

TEXAS COMMISSION ON FIRE PROTECTION
April 20, 2023, 10:00 a.m.
1701 N. Congress Ave., William B. Travis Building, Room 1-104, Austin, Texas

The Texas Commission on Fire Protection may discuss and/or act on any of the following agenda items. The Commission may go into executive session on any agenda item listed below as authorized by the Open Meetings Act, Texas Government Code Chapter 551.

- 1. Call to order with invocation and pledge of allegiance.**
- 2. Roll call and excuse Commissioner absences.**
- 3. Commission meeting minutes of January 26, 2022.**
- 4. The Budget and Strategic Plan Subcommittee may meet on April 20, 2023, during the commission meeting and provide a report relating to any recommendations developed by the subcommittee relating to modifications to the agency's operating budget and strategic plan.**
- 5. Reports from fire service interest groups and agencies on matters relating to their specific organizational purposes, functions, activities, and objectives, including reports from TEEEX, the Texas Fire Chiefs Association, the Texas State Association of Fire Fighters, the State Firefighters and Fire Marshals' Association of Texas, the Texas Fire Marshal's Association, the Texas Association of Fire Educators, the Texas A&M Forest Service, the National Fire Protection Association, Texas State Association of Fire and Emergency Districts, the Center for Public Safety Excellence, the State Fire Marshal's Office, and the National Fallen Fire Fighters Foundation.**
- 6. Report from commission representative to the Homeland Security Council.**
- 7. Report from the Health and Wellness ad-hoc Committee.**
- 8. Subjects for future commission meeting agendas.**
- 9. Future meeting date.**
- 10. Discussion and possible action on updates to the Investigator Curriculum Manual as referred from the Curriculum and Testing Committee.**
- 11. Discussion and possible action on 37 Texas Administrative Code (TAC), Chapter 443, Certification Curriculum Manual.**
- 12. Discussion and possible action on rules reviewed as referred from the Fire Fighter Advisory Committee:**
 - A. 37 Texas TAC, Chapter 459, Fire and Life Safety Educator.**
 - B. 37 TAC, Chapter 461, Incident Commander.**

- C. 37 TAC, Chapter 491, Voluntary Regulation of State Agencies and State Agency Employees.
 - D. 37 TAC, Chapter 493, Voluntary Regulation of Federal Agencies and Federal Fire Fighters.
13. Discussion and possible action on 37 TAC, Chapter 463, Advisory Committees.
 14. Discussion and possible action on filling the current vacancy on the Firefighter Advisory Committee.
 15. Update from 37 TAC, Chapter 403, Criminal Convictions and Eligibility for Certification Ad Hoc Committee.
 16. Review of 2022 data collected regarding fire fighter injuries and the development of recommendations to be submitted to the State Fire Marshal's Office for inclusion in its annual report.
 17. Matters from the Agency Chief:
 - A. Update regarding agency duties and responsibilities.
 - B. Decision of the Agency Chief in contested cases and consent orders.
 - C. Status regarding division functions:
 1. Training Approval & Testing – test administered, training approvals, record reviews, and online training audits.
 2. Certification & Professional Development – training applications, IFSAC seals issued, certifications issued, training facilities, curriculum development, library resource requests.
 3. Compliance – biennial inspections, compliance officers training, issues involving regulated entities.
 4. Information Technology – public website design, FARM and FIDO improvements, CAPPs (Central Accounting Payroll/Personnel System), IT security policy, and service requests.
 18. Personal matters regarding the appointment, employment, compensation, Evaluation, reassignment, and duties of the Agency Chief.
 19. Adjourn meeting.

Any invocation that may be offered before the official start of the commission meeting shall be a voluntary offering of a chaplain, to and for the benefit of the commission. The views or beliefs expressed by the invocation speaker have not been previously reviewed or approved by the commission and do not necessarily represent the religious beliefs or views of the Council in part or as a whole. No member of the community is required to

or approved by the commission and do not necessarily represent the religious beliefs or views of the Council in part or as a whole. No member of the community is required to attend or participate in the invocation. Such a decision will not impact their right to participate actively in the business of the commission. Copies of the policy governing invocations and setting forth the procedure to have a volunteer deliver an invocation are available upon written request submitted to the commission Clerk.

1. Call to order with invocation and pledge of allegiance.

2. Roll call and excuse Commissioner absences.

3. Commission meeting minutes of January 26, 2022.

TEXAS COMMISSION ON FIRE PROTECTION

Presiding Officer, J. P. Steelman, at 10:00 a.m. called the January 26, 2023, meeting of the Texas Commission on Fire Protection to order at 1701 N. Congress Avenue, Room 1-104, Austin, Texas.

Attending	Chris Cantu Mike Jones* J. P. Steelman	David Coatney Clyde Loll* Kelly Vandygriff	Sue DeVillez Bob Morgan Rusty Wilson	Michael Glynn Mala Sharma	Paul Hamilton Tim Smith
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*Excused absence

Staff	Cliff Grant Amanda Khan Robert Reese	Holden Wenger Candace Barnett Grace Wilson	Grace Wilson Ashley Barnett Laura Smith, Assistant Attorney General	Rick Wallace Joyce Guinn
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Guests See Guest List attached.

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1. Invocation and Pledge of Allegiance The invocation was given by Commissioner Kelly Vandygriff and the Pledge of Allegiance was lead by Presiding Officer, J. P. Steelman.
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2. Roll call and excuse of Commissioner absences Called the roll, and a quorum was present.
-
3. Adoption of Minutes A motion was made by Michael Glynn and seconded by David Coatney to approve the minutes of the October 27, 2022, commission meeting. The motion carried.
-
4. Report from Budget and Strategic Plan Subcommittee No action necessary.
-
5. Reports from Interest Groups A brief report was given by the Texas Fire Chief's Association, the Texas Fire Marshal's Association, Texas A&M Forest Service, Texas Association of Fire Educators, National Fire Protection Association, Texas State Association of Fire and Emergency Districts, the Center for Public Safety Excellence, and the National Fallen Fire Fighters Foundation.
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6. Report from TX Fire School Advisory Board A brief report on activities of the board to date.
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7. Report from Homeland Security Council No report given.
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8. Report from Health & Wellness Chairman, Mala Sharma gave a brief report.
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9. Subjects for future meeting agendas 439, matrix correction.
-
10. Future meeting Dates The Commission announced the 2023 meeting dates: April 20, July 12 and 13, and October 26. Commission to look at July meeting dates due to scheduling conflicts.
-
11. Matters from Curriculum and Testing Committee
- A) A motion was made by Paul Hamilton and seconded by David Coatney to adopt proposed changes to 37 Texas Administrative Code (TAC), Chapter 461, Incident Commander. The motion carried.
- B) A motion was made by Rusty Wilson and seconded by Kelly Vandygriff to adopt with changes new 37 TAC, Chapter 467, Fire Marshal. The motion carried.
-
12. Matters from Fire Fighter Advisory Committee
- A) A motion was made by Paul Hamilton and seconded by Bob Morgan to approve with proposed changes to 37 TAC, Chapter 427, Training Facility Certification. The motion carried.
- B) A motion was made by Michael Glynn and seconded by Bob to approve the following rule reviews without changes to the rules listed below. The motion carried.
1. 37 TAC, Chapter 449, Head of Department.
 2. 37 TAC, Chapter 451, Fire Officer.
 3. 37 TAC, Chapter 453, Hazardous Materials.
 4. 37 TAC, Chapter 457, Minimum Standards for Incident Safety Officer.
-
13. 463 Advisory Committee A motion was made by Chris Cantu and seconded by Bob Morgan to allow the Agency Chief to amend proposed new 37 TAC, Chapter 463, Advisory Committees to present at the next Commission meeting. The motion carried.
-
14. 403 Advisory Committee No action was taken on 37 TAC, Chapter 403, Criminal Convictions and Eligibility for Certification.
-
15. Proposed rule Reviews A motion was made by Kelly Vandygriff and seconded by Chris Cantu to have the Fire Fighter Advisory Committee review the rules for 37 TAC, Chapter 459, Head of Fire and Life Safety Educator, 37 TAC, Chapter 461, Incident Commander, 37 TAC, Chapter 491, Voluntary Regulation of State Agencies and State Agency Employees, 37 TAC, Chapter 493, Voluntary Regulation of Federal Agencies and Federal Fire Fighters, and 37 TAC, Chapter 495, Regulation of Nongovernmental Departments.

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16. Matters from Agency Chief
- A. Cliff Grant, Deputy Chief, gave an update on agency duties and responsibilities.
 - B. Mr. Grant reported that there were no contested cases.
 - C. Mr. Grant reported status on division functions.

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17. Executive Session
- No executive session was called.

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18. Adjournment
- A motion to adjourn was made by Michael Glynn and seconded by Rusty Wilson. The motion carried.
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J. P. Steelman, Presiding Officer

4. The Budget and Strategic Plan Subcommittee may meet on April 20, 2023, during the commission meeting and provide a report relating to any recommendations developed by the subcommittee relating to modifications to the agency's operating budget and strategic plan.

5. Reports from fire service interest groups and agencies on matters relating to their specific organizational purposes, functions, activities, and objectives, including reports from TEEEX, the Texas Fire Chiefs Association, the Texas State Association of Fire Fighters, the State Firefighters and Fire Marshals' Association of Texas, the Texas Fire Marshal's Association, the Texas Association of Fire Educators, the Texas A&M Forest Service, the National Fire Protection Association, Texas State Association of Fire and Emergency Districts, the Center for Public Safety Excellence, the State Fire Marshal's Office, and the National Fallen Fire Fighters Foundation.

6. Report from commission representative to the Homeland Security Council.

7. Report from the Health and Wellness ad-hoc Committee.

8. Subjects for future commission meeting agendas.

9. Future meeting date.

10. Discussion and possible action on updates to the Investigator Curriculum Manual as referred from the Curriculum and Testing Committee.

CERTIFICATION CURRICULUM MANUAL

CHAPTER FIVE

FIRE INVESTIGATOR

**NFPA 921, 2021 Edition
NFPA 1033, 2022 Edition**

Effective June 1, 2022

Revised May 1st 2023



Texas Commission on Fire Protection
P.O. Box 2286 Austin, Texas 78768-2286 (512) 936-3838

REFERENCE LIST FOR THE FIRE INVESTIGATOR CURRICULUM

This Reference List is provided as a general guide for both instructors and students to locate information pertaining to the specific objectives in the TCFP Curriculum. This list is **not** all-inclusive and does not in any way limit TCFP development and use of questions to test the objectives of the curriculum.

Required References

Certification Curriculum Manual. Austin, TX: Texas Commission on Fire Protection.

Emergency Response Guidebook, (Current ed.) U.S. Department of Transportation Research and Special Programs Administration, Office of Hazardous Materials Initiatives and Training.

Fire Inspection and Code Enforcement (8th ed.) (2016). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association.

Fire Investigator: Principles and Practice (6⁵th ed.) (~~2016~~2023). Burlington, MA: Jones and Bartlett Learning. ISBN:1284247724

Icove, David J., *Kirk's Fire Investigation*, (8th ed.) (2018). New York, NY: Pearson Education, Inc.

Lentini, John J., *Scientific Protocols for Fire Investigation* (3rd ed.) (2019). Boca Raton, FL: CRC Press.

NFPA 921: Guide for Fire and Explosion Investigations (2021 ed.) Quincy, MA: National Fire Protection Association. NFPA Publications.

NFPA 1033: Standard for Professional Qualifications for Fire Investigator (2022 ed.) Quincy, MA: National Fire Protection Association. NFPA Publications.

Standards Manual for Fire Protection Personnel. Austin, TX: Texas Commission on Fire Protection.

ASTM E620 *Standard Practice for Reporting Opinions of Scientific or Technical Experts* (current ed.)

ASTM E678 *Standard Practice for Evaluation of Scientific or Technical Data* (current ed.)

ASTM E860 *Standard Practice for Examining and Preparing Items That Are Or May Become Involved in Criminal or Civil Litigation* (current ed.)

ASTM E1188 *Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator* (current ed.)

ASTM E1459 *Standard Guide for Physical Evidence Labeling and Related Documentation* (current ed.)

Recommended References

The most current edition of the following publications and media are recommended (not required) supplemental material for program use.

ASTM E1020 *Standard Practice for Reporting Incidents that May Involve Criminal or Civil Litigation* (current ed.)

ASTM E1492 *Standard Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory* (current ed.)

ASTM E2917 *Standard Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs* (current ed.)

Building Construction Related to the Fire Service (4th ed.) (2016). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association.

Cole, Lee S., *Investigation of Motor Vehicles*, (current ed.). Lee Books.

Crime Scene Investigation: A Guide for Law Enforcement (current ed.). Largo, FL: National Forensic Science Technology Center. (On 5/06/21 this publication was available online at <https://nist.gov/system/files/documents/forensics/crime-scene-investigation.pdf>)

Emergency Field Guide, (current ed.). NFPA.
<https://catalog.nfpa.org/Emergency-Field-Guide-P13872.aspx>

Crime Laboratory Service Manual Part II: Handbook. Texas Department of Public Safety. Current edition. <https://txdpslabs.qualtraxcloud.com/showdocument.aspx?ID=67707>

Fent, Kenneth. "Contamination of firefighter personal protective equipment and skin and the effectiveness of decontamination procedures." *Journal of Occupational and Environmental Hygiene*. (2017).

Fire and Arson Scene Evidence: A Guide for Public Safety Personnel, (current ed.). Washington, DC: US Department of Justice, Office of Justice Programs.

(On 5/06/21 this publication was available online at
<https://www.ncjrs.gov/pdffiles1/nij/181584.pdf>)

Fire Protection, Detection, and Suppression Systems (5th ed.)(2016). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association (IFSTA).

Fire Protection Handbook (current ed.). National Fire Protection Association.

Fires in Texas, Annual Fire Statistics report (current ed.) Texas State Fire Marshals Office. Department of Insurance, TEXFIRS section. A link to the report can be found on their website: www.tdi.texas.gov/fire/

Gorbett, Gregory E. *Fire Dynamics* (2nd ed.) (2016). Boston: Pearson.

Guide to Wildland Fire Origin and Cause Determination (PMS 412)(current ed.), National Wildfire Coordinating Group. (On 5/06/21 this publication was available online at <https://www.nwccg.org/sites/default/files/publications/pms412.pdf>)

Health Hazard Evaluation Report 96-0171-2692. Bureau of Alcohol, Tobacco, and Firearms. Washington D.C. May 1988.

Konefal, Joseph and Edward Nordskog. *Fire Death Scene Investigation*. (2019). Self-published. www.arsonprofiler.com.

Munday, James W., *Safety at Scenes of Fire and Related Incidents* (current ed.). London: The Fire Protection Association.

NFPA 170: Standard for Fire Safety and Emergency Symbols (current ed.) Quincy, MA: National Fire Protection Association. NFPA Publications.

NFPA 472: Standard for Professional Competence of Responders to Hazardous Materials Incidents (current ed.). Quincy, MA: National Fire Protection Association. NFPA Publications.

NFPA 556: Guide on Methods for Evaluating Fire Hazard to Occupants of Passenger Road Vehicles (current ed.) Quincy, MA: National Fire Protection Association. NFPA Publications.

NFPA 1037: Standard on Fire Marshal Professional Qualifications (current ed.). Quincy, MA: National Fire Protection Association. NFPA Publications.

NFPA 1730: Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public

Education Operations (current ed.). Quincy, MA: National Fire Protection Association. NFPA Publications.

NIJ Research Report: *Death Investigation: A Guide for the Scene Investigator* (current ed.). US Department of Justice, Office of Justice Programs, National Institute of Justice. (On 5/06/21 this publication was available online at <https://www.ncjrs.gov/pdffiles1/nij/234457.pdf>)

Passenger Vehicle Identification Manual (current ed.) National Insurance Crime Bureau, 1111 E. Touhy Avenue, Suite 400, Des Plaines, IL 60018-2805.

Physical Evidence Handbook (current ed.). Texas Department of Public Safety. (On 5/06/21 this publication was available online at <https://www.dps.texas.gov/CrimeLaboratory/documents/PEHmanual.pdf>)

Pocket Guide to Fire and Arson Investigation (P7923) (current ed.). Factory Mutual Global.

Rules of Criminal Evidence, latest edition. (On 5/06/21, this information was available online at <http://www.txcourts.gov/rules-forms/rules-standards.aspx>).

Strengthening Fire and Explosion Investigation in the United States: A Strategic Vision for Moving Forward. 1 Apr. 2021, <https://doi.org/10.29325/OSAC.TG.0005>. Accessed 27 Apr. 2021.

Strengthening Forensic Science in the United States: A Path Forward, (current ed.) (Committee on Identifying the Needs for the Forensic Sciences Community. National Research Council. (On 5/06/21 this publication was available online at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>)

Texas Code of Criminal Procedure, latest edition. (On 5/06/21, this information was available online at <http://www.statutes.legis.state.tx.us/>).

Texas Family Code, current ed. (On 5/06/21, this information was available online at <http://www.statutes.legis.state.tx.us/>).

Texas Insurance Code, current ed. (On 5/06/21, this information was available online at <http://www.statutes.legis.state.tx.us/>).

Texas Penal Code, current ed. (On 5/06/21, this information was available online at <http://www.statutes.legis.state.tx.us/>).

Texas Public Information Act Handbook, current ed. (On 5/06/21, this information was available online at http://www.oag.state.tx.us/AG_publications/pdfs/publicinfo_hb.pdf. It is available through the Texas Attorney General's office.)

United States Constitution. (On 5/06/21, this information was available online at <http://www.archives.gov/exhibits/charters/charters.html>).

**CHAPTER FIVE
FIRE INVESTIGATOR
COURSE OUTLINE**

SECTION	SUBJECT	RECOMMENDED HOURS
501-1	Commission on Fire Protection Rules and Regulations	2
501-2	NFPA 1033 - Administration	
501-3	Definitions	
501-4	Basic Methodology	2
501-5	Basic Fire Science	16
501-6	Fire Effects and Fire Patterns	20
501-7	Building Systems	2
501-8	Active Fire Protection Systems	4
501-9	Electricity and Fire	8
501-10	Building Fuel Gas Systems	4
501-11	Fire-Related Human Behavior	4
501-12	Legal Considerations	12
501-13	Safety	4
501-14	Sources of Information	6
501-15	Planning the Investigation	2
501-16	Documentation of the Investigation	12
501-17	Physical Evidence	12
501-18	Origin Determination	8
501-19	Fire Cause Determination	4
501-20	Analyzing the Incident for Cause and Responsibility	4
501-21	Failure Analysis and Analytical Tools	8
501-22	Explosions	8
501-23	Incendiary Fires	8
501-24	Fire and Explosion Deaths and Injuries	4
501-25	Appliances	2
501-26	Motor Vehicle Fires	8
501-27	Wildfire Investigations	8
501-28	Management of Complex Investigations	2
501-29	Marine Fire Investigations	2
501-30	Practical Exercises	24
TOTAL HOURS RECOMMENDED		200

* The recommended hours includes time for skills evaluation and is based on 12 students. Actual hours needed will depend on the number of students, the number of examiners, availability of equipment, and the student skill level.

NFPA 1033 MATRIX

2014 Objective	LOCATION IN CURRICULUM	SKILL
4.1	GENERAL	
4.1.1	1	None
4.1.2	4	None
4.1.3	13, 15, 26	None
4.1.4	14, 15	None
4.1.5	12	None
4.1.6	15, 28	None
4.1.7	4,5,7,8,9,10,13,16,17,20,21,22	None
4.2	SCENE EXAMINATION	
4.2.1	15, 17	1
4.2.2	13, 18	2, 26
4.2.3	18,	3
4.2.4	5, 6, 26	4, 5
4.2.5	5, 6, 7, 18, 26	5
4.2.6	5, 17, 26	6
4.2.7	6	7
4.2.8	7, 8, 9, 10, 14, 25	8
4.2.9	22	6
4.3	DOCUMENTING THE SCENE	
4.3.1	16, 17	9
4.3.2	16	10
4.3.3	12, 16	11
4.4	EVIDENCE COLLECTION/PRESERVATION	
4.4.1	11, 17, 24	12
4.4.2	12, 17	12
4.4.3	14, 17	12
4.4.4	12, 17	13
4.4.5	17	14
4.5	INTERVIEW	
4.5.1	14	15
4.5.2	14	16
4.5.3	14	17
4.6	POST-INCIDENT INVESTIGATION	
4.6.1	14, 16, 20, 21	18
4.6.2	16, 20, 21	19
4.6.3	12, 14, 15, 20, 21	20
4.6.4	11, 20, 21, 23	21
4.6.5	11, 18, 19, 20, 21, 23	22
4.7	PRESENTATIONS	
4.7.1	16, 30	23
4.7.2	30	24
4.7.3	12, 30	25
Annex A	EXPLANATORY MATERIAL	
A.1.1	26, 27, 29	

Course Instructor Information

Fire Investigator

Overview

The Fire Investigator curriculum is designed to provide clear guidance that ensures adequate presentation of the information required to meet the Job Performance Requirements (JPRs) of National Fire Protection Association (NFPA) 1033, *Standard for Professional Qualifications for Fire Investigator*, 2022 edition.

The Fire Investigator curriculum is Chapter 5 of the Texas Commission on Fire Protection (TCFP) Curriculum Manual.

Certification Level	TCFP Chapter Number	NFPA 1033 Chapter
Fire Investigator	5	4

Layout

The NFPA numbering sequence is mirrored to allow easy correlation between this document and the NFPA Standard. For example, 501-5.5.1 identifies the section in Fire Investigator that corresponds to *NFPA 921, Guide for Fire and Explosion Investigation (2021 Edition)* section 5.5.1.

TCFP Standards Manual

It is critical that the Course Instructor review the chapters in the TCFP Standards Manual that apply to this curriculum. Of primary importance are the following chapters: Chapter 421, Standards for Certification; Chapter 437, Fees; Chapter 431, Fire Investigator Certification; Chapter 439, Examinations for Certification; Chapter 449.5, Certification as Head of a Prevention Only Department. These chapters do not address every issue that could impact this curriculum; therefore, the Course Instructor is encouraged to become familiar with the TCFP Standards Manual.

Supplemental Information

Instructors are expected to provide supplemental information if the main reference text does not provide adequate information to ensure successful completion of the Job Performance Requirements as listed in the curriculum.

Components of the Curriculum

Each section of the curriculum identifies the NFPA JPR in NFPA 1033, *Standard for Professional Qualifications for Fire Investigator*, 2022 Edition and knowledge components in *NFPA 921, Guide for Fire and Explosion Investigations, 2021 Edition* and subdivides them into learning components.

For example:

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.5* Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

(A) Requisite Knowledge: Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills: Analytical and assimilation skills.

501-19.1 **The Investigator candidate shall define fire cause and identify fire cause factors.**

19.1.1 *Fire Cause Factors*

19.1.2 *First Fuel Ignited*

19.1.3 *Ignition Source*

19.1.4 *Oxidant*

19.1.5 *Ignition Sequence*

501-19.2 **The Investigator candidate shall utilize the scientific method as the overall methodology.**

19.1.1 *Consideration of Data*

19.1.2 *Sequence of Activities*

19.1.3 *Point and Area of Origin*

501-19.3 **The Investigator candidate shall identify the data that needs to be collected for fire cause determination.**

Skills

NFPA's "Requisite Skills" requirements are addressed in the corresponding Skill Sheets and are based on the JPRs in National Fire Protection Association (NFPA) 1033, *Standard for Professional Qualifications for Fire Investigator*, 2022 edition.

Descriptions of Certification Levels

A Fire Investigator is an individual who has demonstrated the skills and knowledge necessary to conduct, coordinate, and complete a fire investigation.

Fire Investigator

A Fire Investigator is an individual who has demonstrated the knowledge, skills, and abilities necessary to conduct, coordinate, and complete a fire investigation employing all the elements of the scientific method as the operating analytical process throughout the investigation. A Fire Investigator can competently determine the origin and cause of a fire and has mastered all the job performance requirements of NFPA 1033: *Standard for Professional Qualifications for Fire Investigator*.

SECTION 1

COMMISSION ON FIRE PROTECTION

RULES AND REGULATIONS

4.1 General

NFPA 1033 4.1.1 The fire investigator shall meet the job performance requirements defined in Sections 4.2 through 4.7.

References:

Certification Curriculum Manual
Standards Manual for Fire Protection Personnel

501-1.1 **The Investigator candidate shall describe the purpose of the NFPA standard and guide applicable to Fire Investigators.**

- 1.1.1 NFPA 1033 *Standard for Professional Qualifications for Fire Investigator*, 2022 edition.
- 1.1.2 NFPA 921 *Guide for Fire and Explosion Investigations*, 2021 edition.

501-1.2 **The Investigator candidate shall identify rules applicable to the Fire/Arson Investigator certification adopted by the Texas Commission on Fire Protection.**

- 1.2.1 The Investigator candidate shall identify the requirements for certification as a Fire Investigator as stated in the *Standards Manual for Fire Protection Personnel*, Chapter 431.
- 1.2.2 The Investigator candidate shall identify the requirements for certification as an Arson Investigator as stated in the

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Standards Manual for Fire Protection Personnel, Chapter 431.

1.2.3 The Investigator candidate shall identify the various levels of certification for Fire and/or Arson Investigator, as stated in the *Standards Manual for Fire Protection Personnel*, Chapter 431.

- 1.2.3.1 Basic
- 1.2.3.2 Intermediate
- 1.2.3.3 Advanced
- 1.2.3.4 Master

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SECTION 2

NFPA 1033

NFPA 1033 1.1* Scope. This standard shall identify the professional level of job performance requirements for fire investigators.

1.2 * Purpose. This standard shall specify the minimum JPRs for serving as a fire investigator in both the private and public sectors.

1.2.1 This standard shall define the fire investigator position.

1.2.2 The intent of this standard shall be to ensure that individuals who serve as fire investigators are qualified to do so.

1.2.3 It shall not be the intent of this standard to restrict any jurisdiction from exceeding or combining these minimum requirements.

1.2.4 JPRs for each duty are the tasks personnel shall be able to perform to successfully carry out that duty.

1.2.5 Fire investigators who perform or support fire investigations shall remain current with the general knowledge, skills, and JPRs.

1.2.6 Fire investigators who perform or support fire investigations shall remain current with practices and applicable standards.

1.3 Application.

The application of this standard shall be to specify the JPRs that shall apply to specific personnel who perform and support fire investigations.

1.3.1 The JPRs shall be accomplished in accordance with the requirements of the AHJ and all applicable NFPA and other standards development organization (SDO) standards.

1.3.2 Priority.

1.3.2.1 * It shall not be required that the JPRs be mastered in the order in which they appear.

1.3.2.2 The AHJ shall establish instructional priority and the training program content to prepare personnel to meet the JPRs of this standard.

1.3.2.3 * The performance of each requirement of this chapter shall be evaluated by personnel approved by the AHJ.

1.3.2.4 The JPRs for fire investigators shall be completed in accordance with recognized practices and procedures or as defined by law or by the AHJ.

1.3.2.5 Fire investigators who perform or support fire investigations shall meet the requirements of this standard for each fire investigation performed.

1.3.2.6 The AHJ shall provide the necessary personal protective equipment (PPE), force protection, and clothing to conduct assignments.

1.3.2.7 JPRs involving exposure to products of combustion shall be performed in approved PPE.

1.3.2.8 Prior to training to meet the requirements of this standard, personnel shall meet the following requirements:

- (1) Be at least age 18
- (2) Have a high school diploma or equivalent
- (3) Be subjected to a thorough background and character investigation by the AHJ prior to being accepted as an individual candidate for certification as a fire investigator

4.1.1 * The fire investigator shall meet the job performance requirements defined in Sections 4.2 through 4.7. (see below)

4.1.2 * The fire investigator shall employ all elements of the scientific method as the operating analytical process throughout the investigation and for the drawing of conclusions.

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4.1.3 * Because fire investigators are required to perform activities in adverse conditions, site safety assessments shall be completed on all scenes and regional and national safety standards shall be followed and included in organizational policies and procedures.

4.1.4 * The fire investigator shall maintain necessary liaison with other interested professionals and entities.

4.1.5 * The fire investigator shall adhere to all applicable legal and regulatory requirements.

4.1.6 The fire investigator shall understand the organization and operation of the investigative team within an incident management system.

4.1.7 * In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following:

- (1) Fire science:
 1. Fire chemistry
 2. Thermodynamics
 3. Fire dynamics
 4. Explosion dynamics
- (2) Fire investigation:
 5. Fire analysis
 6. Fire investigation methodology
 7. Fire investigation technology
 8. Evidence documentation, collection, and preservation
 9. Failure analysis and analytical tools
- (3) Fire scene safety:
 10. Hazard recognition, evaluation, and basic mitigation procedures
 11. Hazardous materials
 12. Safety regulations
- (4) Building systems:
 13. Types of construction
 14. Fire protection systems
 15. Electricity and electrical systems
 16. Fuel gas systems

4.1.7.1 The fire investigator shall remain current in the subjects listed as “requisite knowledge” for the JPRs and as summarized in 4.1.7.

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4.1.7.2 The fire investigator shall remain current by attending formal education courses, workshops, in-person or online seminars, and/or through professional publications, journals, and treatises.

4.1.7.3 The fire investigator shall complete and document a minimum of 40 hours of continuing education training every five years by attending formal education courses, workshops, and seminars.

28 Job Performance Requirements (Annex C, Table C.1)

- 1-Secure the fire ground (4.2.1)
- 2-Conduct an exterior survey (4.2.2)
- 3-Conduct an interior survey (4.2.3)
- 4-Interpret fire patterns (4.2.4)
- 5-Interpret and analyze fire patterns (4.2.5)
- 6-Examine and remove fire debris (4.2.6)
- 7-Reconstruct the area of origin (4.2.7)
- 8-Inspect the performance of building systems (4.2.8)
- 9-Discriminate the effects of explosions (4.2.9)
- 10- Diagram the Scene (4.3.1)
- 11- Photographically document the scene (4.3.2)
- 12-Construct investigative notes (4.3.3)
- 13-Utilize proper procedures for managing victims and fatalities (4.4.1)
- 14-Locate, document, collect, label, package, and store evidence (4.4.2)
- 15-Select evidence for analysis (4.4.3)
- 16-Maintain a chain of custody (4.4.4)
- 17-Dispose of evidence (4.4.5)
- 18-Develop an interview plan (4.5.1)
- 19-Conduct interviews (4.5.2)
- 20-Evaluate interview information (4.5.3)
- 21-Gather reports and records (4.6.1)
- 22-Evaluate the investigative file (4.6.2)
- 23- Coordinate expert resources (4.6.3)
- 24- Establish evidence as to motive and/or opportunity (4.6.4)
- 25- Formulate an opinion concerning origin, cause, or responsibility for the fire (4.6.5)
- 26- Prepare a written report (4.7.1)
- 27- Express investigative findings verbally (4.7.2)
- 28-Testify during legal proceedings (4.7.3)

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SECTION 3
DEFINITIONS

References:
NFPA 921 2021 edition

501-3.1 ***The Investigator candidate shall define the terms used in Chapter 3 of NFPA 921, Guide for Fire and Explosion Investigations (2021 Edition).***

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SECTION 4

BASIC METHODOLOGY

4.1 General

NFPA 1033 4.1.2 The fire investigator shall employ all elements of the scientific method as the operating analytical process throughout the investigation and for the drawing of conclusions.

4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (2)(b) Fire Investigation Methodology.

References:

J & B, chapter 2
Lentini, chapter 4

501-4.1 **The Investigator candidate shall describe the nature of fire investigations.**

501-4.2 **The Investigator candidate shall apply the principles of the systematic approach of the scientific method.**

501-4.3 **The Investigator candidate shall describe the steps of the scientific method relating to fire investigations.**

4.3.1 Recognize the Need

4.3.2 Define the Problem

4.3.3 Collect Data

4.3.4 Analyze the Data

4.3.5 Develop a Hypotheses (Inductive Reasoning)

4.3.6 Test the Hypotheses (Deductive Reasoning)

4.3.7 Select Final Hypothesis

4.3.8 Avoid Presumption

4.3.9 Expectation Bias

4.3.10 Confirmation Bias

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501-4.4

The Investigator candidate shall describe the basic method of fire investigation.

