

Report of the Committee on

Fire Service Occupational Safety and Health

Glenn P. Benarick, *Chair*

Aiken, SC [U]

Rep. NFPA Fire Service Section

Murrey E. Loflin, Secretary (Alternate)

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(Alt. to Glenn P. Benarick)

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David J. Barillo, University of Florida College of Medicine, FL [SE]

Paul “Shon” Blake, City of Baytown Fire & Rescue Services, TX [E]

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Rep. California State Firefighter Association

Dominic J. Colletti, Hale Products, Inc., PA [M]

Rep. Fire Apparatus Manufacturers Association

Thomas J. Cuff, Jr., Firemens Association of the State of New York, NY [U]

Phil Eckhardt, Mine Safety Appliances Company, PA [M]

Rep. International Safety Equipment Association

Jodi A. Gabelmann, Cobb County Fire and Emergency Services, GA [L]

Rep. Women in the Fire Service, Inc.

Tom Hillenbrand, Underwriters Laboratories Inc., IL [RT]

Jonathan D. Kipp, Primex3, NH [I]

Steve L. Kreis, City of Phoenix Fire Department, AZ [E]

Tamara DiAnda Lopes, Reno Fire Department, NV [U]

David A. Love, Jr., Volunteer Firemen’s Insurance Services, Inc., PA [I]

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Rep. Association of Fire Districts/State of New York

Stephen E. Norris, United Firefighters of Los Angeles City, CA [L]

David J. Prezant, Fire Department City of New York, NY [E]

Joseph W. Rivera, US Air Force, FL [U]

David Ross, Toronto Fire Services, Canada [E]

Rep. Fire Department Safety Officers Association

Mario D. Rueda, Los Angeles City Fire Department, CA [U]

Daniel G. Samo, ENH - OMEGA, IL [SE]

Donald F. Stewart, Medocracy Inc./Fairfax County Fire & Rescue, VA [E]

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Rep. National Volunteer Fire Council

Clifford H. Turen, University of Maryland Orthopaedics, MD [SE]

Teresa Wann, Santa Ana College, CA [SE]

Don N. Whittaker, US Department of Energy, ID [E]

Hugh E. Wood, US Department of Homeland Security, MD [SE]

Kim D. Zagaris, State of California, CA [E]

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Janice C. Bradley, International Safety Equipment Association, VA [M]

(Alt. to Phil Eckhardt)

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Gary L. Neilson, Reno Fire Department, NV [U]

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Cathleen S. Orchard, Monterey Park Fire Department, CA [L]

(Alt. to Jodi A. Gabelmann)

Michael W. Smith, Nevada Division of Forestry, NV [U]

(Alt. to Philip C. Stittleburg)

Fred C. Terryn, US Air Force, FL [U]

(Alt. to Joseph W. Rivera)

Michael L. Young, Volunteer Firemen’s Insurance Services, Inc., PA [I]

(Alt. to David A. Love, Jr.)

Staff Liaison: Carl E. Peterson

Committee Scope: This Committee shall have primary responsibility for documents on occupational safety and health in the working environment of the fire service. The Committee shall also have responsibility for documents related to medical requirements for fire fighters.

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the front of this book.

The Technical Committee on **Fire Service Occupational Safety and Health** is presenting two Reports for adoption, as follows:

Report I: The Technical Committee proposes for adoption, a complete revision to NFPA 1561, **Standard on Emergency Services Incident Management System**, 2005 edition. NFPA 1561-2005 is published in Volume 11 of the 2006 National Fire Codes and in separate pamphlet form.

The report on NFPA 1561 has been submitted to letter ballot of the **Technical Committee on Fire Service Occupational Safety and Health**, which consists of 31 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.

Report II: The Technical Committee proposes for adoption, a complete revision to NFPA 1584, **Recommended Practice on the Rehabilitation of Members Operating at Incidents Scene Operations and Training Exercises**, 2003 edition. NFPA 1584-2003 is published in Volume 15 of the 2006 National Fire Codes and in separate pamphlet form.

Upon adoption, the document will be redesignated as a standard and retitled as “**Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises.**”

The report on NFPA 1584 has been submitted to letter ballot of the **Technical Committee on Fire Service Occupational Safety and Health**, which consists of 31 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.

1584-1 Log #CP2 **Final Action: Accept**
(Entire Document)

Submitter: Technical Committee on Fire Service Occupational Safety and Health,

Recommendation: Completely revise NFPA 1584, Recommended Practice on the Rehabilitation of Members Operating at Incident Scene Operations and Training Exercises, 2003 edition, to include changing the document from a recommended practice to a standard and renaming it as “Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises.” A draft of the document is shown at the end of this report. All text from proposals with affirmative actions has been incorporated in the draft.

Substantiation: The committee feels that rehabilitation is important enough to the health and safety of firefighters that it should be addressed in a standard rather than a recommended practice.

In revising the document the committee reviewed each recommendation in the current document and updated it as necessary to be a mandatory requirement reflecting current science and knowledge on the subject or moved it to the annex to remain as a recommendation or suggestion. Terminology was updated to be compatible with the National Incident Management System (NIMS).

Annex material was added to Chapter 4 to show a sample standard operating procedure for a rehabilitation process, and to show information on the classification, signs, symptoms and treatment of heat stress and cold stress. Emphasis has been placed on fire fighters maintaining proper nutrition, hydration and a healthy lifestyle prior to emergency operations or training exercises.

In chapter 6, the committee added requirements for medical monitoring during rehabilitation with a lengthy discussion in the annex but it recognizes that vital signs alone cannot be used to determine if a firefighter entering or in rehabilitation should receive further medical treatment.

The example of the emergency incident rehabilitation report in the current annex as Figure A.6.13.2 was revised to reflect the data of one individual rather than several individuals on the same report to comply with HIPAA medical data confidentiality requirements.

Committee Meeting Action: Accept

Number Eligible to Vote: 31

Ballot Results: Affirmative: 28 Negative: 2

Ballot Not Returned: 1 Gillespie, A.

Explanation of Negative:

BOGUCKI, S.: First, there continues to be inadequate science to require measures beyond periodic rest and rehydration breaks for firefighters during emergency operations. Neither medical monitoring nor active cooling of asymptomatic, working FF’s has been shown to offer any benefit, and should therefore not be anything more than recommended practice.

Second, making ‘water supply for forearm immersion cooling’ a requirement in the standard is not justifiable. Even if one supports a need for active cooling, this requirement prescribes a single approach that the committee shouldn’t endorse exclusively.

Third, using forearm immersion cooling as a treatment for heat exhaustion and heat stroke is utterly unproven to my knowledge; In addition to calling for immediate transport to hospital via advance life support, there are standard cooling measures that would be considered ‘standard of care’. I doubt NFPA wants to be in the business of publishing any type of medical treatment protocols... but would certainly prefer to steer clear of the unproven kind.

Finally, the benefits of active cooling measures, as opposed to resting long enough to allow temperatures to normalize in asymptomatic, working firefighters have not been proven. Active cooling feels better, and studies by 1 group of investigators have shown that body temperatures are reduced more quickly by forearm cooling. The physiology of this phenomenon is not well understood.

These observations in no way constitute sufficient evidence for the practice to be mandated as a fire service standard. In fact, we don’t know that by instituting them we won’t hurt people more than we help them. It simply hasn’t been adequately and independently studied.

PREZANT, D.: I agree with Dr. Bogucki and have copied her comments below with her permission

“First, there continues to be inadequate science to require measures beyond periodic rest and rehydration breaks for firefighters during emergency operations. Neither medical monitoring nor active cooling of asymptomatic, working FF’s has been shown to offer any benefit, and should therefore not be anything other than recommended practice.

Second, making ‘water supply for forearm immersion cooling’ a requirement in the standard is not justifiable. Even if one supports a need for active cooling, this requirement prescribes a single approach that the committee shouldn’t endorse exclusively.

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These observations in no way constitute sufficient evidence for the practice to be a fire service standard. In fact, we don’t know that by instituting them we won’t hurt people more than we help them. It simply hasn’t been adequately and independently studied.”

Comment on Affirmative:

RUEDA, M.: 1. Exceptions.

3.3.5.1 Definition of Active Cooling.

4.1.1.2* (3) Standard Operating Procedures. Cooling (both active and passive) or warming.

I am concerned that the definition of active cooling may not include wetting down Firefighters as an option, and may require the use of other ancillary equipment to meet this requirement. The definition should include broader language that clarifies this point.

1584-2 Log #CPI **Final Action: Accept in Part**
(Chapter 3 Definitions (GOT))

Submitter: Technical Committee on Fire Service Occupational Safety and Health,

Recommendation: Adopt the preferred definitions from the NFPA Glossary of Terms for the following terms:

Company. (preferred) NFPA 1500, 2002 ed.

A group of members: (1) Under the direct supervision of an officer; (2) Trained and equipped to perform assigned tasks; (3) Usually organized and identified as engine companies, ladder companies, rescue companies, squad companies, or multi-functional companies; (4) Operating with one piece of fire apparatus (engine, ladder truck, elevating platform, quint, rescue, squad, ambulance) except where multiple apparatus are assigned that are dispatched and arrive together, continuously operate together, and are managed by a single company officer; (5) Arriving at the incident scene on fire apparatus.

Company. (secondary) NFPA 1584, 2003 ed.

A group of members having the following characteristics: (1) under the direct supervision of an officer or leader; (2) trained and equipped to perform assigned tasks; (3) usually organized and identified as engine companies, ladder companies, rescue companies, or squad companies; (4) usually operating with one piece of fire apparatus (e.g., quint, pumper, ladder truck, elevating platform, rescue, squad, or ambulance); (5) arriving at the incident scene on fire apparatus or assembling at the scene prior to assignment; (6) company configurations shall be permitted to allow for multiple apparatus that are dispatched and arrive together and continuously operate together and are managed by a single company officer.

Emergency Incident. (preferred) NFPA 1561, 2005 ed.

Any situation to which the emergency services organization responds to deliver emergency services, including rescue, fire suppression, emergency medical care, special operations, law enforcement, and other forms of hazard control and mitigation.

Emergency Incident. (secondary) NFPA 1584, 2003 ed.

A specific emergency operation.

Health and Safety Officer. (preferred) NFPA 1500, 2002 ed.

The member of the fire department assigned and authorized by the fire chief as the manager of the safety and health program.

Health and Safety Officer. (secondary) NFPA 1584, 2003 ed.

The member of the fire department assigned and authorized by the fire chief as the manager of the safety and health program and who performs the duties and responsibilities specified in this recommended practice.

Incident Commander. (preferred) NFPA 472, 2002 ed.

The person who is responsible for all decisions relating to the management of the incident and is in charge of the incident site.

Incident Commander. (secondary) NFPA 1584, 2003 ed.

The fire department member in overall command of an emergency incident.

Incident Management System (IMS). (preferred) NFPA 1071, 2006 ed.

A system that defines the roles and responsibilities to be assumed by responders and the standard operating procedures to be used in the management and direction of emergency incidents and other functions.

Incident Management System (IMS). (secondary) NFPA 1584, 2003 ed.

A system that defines the roles and responsibilities to be assumed by personnel and the operating procedures to be used in the management and direction of emergency operations; the system is also referred to as an incident command system (ICS).

