
- Disposa-John solid waste pouches (6 ea.)

## Toilet-in-a-Box Assembly

1. Remove the outer and inner lids from the box to access the receptacle buckets.
2. One bucket contains a rubberized seat gasket, the other a mesh shower caddy and Daily Restroom Kit packets.
3. Place the rubberized gasket on the lip of one bucket, and place that bucket in the center of the case.
4. Reattach the inner lid of the case. Position the rubberized gasket directly below white toilet seat.

## Toilet Installation

1. One 3' x 3' shower mat is pre-installed in the center of the stall floor.
2. Place the Toilet-in-a-Box unit in the stall, on top of the shower mat.
3. Disposa-John portable restroom packets are designed to be used in conjunction with the Toilet-in-a-Box commode seat. Refer to the back of each Disposa-John packet for installation assistance.
4. Hang the stall caddy from the metal D-ring in the inside rear corner of the stall. Stock the caddy with Brief Relief and Disposa-John Daily Restroom kits.

## Sink

The Hygiene Center includes one WS-S1A single basin sink. The sink is contained in its own storage and transport case and contains the following components:

- Sink unit (1 ea.)
- Upper leg segments (4 ea.)
- Lower leg segments (4 ea.)
- Leg storage bags (2 ea.)

### *Sink Installation*

1. Open the sink unit and remove the two leg storage bags, secured on either side of the inner lid.
2. Close and re-latch the lid before proceeding.
3. Each leg ships in upper and lower segments. Snap the two segments together before attaching the legs to the sink.
4. Slide the legs into position in the bottom corners of the sink unit. (Note the legs friction-lock into the sink unit; they do not snap into place.)
5. Reopen the sink unit and lock support struts into position.
6. Position the assembled sink against the wall on the shower side of the Hygiene Center.

## Plumbing

The Hygiene Center plumbing consists of two main segments, internal and external. Internal plumbing routes fresh and waste water to and from the shower and sink and includes the hoses and pumps to make this possible. External plumbing provides for fresh water staging/heating and gray water collection. All the hoses, bladders, pumps, and heaters are included to make this possible.

### Internal Plumbing

All components necessary for the internal plumbing of the Hygiene Center are located within cases **1 of 4** and **2 of 4**. Plumbing the inside of the Hygiene Center will require the following components:

- 25' red hot water hoses (2 ea.)
- 25' blue cold water hose (1 ea.)
- 15' black drain hoses (2 ea.)
- Check valves (2 ea.)
- Sump pump kit with switch box (2 ea.)
- 36" black drain hoses (2 ea. – located in sump pump kit.)

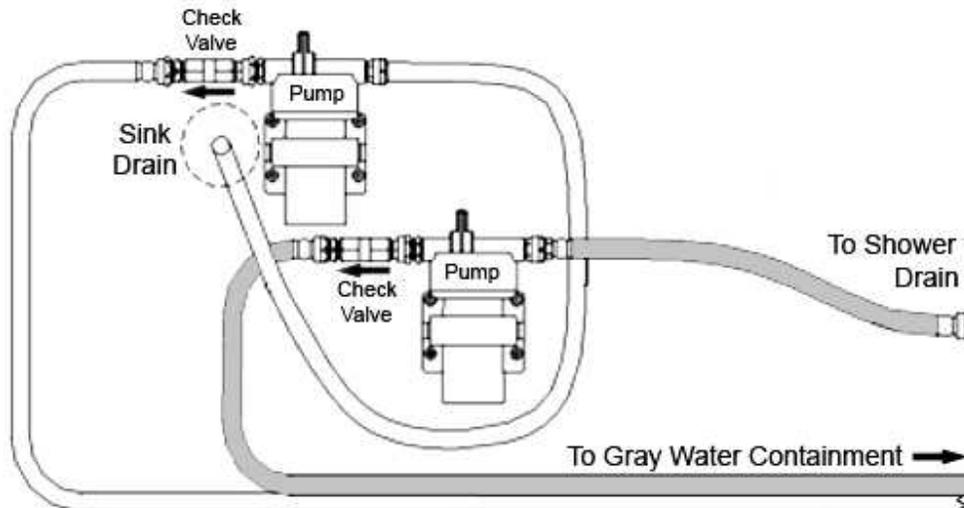
### Fresh Water Supply Installation

Four garden hose thread (GHT) connectors are located at the bottom of the sink unit. These connectors are labeled; Drain, 100 Deg. F Output, Hot input and Cold input.

1. Attach the male end of one 25' blue cold water hose to the Cold Input connector on the bottom of the sink.
2. Attach the male end of one 25' red hot water hose into the Hot Input connector on the bottom of the sink.
3. Attach the female end of one 25' red hot water hose to the 100<sup>o</sup>. F Output connector on the bottom of the sink.
4. Feed the 25' red hot water hose from Step 3 through the gap between the shower stall and the side of the Hygiene Center. Connect the male end of that hose to the shower manifold at the back of the stall.
5. Coil the remaining hoses and tuck them into the gap between the shower stall and the Hygiene Center wall.