- 4.4.1 Receiving the Assignment
- 4.4.2 Preparing for the Investigation
- 4.4.3 Conducting the Investigation
- 4.4.4 Collecting and Preserving Evidence
- 4.4.5 Analyzing the Incident
- 4.4.6 Conclusions

501-4.5

The Investigator candidate shall properly distinguish between the different levels of certainty.

- 4.5.1 Probable versus Possible
- 4.5.2 Suspected
- 4.5.3 Expert Opinions

501-4.6

The Investigator candidate shall develop “review procedures.”

- 4.6.1 Administrative Review
- 4.6.2 Technical Review
- 4.6.3 Peer Review

501-4.7

The Investigator candidate shall describe different reporting procedures.

SECTION 5

BASIC FIRE SCIENCE

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (1)(a) Fire Chemistry, (b) Thermodynamics, (c) Fire Dynamics.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.4 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that each pattern is identified and analyzed with respect to the burning characteristics of the material involved, the stage of fire development, the effects of ventilation within the context of the scene, the relationship with all patterns observed, and the understanding of the methods of heat transfer that led to the formation of the patterns identified and analyzed, and the sequence in which the patterns were produced is determined.

(A) Requisite Knowledge. Fire dynamics, fire development, and the interrelationship of heat release rate, form, and ignitability of materials.

(B) Requisite Skills. Ability to interpret the effects of burning characteristics on different types of materials.

NFPA 1033 4.2.5 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that fire development is determined, methods and effects of suppression are evaluated, false origin area patterns are recognized, and all areas of origin are correctly identified.

(A) Requisite Knowledge. Fire behavior and spread based on fire chemistry, fire dynamics, and physics, fire suppression effects, building construction.

(B) Requisite Skills. Ability to interpret variations of fire patterns on different materials with consideration given to heat release rate, form, and ignitability; distinguish impact of different types of fuel loads; evaluate fuel trails; and analyze and synthesize information.

NFPA 1033 4.2.6 Examine and remove fire debris, given standard equipment and tools, so that all debris is checked for fire cause evidence, potential ignition source(s) is identified, and evidence is preserved without investigator-inflicted damage or contamination.

(A) Requisite Knowledge. Basic understanding of ignition processes, characteristics of ignition sources, and ease of ignition of fuels; debris-layering techniques; use of tools and equipment during the debris search; types of fire cause evidence commonly found in various degrees of damage; and evidence-gathering methods and documentation.

(B) Requisite Skills. Ability to employ search techniques that further the discovery of fire cause evidence and ignition sources, use search techniques that incorporate documentation, and collect and preserve evidence.

References:

J&B, chapter 3

Kirk's, chapter 2

Lentini, chapter 1-2

501-5.1 ***The Investigator candidate shall define and describe fire science.***

5.1.1 Fire and Energy

5.1.2 Energy

5.1.3 Power

5.1.4 Heat Flux

5.1.5 Identify and describe the elements of the fire tetrahedron.

5.1.5.1 Define fuel and describe the three states in which fuel exists.

5.1.5.2 Describe the action of oxidizing agents.

5.1.5.3 Describe the relationship of heat in the combustion process.

5.1.5.4 Describe the uninhibited chemical chain reaction of combustion.

501-5.2 ***The Investigator candidate shall be able to discuss fire chemistry as the study of chemical processes that occur in fires, including changes of state, decomposition, and combustion.***

5.2.1 Phase Changes and Thermal Decomposition

5.2.2 Combustion

501-5.3 ***The Investigator candidate shall identify and describe products of combustion.***

501-5.4 ***The Investigator candidate shall identify and describe fluid flows generated by mechanical forces or by buoyant forces generated by temperature differences.***

5.4.1 General

5.4.2 Buoyant Flows

5.4.3 Fire Plumes

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5.4.4 Ceiling Jets

5.4.5 Vent Flows

501-5.5 ***The Investigator candidate shall define and describe methods of heat transfer.***

5.5.1 General

5.5.2 Conduction

5.5.3 Convection

5.5.4 Radiation

5.5.5 Thermometry

5.5.5.1 Different systems

5.5.5.2 Empirical Temperature Scales

5.5.5.3 Thermodynamic (Absolute) Temperature Scales

501-5.6 ***The Investigator candidate shall define and describe the fuel load, fuel packages, and properties of flame.***

5.6.1 Fuel Load

5.6.2 Fuel Items and Fuel Package

5.6.3 Heat Release Rate

5.6.4 Properties of Flames

5.6.5 Thermal Structure of a Flame

5.6.5.1 Continuous Flaming Region

5.6.5.2 Intermittent Flame Region

5.6.5.3 Plume Region

5.6.6 Heat Fluxes from Flames

5.6.6.1 Heat Fluxes from Flames to Contacted Surfaces

5.6.6.2 Heat Fluxes from Flames to Remote Surfaces

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501-5.7 ***The Investigator candidate shall describe the different forms and mechanisms of ignition.***

- 5.7.1 Ignition in General
- 5.7.2 Ignition of Flammable Gases
- 5.7.3 Ignition of Liquids
- 5.7.4 Ignition of Solids

501-5.8 ***The Investigator candidate shall describe the different flame spreads and their characteristics.***

- 5.8.1 Ger eral
 - 5.8.1.1 Counterflow Flame Spread
 - 5.8.1.2 Concurrent Flame Spread
 - 5.8.1.3 Fire Spread on Sloped Surfaces
- 5.8.2 Flame spread on Liquids
- 5.8.3 Flame spread on Solids

501-5.9 ***The Investigator candidate shall describe the different methods of fire spread in a compartment.***

- 5.9.1 General
- 5.9.2 Fire Spread
 - 5.9.2.1 Fire Spread by Flame Impingement
 - 5.9.2.2 Fire Spread by Remote Ignition

501-5.10 ***The Investigator candidate shall describe compartment fire development.***

- 5.10.1 General
- 5.10.2 Compartment Fire Phenomena
- 5.10.3 Compartment Vent Flows
- 5.10.4 Flashover

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- 5.10.5 Fully Developed Compartment Fires
- 5.10.6 Effects of Enclosures on Fire Growth
 - 5.10.6.1 Room Volume and Ceiling Height
 - 5.10.6.2 Location of the Fire in the Compartment

501-5.11 ***The Investigator candidate shall identify fire spread between compartments.***

- 5.11.1 Fire Spread via Openings
- 5.11.2 Fire Spread via Barriers

501-5.12 ***The Investigator candidate shall describe the paths of smoke spread in buildings.***

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SECTION 6

FIRE EFFECTS AND FIRE PATTERNS

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire

NFPA 1033 4.2. Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that each pattern is identified and analyzed with respect to the burning characteristics of the material involved, the stage of fire development, the effects of ventilation within the context of the scene, the relationship with all patterns observed, and the understanding of the methods of heat transfer that led to the formation of the patterns identified and analyzed, and the sequence in which the patterns were produced is determined.

(A) Requisite Knowledge. Fire dynamics, fire development, and the interrelationship of heat release rate, form, and ignitability of materials.

(B) Requisite Skills. Ability to interpret the effects of burning characteristics on different types of materials.

NFPA 1033 4.2.5 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that fire development is determined, methods and effects of suppression are evaluated, false origin area patterns are recognized, and all areas of origin are correctly identified.

(A) Requisite Knowledge. Fire behavior and spread based on fire chemistry, fire dynamics, and physics, fire suppression effects, building construction.

(B) Requisite Skills. Interpret variations of fire patterns on different materials with consideration given to heat release rate, form, and ignitability; distinguish impact of different types of fuel loads; evaluate fuel trails; and analyze and synthesize information.

NFPA 1033 4.2.7 Reconstruct potential area(s) of origin, given standard and, if needed, special equipment and tools as well as sufficient personnel, so that all protected areas and fire patterns are identified and correlated to contents or structural remains; and items potentially critical to cause determination are returned to their prefire location as a means of hypothesis testing, such that the area(s) or point(s) of origin is discovered.

(A) Requisite Knowledge. The effects of fire on different types of material and the importance and uses of reconstruction.

(B) Requisite Skills. Ability to examine all materials to determine the effects of fire, identify and distinguish among different types of fire-damaged contents, and return materials to their original position using protected areas and fire patterns.

References:
J&B, chapter 4
Kirk's, chapter 5
Lentini, chapter 3

501-6.1 **The Investigator candidate shall define fire effects and fire patterns.**

501-6.2 **The Investigator candidate shall be able to identify fire effects.**

6.2.1 Fire Effects

- 6.2.1.1 Deformation
- 6.2.1.2 Deposition
- 6.2.1.3 Discoloration
- 6.2.1.4 Mass Loss

6.2.2 Characteristics and context of fire effects

501-6.3 **The Investigator candidate shall be able to analyze the following fire effects.**

6.3.1 Introduction

6.3.2 Char

- 6.3.2.1 Char Observations
- 6.3.2.2 Material Sciences – Surface Effect of Char
- 6.3.2.3 Pyrolysis
- 6.3.2.4 Analysis of Char
- 6.3.2.5 Depth of Char Diagram
- 6.3.2.6 Measuring Depth of Char
- 6.3.2.7 Measuring Depth of Char
- 6.3.2.8 Missing Wood
- 6.3.2.9 Depth of Char Surveys with fuel Gases
- 6.3.2.10 Appearance of Char
- 6.3.2.11 Limitations with Char
- 6.3.2.12 Rate of Wood Charring

6.3.3 Clean Burn

- 6.3.3.1 Clean Burn Observations
- 6.3.3.2 Material Sciences Related to Clean Burn
- 6.3.3.3 Analysis of Clean Burn
- 6.3.3.4 Limitations

6.3.4 Color Change

- 6.3.4.1 Color Changes Observations
- 6.3.4.2 Material Sciences Related to Color Changes

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- 6.3.4.3 Fabric Dyes
- 6.3.4.4 Light
- 6.3.4.5 Analysis of Color Changes
- 6.3.4.6 Limitations

- 6.3.5 Deposition of Smoke on Surfaces
 - 6.3.5.1 Deposition of Smoke on Surfaces Observations
 - 6.3.5.2 Smoke Characteristics
 - 6.3.5.3 Material Sciences for Deposition of Smoke
 - 6.3.5.4 Analysis Related to Deposition of Smoke on Surfaces
 - 6.3.5.5 Location of Objects
 - 6.3.5.6 Position of Switches
 - 6.3.5.7 Limitations

- 6.3.6 Distorted Lightbulbs
 - 6.3.6.1 Observations for Distorted Lightbulbs
 - 6.3.6.2 Material Science for Distorted Lightbulbs
 - 6.3.6.3 Distorted Lightbulb Analysis
 - 6.3.6.4 Limitations

- 6.3.7 Furniture Springs
 - 6.3.7.1 Furniture Springs Observations
 - 6.3.7.2 Material Science Related to Furniture Springs
 - 6.3.7.3 Analysis of Furniture Springs
 - 6.3.7.4 Limitations

- 6.3.8 Gypsum Wallboard
 - 6.3.8.1 Gypsum Wallboard Observations
 - 6.3.8.2 Material Science related to Gypsum Wallboard
 - 6.3.8.3 Analysis of Gypsum Wallboard
 - 6.3.8.4 Mass Loss and Density
 - 6.3.8.5 General Indications of Calcination
 - 6.3.8.6 Depth of Calcination Survey
 - 6.3.8.7 Depth of Calcination Diagram
 - 6.3.8.8 Measuring Depth of Calcination
 - 6.3.8.9 Limitations

- 6.3.9 Mass Loss of Material
 - 6.3.9.1 Mass Loss Observations
 - 6.3.9.2 Fire-Damaged Materials and Exemplar Materials

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- 6.3.9.3 Material Science Related to Mass Loss
- 6.3.9.4 Analysis of Mass Loss Observations
- 6.3.9.5 Limitations
- 6.3.9.6 Other conditions of nonuniformity

- 6.3.10 Melting of Materials
 - 6.3.10.1 Melting Observations
 - 6.3.10.2 Material Science Related to Melting
 - 6.3.10.3 Common Metals
 - 6.3.10.4 Thermoplastics
 - 6.3.10.5 Glass
 - 6.3.10.6 Alloying of Metals
 - 6.3.10.7 Analysis of Melting Effects in Fires
 - 6.3.10.8 Limitations

- 6.3.11 Oxidation
 - 6.3.11.1 Observations
 - 6.3.11.2 Galvanized Steel
 - 6.3.11.3 Uncoated Iron or Steel
 - 6.3.11.4 Oxidation Versus Melting
 - 6.3.11.5 Stainless Steel
 - 6.3.11.6 Copper
 - 6.3.11.7 Rocks and Soil
 - 6.3.11.8 Materials Science Related to Oxidation
 - 6.3.11.9 Analysis of Oxidation Observations
 - 6.3.11.10 Limitations

- 6.3.12 Rainbow Effect
 - 6.3.12.1 Rainbow Effect Observations
 - 6.3.12.2 Material Science for Rainbow Effects
 - 6.3.12.3 Analysis of Rainbow Effect
 - 6.3.12.4 Limitations

- 6.3.13 Smoke Alarms - Enhanced Soot Deposition, or Acoustic Soot Agglomeration
 - 6.3.13.1 Smoke Alarm Observations
 - 6.3.13.2 Enhanced Soot Deposition, or Acoustic Agglomeration
 - 6.3.13.3 Analysis of Smoke Alarms
 - 6.3.13.4 Limitations

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- 6.3.14 Spalling
 - 6.3.14.1 Observations
 - 6.3.14.2 Material Science Related to Spalling
 - 6.3.14.3 Analysis for Spalling
 - 6.3.14.4 Limitations

- 6.3.15 Thermal Expansion and Deformation of Materials
 - 6.3.15.1 Observations of Thermal Expansion and Deformation of Materials
 - 6.3.15.2 Material Science of Thermal Expansion and Deformation of Materials
 - 6.3.15.3 Bending and Buckling
 - 6.3.15.4 Metal Construction Elements
 - 6.3.15.5 Analysis of Thermal Expansion and Deformation
 - 6.3.15.6 Piping Systems
 - 6.3.15.7 Plastered Surfaces
 - 6.3.15.8 Limitations
 - 6.3.15.9 Collapse

- 6.3.16 Victim Injuries
 - 6.3.16.1 Victim Injuries Observations
 - 6.3.16.2 Material Science of Victim Injuries
 - 6.3.16.3 Skin
 - 6.3.16.4 The Body as Fuel
 - 6.3.16.5 Analysis of Victim Injuries
 - 6.3.16.6 Limitations

- 6.3.17 Window Glass
 - 6.3.17.1 Window Glass Observations
 - 6.3.17.2 Material Science of Glass
 - 6.3.17.3 Tempered Glass
 - 6.3.17.4 Analysis of Glass
 - 6.3.17.5 Limitations

- 6.3.18 Fire Patterns
 - 6.3.18.1 Introduction
 - 6.3.18.2 Location of Patterns
 - 6.3.18.3 Location of Objects
 - 6.3.18.4 Penetrations of Horizontal Surfaces
 - 6.3.18.5 Depth of Char Patterns with Fuel Gases

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- 6.3.19 Fire Pattern Generation
 - 6.3.19.1 Plume-Generated Patterns
 - 6.3.19.2 Ventilation-Generated Patterns
 - 6.3.19.3 Hot Gas Layer-Generated Patterns
 - 6.3.19.4 Full Room Involvement-Generated Patterns
 - 6.3.19.5 Suppression-Generated Patterns
 - 6.3.19.6 Undetermined-Generated Patterns

- 6.3.20 Fire Pattern Geometry
 - 6.3.20.1 V Patterns on Vertical Surfaces
 - 6.3.20.2 Inverted Cone (Triangular) Patterns
 - 6.3.20.3 Hourglass Patterns
 - 6.3.20.4 U-Shaped Patterns
 - 6.3.20.5 Circular-Shaped Patterns
 - 6.3.20.6 Truncated Cone Patterns
 - 6.3.20.7 Irregular Patterns
 - 6.3.20.8 Doughnut-Shaped Patterns
 - 6.3.20.9 Linear Patterns
 - 6.3.20.10 Area Patterns

- 6.3.21 Arc Mapping

- 6.3.22 Pointer and Arrow Patterns

501-6.4 ***The Investigator candidate shall be able to analyze fire patterns.***

- 6.4.1 Types of Fire Patterns
 - 6.4.1.1 Fire Spread (Movement) Patterns
 - 6.4.1.2 Heat (Intensity) Patterns
 - 6.4.1.3 Combination of Patterns

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SECTION 7

BUILDING SYSTEMS

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (4)(a) Types of Construction, (b) Fire Protection Systems, (c) Electricity and Electrical Systems, (d) Fuel Gas Systems.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.5 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that fire development is determined, methods and effects of suppression are evaluated, false origin area patterns are recognized, and all areas of origin are correctly identified.

(A) Requisite Knowledge. Fire behavior and spread based on fire chemistry, fire dynamics, and physics, fire suppression effects, building construction.

(B) Requisite Skills. Interpret variations of fire patterns on different materials with consideration given to heat release rate, form, and ignitability; distinguish impact of different types of fuel loads; evaluate fuel trails; and analyze and synthesize information.

NFPA 1033 4.2.8 Inspect and analyze the performance of building systems, including fire protection, detection and suppression systems, HVAC, electricity and electrical systems, fuel gas systems, and building compartmentation, given standard and special equipment and tools, so that a determination can be made as to the need for expert resources; an operating system’s impact on fire growth and spread is considered in identifying origin areas; defeated and failed systems are identified; and the system’s potential as a fire cause is recognized.

(A) Requisite Knowledge. Different types of detection, suppression, HVAC, utility, and building compartmentation such as fire walls and fire doors; types of expert resources for building systems; the impact of fire on various systems; common methods used to defeat a system’s functional capability; and types of failures.

(B) Requisite Skills. Ability to determine the system’s operation and its effect on the fire; identify alterations to, and failure indicators of, building systems; and evaluate the impact of suppression efforts on building systems.

References:
J&B, chapter 5

501-7.1 The Investigator candidate shall recognize the reaction of buildings and building assemblies to fire.

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501-7.2 **The Investigator candidate shall evaluate the features of design, construction and structural elements in evaluating fire development.**

- 7.2.1 General
- 7.2.2 Building design
 - 7.2.2.1 General
 - 7.2.2.2 Building Loads
 - 7.2.2.3 Room Size
 - 7.2.2.4 Compartmentation
 - 7.2.2.5 Concealed and Interstitial Spaces
 - 7.2.2.6 Planned Designs as Compared to “As-Built” Condition
- 7.2.3 Materials
 - 7.2.3.1 Ignitability
 - 7.2.3.2 Flammability
 - 7.2.3.3 Thermal Inertia
 - 7.2.3.4 Thermal Conductivity
 - 7.2.3.5 Toxicity
 - 7.2.3.6 Physical State and Heat Resistance
 - 7.2.3.7 Orientation, Position, and Placement
- 7.2.4 Occupancy
- 7.2.5 Computer Fire Model Survey of Building Component Variations
- 7.2.6 Explosion Damage

501-7.3 **The Investigator candidate shall identify the different types of building construction.**

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****Note** (Only 501-7.3.1)**

The following section is not contained in NFPA 921, *Guide for Fire and Explosion Investigations*. The reference for this material is found in IFSTA, *Fire Inspection and Code Enforcement and Fire Investigator*.

- 7.3.1 General
 - 7.3.1.1 Type I – fire resistive
 - 7.3.1.2 Type II – non-combustible
 - 7.3.1.3 Type III – ordinary
 - 7.3.1.4 Type IV – heavy timber
 - 7.3.1.5 Type V – wood frame

- 7.3.2 Wood Frame (Type V)
 - 7.3.2.1 Platform Frame Construction
 - 7.3.2.2 Balloon Frame
 - 7.3.2.3 Plank and Beam
 - 7.3.2.4 Post and Frame

 - 7.3.2.5 Heavy Timber
 - 7.3.2.6 Alternative Residential Construction
 - 7.3.2.6.1 Manufactured homes (Mobile Homes)
 - 7.3.2.6.2 Modular Homes
 - 7.3.2.6.3 Steel Frame Residential Construction
 - 7.3.2.7 Manufactured Wood Structural Elements

- 7.3.3 Ordinary Construction (Type III)

- 7.3.4 Mill Construction (Type IV)

- 7.3.5 Noncombustible Construction (Type II)
 - 7.3.5.1 General
 - 7.3.5.2 Metal Construction
 - 7.3.5.3 Concrete or Masonry Construction

501-7.4 *The Investigator candidate shall identify the different construction assemblies.*

- 7.3.6 General

- 7.3.7 Floor/Ceiling/Roof Assemblies

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- 7.4.1 Walls
- 7.4.2 Doors
- 7.4.3 Concealed Spaces

501-7.5 ***The Investigator candidate shall describe the different construction materials.***

- 7.5.1 Structural Steel
- 7.5.2 Reinforced Concrete
- 7.5.3 Wood

501-7.6 ***The Investigator candidate shall analyze the impact of passive fire protection systems on the investigation.***

501-7.7 ***The Investigator candidate should analyze the design and installation parameters when the passive fire protection system is determined to be a factor.***

501-7.8 ***The Investigator candidate should produce the additional documentation and data collection when the passive fire protection system is determined to be a factor.***

501-7.9 ***The Investigator candidate shall perform the required additional analysis.***

- 7.9.1 Code Analysis
- 7.9.2 Design Analysis
- 7.9.3 Installation Analysis
- 7.9.4 System Performance
- 7.9.5 Testing and Maintenance Analysis
- 7.9.6 Origin and Cause Determination

501-7.10 ***The Investigator candidate shall maintain a basic***

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understanding of heating systems commonly encountered in residential and light commercial fire incidents.

- 7.10.1 Systems components
 - 7.10.1.1 Fuel Storage and Supply
 - 7.10.1.2 Heat Producing Devices
 - 7.10.1.3 Chimney/Vent
 - 7.10.1.4 Control and Safety Devices
- 7.10.2 Installation
- 7.10.3 Operation and maintenance
- 7.10.4 Potential fire causes
 - 7.10.4.1 Improper Installation of Fuel Delivery Systems
 - 7.10.4.2 Improper Installation of Heat Producing Systems
 - 7.10.4.3 Improper Installation of Control and Safety Devices
 - 7.10.4.4 Improper Installation of Chimneys and Vents
 - 7.10.4.5 Airspace Requirement Violations
 - 7.10.4.6 Utilizing Non-Listed Devices and Accessories
 - 7.10.4.7 Circumvented or Failed Control and Safety Components
 - 7.10.4.8 Inadequate Maintenance or Cleaning
 - 7.10.4.9 Improper Usage
 - 7.10.4.10 Electrical Events
- 7.10.5 Documentation and Data Collection
- 7.10.6 Analysis of Origin and Causes

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SECTION 8

ACTIVE FIRE PROTECTION SYSTEMS

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (4)(b) Fire Protection Systems.

4.2. Scene Examination

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.8 Inspect and analyze the performance of building systems, including fire protection, detection and suppression systems, HVAC, electricity and electrical systems, fuel gas systems, and building compartmentation, given standard and special equipment and tools, so that a determination can be made as to the need for expert resources; an operating system’s impact on fire growth and spread is considered in identifying origin areas; defeated and failed systems are identified; and the system’s potential as a fire cause is recognized.

(A) Requisite Knowledge. Different types of detection, suppression, HVAC, utility, and building compartmentation such as fire walls and fire doors; types of expert resources for building systems; the impact of fire on various systems; common methods used to defeat a system’s functional capability; and types of failures.

(B) Requisite Skills. Ability to determine the system’s operation and its effect on the fire; identify alterations to, and failure indicators of, building systems; and evaluate the impact of suppression efforts on building systems.

References:

J&B, chapter 6

IFSTA, Fire Inspection, chapter 12-14

501-8.1 ***The Investigator candidate shall develop basic understanding of active fire protection systems.***

501-8.2 ***The Investigator candidate shall develop basic understanding of documentation of fire protection systems.***

8.2.1 Design Documentation

8.2.2 Permit History

8.2.3 Invoices and Contracts

8.2.4 Installation Documentation

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- 8.2.5 Inspection and Maintenance Records
- 8.2.6 Product Literature
- 8.2.7 Alarm / Activation History

501-8.3 ***The Investigator candidate shall identify the basic components and operation of a fire alarm system.***

- 8.3.1 General information
 - 8.3.1.1 Purpose of Systems
 - 8.3.1.2 System Components
 - 8.3.1.3 General System Operation
- 8.3.2 Key Components of Systems
 - 8.3.2.1 Fire Alarm Control Unit (FACU)
 - 8.3.2.2 Power Supply
 - 8.3.2.3 Initiating Devices
 - 8.3.2.4 Smoke Detection
 - 8.3.2.5 Heat Detection
 - 8.3.2.6 Other Types of Detectors
 - 8.3.2.7 Notification Appliances
- 8.3.3 Operations and Installation Parameters of the System
 - 8.3.3.1 FACU Features
 - 8.3.3.2 Location and Spacing of Devices
 - 8.3.3.3 Internal System Communication
 - 8.3.3.4 Means of Alarm Transmission
 - 8.3.3.5 Systems Monitored and Controlled
- 8.3.4 Analysis
 - 8.3.4.1 System Documentation and Data Collection
 - 8.3.4.2 Code Analysis
 - 8.3.4.3 Design Analysis
 - 8.3.4.4 Installation Analysis
 - 8.3.4.5 Testing and Maintenance Analysis
 - 8.3.4.6 System Performance
 - 8.3.4.7 Development of Timeline
 - 8.3.4.8 Thermal Damage
 - 8.3.4.9 Fire Alarm Effectiveness
 - 8.3.4.10 Impact on Human Behavior

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501-8.4 ***The Investigator candidate shall identify the basic components and operation of a water-based fire suppression system.***

- 8.4.1 General Information
 - 8.4.1.1 Purpose of Systems
 - 8.4.1.2 General System Operation

- 8.4.2 Key Components of Water-Based Systems
 - 8.4.2.1 Sprinklers/Nozzles
 - 8.4.2.2 Piping
 - 8.4.2.3 Systems Valves
 - 8.4.2.4 Water Supply

- 8.4.3 Operation and Installation Parameters of the System
 - 8.4.3.1 Location and Spacing of Sprinklers
 - 8.4.3.2 Pipe Sizing and Arrangement
 - 8.4.3.3 Sprinkler Coverage and Distribution
 - 8.4.3.4 Water Flow Rate and Pressure
 - 8.4.3.5 Activation Mechanisms and Criteria
 - 8.4.3.6 Systems Monitored and Controlled

- 8.4.4 Analysis
 - 8.4.4.1 System Documentation and Data Collection
 - 8.4.4.2 Code Analysis
 - 8.4.4.3 Design Analysis
 - 8.4.4.4 Hazard Protected

501-8.5 ***The Investigator candidate shall identify the basic components and operation of a non-water-based fire suppression system.***

- 8.5.1 General Information
 - 8.5.1.1 Purpose of Systems
 - 8.5.1.2 Method of Application
 - 8.5.1.3 Suppression Agents

- 8.5.2 Key Components of Systems
 - 8.5.2.1 Suppression Agent Supply
 - 8.5.2.2 Pressure Sources
 - 8.5.2.3 Distribution Piping
 - 8.5.2.4 Valves, Hoses, and Fittings

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- 8.5.2.5 Proportioners
- 8.5.2.6 Distribution Nozzles
- 8.5.2.7 Actuation System
- 8.5.2.8 System Monitoring and control
- 8.5.3 Operation and Installation Parameters of the System
 - 8.5.3.1 Location and Spacing of Nozzles
 - 8.5.3.2 Pipe Sizing and Arrangement
 - 8.5.3.3 Nozzle Coverage and Distribution
 - 8.5.3.4 Activation Mechanisms and Criteria
 - 8.5.3.5 Systems Monitored and Controlled
- 8.5.4 Analysis
 - 8.5.4.1 General Information and Codes
 - 8.5.4.2 Design Analysis

501-8.6 ***The Investigator candidate shall identify spoliation issues regarding the documentation of the fire protection system.***

****Note****

The following sections (501-8.7 through 501-8.12) are not contained in NFPA 921, *Guide for Fire and Explosion Investigations*. The reference for this material is found in IFSTA, *Fire Inspection and Code Enforcement, chapter 12-14*.

501-8.7 ***The Investigator candidate shall describe the types and characteristics of automatic sprinkler systems.***

- 8.7.1 Identify various types of automatic sprinkler systems.
 - 8.7.1.1 Wet pipe
 - 8.7.1.2 Dry pipe
 - 8.7.1.3 Pre-action
 - 8.7.1.4 Deluge
 - 8.7.1.5 Residential
- 8.7.2 Identify reasons for unsatisfactory performance of an automatic sprinkler system.
- 8.7.3 Describe fire sprinkler components and operations.

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501-8.8 **The Investigator candidate shall describe the types, operations, capabilities and the effects of proper application of “special agent” fire extinguishing systems.**

- 8.8.1 Dry chemical
- 8.8.2 Wet chemical
- 8.8.3 Halogenated agent
- 8.8.4 Carbon dioxide
- 8.8.5 Foam
- 8.8.6 Gaseous agent

501-8.9 **The Investigator candidate shall identify the classes and capabilities of standpipe and hose systems.**

- 8.9.1 Class I systems
- 8.9.2 Class II systems
- 8.9.3 Class III systems

501-8.10 **The Investigator candidate shall identify alarm-initiating devices.**

- 8.10.1 Local system
- 8.10.2 Auxiliary system
- 8.10.3 Remote station
- 8.10.4 Proprietary system
- 8.10.5 Central station system

501-8.11 **The Investigator candidate shall identify fire detection systems.**

- 8.11.1 Smoke
- 8.11.2 Flame

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8.11.3 Heat

8.11.4 Gas

501-8.12 ***The Investigator candidate shall describe Heating Ventilation and Air Conditioning (HVAC) system components and their relation to smoke and fire spread.***

8.12.1 Smoke dampers

8.12.2 Automatic shutoffs

8.12.3 Ductwork

8.12.4 Pipe and duct chases

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SECTION 9

ELECTRICITY AND FIRE

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (4)(c) Electricity and Electrical Systems.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.8 Inspect and analyze the performance of building systems, including fire protection, detection and suppression systems, HVAC, electricity and electrical systems, fuel gas systems, and building compartmentation, given standard and special equipment and tools, so that a determination can be made as to the need for expert resources; an operating system’s impact on fire growth and spread is considered in identifying origin areas; defeated and failed systems are identified; and the system’s potential as a fire cause is recognized.

(A) Requisite Knowledge. Different types of detection, suppression, HVAC, utility, and building compartmentation such as fire walls and fire doors; types of expert resources for building systems; the impact of fire on various systems; common methods used to defeat a system’s functional capability; and types of failures.

(B) Requisite Skills. Ability to determine the system’s operation and its effect on the fire; identify alterations to, and failure indicators of, building systems; and evaluate the impact of suppression efforts on building systems.

References:

J&B, chapter 7

Kirk’s, chapter 3-4

Lentini, chapter 6

501-9.1 The Investigator candidate shall understand the basic principles of physics that relate to electricity and fire, including systems and equipment.

501-9.2 The Investigator candidate shall describe basic electrical theory.

