THE EXPERIENCE™

• CONVENTION AND TRADE SHOW •

SEPTEMBER 3–5, 2025

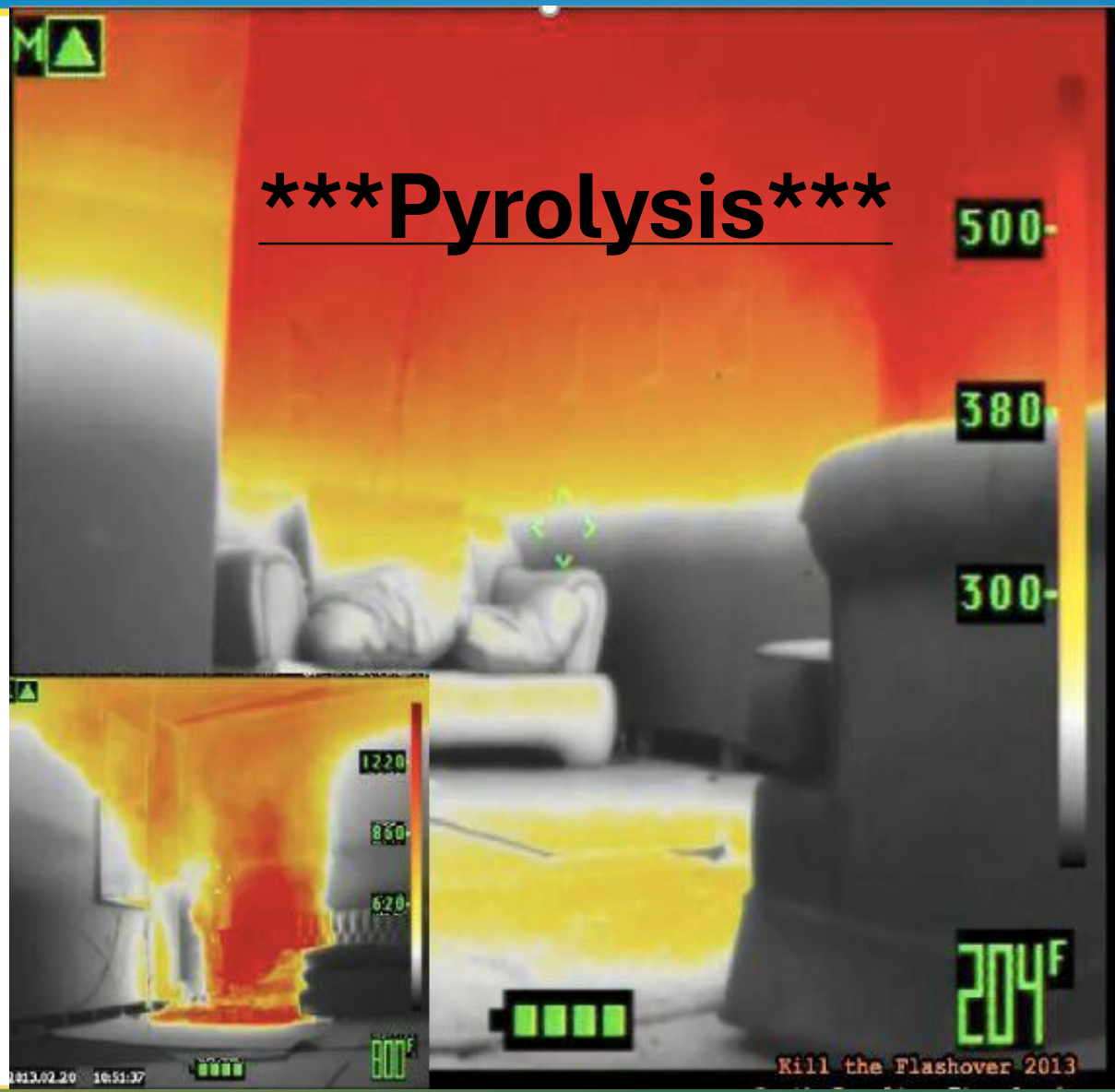
CAESARS FORUM CONFERENCE CENTER

LAS VEGAS, NV


FIRE!
What Are We Missing?