## Gray Water Return

The shower and sink unit feature independent drainage systems, facilitated by two 115V DPP-550 sump pumps. Switch boxes are provided to connect the pumps to your AC power source.



1. Run two 36" black drain hoses between the pumps and drains, and connect two 15' black drain hoses to check valves.
2. Tuck the gray water return system under the sink to minimize tripping hazard.
3. Each DPP-550 sump pump ships with an electrical switchbox. Hang the switchboxes from the eave bar above the pumps. Plug each pump into its switchbox and connect the switchboxes to a 115VAC power supply.
  - a. **IMPORTANT! Turn off the pumps when not in use.** The DPP-550 sump pumps have a dry run feature that will prevent them from becoming damaged in the event the water source has been exhausted. However, prolonged use without water may result in damage to the pump units.
4. Coil the gray water hoses and tuck them into the gap between the shower stall and the Hygiene Center wall. Reach in through the plumbing duct from the outside of the Hygiene Center and pull the coiled hoses through the duct.
5. Tighten the web strap on the outside of the plumbing duct to tighten it around the hoses.

## External Plumbing

The Hygiene Center requires a source of hot and cold potable water, as well as a collection or disposal system for gray water discharge. A water distribution kit is provided to interface Hygiene Center plumbing with any available water and sewer services.

If service is unavailable, pumps, water heaters, and storage bladders are provided with the standard Hygiene Center kit.

Please note that the included WS-12AHZ Water Heater will require a source of propane gas, and the EJ110 Primary Water Distribution Pump will require 110V AC to function.

## *Maintenance and Care part of Hygiene Center Content*

The life span of a Western Shelter depends on how well it is maintained.

Western Shelter Systems provides protective bags for shipping and storage. The field bags are made of 18-oz vinyl coated polyester, which will withstand a reasonable amount of use. All bags have carry handles, so dragging units is not necessary or recommended. All bags are easily carried by two people.

Replacing the components in the proper bags insures all parts will be accounted for, and ready for deployment, by the next user. Optional storage and transport aluminum cases convert to tables and desk when empty.

### *Vinyl Care*

While the 14-oz vinyl is basically inert, mild soap and water will normally remove most contaminants from the surface. If necessary, more aggressive chemicals may be used without damaging the fabric.

In some cases it may be necessary to put the fabric into bags wet. It is recommended that the fabric be dried at a later time and returned to the bags ready for the next deployment.

## A Typical Hygiene Center



## Water Purification Overview

The Arctic Clear® 201-2 is a portable water filtration unit that utilizes any non-salt water source in a series of micro filtration stages, concluding with ultraviolet treatment. The unit is designed to produce up to 1,800 gallons (6,812 liters) of safe, clean, and clear drinking and cooking water in a twenty-four hour period, in which harmful chemical and microbiological contaminants are removed. This is achieved without the addition of chemicals, additives, or salt to the treated water. The water exiting the unit retains essential minerals and nutrients.

The unit is small in size and weighs about forty pounds. Being slightly larger in size than a legal-type briefcase, it can be hand carried to the most remote areas. Power can be drawn from three different power sources: 110VAC (voltage alternating current), 220VAC, or 12VDC (voltage direct current), by electrical current, battery (marine, automotive, or solar powered), or generator. The 201-2 requires very little maintenance except for cleaning or replacing the filters. Replacement parts and filters may be removed or installed with ease. All hardware (e.g., screws, nuts, washers) are stainless steel.

The 201-2's patented sensing monitor, located on the ultraviolet chamber, will automatically shut down the unit if the sensor detects lack of UV energy penetrating the water as it passes through the UV chamber. This fail-safe measure insures that the water exiting the unit is safe to consume. This is due to the complete destruction of the DNA of any remaining microbiological organism as it passes through the UV chamber.

Experience has shown, the particular combination of ultraviolet energy and the micro filtration stages used by the 201-2 is the most effective method of directly treating contaminated water with a portable water filtration system.

The Arctic Clear® 201-2 can be operated from either a pressurized water source or from a contained water source. **NOTE:** The unit cannot be operated with both the pressurized and pump features at the same time. When operating the unit through a pressurized water source, such as through a municipality water source, the maximum operating input pressure cannot exceed 29 psi. If the input pressure exceeds 29 psi, the quality of the water exiting the unit cannot be guaranteed. When using the pressurized water input feature, a flow regulator must be used in line.

## *Description of Arctic Clear® MODEL 201-2*

Using the Pump Feature from any Contained Water Source: The intake hose is placed into any existing non-salt water source and then the unit is activated. The hose is hooked into the Water Inlet bulkhead located on the top of the unit. At the end of the hose, a screening capsule prevents large particles of debris, sediment, or silt from entering the system and the pump. This pre-filter is an 80 mesh screen (177 microns).