9.2.1 General

9.2.2 Comparing Electricity to Hydraulics

9.2.3 Ampacity

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- 9.2.4 Conductivity of Conductors
- 9.2.5 Ohm's Law
- 9.2.6 Electrical Power
- 9.2.7 Ohm's Law Wheel
- 9.2.8 Applying Ohm's Law

501-9.3 ***The Investigator candidate shall describe the typical building electrical systems and its components.***

- 9.3.1 General
- 9.3.2 Electrical Service
 - 9.3.2.1 Single-Phase Service
 - 9.3.2.2 Three-Phase Service
- 9.3.3 Meter and Base
- 9.3.4 Significance

501-9.4 ***The Investigator candidate shall identify the functions of service equipment.***

501-9.5 ***The Investigator candidate shall identify the principle of grounding.***

- 9.5.1 General
- 9.5.2 Floating Neutral (Open Neutral)

501-9.6 ***The Investigator candidate shall describe the components of overcurrent protection.***

- 9.6.1 General
- 9.6.2 Fuses
 - 9.6.2.1 Operations
 - 9.6.2.2 Plug Fuses
 - 9.6.2.3 Type S Fuses
 - 9.6.2.4 Time-Delay Fuses
 - 9.6.2.5 Cartridge Fuses
- 9.6.3 Circuit Breakers

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- 9.6.3.1 Operations
- 9.6.3.2 Main Breakers
- 9.6.3.3 Branch Circuit Breakers
- 9.6.3.4 Ground Fault Circuit Interrupters (GFCI)
- 9.6.3.5 Arc Fault Circuit Interrupter (AFCI)

9.6.4 Circuit Breaker Panels

501-9.7 ***The Investigator candidate shall describe a branch circuit and its components.***

- 9.7.1 Conductors
- 9.7.2 Size of Conductors
- 9.7.3 Copper Conductors
- 9.7.4 Aluminum Conductors
- 9.7.5 Insulation

501-9.8 ***The Investigator candidate shall identify and describe the different types of outlets and devices found in a branch circuit.***

- 9.8.1 Switches
- 9.8.2 Receptacles
- 9.8.3 Other Outlets, Devices, or Equipment

501-9.9 ***The Investigator candidate shall describe how the use of improper electrical components can create sufficient heat for ignition.***

- 9.9.1 General
- 9.9.2 Resistance Heating
- 9.9.3 Overcurrent and Overload
- 9.9.4 Arcs
 - 9.9.4.1 General
 - 9.9.4.2 High-Voltage Arcs
 - 9.9.4.3 Static Electricity
 - 9.9.4.4 Parting Arcs
 - 9.9.4.5 Arcing Across a Carbonized Path

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- 9.9.5 Sparks
- 9.9.6 High-Resistance Faults

501-9.10 ***The Investigator candidate shall identify and describe types of damage encountered in electrical systems.***

- 9.10.1 General
- 9.10.2 Short-Circuit and Ground-Fault Parting Arcs
- 9.10.3 Arcing Through a Carbonized Path Due to Thermal Means (Arcing Through Char)
- 9.10.4 Overheating Connections
- 9.10.5 Overload
- 9.10.6 Effects Not Caused by Electricity
 - 9.10.6.1 Conductor Surface Colors
 - 9.10.6.2 Melting by Fire
 - 9.10.6.3 Alloying
 - 9.10.6.4 Mechanical Gouges
- 9.10.7 Insulation Damage

501-9.11 ***The Investigator candidate shall identify arc melting of electrical conductors.***

- 9.11.1 Melting Caused by Electrical Arcing
- 9.11.2 Melting Caused by Fire
- 9.11.3 Eutectic Melting
- 9.11.4 Extraneous Melting
- 9.11.5 Undersized Conductors
- 9.11.6 Nicked or Stretched Conductors
- 9.11.7 Deteriorated Insulation
- 9.11.8 Overdriven or Misdriven Staple

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- 9.11.9 Short Circuit
- 9.11.10 Beaded Conductor

501-9.12 ***The Investigator candidate shall describe the role of static electricity in an ignition sequence.***

- 9.12.1 Introduction to Static Electricity
- 9.12.2 Generation of Static Electricity
 - 9.12.2.1 General
 - 9.12.2.2 Ignitable Liquids
 - 9.12.2.3 Charges on the Surface of a Liquid
 - 9.12.2.4 Switch Loading
 - 9.12.2.5 Spraying Operations
 - 9.12.2.6 Gases
 - 9.12.2.7 Dusts and Fibers
 - 9.12.2.8 Static Electric Discharge from the Human Body
 - 9.12.2.9 Clothing
- 9.12.3 Incendive Arc
- 9.12.4 Ignition Energy
- 9.12.5 Controlling Accumulations of Static Electricity
 - 9.12.5.1 Humidification
 - 9.12.5.2 Bonding and Grounding
- 9.12.6 Conditions Necessary for Static Arc Ignition
- 9.12.7 Investigating Static Electric Ignitions
- 9.12.8 Lightning
 - 9.12.8.1 General
 - 9.12.8.2 Lightning Characteristics
 - 9.12.8.3 Lightning Strikes
 - 9.12.8.4 Lightning Damage
 - 9.12.8.5 Lightning Detection Networks

501-9.13 ***The Investigator candidate shall describe characteristics common to most lithium-ion batteries.***

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SECTION 10

BUILDING FUEL GAS SYSTEMS

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (4)(d) Fuel Gas Systems.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.8 Inspect and analyze the performance of building systems, including fire protection, detection and suppression systems, HVAC, electricity and electrical systems, fuel gas systems, and building compartmentation, given standard and special equipment and tools, so that a determination can be made as to the need for expert resources; an operating system’s impact on fire growth and spread is considered in identifying origin areas; defeated and failed systems are identified; and the system’s potential as a fire cause is recognized.

(A) Requisite Knowledge. Different types of detection, suppression, HVAC, utility, and building compartmentation such as fire walls and fire doors; types of expert resources for building systems; the impact of fire on various systems; common methods used to defeat a system’s functional capability; and types of failures.

(B) Requisite Skills. Ability to determine the system’s operation and its effect on the fire; identify alterations to, and failure indicators of, building systems; and evaluate the impact of suppression efforts on building systems.

References:

J&B, chapter 8

Kirk’s, chapter 4

Lentini, chapter 6

501-10.1 The Investigator candidate shall describe building fuel gas systems.

10.1.1 Impact of Fuel Gases on Fire and Explosions Investigations

10.1.2 Additional Fire Spread

501-10.2 The Investigator candidate shall identify the different fuel gases.

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- 10.2.1 Natural Gas
- 10.2.2 Commercial Propane
- 10.2.3 Other Fuel Gases
 - 10.2.3.1 Commercial Butane
 - 10.2.3.2 Propane HD5
 - 10.2.3.3 Manufactured Gases
- 10.2.4 Odorization

501-10.3 ***The Investigator candidate shall identify different natural gas systems.***

- 10.3.1 Transmission Pipelines
- 10.3.2 Main Pipelines (Mains)
- 10.3.3 Service Lines
- 10.3.4 Metering

501-10.4 ***The Investigator candidate shall identify different LP-Gas Systems.***

- 10.4.1 LP-Gas Storage Containers
 - 10.4.1.1 Tanks
 - 10.4.1.2 Cylinders
- 10.4.2 Container Appurtenances
 - 10.4.2.1 Pressure Relief Devices
 - 10.4.2.2 Connections for Flow Control
 - 10.4.2.3 Liquid Level Gauging Devices
 - 10.4.2.4 Pressure Gauges
- 10.4.3 Pressure Regulation
- 10.4.4 Vaporizers

501-10.5 ***The Investigator candidate shall identify common fuel gas system components.***

- 10.5.1 Pressure Regulations (Reduction)
- 10.5.2 Service Piping Systems

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- 10.5.3 Valves
- 10.5.4 Gas Burners
 - 10.5.4.1 Manual Ignition
 - 10.5.4.2 Pilot Lights
 - 10.5.4.3 Pilotless Igniters

501-10.6 ***The Investigator candidate shall identify the common piping in buildings.***

- 10.6.1 Size of Piping
- 10.6.2 Piping Materials
- 10.6.3 Joints and Fittings
- 10.6.4 Piping Installation
- 10.6.5 Main Shutoff Valves
- 10.6.6 Prohibited Locations
- 10.6.7 Electrical Bonding and Grounding

501-10.7 ***The Investigator candidate shall identify common appliance and equipment requirements.***

- 10.7.1 Installation
- 10.7.2 Venting and Air Supply
- 10.7.3 Appliance Controls

501-10.8 ***The Investigator candidate shall identify common fuel gas utilization equipment.***

- 10.8.1 Air Heating
- 10.8.2 Water Heating
- 10.8.3 Cooking
- 10.8.4 Refrigeration and Cooling
- 10.8.5 Engines

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10.8.6 Illumination

10.8.7 Incinerators, Toilets, and Exhaust Afterburners

501-10.9 ***The Investigator candidate shall explain investigating fuel gas systems.***

10.9.1 Recognize Limitations

10.9.2 Fuel Gas System Analysis

10.9.3 Compliance with Codes and Standards

10.9.4 Leakage

10.9.5 Pressure Testing

10.9.6 Locating Leaks

10.9.7 Testing Flow Rates and Pressures

10.9.8 Collection of Gas Piping

10.9.9 Underground Migration of Fuel Gases

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SECTION 11

FIRE-RELATED HUMAN BEHAVIOR

4.4 Evidence Collection/Preservation

Duties shall include using proper physical and legal procedures to identify, document, collect, and preserve evidence required within the investigation.

NFPA 1033 4.4.1 Utilize proper procedures for managing victims and fatalities, given a protocol and appropriate personnel, so that all evidence is discovered and preserved and the protocol procedures are followed.

(A) Requisite Knowledge: Types of evidence associated with fire victims and fatalities and evidence preservation methods.

(B) Requisite Skills: Observational skills and the ability to apply protocols to given situations.

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.4: Establish evidence as to motive and/or opportunity, given an incendiary fire, so that the evidence is supported by documentation and meets the evidentiary requirements of the jurisdiction.

(A) Requisite Knowledge: Types of motives common to incendiary fires, methods used to discover opportunity, and human behavioral patterns relative to fire-setting.

(B) Requisite Skills: Financial analysis, records gathering and analysis, interviewing, and interpreting fire scene information and evidence for relationship to motive and/or opportunity.

NFPA 1033 4.6.5 Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

(A) Requisite Knowledge: Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills: Analytical and assimilation skills.

References:
J&B, chapter 9

501-11.1 The Investigator candidate shall recognize that the analyses of fire related human behavior will often be an integral part of the investigation.

501-11.2 The Investigator candidate shall recall the history of research as related to fire related human behavior.

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501-11.3 **The Investigator candidate shall identify and describe general considerations of human response to fires.**

- 11.3.1 Individual
 - 11.3.1.1 Physical Limitations
 - 11.3.1.2 Cognitive Comprehension Limitations
 - 11.3.1.3 Familiarity and Physical Setting

- 11.3.2 Groups
 - 11.3.2.1 Group Size
 - 11.3.2.2 Group Structure
 - 11.3.2.3 Group Permanence
 - 11.3.2.4 Roles and Norms

- 11.3.3 Characteristics of the Physical Setting
 - 11.3.3.1 Locations of Exits
 - 11.3.3.2 Number of Exits
 - 11.3.3.3 Height of Structure
 - 11.3.3.4 Fire Alarm Systems
 - 11.3.3.5 Fire Suppression Systems

- 11.3.4 Characteristics of the Fire
 - 11.3.4.1 Presence of Flames
 - 11.3.4.2 Presence of Smoke
 - 11.3.4.3 Effects of Toxic Gases and Oxygen Depletion

501-11.4 **The Investigator candidate shall identify and describe the factors related to fire initiation.**

- 11.4.1 Factors Involved in Accidental Fires
 - 11.4.1.1 Improper Maintenance and Operations
 - 11.4.1.2 Housekeeping
 - 11.4.1.3 Product Labels, Instructions, and Warnings
 - 11.4.1.4 Purpose of Labels
 - 11.4.1.5 Purpose of Instructions
 - 11.4.1.6 Purpose of Warnings
 - 11.4.1.7 Key Elements of a Proper Warning
 - 11.4.1.8 Standards on Labels, Instructions, and Warnings

- 11.4.2 Recalls

- 11.4.3 Other Considerations

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11.4.4 Violations of Fire Safety Codes and Standards

501-11.5 ***The Investigator candidate shall identify and describe the factors related to youth fire-setting behavior.***

11.5.1 Developmental Stages

11.5.2 Mental Health

501-11.6 ***Incendiary fires – see SECTION 501-23.4 for additional information.***

501-11.7 ***The Investigator candidate shall identify and describe human factors related to fire spread.***

501-11.8 ***The Investigator candidate shall identify the basic concepts in recognition and response to fires.***

11.8.1 Perception of the Danger (Sensory Cues)

11.8.2 Decision to Act (Response)

11.8.3 Action Taken

11.8.4 Escape Factors

11.8.5 Information Received from Survivors

SECTION 12

LEGAL CONSIDERATIONS

4.1 General

NFPA 1033 4.1.5* The fire investigator shall adhere to all applicable legal and regulatory requirements.

4.3 Documenting the Scene

Duties shall include diagramming the scene, photographing, and taking field notes to be used to compile a final report.

NFPA 1033 4.3.3 Construct investigative notes, given a fire scene, available documents (e.g., prefire plans and inspection reports), and interview information, so that the notes are accurate, provide further documentation of the scene, and represent complete documentation of the scene findings.

(A) Requisite Knowledge. Relationship between notes, diagrams, and photos, how to reduce scene information into concise notes, and the use of notes during report writing and legal proceedings.

(B) Requisite Skills. Data-reduction skills, note-taking skills, and observational and correlating skills.

4.4 Evidence Collection/Preservation.

Duties shall include using proper physical and legal procedures to identify, document, collect and preserve evidence required within the investigation.

NFPA 1033 4.4.2 Locate, document, collect, label, package and store evidence, given standard or special tools and equipment and evidence collection materials, so that evidence is identified, preserved, collected, packaged and stored for use in testing, legal, or other proceedings and examinations, ensuring cross-contamination and investigator-inflicted damage and the chain of custody is established.

(A) Requisite Knowledge. Types of evidence, authority requirements, impact of removing evidentiary items on civil or criminal proceedings (exclusionary or fire-cause supportive evidence), types, capabilities, and limitations of standard and special tools used to locate evidence, types of laboratory tests available, packaging techniques and materials, and impact of evidence collection on the investigation.

(B) Requisite Skills. Ability to recognize different types of evidence and determine whether evidence is critical to the investigation.

NFPA 1033 4.4.4 Maintain a chain of custody, given standard investigative tools, marking tools, and evidence tags or logs, so that written documentation exists for each piece of evidence and evidence is secured.

(A) Requisite Knowledge. Rules of custody and transfer procedures, types of evidence (e.g., physical evidence obtained at the scene, photos, and documents), and methods of recording the chain of custody.

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(B) Requisite Skills. Ability to execute the chain of custody procedures and accurately complete necessary documents.

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.3 Coordinate expert resources, given the investigative file, reports, and documents, so that the expert's competencies are matched to the specific investigation needs, financial expenditures are justified, and utilization clearly furthers the investigative goals of determining cause or affixing responsibility.

(A) Requisite Knowledge. How to assess one's own expertise, qualification to be called for expert testimony, types of expert resources (e.g., forensic, CPA, polygraph, financial, human behavior disorders, and engineering), and methods to identify expert resources.

(B) Requisite Skills. Ability to apply expert resources to further the investigation by networking with other investigators to identify experts, questioning experts relative to their qualifications, and developing a utilization plan for use of expert resources.

4.7 Presentations.

Duties shall include the presentation of findings to those individuals not involved in the actual investigations.

NFPA 1033 4.7.3 Testify during legal proceedings, given investigative findings, contents of reports, and consultation with legal counsel, so that all pertinent investigative information and evidence are presented clearly and accurately and the investigator's demeanor and attire are appropriate to the proceedings.

(A) Requisite Knowledge. Types of investigative findings, types of legal proceedings, professional demeanor requirements, and an understanding of due process and legal proceedings.

(B) Requisite Skills. Communication and listening skills and ability to differentiate facts from opinion and determine accepted procedures, practices, and etiquette during legal proceedings.

References:
J&B, chapter 10

501-12.1 ***The Investigator candidate shall recognize the legal consideration impact on every phase of the fire investigation.***

501-12.2 ***The Investigator candidate shall ensure that constitutional considerations are observed.***

12.2.1 Amendment Four

12.2.2 Amendment Five

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12.2.3 Amendment Six

501-12.3 ***The Investigator candidate shall observe all legal considerations during the investigation.***

12.3.1 Authority to Conduct the Investigation

12.3.2 Right of Entry

12.3.3 Method of Entry

12.3.3.1 Consent

12.3.3.2 Exigent Circumstance

12.3.3.3 Administrative Search Warrant

12.3.3.4 Criminal Search Warrant

12.3.4 The Questioning of Suspects

12.3.5 Spoliation of Evidence

12.3.5.1 Responsibility

12.3.5.2 Documentation

12.3.5.3 Remedies for Spoliation

12.3.5.4 Notification to Interested Parties

12.3.5.5 Documentation Prior to Alteration

12.3.5.6 Alteration and Movement of Evidence

12.3.5.7 Notification Prior to Destructive Testing

501-12.4 ***The Investigator candidate shall recognize pretrial legal considerations.***

12.4.1 Introduction

12.4.2 Forms of Discovery

12.4.2.1 Request to Produce

12.4.2.2 Interrogatories

12.4.2.3 Depositions

12.4.2.3.1 Procedure

12.4.2.3.2 Discovery Depositions

12.4.2.3.3 Trial Depositions

12.4.2.4 Reports

12.4.3 Motions

501-12.5 ***The Investigator candidate shall identify the trial procedures in criminal and civil cases.***

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- 12.5.1 Rules of Evidence
- 12.5.2 Types of Evidence
 - 12.5.2.1 Demonstrative Evidence
 - 12.5.2.1.1 Photographs/Illustrative Forms of Evidence
 - 12.5.2.1.2 Samples
 - 12.5.2.2 Documentary Evidence
 - 12.5.2.3 Testimonial Evidence
 - 12.5.2.3.1 Fact Witnesses
 - 12.5.2.3.2 Expert Witnesses
 - 12.5.2.3.3 Admissibility of Expert Testimony
 - 12.5.2.3.4 Relevance
 - 12.5.2.3.5 Qualifications of Expert
 - 12.5.2.3.6 Reliability of Opinions
- 12.5.3 Forms of Examination
 - 12.5.3.1 Direct Examination
 - 12.5.3.2 Cross-Examination
- 12.5.4 Forms of Testimony
 - 12.5.4.1 Affidavits
 - 12.5.4.2 Answers to Interrogatories
 - 12.5.4.3 Depositions and Trial Testimony
- 12.5.5 Burden of Proof
- 12.5.6 Criminal Prosecution
 - 12.5.6.1 Arson
 - 12.5.6.2 Arson Statutes
 - 12.5.6.3 Factors to be Considered
 - 12.5.6.4 Other Fire-Related Criminal Acts
 - 12.5.6.5 Arson-Reporting/Immunity Statutes
- 12.5.7 Civil Litigation
 - 12.5.7.1 Negligence
 - 12.5.7.2 Codes, Regulations, and Standards
 - 12.5.7.3 Product Liability
 - 12.5.7.4 Strict Liability

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SECTION 13

SAFETY

4.1 General

NFPA 1033 4.1.3* Because fire investigators are required to perform activities in adverse conditions, site safety assessments shall be completed on all scenes and regional and national safety standards shall be followed and included in organizational policies and procedures.

NFPA 1003 4.1.7

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.2* Conduct an exterior survey, given standard equipment and tools, so that evidence is identified and preserved, fire damage is interpreted, hazards are identified to avoid injuries, accessibility to the property is determined, and all potential means of ingress and egress are discovered.

(A) Requisite Knowledge. The types of building construction and the effects of fire on construction materials, types of evidence commonly found in the perimeter, evidence preservation methods, the effects of fire suppression, fire behavior and spread, fire patterns, and a basic awareness of the dangers of hazardous materials.

(B) Requisite Skills. Ability to assess fire ground and structural condition, observe the damage from and effects of the fire, and interpret fire patterns.

References:

J&B, chapter 11

Journal of Occupational and Environmental Hygiene, "Contamination of Firefighter Personal Protective Equipment and Skin and the Effectiveness of Decontamination Procedures"

The Bureau of Alcohol, Tobacco and Firearms, HETA 96-0171-2692, Health Hazard Evaluation Report

501-13.1 ***The Investigator candidate shall describe the safety issues as they relate to the fire investigation.***

13.1.1 General Injury/Health Statistics

13.1.2 Health and Safety Programs

13.1.2.1 Five Critical Elements of Safety and Health Programs

13.1.2.1.1 Management Commitment and Employee Participation

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- 13.1.2.1.2 Hazard and Risk Assessment
- 13.1.2.1.3 Hazard Prevention and Control
- 13.1.2.1.4 Safety and Health Training and Education
- 13.1.2.1.5 Long- Term Commitment

501-13.2 ***The Investigator candidate shall describe factors that have an influence on general fire scene safety.***

- 13.2.1 Investigating the Scene Alone
- 13.2.2 Investigator Fatigue
- 13.2.3 Working Above or Below Grade Level
- 13.2.4 Working Around Mechanized Equipment
- 13.2.5 Safety of Bystanders
- 13.2.6 Status of Suppression
- 13.2.7 First Aid Kit and Emergency Notification Numbers
- 13.2.8 Emergency Notification Signal

501-13.3 ***The Investigator candidate shall describe general and particular hazards of the fire scene.***

- 13.3.1 Physical Hazards
- 13.3.2 Structural Stability Hazards
- 13.3.3 Electrical Hazards
- 13.3.4 Chemical Hazards
- 13.3.5 Biological Hazards
- 13.3.6 Mechanical Hazards
- 13.3.7 Miscellaneous Hazards
 - 13.3.7.1 Radiological Hazards
 - 13.3.7.2 Utilities
 - 13.3.7.3 Mechanized Equipment Hazards

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501-13.4 ***The Investigator candidate shall describe safety plans that may be part of the investigative process.***

- 13.4.1 Hazard and Risk Assessment
 - 13.4.1.1 Identify the Hazards
 - 13.4.1.2 Determine the Risk of the Hazard
 - 13.4.1.3 Control the Hazard
 - 13.4.1.3.1 Engineering Controls
 - 13.4.1.3.2 Administrative Controls
 - 13.4.1.3.3 Proper Selection and Use of Personal Protective Equipment (PPE)

- 13.4.2 Site-Specific Safety Plans
 - 13.4.2.1 Hazard Communication Site Plan (HazCom Plan)
 - 13.4.2.2 Confined Space Program

- 13.4.3 Management of Plans and Site Safety

- 13.4.4 Safety Meetings and Briefings

501-13.5 ***The Investigator candidate shall describe factors associated with chemical and contaminant exposure.***

- 13.5.1 Types of Exposure Effects
 - 13.5.1.1 Local Effect
 - 13.5.1.2 Systemic Effect

- 13.5.2 Routes of Exposure
 - 13.5.2.1 Inhalation
 - 13.5.2.2 Cutaneous
 - 13.5.2.3 Ingestion
 - 13.5.2.4 Injection
 - 13.5.2.5 Ocular Exposure Route

- 13.5.3 Toxicity Exposure Levels
 - 13.5.3.1 Acute Exposure
 - 13.5.3.2 Chronic Exposure
 - 13.5.3.3 Cumulative Exposure
 - 13.5.3.4 Latency Period

501-13.6 ***The Investigator candidate shall understand the utilization of personal protective equipment on fire and explosion scenes.***

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- 13.6.1 Proper Selection and Use of Personal Protective Equipment (PPE)
 - 13.6.1.1 Safety Clothing and Equipment
 - 13.6.1.2 PPE Use
 - 13.6.1.3 Decontamination
- 13.6.2 Examples of Personal Protective Equipment (PPE)
 - 13.6.2.1 Respiratory Protection
 - 13.6.2.2 Hand Protection
 - 13.6.2.3 Other Specialized Equipment

501-13.7 ***The Investigator candidate shall describe the potential emergency situations that could occur while processing a fire scene and the different types of emergency action plans needed.***

- 13.7.1 Emergency Evacuation Plans
- 13.7.2 Medical Emergency Plans
- 13.7.3 Severe Weather Plans
- 13.7.4 Fire Emergency Plan
- 13.7.5 Additional Emergency Action Plans

501-13.8 ***The Investigator candidate shall describe post-scene safety activities.***

- 13.8.1 Decontamination
- 13.8.2 Medical Screening

501-13.9 ***The Investigator candidate shall describe safety considerations in off-scene investigation activities.***

501-13.10 ***The Investigator candidate shall identify the special hazards associated with investigating the fire scene.***

- 13.10.1 Criminal Acts or Acts of Terrorism
 - 13.10.1.1 Secondary Devices
- 13.10.2 Residue Chemicals

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13.10.3 Biological and Radiological Terrorism

13.10.4 Drug Labs

****Note****

The following part of Section 13 (501-13.11 through 501-13.15) is not contained in NFPA 921, *Guide for Fire and Explosion Investigations*. The reference for this material is found in IFSTA, *Fire Inspection and Code Enforcement*. See also the *Emergency Response Guidebook (ERG)*.

501-13.11 ***The Investigator candidate shall demonstrate knowledge of safety principles applicable to hazardous materials response.***

501-13.12 ***The Investigator candidate shall identify the difference between hazardous materials incidents and other emergencies.***

501-13.13 ***The Investigator candidate, utilizing the Emergency Response Guidebook, shall:***

- 1) Identify the Three Methods for Determining the Appropriate Guide Page for a Specific Hazardous Material.
 - a) Locate UN Number in the Yellow-Bordered Pages.
 - b) Locate Name of Material in the Alphabetic Listing in the Blue-Bordered Pages.
 - c) Locate a Matching Placard in the Table of Placards and Consult the Two-Digit Guide Number Located Next to the Similar Placard.
- 2) Identify Two General Types of Hazards Found on each Guide Page.
 - a) Fire/Explosive
 - b) Health

501-13.14 ***The Investigator candidate, given an example of an NFPA 704 marking, shall identify the significance of the following components.***

- 1) Three Categories of Hazard
 - a) Health - Blue Color
 - b) Flammability - Red Color
 - c) Instability - Yellow Color
- 2) Special Hazards that may be Indicated

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- a) OX (or OXY)
- b) COR
- c) ALK
- d) ACID

3) Numerical rating system of hazards

501-13.15 ***The Investigator candidate shall identify the following information from safety data sheets (SDS).***

- 1) The Investigator Candidate Shall List Four Organizations from Which to Obtain a Safety Data Sheet (SDS)
 - a) Manufacturer of the Material
 - b) Supplier
 - c) Facility Hazard and Communication Plan
 - d) Local Emergency Planning Committee (LEPC)
- 2) The Investigator Candidate Shall be Familiar with the Different SDS Chapters

SECTION 14

SOURCES OF INFORMATION

4.1 General

NFPA 1033 4.1.4 The fire investigator shall maintain necessary liaison with other interested professionals and entities.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2. Inspect and analyze the performance of building systems, including fire protection, detection and suppression systems, HVAC, electricity and electrical systems, fuel gas systems, and building compartmentation, given standard and special equipment and tools, so that a determination can be made as to the need for expert resources; an operating system's impact on fire growth and spread is considered in identifying origin areas; defeated and failed systems are identified; and the system's potential as a fire cause is recognized.

(A) Requisite Knowledge. Different types of detection, suppression, HVAC, utility, and building compartmentation such as fire walls and fire doors; types of expert resources for building systems; the impact of fire on various systems; common methods used to defeat a system's functional capability; and types of failures.

(B) Requisite Skills. Determine the system's operation and its effect on the fire; identify alterations to, and failure indicators of, building systems; and evaluate the impact of suppression efforts on building systems.

4.4 Evidence Collection/Preservation.

Duties shall include using proper physical and legal procedures to identify, document, collect, and preserve evidence required within the investigation.

NFPA 1033 4.4.3 Select evidence for analysis given all information from the investigation, so that items for analysis support specific investigation needs.

(A) Requisite Knowledge. Purposes for submitting items for analysis, types of analytical services available, and capabilities and limitations of the services performing the analysis.

(B) Requisite Skills. Evaluate the fire incident to determine forensic, engineering, or laboratory needs.

4.5 Interview.

Duties shall include obtaining information regarding the overall fire investigation from others through verbal communication.

NFPA 1033 4.5.1 Develop an interview plan, given no special tools or equipment, so that the plan reflects a strategy to further determine the fire cause and affix responsibility and includes a relevant questioning strategy for each individual to be interviewed that promotes the efficient use of the investigator's time.

(A) Requisite Knowledge. Persons who can provide information that furthers the fire cause determination or the affixing of responsibility, types of questions that are pertinent and efficient to ask of different information sources (first responders, neighbors, witnesses, suspects, and so forth), and pros and cons of interviews versus document gathering.

(B) Requisite Skills. Planning skills, development of focused questions for specific individuals, and evaluation of existing file data to help develop questions and fill investigative gaps.

NFPA 1033 4.5.2 Conduct interviews, given incident information, so that pertinent information is obtained, follow-up questions are asked, responses to all questions are elicited, and the response to each question is documented accurately.

(A) Requisite Knowledge. Types of interviews, personal information needed for proper documentation or follow-up, documenting methods and tools, and types of nonverbal communications and their meaning.

(B) Requisite Skills. Ability to adjust interviewing strategies based on deductive reasoning, interpret, and analyze verbal, and nonverbal communications, apply appropriate legal requirements, and exhibit strong listening skills.

NFPA 1033 4.5.3 Evaluate interview information, given interview transcripts or notes and incident data, so that all interview data is individually analyzed and correlated with all other interviews, corroborative and conflictive information is documented, and new leads are developed.

(A) Requisite Knowledge. Types of interviews, report evaluation methods, and data correlation methods.

(B) Requisite Skills. Data correlation skills and the ability to evaluate source information (e.g., first responders and other witnesses).

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.1 Gather reports and records, given no special tools, equipment, or materials, so that all gathered documents are applicable to the investigation, complete, and authentic; the chain of custody is maintained; and the material is admissible in a legal proceeding.

(A) Requisite Knowledge: Types of reports needed that facilitate determining responsibility for the fire (e.g. police reports, insurance policies, financial records, deeds, private investigator reports, outside photos, and videos) and location of these reports.

(B) Requisite Skills: Identify the reports and documents necessary for the investigation, implement the chain of custody, and organizational skills.

NFPA 1033 4.6.3 Coordinate expert resources, given the investigative file, reports, and documents, so that the expert's competencies are matched to the specific investigation needs, financial expenditures are justified, and utilization clearly furthers the investigative goals of determining cause or affixing responsibility.

(A) Requisite Knowledge: How to assess one's own expertise, qualification to be called for expert testimony, types of expert resources (e.g., forensic, CPA, polygraph, financial, human behavior disorders, and engineering), and methods to identify expert resources.

(B) Requisite Skills: Apply expert resources to further the investigation by networking with other investigators to identify experts, questioning experts relative to their qualifications, and developing a utilization plan for use of expert resources.

**References: J&B,
chapter 12 ASTM
E678 ASTM E860
ASTM 1188**

501-14.1 ***The Investigator candidate shall identify sources of information and assistance available to the Investigator during a fire investigation.***

- 14.1.1 Purpose of Obtaining Information
- 14.1.2 Number and Diversity of Informational Sources
- 14.1.3 Data Relevance, Accuracy, and Reliability

501-14.2 ***The Investigator candidate shall describe the legal considerations on sources of information.***

- 14.2.1 Freedom of Information Act
- 14.2.2 Privileged Communications
- 14.2.3 Confidential Communications

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14.2.4 Privacy Considerations

14.2.5 Authorizations for Release of Information

501-14.3 ***The Investigator candidate shall identify the ASTM standards for collecting, preserving and evaluating data.***

501-14.4 ***The Investigator candidate shall distinguish differing forms of information.***

14.4.1 Verbal Information

14.4.2 Written and Printed Information

14.4.3 Visual Information

14.4.4 Digital Information

501-14.5 ***The Investigator candidate shall identify sources of non-scene data.***

14.5.1 Witness Data

14.5.2 Property Data

14.5.3 Electronically Stored Information

14.5.4 Existing Research and Publications

14.5.5 Experimentation and Testing

14.5.6 Governmental Sources of Information

14.5.7 Federal Government

14.5.8. Other Federal Agencies

501-14.6 ***The Investigator candidate shall identify private sources of information useful during a fire investigation.***

- 14.6.1 National Fire Protection Association (NFPA)
- 14.6.2 Society of Fire Protection Engineers (SFPE)
- 14.6.3 American Society for Testing and Materials (ASTM)
- 14.6.4 American National Standards Institute (ANSI)
- 14.6.5 National Association of Fire Investigators (NAFI)
- 14.6.6 International Association of Arson Investigators (IAAI)
- 14.6.7 Regional Fire Investigations Organizations
- 14.6.8 Real Estate Industry
- 14.6.9 Abstract and Title Companies
- 14.6.10 Financial Institutions
- 14.6.11 Insurance Industry
- 14.6.12 Educational Institutions
- 14.6.13 Utility Companies
- 14.6.14 Trade Organizations
- 14.6.15 News Organizations
- 14.6.16 Lightning Detection Networks

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SECTION 15

PLANNING THE INVESTIGATION

4.1 General

NFPA 1033 4.1.3 Because fire investigators are required to perform activities in adverse conditions, site safety assessments shall be completed on all scenes and regional and national safety standards shall be followed and included in organizational policies and procedures.