Substantiation: Adoption of preferred definitions will assist the user by providing consistent meaning of defined terms throughout the National Fire Codes.

Committee Meeting Action: Accept in Part

Use the preferred definition for company, emergency incident, incident commander, and incident management system (IMS). Delete the definition for health and safety officer.

Committee Statement: The definition for health and safety officer is being deleted as the term is no longer used in the standard.

Number Eligible to Vote: 31

Ballot Results: Affirmative: 28 Negative: 2

Ballot Not Returned: 1 Gillespie, A.

Explanation of Negative:

BOGUCKI, S.: See my Explanation of Negative Vote on 1584-1 (Log #CP2).

PREZANT, D.: See my Explanation of Negative Vote on Proposal 1584-1 (Log #CP2).

**FORM FOR COMMENTS ON NFPA REPORT ON PROPOSALS
2007 FALL REVISION CYCLE
FINAL DATE FOR RECEIPT OF COMMENTS: 5:00 pm EST, 3/2/2007**

For further information on the standards-making process, please contact the Codes
and Standards Administration at 617-984-7249

For technical assistance, please call NFPA at 617-770-3000

FOR OFFICE USE ONLY

Log #: _____

Date Rec'd: _____

Please indicate in which format you wish to receive your ROP/ROC **electronic** **paper** **download**
(Note: In choosing the download option you intend to view the ROP/ROC from our Website; no copy will be sent to you.)

Date _____ Name _____ Tel. No. _____

Company _____

Street Address _____ City _____ State _____ Zip _____

Please Indicate Organization Represented (if any) _____

1. a) NFPA Document Title _____ NFPA No. & Year _____

b) Section/Paragraph _____

2. Comment on Proposal No. (from ROP): _____

3. Comment recommends: (check one) new text revised text deleted text

4. Comment (include proposed new or revised wording, or identification of wording to be deleted): (Note: Proposed text should be in legislative format: i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~)). _____

5. Statement of Problem and Substantiation for Comment: (Note: State the problem that will be resolved by your recommendation; give the specific reason for your comment including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.) _____

6. Copyright Assignment

- a) I am the author of the text or other material (such as illustrations, graphs) proposed in this Comment.
- b) Some or all of the text or other material proposed in this Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source) _____

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PLEASE USE SEPARATE FORM FOR EACH COMMENT • NFPA Fax: (617) 770-3500

Mail to: Secretary, Standards Council, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269
11/1/2005

Sequence of Events Leading to Issuance of an NFPA Committee Document

Step 1 Call for Proposals

▼ Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2 Report on Proposals (ROP)

▼ Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.

▼ Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.

▼ Report on Proposals (ROP) is published for public review and comment.

Step 3 Report on Comments (ROC)

▼ Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.

▼ Committee votes by written ballot on Comments. If two-thirds approve, Reports goes forward. Lacking two-thirds approval, Report returns to Committee.

▼ Report on Comments (ROC) is published for public review.

Step 4 Technical Committee Report Session

▼ “*Notices of intent to make a motion*” are filed, are reviewed, and valid motions are certified for presentation at the Technical Committee Report Session. (“Consent Documents” that have no certified motions bypass the Technical Committee Report Session and proceed to the Standards Council for issuance.)

▼ NFPA membership meets each June at the Annual Meeting Technical Committee Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with “certified amending motions.”

▼ Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5 Standards Council Issuance

▼ Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.

▼ Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

The Technical Committee Report Session of the NFPA Annual Meeting

The process of public input and review does not end with the publication of the ROP and ROC. Following the completion of the Proposal and Comment periods, there is yet a further opportunity for debate and discussion through the Technical Committee Report Sessions that take place at the NFPA Annual Meeting.

The Technical Committee Report Session provides an opportunity for the final Technical Committee Report (i.e., the ROP and ROC) on each proposed new or revised code or standard to be presented to the NFPA membership for the debate and consideration of motions to amend the Report. The specific rules for the types of motions that can be made and who can make them are set forth in NFPA's rules, which should always be consulted by those wishing to bring an issue before the membership at a Technical Committee Report Session. The following presents some of the main features of how a Report is handled.

What Amending Motions Are Allowed. The Technical Committee Reports contain many Proposals and Comments that the Technical Committee has rejected or revised in whole or in part. Actions of the Technical Committee published in the ROP may also eventually be rejected or revised by the Technical Committee during the development of its ROC. The motions allowed by NFPA rules provide the opportunity to propose amendments to the text of a proposed code or standard based on these published Proposals, Comments, and Committee actions. Thus, the list of allowable motions include motions to accept Proposals and Comments in whole or in part as submitted or as modified by a Technical Committee action. Motions are also available to reject an accepted Comment in whole or part. In addition, motions can be made to return an entire Technical Committee Report or a portion of the Report to the Technical Committee for further study.

The NFPA Annual Meeting, also known as the World Safety Conference and Exposition®, takes place in June of each year. A second Fall membership meeting was discontinued in 2004, so the NFPA Technical Committee Report Session now runs once each year at the Annual Meeting in June.

Who Can Make Amending Motions. Those authorized to make these motions are also regulated by NFPA rules. In many cases, the maker of the motion is limited by NFPA rules to the original submitter of the Proposal or Comment or his or her duly authorized representative. In other cases, such as a Motion to Reject an accepted Comment, or to Return a Technical Committee Report or a portion of a Technical Committee Report for Further Study, anyone can make these motions. For a complete explanation, NFPA rules should be consulted.

The Filing of a Notice of Intent to Make a Motion. Before making an allowable motion at a Technical Committee Report Session, the intended maker of the motion must file, in advance of the session, and within the published deadline, a Notice of Intent to Make a Motion. A Motions Committee appointed by the Standards Council then reviews all notices and certifies all amending motions that are proper. The Motions Committee can also, in consultation with the makers of the motions, clarify the intent of the motions and, in certain circumstances, combine motions that are dependent on each other together so that they can be made in one single motion. A Motions Committee report is then made available in advance of the meeting listing all certified motions. Only these Certified Amending Motions, together with certain allowable Follow-Up Motions (that is, motions that have become necessary as a result of previous successful amending motions) will be allowed at the Technical Committee Report Session.

Consent Documents. Often there are codes and standards up for consideration by the membership that will be noncontroversial, and no proper Notices of Intent to Make a Motion will be filed. These "Consent Documents" will bypass the Technical Committee Report Session and head straight to the Standards Council for issuance. The remaining Documents are then forwarded to the Technical Committee Report Session for consideration of the NFPA membership.

Action on Motions at the Technical Committee Report Session. In order to actually make a Certified Amending Motion at the Technical Committee Report Session, the maker of the motion must sign in at least an hour before the session begins. In this way, a final list of motions can be set in advance of the session. At the session, each proposed Document up for consideration is presented by a motion to adopt the Technical Committee Report on the Document. Following each such motion, the presiding officer in charge of the session opens the floor to motions on the Document from the final list of Certified Amending Motions followed by any permissible Follow-Up Motions. Debate and voting on each motion proceeds in accordance with NFPA rules. NFPA membership is not required in order to make or speak to a motion, but voting is limited to NFPA members who have joined at least 180 days prior to the session and have registered for the meeting. At the close of debate on each motion, voting takes place, and the motion requires a majority vote to carry. In order to amend a Technical Committee Report, successful amending motions must be confirmed by the responsible Technical Committee, which conducts a written ballot on all successful amending motions following the meeting and prior to the Document being forwarded to the Standards Council for issuance.

Standards Council Issuance

One of the primary responsibilities of the NFPA Standards Council, as the overseer of the NFPA codes and standards development process, is to act as the official issuer of all NFPA codes and standards. When it convenes to issue NFPA documents it also hears any appeals related to the Document. Appeals are an important part of assuring that all NFPA rules have been followed and that due process and fairness have been upheld throughout the codes and standards development process. The Council considers appeals both in writing and through the conduct of hearings at which all interested parties can participate. It decides appeals based on the entire record of the process as well as all submissions on the appeal. After deciding all appeals related to a Document before it, the Council, if appropriate, proceeds to issue the Document as an official NFPA code or standard, recommended practice or guide. Subject only to limited review by the NFPA Board of Directors, the decision of the Standards Council is final, and the new NFPA document becomes effective twenty days after Standards Council issuance. The illustration on page 9 provides an overview of the entire process, which takes approximately two full years to complete.

Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises

2008 Edition

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for mandatory extracts are given in Chapter 2 and those for nonmandatory extracts are given in Annex B. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1 Scope. This standard establishes the minimum criteria for developing and implementing a rehabilitation process for fire department members at incident scene operations and training exercises.

1.2 Purpose. This standard describes the rehabilitation process for members operating within an incident management system.

1.3 Application.

1.3.1 This standard applies to organizations providing rescue, fire suppression, emergency medical services, hazardous materials mitigation, special operations, and other emergency services, including public, military, private, and industrial fire departments.

1.3.2 This standard does not apply to industrial fire brigades that might also be known as emergency brigades, emergency response teams, fire teams, plant emergency organizations, or mine emergency response teams.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2007 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2005 edition.

NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Fighters*, 2000 edition.

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*, 2002 edition

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2007 edition.

NFPA 1521, *Standard for Fire Department Safety Officer*, 2002 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2005 edition.

NFPA 1581, *Standard on Fire Department Infection Control Program*, 2005 edition.

3.1 General. The definitions contained in this chapter apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

3.2.3 Shall. Indicates a mandatory requirement.

3.2.4 Should. Indicates a recommendation or that which is advised but not required

3.2.5 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law.

3.3 General Definitions.

3.3.1 Active Cooling. See 3.3.5.1.

3.3.2 Advanced Life Support (ALS). Emergency medical treatment beyond basic life support level as defined by the medical authority having jurisdiction. [1500, 2007]

3.3.3 Basic Life Support (BLS). Emergency medical treatment at a level as defined by the medical authority having jurisdiction. [1500, 2007]

3.3.4* Company. A group of members (1) under the direct supervision of an officer; (2) trained and equipped to perform assigned tasks; (3) usually organized and identified as engine companies, ladder companies, rescue companies, squad companies, or multi-functional companies; (4) operating with one piece of fire apparatus (pumper, aerial fire apparatus, elevating platform, quint, rescue, squad, ambulance) except where multiple apparatus are assigned that are dispatched and arrive together, continuously operate together, and are managed by a single company officer; (5) arriving at the incident scene on fire apparatus. [1500, 2007]

3.3.5 Cooling.

3.3.5.1 Active Cooling. The process of using external methods or devices (e.g., hand and forearm immersion, misting fans, ice vests) to reduce elevated core body temperature.

3.3.5.2 Passive Cooling. The process of using natural evaporative cooling (e.g., sweating, doffing personal protective equipment) to reduce elevated core body temperature.

3.3.6* Core Body Temperature. The temperature of the central blood.

3.3.7 Crew. A team of two or more fire fighters. [1500, 2007]

3.3.8 Emergency Incident. Any situation to which the emergency services organization responds to deliver emergency services, including rescue, fire suppression, emergency medical care, special operations, law enforcement, and other forms of hazard control and mitigation. [1561, 2005]

3.3.9 Emergency Medical Care. The provision of treatment to patients, including first aid, cardiopulmonary resuscitation, basic life support (first responder or EMT level), advanced life support (paramedic level), and other medical procedures that occur prior to arrival at a hospital or other health care facility. [1581, 2005]

3.3.10 Emergency Medical Services. The provision of treatment, such as first aid, cardiopulmonary resuscitation, basic life support, advanced life support, and other pre-hospital procedures including ambulance transportation, to patients. [1500, 2007]

3.3.11 Emergency Operations. Activities of the fire department relating to rescue, fire suppression, emergency medical care, and special operations, including response to the scene of the incident and all functions performed at the scene. [1500, 2007]

3.3.12* Hydration. A fluid balance between water lost by normal functioning and oral intake of fluids in the form of liquid and foods that contain water.