Using the Pressurized Feature from any Pressurized Water Source: The intake hose is hooked to any pressurized non-salt water source and then the unit is activated. The hose is hooked into the Pressurized Water Inlet 29 psi max. bulkhead located on the top of the unit. The end of the hose can be hooked to any pressurized water system by way of garden hose or faucet tap. **NOTE: A flow regulator must be in place to monitor the intake pressure and not to exceed a maximum of 29 psi.** The Pump switch is not used in the pressurized feature.

### *The Model 201-2 Consists Of Four Chambers:*

#### FIRST CHAMBER = PLEATED FILTER

The first chamber's micro filtration device removes rust, silt, sediment, and giardia cysts to a 1.0 micron level. This filter may be washed and used again.

#### SECOND CHAMBER = KDF/GAC FILTERS

The water passes through the second filtration devices. The KDF filters remove heavy metals, hydrogen sulfide, iron, and chlorine. KDF's bacteriostatic properties prevent bacteria from forming within the third filtration device.

#### THIRD CHAMBER = CARBON-BLOCK FILTER

The third chamber's solid carbon-block micro filtration device removes harmful chemicals, pesticides, and other contaminants which may cause illness, unpleasant taste, and objectionable odor to a 0.5 micron level. Beneficial natural minerals are passed through the filter.

#### FOURTH CHAMBER = ULTRAVIOLET CHAMBER

The micro-filtered water then passes through the ultraviolet sterilization chamber. The chamber uses a mercury vapor lamp to produce ultraviolet energy at the proper frequency and proper intensity to destroy bacteria, yeast, molds, and viruses found in water. Bacteria is either stopped at the filters or destroyed in this ultraviolet chamber. The electronic automated sensor attached to the chamber monitors the frequency and the intensity of the ultraviolet light passing through the water at the greatest distance from the bulb. This energy emission destroys microbiological organisms that cause illness or disease. The unit maintains a minimum of 40,000 microwatt

second per square centimeter ( $\mu\text{Wsec}/\text{cm}^2$ ) of energy. If this light intensity falls below 40,000  $\mu\text{Wsec}/\text{cm}^2$ , the system shuts down and no water passes through the system. After the system has recovered above the 40,000  $\mu\text{Wsec}/\text{cm}^2$  for a period of 30 to 60 seconds, to allow for complete destruction of the bacteria in the chamber, the water will begin to flow again.

## Microbiological Kill Rate

* $\mu$ Wsec/cm <sup>2</sup> of UV energy required for complete destruction.			
<b>BACTERIA</b>			
Agrobacterium Tumefaciens	8500	Spirillum Rubrum	6160
Bacillus Anthracis (anthrax)	8700	Staphylococcus Epidermidis (boils, abscesses)	5800
Bacillus Megaterium (Vegetative)	2500	Staphylococcus Aureus	7000
Bacillus Subtillis	11000	Streptococcus Faecalis	10000
B. Megatherium Sp. (spores)	5200	Streptococcus Hemolyticus	5500
B. Paratyphosus	6100	Streptococcus Lactis (septic sore throat)	8800
Clostridium Telani (tetanus/lockjaw)	22000	Viridans Streptococci	3800
Corynebacterium Diphtheriae (diphtheria)	6500	Vibrio Cholerae	6500
Dysentery Bacilli	4200		
Eberthella Typosa (typhoid fever)	4100	<b>YEAST ORGANISMS</b>	
Escherichia Coli	7000	Baker's Yeast	8800
Legionella Bozemanii	3500	Brewer's Yeast	6600
Legionella Dumoffii	5500	Common Yeast Cake	13200
Legionella Gornanii	4900	Saccharomyces Sp	17600
Legionella Micdadei	3100	Saccharomyces Var. Ellipsoideus	13200
Legionella Longbeachae	2900		
Legionella Pneumophila	3800	<b>MOLD SPORES</b>	
Leptospira Interrogans (infectious Jaundice)	6000	Mucor Ramosissimus (white gray)	35200
Micrococcus Candidus	12300	Penicilliwn Expensum (olive)	22000
Micrococcus Spaeroides	15400	Penicillium Roqueforti (green)	26400
Mycobacterium Tuberculosis (TB)	10000	Oospora Lactis	11000
Neisseria Catarrhalis (meningitis)	8500		
Phytomonas Tumefaciens	8500	<b>VIRUS ORGANISMS</b>	
Proteus Vulgaris	6600	Bacteriophage (E. Coli)	6600
Pseudomonas Aeruginosa (from feces)	10500	Coxsackie AZ	5940
Rhodospirillum Rubrum	6200	Hepatitis Virus	8000
Salmonella Enteritidis	7600	Influenza Virus	6600
Salmonella Paratyphi (enteric fever)	6100	Polio Virus (poliomeylitis)	21000
Salmonella Typhimurium	15200	Rotavirus	24000
Salmonella Tvphosa (typhoid fever)	6000		

Sarcina Lutea	26400	PROTOZOA ORGANISMS	
Serratia Marcescens	6200	Chlorella Vulgaris (algae)	22000
Shigella Dysenteriae (dysentery)	4200		
Shigella Flexneri (dysentery)	3400	(Figures provided by the National Institute of	
Shigella Sonnei	7000	Standards and Technology)	