combustion

Pyrolysis


500
380
300
204F
1220
860
620
Kill the Flashover 2013

Pyrolysis vs Combustion

- ***Pyrolysis*** -Thermal Decomposition without combustion in absence of oxygen

- ***Combustion*** - a chemical process where a substance reacts rapidly with an oxidizer (usually oxygen) to produce heat and often light


H
390
335
300
500
380
300
2013.02.20 10:49:39
69F
Kill the Flashover 2013
South Carolina Fire Academy

- Used in manufacturing processes
- Clear, colorless liquid
- Used in:
  - Paint
  - Varnishes
  - Metal cleaner
  - Adhesives
  - Gasoline

Can cause:
- Irritated eyes, nose, & throat
- Dizziness & headaches

Long-term exposures:
- Numbness
- Reproductive Damage

Toluene

CaseStudy

- Fire in attic
- Pyrolysis in spray foam insulation
- Combustion products throughout home
- Original contractor removed
- New contractor brought in over **3 weeks after fire**
- CIH brought in **one month** after fire


0.2
ppm
CF = 1.00 Isobutyl

Photo 64: Wipe sample of smoke residue obtained from 2nd floor master bath counters – held in file for possible future analysis

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit
VOLATILE ORGANICS IN AIR	**TO-15**			
Tetrahydrofuran	< 5.0	5.0	< 14.75	14.75
Toluene	**0.7**	**0.5**	**2.64**	**1.89**
Acetone	**16**	**5.0**	**38.2**	**11.9**
Allyl chloride	< 2.0	2.0	< 6.26	6.26
Benzene	< 0.5	0.5	< 1.60	1.60
Heptane	**1.7**	**0.5**	**6.85**	**2.05**
Hexachlorobutadiene	< 1.0	1.0	< 10.7	10.7
Hexane	**2.3**	**1.0**	**7.92**	**3.52**

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Home › Permissible Exposure Limits - Annotated Tables

Permissible Exposure Limits – Annotated Tables

"OSHA's mandatory PELs in the Z-Tables remain in effect. However, OSHA recommends that employers consider using the alternative occupational exposure limits because the Agency believes that exposures above some of these alternative occupational exposure limits may be hazardous to workers, even when the exposure levels are in compliance with the relevant PELs."

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Home › Permissible Exposure Limits - Annotated Tables

Permissible Exposure Limits – Annotated Tables

- California Division of Occupational Safety and Health (Cal/OSHA) Permissible Exposure Limits (PELs).
- National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs).
- ACGIH® Threshold Limit Values (TLVs®) and Biological Exposure Indices (BEIs®)

Annotated OSHA Z-2 Table[a]

*Go to list of all footnotes

Regulatory Limits						Recommended Limits	
OSHA PELs[b]					Cal/OSHA PEL[c] (as of 10/2/2019)	NIOSH REL[d] (as of 10/18/2019)	ACGIH® 2019 TLV®[e]
Substance	8-hour Time Weighted Average (TWA)	Acceptable Ceiling Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift				
			Concentration	Maximum Duration	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 min	10 ppm (ST) 150 ppm (C) 500 ppm	100 ppm (ST) 150 ppm	20 ppm

OSHA Annotated Table Z-1[(a)]

*Go to list of all footnotes

Substance	CAS No. [(c)]	Regulatory Limits			Recommended Limits	
		OSHA PEL[(b)]		Cal/OSHA PEL[(f)] *(as of 10/2/2019)*	NIOSH REL[(g)] *(as of 10/18/2019)*	ACGIH® 2019 TLV® [(h)]
		ppm[(d)]	mg/m^3[(e)]	8-hour TWA (ST) STEL (C) Ceiling	Up to 10-hour TWA (ST) STEL (C) Ceiling	8-hour TWA (ST) STEL (C) Ceiling
Acetone	67-64-1	1000	2400	500 ppm (ST) 750 ppm (C) 3000 ppm	250 ppm	250 ppm (ST) 500 ppm
n-Hexane	110-54-3	500	1800	50 ppm	50 ppm	50 ppm

- **Part Number:** 1926
- **Part Number Title:** Safety and Health Regulations for Construction
- **Subpart:** 1926 Subpart D
- **Subpart Title:** Occupational Health and Environmental Controls
- **Standard Number:** 1926.55
- **Title:** Gases, vapors, fumes, dusts, and mists.
- **GPO Source:** e-CFR