3.3.13 Incident Commander (IC). The person who is responsible for all decisions relating to the management of the incident and is in charge of the incident site. [472, 2002]

3.3.14 Incident Management System (IMS). A system that defines the roles and responsibilities to be assumed by responders and the standard operating procedures to be used in the management and direction of emergency incidents and other functions. [1561, 2005]

3.3.15* Medical Monitoring. The ongoing, systematic evaluation of members who are at risk of suffering adverse effects from stress or from exposure to heat, cold, or hazardous environments.

3.3.16* Member. A person involved in performing the duties and responsibilities of a fire department, under the auspices of the organization. [1500, 2007]

3.3.17 Passive Cooling. See 3.3.5.2.

3.3.18 Patient. An emergency responder who undergoes medical monitoring and treatment during the rehabilitation process.

3.3.19 Personnel Accountability System. A system that readily identifies both the location and function of all members operating at an incident scene. [1500, 2007]

3.3.20 Procedure. An organizational directive issued by the authority having jurisdiction or by the department that establishes a specific policy that must be followed. [1561, 2005]

3.3.21 Rate of Perceived Exertion (RPE). A subjective impression of overall physical effort, strain, and fatigue during acute physical exertion.

3.3.22* Recovery. The process of returning a member's physiological and psychological states to normal or neutral where this person is able to perform additional emergency tasks, be re-assigned, or released without any adverse effects.

3.3.23* Rehabilitation. An intervention designed to mitigate against the physical, physiological, and emotional stress of fire fighting in order to sustain a member's energy, improve performance, and decrease the likelihood of on-scene injury or death.

3.3.24 Rehabilitation Manager. The person or officer assigned to manage the rehabilitation tactical level management unit.

3.3.25 Sports Drink. A fluid replacement beverage that is between 4 percent and 8 percent carbohydrate and contains between 0.5 g and 0.7 g of sodium per liter of solution.

3.3.26* Standard Operating Procedure. A written organizational directive that establishes or prescribes specific operational or administrative methods to be followed routinely for the performance of designated operations or actions. [1521, 2002]

3.3.27 Tactical Level Management Component (TLMC). A management unit identified in the incident management system commonly known as "division" or "group." [1561, 2005]

Chapter 4 Preparedness

4.1 General.

4.1.1 Standard Operating Procedures.

4.1.1.1* The fire department shall develop standard operating procedures (SOPs) that outline a systematic approach for the rehabilitation of members operating at incidents and training exercises.

4.1.1.2* These procedures shall include but not be limited to the following:

- 1) Relief from climactic conditions
- (2) Rest and recovery
- (3) Cooling (both active and passive) or warming
- (4) Re-hydration (fluid replacement)
- (5) Calorie and electrolyte replacement
- (6) Medical monitoring
- (7) Member accountability
- (8) Release

4.1.1.3* Crews shall be rotated as necessary to allow for rehabilitation.

4.1.2 Protocols and procedures guiding fire department and other emergency services personnel who care for ill or injured members during emergency operations shall be developed by the emergency medical care (EMC) medical director in collaboration with the fire department physician and fire chief.

4.2 Training and Recognition of Heat/Cold Stress.

4.2.1 All members shall be provided with information on how the body regulates core temperature and how to recognize the signs, symptoms, and controls for heat and cold stress. (See *Annex B*.)

4.2.2* Departments and members shall follow NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Fighters*.

4.2.3 Procedures shall be in place to ensure that rehabilitation operations commence whenever emergency operations pose the risk of members exceeding a safe level of physical or mental endurance.

4.3 Pre-Incident and Fireground Training Operations.

4.3.1* Members shall maintain proper hydration, nutrition, and diet to maintain normal body function.

4.3.2* To maintain adequate, minimum hydration, members' shall drink a minimum 6 oz to 8 oz (180 mL to 240 mL) of approved fluids every 6 hours in addition to those fluids ingested with meals.

4.3.3* When a specific event that the member has to participate in is known in advance, pre-hydration shall include an additional 16 oz (500 mL) of fluids within 2 hours prior to the event.

Chapter 5 Rehabilitation Area Characteristics

5.1 Area for Rehabilitation. The incident commander shall ensure that an adequate area and/or shelter is available to conduct rehabilitation of members.

5.1.1 For hot environments, this area shall include shade and/or air-conditioning, and a place to sit.

5.1.2 For cold or wet environments, this area shall provide for dry protected areas out of the wind, heated areas, and a place to sit.

5.1.3 Multiple Rehabilitation Areas.

5.1.3.1 When the size of the operation or geographic barriers limit members access to the rehabilitation area, the incident commander shall establish more than one rehabilitation area.

5.1.3.2* Each rehabilitation location shall be given a geographic name consistent with its location at the incident site.

5.2 Site Characteristics.

5.2.1* The site shall be a sufficient distance from the effects of the operation that members can safely remove their personal protective equipment (PPE) and can be afforded physical and mental rest.

5.2.2* The site shall include an area where members can remove and leave their PPE prior to entering the designated rehabilitation area.

5.2.3 The site shall provide protection from the prevailing environmental conditions.

5.2.4 The site shall be free of exhaust fumes from apparatus, vehicles, or equipment.

5.2.5 The site shall be large enough to accommodate multiple crews and rehabilitation personnel, based on the size of the incident.

5.2.6 The site shall include a medical monitoring and treatment area.

5.2.7 The site shall allow access to transport members to a (medical) treatment facility where required.

5.3* Establishing Rehabilitation Resources. The incident commander or the rehabilitation manager shall identify those resources to be used at an incident rehabilitation facility.

Chapter 6 Incident Scene and Training Rehabilitation

6.1 Criteria for Implementation. Rehabilitation operations shall be provided in accordance with fire department standard SOPs; NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*; and NFPA 1561, *Standard on Emergency Services Incident Management System*.

6.1.1* Rehabilitation operations shall commence whenever emergency operations or training exercises pose a safety or health risk to members.

6.1.2 Members shall be assigned to rehabilitation as prescribed by departmental SOPs.

6.1.3* All personnel entering rehabilitation shall operate within the chain of command.

6.1.4 If personnel are required to undergo additional medical evaluation, they shall comply with the directive in 6.1.3.

6.1.5* Members shall, at minimum, report to rehabilitation following the use of a second 30-minute self-contained breathing apparatus (SCBA) cylinder, a

single 45-minute or 60-minute SCBA cylinder, or a 45-minute work cycle.

6.2 Rehabilitation Efforts. Rehabilitation efforts shall include providing the following:

- (1) Relief from climactic conditions
- (2) Rest and recovery
- (3) Cooling (both active and passive) or warming
- (4) Re-hydration (fluid replacement)
- (5) Calorie and electrolyte replacement
- (6) Medical monitoring
- (7) Member accountability
- (8) Release

6.2.1 Members shall be afforded relief from climactic and/or extreme conditions (*see 5.2.1*).

6.2.2 Rest and Recovery.

6.2.2.1 Members entering rehabilitation for the first time shall rest for a minimum of 10 minutes and longer where practical.

6.2.2.2 Members shall rest for a minimum of 20 minutes following the use of a second 30-minute SCBA cylinder, a single 45-minute or 60-minute SCBA cylinder, or a 45-minute work cycle.

6.2.3 Active Cooling and Warming.

6.2.3.1* Members with heat-related stress shall remove protective clothing and, if applicable, apply active cooling to regain normal body temperature.

6.2.3.2 Members with cold-related stress shall add clothing, wrap themselves in blankets, or use other methods to regain normal body temperature.

6.2.4* Members entering rehabilitation shall, at minimum, consume at least 32 oz (1 L) of fluid during rehabilitation and be encouraged to continue to rehydrate when they return to the fire station or their personal life.

6.2.5* Members shall replace calories and electrolytes as required, particularly during incidents of more than 3 hours and incidents where members are likely to be working for more than 1 hour.

6.2.5.1* Fire departments shall ensure that appropriate calorie and electrolyte replacements are available.

6.2.5.2* Fire departments shall ensure that a means to wash members' hands and faces is available whenever calorie replacement will be used.

6.2.6* Medical Monitoring and Emergency Medical Care.

6.2.6.1* Emergency medical care (EMC) shall be available as part of the incident scene rehabilitation for the evaluation and treatment of members.

6.2.6.2* Basic life support (BLS) shall be the minimum level of available care.

6.2.6.3 EMC personnel shall evaluate members arriving at rehabilitation for symptoms suggestive of a health and/or safety concern.

6.2.6.4 At a minimum, EMC personnel shall be alert for the following:

- (1)* Personnel complaining of chest pain, dizziness, shortness of breath, weakness, nausea, or headache
- (2)* General complaints such as cramps, aches and pains, rate of perceived exertion (RPE) scale
- (3) Symptoms of heat- or cold-related stress (*see A.4.2.1*)
- (4) Changes in gait, speech, or behavior
- (5)* Alertness and orientation to person, place, and time of members

6.2.6.5 Symptomatic members, or members with abnormal findings shall receive additional monitoring during rehabilitation.

6.2.6.6 Emergency medical care personnel shall access and provide member treatment in accordance with protocols developed by the fire department physician or medical authority.

6.2.6.7 Members treated for any heat-related injuries shall be removed from active duties.

6.2.6.8* Emergency medical care personnel shall record the information obtained during any medical monitoring or medical treatment.

6.2.7* Member Accountability. All members entering and leaving rehabilitation shall be assigned by the incident commander and shall be tracked through the personnel accountability system.

6.2.8 Release.

6.2.8.1 Emergency medical care personnel shall also evaluate members prior to their release from rehabilitation to ensure they are fit to return to duty.

6.2.8.2 Members being released from rehabilitation shall confirm their accountability with the rehabilitation manager.

6.3 Company/Crew Level Rehabilitation.

6.3.1* Company officers shall ensure that members remain hydrated and that safe drinking water is available (*see 6.2.4*).

6.3.2 Work-to-Rest Ratio.

6.3.2.1* Company officers shall assess their crew at least every 45 minutes and more frequently when working in extreme conditions to determine their need for rehabilitation.

6.3.2.2 If one or more of the crew members is seriously injured or killed during the incident, all members of the crew shall be removed from service and shall undergo critical incident stress management procedures as per department policy.

6.4 Documentation.

6.4.1* Time-in/time-out for members/crews entering or leaving the rehabilitation area shall be documented.

6.4.2 If medical evaluation and treatment is necessary, a rehabilitation evaluation report shall document the evaluation.

6.4.3 Where medical monitoring is performed, these records shall be placed in the member's employee medical record.

6.4.4 If medical treatment is required, emergency medical care documentation shall be completed as well as responder injury and workers' compensation reports.