## Set-Up Instructions

### WARNING!

- USE WITH FRESH WATER ONLY (no salt water!)
  - Pressurized water input 20psi maximum!
  - DO NOT operate with both the pressurized and pump features running simultaneously.
  - Do not subject unit to freezing temperatures.
  - Choose the cleanest water available.
  - Do not turn bulb on and off excessively.
  - Unit must run with Western Shelter approved parts and filters only.
  - Allow unit to stabilize at ambient temperature (room temperature or outdoor temperature) before running.
  - Pump operation only (non-pressurized water source).
1. Open the case and remove the water hoses. The inlet hose has a screen at the water intake end of the hose to prevent large particles of debris, sediment, or silt from entering the system. The screen **MUST** be in place before operation. As the unit operates, this inlet screen may become clogged with debris that attaches to the outside of the screen as the pump draws water up into the unit. If needed, shake or swish this inlet screen in the water to loosen and remove the debris.
  2. Fasten the water hoses by inserting them into the Water Inlet and Water Outlet bulkheads on top of unit. Place the other end of water inlet hose into the cleanest source of water available. The unit will pull water vertically 13 feet (4 meters).
  3. Make sure all switches are off. Choose power source:
    - a. 110 or 220 volts AC electrical current.
      - i. Instructions for a) 110V AC or 220V AC Electrical Current:
      - ii. Select 110 or 220 voltage on the Voltage Selection Dial switch with a straight screw driver or coin, by pressing down on the dial and turning to the proper voltage setting.
      - iii. Plug Model 201-2 into electrical power source receptacle with the proper power cord.
      - iv. Turn AC and Water switches on. Go to Step #5.
    - b. 12 volts DC battery power.
      - i. Instructions for b) 12VDC Battery Power:
      - ii. Insert the dual plug of the red and black DC power cord located in the case lid into battery input. Note plug's polarity (red wire into red [+] terminal)
      - iii. Fasten the red clip at opposite end to the red (+) terminal of a 12 volt DC battery, such as an automotive or marine battery.
      - iv. Fasten the black clip to the black (-) terminal of the battery.
      - v. Turn DC and Water switches on. Go to Step #4.
  4. Turn Pump switch on. Unit is now operational to supply filtered and sterilized Water. Turn Water switch on for clean water flow.

**Note:** For first time use, run water through the system for five minutes.

### *Pressurized Water Source Operation Only*

**NOTE:** The unit **cannot** be operated with both the pressurized and pump features at the same time. When operating the unit through a pressurized water source, such as through a municipality water source, the maximum operating input pressure cannot exceed 29 psi. If the input pressure exceeds 29 psi, the quality of the water exiting the unit cannot be guaranteed. When using the pressurized water input feature a flow regulator must be used in line.

1. Fasten the pressurized water inlet hose by inserting it into the Pressurized Water Inlet 29 psi max. bulkhead and the outlet hose into the Water Outlet bulkhead. Hook the other end of the pressurized hose to a flow regulator and then into a pressurized water source.
2. Make sure all switches are off.
3. Choose power source (See Step #3 above for choice (a) 110/220 Volts AC or b. 12 Volts DC).
4. Turn pressurized water source on. Unit is now operational to supply filtered and sterilized water. Turn Water switch on for clean water flow.

**NOTE:** Pump switch must be off at this time.

### *Operation of the 201-2 with the lid closed*

1. The system may be operated with the lid closed. Remove the plugs and hoses from the left and right side of the lid assembly.
2. Feed both of the water hoses through the right hole. Form the hoses into a semi-circle if using the pump operation before inserting the hose into the Water Inlet and Water Outlet bulkheads. If using the pressurized water source, form only the Water Outlet hose into a semi-circle. The pressurized hose can reach across the top of the unit to its bulkhead position.
3. Feed the power cord or battery cord through the left hole. Turn Power switch on and wait for the green light. When you are ready to run the water, turn Water switch on and then close the lid.
4. To turn water flow off, open the lid and turn Water switch off.
5. When ready to move the system, open the lid and turn either AC or DC Power switch off. Remove the power cord and water hoses from the bulkheads and store in the lid.

## *Removing and Reinstalling Unit to Case*

### Removing Unit from Case

1. Turn Power off. Disconnect electric cord.
2. Turn the four corner latch knobs counter-clockwise to loosen, then rotate the stainless steel base 90° to unlatch.
3. Lift the system out of the case by the handle located on top of the unit.  
**NOTE:** The unit rests on the filter housings when it is out of the case. It is recommended to remove and replace one filter housing at a time for balance. When removing the housings, use caution so the unit does not tip over.

### *Reinstalling Unit into Case*

1. Place unit back into the case, making sure the center plate of the unit falls into the groove at the bottom of the case.
2. Relatch each corner of the unit by turning the stainless steel base 90° so that the point of each base of the latch points directly into its corner before tightening the latch knobs clockwise.