Table 1 to §1926.55 — Permissible Exposure Limits for Airborne Contaminants

Substance	CAS No.[d]	ppm[a]	mg/m^3 [b]	Skin designation*
Acetone	67-64-1	1000	2400	—
n-Hexane	110-54-3	500	1800	—
Toluene	108-88-3	200	750	—
Ozone	10028-15-6	0.1	0.2	—

- **Part Number:** 1926
- **Part Number Title:** Safety and Health Regulations for Construction
- **Subpart:** 1926 Subpart E
- **Subpart Title:** Personal Protective and Life Saving Equipment
- **Standard Number:** 1926.103
- **Title:** Respiratory protection.
- **GPO Source:** e-CFR

Note: The requirements applicable to construction work under this section are identical to those set forth at 29 CFR 1910.134 of this chapter

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Home > By Standard Number > 1910.134 - Respiratory protection.

- **Part Number:** 1910
- **Part Number Title:** Occupational Safety and Health Standards
- **Subpart:** 1910 Subpart I
- **Subpart Title:** Personal Protective Equipment
- **Standard Number:** 1910.134
- **Title:** Respiratory protection.
- **Appendix:** A, B-1, B-2, C, D
- **GPO Source:** e-CFR

1910.134(d)(1)(iii)

The employer shall identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include

- **a reasonable estimate of employee exposures to respiratory hazard(s) and**
- **an identification of the contaminant's chemical state and physical form.**

Where the employer cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be IDLH

Hi David,

My name is Bruce Hanna. I am an industrial hygiene consultant with the Arizona Division of Occupational Safety and Health (ADOSH) here in Phoenix, AZ. Your question was submitted to Federal OSHA (October 25, 2017) who returned your question to Region IV who forwarded your question to ADOSH (November 2, 2017) probably because we are a state OSHA program here in Arizona. I am sorry for the delay.

Our industry lacks studies we can source for much of what we see. Having said that, a few questions have arisen within our industry regarding the interpretation of certain OSHA standards.

Please review the questions and give us guidance on interpretations:

1) In structure fires, after the fire is extinguished, restoration companies go in to restore the properties. In most all cases, the structures still possess visible smoke contaminants throughout the home. Diverse types of toxins can be created during incomplete combustion and they are either solid particulate or chemicals that attach or-bind to particulates and remain in the buildings on surfaces or in the atmosphere. The questions, are regarding the OSHA RPP standard 1910.134 (d)(1)(iii).

a) Are restoration companies required to have air and surface samples taken to identify what respiratory hazards exist in these work places to determine what is there and how much?

Response is taken directly from the Respiratory Protection CPL 02-00-158:

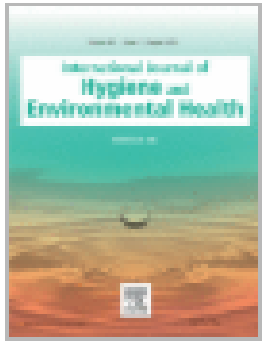
The employer is required to select and provide an appropriate respirator (NIOSH certified) based on the respiratory hazard(s) present in the workplace. The employer must identify hazardous airborne contaminants that employees may inhale and make a reasonable estimate of employee exposures in determining the appropriate respirator for employees to use. The employer must evaluate the respiratory hazards in the workplace where there is a potential for an employee overexposure.

Oxygen deficient atmospheres and those atmospheres that are not or cannot be estimated must be treated as immediately dangerous to life and health (IDLH) environments.

