Preliminary

A. Circumstances of Death

1. Line-of-duty

a. Fire suppression

b. Special operations (e.g., hazmat, technical rescue)

c. In transit to emergency

d. Other official activity

2. Non-line-of-duty

a. Active firefighter, unrelated activity

b. Former firefighter activity or exposure

B. Medical Records Review

1. Fire department injury/exposure records

a. Prior incidents

b. Prior injuries and treatments

2. Current medical conditions/medications

a. Prescribed

b. Over-the-counter

c. Administered by paramedics

C. Complete Work History

1. Length of fire suppression duty

2. Other jobs held during fire service3. Jobs held after fire service

D. Scene Investigation

E. Scene Photography

1. The body as discovered

2. The site after the body is removed

3. The body clothed at autopsy

4. The body after removal of clothing

5. Specific shots of body depending on type of injury

F. Jurisdiction/Authority to Conduct Autopsy

V **Initial Examination**

II A. Identification of Victim

I. B. Document Condition of PPE

1. Refer to PPE diagram in Figure 8 and information in Appendix C for standardized nomenclature. Ppe description should include

:a. Turnout coat

b. Turnout pants

c. Helmet

d. Gloves

e. Boots

f. Self-contained breathing apparatus (SCBA)

g. Personal Alert Safety System (PASS)

h. Protective hood. Clothing worn under turnouts

j. Other PPE not listed above

2. Use photographs to enhance documentation (see Appendix C)

Firefighters are subject to many uncommon occupational hazards, including toxic and superheated atmospheres; explosions; falls; crushing/penetrating forces; contact with fire, electricity, or hazardous materials; and extremely strenuous and stressful physical activities. The autopsy results may be essential to determine why or how a firefighter was incapacitated, how the activity related to the cause of death, and whether protective equipment performed properly. Having a clear picture of the nature of firefighting operations that were taking place (and to which the deceased was assigned) will assist in identifying possible mechanisms of injury. If the firefighter was reported missing, try to determine the time of last contact or the length of time between the initial report and the finding of the body. The fire department should have an officer or internal Line-of-Duty Death Investigation Team assigned to conduct a death investigation. Other investigators may include the police, the State Fire Marshal (or other State officials), and/or Federal/State agencies responsible for occupational safety and health, including the National Institute for Occupational Safety and Health (NIOSH). Consult with these officials as necessary. In conducting the medical records review, obtain any documents that pertain to the incident. Document the occupational history of the deceased, including the number of years assigned as a "line" firefighter, any history of unusual exposures (or changes in frequency of exposure) to hazardous substances or diseases, and any relevant occupational medical history. Finally, all recent medical history should be reviewed, including documentation of any attempts at onscene resuscitation.

Exercise caution when handling contaminated PPE, especially from hazardous materials incidents, as residue may be harmful to those involved in the autopsy. Gloves and other PPE should be used. Ppe should be sealed in a plastic bag if fire accelerants or other volatile/toxic chemicals are suspected to be present; otherwise PPE should be air-dried and preserved for examination. (Do not store clothing wet.) Preservation of the original state of PPE, including clothing, is essential. Ppe should be considered as evidence, and handled according to the Special Incident Procedures in NFPA 1851, *Standard on Selection, Care, and Maintenance of Structural and Proximity Firefighting Protective Ensembles* (2008 edition). The Death Investigation Team should perform or assist in the evaluation/documentation of PPE condition and perfor-mance. Documentation of the chain of custody of the PPE is required, especially as it may be examined by a number of individuals; however, examinations should be limited if the condition of the clothing is fragile and will be further destroyed upon successive evaluations. Upon completion of any examination, PPE should be secured in an evidence storage area. (International Association of Fire Fighters. *Guide for Investigation of a Line-of-Duty Death.* Washington, DC, 2000).

PROTOCOL

C. Maintenance of Custody of Equipment
1. Appropriate storage conditions
2. Chain of custody
3. Limitation of handling if clothing and equipment is fragile

DISCUSSION

Observations and photos recorded at the scene should indicate whether the deceased was found wearing SCBA and/or other PPE. If SCBA and PASS are user-controlled, were they properly activated or working at the time of discovery of the deceased? A swab from the inside of the SCBA facepiece may help in determining operability. A qualified specialist should inspect the PPE and note any damage. NIOSH can assist in the determination of any contribution of the deceased's SCBA to the death. Ppe manufacturers may be able to assist in evaluating damage, but PPE should not be returned to the manufacturer for examination (because of concerns about product liability).Breathing apparatus filter cartridges, if any, should be retained.

V **External Examination**
I A. Document Condition of Body
I 1. Photograph
I 2. Radiograph
. 3. Record color of fingernails
4. Record appearance of blood
B. Document Evidence of Injury
C. Document Evidence of Medical Treatment
D. Collect Evidence from External Surfaces
1. Swabs of nasal/oral soot or other substances*
2. Hair*
3. Injection sites
E. Collect Vitreous Fluid
F. Document Burns*
1. Location
2. Degree
3. Etiology
4. Percentage of body surface area (BSA)
G. Biopsy Skin Lesions
I **Internal Examination**
I A. Document Evidence of Injury
I B. Document Evidence of Medical Treatment
V C. Describe Internal Organ System
. D. Collect Samples for Toxicologic Analysis
1. Blood (2 x 20 cc red- and grey-top tubes)
2. Urine (20 to 30 cc) and/or trimmed bladder
3. Bile (all available) or gallbladder (if bile unavailable)

A complete initial examination of the body is important prior to the full autopsy, including X-rays, to help with identification, locate equipment, and look for nonobvious causes of death. Firefighters are trained to provide emergency medical care for fire casualties. Of particular importance is that resuscitative efforts for fellow firefighters are likely to be heroic and prolonged. This fact should be taken into account when examining the body for evidence of medical intervention and when interpreting the results of blood gas assay. Note the presence of soot or other unidentified substances on the skin and place samples (swabs) in a sealed container. Certain internal samples (such as soot swabs and vitreous fluid) which can be done before the body is opened are taken at this point because collection can be accomplished in a more controlled manner, thus reducing the potential for cross-contamination of the surfaces. Hair samples should be about the thickness of a finger, pulled out so as to include the roots, tied around the middle, with the proximal and distal ends marked, and stored in a plastic evidence bag. Match burn injury locations to areas of heat/thermal damage on clothing and equipment. Vitreous fluid should be taken from both eyes. Vitreous fluid can be used to corroborate blood alcohol levels.