### *Filter Care*

The filters need to be cleaned or replaced when:

- The flow of filtered water decreases.
- A change in taste of the water is detected.
- An unusual odor from the water is detected.
- Visual inspection of the filters reveals they are severely discolored from sediment.
- A time period of six months elapses, depending on usage of the unit.

### *Cleaning of the First Filter, Pleated*

**NOTE:** Enclosed with the Model 201-2 is a nominal 1 micron pleated reusable filter. This filter will remove giardia lambia cysts from the water source if any are present. The cysts are prevalent throughout many parts of North America. Drinking water contaminated with cysts can cause diarrhea, stomach cramps, fever, and weight loss. The infection can last up to 10 days and the parasite can remain in the host for several weeks later. Even chlorine added to municipal water supplies has little effect on the cysts. Fortunately, the cysts can be removed by filtering the water through a cartridge filter specifically designed for giardia cyst removal.

The manufacturer of the enclosed filter recommends that for giardia lambia cyst removal, the filter should not be reused. For removing silt and sediment from the water, the filter can be reused.

1. See Section III. Care of Model 201-2, A. Removing and Reinstalling Unit To Case, for instructions on removing the unit from the case.
2. Use the spanner wrench located inside the case to carefully unscrew the housing to drain off water and remove the filter. (**Note:** Pleated filter housing is labeled CRE-I.)

3. Clean and reuse the pleated filter when the filter becomes discolored or clogged with sediment and the flow rate has decreased. Rinse the filter under running water to loosen and wash away the sediment; making sure to run the water between each pleat. If running water is not available, swish the filter off in water and gently brush with scrubber brush included with the unit. (This method is not as effective as cleaning the filter with running water).
4. Place filter in housing and reassemble housing onto unit. Tighten housing with the filter spanner wrench. Be sure the rubber housing O-ring is in its groove or a leak may occur. The rubber housing O-ring forms a tight seal between the filter housing and cap.
5. The unit is now operational and you may run water.

### *Optional Filters*

Pleated reusable filters are also available in 0.35, 5, and 10 micron ratings. A 1 micron ceramic element filter is also available to remove silt, sediment, and giardia cysts. Additional filters are available from Arctic Clear® Products or an authorized distributor.

**NOTE:** The second filter, the carbon-block CBC-10, may need to be replaced sooner if a larger micron rated pleated filter is used. For example, to change the pleated filter from a 1 micron filter to a 10 micron, the 10 micron filter will allow more particles to pass through the filter that would normally have been caught by the 1 micron filter. These particles will then be caught by the carbon block filter, shortening its life span.

### *Replacement of the Pleated and Carbon-Block Filters*

1. Use the spanner wrench located inside the case to carefully unscrew the housings to drain off water and remove the filters. Dispose of used filters in plastic bags.
2. Replace the first filter with a 1 micron size Arctic Clear® approved pleated filter, or optional 0.35, 5, or 10 micron size approved filter.
3. Replace the second filter with a 0.5 micron size Arctic Clear® approved carbon-block filter, CBC-10.
4. Reassemble housings onto unit and tighten them with the spanner wrench. Be sure the rubber housing O-rings are in their grooves, or a leak may occur. The rubber housing O-ring forms a tight seal between the filter housing and cap.
5. The unit is now operational and you may run water.

### *Replacement of the KDF Filters*

KDF filters are located on the center plate, on the opposite side from the pump.

1. See Section III. Care of Model 201-2, A. Removing and Reinstalling Unit To Case, for instructions on removing the unit from the case.
2. Remove used filters by releasing the Velcro straps holding them onto the unit. To remove the filters from the tubing push the gray ring on the filter connector towards the connector while pulling the tubing in the opposite direction. NOTE: The elbow and straight connectors that hold the tubing will be reused on the replacement filters.

3. Unscrew the elbow and straight connectors and remove from KDF filters. Reassemble onto new Arctic Clear® approved KDF filters. Elbow connectors will go on the ends opposite the flow arrows. Straight connectors on the ends with the flow arrows.
4. Place the new KDF filters onto the unit with the arrows on filters pointing to the left. Close the Velcro straps to hold KDF filters in place. Dispose of used filters in a plastic bag.
5. Reinsert the tubing into the filter's end connectors and push in to seal. The unit is now operational and you may run water.

**NOTE:** OBSERVE THE WATER FLOW DIRECTION ARROWS ON THE KDF FILTERS WHEN INSTALLING. ARROWS SHOULD POINT TO THE LEFT.

## Filter Housings

How to clean or decontaminate the filter housings which hold the pleated and carbon-block filters:

**Recommendation:** Rinse the filter housings with a 2% bleach solution, hydrogen peroxide, or boil for ten minutes following the procedure listed below.