NFPA 1033 4.1.4 The fire investigator shall maintain necessary liaison with other interested professionals and entities.

NFPA 1033 4.1.6 The fire investigator shall understand the organization and operation of the investigative team within an incident management system.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.1 Secure the fire ground, given marking devices, sufficient personnel, and special tools and equipment, so that unauthorized persons can recognize the perimeters of the investigative scene and are kept from restricted areas and all evidence or potential evidence is protected from damage or destruction.

(A) Requisite Knowledge. Fire ground hazards, types of evidence, and the importance of fire scene security, evidence preservation, and issues relating to spoliation.

(B) Requisite Skills. Use of marking devices.

4.6 Post-Incident Investigation

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.3 Coordinate expert resources, given the investigative file, reports, and documents, so that the expert's competencies are matched to the specific investigation needs, financial expenditures are justified, and utilization clearly furthers the investigative goals of determining cause or affixing responsibility.

(A) Requisite Knowledge. How to assess one's own expertise, qualifications to be called for expert testimony, types of expert resources (e.g. forensic, CPA, polygraph, financial, human behavior disorders, an engineering), and methods to identify expert resources.

(B) Requisite Skills. Apply expert resources to further the investigation by networking with other investigators to identify experts, questioning experts relative to their qualifications, and developing a utilization plan for use of expert resources.

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References:
J&B, chapter 13
Kirk's, chapters 1 and 5
Lentini, chapter 4

501-15.3 **The Investigator candidate shall be able to organize the basic investigation functions that are commonly performed in each investigation.**

501-15.4 **The Investigator candidate shall identify the goals of a pre- investigation team meeting.**

15.4.1 Equipment and Facilities

15.4.2 Personal Safety Equipment

15.4.3 Tools and Equipment

501-15.5 **The Investigator candidate shall identify the specialized personnel and technical consultants that may be needed to provide technical assistance.**

501-15.6 **The Investigator candidate shall identify a method to organize information generated throughout the investigation and coordinate the efforts of the various people involved.**

SECTION 16

DOCUMENTATION OF THE INVESTIGATION

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (2)(c) Fire Investigation Technology.

4.3 Documenting the Scene.

Duties shall include diagramming the scene, photographing, and taking field notes to be used to compile a final report.

NFPA 1033 4.3.1 Diagram the scene, given standard tools and equipment, so that the scene is accurately represented and evidence, pertinent contents, significant patterns, and area(s) or point(s) of origin are identified.

(A) Requisite Knowledge. Commonly used symbols and legends that clarify the diagram, types of evidence and patterns that need to be documented, and formats for diagramming the scene.

(B) Requisite Skills. Ability to sketch the scene, basic drafting skills, and evidence recognition and observational skills.

NFPA 1033 4.3.2 Photographically document the scene, given standard tools and equipment, so that the scene is accurately depicted and the photographs support scene findings.

(A) Requisite Knowledge. Working knowledge of high-resolution camera and flash, the types of film, media, and flash available, and the strengths and limitations of each.

(B) Requisite Skills. Ability to use a high-resolution camera, flash, and accessories.

NFPA 1033 4.3.3 Construct investigative notes, given a fire scene, available documents (e.g., prefire plans and inspection reports), and interview information, so that the notes are accurate, provide further documentation of the scene, and represent complete documentation of the scene findings.

(A) Requisite Knowledge. Relationship between notes, diagrams, and photos, how to reduce scene information into concise notes, and the use of notes during report writing and legal proceedings.

(B) Requisite Skills. Data-reduction skills, note-taking skills, and observational and correlating skills.

NFPA 1033 4.6.2 Evaluate the investigative file, given all available file information, so that areas for further investigation are identified, the relationship between gathered documents and information is interpreted, and corroborative evidence and information discrepancies are discovered.

(A) Requisite Knowledge. File assessment and/or evaluation methods, including accurate documentation practices, and requisite investigative elements.

(B) Requisite Skills. Information assessment, correlation, and organizational skills.

4.7 Presentations

Duties shall include the presentation of findings to those individuals not involved in the actual investigations.

NFPA 1033 4.7.1 Prepare a written report, given investigative findings, so that the report accurately reflects the facts, data, and scientific principles on which the investigator relied; clearly identifies and expresses the investigator's opinions and conclusions; and contains the reasoning by which each opinion or conclusion was reached in order to meet the requirements of the intended audience(s).

(A) Requisite Knowledge. Elements of writing, typical components of a written report, and types of audiences and their respective needs or requirements.

(B) Requisite Skills. Writing skills, ability to analyze information and determine the reader's needs or requirements.

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.1 Gather reports and records, given no special tools, equipment, or materials, so that all gathered documents are applicable to the investigation, complete, and authentic; the chain of custody is maintained; and the material is admissible in a legal proceeding.

(A) Requisite Knowledge. Types of reports needed that facilitate determining responsibility for the fire (e.g., police reports, fire reports, insurance policies, financial records, deeds, private investigator reports, outside photos, and videos) and location of these reports.

(B) Requisite Skills. Ability to identify the reports and documents necessary for the investigation, implement the chain of custody, and organizational skills.

References:

J&B, chapter 14
Kirk's, chapter 6
Lentini, chapter
4 ASTM E860
ASTM E620

501-16.1 **The Investigator candidate shall describe the purpose of recording the fire scene.**

501-16.2 **The Investigator candidate shall describe the purpose of fire scene photography and the importance of timing.**

16.2.1 General

16.2.2 Timing

16.2.3 Basics

16.2.3.1 Types of Cameras

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- 16.2.4 Understanding the Parts of a Camera
 - 16.2.4.1 Lenses
 - 16.2.4.2 Focal Length
 - 16.2.4.3 Depth of Field
 - 16.2.4.4 Filters
 - 16.2.4.5 Shutter Speed
- 16.2.5 Lighting
- 16.2.6 Special Types of Photography
 - 16.2.6.1 Composition and Techniques
 - 16.2.6.2 Sequential Photographs
 - 16.2.6.3 Mosaic Photographs
 - 16.2.6.4 Photo Diagram
 - 16.2.6.5 Assisting Photographer
 - 16.2.6.6 Photography and the Courts
- 16.2.7 Video
- 16.2.8 Suggested Activities to Be Documented
 - 16.2.8.1 During the Fire
 - 16.2.8.2 Overhaul Photographs
 - 16.2.8.3 Bystander Photographs
 - 16.2.8.4 Exterior Photographs
 - 16.2.8.5 Structural Photographs
 - 16.2.8.6 Interior Photographs
 - 16.2.8.7 Utility Photographs
 - 16.2.8.8 Evidence Photographs
 - 16.2.8.9 Victim Photographs
 - 16.2.8.10 Witness Viewpoint Photographs
 - 16.2.8.11 Aerial Photographs
 - 16.2.8.12 Satellite Imagery
- 16.2.9 Photography Tips
- 16.2.10 Presentation of Photographs

501-16.3 ***The Investigator candidate shall describe the importance of note taking.***

- 16.3.1 Forms of Incident Field Notes
- 16.3.2 Forms for Collecting Data
- 16.3.3 Dictation of Field Notes

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501-16.4 ***The Investigator candidate shall explain the importance of diagrams and drawings.***

- 16.4.1 Types of Drawings
 - 16.4.1.1 Sketches
 - 16.4.1.2 Diagrams
- 16.4.2 Selection of Drawings
- 16.4.3 Drawing Tools and Equipment
- 16.4.4 Diagram Elements
 - 16.4.4.1 General Information
 - 16.4.4.2 Identification of Compass Orientation
 - 16.4.4.3 Scale
 - 16.4.4.4 Symbols
 - 16.4.4.5 Legend
- 16.4.5 Drawings
 - 16.4.5.1 Site or Area plans
 - 16.4.5.2 Floor Plans
 - 16.4.5.3 Elevations
 - 16.4.5.4 Details and Sections
 - 16.4.5.5 Exploded View Diagrams
 - 16.4.5.6 Three-Dimensional (3D) Representations
 - 16.4.5.7 Specialized Fire Investigation Diagrams
- 16.4.6 Prepared Design and Construction Drawings
 - 16.4.6.1 General
 - 16.4.6.2 Architectural and Engineering Drawings
 - 16.4.6.3 Architectural and Engineering Schedules
 - 16.4.6.4 Specifications
 - 16.4.6.5 Appliances and Building Equipment

501-16.5 ***The Investigator candidate must understand the purpose of the report to effectively communicate the observations analyses and conclusions made during an investigation.***

- 16.5.1 Purpose
- 16.5.2 Report Organization
- 16.5.3 Descriptive Information

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16.5.4 Opinions and Conclusions

16.5.5 Pertinent Facts

16.5.6 Reference to Methodology

****Note: The following part of Section 16 does not come from NFPA 921**
The reference for this material is found in ASTM E620 *Standard Practice for Reporting Opinions of Scientific or Technical Experts* (current ed.)**

501-16.6 The Investigator candidate shall identify and describe the process of preparing and completing a final, accurate and concise report.

SECTION 17

PHYSICAL EVIDENCE

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (2)(d) Evidence Documentation, Collection, and Preservation.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.1 Secure the fire ground, given marking devices, sufficient personnel, and special tools and equipment, so that unauthorized persons can recognize the perimeters of the investigative scene and are kept from restricted areas and all evidence or potential evidence is protected from damage or destruction.

(A) Requisite Knowledge. Fire ground hazards, types of evidence, and the importance of fire scene security, evidence preservation, and issues relating to spoliation.

(B) Requisite Skills. Use of marking devices.

NFPA 1033 4.2.6 Examine and remove fire debris, given standard equipment and tools, so that all debris is checked for fire cause evidence, potential ignition source(s) is identified, and evidence is preserved without investigator-inflicted damage or contamination.

(A) Requisite Knowledge. Basic understanding of ignition processes, characteristics of ignition sources, and ease of ignition of fuels; debris-layering techniques; use of tools and equipment during the debris search; types of fire cause evidence commonly found in various degrees of damage; and evidence-gathering methods and documentation.

(B) Requisite Skills. Employ search techniques that further the discovery of fire cause

(C) evidence and ignition sources, use search techniques that incorporate documentation, and collect and preserve evidence.

4.3 Documenting the Scene.

Duties shall include diagramming the scene, photographing, and taking field notes to be used to compile a final report.

NFPA 1033 4.3.1 Diagram the scene, given standard tools and equipment, so that the scene is accurately represented and evidence, pertinent contents, significant patterns, and area(s) or point(s) of origin are identified.

(A) Requisite Knowledge. Commonly used symbols and legends that clarify the diagram, types of evidence and patterns that need to be documented, and formats for diagramming the scene.

(B) Requisite Skills. Ability to sketch the scene, basic drafting skills, and evidence recognition and observational skills.

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4.4 Evidence Collection/Preservation

Duties shall include using proper physical and legal procedures to retain evidence required within the investigation.

NFPA 1033 4.4.1 Utilize proper procedures for managing victims and fatalities, given a protocol and appropriate personnel, so that all evidence is discovered and preserved and the protocol procedures are followed.

(A) Requisite Knowledge. Types of evidence associated with fire victims and fatalities and evidence preservation methods.

(B) Requisite Skills. Observational skills and the ability to apply protocols to given situations.

NFPA 1033 4.4.2* Locate, collect, and package evidence, given standard or special tools and equipment and evidence collection materials, so that evidence is identified, preserved, collected, and packaged to avoid contamination and investigator-inflicted damage and the chain of custody is established.

(A) Requisite Knowledge. Types of evidence, authority requirements, impact of removing evidentiary items on civil or criminal proceedings (exclusionary or fire-cause supportive evidence), types, capabilities, and limitations of standard and special tools used to locate evidence, types of laboratory tests available, packaging techniques and materials, and impact of evidence collection on the investigation.

(B) Requisite Skills. Ability to recognize different types of evidence and determine whether evidence is critical to the investigation.

NFPA 1033 4.4.3 Select evidence for analysis given all information from the investigation, so that items for analysis support specific investigation needs.

(A) Requisite Knowledge. Purposes for submitting items for analysis, types of analytical services available, and capabilities and limitations of the services performing the analysis.

(B) Requisite Skills. Evaluate the fire incident to determine forensic, engineering, or laboratory needs.

NFPA 1033 4.4.4 Maintain a chain of custody, given standard investigative tools, marking tools, and evidence tags or logs, so that written documentation exists for each piece of evidence and evidence is secured.

(A) Requisite Knowledge. Rules of custody and transfer procedures, types of evidence (e.g., physical evidence obtained at the scene, photos, and documents), and methods of recording the chain of custody.

(B) Requisite Skills. Ability to execute the chain of custody procedures and accurately complete necessary documents.

NFPA 1033 4.4.5 Dispose of evidence, given jurisdictional or agency regulations and file information, so that the disposal is timely, safely conducted, and in compliance with jurisdictional or agency requirements.

(A) Requisite Knowledge. Disposal services available and common disposal procedures and problems.

(B) Requisite Skills. Documentation skills.

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Lentini, chapter
4 ASTM E1188
ASTM E1459

References:
J&B, chapter 15
Kirk's, chapter 7

501-17.1 ***The Investigator candidate shall describe the recommended and accepted methods of processing physical evidence.***

501-17.2 ***The Investigator candidate shall define physical evidence.***

501-17.3 ***The Investigator candidate shall describe the importance of preservation of the fire scene and physical evidence.***

17.3.1 General

17.3.2 Fire Patterns as Physical Evidence

17.3.3 Artifact Evidence

17.3.4 Protecting Evidence

17.3.5 Role and Responsibilities of Fire Suppression Personnel
in Preserving the Fire Scene

17.3.5.1 General

17.3.5.2 Preservation

17.3.5.3 Caution in Fire Suppression Operations

17.3.6 Roles and Responsibilities of the Fire Investigator

17.3.7 Practical Considerations

501-17.4 ***The Investigator candidate shall describe contamination of physical evidence.***

17.4.1 Contamination of Evidence Containers

17.4.2 Contamination During Collection

17.4.3 Contamination by Fire Fighters

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501-17.5 **The Investigator candidate shall describe methods of collection.**

- 17.5.1 General
- 17.5.2 Documenting the Collection of Physical Evidence
- 17.5.3 Collection of Traditional Forensic Physical Evidence
- 17.5.4 Collection of Evidence for Accelerant Testing
 - 17.5.4.1 Liquid Accelerant Characteristics
 - 17.5.4.2 Canine-Handler Teams
 - 17.5.4.3 Collection of Liquid Samples for Ignitable Liquid Testing
 - 17.5.4.4 Collection of Liquid Evidence Absorbed by Solid Materials
 - 17.5.4.5 Collection of Solid Samples for Accelerant Testing
 - 17.5.4.6 Comparison Samples
- 17.5.5 Collection of Gaseous Samples
- 17.5.6 Collection of Electrical Equipment and System Components
- 17.5.7 Collection of Appliances or Small Electrical Equipment

501-17.6 **The Investigator candidate shall identify and describe different types of evidence containers.**

- 17.6.1 General
- 17.6.2 Liquid and Solid Accelerant Evidence Containers
 - 17.6.2.1 Metal Cans
 - 17.6.2.2 Glass Jars
 - 17.6.2.3 Special Evidence Bags
 - 17.6.2.4 Common Plastic Bags

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501-17.7 ***The Investigator candidate shall understand the benefits and limitations of utilizing Canine-Handler Teams.***

17.7.1 Preferred Designation

17.7.2 Other Designations for IGL Canines

17.7.3 Investigators' Discretion

17.7.4 Handlers' Expertise

17.7.5 Canine-Handler Teams

17.7.6 Purpose of Canine-Handler Team

17.7.7 Limitations on the Use of Alerts by Canine-Handler Teams

17.7.8 Canine-Handler Teams and Accelerant Detection

17.7.9 Coordinating the Investigation with the Handler

17.7.10 Safety of Canine, Handler, and Others

501-17.8 ***The Investigator candidate shall identify the ASTM standards related to physical evidence.***

501-17.9 ***The Investigator candidate shall describe the proper methods of transportation and storage of physical evidence.***

17.9.1 Hand Delivery

17.9.2 Shipment

17.9.3 Storage of Evidence

501-17.10 ***The Investigator candidate shall identify and describe the evidence chain of custody of physical evidence.***

501-17.11 **The Investigator candidate shall identify types of analytical methods and tests applicable to certain fire investigations, and the capabilities and limitations of the services that perform the analysis.**

- 17.11.1 Evidence Collection or Inspections Involving Alteration Without Changes to the Evidentiary Value of the Artifacts
- 17.11.2 Test Methods
- 17.11.3 Sufficiency of Samples
- 17.11.4 Comparative Examination and Testing

501-17.12 **The Investigator candidate shall describe the proper procedure for evidence disposition.**

SECTION 18

ORIGIN DETERMINATION

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.2* Conduct an exterior survey, given standard equipment and tools, so that evidence is identified and preserved, fire damage is interpreted, hazards are identified to avoid injuries, accessibility to the property is determined, and all potential means of ingress and egress are discovered.

(A) Requisite Knowledge. The types of building construction and the effects of fire on construction materials, types of evidence commonly found in the perimeter, evidence preservation methods, the effects of fire suppression, fire behavior and spread, fire patterns, and a basic awareness of the dangers of hazardous materials.

(B) Requisite Skills. Assess fire ground and structural condition, observe the damage from and effects of the fire, and interpret fire patterns.

NFPA 1033 4.2.3 Conduct an interior survey, given standard equipment and tools, so that areas of potential evidentiary value requiring further examination are identified and preserved, the evidentiary value of contents is determined, and hazards are identified in order to avoid injuries.

(A) Requisite Knowledge. The types of building construction and interior finish and the effects of fire on those materials, the effects of fire suppression, fire behavior and spread, evidence preservation methods, fire patterns, effects of building contents on fire growth, the relationship of building contents to the overall investigation, weather conditions at the time of the fire, and fuel moisture.

(B) Requisite Skills. Assess structural conditions, observe the damage and effects of the fire, discover the impact of fire suppression efforts on fire flow and heat propagation, and evaluate protected areas to determine the presence and/or absence of contents.

NFPA 1033 4.2.5 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that fire development is determined, methods and effects of suppression are evaluated, false origin area patterns are recognized, and all areas of origin are correctly identified.

(A) Requisite Knowledge. Fire behavior and spread based on fire chemistry, fire dynamics, and physics, fire suppression effects, building construction.

(B) Requisite Skills. Ability to interpret variations of fire patterns on different materials with consideration given to heat release rate, form, and ignitability; distinguish impact of different types of fuel loads; evaluate fuel trails; and analyze and synthesize information.

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.5* Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

(A) Requisite Knowledge: Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills: Analytical and assimilation skills.

References:

J&B, chapter 16

Kirk's, chapters 1 and 5

Lentini, chapter 4

501-18.1 ***The Investigator candidate shall identify witness information and/or electronic data, fire patterns, and fire dynamics used in origin determination.***

501-18.2 ***The Investigator candidate shall identify and describe the overall methodology of conducting a scene assessment.***

- 18.2.1 Scientific Method
- 18.2.2 Sequence of Activities
- 18.2.3 Sequential Pattern Analysis
- 18.2.4 Systematic Procedure
- 18.2.5 Recommended Methodology

501-18.3 ***The Investigator candidate shall identify the data collection process for origin determination.***

- 18.3.1 Initial Scene Assessment
 - 18.3.1.1 Safety Assessment
 - 18.3.1.2 Scope of the Examination
 - 18.3.1.3 Order of the Examination
 - 18.3.1.4 Surrounding Areas
 - 18.3.1.5 Structure Exterior
 - 18.3.1.6 Structure Interior
 - 18.3.1.7 Post-Fire Alterations
 - 18.3.1.8 Determination of the Safety of the Fire Scene

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- 18.3.2 Excavation and Reconstruction
 - 18.3.2.1 Scope of Excavation and Reconstruction
 - 18.3.2.2 Safety
 - 18.3.2.3 Excavation
 - 18.3.2.4 Heavy Equipment
 - 18.3.2.5 Avoiding Spoliation
 - 18.3.2.6 Avoiding Contamination
 - 18.3.2.7 Washing Floors
 - 18.3.2.8 Contents

- 18.3.3 Additional Data Collection Activities for Origin Determination
 - 18.3.3.1 Pre-Fire Conditions
 - 18.3.3.2 Description of Fuels
 - 18.3.3.3 Structure Dimensions
 - 18.3.3.4 Weather Conditions
 - 18.3.3.5 Electrical Systems
 - 18.3.3.6 Electrical Loads
 - 18.3.3.7 HVAC Systems
 - 18.3.3.8 Fuel Gas Systems
 - 18.3.3.9 Liquid Fuel Systems
 - 18.3.3.10 Fire Protection Systems
 - 18.3.3.11 Fire Protection Systems Data
 - 18.3.3.12 Security Cameras
 - 18.3.3.13 Intrusion Alarm Systems
 - 18.3.3.14 Witness Observations

501-18.4 ***The Investigator candidate shall recognize the importance of analyzing the following data.***

- 18.4.1 Fire Patterns Analysis
 - 18.4.1.1 Consideration of All Patterns
 - 18.4.1.2 Sequence of Patterns
 - 18.4.1.3 Pattern Generation
 - 18.4.1.4 Ventilation
 - 18.4.1.5 Movement and Intensity Patterns
 - 18.4.1.6 Evaluation of Every Pattern

- 18.4.2 Heat and Flame Vector Analysis
 - 18.4.2.1 Complementary Vectors
 - 18.4.2.2 Heat Source
 - 18.4.2.3 Additional Tools for Pattern Visualization

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18.4.3 Analysis of Sequential Events

18.4.4 Fire Dynamics

18.4.5 Origin Matrix Analysis

501-18.5 ***The Investigator candidate shall identify the process of developing origin hypotheses.***

18.5.1 Initial Hypothesis

18.5.2 Modifying the Initial Hypothesis

501-18.6 ***The Investigator candidate shall identify means and methods for testing the validity of the origin hypothesis.***

18.6.1 Means of Hypothesis Testing

18.6.2 Analytical Techniques and Tools

18.6.2.1 Time Line Analysis

18.6.2.2 Fire Modeling

18.6.2.3 Experimental Testing

501-18.7 ***The Investigator candidate shall select a final hypothesis.***

18.7.1 Defining the Area of Origin

18.7.2 Inconsistent Data

18.7.3 Case File Review

501-18.8 ***The Investigator candidate shall identify when there is insufficient data to define the origin.***

18.8.1 Large Area Adequate for Determination

18.8.2 Justification of a Large Area of Origin

18.8.3 Eyewitness Evidence of Origin Area

SECTION 19

FIRE CAUSE DETERMINATION

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.5* Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

(A) Requisite Knowledge. Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills. Analytical and assimilation skills.

References:

J&B, chapter 17

Kirk's, chapters 1 and 5

501-19.1 **The Investigator candidate shall define fire cause and identify fire cause factors.**

19.1.1 Fire Cause Factors

19.1.2 First Fuel Ignited

19.1.3 Ignition Source

19.1.4 Oxidant

19.1.5 Ignition Sequence

501-19.2 **The Investigator candidate shall utilize the scientific method as the overall methodology.**

19.2.1 Consideration of Data

19.2.2 Sequence of Activities

19.2.3 Point and Area of Origin

501-19.3 **The Investigator candidate shall identify the data that needs to be collected for fire cause determination.**

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- 19.3.1 Identify Fuels in the Area of Origin
- 19.3.2 Identify Source and Form of the Heat of Ignition
- 19.3.3 Identify Items and Activities in Area of Origin
- 19.3.4 Identify the Oxidant
- 19.3.5 Identify Ignition Sequence Data

501-19.4 ***The Investigator candidate shall demonstrate the proper use of the scientific method to analyze the data.***

- 19.4.1 Fuel Analysis
 - 19.4.1.1 Geometry and Orientation
 - 19.4.1.2 Ignition Temperature
 - 19.4.1.3 Quantity of Fuel
- 19.4.2 Ignition Source Analysis
- 19.4.3 Oxidant
- 19.4.4 Ignition Sequence

501-19.5 ***The Investigator candidate shall develop cause hypotheses.***

501-19.6 ***The Investigator candidate shall test the cause hypothesis for validity.***

- 19.6.1 Scientific Method
- 19.6.2 Deductive Reasoning
- 19.6.3 Hypotheses Testing Questions
- 19.6.4 Means of Hypothesis Testing
 - 19.6.4.1 Scientific Literature
 - 19.6.4.2 Fundamental Principles of Science
 - 19.6.4.3 Physical Experiments or Testing
 - 19.6.4.4 Cognitive Experiments
 - 19.6.4.5 Time Lines
 - 19.6.4.6 Fault Trees
 - 19.6.4.7 Additional Techniques

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- 19.6.5 Appropriate Use of the Process of Elimination
 - 19.6.5.1 Cause Undetermined
 - 19.6.5.2 Ignition Source vs. Fire Cause

501-19.7 ***The Investigator candidate shall demonstrate the proper selection of a final hypothesis.***

- 19.7.1 Establishing the Cause
- 19.7.2 Inconsistent Data
- 19.7.3 Safety Devices and Features
- 19.7.4 Undetermined Fire Cause

501-19.8 ***The Investigator candidate shall use a set of prescribed incident classification system when classification is required of the investigator.***

- (1) NFIRS - National Fire Incident Reporting System**
- (2) NFPA 901 – Standard Classifications for Fire and Emergency Services Incident Reporting**
- (3) BATS – Bombs Arson Tracking System**
- (4) UCR – Uniform Crime Reporting Program**
- (5) The Canadian Code Structure**
- (6) NIBRS – National Incident Based Reporting System**

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SECTION 20

ANALYZING THE INCIDENT FOR CAUSE AND RESPONSIBILITY

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (2)(a) Fire Analysis, (e) Failure Analysis and Analytical Tools.

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.1 Gather reports and records, given no special tools, equipment, or materials, so that all gathered documents are applicable to the investigation, complete, and authentic; the chain of custody is maintained; and the material is admissible in a legal proceeding.

(A) Requisite Knowledge. Types of reports needed that facilitate determining responsibility for the fire (e.g., police reports, fire reports, insurance policies, financial records, deeds, private investigator reports, outside photos, and videos) and location of these reports.

(B) Requisite Skills. Ability to identify the reports and documents necessary for the investigation, implement the chain of custody, and organizational skills.

NFPA 1033 4.6.2 Evaluate the investigative file, given all available file information, so that areas for further investigation are identified, the relationship between gathered documents and information is interpreted, and corroborative evidence and information discrepancies are discovered.

(A) Requisite Knowledge. File assessment and/or evaluation methods, including accurate documentation practices, and requisite investigative elements.

(B) Requisite Skills. Information assessment, correlation, and organizational skills.

NFPA 1033 4.6.3 Coordinate expert resources, given the investigative file, reports, and documents, so that the expert’s competencies are matched to the specific investigation needs, financial expenditures are justified, and utilization clearly furthers the investigative goals of determining cause or affixing responsibility.

(A) Requisite Knowledge. How to assess one’s own expertise, qualification to be called for expert testimony, types of expert resources (e.g., forensic, CPA, polygraph, financial, human behavior disorders, and engineering), and methods to identify expert resources.

(B) Requisite Skills. Ability to apply expert resources to further the investigation by networking with other investigators to identify experts, questioning experts relative to their qualifications, and developing a utilization plan for use of expert resources.

NFPA 1033 4.6.4 Establish evidence as to motive and/or opportunity, given an incendiary fire, so that the evidence is supported by documentation and meets the evidentiary requirements of the jurisdiction.

(A) Requisite Knowledge. Types of motives common to incendiary fires, methods used to discover opportunity, and human behavioral patterns relative to fire-setting

(B) Requisite Skills. Financial analysis, records gathering and analysis, interviewing, and interpreting fire scene information and evidence for relationship to motive and/or opportunity.

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NFPA 1033 4.6.5 Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

References:

J&B, chapter 19
Kirk's, chapters 1 and 5

(A) Requisite Knowledge. Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills. Analytical and assimilation skills.

501-20.1 **The Investigator candidate shall describe methods for analyzing the incident for cause and responsibility.**

- 20.1.1 (1) The cause of the fire or explosion.
 - (2) The cause of damage to property resulting from the incident.
 - (3) The cause of bodily injury or loss of life.
 - (4) The degree to which human fault contributed to any one or more of the causal issues described in 20.1.1(1), 20.1.1(2), and 20.1.1(3).
- 20.1.2 Based on the scope of the assignment, an individual investigator may not have responsibility or be required to address all of the aspects of this chapter.
- 20.1.3 The cause of a fire or the causes of damage or casualties may be grouped in broad categories for general discussion, for assignment of legal responsibility or culpability, or for reporting purposes.

501-20.2 **The Investigator candidate shall identify the competent ignition source, the fuel first ignited, and the events that brought them together.**

501-20.3 **The Investigator candidate shall describe the causes of damage to property resulting from the Incident.**

- 20.3.1 Considerations

- 20.3.2 Fire/Smoke Spread
 - 20.3.2.1 Compartmentation
 - 20.3.2.2 Change of occupancy/hazard
 - 20.3.2.3 Detection/alarm systems
 - 20.3.2.4 Human behavior
 - 20.3.2.5 Fire suppression
 - 20.3.2.6 Fuel loads
 - 20.3.2.7 Housekeeping
 - 20.3.2.8 Ventilation
 - 20.3.2.9 Code violations
 - 20.3.2.10 Structural failure

- 20.3.3 Other consequential damage

501-20.4 **The Investigator candidate shall describe the causes of bodily injury or loss of life. See Chapters 11 and 24.**

- 20.4.1 Fire/Smoke Spread
 - 20.4.1.1 Toxicity
 - 20.4.1.2 Hazardous materials
 - 20.4.1.3 Compartmentation
 - 20.4.1.4 Change of occupancy/hazard
 - 20.4.1.5 Detection/alarm systems
 - 20.4.1.6 Human behavior
 - 20.4.1.7 Fire suppression
 - 20.4.1.8 Housekeeping
 - 20.4.1.9 Fuel loads
 - 20.4.1.10 Ventilation
 - 20.4.1.11 Code violations
 - 20.4.1.12 Means of egress/refuge
 - 20.4.1.13 Structural failure
 - 20.4.1.14 Intentional acts

- 20.4.2 Emergency Preparedness

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501-20.5 ***The Investigator candidate shall describe the determination of responsibility.***

- 20.5.1 Nature of Responsibility
- 20.5.2 Definition of Responsibility
- 20.5.3 Assessing of Responsibility
- 20.5.4 Degrees of Responsibility

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SECTION 21

FAILURE ANALYSIS AND ANALYTICAL TOOLS

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (2)(e) Failure Analysis and Analytical Tools.

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.1 Gather reports and records, given no special tools, equipment, or materials, so that all gathered documents are applicable to the investigation, complete, and authentic; the chain of custody is maintained; and the material is admissible in a legal proceeding.

(A) Requisite Knowledge. Types of reports needed that facilitate determining responsibility for the fire (e.g., police reports, fire reports, insurance policies, financial records, deeds, private investigator reports, outside photos, and videos) and location of these reports.

(B) Requisite Skills. Ability to identify the reports and documents necessary for the investigation, implement the chain of custody, and organizational skills.

NFPA 1033 4.6.2 Evaluate the investigative file, given all available file information, so that areas for further investigation are identified, the relationship between gathered documents and information is interpreted, and corroborative evidence and information discrepancies are discovered.

(A) Requisite Knowledge. File assessment and/or evaluation methods, including accurate documentation practices, and requisite investigative elements.

(B) Requisite Skills. Information assessment, correlation, and organizational skills.