Chapter 7 Post-Incident Rehabilitation

7.1 Policy. The authority having jurisdiction shall ensure there is a policy on post-incident rehabilitation.

7.2* Re-Hydration. Fluid intake shall include 16 oz to 32 oz (0.5 L to 1 L) over a period of up to 2 hours after the end of an incident.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.3.4 Company. For fire suppression and other emergency operations, there are jurisdictions where the response capability of the initial arriving company is configured with two apparatus operating together. This may be a result of apparatus not being configured with seated and belted positions

for four personnel, therefore requiring a second vehicle to carry additional personnel. It may also be the result of the fire department's SOPs that require two apparatus operating together to complete the operational procedures. The objective is to ensure that a minimum of four personnel are assigned to and deployed as a company. The two (or more) pieces of apparatus would always be dispatched and respond together as a single company. Some examples of this include the following:

- (1) A pumper and tanker/tender that would be responding together outside a municipal water district
- (2) A multiple-piece company, specified as such in a fire department's standard operating procedures, such as an engine company that responds with a pumper and a hose wagon
- (3) A company that consists of a pumper with an additional vehicle as a personnel carrier
- (4) A pumper and an ambulance or rescue unit that always respond together

Company, as used in this standard, is synonymous with company unit, response team, crew, and response group, rather than a synonym for a fire department.

A.3.3.6 Core Body Temperature. There is no single core temperature as temperature varies from one site to another, but valid measures of core body temperature approximate the temperature of the central blood. Clinically measured sites to approximate core body temperature include the rectum, gastrointestinal tract, tympanic membrane, and oral cavity. (*See Textbook of Military Medicine: Medical Aspects of Harsh Environments*).

A.3.3.12 Hydration. Dehydration is the loss of body fluid, also called hypohydration or negative fluid balance. The magnitude of dehydration can vary tremendously following strenuous activity in the heat. Dehydration can cause impairment of thermoregulation, decreased physical performance, increased cardiovascular strain, and a disruption of blood chemistry.

A.3.3.14 Incident Management System (IMS). The system is also referred to as an incident command system (ICS). [1561, 2005]

A.3.3.15 Medical Monitoring. This monitoring is done for the purpose of achieving early recognition and prevention of these effects in order to maintain the optimal health and safety of on-scene personnel.

A.3.3.16 Member. A fire department member can be a full-time or part-time employee or a paid or unpaid volunteer, can occupy any position or rank within the fire department, and can engage in emergency operations. [1500, 2007]

A.3.3.22 Recovery. Recovery suggests that all functions have returned to normal and that the member is not suffering any adverse effects from a current or previous activity (e.g., member could still be dehydrated from a previous activity.)

A.3.3.23 Rehabilitation. Rehabilitation efforts should include providing relief from extreme climate and/or incident conditions, rest and recovery, rehydration, replacement of calories and electrolytes, active cooling (or warming if necessary), medical monitoring, and member accountability.

A.3.3.26 Standard Operating Procedure. The intent of standard operating procedures is to establish directives that must be followed. Standard operating guidelines allow flexibility in application.

A.4.1.1.1 This procedure should include the following elements of the rehabilitation process:

- (1) Initiate rehabilitation
- (2) Responsibilities
- (3) Accountability
- (4) Safety
- (5) Release

A.4.1.1.2 Figure A.4.1.1.2 shows a generic rehabilitation procedure that can be adopted for use by a fire department. (See Figure A.4.1.1.2 on pages 7 thru 9.)

A.4.1.1.3 Where limited resources strain existing personnel, crews can be rotated to a less physically demanding task (e.g., operating the pump rather than being part of the interior attack) as part of a strategic approach to limiting exertion.

A.4.2.1 See Annex B.

A.4.2.2 Physical conditioning is known to allow individuals to operate at

a higher core temperature, decrease cardiovascular strain associated with strenuous activity, and improve physical performance. Maintaining good physical conditioning will optimize a member's performance under extreme conditions and facilitate effective rehabilitation.

A.4.3.1 Members should follow nutrition guidelines that include the following:

- (1) Carbohydrates (fruits, vegetables, grains, starches)
- (2) Proteins
- (3) Fats
- (4) Smaller, more frequent meals

Beverages, foods, and substances that should be avoided include the following:

- (1) Caffeinated, carbonated, high-fructose-content, and high-sugar drinks [exceeding 7 percent carbohydrate (CHO) solution]
- (2) Foods with high fat and/or high protein content
- (3) Alcohol within 8 hours prior to duty
- (4) Excessive fluids
- (5) Tobacco
- (6) Creatine
- (7) Ephedrine

A.4.3.2 Caffeinated beverages should not be approved fluids.

A.4.3.3 When hydration is taken with a meal, water is appropriate. Sports drinks should be considered for rehydration and calorie and electrolyte replacement when scheduled activities are of moderate to high intensity and last 1 hour or longer.

Consumption of smaller amounts of fluids more frequently is recommended to facilitate excretion and bladder comfort [e.g., 2 oz to 4 oz (60 mL to 120 mL) servings]. Scheduled events can include planned training and mass gatherings. Members should drink water every day, but water can quench thirst without providing needed carbohydrates and electrolytes. If activities such as training exercises or demonstrations that are likely to induce heat stress are planned or scheduled, drinking sports drinks before the activities can help reduce the effects of heat stress during those activities. Proper diet throughout the day can also help reduce these risks.

If high-intensity and/or long-duration activities are anticipated, consider increasing recommended servings of fluid. Carbohydrate (CHO) and electrolyte intake should also be increased under these conditions.

Some medications can increase the need for fluids.

If using powdered mix or concentrate for sports drink, follow the manufacturer's instructions for mixing to ensure proper balance of carbohydrate and electrolyte content. A mixture that is too concentrated will be absorbed slowly.

A.5.1.3.2 Examples of geographic names are "north rehabilitation," "south rehabilitation," and "1st floor rehabilitation," "12th floor rehabilitation."

A.5.2.1 Rehabilitation shelters (where a rehabilitation area could be established) could include the following:

- (1) Nearby garage, building lobby, or other structure
- (2) Large tree, overhang, and so forth for shade
- (3) Open area in which a rehabilitation area can be created using tarps, fans, and so forth
- (4) Tents or other portable structures
- (5) Several floors below a fire in a high-rise building
- (6) School bus or municipal bus
- (7) Cabs of fire apparatus or any enclosed areas of emergency vehicles at the scene
- (8) Retired fire apparatus or surplus government vehicle that has been renovated as a rehabilitation unit, which could respond by request or be dispatched during certain weather conditions
- (9) Specially designed rehabilitation apparatus

STANDARD OPERATING PROCEDURE FOR REHABILITATION

PURPOSE. To provide guidance on the implementation and use of a rehabilitation process as a tactical requirement of the incident management system (IMS) at the scene of a fire, other emergency, or training exercise. It will ensure that personnel who might be suffering the effects of metabolic heat buildup, dehydration, physical exertion, and/or extreme weather receive evaluation and rehabilitation during emergency operations.

SCOPE. All personnel attending or operating at the scene of a fire/emergency or training exercise.

RULES.

- (1) Rehabilitation shall commence when fire/emergency operations and/or training exercises pose a health and safety risk.
- (2) Tactical-level rehabilitation shall be established for large-scale incidents, long-duration and/or physically demanding incidents, and extreme temperatures.
- (3) The incident commander shall establish rehabilitation according to the circumstances of the incident. The rehabilitation process shall include the following:
 - (a) Rest — a “time out” to help fire fighters stabilize their vital signs
 - (b) Rehydration to replace lost body fluids
 - (c) Cooling (passive and/or active)
 - (d) Warming
 - (e) Medical monitoring and treatment
 - (f) Relief from extreme climatic conditions (heat, cold, wind, rain)
 - (g) Calorie and electrolyte replacement
 - (h) Accountability
 - (i) Release

RESPONSIBILITIES.

The incident commander shall be responsible for the following:

- (1) Include tactical rehabilitation in incident/event size-up
- (2) Establish a rehabilitation group to reduce adverse physical effects on fire fighter while operating during fire/emergencies, training exercises, and extreme weather conditions
- (3) Designate and assign an officer to manage the rehabilitation sector
- (4) Ensure sufficient resources are assigned to the rehabilitation sector
- (5) Ensure EMS personnel are available for medical monitoring and treatment of fire fighters as required

The rehabilitation manager shall be responsible for the following:

- (1) Don the rehabilitation manager vest
- (2) Whenever possible, select a location for rehabilitation with the following site characteristics:
 - (a) Large enough to accommodate the number of personnel expected (including EMS personnel for medical monitoring)
 - (b) Have a separate area for members to remove PPE
 - (c) Be accessible for an ambulance and EMS personnel should medical treatment be required
 - (d) Be removed from hazardous atmospheres including apparatus exhaust fumes, smoke, and other toxins
 - (e) Provide shade in summer and protection from inclement weather at other times
 - (f) Have access to a water supply (bottled or running) to provide for hydration and active cooling
 - (g) Be away from spectators and media

FIGURE A.4.1.1.2 Sample Rehabilitation Standard Operating Procedure.

STANDARD OPERATING PROCEDURE FOR REHABILITATION (continued)

- (3) Ensure personnel in rehabilitation “dress down” by removing their bunker coats, helmets, hoods, and opening their bunker pants to promote cooling
- (4) Provide the required resources for rehabilitation including the following:
 - (a) Potable drinking water for hydration
 - (b) Sports drinks (to replace electrolytes and calories) for long duration incidents (working more than one hour)
 - (c) Water supply for active cooling through forearm immersion
 - (d) Medical monitoring equipment (chairs to rest on, blood pressure cuffs, stethoscopes, first aid supplies, checksheets, etc.)
 - (e) Food where required and a means to wash or clean hands and face prior to eating
 - (f) Blankets and warm, dry clothing for winter months
 - (g) Washroom facilities where required
- (5) Time personnel in rehabilitation to ensure they receive at least 10 minutes to 20 minutes of rest
- (6) Ensure personnel rehydrate themselves
- (7) Ensure personnel are provided with a means to be actively cooled where required
- (8) Maintain accountability and remain within rehabilitation at all times
- (9) Document members entering or leaving rehabilitation
- (10) Inform the incident commander, accountability officer (resource status unit), and EMS personnel if a member requires transportation to and treatment at a medical facility
- (11) Serve as a liaison with EMS personnel

Company officers shall be responsible for the following:

- (1) Be familiar with the signs and symptoms of heat stress and cold stress
- (2) Monitor their company members for signs of heat stress and cold stress
- (3) Notify the IC when stressed members require relief, rotation, or reassignment according to conditions
- (4) Provide access to rehabilitation for company members as needed
- (5) Ensure that their company is properly checked in with the rehabilitation manager, accountability officer (resource unit) and that the company remains intact

Crew members shall be responsible for the following:

- (1) Be familiar with the signs and symptoms of heat and cold stress
- (2) Maintain awareness of themselves and company members for signs and symptoms of heat and cold stress
- (3) Promptly inform the company officer when members require rehabilitation and/or relief from assigned duties
- (4) Maintain unit integrity

EMS personnel shall be responsible for the following:

- (1) Report to the incident commander and obtain the rehabilitation requirements
- (2) Coordinate with rehabilitation manager
- (3) Identify the EMS personnel requirements
- (4) Check vital signs, monitor for heat stress and other medical issues, and provide treatment and transportation to medical facilities as required
- (5) Inform the incident commander and the rehabilitation manager when personnel require transportation to and treatment from a medical facility
- (6) Document medical treatment provided and, where possible, document medical monitoring including core temperature for all members in rehabilitation