1. See “Removing and Reinstalling Unit To Case” (page 25), for instructions on removing the unit from the case.
2. Use the spanner wrench located inside the case to carefully unscrew the housings to drain off water and remove the filters
3. Remove the rubber O-rings located at the top of the housing.
  - a. Use a lint free cloth to wipe the O-rings and to clean the O-ring grooves in the housings. This cleaning removes any excess petroleum jelly lubricate from the housings before cleaning.
  - b. Rinse the housing with hydrogen peroxide, a 2% bleach solution, or boil for ten minutes.
  - c. Drain bleach and/or water from housings and dry.
  - d. Reapply petroleum jelly to the O-rings and install new or cleaned filters into the housings. Reassemble housings onto unit and tighten with the spanner wrench. Be sure the rubber housing O-rings are in the grooves, or a leak may occur.

**NOTE:** After several years of operation the O-rings may need replacement if they become excessively flat or cracked. Replace with a #237 O-rings, available from Arctic Clear® Products.

## *Ultraviolet Chamber Assembly*

DIRECT ULTRAVIOLET RAYS WILL HARM EYES AND SKIN.  
NEVER WORK ON THE ULTRAVIOLET CHAMBER WHILE IT IS IN OPERATION OR  
WITH THE UNIT PLUGGED INTO A POWER SOURCE.

The Quartz Tube, which holds the Ultraviolet Bulb, is fragile. Handle with Care!

### *Removal of Ultraviolet Bulb/Quartz Tube Assembly for Cleaning or Replacement*

1. See “Removing and Reinstalling Unit To Case” (page 25), for instructions on removing the unit from the case.
2. Release the water pressure in the UV Chamber to empty the chamber of water. Remove the tubing from the end of connector that flows water into the UV Chamber. This is the piece of tubing coming from the carbon-block filter. Remove tubing from the connector by pushing the gray ring on the connector towards the connector while pulling the tubing in the opposite direction. The UV Chamber will empty water through this open connector. The unit may have to be tipped slightly or the UV Chamber rotated to drain all the water out.
3. When the UV Chamber is empty, reinsert the tubing into connector and push in to seal.
4. Remove the blue UV protector caps from both ends of the chamber by pulling gently. Do not twist. The terminal connectors (term conns) inside the caps may come along with the caps when removing. If the bulb also pulls out with a cap, hold the end of the bulb and remove the cap gently. Slide the bulb back inside of the quartz tube.
5. Remove term conns from each end of the bulb if they did not come off with the blue caps.
6. Remove the UV Chamber's metal end caps by turning the caps counter clockwise. A pair of channel-lock type pliers may aid in doing this.
7. Remove O-rings from both ends of the quartz tube.
8. Carefully remove UV bulb and quartz tube assembly as one unit from the chamber by sliding the assembly out either end of the UV chamber. Hold the quartz tube by the ends to prevent finger prints on the tube. Do not allow the ultraviolet bulb to slip out of the quartz tube.

### *Cleaning of the UV Bulb/Quartz Tube Assembly*

1. Carefully remove the ultraviolet bulb from the quartz tube by sliding it out gently.
2. Wash the tube with distilled vinegar or citric acid to remove deposits on the quartz tube.
3. Dry carefully with a clean cloth. Handle the bulb and tube only on the ends of each part.
4. Remove any fingerprints from handling the quartz tube and/or UV bulb with vinegar and soft cloth or tissue. Do not remove the O-rings on each end of the bulb.
5. Gently slide the UV bulb back into the quartz tube. NOTE: The O-rings at each end of the UV Bulb must remain in place.

### *Installation of New or Cleaned Ultraviolet Bulb/Quartz Tube Assembly*

USE ONLY Arctic Clear® Products. Inc. APPROVED ULTRAVIOLET BULB AND QUARTZ TUBE OR THE WARRANTY WILL BE VOIDED. Arctic Clear® IS NOT RESPONSIBLE FOR THE UNIT'S PERFORMANCE, OR LACK THEREOF, IF REPLACEMENT PARTS ARE NOT APPROVED BY Arctic Clear® Products.

1. Insert UV bulb/quartz tube assembly into the UV chamber by gently sliding it into place.
2. Carefully add O-rings to both ends of the quartz tube. The tube and bulb will extend slightly from each end of the UV chamber.
3. Replace metal end caps and turn clockwise.  
**WARNING! HAND-TIGHTEN ONLY. QUARTZ TUBE MAY FRACTURE IF END CAPS ARE EXCESSIVELY TIGHTENED.**
4. Assemble term conns to each end of the UV bulb/quartz tube assembly
5. If term conns came off with the UV protective caps, push them out from inside the caps and line UV bulb terminals up with the two connector terminals and push on. Ease of assembly occurs when putting one term conn on first while carefully holding bulb at other end, then assembling other term conn.
6. Press UV protector caps on over term conns. Do not twist.
7. Dispose of UV bulb/quartz tube assembly properly. Do not dispose near water source.

### *Cleaning of Sensor/Filter Assembly*

**NOTE:** THIS PROCEDURE IS RECOMMENDED AT THE SAME TIME AS THE UV BULB/QUARTZ TUBE ASSEMBLY CLEANING OR REPLACEMENT.

1. Unscrew the sensor cap by turning it counterclockwise.
2. Carefully remove the sensor assembly from chamber.
3. Lift out the filter assembly from inside nipple on UV Chamber. When removing the sensor assembly, the filter assembly may come out with it.
4. Use vinegar or citric acid with a clean cloth or tissue to clean bottom of filter window. (Clean top of filter window and sensor window if necessary.)
5. Rinse with clean water.