NFPA 1033 4.6.3 Coordinate expert resources, given the investigative file, reports, and documents, so that the expert’s competencies are matched to the specific investigation needs, financial expenditures are justified, and utilization clearly furthers the investigative goals of determining cause or affixing responsibility.

(A) Requisite Knowledge. How to assess one’s own expertise, qualification to be called for expert testimony, types of expert resources (e.g., forensic, CPA, polygraph, financial, human behavior disorders, and engineering), and methods to identify expert resources.

(B) Requisite Skills. Ability to apply expert resources to further the investigation by networking with other investigators to identify experts, questioning experts relative to their qualifications, and developing a utilization plan for use of expert resources.

NFPA 1033 4.6.4 Establish evidence as to motive and/or opportunity, given an incendiary fire, so that the evidence is supported by documentation and meets the evidentiary requirements of the jurisdiction.

(A) Requisite Knowledge. Types of motives common to incendiary fires, methods used to discover opportunity, and human behavioral patterns relative to fire-setting.

(B) Requisite Skills. Financial analysis, records gathering and analysis, interviewing, and interpreting fire scene information and evidence for relationship to motive and/or opportunity.

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NFPA 1033 4.6.5 Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

(A) Requisite Knowledge. Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills. Analytical and assimilation skills.

References:
J&B, chapter 20
Kirk's, chapters
1 and 5

501-21.1 **The Investigator candidate shall describe failure analysis and the use of analytical tools.**

501-21.2 **The Investigator candidate shall describe time lines available for use in analyzing fire cause.**

- 21.2.1 General
- 21.2.2 Hard Time (Actual)
- 21.2.3 Soft Time (Estimated)
- 21.2.4 Benchmark Events
- 21.2.5 Multiple Time Lines

501-21.3 **The Investigator candidate shall describe system analysis techniques.**

- 21.3.1 Fault Trees
- 21.3.2 Failure Mode and Effects Analysis (FMEA)

501-21.4 **The Investigator candidate shall describe the purpose for mathematical modeling.**

- 21.4.1 General and Limitations of Mathematical Modeling
- 21.4.2 Heat Transfer Analysis
- 21.4.3 Flammable Gas Concentrations

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- 21.4.4 Hydraulic Analysis
- 21.4.5 Thermodynamic Chemical Equilibrium Analysis
- 21.4.6 Structural Analysis
- 21.4.7 Egress Analysis
- 21.4.8 Fire Dynamics Analysis
- 21.4.9 Guidelines for Selection and Use of a Fire Model

501-21.5 The Investigator candidate shall describe the role of fire testing.

- 21.5.1 Role of Fire Testing
- 21.5.2 Fire Test Methods
- 21.5.3 Limitations of Fire Testing

501-21.6 The Investigator candidate shall identify the data required for modeling and testing.

- 21.6.1 Materials and Contents
- 21.6.2 Ventilation

SECTION 22

EXPLOSIONS

NFPA 1033 4.1.7 In order to successfully complete the tasks identified in the JPRs of Sections 4.2 through 4.7, the fire investigator shall remain current in the subjects listed as “requisite knowledge” as they relate to fire investigations, which include the following: (1)(e) Explosion Dynamics.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.9 Discriminate the effects of explosions from other types of damage, given standard equipment and tools, so that an explosion is identified and its evidence is preserved.

(A) Requisite Knowledge. Different types of explosions and their causes, characteristics of an explosion, and the difference between low- and high-order explosions.

(B) Requisite Skills. Identify explosive effects on glass, walls, foundations, and other building materials; distinguish between low- and high-order explosion effects; and analyze damage to document the blast zone and origin.

References:

J&B, chapter 21
Kirk’s, chapter 3

501-22.1 **The Investigator candidate shall define the term “explosion”.**

501-22.2 **The Investigator candidate shall identify the different types of explosions.**

22.2.1 Mechanical Explosions

22.2.2 Boiling Liquid Expanding Vapor Explosion (BLEVE)

22.2.3 Chemical Explosions

22.2.4 Electrical Explosions

22.2.5 Nuclear Explosions

501-22.3 **The Investigator candidate shall distinguish between the characterization of explosion damage.**

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22.3.1 Low-Order Damage

22.3.2 High-Order Damage

501-22.4 ***The Investigator candidate shall be able to describe the effects of explosions.***

22.4.1 Blast Overpressure and Wave Effect

22.4.1.1 General

22.4.1.2 Positive Pressure Phase

22.4.1.3 Negative Pressure Phase

22.4.1.4 Shape of Blast Wave (Front)

22.4.1.5 Rate of Pressure Rise versus Maximum Pressure

22.4.2 Shrapnel Effect (Projectiles)

22.4.3 Thermal Effect

22.4.4 Seismic Effect (Ground Shock)

501-22.5 ***The Investigator candidate shall identify the factors controlling explosion effects.***

22.5.1 Fuel

22.5.2 Turbulence

22.5.3 Nature of Confining Space

22.5.4 Location and Magnitude of Ignition Source

22.5.5 Venting

22.5.6 Blast Pressure Wave (Blast Pressure Front) Modification by Reflection

22.5.7 Blast Pressure Front Modification by Refraction and Blast Focusing

501-22.6 ***The Investigator candidate shall be able to identify a seated explosion.***

- 22.6.1 General
- 22.6.2 Explosives
- 22.6.3 Boiler and Pressure Vessels
- 22.6.4 Confined Fuel Gas and Liquid Vapor
- 22.6.5 Boiling Liquid Expanding Vapor Explosion (BLEVE)

501-22.7 ***The Investigator candidate shall be able to identify a non-seated explosion.***

- 22.7.1 Fuel Gases
- 22.7.2 Pool Flammable/Combustible Liquids
- 22.7.3 Dusts
- 22.7.4 Backdraft (Smoke Explosion)

501-22.8 ***The Investigator candidate shall be able to describe the characteristics of gas/vapor combustion explosions.***

- 22.8.1 Ignition of Gases and Vapors
- 22.8.2 Interpretation of Explosion Damage
 - 22.8.2.1 Fuel-to-Air Ratio
 - 22.8.2.2 Specific Gravity
- 22.8.3 Underground Migration of Fuel Gases
- 22.8.4 Multiple Explosions

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501-22.9 ***The Investigator candidate shall describe the characteristics of dust explosions.***

- 22.9.1 General
- 22.9.2 Particle Size
- 22.9.3 Concentration
- 22.9.4 Turbulence in Dust Explosions
- 22.9.5 Moisture
- 22.9.6 Minimum Temperature and Ignition Energy for Dust
- 22.9.7 Multiple Explosions

501-22.10 ***The Investigator candidate shall be able to describe backdraft (smoke explosions).***

501-22.11 ***The Investigator candidate shall be able to identify an unconfined vapor cloud explosion.***

501-22.12 ***The Investigator candidate shall be able to distinguish the two types of explosives.***

- 22.12.1 Low Explosives
- 22.12.2 High Explosives

501-22.13 ***The Investigator candidate shall describe the complexity of the investigation of explosive incidents.***

501-22.14 ***The Investigator candidate shall be able to investigate the explosion scene.***

- 22.14.1 General
- 22.14.2 Securing the Scene
 - 22.14.2.1 Establishing the Scene
 - 22.14.2.2 Obtain Background Information
 - 22.14.2.3 Establish the Scene Search Pattern
 - 22.14.2.4 Safety at the Explosion Scene

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- 22.14.3 Initial Scene Assessment
 - 22.14.3.1 General
 - 22.14.3.2 Identify Explosion or Fire
 - 22.14.3.3 Document Damage
 - 22.14.3.4 Seated or Nonseated Explosion
 - 22.14.3.5 Identify Type of Explosion
 - 22.14.3.6 Identify Potential General Fuel Type
 - 22.14.3.7 Establish the Origin
 - 22.14.3.8 Establish Ignition Source
- 22.14.4 Detailed Scene Assessment
 - 22.14.4.1 Identify Damage Effects of Explosion
 - 22.14.4.2 Identify Pre-Blast and Post-Blast Fire Damage
 - 22.14.4.3 Locate and Identify Articles of Evidence
 - 22.14.4.4 Identify Force Vectors

501-22.15 ***The Investigator candidate shall analyze the origin (epicenter) of an explosion scene.***

501-22.16 ***The Investigator candidate shall analyze a fuel source.***

501-22.17 ***The Investigator candidate shall analyze the ignition source.***

501-22.18 ***The Investigator candidate shall analyze to establish cause.***

- 22.18.1 General
- 22.18.2 Time Line Analysis
- 22.18.3 Damage Pattern Analysis
 - 23.18.3.1 Debris Analysis
 - 23.18.3.2 Relative Structural Damage Analysis
- 22.18.4 Correlation of Explosion Type and Energy with Damage Incurred
- 22.18.5 Analysis of Damaged Items and Structures
- 22.18.6 Correlation of Thermal Effects

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SECTION 23

INCENDIARY FIRES

4.6 Post-Incident Investigation.

Duties shall include the investigation of all factors beyond the fire scene at the time of the origin and cause determination.

NFPA 1033 4.6.4 Establish evidence as to motive and/or opportunity, given an incendiary fire, so that the evidence is supported by documentation and meets the evidentiary requirements of the jurisdiction.

(A) Requisite Knowledge. Types of motives common to incendiary fires, methods used to discover opportunity, and human behavioral patterns relative to fire-setting.

(B) Requisite Skills. Financial analysis, records gathering and analysis, interviewing, and interpreting fire scene information and evidence for relationship to motive and/or opportunity.

NFPA 1033 4.6.5 Formulate an opinion concerning origin, cause, or responsibility for the fire, given all investigative findings, so that the opinion regarding origin, cause, or responsibility for a fire is supported by the data, facts, records, reports, documents, and evidence.

(A) Requisite Knowledge: Analytical methods and procedures (e.g., hypothesis development and testing, systems analysis, time lines, link analysis, fault tree analysis, and data reduction matrixing).

(B) Requisite Skills: Analytical and assimilation skills.

References:

J&B, chapter 21

Kirk's, chapter 11

Lentini, chapter 8

501-23.1 **The Investigator candidate shall define "incendiary" fires.**

501-23.2 **The Investigator candidate shall identify and describe indicators of incendiary fires.**

23.2.1 Multiple Fires

23.2.2 Trailers

23.2.3 Lack of Expected Fuel Load and Ignition Sources

23.2.4 Unusual Fuel Load or Configuration

23.2.5 Burn Injuries

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- 23.2.6 Incendiary Devices
- 23.2.7 Assessment of Fire Growth and Fire Damage

501-23.3 ***The Investigator candidate shall identify and explain potential indicators of incendiary fires not directly related to combustion.***

- 23.3.1 Remote Locations with View Blocked or Obscured
- 23.3.2 Forced Entry
- 23.3.3 Fires Near Service Equipment and Appliances
- 23.3.4 Removal or Replacement of Contents Prior to the Fire
 - 23.3.4.1 Replacement
 - 23.3.4.2 Removal
 - 23.3.4.3 Absence of Personal Items Prior to the Fire
- 23.3.5 Entry Blocked or Obstructed
- 23.3.6 Sabotage to the Structure or Fire Protection Systems
 - 23.3.6.1 Definition of Sabotage
 - 23.3.6.2 Damage to Fire-Resistive Assemblies
 - 23.3.6.3 Damage to Fire Protection Systems
- 23.3.7 Open Windows and Exterior Doors

501-23.4 ***The Investigator candidate shall identify and describe other evidentiary factors associated with incendiary fires.***

- 23.4.1 Evidentiary Factors that should be recorded and examined
- 23.4.2 Analysis of Confirmed Incendiary Fires
 - 23.4.2.1 Geographic Areas, or Clusters
 - 23.4.2.2 Temporal Frequency
 - 23.4.2.3 Materials and Method
- 23.4.3 Evidence of Other Crimes, Crime Concealment
- 23.4.4 Indications of Financial Stress
- 23.4.5 Existing or History of Code Violations

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- 23.4.6 Owner with Fires at Other Properties
- 23.4.7 Overinsurance
- 23.4.8 Timed Opportunity
 - 23.4.8.1 Fires During Severe Natural Conditions
 - 23.4.8.2 Fires During Civil Unrest
 - 23.4.8.3 Fire Department Unavailable
- 23.4.9 Motives for Firesetting Behavior
 - 23.4.9.1 Define “Motive”
 - 23.4.9.2 Motive Versus Intent
 - 23.4.9.3 Classifications of Motive
 - 23.4.9.3.1 Introduction
 - 23.4.9.3.2 Vandalism
 - 23.4.9.3.2.1 Willful and Malicious Mischief
 - 23.4.9.3.2.2 Peer or Group Pressure
 - 23.4.9.3.3 Excitement
 - a. Thrill Seeking
 - b. Attention Seeking
 - c. Recognition
 - d. Sexual Gratification or Perversion
 - 23.4.9.3.4 Revenge
 - a. Personal Retaliation
 - b. Societal Retaliation
 - c. Institutional Retaliation
 - d. Group Retaliation
 - 23.4.9.3.5 Crime Concealment
 - a. Murder Concealment
 - b. Burglary Concealment
 - c. Destruction of Records or Documents
 - 23.4.9.3.6 Profit
 - 23.4.9.3.7 Extremism
 - a. Terrorism
 - b. Riot/Civil Disturbance

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SECTION 24

FIRE AND EXPLOSION DEATHS AND INJURIES

4.4 Evidence Collection/Preservation.

Duties shall include using proper physical and legal procedures to identify, document, collect and preserve evidence required within the investigation.

NFPA 1033 4.4.1 Utilize proper procedures for managing victims and fatalities, given a protocol and appropriate personnel, so that all evidence is discovered and preserved and the protocol procedures are followed.

(A) Requisite Knowledge. Types of evidence associated with fire victims and fatalities and evidence preservation methods.

(B) Requisite Skills. Observational skills and the ability to apply protocols to given situations.

References:

J&B, chapter 23
Kirk's, chapter 12
Konefal, Fire Death Scene Investigation
ASTM E678

501-24.1 The Investigator candidate shall demonstrate the ability to utilize specialized skills associated with death and injuries from fire and explosions.

501-24.2 The Investigator candidate shall identify the mechanisms of death and injury.

- 24.2.1 Carbon Monoxide
- 24.2.2 Cyanide
- 24.2.3 Other Toxic Gases
- 24.2.4 Hyperthermia
- 24.2.5 Skin Burns
- 24.2.6 Inhalation of Hot Gases
- 24.2.7 Soot and Smoke
- 24.2.8 Hypoxia
- 24.2.9 Sublethal Inhalation Exposure Effects on the Individual

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- 24.2.9.1 Narcotic Gases
- 24.2.9.2 Irritant Gases
- 24.2.9.3 Smoke

- 24.2.10 Explosion-Related Injuries
 - 24.2.10.1 Blast Pressure Injuries
 - 24.2.10.2 Shrapnel Injuries
 - 24.2.10.3 Thermal Injuries
 - 24.2.10.4 Building Collapse Injuries

501-24.3 ***The Investigator candidate shall describe the consumption of the body by fire.***

- 24.3.1 Skin
- 24.3.2 Muscle
- 24.3.3 Bone
- 24.3.4 Fat

501-24.4 ***The Investigator candidate shall describe the postmortem changes that a deceased body will undergo when exposed to heat and to death.***

- 24.4.1 Lividity
- 24.4.2 Rigor Mortis

501-24.5 ***The Investigator candidate shall describe the considerations to be made before the investigation of a fatal fire.***

- 24.5.1 Notification
- 24.5.2 The Fire Department
- 24.5.3 Team Investigation
- 24.5.4 Safety
- 24.5.5 Scene Documentation
- 24.5.6 Victim Documentation

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- 24.5.7 Recovery of Bodies and Evidence
 - 24.5.7.1 Layering of Debris
 - 24.5.7.2 Sifting of Debris
 - 24.5.7.3 Body Removal
 - 24.5.7.4 Victim Clothing
- 24.5.8 Collection of Other Physical Evidence

501-24.6 ***The Investigator candidate shall describe the steps of investigating fire scenes with injuries.***

- 24.6.1 Notification Laws
- 24.6.2 Scene Documentation
- 24.6.3 Victim Documentation
- 24.6.4 Victim Timeline
- 24.6.5 Physical Evidence

501-24.7 ***The Investigator candidate shall describe the documentation of an explosion incident where injury and/or death has occurred.***

- 24.7.1 Collecting Physical Evidence from Explosions

501-24.8 ***The Investigator candidate shall describe post scene investigation of injuries.***

- 24.8.1 Burns
 - 24.8.1.1 Degree of Burns
 - 24.8.1.2 Body Area (Distribution)
- 24.8.2 Inhalation Medical Evidence
- 24.8.3 Hospital Tests and Documentation
- 24.8.4 Access to Medical Evidence

501-24.9 ***The Investigator candidate shall describe the fire death pathological and toxicological examination.***

- 24.9.1 The Coroner or Medical Examiner

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- 24.9.2 Identifying the Remains
 - 24.9.2.1 Human vs. Animal Remains
 - 24.9.2.2 Visual Identification
 - 24.9.2.3 Identification by Clothing and Personal Effects
 - 24.9.2.4 Fingerprint Identification
 - 24.9.2.5 X-ray Identification
 - 24.9.2.6 DNA Identification
- 24.9.3 X-ray Examination
- 24.9.4 Carbon Monoxide Levels
- 24.9.5 Cyanide Levels
- 24.9.6 Presence of Other Toxicants
- 24.9.7 Smoke and Soot Exposure
- 24.9.8 Burns
- 24.9.9 Physical Trauma and Wounds
- 24.9.10 Stomach Contents
- 24.9.11 Internal Body Temperature
- 24.9.12 Pre-Existing Medical Conditions
- 24.9.13 Death Pre-Fire
- 24.9.14 Death from a Medical Condition

501-24.10 ***The Investigator candidate shall describe how to analyze the data developed from the death or injury investigation and correlate it with the other data from the investigation.***

- 24.10.1 Timeline Development
- 24.10.2 Victim Activity
- 24.10.3 Pre-Fire Victim Impairment
- 24.10.4 Medical History

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- 24.10.5 Fire Pattern
- 24.10.6 Burns
- 24.10.7 Clothing
- 24.10.8 Applications of Toxicology in Fire Investigation
 - 24.10.8.1 Toxicological Analysis Techniques
 - 24.10.8.2 Physiological Models
 - 24.10.8.2.1 The Steward Equation
 - 24.10.8.2.2 The Colburn Forster Kane (CFK) Equation

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SECTION 25

APPLIANCES

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.8 Inspect and analyze the performance of building systems, including fire protection, detection and suppression systems, HVAC, electricity and electrical systems, fuel gas systems, and building compartmentation, given standard and special equipment and tools, so that a determination can be made as to the need for expert resources; an operating system's impact on fire growth and spread is considered in identifying origin areas; defeated and failed systems are identified; and the system's potential as a fire cause is recognized.

(A) Requisite Knowledge. Different types of detection, suppression, HVAC, utility, and building compartmentation such as fire walls and fire doors; types of expert resources for building systems; the impact of fire on various systems; common methods used to defeat a system's functional capability; and types of failures.

(B) Requisite Skills. Determine the system's operation and its effect on the fire; identify alterations to, and failure indicators of, building systems; and evaluate the impact of suppression efforts on building systems.

References:

J&B, chapter 24
Kirk's, chapter 4
Lentini, chapter 6

501-25.1 ***The Investigator candidate shall analyze appliances as it relates to investigation of the cause of fires.***

501-25.2 ***The Investigator candidate shall record the scene involving an appliance.***

- 25.2.1 Recording Specific Appliances
- 25.2.2 Measurements of the Location of the Appliances
- 25.2.3 Positions of Appliance Controls
- 25.2.4 Document Appliance Information
- 25.2.5 Gathering All of the Parts from the Appliance

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501-25.3 ***The Investigator candidate shall analyze the origin of fires involving appliances.***

- 25.3.1 Relationship of the Appliance to the Origin
- 25.3.2 Fire Patterns
- 25.3.3 Plastic Appliance Components
- 25.3.4 Reconstruction of the Area of Origin

501-25.4 ***The Investigator candidate shall analyze the cause of fires involving appliances.***

- 25.4.1 How the Appliance Generated Heat
- 25.4.2 The Use and Design of the Appliance
- 25.4.3 Electrical Appliances as Ignition Sources
- 25.4.4 Photographing Appliance Disassembly
- 25.4.5 Obtaining Exemplar Appliances
- 25.4.6 Testing Exemplar Appliances

501-25.5 ***The Investigator candidate shall describe each of the common parts or components that might be found in various appliances.***

- 25.5.1 Appliance Housings
- 25.5.2 Power Sources
 - 25.5.2.1 Power Cords
 - 25.5.2.2 Voltages Less than 120
 - 25.5.2.3 Batteries
 - 25.5.2.4 Overcurrent Protection
- 25.5.3 Switches
 - 25.5.3.1 Manual Switches
 - 25.5.3.2 Automatic Switches
- 25.5.4 Solenoids and Relays

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- 25.5.5 Transformers
- 25.5.6 Motors
- 25.5.7 Heating Elements
- 25.5.8 Lighting
 - 25.5.8.1 Fluorescent Lighting Systems
 - 25.5.8.2 High Intensity Discharge Lighting Systems
- 25.5.9 Miscellaneous Components

501-25.6 ***The Investigator candidate shall describe the operation and components of common residential appliances.***

- 25.6.1 Range or Oven
- 25.6.2 Coffee Makers
- 25.6.3 Toaster
- 25.6.4 Electric Can Opener
- 25.6.5 Refrigerator
- 25.6.6 Dishwasher
- 25.6.7 Microwave Oven
- 25.6.8 Portable Space Heater
- 25.6.9 Electric Blanket
- 25.6.10 Window Air Conditioner Unit
- 25.6.11 Hair Dryer and Hair Curler
- 25.6.12 Clothes Iron
- 25.6.13 Clothes Dryer
- 25.6.14 Consumer Electronics
- 25.6.15 Lighting

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SECTION 26

MOTOR VEHICLE FIRES

Annex A Explanatory Material

NFPA 1033 A.1.1 The intent of this standard applies to all fire investigation, including outside, wildland, vehicle, and structural fires.

4.1 General

NFPA 1033 4.1.3 Because fire investigators are required to perform activities in adverse conditions, site safety assessments shall be completed on all scenes and regional and national safety standards shall be followed and included in organizational policies and procedures.

4.2 Scene Examination.

Duties shall include inspecting, evaluating, and analyzing the fire scene or evidence of the scene, and conducting a comprehensive review of documentation generated during the examination(s) of the scene if the scene is no longer available, so as to determine the area or point of origin, source of ignition, material(s) ignited, and action or activity that brought the ignition source and materials together and to assess the subsequent progression, extinguishment, and containment of the fire.

NFPA 1033 4.2.4 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that each pattern is identified and analyzed with respect to the burning characteristics of the material involved, the stage of fire development, the effects of ventilation within the context of the scene, the relationship with all patterns observed, and the understanding of the methods of heat transfer that led to the formation of the patterns identified and analyzed, and the sequence in which the patterns were produced is determined.

(A) Requisite Knowledge. Fire dynamics, fire development, and the interrelationship of heat release rate, form, and ignitability of materials.

(B) Requisite Skills. Ability to interpret the effects of burning characteristics on different types of materials.

NFPA 1033 4.2.5 Interpret and analyze fire patterns, given standard equipment and tools and some structural or content remains, so that fire development is determined, methods and effects of suppression are evaluated, false origin area patterns are recognized, and all areas of origin are correctly identified.

(A) Requisite Knowledge. Fire behavior and spread based on fire chemistry, fire dynamics, and physics, fire suppression effects, building construction.

(B) Requisite Skills. Interpret variations of fire patterns on different materials with consideration given to heat release rate, form, and ignitability; distinguish impact of different types of fuel loads; evaluate fuel trails; and analyze and synthesize information.

NFPA 1033 4.2.6 Examine and remove fire debris, given standard equipment and tools, so that all debris is checked for fire cause evidence, potential ignition source(s) is identified, and evidence is preserved without investigator-inflicted damage or contamination.

(A) Requisite Knowledge. Basic understanding of ignition processes, characteristics of ignition sources, and ease of ignition of fuels; debris-layering techniques; use of tools and equipment during the debris search; types of fire cause evidence commonly found in various degrees of damage; and evidence-gathering methods and documentation.

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B) Requisite Skills. Employ search techniques that further the discovery of fire cause evidence and ignition sources, use search techniques that incorporate documentation, and collect and preserve evidence.

References:
J&B, chapter 25
Kirk's, chapter 7

501-26.1 **The Investigator candidate shall describe the factors related to the investigation of fires involving motor vehicles.**

501-26.2 **The Investigator candidate shall describe the differences, in safety related concerns, that burned vehicles pose as compared to those found in structure fires.**

501-26.3 **The Investigator candidate shall describe and identify the different types of fuels that may be involved in vehicle fires.**

26.3.1 Ignitable Liquids
 26.3.1.1 Hot Surface Ignition

26.3.2 Gaseous Fuels

26.3.3 Solid Fuels

501-26.4 **The Investigator candidate shall describe and identify the different ignition sources that can be present in vehicle fires.**

26.4.1 Open Flames

26.4.2 Electrical Sources
 26.4.2.1 Recreational Vehicles
 26.4.2.2 Overloaded Wiring
 26.4.2.3 Electrical High Resistance Connections
 26.4.2.4 Electrical Short Circuits and Arcs -
 Electric Discharge
 26.4.2.5 Arc, Carbon, Tracking
 26.4.2.6 Lamp Bulbs and Filaments
 26.4.2.7 External Electrical Sources Used in Vehicles

26.4.3 Hot Surfaces

26.4.4 Mechanical Sparks

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26.4.5 Smoking Materials

501-26.5 ***The Investigator shall identify the different types of systems that a motor vehicle may possess and their respective functions.***

- 26.5.1 Fuel Systems
 - 26.5.1.1 Vacuum/Low-Pressure Carbureted Systems
 - 26.5.1.2 High-Pressure Fuel-Injected Systems
 - 26.5.1.3 Diesel Fuel System
 - 26.5.1.4 Natural Gas
 - 26.5.1.5 Propane Fuel
 - 26.5.1.6 Turbochargers
- 26.5.2 Emission Control System
- 26.5.3 Motor Vehicle Electrical Systems
- 26.5.4 Mechanical Power Systems
- 26.5.5 Mechanical Power Distribution
- 26.5.6 Accessories to the Mechanical Power System
- 26.5.7 Hydraulic Braking System
- 26.5.8 Windshield Washer Systems

501-26.6 ***The Investigator candidate shall identify the different body systems that can be found within or upon motor vehicles.***

- 26.6.1 Interior Finishes and Accessories
- 26.6.2 Cargo Areas

501-26.7 ***The Investigator candidate shall identify and employ the proper technique for investigating motor vehicle fires.***

- 26.7.1 Vehicle Identification
- 26.7.2 Vehicle Fire Scene History
- 26.7.3 Vehicle Particulars
- 26.7.4 Documenting the Vehicle at the Fire Scene

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26.7.5 Documenting the Vehicle Away from the Scene

501-26.8 ***The Investigator candidate shall identify factors related to the examination of motor vehicles after they have burned.***

26.8.1 General

26.8.2 Examination of Vehicle Systems

26.8.3 Switches, Handles, and Levers

501-26.9 ***The Investigator candidate shall define total burns as it relates to motor vehicle fires and describe the actions that should be taken when these types of fires are encountered.***

501-26.10 ***The Investigator candidate shall identify factors related to incendiary vehicle fires.***

501-26.11 ***The Investigator shall identify components of the vehicle's ignition system as they relate to the fire investigation.***

501-26.12 ***The Investigator candidate shall identify factors concerning vehicle fires in structures and evaluate them as a potential source of fire ignition.***

501-26.13 ***The Investigator candidate shall identify and describe the factors relative to the investigation of recreational vehicle fires.***

501-26.14 ***The Investigator candidate shall identify the factors related to fire investigations involving heavy equipment.***

26.14.1 Medium- and Heavy-Duty Trucks, and Buses

26.14.2 Mass Transit Vehicles

26.14.3 Earth-Moving Equipment

26.14.4 Forestry/Logging Equipment

26.14.5 Landfill Equipment

26.14.6 Agricultural Equipment

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501-26.15 ***The Investigator candidate shall identify the factors related to fire investigations involving self-propelled agricultural equipment and drawn implements.***

- 26.15.1 Agricultural Equipment Investigation Safety
- 26.15.2 Equipment Classification and Description
- 26.15.3 Unique Safety Concerns
- 26.15.4 Unique Fire Cause Concerns
- 26.15.5 Fuels
- 26.15.6 Ignition Sources

501-26.16 ***The Investigator candidate shall identify factors related to the investigation of fires involving hybrid vehicles.***

- 26.16.1 Hybrid Vehicle Investigation Safety
- 26.16.2 Hybrid Vehicle Technology
- 26.16.3 Investigation of Hybrid Vehicle Fires

501-26.17 ***The Investigator candidate shall identify factors related to towing or vehicle transport as it relates to fire investigations.***

501-26.18 ***The Investigator candidate shall identify factors related to the investigation of fires involving hydrogen fueled vehicles.***

SECTION 27

WILDFIRE INVESTIGATIONS

Annex A Explanatory Material

NFPA 1033 A.1.1 The intent of this standard applies to all fire investigation, including outside, wildland, vehicle, and structural fires.

References:

J&B, chapter 26

Kirk's, chapter 7

501-27.1 **The Investigator candidate shall identify the specialized techniques, practices, equipment, and terminology associated with the investigation of wildfires.**

501-27.2 **The Investigator candidate shall identify and describe wildfire fuels.**

27.2.1 Fuel Condition Analysis

27.2.2 Ground Fuels

27.2.2.1 Duff

27.2.2.2 Roots

27.2.3 Surface Fuels

27.2.3.1 Fine Dead Wood

27.2.3.2 Dead Leaves and Coniferous Litter

27.2.3.3 Grass

27.2.3.4 Downed logs, Stumps, and Large Limbs

27.2.3.5 Low Brush and Reproduction

27.2.4 Aerial Fuels

27.2.4.1 Tree Branches and Crowns

27.2.4.2 Tree Moss

27.2.4.3 High Brush

27.2.5 Species

27.2.6 Fuel Size

27.2.7 Fuel Moisture Content

27.2.8 Oil Content

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501-27.3 ***The Investigator candidate shall identify and describe the effects of weather on fire spread.***

- 27.3.1 Weather History
- 27.3.2 Temperature
- 27.3.3 Relative Humidity
- 27.3.4 Wind Influences
 - 27.3.4.1 Meteorological Winds
 - 27.3.4.2 Diurnal Winds
 - 27.3.4.3 Foehn Winds
 - 27.3.4.4 Fire Winds

501-27.4 ***The Investigator candidate shall identify, describe and interpret the effect of topography on fire spread.***

- 27.4.1 Slope
- 27.4.2 Aspect

501-27.5 ***The Investigator candidate shall be able to describe fire shape.***

- 27.5.1 Fire Head
- 27.5.2 Fire Flanks
- 27.5.3 Fire Heel
- 27.5.4 Factors Affecting Fire Spread
 - 27.5.4.1 Lateral Confinement
 - 27.5.4.2 Fuel Influence
 - 27.5.4.3 Suppression
- 27.5.5 Other Natural Mechanisms of Fire Spread
 - 27.5.5.1 Embers and Firebrands
 - 27.5.5.2 Fire Storms
 - 27.5.5.3 Animals

501-27.6 ***The Investigator candidate shall identify and describe indicators of a wildfire.***

- 27.6.1 Wildfire V-Shaped Patterns

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- 27.6.2 Degree of Damage
- 27.6.3 Grass Stems
- 27.6.4 Angle of Char
- 27.6.5 White Ash Deposit
- 27.6.6 Cupping
- 27.6.7 Die-Out Pattern
- 27.6.8 Exposed and Protected Fuels
- 27.6.9 Staining and Sooting
- 27.6.10 Depth of Char
- 27.6.11 Spalling
- 27.6.12 Foliage Freeze
- 27.6.13 Curling

501-27.7 ***The Investigator candidate shall identify the area of origin of a wildfire.***

- 27.7.1 Initial Area of Investigation
- 27.7.2 General Origin Area
- 27.7.3 General Origin Investigation Techniques
- 27.7.4 Specific Origin Investigation Techniques
- 27.7.5 Search Equipment

501-27.8 ***The Investigator candidate shall determine the cause of a wildfire.***

- 27.8.1 Natural Fire Cause
- 27.8.2 Human Fire Cause

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- 501-27.9** ***The Investigator candidate shall recognize that evidence protection, preservation, collection, and documentation at wildfires are similar to other fires.***
- 501-27.10** ***The Investigator candidate shall identify special safety considerations associated with investigation of wildfires.***
- 501-27.11** ***The Investigator candidate shall identify sources of information as prescribed in Annex B and Section B.11. .***

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SECTION 28

MANAGEMENT OF COMPLEX INVESTIGATIONS

NFPA 1033 4.1 General

NFPA 1033 4.1.6 The fire investigator shall understand the organization and operation of the investigative team within an incident management system.