1. **Workplace Hazard Assessment** (for PPE)
2. **Personal Sampling** (breathing zone)
3. **Environmental Screening** (PIDs, FIDs, IR, scattered light dust detectors, etc.
4. **Historical Data**
5. **Objective Data** (Industry Studies, Trade Associations, Tests)
6. **Mathematical Approaches**

International Journal of Hygiene and Environmental Health

Volume 222, Issue 7, August 2019, Pages 991-1000



Firefighters' and instructors' absorption of PAHs and benzene during training exercises

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit
VOLATILE ORGANICS IN AIR	**TO-15**			
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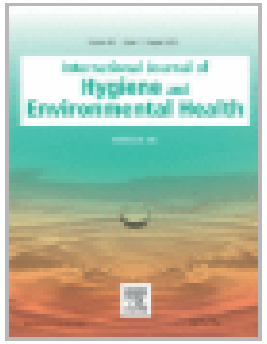

Firefighters' and instructors' absorption of PAHs and benzene during training exercises

- The highest polycyclic aromatic hydrocarbon (PAH) exposures came from exercises involving oriented strand board as fuel.
- Instructors' PAH exposures may be higher from repeated training fires than responding to a single residential fire.
- Skin contamination likely contributed to the biomarkers and should be minimized.

Conclusions

Dermal absorption likely contributed to the biological levels as the respiratory route was well protected. Training academies should consider exposure risks as well as instructional objectives when selecting training exercises.

5. While there is a known association between firefighting and occupational disease in firefighters; there is no known association between fire and smoke damage restoration work and occupational disease in restorers working in cold fire scenes.

occupational diseases in fire damage restoration workers

AI Mode | All | Images | News | Videos | Short videos | Forums | More options | Tools

AI Overview

Fire damage restoration workers face a variety of occupational diseases due to exposure to hazardous materials and conditions. These include **respiratory issues from smoke and soot inhalation, skin and eye irritation from chemical exposure, and long-term risks from carcinogens like asbestos and PAHs**. Furthermore, potential hazards like mold, structural instability, and carbon monoxide exposure can exacerbate these risks.

Specific Occupational Diseases and Hazards:

Respiratory Issues:

Smoke and soot contain microscopic particles that can irritate lungs, worsen asthma, and cause bronchitis, pneumonia, or even long-term respiratory conditions says PuroClean. Workers with pre-existing respiratory conditions are especially vulnerable.

Skin and Eye Irritation:

Exposure to smoke, soot, and certain chemicals can cause skin rashes, irritation, and eye problems.

Worker Safety and Health During Fire Cleanup

Health Hazards. Carbon monoxide poisoning. Ash, soot and dust. Asbestos. Hazardous liquids. Heat illness. Confinement...

California Department of Industrial Relations

Hazards During Wildland Fire Cleanup | Outdoor - CDC

Nov 6, 2024 — Carbon Monoxide Wildland fire cleanup activities may involve the use of...

Centers for Disease Control and Prevention ...

Occupational hazards of fire debris cleanup - Wikipedia

Arsenic: Health Risk: It is a carcinogen that can cause cancer, vomiting and damage nerves,...

Wikipedia

As documented in this Standard, restorers are required by Authorities Having Jurisdiction (AHJ) to provide employees with appropriate training, PPE (Personal Protective Equipment), and engineering controls to reduce risks from hazardous substances which may be released during and after a fire.

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Home > By Standard Number > 1910.134 - Respiratory protection.

- **Part Number:** 1910
- **Part Number Title:** Occupational Safety and Health Standards
- **Subpart:** 1910 Subpart I
- **Subpart Title:** Personal Protective Equipment
- **Standard Number:** 1910.134
- **Title:** Respiratory protection.
- **Appendix:** A, B-1, B-2, C, D
- **GPO Source:** e-CFR

5. While there is a known association between firefighting and occupational disease in firefighters; there is no known association between fire and smoke damage restoration work and occupational disease in restorers working in cold fire scenes.

occupational diseases in chimney sweep workers

AI Mode | All | Images | Videos | Short videos | Forums | News | More options | Tools

AI Overview

Chimney sweeps face a variety of occupational hazards, leading to increased risks of certain **cancers, respiratory illnesses, and cardiovascular diseases**. These risks stem from exposure to soot, silica, and other airborne particles generated during chimney cleaning and maintenance.

Increased Cancer Risks:

Scrotal Cancer:
One of the earliest recognized occupational cancers, scrotal cancer, was linked to chimney sweeps' exposure to soot as far back as the 1700s.

Lung Cancer:
Studies have consistently shown that chimney sweeps have a higher risk of lung cancer.

Other Cancers:
Increased risks have also been observed for cancers of the bladder, esophagus, bowel, liver, and pleura.