### *Installation of Sensor Filter Assembly*

1. Insert filter assembly into nipple on UV Chamber. Be sure O-ring is in bottom of the nipple.
2. Place sensor assembly on top of filter assembly and screw on sensor cap. Hand-tighten only.

**NOTE:** WHEN CHAMBER HAS BEEN EMPTIED OF WATER, AIR WILL BE PASSED THROUGH THE WATER OUTLET WHEN RE-PRIMING UNTIL THE CHAMBER FILLS WITH WATER. CHECK FOR WATER LEAKS AFTER REASSEMBLING ANY OF THE UNIT'S COMPONENTS.

## Water Outlet Hose

The following procedure is recommended if the system is used periodically:

1. Turn power off. Disconnect water outlet hose by pressing on lever of Water Outlet bulkhead.
2. Wash the water outlet hose on occasion during periodic use with hydrogen peroxide or a 2% bleach solution. This will aid in prevention of contamination of the water outlet hose. To wash outlet hose, dip it in a 2% bleach solution. Hold end of outlet valve in with thumbnail or screwdriver so that bleach will be taken up into the hose while submersed in the bleach solution. Lift out of solution and drain hose of bleach solution by releasing valve. Splash Water Outlet bulkhead on top of the unit with bleach or hydrogen peroxide before reconnecting outlet hose. Reconnect water outlet hose.
3. Turn power on. Run water for five minutes to wash out any remaining bleach solution in the hose.

## Case

**Note:** When the case does not contain the Model 201-2, it may tip over backwards when all power cords and hoses are located inside the lid.

For cleaning the outside, wash the case with soap and water. Periodically, wipe the top of the unit inside with a clean damp cloth.

Check for any possible water accumulation in the case periodically and drain water off by tipping the case slightly. Water will run out the vent holes located on each side of the case bottom.

## *Troubleshooting Procedures*

### *Red Wait Light Does Not Light*

1. Check that the unit is plugged into a power source and the correct voltage is set on the Voltage Selector Dial.
2. Be sure DC switch is on for battery operation, or AC switch is on for AC operation.
3. AC option: Check fuse. Fuse and spare fuse are located adjacent to power cord receptacle on top of unit. Remove power cord plug. Press and pull up on fuse holder with a straight screw driver until fuse holder is released. Spare fuse is located inside fuse holder box. Use only 1 amp fuse.
4. DC option: Be sure dual plug is inserted properly into battery input. DC Power Cord clips must be secured to battery terminal posts. Battery must be charged.
5. Contact Service Center.

### *Red Wait Light On but Green Ready Light Takes More than Two Minutes to Turn On, or Does Not Turn On at All*

**NOTE:** A 30 TO 60 SECOND DELAY IS NORMAL FOR PROPER OPERATION.

1. Check end term conns inside UV protector caps to the UV bulb for tightness.
2. Check filter/sensor assembly for loose wiring.
3. Check pump's electrical connections at both ends of pump for tightness.
4. Use Care of Model 201-2, D. UV Chamber Assembly procedures, to clean the UV bulb/quartz tube assembly and the sensor/filter assembly.
5. If the above procedure does not work, change the UV bulb/quartz tube assembly.

Follow these same steps if green ready light turns on and red wait light turns on and off repeatedly.

### *Decreased or No Water Flow with Green Ready Light On and Red Wait Light Off*

1. Check water inlet hose for obstructions. Shake or swish the inlet screen in the water to remove any debris that may be attached to the screen.
2. Clean pleated filter if water flow does not increase or replace with new filter.
3. Check pump's electrical connections at both ends of pump for tightness.
4. Unit may overheat if used continuously for a long period of time. Unit will shut itself off with green ready light on. Shut unit off and allow to cool before running again.
5. Contact Service Center.

## ***Decontamination Procedures***

The clear water produced by this unit will become contaminated again if used with utensils that have been washed with contaminated water. It is recommended that all kitchen utensils either be placed in boiling water for a period of ten minutes or rinsed in hydrogen peroxide or a 2% bleach solution for two minutes. Water that has been sterilized by the Arctic Clear® Model 201-2 unit can be stored up to 48 hours. Stored water can recontaminate itself due to improper storage and handling.

It is recommended that hands always be washed before using the Arctic Clear® unit. Be sure to dry the washed utensils thoroughly to discourage bacteria growth. Do not touch any utensils to the water outlet hose to discourage contamination of the hose.

## ***Consumer Questions and Concerns***

### *When do I clean or replace the filters?*

1. The flow of filtered water decreases.
2. A change in taste of the water is detected.
3. An unusual odor from the water is detected.
4. Visual inspection of the filters reveals they are severely discolored from sediment.
5. A time period of six months elapses, depending on usage of the unit.