References:
J&B, chapter 27

501-28.1 **The Investigator candidate shall distinguish those issues that are unique to managing investigations that are complex due to size, scope, or duration.**

28.1.1 Governmental Inquiry

28.1.2 Intent

28.1.3 Purpose

28.1.4 Interested Parties

28.1.5 Chapter Definitions

501-28.2 **The Investigator candidate shall describe the basic information and documents associated with complex investigations.**

501-28.3 **The Investigator candidate shall recognize the importance of communications among interested parties.**

28.3.1 Notice to Interested Parties

28.3.1.1 Entity in Control

28.3.1.2 All Interested Parties

28.3.1.3 Roster of Interested Parties

28.3.1.4 Notification of Changes

28.3.1.5 Making Notification

28.3.1.6 Content of Notification

28.3.1.7 Subsequent Notifications

28.3.2 Meetings

28.3.2.1 Preliminary Meeting

28.3.2.2 Meetings as the Investigation Progresses

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28.3.3 Website

28.3.4 Additional Dissemination of Information

501-28.4 ***The Investigator candidate shall recognize the complexity of the investigation and ensure that all known interested parties are afforded an opportunity to investigate the incident and protect their respective interests, understandings or agreements.***

28.4.1 Purposes

28.4.2 Scheduling

28.4.3 Cost Sharing

28.4.4 Nondisclosure Agreements

28.4.5 Protocols

28.4.6 Information Sharing

28.4.7 Interviews

28.4.8 Amendments to Agreements

28.4.9 Disagreements

501-28.5 ***The Investigator candidate shall identify and describe the components of managing a complex investigation.***

28.5.1 Organizational Models

28.5.2 Control of the Site and Scene

28.5.2.1 Securing the Site and Scene

28.5.2.2 Delegation of Control

28.5.2.3 Transfer of Control

28.5.2.4 Site and Scene Access

28.5.2.5 Site-Specific Restrictions or Requirements

28.5.2.6 Scene Integrity

28.5.2.7 Release of Information

501-28.6 ***The Investigator candidate shall recognize the unique components of handling evidence of a complex investigation.***

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- 28.6.1 Evidence Control
 - 29.6.1.1 Evidence Custodian
 - 29.6.1.2 Interested Party Responsibility
- 28.6.2 Evidence Removal from the Scene
- 28.6.3 Evidence Storage
- 28.6.4 Evidence Inspections
 - 28.6.4.1 Nondestructive Inspections
 - 28.6.4.2 Destructive Inspections
 - 28.6.4.3 Testing of Evidence

501-28.7 ***The Investigator candidate shall identify logistical support needs involving the complex investigation.***

- 28.7.1 Transportation
- 28.7.2 Equipment
- 28.7.3 Investigation Site Security
- 28.7.4 Decontamination
- 28.7.5 Environmental
- 28.7.6 Communications
- 28.7.7 Sanitary and Comfort Needs
- 28.7.8 Trash Disposal and Removal
- 28.7.9 Snow and Ice Removal
- 28.7.10 Lighting
- 28.7.11 Evidence Storage

501-28.8 ***The Investigator candidate shall distinguish the unique characteristics of safety at the complex investigation site.***

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SECTION 29

MARINE FIRE INVESTIGATION

Annex A Explanatory Material

NFPA 1033 A.1.1 The intent of this standard applies to all fire investigation, including outside, wildland, vehicle, and structural fires.

References:

J&B, chapter 28

Kirk's, chapter 7

501-29.1 **The Investigator candidate shall identify the factors related to the investigations of fires involving recreational boats.**

501-29.2 **The Investigator candidate shall define the following terms as they relate to Power Boat and Sailboat terminology.**

29.2.1 Accommodation space

29.2.2 Adrift

29.2.3 Afloat

29.2.4 Aft

29.2.5 Aground

29.2.6 Beam

29.2.7 Below

29.2.8 Bilge

29.2.9 Boat

29.2.10 Bulkhead

29.2.11 Cabin

29.2.12 Capsize

29.2.13 Chain plate

29.2.14 Deck

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- 29.2.15 Dock
- 29.2.16 Dorade Vent
- 29.2.17 Fender
- 29.2.18 Forward
- 29.2.19 Freeboard
- 29.2.20 Galley
- 29.2.21 Gear
- 29.2.22 Gunwale
- 29.2.23 Hatch
- 29.2.24 Hold
- 29.2.25 Hull
- 29.2.26 Inboard
- 29.2.27 Inboard/Out-Drive (I/O)
- 29.2.28 Outboard
- 29.2.29 Overboard
- 29.2.30 Port
- 29.2.31 Rub Rail
- 29.2.32 Shore Power
- 29.2.33 Shroud
- 29.2.34 Sole
- 29.2.35 Starboard
- 29.2.36 Superstructure

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- 29.2.37 Topside
- 29.2.38 Transom
- 29.2.39 Underway
- 29.2.40 Vessel
- 29.2.41 Waterline

501-29.3 ***The Investigator candidate shall recognize the importance of boat investigation safety.***

- 29.3.1 Safety Assessment
- 29.3.2 Inspection of Boats on Land
- 29.3.3 Inspection of Boats Afloat
- 29.3.4 Underwater Inspections
- 29.3.5 Specific Safety Concerns
 - 29.3.5.1 Confined Spaces
 - 29.3.5.1.1 Automatic Fire Suppression Systems Inactive/Deactivated
 - 29.3.5.2 Airborne Particulates
 - 29.3.5.3 Identify and Assess Energy Sources
 - 29.3.5.3.1 Batteries
 - 29.3.5.3.2 Inverters
 - 29.3.5.3.3 Shore Power
 - 29.3.5.4 Fuel Leaks
 - 29.3.5.5 Sewage Holding Tank
 - 29.3.5.6 Hydrogen Gas
 - 29.3.5.7 Other Hydrocarbon Contaminants
 - 29.3.5.8 Stability
 - 29.3.5.9 Damage to the Structure of the Boat
 - 29.3.5.10 Wharves, Docks, and Jetties
 - 29.3.5.11 Submerged Boat
 - 29.3.5.12 Visual Distress Signals and Pyrotechnics
- 29.3.6 Openings

501-29.4 ***The Investigator candidate shall identify the different marine systems and functions.***

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- 29.4.1 Fuel Systems: Propulsion and Auxiliary
 - 29.4.1.1 Vacuum/Low Pressure Carbureted
 - 29.4.1.2 High-Pressure/Marine Fuel Injection Systems, Including Return Systems
 - 29.4.1.3 Diesel
- 29.4.2 Fuel Systems: Cooking and Heating
 - 29.4.2.1 Liquefied Petroleum Gases
 - 29.4.2.2 Compressed Natural Gas
 - 29.4.2.3 Alcohol
 - 29.4.2.4 Solid Fuels
 - 29.4.2.5 Diesel
- 29.4.3 Turbochargers/Super Chargers
- 29.4.4 Exhaust System
 - 29.4.4.1 Dry Exhaust Systems
 - 29.4.4.2 Wet Exhaust Systems
 - 29.4.4.3 De-watered Exhaust Systems
- 29.4.5 Electrical Systems
 - 29.4.5.1 Alternating Current (AC)
 - 29.4.5.2 Direct Current (DC)
- 29.4.6 Engine Cooling Systems
- 29.4.7 Ventilation
- 29.4.8 Transmissions
 - 29.4.8.1 Mechanical Gear Transmissions
 - 29.4.8.2 Hydraulic-Geared Transmissions
- 29.4.9 Accessories

501-29.5 ***The Investigator candidate shall identify the exterior construction of the vessel.***

- 29.5.1 Hull Construction
- 29.5.2 Superstructure Construction Material
- 29.5.3 Deck
- 29.5.4 Exterior Accessories

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501-29.6 **The Investigator candidate shall identify the interior construction of the vessel.**

- 29.6.1 Construction Materials

- 29.6.2 Finishes
 - 29.6.2.1 Accommodation Furnishings
 - 29.6.2.2 Interior Accessories
 - 29.6.2.3 Engine/Machinery Compartments
 - 29.6.2.4 Flammable/Explosive Vapor Detectors
 - 29.6.2.5 Storage and Holds
 - 29.6.2.6 Fuel Tanks

501-29.7 **The Investigator candidate shall identify the propulsion system of the vessel.**

- 29.7.1 Electric Systems

- 29.7.2 Fuels for Boats with Motorized Propulsion Systems
 - 29.7.2.1 Fuel Systems
 - 29.7.2.1.1 Engines
 - 29.7.2.1.1.1 Outboard Engines (Outboard Motors)
 - 29.7.2.1.1.2 Inboard Gasoline Engines
 - 29.7.2.1.1.3 Diesel Engines
 - 29.7.2.1.1.4 Propulsion System Fluids
 - 29.7.2.1.2 Inboard Gasoline Engines
 - 29.7.2.1.3 Diesel Engines
 - 29.7.2.1.4 Propulsion System Fluids
 - 29.7.2.2 Appliance Fuel Systems
 - 29.7.2.3 Electric Generators

- 29.7.3 Other Fuel Systems Used for Propulsion

501-29.8 **The Investigator candidate shall identify common ignition sources found in marine vessels.**

- 29.8.1 Open Flames

- 29.8.2 Electrical Sources
 - 29.8.2.1 Overloaded Wiring
 - 29.8.2.2 Electrical Short Circuiting and Arcs
 - 29.8.2.3 Electrical Connections
 - 29.8.2.4 Lightning
 - 29.8.2.5 Static Electricity and Incendive Arcs

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- 29.8.3 Hot Surfaces
 - 29.8.3.1 Manifolds
 - 29.8.3.2 Exhaust Systems
 - 29.8.3.3 Cooking Surfaces
 - 29.8.3.4 Heating Systems

- 29.8.4 Mechanical
 - 29.8.4.1 Bearing Failures
 - 29.8.4.2 Friction

- 29.8.5 Smoking Materials

501-29.9 ***The Investigator candidate shall describe proper documentation of the boat fire scene.***

- 29.9.1 On Land
- 29.9.2 In Water
 - 29.9.2.1 Moored
 - 29.9.2.2 Anchored and Underway
 - 29.9.2.3 Underwater
- 29.9.3 Boat Identification
 - 29.9.3.1 Hull Identification Number (HIN)
 - 29.9.3.2 Registration Numbers
 - 29.9.3.3 U.S. Coast Guard Documentation Numbers
 - 29.9.3.4 Boat Name and Hailing Port
 - 29.9.3.5 Boat History
 - 29.9.3.6 Fire Scene History
 - 29.9.3.6.1 Actions Before the Fire
 - 29.9.3.6.2 Actions During the Fire
 - 29.9.3.6.3 Actions After the Fire
- 29.9.4 Boat Particulars

501-29.10 ***The Investigator candidate shall identify the steps of a proper boat examination.***

- 29.10.1 General
- 29.10.2 Examination of Boat Systems

501-29.11 ***The Investigator candidate shall describe marine fire investigations of boats in structures.***

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501-29.12 ***The Investigator candidate shall describe legal considerations related to marine fire investigations.***

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SECTION 30

PRACTICAL EXERCISES

4.7 Presentations.

Duties shall include the presentation of findings to those individuals not involved in the actual investigations.

NFPA 1033 4.7.1 Prepare a written report, given investigative findings, so that the report accurately reflects the facts, data, and scientific principles on which the investigator relied; clearly identifies and expresses the investigator's opinions and conclusions; and contains the reasoning by which each opinion or conclusion was reached in order to meet the requirements of the intended audience(s).

(A) Requisite Knowledge. Elements of writing, typical components of a written report, and types of audiences and their respective needs or requirements.

(B) Requisite Skills. Writing skills, ability to analyze information and determine the reader's needs or requirements.

NFPA 1033 4.7.2 Express investigative findings verbally, given investigative findings, notes, a time allotment, and a specific audience, so that the information is accurate, the presentation is completed within the allotted time, and the presentation includes only need-to-know information for the intended audience.

(A) Requisite Knowledge. Types of investigative findings, the informational needs of various types of audiences, and the impact of releasing information.

(B) Requisite Skills. Communication skills and ability to determine audience needs and correlate findings.

NFPA 1033 4.7.3 Testify during legal proceedings, given investigative findings, contents of reports, and consultation with legal counsel, so that all pertinent investigative information and evidence are presented clearly and accurately and the investigator's demeanor and attire are appropriate to the proceedings.

(A) Requisite Knowledge. Types of investigative findings, types of legal proceedings, professional demeanor requirements, and an understanding of due process and legal proceedings.

(B) Requisite Skills. Communication and listening skills and ability to differentiate facts from opinion and determine accepted procedures, practices, and etiquette during legal proceedings.

501-30.1 ***The Investigator candidate shall demonstrate proficiency in all required skills in the TCFP Fire Investigator Skills Manual.***

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11. Discussion and possible action on 37 Texas Administrative Code (TAC), Chapter 443, Certification Curriculum Manual.

CHAPTER 443
CERTIFICATION CURRICULUM MANUAL

§443.1. Approval by the Curriculum and Testing [~~Fire Fighter Advisory~~] Committee.

(a) All proposals for new or revised curricula and training programs must be submitted to the Fire Fighter Advisory Committee for approval.

(b) The **Curriculum and Testing** [~~Fire Fighter Advisory~~] Committee may:

(1) submit proposals to a subcommittee formed of members of the **Curriculum and Testing** [~~Fire Fighter Advisory~~] Committee for study and review before approval; or

(2) submit proposals to an advisory committee formed of members of the fire service who are recommended by the **Curriculum and Testing** [~~Fire Fighter Advisory~~] Committee and appointed by the commission to report to the Fire Fighter Advisory Committee, for study and review before approval.

(c) All proposals approved by the **Curriculum and Testing** [~~Fire Fighter Advisory~~] Committee shall be placed on the next scheduled meeting agenda of the Texas Commission on Fire Protection.

Source Note: The provisions of this §443.1 adopted to be effective November 1, 1998, 23 TexReg 10904; amended to be effective August 23, 2017, 42 TexReg 4141

§443.3. Approval by the Texas Commission on Fire Protection.

(a) All proposals for new or revised curricula and training programs approved by the **Curriculum and Testing** [~~Fire Fighter Advisory~~] Committee must receive final approval by the Texas Commission on Fire Protection.

(b) Proposals not approved by the commission shall be sent back to the committee for further development. The commission shall indicate to the committee the reasons that the proposals were not approved.

Source Note: The provisions of this §443.3 adopted to be effective November 1, 1998, 23 TexReg 10904; amended to be effective August 23, 2017, 42 TexReg 4141

§443.5. Effective Date of New or Revised Curricula and Training Programs Required by Law or Rule.

(a) New curricula and training programs will become effective on January 1 of the year following final approval by the commission or on the date specified by the commission.

(b) Changes to curricula and training programs will become effective on January 1 of the year following final approval by the commission or on the date specified by the commission.

(c) Changes to curricula and training programs which involve reference materials will become effective on January 1 of the year following final approval by the commission or on the date specified by the commission, as recommended by the **Curriculum and Testing** [~~Fire Fighter~~

~~Advisory~~ Committee, depending on the impact the change will have on the curricula or training programs.

(d) Changes to curricula and training programs that involve a safety consideration as determined by the **Curriculum and Testing** ~~[Fire-Fighter-Advisory]~~ Committee shall become effective immediately following final approval by the commission.

Source Note: The provisions of this §443.5 adopted to be effective November 1, 1998, 23 TexReg 10904; amended to be effective March 1, 1999, 24 TexReg 791; amended to be effective August 23, 2017, 42 TexReg 4141

§443.7. Effective Date of New or Revised Curricula and Training Programs Which Are Voluntary.

(a) New curricula and training programs will become effective on the date recommended by the **Curriculum and Testing** ~~[Fire-Fighter-Advisory]~~ Committee and specified by the commission.

(b) Changes to curricula and training programs will become effective on the date recommended by the **Curriculum and Testing** ~~[Fire-Fighter-Advisory]~~ Committee and specified by the commission.

(c) Changes to curricula and training programs that involve a safety consideration as determined by the **Curriculum and Testing** ~~[Fire-Fighter-Advisory]~~ Committee shall become effective immediately following final approval by the commission.

Source Note: The provisions of this §443.7 adopted to be effective November 1, 1998, 23 TexReg 10904; amended to be effective August 23, 2017, 42 TexReg 4141

§443.9. National Fire Protection Association Standard.

(a) All curricula and training programs must, as a minimum, meet the standards, to include manipulative skills objectives and knowledge objectives, of the current NFPA standard pertaining to the discipline, if such a standard exists and is subject to subsection (c) of this section.

(b) New curricula and training programs presented to the **Curriculum and Testing** ~~[Fire-Fighter-Advisory]~~ Committee must, as a minimum, meet the standards of the current edition of the applicable NFPA standard for the discipline, if such a standard exists.

(c) If **an** ~~[a]~~ NFPA standard is adopted or an existing NFPA standard is revised, all curricula and training programs must meet the standards of the new or revised applicable NFPA standard within three years of the official adoption date of the applicable NFPA standard.

Source Note: The provisions of this §443.9 adopted to be effective November 1, 1998, 23 TexReg 10904; amended to be effective February 17, 2004, 29 TexReg 1415; amended to be effective August 23, 2017, 42 TexReg 4141

12. Discussion and possible action on rules reviewed as referred from the Fire Fighter Advisory Committee:

A. 37 Texas TAC, Chapter 459, Fire and Life Safety Educator.

CHAPTER 459

FIRE AND LIFE SAFETY EDUCATOR

SUBCHAPTER A

MINIMUM STANDARDS FOR FIRE AND LIFE SAFETY EDUCATOR I

§459.1. Fire and Life Safety Educator I Certification.

(a) A Fire and Life Safety Educator I is defined as an individual who performs professional work in the coordination and delivery of public fire and life safety education, and fire prevention programs.

(b) All individuals holding a Fire and Life Safety Educator I certification shall be required to comply with the continuing education requirements in Chapter 441 of this title (relating to Continuing Education).

(c) A regulated entity that employs an individual certified as Fire and Life Safety Educator I must report the individual's employment via the commission's online data management system (FIDO system).

Source Note: The provisions of this §459.1 adopted to be effective February 28, 2019, 44 TexReg 869; amended to be effective August 14, 2019, 44 TexReg 4194

§459.3. Minimum Standards for Fire and Life Safety Educator I Certification.

In order to be certified as a Fire and Life Safety Educator I, an individual must:

(1) possess valid documentation of accreditation from the International Fire Service Accreditation Congress as a Fire and Life Safety Educator I; or

(2) complete a commission approved Fire and Life Safety Educator I program and successfully pass the commission examination as specified in Chapter 439 of this title (relating to Examinations for Certification). An approved Fire and Life Safety Educator I program must consist of one of the following:

(A) completion of an in-state Fire and Life Safety Educator I program meeting the requirements of the applicable NFPA standard and conducted by a commission certified training provider that was submitted and approved through the commission's training prior approval system; or

(B) completion of an out-of-state educational institution of higher education, and/or military training program that has been submitted to the commission for evaluation and found to meet the requirements of the applicable NFPA standard.

Source Note: The provisions of this §459.3 adopted to be effective February 28, 2019, 44 TexReg 869

§459.5. Examination Requirement

Examination requirements in Chapter 439 of this title (relating to Examinations for Certification) must be met to receive Fire and Life Safety Educator I certification.

Source Note: The provisions of this §459.5 adopted to be effective February 28, 2019, 44 TexReg 869

§459.7. International Fire Service Accreditation Congress (IFSAC) Seal.

Individuals completing a commission-approved Fire and Life Safety Educator I program may be granted an IFSAC seal for Fire and Life Safety Educator I by making application to the commission for the IFSAC seal and paying applicable fees. Individuals must submit the fee for the seal prior to the expiration of the examination to qualify for the IFSAC seal.

Source Note: The provisions of this §459.7 adopted to be effective August 14, 2019, 44 TexReg 4194

CHAPTER 459

FIRE AND LIFE SAFETY EDUCATOR

SUBCHAPTER B

MINIMUM STANDARDS FOR FIRE AND LIFE SAFETY EDUCATOR II

§459.201. Fire and Life Safety Educator II Certification.

(a) A Fire and Life Safety Educator II is defined as an individual who performs professional work in the coordination and delivery of public fire and life safety education, and fire prevention programs.

(b) All individuals holding a Fire and Life Safety Educator II certification shall be required to comply with the continuing education requirements in Chapter 441 of this title (relating to Continuing Education).

Source Note: The provisions of this §459.201 adopted to be effective February 28, 2019, 44 TexReg 869, the provisions of this §459.201 adopted to be effective December 3, 2020, 45 TexReg 8528

§459.203 Minimum Standards for Fire and Life Safety Educator II Certification.

In order to be certified as a Fire and Life Safety Educator II, an individual must:

- (1) hold as a prerequisite Fire and Life Safety Educator I certification; and
- (2) possess valid documentation of accreditation from the International Fire Service Accreditation Congress as a Fire and Life Safety Educator II; or
- (3) complete a commission approved Fire and Life Safety Educator II program and successfully pass the commission examination as specified in Chapter 439 of this title (relating to Examinations for Certification). An approved Fire and Life Safety Educator II program must consist of one of the following:
 - (A) completion of an in-state Fire and Life Safety Educator II program meeting the requirements of the applicable NFPA standard and conducted by a commission certified training provider, that was submitted and approved through the commission's training prior approval system; or
 - (B) completion of an out-of-state, educational institution of higher education, and/or military training program that has been submitted to the commission for evaluation and found to meet the requirements of the applicable NFPA standard.

Source Note: The provisions of this §459.203 adopted to be effective February 28, 2019, 44 TexReg 869

§459.205. Examination Requirement.

Examination requirements in Chapter 439 of this title (relating to Examinations for Certification) must be met to receive Fire and Life Safety Educator II certification.

Source Note: The provisions of this §459.205 adopted to be effective February 28, 2019, 44 TexReg 869

§459.207. International Fire Service Accreditation Congress (IFSAC) Seal.

Individuals completing a commission-approved Fire and Life Safety Educator II program may be granted an IFSAC seal for Fire and Life Safety Educator II by making application to the commission for the IFSAC seal and paying applicable fees. Individuals must submit the fee for the seal prior to the expiration of the examination to qualify for the IFSAC seal.

Source Note: The provisions of this §459.207 adopted to be effective August 14, 2019, 44 TexReg 4194

12. Discussion and possible action on rules reviewed as referred from the Fire Fighter Advisory Committee:

B. 37 TAC, Chapter 461, Incident Commander.

CHAPTER 461

INCIDENT COMMANDER

MINIMUM STANDARDS FOR INCIDENT COMMANDER

§461.1. Incident Commander Certification.

(a) An Incident Commander is defined as an individual responsible for all incident activities, including the development of strategies and tactics and the ordering and release of resources, who has overall authority and responsibility for conducting and managing all incident operations at the incident site.

(b) All individuals holding an Incident Commander certification shall be required to comply with the continuing education requirements in Chapter 441 of this title (relating to Continuing Education).

~~(c) Special temporary provision. Individuals are eligible to take the commission examination for Incident Commander by:~~

- ~~(1) holding as a minimum, Fire Officer II certification through the commission; and~~
- ~~(2) providing documentation of completion of the National Incident Management System courses 100, 200, 700 and 800; and~~
- ~~(3) providing documentation acceptable to the commission that the individual has successfully completed Incident Commander training that meets the minimum requirements of the National Fire Protection Association Standard 1026; or~~
- ~~(4) providing documentation acceptable to the commission, in the form of an affidavit from the individual's Head of Department or Chief Training Officer, that the individual has met the department's requirements to perform as an Incident Commander and has demonstrated proficiency as an Incident Commander.~~
- ~~(5) This subsection will expire on January 1, 2022.~~

Source Note: The provisions of this §461.1 adopted to be effective December 3, 2020, 45 TexReg 8528.

§461.3 Minimum Standards for Incident Commander Certification.

In order to be certified as an Incident Commander, an individual must:

- (1) provide documentation of completion of the National Incident Management System courses 100, 200, 700, and 800; and
- (2) possess valid documentation of accreditation from the International Fire Service Accreditation Congress as an Incident Commander; or

(3) complete a commission approved Incident Commander program and successfully pass the commission examination as specified in Chapter 439 of this title (relating to Examinations for Certification). An approved Incident Commander program must consist of one of the following:

- (A) completion of an in-state Incident Commander program meeting the requirements of the applicable NFPA standard and conducted by a commission certified training provider, that was submitted and approved through the commission's training prior approval system; or
- (B) completion of an out-of-state, educational institution of higher education, and/or military training program that has been submitted to the commission for evaluation and found to meet the requirements of the applicable NFPA standard.

Source Note: The provisions of this §461.1 adopted to be effective December 3, 2020, 45 TexReg 8528.

§461.5. Examination Requirement.

Examination requirements in Chapter 439 of this title (relating to Examinations for Certification) must be met to receive Incident Commander certification.

Source Note: The provisions of this §461.1 adopted to be effective December 3, 2020, 45 TexReg 8528.

12. Discussion and possible action on rules reviewed as referred from the Fire Fighter Advisory Committee:

C. 37 TAC, Chapter 491, Voluntary Regulation of State Agencies and State Agency Employees.

CHAPTER 491

VOLUNTARY REGULATION OF STATE AGENCIES AND STATE AGENCY EMPLOYEES

§491.1. Election of Components for Voluntary Regulation.

A state agency or state employee eligible for regulation under the Texas Government Code, §419.083, may apply to the Commission for regulation. The agency or individual must submit an application to the Commission for regulation under one or more components of the Commission's regulatory authority.

Source Note: The provisions of this §491.1 adopted to be effective September 9, 1992, 17 TexReg 5799; amended to be effective July 14, 1993, 18 TexReg 4330; amended to be effective January 1, 1999, 23 TexReg 11963; amended to be effective November 28, 2007, 32 TexReg 8533

§491.3. Documentation.

(a) The state agency or state agency employee seeking regulation or certification under this chapter must provide written documentation from the administrative head of the department providing fire protection, fire prevention, fire instruction, or fire training evaluation describing the duties, responsibilities, and work schedule of the state agency or state employee seeking regulation.

(b) State agency employees who are employed in the field of fire instruction or fire training evaluation who receive certification under this chapter must be full-time employees.

Source Note: The provisions of this §491.3 adopted to be effective September 9, 1992, 17 TexReg 5799; amended to be effective March 23, 1994, 19 TexReg 1681

§491.5. Notification.

If the applicant meets the requirements of the Texas Government Code, §419.083, the commission shall notify in writing the applying agency or agency employee of its decision. The applicant has one year from the date of notification to comply with all regulations applicable to the components elected by the applicant.

Source Note: The provisions of this §491.5 adopted to be effective September 9, 1992, 17 TexReg 5799.

12. Discussion and possible action on rules reviewed as referred from the Fire Fighter Advisory Committee:

D. 37 TAC, Chapter 493, Voluntary Regulation of Federal Agencies and Federal Fire Fighters.

CHAPTER 493

VOLUNTARY REGULATION OF FEDERAL AGENCIES AND FEDERAL FIRE FIGHTERS

§493.1. Election of Components for Voluntary Regulation.

A federal agency or federal fire fighter eligible for regulation under the Texas Government Code, §419.084, may apply to the Commission for regulation. The agency or individual must submit an application to the Commission for regulation under one or more components of the Commission's regulatory authority.

Source Note: The provisions of this §493.1 adopted to be effective September 9, 1992, 17 TexReg 5800; amended to be effective July 14, 1993, 18 TexReg 4331; amended to be effective March 23, 1994, 19 TexReg 1681; amended to be effective January 1, 1999, 23 TexReg 11963; amended to be effective November 28, 2007, 32 TexReg 8534

§493.3. Documentation.

The federal agency or federal fire fighter seeking regulation or certification under this chapter must provide written documentation from the administrative head of the department providing fire protection or prevention describing the duties, responsibilities, description, or nature of federal property protected, and work schedule of the federal agency or federal fire fighter seeking regulation.

Source Note: The provisions of this §493.3 adopted to be effective September 9, 1992, 17 TexReg 5800; amended to be effective March 23, 1994, 19 TexReg 1681

§493.5. Notification.

If the applicant meets the requirements of the Texas Government Code, §419.084, the commission shall notify in writing the applying agency or federal fire fighter of its decision. The applicant has one year from the date of notification to comply with all regulations applicable to the components elected by the applicant.

Source Note: The provisions of this §493.5 adopted to be effective September 9, 1992, 17 TexReg 5800; amended to be effective March 23, 1994, 19 TexReg 1681.

13. Discussion and possible action on 37 TAC, Chapter 463, Advisory Committees.

CHAPTER 463
ADVISORY COMMITTEES,
~~SUBCHAPTER A~~
PRACTICE AND PROCEDURES

§463.1. OBJECTIVE.

(a) The Texas Commission on Fire Protection (TCFP) is organized to aid in the protection of **the** lives and property of Texas citizens through the development and enforcement of recognized professional standards for individuals and the fire service. To achieve the goals of TCFP, each committee will evaluate, make recommendations, and issue reports to the Commission on any issue in the committee's purview. Committees shall represent TCFP in advocacy for or opposition to projects and issues upon the specific authority of the Commission or such authority as may be clearly granted upon general powers delegated by the Commission to that committee.

(b) The Commission has established a Firefighter Advisory Committee, Curriculum and Testing Committee, and Health and Wellness Committee in compliance with Texas Government Code 2110.008 Duration of Advisory Committees. These committees will continue for four years from the date of creation and may be continued following a vote of the commission, to extend each of the established committees. The commission may create short-term Ad Hoc working groups for specific purposes in accordance with this rule. The committee's purpose, eligibility, terms, and meeting procedures are identified in this rule.

§463.3. GENERAL

(a) ~~The Commission shall approve all committees.~~

~~(a)~~(b) The Commission may convene [additional] committees that are deemed to be in the best interest of the Texas Commission on Fire Protection (TCFP) and its mission.

~~(b)~~(c) All committees shall be subject to, and governed by, these bylaws.

~~(c)~~(d) The approved committee shall elect a member of their committee as the chairperson who may remain in this position for two (2) years before reappointment or until such time as a new person is appointed as the Chairperson.

~~(d)~~(e) Committees should be composed of a reasonable odd number of members, with a minimum of nine and a maximum of 15 members.

~~(e)~~(f) The committees shall meet at least twice each calendar year at the call of either the committee chairperson or the Commission.

~~(f)~~(g) All committees shall be reviewed for relevance by the Commission every odd year and will either be renewed or discontinued.

(g)(h) Committee Chairperson may form ad hoc working groups, when in the judgment of the Chair, it will enhance or provide guidance for a specific purpose and time limit/period. Committee Chairperson may determine working group selection, but membership is limited only to the ad hoc and will disband once the purpose has been met.

(h)(i) Annually each Committee Chairperson will present to the Commission an end-of-year status report.

(i)(j) Meetings to deliberate a test item or information related to a test item do not require an open meeting per Texas Government Code §551.088.

§463.5. ELIGIBILITY.

(a) Any person, association, corporation, partnership, or other entity having an interest in the above-recited objectives shall be eligible for membership.

(b) Committee composition should have representatives from each fire protection stakeholder group, with consideration of ~~an~~ department size, region, and mission.