FIGURE A.4.1.1.2 Sample Rehabilitation Standard Operating Procedure. (continued)

STANDARD OPERATING PROCEDURE FOR REHABILITATION (continued)**PROCEDURES.**

- (1) All personnel shall maintain hydration on an ongoing basis (pre-incident, incident, post-incident).
- (2) Members shall be sent to rehabilitation as required.
- (3) All members shall be sent to rehabilitation following the use of two 30-minute SCBA cylinders or one 45- to 60-minute SCBA cylinder. Shorter times might be considered during extreme weather conditions.
- (4) Active cooling (e.g., forearm immersion, misting fans) shall be applied where temperatures, conditions, and/or workload create the potential for heat stress.
- (5) In hot, humid conditions, a minimum of 10 minutes (20 minutes is preferable) of active cooling shall be applied following the use of the second and each subsequent SCBA cylinder.
- (6) Personnel in rehabilitation shall rest for at least 10 minutes to 20 minutes prior to being reassigned or released.
- (7) EMS personnel shall provide medical monitoring and treatment. Members displaying abnormal signs shall be considered for medical treatment.
- (8) If a member is demonstrating abnormal vital signs, he or she shall be monitored frequently during rehabilitation.
- (9) Vital signs shall be within the normal range prior to the member being released from rehabilitation.
- (10) Personnel who are weak or fatigued, with pale clammy skin, low blood pressure, nausea, headache, or dizziness shall be assessed by EMS personnel.
- (11) Personnel experiencing chest pain, shortness of breath, dizziness, or nausea shall be transported to a medical facility for treatment.
- (12) Personnel transported to a medical facility for treatment shall be accompanied and attended to by a department representative.
- (13) Members should drink approximately 32 oz (1 L) of water during rehabilitation. After the first hour, a sports drink containing electrolytes should be provided. Soda and caffeinated and carbonated beverages should be avoided.
- (14) Members should also consume at least 16 oz (500 mL) of water during the final rehabilitation period.
- (15) Nutritional snacks or meals shall be provided as required during longer duration incidents.
- (16) No tobacco use shall be permitted in or near the rehabilitation area.

**FIGURE A.4.1.1.2 Sample Rehabilitation Standard
Operating Procedure. (continued)**

A.5.2.2 Figure A.5.2.2 gives an example of the layout of a rehabilitation area and treatment area.

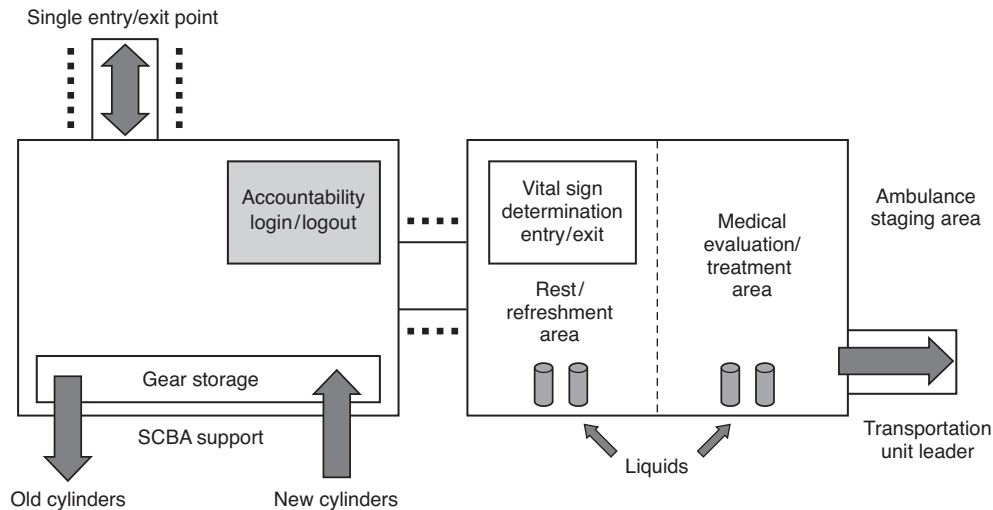


FIGURE A.5.2.2 Sample Layout of a Rehabilitation and Treatment Sector.

A.5.3 Rehabilitation resources could include, but do not have to be limited to, the following:

- (1) Portable shelters
- (2) Fans/blowers
- (3) Blankets
- (4) Portable heaters
- (5) Dry clothing
- (6) Lighting
- (7) Electrical generating equipment
- (8) Misting and cooling equipment
- (9) Rehabilitation area designation marking equipment
- (10) Chairs
- (11) Beverage-serving equipment
- (12) Exposure protective garments for rehabilitation staff
- (13) Personnel washing equipment (basins, soap, water, towels)
- (14) Cups (hot or cold according to the beverage)
- (15) One gallon (4 L) of drinking water per responder
- (16) Large clock
- (17) Traffic cones
- (18) Fireline tape
- (19) Log book and forms and writing utensils
- (20) Paper towels
- (21) Sanitary facilities (portable toilets)
- (22) Food (including appropriate serving devices and equipment)
- (23) Trash receptacles

A.6.1.1 Rehabilitation operations should consider the scope of the incident, including the following:

(1) *Time.* Extended use of turnout gear; extended exposure to weather conditions.

(2) *Complexity.* Crime scenes, standoffs, search operations, mass gatherings/public events, and so forth.

(3) *Intensity.* Mental and/or physical stress on a member, such as major extrications, actual fire attack, radiant heat load, or interior search and rescue.

Rehabilitation operations should consider hot weather conditions, including the following:

- (1) Temperature (*see Table A.6.1.1*)
- (2) Relative humidity (*see Table A.6.1.1*)
- (3) Direct sunlight

Rehabilitation operations should consider cold weather conditions, including the following:

- (1) Temperature
- (2) Wind speed
- (3) Moisture

The National Weather Service (NWS) implemented a new wind chill-temperature (WCT) index during the 2001–2002 winter season (*see Figure A.6.1.1*). The reason for the change was to improve the previous index used by the NWS and the Meteorological Services of Canada (MSC), which was based on the 1945 Siple and Passel index. Most of the changes in the new index are at temperatures below 5°F (-12°C).

The new WCT index makes use of advances in meteorology, biometeorology, and computer modeling to provide a more accurate, more useful formula for calculating the dangers of winter winds and freezing temperatures. In addition, clinical trials have been conducted and the results of those trials have been used to verify and improve the accuracy of the new formula.

Specifically, the improvements of the new WCT index are as follows:

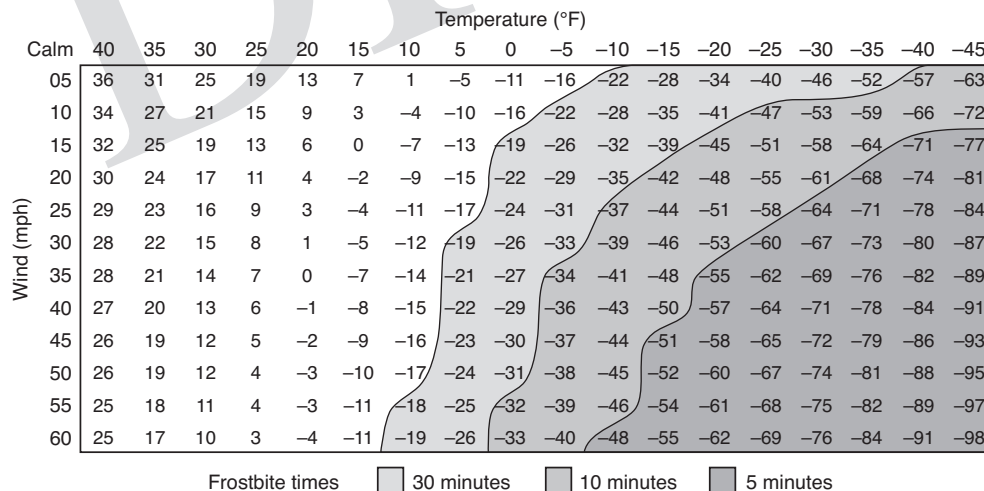
- (1) It uses calculated wind speeds at an average height of 5 ft (1.5 m) (typical height of a human face) based on readings from the national standard height of 33 ft (10 m) (typical height of an anemometer).
- (2) It is based on the latest heat transfer theory (i.e., heat loss from the body to its surroundings during cold and breezy/windy days).
- (3) It uses a standard factor for skin tissue and assumes a no sunlight scenario.

Table A.6.1.1 Heat Stress Index

Relative Humidity (percent)	Air Temperature (°F)										
	70	75	80	85	90	95	100	105	110	115	120
	Apparent Temperature (°F)										
0	64	69	73	78	83	87	91	95	99	103	107
10	65	70	75	80	85	90	95	100	105	111	116
20	66	72	77	82	87	93	99	105	112	120	130
30	67	73	78	84	90	96	104	113	123	135	148
40	68	74	79	86	93	101	110	123	137	151	
50	69	75	81	88	96	107	120	135	150		
60	70	76	82	90	100	114	132	149			
70	70	77	85	93	106	124	144				
80	71	78	86	97	113	136	157				
90	71	79	88	102	122	150	170				
100	72	80	91	108	133	166					

Apparent Temperature (°F)	Danger Category	Injury Threat
Below 80	None	Little or no danger under normal circumstances
80–90	Caution	Fatigue possible if exposure is prolonged and there is physical activity
91–105	Extreme Caution	Heat cramps and heat exhaustion possible if exposure is prolonged and there is physical activity
106–130	Danger	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity
Above 130	Extreme Danger	Heat stroke imminent!

Note: Add 10°F when protective clothing is worn and add 10°F when in direct sunlight.
 Source: U.S. Fire Administration, FA-114, *Emergency Incident Rehabilitation*, July 1992.



Frostbite times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

T = Air temperature (°F) V = Wind speed (mph)

FIGURE A.6.1.1 National Weather Service Wind Chill–Temperature (WCT) Index. (Courtesy of National Weather Service.)

A.6.1.3 All members are operating within the incident management system until such time as they arrive at medical facility, have returned from the incident scene, or their shift is over.

A.6.1.5 Ideally, members should be provided with rehabilitation or be released from their assignments following the use of a single 30-minute SCBA cylinder or a 20-minute work cycle.

A.6.2.3.1 Active cooling is often necessary to return a member's core temperature to within the safe, normal range and minimizing the chance of experiencing heat stress.

Scientific studies have demonstrated the effectiveness of using active cooling to quickly and safely lower a member's core temperature. Both forearm immersion and misting fans have been found to be effective. Misting fans may not provide adequate cooling in a humid environment where they are less effective and personnel wet by mists may become more susceptible to steam burns if they are sent back into a fire environment with wet clothes, and so forth.

Forearm immersion, where the hands and forearms are immersed in cool water, has been found to be more effective than misting fans in hot and humid areas to reduce a member's body core temperature. (See McLellan, Tom M., and Glen A. Selkirk, "The Management of Heat Stress for the Firefighter.") The vascularity of blood vessels close to the skin of the arms and hands acts as an excellent means of heat transfer.