Soot swabs should be obtained from the upper and lower airways as well as from the inside of the SCBA facepiece. These will assist in the determination of SCBA usage and operability. Note any unusual odors/colors of anything found during the internal examination. Fresh-frozen samples of vital organs should be taken and retained a minimum of 90 days, preferably longer, as storage space permits. An area of growing interest is the cancer rate of firefighters. Potentially cancerous tissue should be biopsied and saved. Additionally, histological type and the exact location of the tumor (if site-specific) within an organ should be documented in detail.

4. Cerebrospinal fluid (up to approx. 30 ml)
5. Soot swabs from airway*
a. Tracheal
b. Bronchial
6. Representative sampling of gastric and duodenal contents (50 g; note total amount)
7. Take and retain fresh-frozen samples
a. Lung 100 g
b. Kidney 100 g
c. Liver 100 g
d. Spleen 100 g
e. Skeletal muscle (psoas or thigh) 20 g
f. Subcutaneous fat 20 g

In the case of incinerated remains, bone marrow or spleen may be the only source of tissue for toxicological studies, especially for those establishing carbon monoxide levels. Request determination of carbon monoxide content and of carbon monoxide-binding capacity of mixture from water extract of spleen, kidneys, or other organs. Gastric and duodenal contents should be representative. Solid dosage forms should be removed, counted, and analyzed. When taking lung samples, use the right lung because aspirated foreign materials have a greater propensity to lodge in the right lung. Soot particles and other heat injuries indicate that the victim was breathing in fire. Absence of soot particles does not prove that the victim was already dead when exposed to the fire.

g. Section of bone with marrow (3-4 cm)h. Brain 100 g
8. Additional specific samples to be taken:
a. Tied-off lower lobe of right lung (store in arson debris paint can)
b. Peripheral blood from leg vein (fluoridated and red-top tubes)
c. Any specimens taken in field or during hospital resuscitation
d. Sample hematomase. Any other sites should be labeled

I **Toxicological Examination**
I A. Urine Screen/Analysis
I 1. Volatile compounds (e.g., benzene, hydrocarbons
V including accelerants, ethanol)
. 2. Psychoactive substances (e.g. opiate derivatives, marijuana metabolites, cocaine metabolites, stimulants, phencyclidine)
B. Blood Analysis.
1. Carboxyhemoglobin, methemoglobin, sulfhemoglobin
2. Volatile compounds (see A.I. above)
3. Other (e.g., hydrocyanic acid, flouride)
4. Confirm results of positive urine screen
C. Subcutaneous Fat Analysis
1. Organic compounds, including:
a. Herbicides
b. Pesticides
2. Polychlorinated biphenyls (PCBs)
D. Soot Screen (from swabs)*
1. Metals, including:
a. Arsenicb. Antimonyc. Lead

The toxicologic analysis performed for firefighters should be of a higher order than that performed for civilian fire casualties. In addition to ascertaining blood levels of various toxic products that are commonly found in a fire environment, it is beneficial to know about the presence of any judgment-impairing substances. This may be important in the determination of eligibility for death benefits as well as for determining causality. Determinations of asphyxiation from carbon monoxide levels should take into account victim medical history (i.e., smoking) in addition to other types of exposure. If victim survived carbon monoxide poison-ing for several hours, portmortem samples usually will fail to show presence of carboxyhemoglobin. Blood taken at time of admission to hospital still may be available and of particular value. Determination of specific levels of metals, organic compounds, and gross particulate matter should be conducted because firefighter exposure to these substances is believed to be greater than that for civilians. Additionally, this information may yield important clues about the cause, manner, and mechanism of firefighter death. Use vitreous fluids or bile to confirm presence of ethanol in either blood or urine.

2. 3. Organics, including:
a. Pesticides
b. Herbicides
c. Vinyl chlorided. Acrylonitrilee. AcroleinParticulate analysis (e.g., asbestos)

Use caution when noting the presence of hydrocyanic acid, as it can be produced by bacterial decomposition within the tissues of the deceased. Check for the presence of PCBs and polynuclear aromatic com-pounds in the subcutaneous fat, as this will help in the determination of a history of exposure.

II **Microscopic Examination**A. Findings of Microscopic
V Examination
I.

Representative samples of all organs and body systems should be collected. The sections should be microscopically examined for malignant neoplasms and other abnormalities, including suggestive premalignant changes

I
V **Summary of Pathological Findings**
II A. Medical Facts
1. Correlation
.

State objective findings related to gross and microscopic examinations. Correlate physical circumstances, toxicological analyses, and other investigative studies to pathological findings.

V **Conclusions**
II A. Discrepancies
I. 1. Inconsistent observations
2. Differences between death certificate and subsequent findings
B. Conclusions
1. List diagnoses on a separate page
2. Cause and manner of death

Include determination of **cause, manner, and mechanism** of death. Describe discrepancies between evidence collected or observations of eyewitnesses and the autopsy findings.