(c) Vacant positions will be announced. Interested, qualified candidates may apply for committee appointments. A candidate selection committee may be formed to assist in the application process and may make recommendations for appointments. The list of candidates will then be presented to the Commission during their next meeting for consideration. The Commission will appoint committee members and select alternates at the same time in the event committee members cannot fulfill their tenure and/or replacement members are needed. Terms shall begin immediately following Commission approval. Interim appointments may be made to complete vacated, **unexpired** ~~un-expired~~ terms.

§463.7. TERMS.

Committee members shall be appointed to serve **six-year** [~~four (4)-year~~] terms of office, with the intent to stagger and to ensure continuity of membership from year to year. Committee members serve **six-year** [~~four-year~~] terms and may serve consecutively; however, after a second **six-year** [~~four-year~~] term, the member will not be eligible for another term until after a lapse of two years.

§463.9. MEETINGS.

(a) Committee Chairperson or a designated Committee member when the Chairperson is unavailable, shall conduct all committee meetings.

(b) Committee meetings should be held in Austin, Texas. Committee meetings cannot be held outside of the state of Texas.

(c) Committees shall post meeting times, locations, and agendas with the Secretary of State in accordance with the Open Meetings Act, Texas Government Code Chapter 551. Committees shall keep minutes in accordance with the Open Meetings Act. When feasible, committees may allow members of the public to participate in a meeting from a remote location by videoconference call pursuant to Texas Government Code §551.127(k) to encourage access and participation throughout the state.

(d) Committee Chairpersons may limit discussion times if, in the opinion of the Chairperson, it is warranted. Participants who fail to follow the above rules may be subject to removal from the meeting.

(e) Committees may meet by videoconference calls, but only if they follow requirements of Texas Government Code §551.127. The committee must still have a physical location for the public to attend. The member presiding over the meeting must attend in person, while other members and staff may attend remotely.

§463.11. LIMITATION OF POWERS.

No action by any Committee Chairperson or its members shall be binding upon, or constitute an expression of, the policy of TCFP until it has been approved or ratified by the Commission. It shall be the function of the committees to evaluate, ~~to~~ make recommendations, and ~~to~~ report only to the Commission. Committees shall represent TCFP in advocacy for or opposition to projects and issues upon the specific authority of the Commission or such authority as may be clearly granted upon general powers delegated by the Commission to that committee.

§463.13. TESTIMONY.

Once committee action has been approved by [~~both the Chairperson of the Commission and~~] the Commission, testimony and/or presentations may be given and made before stakeholders, governmental agencies, or any other entity as deemed appropriate by the Chairperson of the Commission.

§463.15. EXPULSION.

After written notice and a hearing before the Commission, any Committee member may be expelled from a committee for conduct that is unbecoming or prejudicial to the aims or repute of TCFP or expelled for lack of attendance, unless excused, to more than half of the scheduled committee meetings in a calendar year.

§463.17. Abolishment Date

Any Advisory committee created by the Commission will be abolished after four years from the date of creation unless re-established by the Commission prior to the abolishment date.

14. Discussion and possible action on filling the current vacancy on the Firefighter Advisory Committee.



Krum Fire Department
400 N. First Street Krum, Texas 76249
Admin (940) 482-6257 Fax (940) 482-3705
www.krumfire.com



March 29, 2023

Daniel E. DeYear
TCFP Advisory Committee
Presiding Officer

Dear Daniel,

It is with regret that I am writing to inform you of my decision to resign my position on the Advisory Committee, effective March 31, 2023.

It has been a pleasure being a part of the TCFP Advisory Committee. I am very proud of all we have accomplished in the past decade, and I have no doubt the committee will continue these successes in the future.

If I can be of any assistance during the time it will take to fill the position, please don't hesitate to ask

Best regards,

Ken Swindle,
Fire Chief
Krum Fire Department

15. Update from 37 TAC, Chapter 403, Criminal Convictions and Eligibility for Certification Ad Hoc Committee.

16. Review of 2022 data collected regarding fire fighter injuries and the development of recommendations to be submitted to the State Fire Marshal's Office for inclusion in its annual report.

2022 INJURY REPORT

An Annual Summary of Fire Fighter Injuries, Exposures, and Cancer Diagnoses Reported to the Texas Commission on Fire Protection in Calendar Year 2022

By
Grace Wilson
of the
Texas Commission on Fire Protection

Published in cooperation with the Health and Wellness Committee of the Texas Commission on Fire Protection, August 2023



Texas Commission on Fire Protection
PO Box 2286
Austin, TX 78768
512-936-3838

*This publication can be downloaded free of charge on-line:
<https://www.tcfp.texas.gov/services/injury-reports>*

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Mission

The commission shall gather and evaluate data on fire protection personnel injuries and develop recommendations for reducing injuries.

Why we are collecting injury data

Under Texas Government Code §419.048, the Texas Legislature charged the commission with gathering and evaluating data on injuries. The rules requiring regulated entities to report injuries to the commission are in Texas Administrative Code §435.23. The commission encourages volunteer entities to report injuries so that it can gain as accurate a picture as possible concerning injury trends in the Texas fire service. The injury reporting program began in March 2010.

Information the commission collects

- Minor, serious, and fatal injuries,
- Exposures (toxic and pathogenic)
- Cancer diagnoses
- Activities where fire personnel are injured
- Types of injuries (burns, strain-sprains, wounds, etc.)
- Body parts being injured
- Tasks performed at the time of injury
- Missed time
- Work assignment after injury
- Malfunctions/failures of personal protective equipment (PPE), self-contained breathing apparatus (SCBA), personal alert safety systems (PASS devices) and standard operating procedures (SOPs)

How this will help the fire service

- Identify common injuries and exposures
- Identify trends in injuries and exposures
- Identify needed training
- Evaluate and find improvements in procedures

Executive Summary

The information in this report is collected by the Texas Commission on Fire Protection (TCFP) via an on-line injury reporting application. At the time of this writing, the TCFP regulated 38,150 individuals and 795 entities. This report is a comprehensive analysis of injuries and exposures to Texas fire fighters. These injuries and exposures were reported to the TCFP in 2022 by fire departments throughout the state, and this report contains charts and graphs depicting the results of the information that was collected. The report also compares Texas fire fighter injury statistics with national statistics that were gathered by the National Fire Protection Association (NFPA) in 2021.

Under Texas Government Code §419.048, the Texas Commission on Fire Protection is charged with developing and establishing criteria to receive and analyze injury information pertaining to Texas fire fighters. The commission reviews this information to develop recommendations to help reduce injuries to fire protection personnel. The commission provides this information to the State Fire Marshal's Office (SFMO) by September 1 of each year for inclusion in the SFMO's annual Firefighter Fatality Investigations Report. The commission has enacted rules about reporting injuries in the Texas Administrative Code (TAC) Title 37, Chapter 435, and has established the criteria and policies for reporting and analyzing the information.

The commission originally built the data systems necessary to gather this information in 2010. In 2017 the data systems were migrated from a Microsoft Access database structure to a new system which was developed in-house and designed specifically to meet the information resource needs of the TCFP. Fine-tuning of this newer system is ongoing as we receive feedback from stakeholders. The reporting process is accomplished online via TCFP's FIDO system. Fire departments regulated by the commission have been notified of the requirement to report. Several volunteer departments, which are not regulated by the commission, are also participating voluntarily.

This report concludes with recommendations from the commission to help reduce the number of fire fighter injuries in Texas and to improve the injury reporting program.

Abstract

This report contains data submitted by regulated and non-regulated entities.

Grand Totals – 2022

Total number of incidents (injury reports) submitted: 7,223

Total number of individuals who sustained an injury or exposure: 6,986* (A)

Total number of injuries reported: 3,313 (B)

Total number of exposures reported: 3,989 (C)

**Note that an individual could have more than one injury or could have an injury and an exposure. This explains why the total number of individuals who sustained an injury is less than the total number of injuries + total number of exposures. (A < B + C)*

It's important to remember that one incident report can have multiple individuals involved, and each of those individuals can have one or more injuries. For example:

Joe and Bob were burned in a fire while on duty. This resulted in:

- One incident (one injury report), with
- Two individuals who...
- Sustained three injuries
 - Joe was burned on the hand and arm (two injuries)
 - Bob was burned on the leg (one injury)

The "Bird's Eye View"

Reporting Rate 76%. 601 of the 795 regulated departments used TCFP's injury reporting system in 2022.

Top 5 activities that resulted in injuries or exposures:

1. **EMS** = 2,443 injured individuals (34% of the total reported injuries/exposures)
2. **Station Duties** = 2,334 (32% of the total)
3. **Fire Suppression** = 819 (11% of the total)
4. **Skills Training** = 475 (7% of the total)
5. **Wellness/Fitness** = 414 (6% of the total)

State of Texas vs. NFPA

Comparison between the State of Texas (2021) and National Fire Protection Association (NFPA) U.S. Firefighter Injuries (2021)

For the purposes of comparison, the commission has mapped its categories to the NFPA categories as follows:

- “Fireground” includes the commission’s Fire Suppression and Rescue – Fire Related categories.
- “Non-Fire” includes Rescue Non-Fire, EMS and Hazmat.
- “Other On-Duty” includes Fire Prevention, Station Duties and Wellness/Fitness.

The NFPA’s “Responding and Returning” and “Training” categories appear to correspond closely to the commission’s categories. (The NFPA numbers include Texas statistics, although the reporting populations may not be the same.)

Please keep in mind that the comparisons between Texas and the NFPA are using numbers from 2021, and not 2022 data as in the remainder of this report. NFPA’s 2022 injury data will not be published and available until 2024.

Comparing Texas 2021 and NFPA 2021

Table 1: Comparison of Texas 2021 and NFPA 2021

Category	Texas 2021		NFPA 2021	
	Count	Percent	Count	Percent
Fireground	742	12%	19,200	32%
Non-Fire	2,947	46%	13,325	22%
Other On-Duty	2,095	33%	14,850	25%
Training	423	7%	8,125	13%
Responding and Returning	223	3%	4,950	8%
Total	6,430	100%	60,450	100%

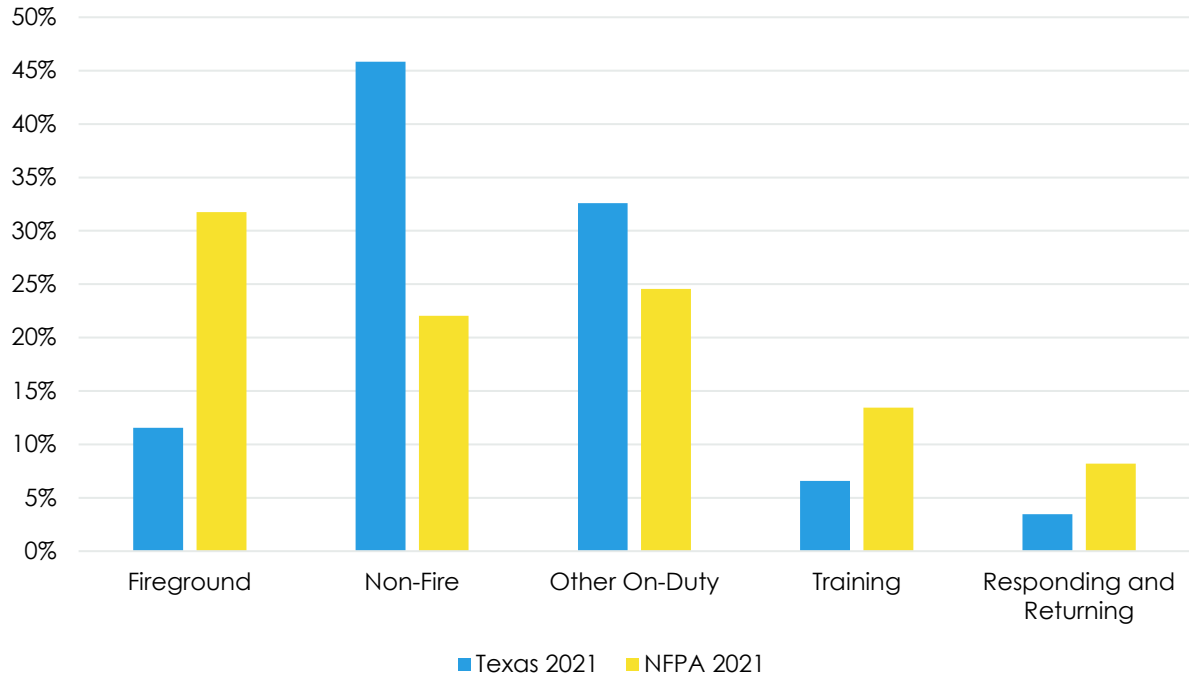
Fatalities in 2021

NFPA: 135 on-duty firefighter fatalities (70 non-COVID deaths, 65 from COVID)

Texas: 3 reported fatalities (2 from COVID, 1 colon cancer)

NFPA data is from the [United States Firefighter Injuries in 2021](#) report, copyright 2022, National Fire Protection Association, Quincy, MA.

Figure 1: Injuries by Activity, percentages
(Comparing Texas 2021 and NFPA 2021)

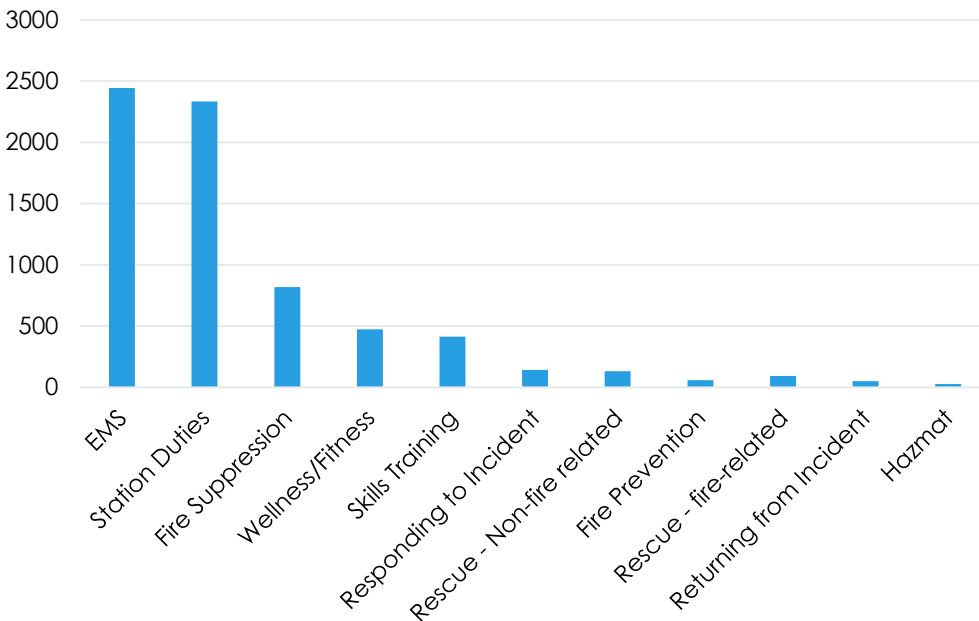


Fire Protection Personnel Injuries

Table 2: Total Injured or Exposed Individuals by Activity and Severity, 2022

Activity	Minor	Serious	Fatal	Total	2021	2020
EMS	1,437	1,006	0	2,443	2,852	3,192
Station Duties	1,105	1,228	1	2,334	1,594	1,454
Fire Suppression	635	183	1	819	691	525
Skills Training	351	124	0	475	423	429
Wellness/Fitness	290	124	0	414	450	422
Rescue - nonfire	110	32	0	142	116	118
Responding to Incident	95	37	0	132	158	91
Fire prevention	37	55	0	92	51	76
Rescue - fire-related	54	5	0	59	51	29
Returning from Incident	30	20	0	50	65	41
Hazmat	22	4	0	26	44	29
Total	4,166	2,818	2	6,986	6,495	6,406

Figure 2: Total Injured or Exposed Individuals by Activity, 2022



Injuries/Exposures by Activity

EMS activities resulted in the highest number of minor injuries in 2022 (see Table 3), which is consistent with the previous five years. The effects of the COVID-19 pandemic can be seen starting in 2020.

Definitions

Minor = An injury/exposure that does not result in the employee missing a full duty period.

Serious = An injury/exposure that results in the employee missing one or more full duty periods.

Fatal = The injured/exposed individual did not survive.

Table 3: Minor Injury/Exposure Activities, 2018 – 2022

Activity	2018		2019		2020		2021		2022	
	Count	%	Count	%	Count	%	Count	%	Count	%
EMS	843	29%	776	26%	2,529	56%	2,095	47%	1,437	34%
Station Duties	437	15%	591	20%	722	16%	828	19%	1,105	27%
Fire Suppression	607	21%	616	21%	397	9%	537	12%	635	15%
Skills Training	277	10%	330	11%	304	7%	303	7%	351	8%
Wellness/Fitness	286	10%	290	10%	306	7%	311	7%	290	7%
Rescue - Non-Fire	157	5%	140	5%	89	2%	94	2%	110	3%
Responding to Incident	99	3%	114	4%	68	2%	123	3%	95	2%
Rescue - Fire Related	39	1%	37	1%	26	1%	41	1%	54	1%
Fire Prevention	69	2%	46	2%	49	1%	40	1%	37	1%
Returning from Incident	57	2%	39	1%	28	1%	41	1%	30	1%
Hazmat	27	1%	24	1%	22	0%	41	1%	22	1%
Total	2,871	100%	2,979	100%	4,518	100%	4,413	100%	4,166	100%

(Numbers in red above = lowest number of injuries for the five-year period.)

Table 4: Serious Injury/Exposure Activities, 2018 – 2022

Activity	2018		2019		2020		2021		2022	
	Count	%	Count	%	Count	%	Count	%	Count	%
Station Duties	201	20%	147	19%	731	39%	766	38%	1,228	44%
EMS	184	19%	146	19%	660	35%	755	37%	1,006	36%
Fire Suppression	191	19%	145	19%	127	7%	153	8%	183	6%
Wellness/Fitness	131	13%	117	15%	116	6%	139	7%	124	4%
Skills Training	123	13%	139	18%	125	7%	120	6%	124	4%
Fire Prevention	21	2%	14	2%	27	1%	11	1%	55	2%
Responding to Incident	64	7%	28	4%	23	1%	35	2%	37	1%
Rescue - Non-Fire	26	3%	17	2%	29	2%	22	1%	32	1%
Returning from Incident	34	3%	14	2%	13	1%	24	1%	20	1%
Rescue - Fire Related	1	0%	2	0%	3	0%	10	0%	5	0%
Hazmat	5	1%	4	1%	7	0%	3	0%	4	0%
Total	981	100%	773	100%	1,861	100%	2,038	100%	2,818	100%

(Numbers in red above = lowest number of injuries for the five year period.)

Fatalities

The commission's 2022 injury report includes two fatalities (one from cancer, one from COVID-19). Fatalities noted in this report include only those reported to the Texas Commission on Fire Protection (TCFP) by the entities it regulates.

The State Fire Marshal's Office conducted four Texas fire fighter fatality incident investigations in 2022. Comprehensive information about the investigations may be found on their website at the following web address:

<https://www.tdi.texas.gov/fire/fmloddannuals.html>

Table 5: Number of Individuals Who Sustained Fatal Injuries/Exposures, 2022

Activity	Count	Percent
Station Duties	1	50%
Fire Suppression	1	50%
Total	2	100%

Emergency vs. Non-Emergency Injuries

Table 6: Number of Injured Individuals by Emergency Activity and Severity, 2022

Activity	Minor	Serious	Fatal	Total
EMS	1,437	1,006	0	2,443
Fire Suppression	635	183	1	819
Rescue - Non-fire related	110	32	0	142
Responding to Incident	95	37	0	132
Returning from Incident	30	20	0	50
Hazmat	22	4	0	26
Rescue - Fire related	54	5	0	59
Total	2,383	1,287	1	3,671

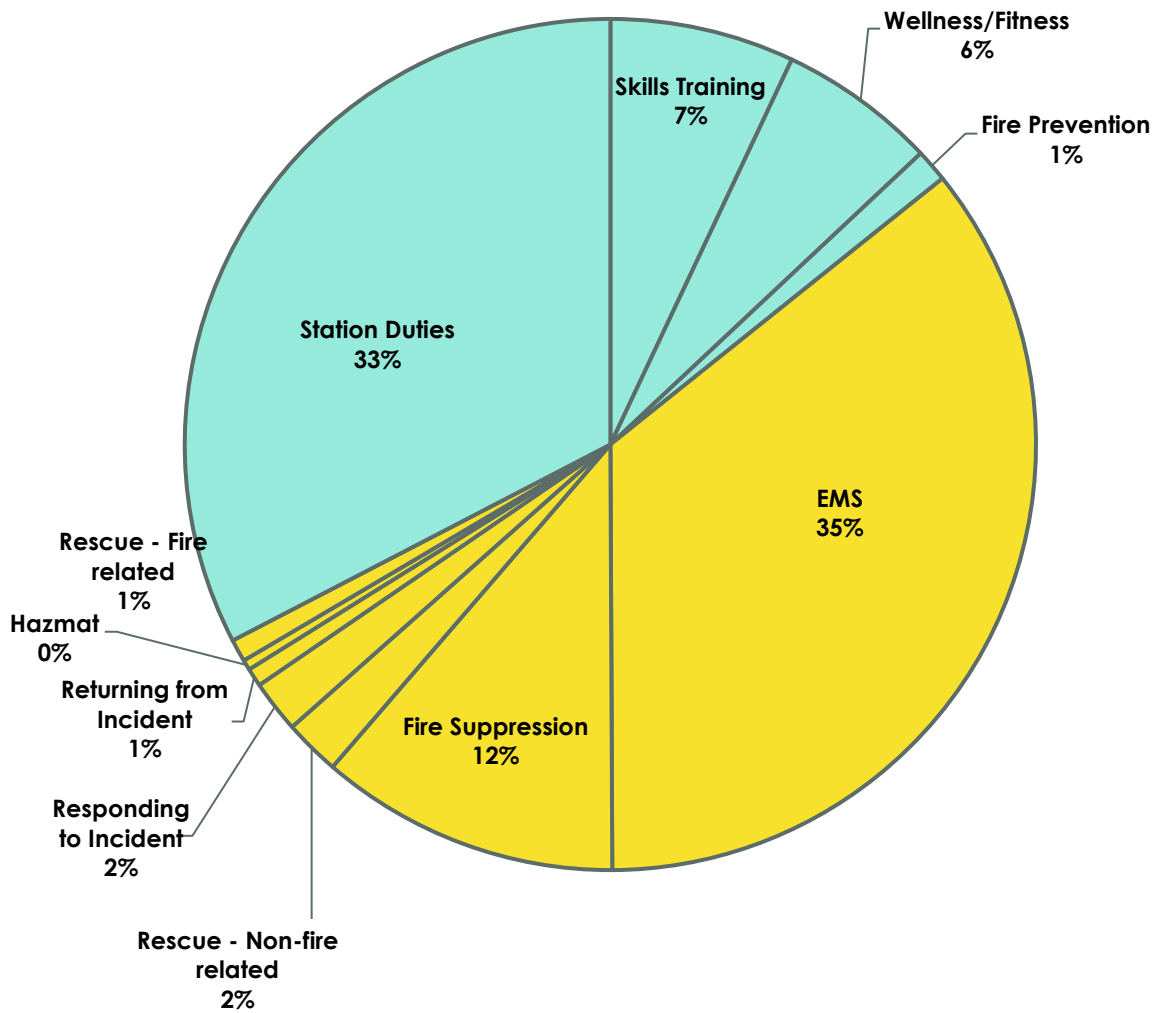
Table 7: Number of Injured Individuals by Non-Emergency Activity and Severity, 2022

Activity	Minor	Serious	Fatal	Total
Station Duties	1,105	1,228	1	2,334
Skills Training	351	124	0	475
Wellness/Fitness	290	124	0	414
Fire Prevention	37	55	0	92
Total	1,783	1,531	1	3,315

Figure 3: Percentages of Injured Individuals in Emergency and Non-Emergency Activities, 2022

Emergency Activities = 53%

Non-emergency Activity Activities = 47%

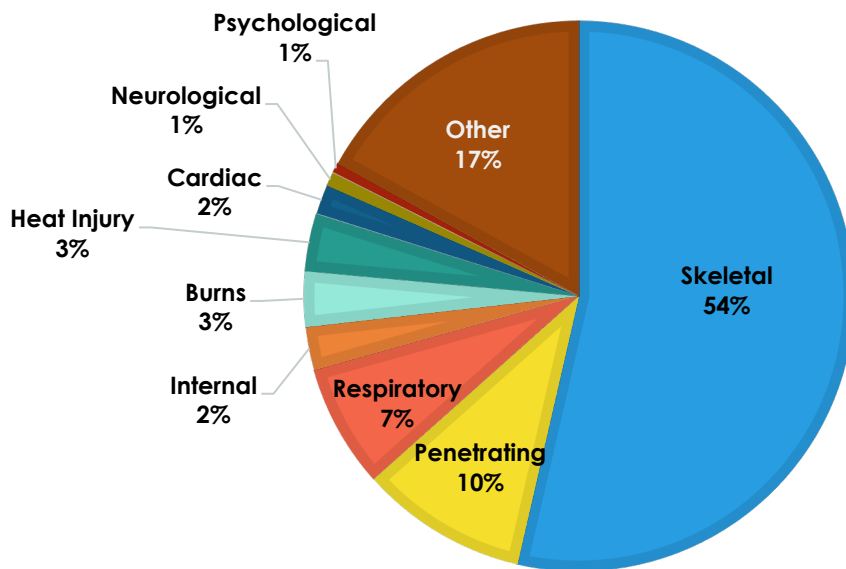


Types of Injuries

Table 8: Types of Injuries, 2022

Type of Injury	2022	
	Count	Percent
Skeletal	1,768	54%
Penetrating	324	10%
Respiratory	239	7%
Internal	85	3%
Burns	106	3%
Heat Injury	111	3%
Cardiac	58	2%
Neurological	27	1%
Psychological	20	1%
Other	561	17%
Total	3,299	100%

Figure 4: Types of Injuries, 2022

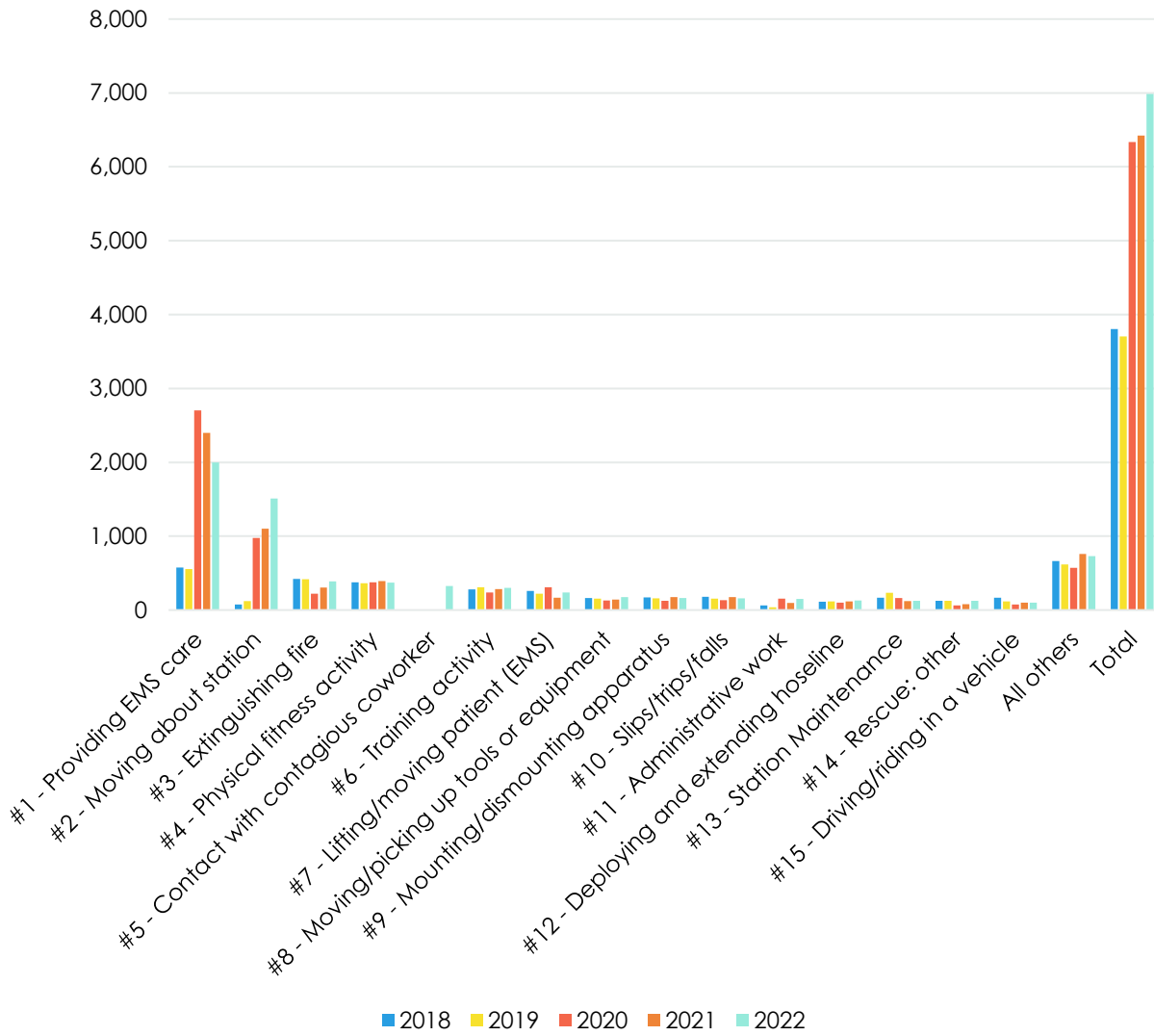


Task at Time of Injury

Table 9: Top 15 Tasks at Time of Injury, 2018 – 2022 (ordered by 2022, descending)

Task	2018	2019	2020	2021	2022
#1 - Providing EMS care	575	556	2,704	2,398	2,000
#2 - Moving about station	77	122	975	1,100	1,511
#3 - Extinguishing fire	423	416	222	306	386
#4 - Physical fitness activity	376	364	376	394	373
#5 - Contact with contagious coworker	n/a	n/a	n/a	n/a	325
#6 - Training activity	281	309	236	284	301
#7 - Lifting/moving patient (EMS)	259	220	307	168	239
#8 - Moving/picking up tools or equipment	163	153	130	142	174
#9 - Mounting/dismounting apparatus	173	159	125	175	164
#10 - Slips/trips/falls	181	154	132	177	157
#11 - Administrative work	61	37	156	98	150
#12 - Deploying and extending hoseline	113	117	100	119	131
#13 - Station Maintenance	166	235	161	123	124
#14 - Rescue: other	126	126	64	79	124
#15 - Driving/riding in a vehicle	166	119	77	100	99
All others	665	617	570	760	728
Total	3,805	3,704	6,335	6,423	6,986

Figure 5: Top 15 Tasks at Time of Injury, 2018 – 2022



Injuries by Body Part

Table 10: Injuries by Body Part Type, 2018 – 2022

Injured Body Part	2018	2019	2020	2021	2022
Upper Extremities	864	795	700	812	824
Lower Extremities	810	684	616	724	762
Back	490	466	445	492	492
Multiple Parts	318	255	281	284	381
Internal	105	125	144	402	326
Head	300	327	197	248	315
Chest	104	108	107	124	141
Neck	64	56	33	38	50
Hip	23	33	29	35	22
Total	3,078	2,849	2,552	3,159	3,313

Table 11: Injuries by Body Part Sub-Type, 2018 – 2022

Body Part by Sub-Type	2018	2019	2020	2021	2022
Back: Back	198	194	191	191	208
Back: Buttocks	1	3	2	2	1
Back: Lower Back	282	258	248	287	271
Back: Neck	4	4	1	8	5
Back: Spine	5	7	3	4	7
Chest: Abdomen	5	4	2	3	3
Chest: Abdominal Area	10	4	9	5	8
Chest: Chest	89	100	96	116	130
Head: Brain	n/a	n/a	n/a	7	23
Head: Cheek	5	7	4	7	7
Head: Chin	7	1	4	2	3
Head: Ear	77	117	50	52	49
Head: Eye	64	60	44	50	56
Head: Face	111	112	78	57	31
Head: Forehead	n/a	n/a	n/a	3	29