A.6.2.4 During emergency incidents and training exercises, the goal should be to match the volume of fluid intake with the volume of sweat output. Humans can easily exceed a sweat rate of 64 oz (2 L) per hr in hot and humid conditions. (See Sawka, M. N., and K. B. Pandol, "Effects of Body Water Loss on Physiological Function and Exercise Performance.") It is important to remember that fire-fighting gear interferes with heat dissipation and traps moisture next to the skin, hence as soon as fire fighters don their gear the skin experiences a hot -and humid environment and sweating begins. Furthermore, sweating continues even after a fire fighter stops working and enters rehabilitation.

It is important to consider all of this fluid loss through sweat when trying to match sweat loss with fluid intake. Fire fighters can easily lose 32 oz (1 L) of water in less than 20 minutes of strenuous firefighting activity. (See Smith, D. L., and S. J. Petruzzello, "Selected Physiological and Psychological Responses to Live-Fire Drills in Different Configurations of Firefighting Gear.")

Dehydration has several detrimental effects on the body as follows:

- (1) Impairs the body's ability to maintain core temperature
- (2) Decreases strength
- (3) Shortens endurance time
- (4) Decreases blood volume, which increases cardiovascular strain

A 15 percent reduction in plasma volume and a 40 percent reduction in stroke volume have been reported following less than 20 minutes of strenuous firefighting activity. (See Smith, D. L., and S. J. Petruzzello, M. A. Chludzinski, J. J. Reed, J. A. Woods, "Effects of strenuous live-fire fire fighting drills on hematological, blood chemistry, and psychological measures"; and Smith, D. L., and S. J. Petruzzello, and T. S. Manning, "The Effect of Strenuous Live-Fire Drills on Cardiovascular and Psychological Responses of Recruit Firefighters.")

A.6.2.5 Many sports drinks now contain protein and this is something that should be considered to speed glucose uptake by the muscles, to speed muscle recovery, and to mitigate against disruption of the immune system.

A.6.2.5.1 Longer duration or heavy exertion events, time since last meal, and individual conditions should be factors considered when determining if calorie and electrolyte replacements are needed.

A.6.2.5.2 Packaged wipes are an example of a means that members can use to wash their faces and hands.

A.6.2.6 Medical monitoring is the process of monitoring members who are at risk of suffering adverse health or safety effects. Vital sign measurements must be interpreted in context of the overall appearance and health status of the member. The fire department physician or appropriate medical authority should establish medical protocols and procedures with parameters regarding the following:

- (1) Immediate transport to the emergency department
- (2) Close monitoring and treatment in rehabilitation
- (3) Release from rehabilitation

Currently there are no studies that quantify vital sign measurements with the length of rehabilitation or with the need to direct members to a treatment area. Visual signs and symptoms remain the best method to evaluate members in

the rehabilitation area. Vital sign measurements can be used as a baseline and may assist to identify other health or safety concerns.

The following information on vital signs may be of help to the fire department physician or appropriate medical authority in establishing the parameters with the understanding that some vital signs (e.g., blood pressure) will not be immediately obtainable as the member enters rehabilitation, but should be measured as soon as practical.

Temperature. Body temperature is a vital piece of information to assessing individuals with both heat and cold stress exposures. Normal core body temperatures range from 98.6°F to 100.6°F (37°C to 38.1°C). The core body temperature (typically obtained using a rectal thermometer) provides the most accurate measurement, but is rarely feasible in the field setting. Alternate methods of obtaining body temperature include oral or tympanic (ear) methods. Oral measurements are about 1°F (0.55°C) lower than core body temperature and tympanic measurements may be up to 2°F (1.1°C) lower than core body temperature. It is important to be aware that these alternate methods are subject to error based on several circumstances (e.g., decreased oral temperature in individuals who are hyperventilating).

Elevated temperature, noted by touch or measured, should alert the rehabilitation manager or EMS personnel to the possibility of heat-related illness. However, given the problem of measuring devices underestimating core body temperature, it is essential that a measured temperature in the normal range not be used to exclude the possibility of heat-related problems.

Heart rate (pulse). Heart rate (pulse) is another critical measure used to assess health status. Normal resting heart rates range from 60 to 100 beats per minute. Under stress and exertion, the pulse rate can, and should, increase, frequently above 100 beats per minute. The level of increase depends on the amount of stress and the individual's physical conditioning. As members report to rehabilitation after expending a significant amount of energy in stressful conditions, a pulse rate that is up to 70 percent of maximum heart rate [(220-age) x (0.7)] is frequently encountered. After resting in rehabilitation, the member's heart rate should return to near normal resting rates. A fire fighter who has not achieved a heart rate of less than 100 beats per minute by the end of 20 minutes should not be released from rehabilitation, but should be further monitored, and if warranted, sent for further medical evaluation. Part of additional monitoring should include orthostatic pulse and blood pressure.

Respiratory rate. Respiratory rate is a vital indicator used to assess health status, stress, as well as a possible indicator of exposure to other hazards. Normal respiratory rate is 12 to 20 breaths per minute. By the end of the rehabilitation period, the fire fighter should have a respiratory rate within these parameters.

Blood pressure. Blood pressure is a critical indicator used to assess health status and stress. Blood pressures should increase as the level of physical exertion/stress increases. Blood pressures that are too low, too high, or fail to return to normal levels while in rehabilitation can indicate a medical problem. For example, individuals can become hypotensive as they decompensate in their reaction to stress (e.g., heat stroke). Upon recovery during the rehabilitation, a member's blood pressure should return to, or even be slightly lower than, their baseline. A member whose blood pressure is greater than 160 systolic and/or 100 diastolic should not be released from rehabilitation. These members should continue to be monitored and treated.

A.6.2.6.1 A transport-capable emergency medical care unit should be considered for rehabilitation areas at all incidents and fireground training.

A.6.2.6.2 Although BLS is the minimum level of care required in rehabilitation, the fire department should consider staffing rehabilitation with advanced life support (ALS) personnel.

A.6.2.6.4(1) These members should undergo immediate medical assessment.

A.6.2.6.4(2) RPE is a scale created to determine the individual's perceived exertion intensity level. Numeric values are assigned according to the individual's fatigue, environment, muscle factors, etc. It takes into account the subjective aspects of an individual's physical and emotional state, rather than relying solely on an objective percentage of age-predicted maximum heart rate.

It is recommended that members be familiar with the RPE scale prior to incident use. This scale can be used as a relative "before/after" comparison to assist in determining a member's readiness to return to duty. Instruments such as tympanic thermometers, pulse oximeters, and similar instruments can be used to expedite this process.

The original chart for RPE was created by Dr. Gunnar Borg, and is therefore often referred to as the Borg scale. This scale started at a low end of 6 and ended at a high end of 20. Borg originally created this scale to directly correspond to heart rates, so that a 6 would be equal to a heart rate of 60 beats per minute. Therefore, on the Borg scale, most individuals would rate between 12 and 16 during maximum exertion.

To assist the user of the document, a new chart has been created that simply goes from 1–10. On a scale of 1–10, 10 being hardest, most individuals rate

between 4 and 7 at maximum exertion. The American College of Sports Medicine suggests that 4 to 6 RPE equates with “somewhat hard to hard” exertion, and that that correlates with 60 percent to 85 percent of maximum heart rate. Table A.6.2.6.4(2) is an example of this chart.

Table A.6.2.6.4(2) New RPE Scale

New RPE Scale	Borg RPE Scale	Description
1	6	No exertion at all
	7	Extremely light
	8	
2	9	Very light
	10	
3	11	Light
4	12	
5	13	Somewhat hard
6	14	
7	15	Hard heavy
8	16	
8.5	17	Very hard
9	18	
9.5	19	Extremely hard
10	20	Maximal exertion

Source: G. Borg, *Borg’s Perceived Exertion and Pain Scales*.

A.6.2.6.4(5) Members should know who they are, where they are, etc. Disoriented members may be suffering from carbon monoxide poisoning, heat stress, or cardiac insufficiency.

A.6.2.6.8 An example of a data collection form is shown in Figure A.6.2.6.8 as shown on page 14.

A.6.2.7 Accountability during member rehabilitation is maintained as it would be during any other incident operation. Each crew or company stays together when entering or exiting the rehabilitation area. Member accountability goes beyond simply tracking the location of people. Equally important to personnel tracking is the function of tracking the completion of an assignment. Members have the responsibility to alert their supervisor of the need for rehabilitation; in most cases, however, the responsibility and accountability for ensuring the safety and welfare of members lie with the supervisor of a company/crew. Thus, the company officer/crew leader will often be charged with making decisions regarding the initiation of rehabilitation and the completion of rehabilitation.

It is important to recognize that rehabilitation can occur in more than one form, each form representing unique accountability concerns. Rehabilitation involves establishing a tactical level management component.

Rehabilitation often takes place without the establishment of rehabilitation as a tactical level management component. During routine incidents, such as a single-family dwelling fire or a small wildland fire, companies/crews will often conduct rehabilitation on their own. This can be a result of their own initiative or of an informal order to “take a break.” Company/crew level rehabilitation can occur during a cylinder change, the transition from active fire attack to overhaul, or other similar situations. Self-rehabilitation will also take place when command fails to recognize the need for rehabilitation. In any case, accountability during company/crew level rehabilitation will most likely show the company/crew as still assigned to an active function. Companies/crews that are not able to continue performing their function will report their status to command.

When a formal assignment and area for rehabilitation is established, accountability is maintained as it would be with any other tactical level management component. The rehabilitation area should have a check-in/check-out point that manages accountability and becomes the communication link between command and the company/crew. Members who are not allowed to leave rehabilitation with their company/crew are appropriately moved within the IMS/accountability system to reflect their current assignments. The staff at a formally assigned rehabilitation area should have the option to use a log-in/log-out sheet if required by the management needs of the rehabilitation area.

A.6.3.1 These fluids should be available on apparatus where spare SCBA cylinders are located so that members can replace fluids while changing SCBA cylinders. If the duration of the incident is likely to exceed 1 hour, sports drinks should be considered.

A.6.3.2.1 The company officer or crew leader should ensure that all members in the company or crew seem fit to return to duty following any rehabilitation.

Company/crew level rehabilitation or reporting to the rehabilitation area should occur based on the following work/rest cycles:

(1) There should be at least 10 minutes of self-rehabilitation after using one 30-minute SCBA cylinder, or performing 20 minutes of intense work without SCBA.

(2) There should be at least 20 minutes of rest (with hydration) in a rehabilitation area after using two 30-minute SCBA cylinders, using one 45-minute or greater SCBA cylinder, or performing 40 minutes of intense work without SCBA.

A.6.4.1 Figure A.6.4.1 shows a crew time-in/time-out report as shown on page 15.

A.7.2 Fluid intake should be increased following the incident with the goal of completely replacing sweat loss. Assuming that adequate fluid was ingested during rehabilitation, 16 oz to 32 oz (0.5 L to 1 L) over a period of up to 2 hours after the end of an operation may be sufficient. Monitoring body weight changes (should not change more than 1 lb pre- to post-incident) and urine color (should be clear) may provide useful indicators that body fluid balance has been maintained. Signs of dehydration include low urine volume, urine with a strong odor, and urine of a dark color.