Soot and PAH Exposure:
The presence of polycyclic aromatic hydrocarbons (PAHs), found in soot, is believed to be a significant factor in the increased cancer risk, with some studies suggesting a causal link.

Protecting Chimney Sweeps from Respiratory Hazards - CDC
Page 1. Chimney sweeping activities can expose sweeps and others. near the work area to toxic...
CDC

SOOT, AS FOUND IN OCCUPATIONAL EXPOSURE ... - NCBI
Overall, considering a consistently observed increased lung-cancer risk in several studies, and on the basis of a large coho...
NCBI

Chimney sweeps' carcinoma - Wikipedia
Chimney sweeps' cancer, also called soot wart or scrotal cancer, is a squamous cell carcinoma of the scrotum. It has th...
Wikipedia

Show all

Percivall POTT

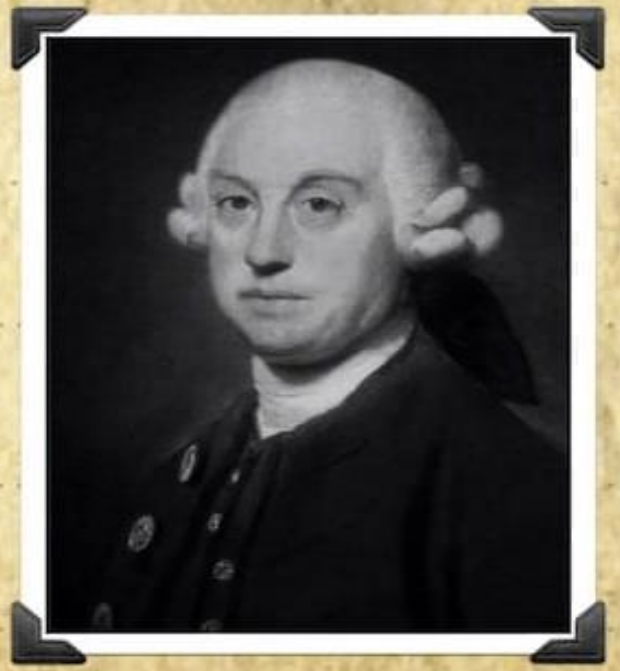
1714 - 1788

Pott fracture

Pott puffy tumour

Pott cancer

Pott disease



eponymictionary

Chimney Sweep

- First reported cases of occupational cancer by Percival Pott in 1775
- Children as young as 8 years old developed scrotal cancer (median age of diagnosis 38 years)
- Polycyclic aromatic hydrocarbons (PAHs) in soot postulated to be the primary cause of the tumors

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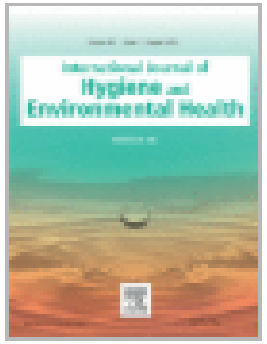


Firefighters' and instructors' absorption of PAHs and benzene during training exercises

Chimney Sweep

- First reported cases of occupational cancer by Percival Pott in 1775
- Children as young as 8 years old developed scrotal cancer (median age of diagnosis 38 years)
- Polycyclic aromatic hydrocarbons (PAHs) in soot postulated to be the primary cause of the tumors

- **Part Number:** 1910
- **Part Number Title:** Occupational Safety and Health Standards
- **Subpart:** 1910 Subpart Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1002
- **Title:** Coal tar pitch volatiles; interpretation of term.
- **GPO Source:** e-CFR

Restoration firms have a long history of managing occupational exposures and have earned commensurate rates with workers' compensation insurers.