### *When do I change the ultraviolet bulb?*

The bulb is rated for about 7,500 hours of usage. A longer time delay of the green ready light will occur as the bulb reaches the useful life span.

### *How dirty can my water be?*

The dirtier the water, the shorter the life of the filters. Attempt to find the cleanest water available. A small amount of water will be produced with very muddy water but you will need to clean or replace the filters sooner than normal. (Rain water is a good source of clean water.)

### *How do I power my unit?*

Model 201-2 uses 110 Volts AC or 220 Volts AC or 12 Volts DC from a marine or automotive battery, solar power, or generator. International power cords are available.

*How do I know the water is safe to drink?*

The patented sensing monitor will not allow contaminated water to exit the unit. The 201-2 will automatically shut off the water flow if the UV emitting bulb is not generating the preset energy level of 40,000  $\mu\text{Wsec/cm}^2$ . Only the Arctic Clear® 201-2 has this fail-safe feature built in. Users of the 201-2 are assured that if water exits the unit, it is safe to consume. In tests run by independent laboratories, 99.99% of all chemical and microbiological contaminants are either removed or destroyed. The drinking water produced by this system still contains the natural minerals necessary for good health and growth.

## *Maintenance Procedures for the Model 201-2*

### *Pump Replacement*

1. See Removing and Reinstalling Unit To Case, for instructions on removing the unit from the case.
2. Disconnect red and black wires from electronic box to pump at connectors.
3. Remove four (4) screws, nuts, and washers with a Phillips screwdriver.
4. Remove pump.
5. Install new pump by inserting screws with washers through rubber grommets and tightening down with nuts. Do not tighten screws excessively; pump must be allowed to vibrate while running.
6. Reconnect red and black wires from electronic box to pump.

### *Electronics Control Assembly Replacement*

1. See “Removing and Reinstalling Unit To Case”, for instructions on removing the unit from the case.
2. Remove the four corner screws and nuts from the electronics control assembly located on top of the unit with a Phillips screwdriver.
3. Disconnect the electronic control wire harness. Pull apart each connector by the housings. Unhook the wires at the Water switch and solenoid.
4. Remove the electronics control assembly and replace with a new unit supplied by Arctic Clear® Products.
5. Reconnect the wire connector housings between the electronics control assembly and the unit. The wires are color coded for correct wire connections. The following wiring code diagram will help in disconnecting and reconnecting wires between the electronics control assembly and the 201-2.
  - a. PUMP: Red and Black to Red and Black
  - b. SENSOR ASSEMBLY: Purple and Yellow to Purple and Yellow
  - c. UV CHAMBER: White to White
  - d. SOLENOID: Gray to outside terminals and Black to center ground terminal
  - e. WATER SWITCH: Blue to switch terminals
6. Replace the four corner screws and nuts to hold the electronics control assembly onto the top plate. Contact Western Shelter for parts or assistance.

## **Reshipment or Storage of the Model 201-2**

The Arctic Clear® Model 201-2's portability, effectiveness, and ease of operation allows the 201-2 to be utilized in remote locations where safe drinking water is needed. The following procedure is recommended if your organization plans to reship the unit to another location or home office. Care should be taken each time the unit is moved to avoid damaging the unit or its case. The potential downtime involved in waiting for replacement parts may be unavoidable if carelessness in handling the unit occurs.

1. See Removing and Reinstalling Unit To Case for instructions on removing the unit from the case.
2. Use the spanner wrench located inside the case to carefully unscrew the housings to drain off water and remove the filters. Reassemble housings onto unit and tighten them with the spanner wrench. Clean the pleated filter. The KDF/GAC or carbon-block filter should not be allowed to dry out. If these filters dry out, new ones will have to be installed before the unit can be used again.
3. Drain off water inside the UV Chamber. Remove the tubing from the end of connector that flows water into the UV Chamber. This is the piece of tubing coming from the carbon-block filter. Remove tubing from the connector by pushing the gray ring on the connector towards the connector while pulling the tubing in the opposite direction. The UV Chamber will empty water through this open connector. The unit may have to be tipped slightly or the UV Chamber rotated to drain all the water out.
4. When UV Chamber is empty, reinsert the tubing into connector and push in to seal.
5. Check that the UV bulb/quartz tube assembly is in place and protective end caps are on tightly.
6. Make sure spanner wrench is secured in holder on inside of case.
7. Place unit back into the case, making sure the center plate of the unit falls into the groove at the bottom of the case. Relatch each corner of the unit by turning the stainless steel base 90° so that the point of each base of the latch points directly into its corner before tightening the latch knobs clockwise.
8. Secure all cords and hoses in case lid with Velcro straps.
9. Latch case shut. Two keys for locking the case are provided inside the case.
10. When transporting the 201-2, it should sit upright and not be allowed to tip over. If crating or cartoning the unit, put packing material around the unit. Mark boxes with upward pointing arrows and mark "FRAGILE" and "HANDLE WITH CARE".
11. When storing the 201-2, filters must be removed and all water drained out of housings, hoses, and UV chamber.





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