The following types of foods should be consumed following an incident:

- (1) Carbohydrates (fruits, vegetables, grains, starches)
- (2) Protein (lean meats, legumes, and protein supplements)

The following types of foods and beverages should be avoided following an incident:

- (1) High-fat meals
- (2) Foods and beverages that potentially can cause gastric distress, including the following:
 - (a) Carbonated beverages
 - (b) Foods with excessive caloric content
 - (c) Beverages with excessive caffeine

EMERGENCY INCIDENT REHABILITATION REPORT

Incident _____ Date _____

Member _____ Company assignment _____

Time	Work time/ # cylinders	Blood Pressure	Heart Rate (Pulse)	Respiratory Rate	Body Temp.	Skin	Taken By

Is member alert and oriented to person, place, and time? _____

Signs associated with heat or cold stress: _____

Changes in gait, speech, or behavior: _____

Medical treatment or transport provided: _____

Other comments: _____

FIGURE A.6.2.6.8 Example of an Emergency Incident Rehabilitation Report.

Annex B Managing Heat and Cold Stress

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Heat Stress. Figure B.1(a) from the Toronto Fire Services provides information on heat stress that can be distributed as recommended training for members. (see Figure B.1(a) on pages 17-20.)

Figure B.1(b) outlines recommended precautions developed by the Toronto Fire Services for four humidex ranges. Due to the variance of individual susceptibility, certain individuals may experience effects of heat stress earlier than expected. Supervisors should therefore begin to remind workers of heat stress prevention strategies as the humidex level approaches the 95°F to 102°F (35°C to 39°F). (See Figure B.1(b) on page 21.)

An emergency service organization cannot choose to not respond to the public when it is too hot. However, it can modify its own activities to ensure it does not place its personnel at extra risk. The key to adapting to the heat is to consistently use the rehabilitation process and active cooling as a prevention strategy. The information in Table B.1 and Figure B.1(b) can be used to assist a fire department to determine whether or not non-emergency activities should be re-scheduled or cancelled.

Table B.1 Activity Table (Estimation of Physical Work Loads)

Work Load	Kcal / hour	Examples of Activities
Light	Up to 200	Sitting or standing to control machines (driving, pump operations), performing light hand or arm work (rope evolutions), intermittent walking
Medium	200–350	Walking with moderate lifting, carrying, pushing or pulling (hose evolutions), SCBA (donning and doffing), fire extinguisher evolutions, mopping floors, mowing lawn on level ground
Heavy	350–500	Intermittent heavy lifting with pushing or pulling, using an axe (live fire burns), SCBA (search and rescue evolutions), auto extrication, ground ladder raises, roof evolutions, special operations evolutions, forcible entry operations

B.2 Cold Stress. The following information is useful in identifying the cause, signs and symptoms, treatment, and prevention of injuries related to sub-freezing conditions.

B.2.1 Frostbite. Frostbite occurs when the skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. While frostbite usually occurs when the temperatures are 30°F (16°C) or lower, wind chill factors can allow frostbite to occur in above freezing temperatures. Frostbite typically affects the extremities, particularly the feet and hands.

B.2.1.1 Signs and Symptoms. Frostbite symptoms vary, are not always painful, but often include a sharp, prickling sensation. The first indication of frostbite is skin that looks waxy and feels numb. Once tissues become hard, the case is a severe medical emergency. The affected body part will be cold, tingling, stinging, or aching followed by numbness. Skin color turns red, then purple, then white, and is cold to the touch. There may be blisters in severe cases. Severe frostbite results in blistering that usually takes about 10 days to subside. Once damaged, tissues will always be more susceptible to frostbite in future.

B.2.1.2 Treatment. Do not rub the area to warm it. Wrap the area in a soft cloth, move the member to a warm area, and contact medical personnel. Do not leave the member alone. If help is delayed, immerse the affected part in warm, not hot, water [maximum 105°F (40.6°C)]. Do not pour water on the affected part. If there is a chance that the affected part will get cold again do not warm. Warming and recooling will cause severe tissue damage.

B.2.2 Hypothermia. Hypothermia, which means “low heat,” is a potentially serious health condition. This occurs when body heat is lost faster than it can be replaced. When the core body temperature drops below the normal 98.6°F (37°C) to around 95°F (35°C), the onset of symptoms normally begins.

B.2.2.1 Signs and Symptoms. The person may begin to shiver and stomp their feet in order to generate heat. Workers may lose coordination, have slurred speech, and fumble with items in the hand. The skin will likely be pale and cold. As the body temperature continues to fall these symptoms will worsen and shivering will stop. Workers may be unable to walk or stand. Once the body temperature falls to around 85°F (29.4°C) severe hypothermia will develop and the person may become unconscious. At 78°F (25.6°C), the person could die.

B.2.2.2 Treatment. Treatment depends on the severity of the hypothermia. For cases of mild hypothermia move the member to a warm area and have them stay active. Remove wet clothes and replace with dry clothes or blankets. Cover the head. To promote metabolism and assist in raising internal core temperature, have the member drink a warm (not hot) sugary drink. Avoid drinks with caffeine. For more severe cases do all the above, plus contact emergency medical personnel, cover all extremities completely, and place very warm objects, such as hot packs or water bottles on the victim’s head, neck, chest, and groin. Arms and legs should be warmed last. In cases of severe hypothermia treat the member very gently and do not apply external heat to re-warm. Hospital treatment is required.

If member is in the water and unable to exit, secure collars, belts, hoods, and similar equipment in an attempt to maintain warmer water against the body. Move all extremities as close to the torso as possible to conserve body heat. As the member is removed from the water, administer the following treatment:

- (1) Stop further cooling of the body and provide heat to begin rewarming
- (2) Carefully remove casualty to shelter (Note that sudden movement or rough handling can upset heart rhythm.)
- (3) Keep casualty awake
- (4) Remove wet clothing and wrap casualty in warm covers
- (5) Rewarm neck, chest, abdomen, and groin but not extremities
- (6) Apply direct body heat or use safe heating devices
- (7) Give warm, sweet drinks, but only if casualty is conscious
- (8) Monitor breathing and administer artificial respiration if necessary
- (9) Call for medical help or transport casualty carefully to nearest medical facility

B.2.3 Immersion Foot. Immersion foot is caused by having feet immersed in cold water at temperatures above freezing for long periods of time. It is similar to frostbite but considered less severe.

B.2.3.1 Signs and Symptoms. Symptoms usually consist of tingling, itching, or burning sensation. Blisters may be present.

B.2.3.2 Treatment. Soak feet in warm water, then wrap with dry cloth bandages. Drink a warm, sugary drink.

B.2.3.3 Prevention. Plan for work in cold weather. Wearing appropriate clothing and being aware of how your body is reacting to the cold are important to preventing cold stress. Avoiding alcohol, certain medications, and smoking can also help to minimize the risk.

Annex C Informational References

C.1 Referenced Publications. The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the recommendations of this document unless also listed in Chapter 2.

C.1.1 NFPA Publications. (Reserved)

C.1.2 Other Publications.

Borg, G. *Borg’s Perceived Exertion and Pain Scales*, Champaign, IL: Human Kinetics, 1998.

McLellan, Tom M., Glen A. Selkirk, “The Management of Heat Stress for the Firefighter,” Defence Research and Development Canada, 2005.

Sawka, M. N., and K. B. Pandolf. Effects of body water loss on physiological function and exercise performance, Gisolfi, C. V., and D. R. Lamb (eds). *Fluid Homeostasis During Exercise*. Benchmark Press, Indianapolis, IN, 1-38 (1990).

Smith, D. L., and S. J. Petruzzello, “Selected Physiological and Psychological Responses to Live-Fire Drills in Different Configurations of Firefighting Gear,” *Ergonomics*, 41(8), 1141-1154 (1998).

Smith, D. L., and S. J. Petruzzello, M. A. Chludzinski, J. J. Reed, J. A. Woods, “Effects of strenuous live-fire fire fighting drills on hematological, blood chemistry, and psychological measures,” *Journal of Thermal Biology*, 26(4-

HEAT STRESS

PURPOSE. This advisory provides guidance for job-specific, safe work procedures for the prevention of heat-related disorders.

RESPONSIBILITY. The supervisor in charge of the facility or workplace is responsible for implementing these heat stress prevention guidelines on a day-to-day basis. It is the responsibility of the individual fire fighters to follow guidelines outlined in the program. All fire fighters and officers should remain aware of the signs and symptoms of heat stress in order to prevent potential injuries or illnesses.

HEAT STRESS. Fire fighting is hot, strenuous work. We work in environments with extremely high temperatures, with little opportunity to cool our bodies through normal sweating. Our bunker gear makes it difficult to dissipate this heat buildup and can result in heat stress. Heat stress occurs when our body's internal core temperature rises above its normal level. It is a result of our internal, metabolic heat buildup (from working in our bunker gear) and external stress from environmental factors (temperature, humidity, etc.).

MANAGING HEAT STRESS. The management of heat stress requires an understanding of the contributing factors and how heat stress can affect a worker. Factors that affect heat stress are environment (climate), workload, and clothing worn. Combined, these factors will dictate the rate of heat gain and, ultimately, the amount of heat loss required to protect the worker. Aspects of the thermal environment that impact heat stress include air temperature, humidity, radiant heat (from the sun or other heat source), and air movement. A worker's metabolic rate is associated with the physical demands of the work performed; higher work demands increase the metabolic process and result in the internal generation of heat. Clothing material, construction, and usage affect the potential heat exchange between the body and the environment and therefore potentially contribute to the risk of heat stress. Other contributing factors that affect the way we manage heat stress are the fire fighter's physical fitness and body composition. Thus it is essential that the fire fighter stay in good physical condition.

CONTROLS. The key to managing heat stress is to be familiar with the controls used to prevent it and to minimize its effect. Controls for heat stress include the following:

- (1) Fluid intake (hydration)
- (2) Work rotation
- (3) Active cooling
- (4) Rest

FIGURE B.1(a) Sample Advisory on Heat Stress.
(Courtesy of Toronto Fire Services)

HEAT STRESS (continued)

Heat Stress Classifications, Signs, Symptoms, and Treatment

Type	Cause	Signs and Symptoms	Treatment	Prevention
Heat Rash	Hot, humid environment; plugged sweat glands.	Red, bumpy rash with severe itching.	Change into dry clothes and avoid hot environments. Rinse skin with cool water.	Wash regularly to keep skin clean and dry.
Sunburn	Too much exposure to the sun.	Red, painful, or blistering and peeling skin.	If the skin blisters, seek medical aid. Use skin lotions (avoid topical anesthetics) and work in the shade.	Work in the shade; cover skin with clothing; apply skin lotions with a sun protection factor of at least 15. Fair people at greater risk.
Heat Cramps	Heavy sweating drains a person's body of salt, which cannot be replaced just by drinking water.	Painful cramps in arms, legs, or stomach that occur suddenly at work or later at home. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.	Move to a cool area; loosen clothing and drink cool salted water (1 tsp. salt per gallon of water) or commercial fluid replacement beverage. If the cramps are severe or don't go away, seek medical aid.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Exhaustion	Fluid loss and inadequate salt and water intake causes a person's body's cooling system to start to break down.	Heavy sweating; cool moist skin; elevated body temperature over 100.4°F (38°C); weak pulse; normal or low blood pressure; person is tired and weak or faint, has nausea and vomiting, is very thirsty, or is panting or breathing rapidly; vision can be blurred.	GET MEDICAL AID. This condition can lead to heat stroke, which can kill. Move the person to a cool shaded area; loosen or remove excess clothing; provide cool (salted) water to drink. Use active cooling (forearm immersion and misting fans) to lower core body temperature.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Stroke	If a person's body has used up all its water and salt reserves, it will stop sweating. This can cause body temperature to rise. Heat stroke can develop suddenly or can follow from heat exhaustion.	Body temperature over 105.8°F (41°C) and any one of the following: the person is weak, confused, upset, or acting strangely; has hot, dry, red skin; a fast pulse; headache or dizziness. In later stages, a person can pass out and have convulsions.	ARRANGE TRANSPORT TO A MEDICAL FACILITY. This condition can kill a person quickly. Remove excess clothing; provide immediate active cooling using forearm immersion and misting fans; spray the person with cool water; offer sips of cool water if the person is conscious.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.