Occupational Safety and Health Administration

OSHA | STANDARDS | ENFORCEMENT | TOPICS | HELP AND RESOURCES

- **Part Number:** 1926
- **Part Number Title:** Safety and Health Regulations for Construction
- **Subpart:** 1926 Subpart C
- **Subpart Title:** General Safety and Health Provisions
- **Standard Number:** 1926.20
- **Title:** General safety and health provisions.
- **GPO Source:** e-CFR

1926.20(b)(1)

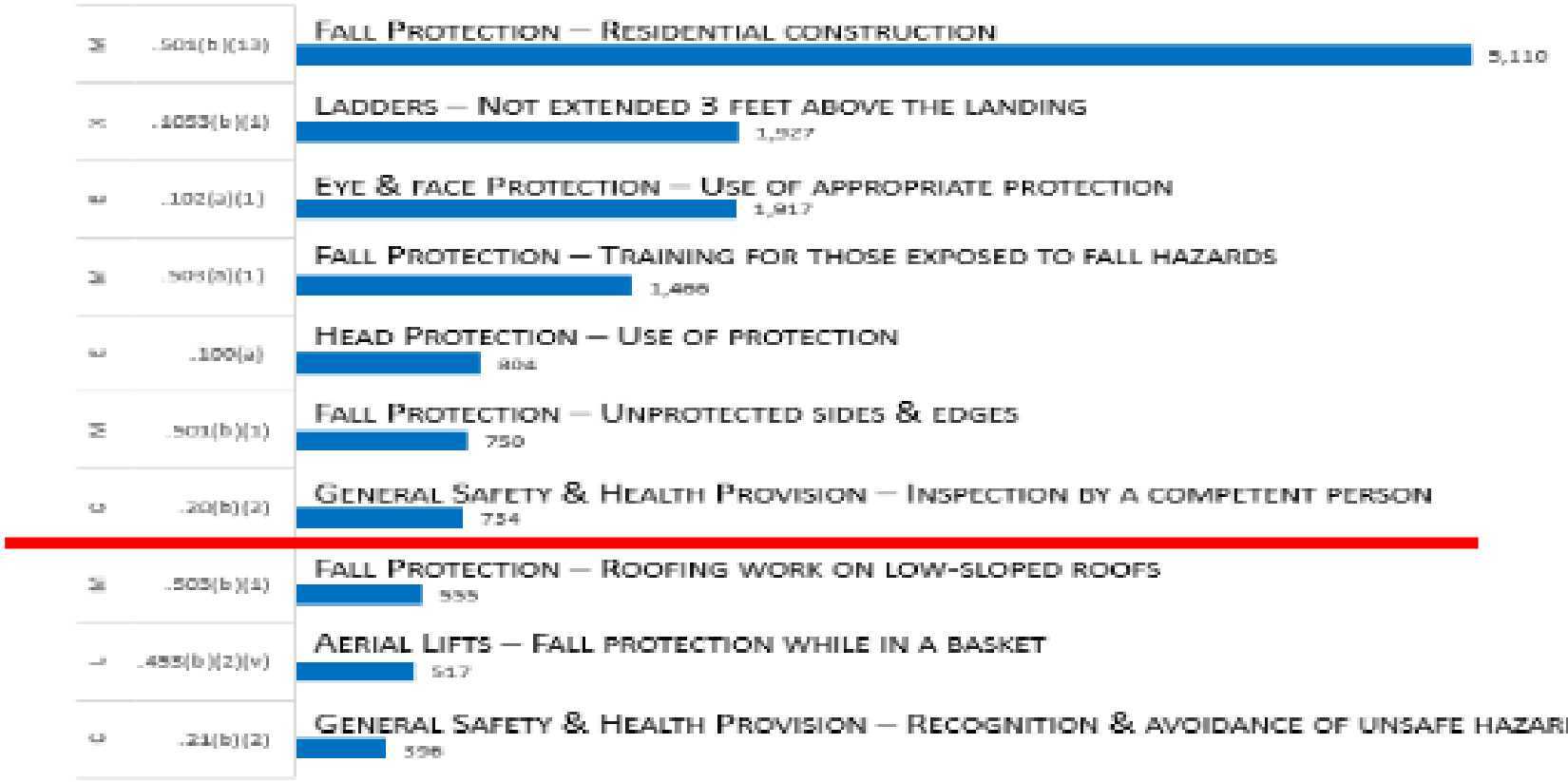
It **shall** be the responsibility of the employer to initiate and maintain such programs as may be necessary to comply with this part.

1926.20(b)(2)

Such programs **shall** provide for frequent and regular inspections of the job sites, materials, and equipment to be made by competent persons designated by the employers.

Most Frequently Cited Serious Violations in Construction FY 2024

29 CFR 1926.



1926 Overall MFC

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