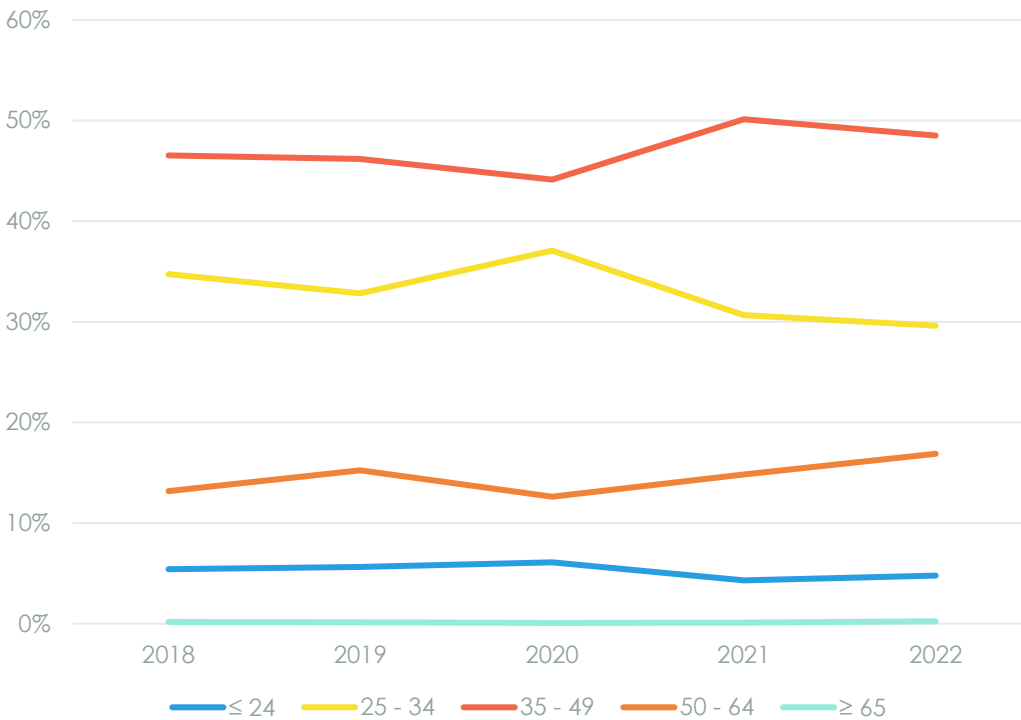
Head: Jaw	1	6	2	2	0
Head: Mouth	15	16	10	8	6
Head: Nose	20	8	3	9	59
Head: Skull	n/a	n/a	2	51	51
Hip: Groin	9	14	9	12	5
Hip: Hip	13	18	18	23	16
Hip: Pelvis	1	1	2	0	1
Internal: Genito-urinary	4	11	4	1	2
Internal: Heart	5	7	4	6	16
Internal: Internal	66	71	74	264	155
Internal: Intestinal tract	5	4	3	2	1
Internal: Lungs	9	11	51	114	140
Internal: Stomach	15	20	8	14	12
Internal: Trachea	1	1	0	1	0
Lower Extremities: Ankle	206	163	135	171	158
Lower Extremities: Foot	93	88	78	78	90
Lower Extremities: Knee	347	273	252	316	342
Lower Extremities: Lower leg	111	97	95	104	88
Lower Extremities: Toes	15	22	13	14	17
Lower Extremities: Upper Leg	38	41	43	41	67
Multiple Parts: Lower Body	26	19	20	15	15
Multiple Parts: Unknown	26	11	27	22	39
Multiple Parts: Upper Body	74	76	65	74	64
Multiple Parts: Whole Body	192	149	169	173	263
Neck: Neck	59	49	30	37	49
Neck: Throat	5	7	3	1	1
Upper Extremities: Elbow	68	44	34	44	61
Upper Extremities: Hands	361	326	319	315	347
Upper Extremities: Lower Arm	10	59	55	55	49
Upper Extremities: Shoulder	234	235	170	270	228
Upper Extremities: Upper Arm	112	72	45	68	89
Upper Extremities: Wrist	79	59	77	60	50
Total	3,078	2,849	2,552	3,159	3,312

Individuals by Age Group

Table 12: Individuals by Age Group, 2018 – 2022

Age Group	2018		2019		2020		2021		2022	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
≤ 24	210	5.41%	210	5.65%	389	6.10%	279	4.31%	316	4.52%
25 - 34	1,348	34.73%	1,220	32.82%	2,365	37.07%	1,986	30.65%	2,067	29.59%
35 - 49	1,806	46.53%	1,716	46.17%	2,815	44.13%	3,248	50.12%	3,416	48.90%
50 - 64	511	13.17%	566	15.23%	805	12.62%	961	14.83%	1,168	16.72%
≥ 65	6	0.15%	5	0.13%	5	0.08%	6	0.09%	19	0.27%
Totals	3,881	100.00%	3,717	100.00%	6,379	100.00%	6,480	100.00%	6,986	100.00%

Figure 6: Individuals by Age Group, percentages, 2018 – 2022



Activities Resulting in Lost Time

Table 13: Activities Individuals Were Doing that Resulted in Lost Time, 2022, Totals

Activity	Count	Days Missed	
		Average	Sum
EMS	950	11	11,097
Station Duties	872	13	11,907
Fire suppression	133	34	4,562
Skills training	89	36	3,222
Wellness/fitness	94	33	3,117
Responding to incident	28	18	521
Rescue - nonfire-related	20	20	412
Returning from incident	16	20	322
Rescue - fire-related	5	33	166
Fire prevention	46	13	630
Hazmat	3	14	43
Total	2,256	22	35,999

Table 14: Activities Individuals Were Doing that Resulted in Lost Time, 2022 Between 1 and 30 Days

Activity	Count	Days Missed	
		Average	Sum
EMS	924	9	8,730
Station Duties	843	10	8,458
Wellness/fitness	64	11	732
Fire suppression	102	10	1,038
Skills training	63	8	552
Responding to incident	24	10	246
Rescue - nonfire-related	18	8	158
Fire prevention	43	9	396
Rescue - fire-related	4	17	69
Returning from incident	12	13	161
Hazmat	3	14	43
Total	2,100	11	20,583

**Table 15: Activities Individuals Were Doing that Resulted in Lost Time, 2022
Between 31 and 90 Days**

Activity	Count	Days Missed	
		Average	Sum
EMS	20	51	1,037
Wellness/Fitness	21	56	1,183
Station Duties	17	45	773
Fire Suppression	18	55	998
Skills Training	14	57	799
Responding to incident	3	36	108
Rescue - nonfire-related	1	53	53
Fire Prevention	2	61	123
Returning from incident	4	40	161
Total	100	50	5,235

**Table 16: Activities Individuals Were Doing that Resulted in Lost Time, 2022
91+ Days**

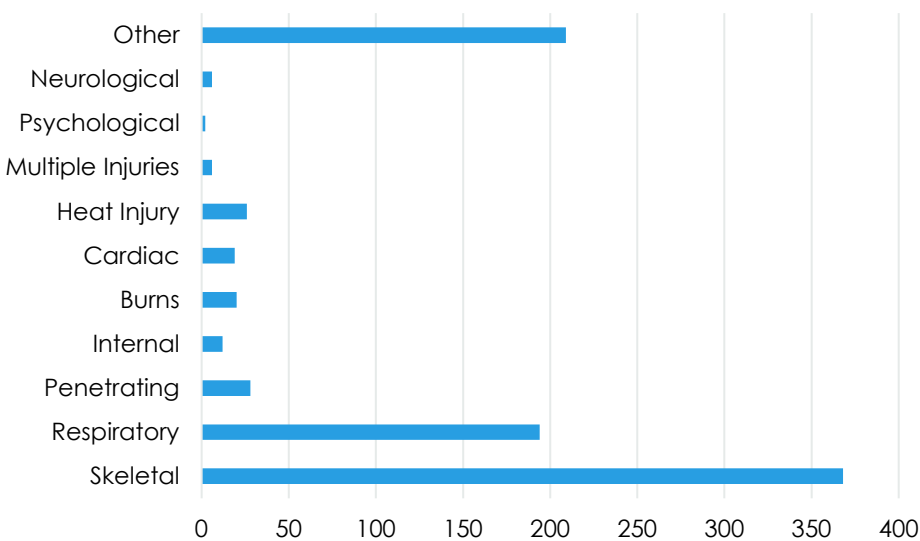
Activity	Count	Days Missed	
		Average	Sum
Fire Suppression	13	194	2,526
EMS	6	221	1,330
Station Duties	12	223	2,676
Skills Training	12	155	1,871
Responding to incident	1	167	167
Fire Prevention	1	111	111
Rescue - fire-related	1	97	97
Wellness/Fitness	9	133	1,202
Rescue - nonfire-related	1	201	201
Total	37	155	6,325

Types of Injuries with Lost Time

Table 17: Types of Injuries Resulting in Lost Time, 2022

Type of Injury	Count
Skeletal	368
Respiratory	194
Penetrating	28
Internal	12
Burns	20
Cardiac	19
Heat Injury	26
Multiple Injuries	6
Psychological	2
Neurological	6
Other	209
Total	890

Figure 7: Types of Injuries Resulting in Lost Time, 2022



Burn Injuries

Table 18: All Burns, 2018 – 2022

All Burns - Types	2018	2019	2020	2021	2022
Heat/Fire (thermal)	108	72	80	66	80
Scald or Steam	12	10	11	12	16
Chemical	6	6	2	3	6
Electrical	1	2	3	4	4
Totals	127	90	96	85	106

Table 19: Burns by Body Part Sub-Type, 2018 – 2022

Body Part Sub-Type	2018	2019	2020	2021	2022
Back: Back	1	0	0	2	2
Back: Buttocks	0	0	0	0	n/a
Back: Lower Back	0	0	0	0	0
Back: Neck	0	0	0	0	0
Back: Spine	0	0	0	0	0
Chest: Abdomen	0	2	0	0	0
Chest: Abdominal Area	0	0	0	0	0
Chest: Chest	2	0	0	0	3
Head: Brain	n/a	n/a	n/a	0	0
Head: Cheek	2	1	1	1	4
Head: Chin	2	1	3	0	1
Head: Ear	17	17	12	13	8
Head: Eye	4	5	3	2	0
Head: Face	9	7	8	2	6
Head: Forehead	n/a	n/a	n/a	1	2
Head: Jaw	0	0	0	0	n/a
Head: Mouth	0	1	0	0	0
Head: Nose	1	0	0	1	0
Head: Skull	n/a	n/a	0	0	1

Hip: Groin	0	0	0	0	0
Hip: Hip	0	0	0	1	0
Hip: Pelvis	0	0	0	n/a	0
Internal: Genito-urinary	0	0	0	0	0
Internal: Heart	0	0	0	0	0
Internal: Internal	0	0	0	0	0
Internal: Intestinal tract	0	0	0	0	0
Internal: Lungs	0	0	0	0	0
Internal: Stomach	0	0	0	0	0
Internal: Trachea	0	0	n/a	0	n/a
Lower Extremities: Ankle	0	0	1	1	1
Lower Extremities: Foot	6	3	4	3	2
Lower Extremities: Knee	0	1	1	0	0
Lower Extremities: Lower Leg	8	3	1	3	5
Lower Extremities: Toes	0	1	0	0	0
Lower Extremities: Upper Leg	0	0	1	0	1
Multiple Parts: Lower Body	0	0	0	0	1
Multiple Parts: Unknown	0	0	0	0	1
Multiple Parts: Upper Body	10	6	11	7	7
Multiple Parts: Whole Body	5	4	0	3	4
Neck: Neck	2	2	2	2	5
Neck: Throat	0	0	0	0	0
Upper Extremities: Elbow	0	0	1	2	2
Upper Extremities: Hands	30	16	20	24	19
Upper Extremities: Lower Arm	0	5	14	8	10
Upper Extremities: Shoulder	9	1	4	3	11
Upper Extremities: Upper Arm	11	3	0	3	8
Upper Extremities: Wrist	8	11	9	3	2
Totals	127	90	96	85	106

Exposures

Table 20: Exposures by Sub-type, 2018 – 2022

Exposure + Sub-Type	2018	2019	2020	2021	2022
Chemical: Ammonia	1	3	0	6	0
Chemical: Battery Acid	n/a	4	0	2	1
Chemical: Benzene	2	15	1	1	0
Chemical: Bleach	1	11	0	2	0
Chemical: Not listed	151	160	70	40	25
Chemical: Unidentified	73	55	27	34	42
Physical: Animal venom	6	17	5	7	2
Physical: Meningitis	38	40	33	3	3
Physical: Not listed	138	201	42	27	34
Physical: Plant toxin	27	14	12	24	22
Physical: Radiation	n/a	4	1	0	0
Physical: Unidentified	87	66	13	17	23
Physical: UV Light	n/a	2	1	0	1
Respiratory: Blood	69	73	78	54	47
Respiratory: COVID 19	n/a	1	1,715	2,878	3,326
Respiratory: Influenza	4	19	7	2	2
Respiratory: Not listed	108	118	56	8	9
Respiratory: Saliva	24	22	28	15	23
Respiratory: Tuberculosis	98	76	31	16	29
Respiratory: Unidentified	50	37	6	19	13
Respiratory: Vomit	7	8	13	4	4
Other: Asbestos	n/a	3	1	109	29
Other: Carbon Monoxide	n/a	1	6	2	11
Other: Carcinogenic Substances	n/a	1	13	15	21
Other: Contaminated Water/Sewage	n/a	4	11	8	21
Other: Chlorine	n/a	n/a	n/a	6	3
Other: Heavy Metals	n/a	0	1	0	1
Other: Mold	n/a	0	9	4	29
Other: Smoke/Products of Combustion	n/a	5	19	37	80
Other: Virus	n/a	3	1,878	266	187
Total	884	963	4,077	3,606	3,988

Table 21: Exposure by Route, 2022

Route	Count
Inhalation	3,659
Absorption	187
Injection/Puncture	54
Ingestion	89
Total	3,989

Figure 8: Exposure by Route, 2022, percentages

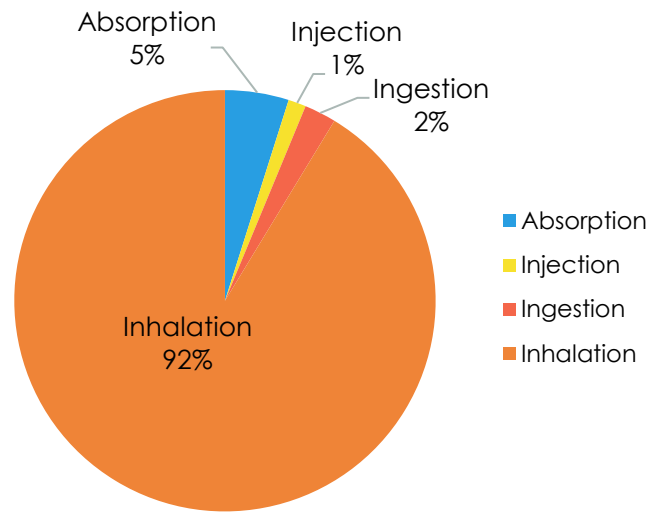
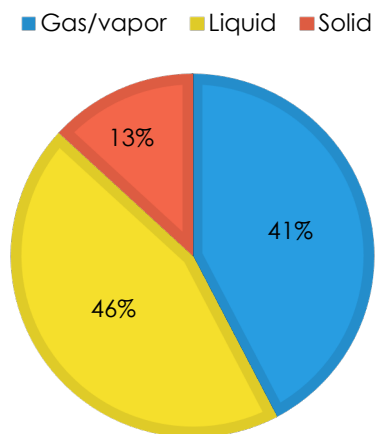


Table 22: Exposure by Substance, 2022

Substance	Count
Liquid	1,819
Gas/vapor	1,641
Solid	529
Total	3,989

Figure 9: Exposure by Substance, 2022, percentages



Cancer

In June of 2019, the Governor of Texas signed Senate Bill 2551 (SB 2551) which expanded the scope of the law in which firefighters and EMTs who suffer from cancer are presumed to have developed the condition during the course and scope of their employment. The types of cancer this law addresses include:

- cancers that originate at the stomach, colon, rectum, skin, prostate, testis or brain
- non-Hodgkin's lymphoma
- multiple myeloma
- malignant melanoma
- renal cell carcinoma

TCFP received **70** reports of cancer diagnoses from fire departments in 2022:

Skin – 17 reports

(Males, ages 40, 40, 43, 44, 45, 47, 49, 49, 50, 51, 52, 54, 54, 55, 59, 61)

(Female – 49)

Prostate – 8

(Males – 49, 49, 53, 54, 57, 58, 62, 64)

Blood – 6

(Males – 39, 43, 44, 47, 47, 48)

Colon – 5

(Males – 47, 51, 53, 61)

(Female – 52)

Kidney – 4

(Males – 54, 60, 68)

(Female – 34)

Testicular – 4

(Males – 26, 31, 31, 33)

Thyroid – 3
(Males – 34, 38, 38)

Adenoid – 1
(Male – 57)

Bladder – 1
(Male – 51)

Brain – 1
(Male – 62)

Breast – 1
(Female – 52)

Bone – 1
(Male – 34)

Lung – 1
(Male – 47)

Pancreas – 1
(Male – 41)

Rectal – 1
(Male – 47)

Stomach – 1
(Male – 49)

Unidentified – 14
(Males – 29, 31, 36, 41, 41, 41, 41, 47, 52, 53, 55, 56, 61, 68)

A Reminder for Fire Departments

Any injuries to fire protection personnel that are reported to the Texas Worker's Compensation Commission must be reported to the Texas Commission on Fire Protection. This includes cancer diagnoses.

The commission strongly encourages fire departments to report cancer diagnoses; the commission recognizes that the number of job-related cancers reported during this time-period represents only a fraction of the cases that Texas fire departments are currently managing. There is a growing awareness of the impact that cancer is having on fire protection personnel nationwide, and the commission urges departments to use this reporting tool to help contribute to the education and awareness of the issue in Texas.

SOP Issues; PPE and PASS Failures

In 2022 there were 17 injuries attributed to failures of fire protection personnel to follow their departments' standard operating procedures (SOPs). All but a few were instances where the individuals were not wearing their provided PPE/SCBA gear in an environment or situation in which they should have been wearing it.

In its compliance inspections, the Texas Commission on Fire Protection verifies that fire departments have written SOPs that cover the appropriate subject matter.

Table 23: Injuries Attributed to SOP Issues, 2022

Activity	Minor	Serious	Total	Previous years' totals			
				2021	2020	2019	2018
EMS	1	0	1	1	18	11	9
Fire Suppression	4	3	7	8	10	10	19
Skills Training	3	0	3	2	5	1	2
Fire related rescue	1	0	1	0	0	2	0
Station Duties	3	1	4	1	2	6	1
Nonfire related rescue	1	0	1	0	0	4	0
Totals	13	4	17	12	35	34	31

Table 24: Injuries Attributed to PPE and PASS Failures, 2022

Activity	Minor	Serious	Fatal	Total	Previous years' totals			
					2021	2020	2019	2018
Fire Suppression	6	1	0	7	4	7	2	8
Skills Training	1	0	0	1	1	1	2	2
Totals	7	1	0	8	5	8	4	10

Recommendations

The commission would like to thank Texas fire departments for their ongoing participation in reporting fire protection personnel injuries. This report would not be possible without their efforts.

Based on their review of the data contained within this report, the commission offers the following recommendations and reminders for the Texas Fire Service:

1. NFPA 1851: Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting is required by state law.
2. Review the following updated legislation:
 - TX Gov't Code 607 (benefits relating to certain diseases and illnesses)
 - HB 2073, Legislative Session 87R (quarantine leave)
 - HB 2143, Legislative Session 86R (workers comp & PTSD)
 - SB 22, Legislative Session 87R (presumptive claims for benefits)
3. Continually review and practice roadway safety and traffic incident management practices.
4. Review all of your department's SOPs with a focus on injury prevention.

These are the recommendations from 2021.  The commission needs to offer new recommendations for this report.

Commission-Adopted Standards

The commission has adopted several NFPA and other nationally recognized standards to help keep Texas fire protection personnel safe. This list summarizes the relationships between some of the Texas laws and national standards and is not intended to be all-inclusive:

Texas Government Code

[§419.040, Protective Clothing](#)

[§419.041, Self-Contained Breathing Apparatus](#)

[§419.042, Personal Alert Safety Systems](#)

[§419.043, Applicable National Fire Protection Association Standard](#)

[§419.044, Incident Management System](#)

[§419.045, Personnel Accountability System](#)

[§419.046, Fire Protection Personnel Operating at Emergency Incidents](#)

[§419.047, Commission Enforcement](#)

Texas Administrative Code

[CHAPTER 425 FIRE SERVICE INSTRUCTORS](#)

[§443.9 National Fire Protection Association Standard](#)

[CHAPTER 435 FIRE FIGHTER SAFETY](#)

[§435.21 Fire Service Joint Labor Management Wellness-Fitness Initiative](#)

[§435.23 Fire Fighter Injuries](#)

[§435.25 Courage to be Safe So Everyone Goes Home Program](#)

[§435.27 Live Fire Training Structure Evolutions](#)

CHAPTER 451 FIRE OFFICER

CHAPTER 457 INCIDENT SAFETY OFFICER CERTIFICATION

Commission's web page

NFPA Standards adopted by the commission

17. Matters from the Agency Chief:

A. Update regarding agency duties and responsibilities.

B. Decision of the Agency Chief in contested cases and consent orders.

C. Status regarding division functions:

1. Training Approval & Testing – test administered, training approvals, record reviews, and online training audits.

2. Certification & Professional Development – training applications, IFSAC seals issued, certifications issued, training facilities, curriculum development, library resource requests.

3. Compliance – biennial inspections, compliance officers training, issues involving regulated entities.

4. Information Technology – public website design, FARM and FIDO improvements, CAPPs (Central Accounting Payroll/Personnel System), IT security policy, and service requests.

Commission Quarterly Report Training Approval and Testing Section

- **Test Administration, Training Approvals, Record Reviews, and Training Audits Statistics – 2nd Quarter, FY 2023**
 - **Test Administration** – 6213 exams were administrated during this quarter with a pass rate of 82.01%.
 - **Training Approvals** – One thousand seventy-four (1074) training approvals were submitted with start dates during this quarter in the commission’s Training Facility Management System.
 - **Record Reviews** – One hundred twenty-four (124) record reviews for equivalency were conducted (74 out of state/education; 16 SFFMA; 34 Wildland/expired certification/expired test scores/reissues). Three (3) of the reviews are pending awaiting additional documentation/information and two (2) were denied. Two hundred and two (202) Qual numbers were issued in the Training Facility Management System.
 - **Training and Skill Testing Audits** – Fourteen (14) online training audits were conducted during the 2nd quarter. Six (6) had no deficiencies noted. Eight (8) had deficiencies ranging from no syllabus, no course schedule, no instructor information, no textbook information, no Lecture and Special instructions and no field examiners. The deficiencies were minor and were corrected with in one or two days.
 - **Online Testing Centers** – Seven (7) new online testing centers were added during the 2nd quarter.

Del Mar College, Corpus Christi	South Texas College, McAllen
Galveston College, Galveston	South Texas College Mid Valley, Weslaco
Navarro College, Waxahachie	South Texas College Starr County, Rio Grande City
TX Tech University – Fredericksburg	
 - **Activities for the Next Quarter** -
 1. Onboard the five (5) online testing centers we have pending.
 2. Working on adding eight (8) additional testing centers (5 in San Antonio, 1 in San Angelo, 1 in DFW area and 1 in Commerce).

Additional Information:

Online vs Written: September 1, 2022 - November 30, 2022

Online: 1983

Written: 1473

Total: 3456

Online vs Written: December 1, 2022 - February 28, 2023

Online: 2451

Written: 1533

Total: 3984

First attempt pass rates for FF1, FF2, AWs and OPS online vs written: Sept. 1, 2021 – Aug. 31, 2022

Online: 1181 / 1722 (68.6%)

Written: 1190 / 1703 (69.9%)

Total: 3425

First attempt pass rates for FF1, FF2, AWs and OPS online vs written: Sept. 1, 2022 – Feb. 28, 2023

Online: 889 / 1273 (69.9%)

Written: 480 / 621 (77.3%)

Total: 1894

2023 1st Quarter: Certification & Professional Development
September 1, 2022- November 31, 2022

	Q1	Q2	Q3	Q4
<u>Certification/Renewal:</u>				
Professional Development Training Applications	8772	2405		
<u>Issued:</u> IFSAC Seals	2164	2208		
TCFP Certifications	2465	2245		
Criminal History	802	691		
Medical documents:	1163	691		
Confirmation of Commissions (Peace Officer)	31	26		
Service time applications	120	110		
<u>Renewals:</u> Department Personnel	34586	44		
Certified Training Facilities	0	234		
Individual Certified Holders	2522	219		
Registered Seals: IFSAC	1773	1794		
TEEX Proboard	443	362		
Total number of Training Facilities	587	593		

Quarterly Report – Curriculum Development

December 2022 – February 2023

1st Quarter Meeting Dates:

Commission Meeting

- January 26

Fire Fighter Advisory Committee

- December 7-8

Curriculum and Testing Committee

- December 13 – Zoom

- January 24-25

- February 14 – Zoom

- February 24 – Zoom

Fire Marshal Ad Hoc Committee

- November 30 - December 1
- February 15-16

Hazmat Ad Hoc Committee

- February 21-22

Vehicle Rescue Ad Hoc Committee

- January 9 – Zoom

Water Rescue Ad Hoc Committee

- January 12

Jones & Bartlett Learning Meeting

- January 23

IFSTA / Pat McAuliff

- February 6

Meetings: Detail

- Texas Commission on Fire Protection – January 26, 2023 9:00 a.m.
 - o Fire Marshal Texas Administration Code Approved
 - o Fire Marshal Curriculum Effective Date Approved
- Fire Fighter Advisory Committee
 - o No agenda items
- Curriculum and Testing Committee – Zoom
 - o December 13

§ Test question Review

- o February 14 – Zoom
- § Review of Rope Rescue Texas Administrative Code
- § Test Question Review
- o February 24 – Zoom
- § Test Question Review
- Fire Marshal Ad Hoc Committee – October 13 Zoom
- o Test Question Review
- Fire Marshal Ad Hoc Committee – November 30-1
- o Test Question Reviewed
- Hazmat Ad Hoc Committee – February 21-22
- § Review –
- Current Documentation
- o Correlation Sheets
- o Skills Manual – Aws/Ops completed
- o Curriculum Manual – Aws / Ops completed
- Updated Documentation 2022
- o NFPA 470 Ch. 5,6,9,11,13
- o Skills Manual – Aws/Ops completed
- o Curriculum Manual – Aws / Ops completed
- o 2022 Edition Correlation Sheets
- Vehicle Rescue Ad Hoc Committee – September 27 Zoom
- o Status update

- Water Rescue Ad Hoc Committee – September 1

- o Status Update

- Jones and Bartlett Meeting

- o Reference Material Availability

- IFSTA Meeting

- o Reference Material Availability

FARM

- Fire Marshal Course Entered into Farm - February 8-9

- Fire Marshal Correlation Sheet Entered into Farm February - 8-9

- Rope Aws/Ops Course Entered into Farm - February 10

- Rope Aws/Ops Correlation Sheet Entered into Farm - February 10

Test Question Feedback Review

- Feedback Scheduled Review-

- o Reviewed Dec. 2

- o Reviewed Dec. 16

- o Reviewed Jan. 6

- o Reviewed Jan. 20

- o Reviewed Feb. 3

- o Reviewed Feb. 24

Note: Unscheduled Reviews were conducted when needed by the Testing Department and/ or Curriculum, or when stakeholders reached out via. phone or email – on day of request.

Test Development and Test Bank Maintenance

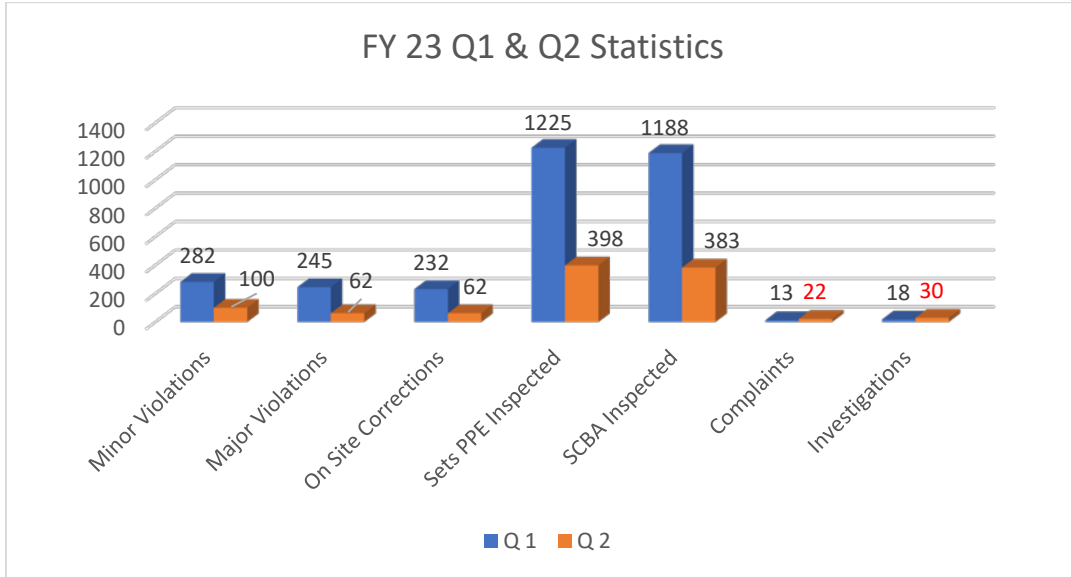
· Updated test bank

§ Feedback questions – Reviewed, Edited, or Archived - Ongoing

§ Question validation/ Reference updates – Ongoing all disciplines

Commission Quarterly Report Compliance Division

Compliance Inspection Activity statistics:



Reorganization of regions due to demographic changes

Compliance Officer hired to fill region 4 vacancy

Training for new compliance officer

Began coordinating & scheduling 2023 regional meetings

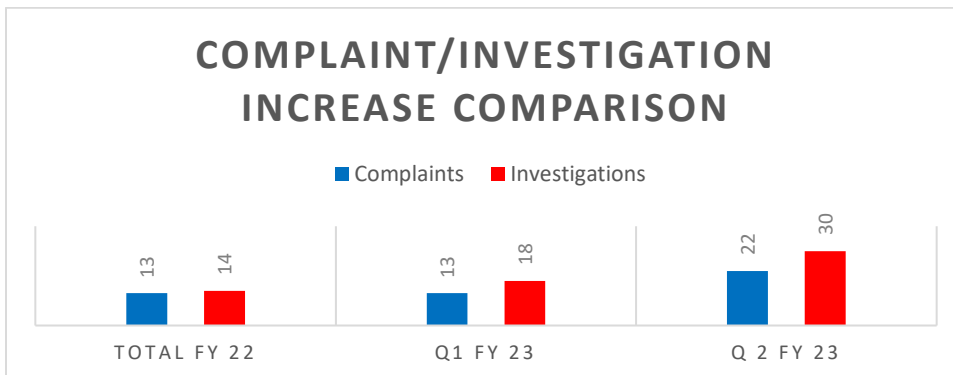
TCFP update at TAFE conference

Worked with testing to coordinate and proctor exams

CAPPS Training

Inspection files forwarded to compliance chief for further action: 5

Significant increase in investigations and complaints



IT Division report for 2nd quarter:

- TCFP Websites and Web Applications Uptime 99.9%
- Databases
 - Server resized
 - FionaExams re-indexed/monitored
- Written/Online Exams
 - Test bank updated
- FARM/ FIDO
 - Bug Fixes
 - Enhancements
- Public Website
 - Optimized
 - Bug Fixes
- Addressed 344 Service Requests (Tickets)

18. Personal matters regarding the appointment, employment, compensation, Evaluation, reassignment, and duties of the Agency Chief.

19. Adjourn meeting.