FIGURE B.1(a) Sample Advisory on Heat Stress. (Courtesy of Toronto Fire Services) (continued)

HEAT STRESS (continued)

FLUID INTAKE. Drink water prior to thirst, at the emergency scene, and during training exercises. When exposed to high work rates and/or hot environments, fire fighters should drink water frequently (every 20 minutes). Alcohol and caffeine beverages should be avoided before and after activities that could lead to heat stress. Fluid loss has to be replaced to avoid impairment of bodily functions. Set up the water cooler early in an incident with plenty of cups and ensure personnel are drinking regularly. This is particularly important for personnel working inside a fire structure. It is important to note that the thirst mechanism is a delayed response. By the time you feel thirsty, you are underhydrated by approximately one liter. It is very difficult to make up this liter during vigorous exercise. This is why the fire fighter should prehydrate, hydrate, and rehydrate whenever possible while responding, attending, and when returning from an emergency call. The following chart indicates how your body reacts when it becomes dehydrated.

Percentage of Body Weight (Lost)	Signs and Symptoms
1%	Thirsty
3%	Heart rate elevates
4–5%	Lose up to 30% of work capacity

If the fire fighter is involved in intense physical activities for more than one hour, the supervisor should consider fluid replacements that contain a carbohydrate solution of 4 percent to 8 percent, and 6 oz to 8 oz (175 mL to 235 mL) should be consumed every 15 minutes during the activity. It is recommended that the drinks be cool and flavored, as the fire fighter will tend to consume more.

REST AND WORK ROTATION. Some environments are too hot to allow continuous exposure. Heat stress can be diminished and effective work performance can be maintained through rehabilitation during rest periods. This is often linked to SCBA air cylinder time (approximately 20 minutes). Rest periods will limit accumulation of metabolic heat and when combined with rehydration and active cooling will also allow the release of body heat and the lowering of core body temperature before the fire fighter returns to the task.

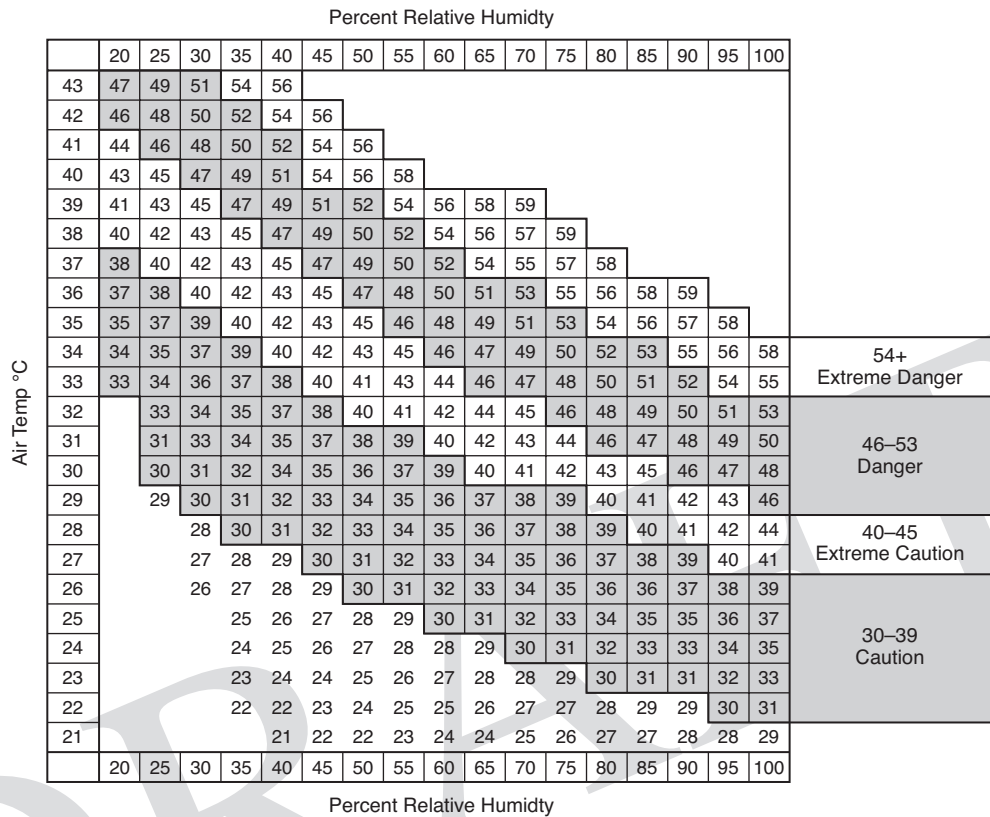
Crews can be assigned from other stations to avoid committing first responding crews to a long duration incident. Activate extra alarms if it is likely that you will need to rotate crews more frequently due to the heat. This allows for staging and crew rotation. It should be noted that studies have shown that during intense workloads, core temperatures continue to increase even when the work has discontinued. Fire fighters might feel that adequate cooling has taken place; however, their core temperature can continue to rise.

ACTIVE COOLING. Fire fighters should “dress down,” removing their bunker coats, helmets, gloves, and so forth, and open their bunker pants to release trapped heat. The use of active cooling through forearm immersion, misting fans, and/or air conditioning can significantly lower core body temperature during normal rehabilitation periods between cylinder changes. Where active cooling is not provided, a smoke ejector placed where fire fighters can remove protective clothing, drink fluids, and rest will still increase evaporation of perspiration and enhance cooling and recovery. Note: When the air temperature is greater than 104°F (40°C), increasing air motion might actually increase heat stress; therefore, a smoke ejector fan will not be effective. If smoke ejector fans are used, fire fighters should use safety goggles or glasses to avoid debris from blowing into their eyes.

FIGURE B.1(a) Sample Advisory on Heat Stress.
(Courtesy of Toronto Fire Services) (continued)

HEAT STRESS (continued)

HUMIDEX Chart



USING THE HEAT/HUMIDEX INDEX. The danger posed by heat and humidity has led biometeorologists to develop various discomfort indices in order to define the danger and alert the public. These indices are, to some degree, subjective. The level of discomfort or danger will depend on a person’s age, health, and physical condition, on the type and amount of clothing worn, and on activity level. In addition to temperature and humidity, weather conditions such as amount of sunshine and windspeed will also affect the “feel” of temperature and humidity.

The Canadian index, called HUMIDEX, combines the temperature and humidity into one number that is intended to reflect perceived temperature. Humidex levels can be heard or seen daily on radio or television and in newspapers. The chart above can be used to determine humidex levels based on identified air temperature in Celsius (°C) using a standard thermometer and percent relative humidity using a hygrometer.

FIGURE B.1(a) Sample Advisory on Heat Stress. (Courtesy of Toronto Fire Services) (continued)

TFS HEAT STRESS PREVENTION GUIDELINES

NOTE: The supervisor in charge of the facility or workplace is responsible for implementing these heat stress prevention guidelines. He or she shall determine the level of PPE required.

ALERT LEVEL 1 HUMIDEX 30–39

Caution: Fatigue and faintness are possible with physical activity or prolonged exposure. The most likely at risk at this level are those performing heavy work for extended periods of time.

- (1) Encourage all staff to increase water intake, be observant of signs and symptoms of heat stress (both in themselves and co-workers), and implement precautionary measures to prevent heat-related disorders.
- (2) Additional rest breaks should be introduced to reduce heavy exertion and allow for cooling.

ALERT LEVEL 2 HUMIDEX 40–45

Extreme Caution: Heat cramps, heat exhaustion, or sunstroke are possible with physical activity or prolonged exposure. An increased number of workers are at risk at this level, including those performing moderate physical exertions.

- (1) Postpone optional activities, or reschedule them to cooler times of the day when possible.
- (2) Introduce additional rest breaks for workers performing moderate work.
- (3) Further reduce heavy work.
- (4) Consider cessation of non-essential operations involving heavy physical activity.
- (5) Minimize using bunker suits whenever possible.

Note: All training activities are considered non-essential except recruit training. The following safety precautions shall be implemented when conducting training within this Humidex range.

- (1) Limit recruit live fire burns to occur between 0700–1200 hours only.
- (2) Provide increased rest breaks for all work loads.
- (3) Limit heavy work to less than 15 minutes per hour.
- (4) Initiate rehabilitation at the beginning of the incident.
- (5) Use active cooling where possible (forearm immersion, misting fan, and/or air conditioning).

ALERT LEVEL 3 HUMIDEX 46–53

Danger: Heat cramps, heat exhaustion, or sunstroke are likely. Heat stroke is possible with physical activity or prolonged exposure. Even those performing light work might require additional rest breaks.

- (1) Significantly reduce both heavy and moderate work.
- (2) Minimize using bunker suits whenever possible.
- (3) Consider cessation of non-essential operations involving moderate physical activity in this environment.
- (4) Cease all non-essential operations involving heavy physical activity.

Note: All outdoor training activities are considered non-essential and shall be rescheduled or cancelled.

ALERT LEVEL 4 HUMIDEX 54 or greater — EMERGENCY HEAT ALERT

Extreme Danger: Heat stroke or sunstroke imminent, danger of DEATH. This is an extremely dangerous humidex level, where all individuals are at risk of heat-related disorders, regardless of the workload.

- (1) Minimize using bunker suits whenever possible.
- (2) Discontinue all non-essential services performed in this environment.
- (3) For essential operations, do the following:
 - (a) Provide increased rest breaks for all workloads.
 - (b) Limit heavy work to less than 15 minutes per hour.
 - (c) Initiate rehabilitation at the beginning of the incident.
 - (d) Use active cooling (forearm immersion, misting fan, and air conditioning).
 - (e) Call for additional crews to facilitate rehabilitation.

Note: All outdoor training shall be re-scheduled or cancelled.

FIGURE B.1(b) Example of Heat Stress Prevention Guidelines.
(Courtesy of Toronto Fire Services)

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C.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

C.2.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1021, *Standard for Fire Officer Professional Qualifications*, 1997 edition.

NFPA 1521, *Standard for Fire Department Safety Officer*, 2002 edition.

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C.2.2 Other Publications.

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Wieder, M., and E. Dickinson. *Emergency Incident Rehabilitation*. Upper Saddle River, NJ: Brady/IFSTA, 2000.

C.3 References for Extracts in Informational Sections. The following documents are listed here to provide reference information, including title and edition, for extracts given throughout this standard as indicated by a reference in brackets [] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2007 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2005 edition.