

Statewide Framework Document for: 430203

**Fire Science and Emergency Services**

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for 1.0 credit lab science and 1.0 credit physical education.**

The Washington State Science Standards performance expectations for high school blend core ideas (Disciplinary Core Ideas, or DCIs) with scientific and engineering practices (SEPs) and crosscutting concepts (CCCs) to support students in developing usable knowledge that can be applied across the science disciplines. These courses are to be taught in a [three-dimensional manner](#). The details about each performance expectation can be found at [Next Generation Science Standards](#).

[Washington state's 2016 Physical Education K–12 Learning Standards](#) reflect the National Standards for physical education that were adopted by SHAPE America (the Society of Health and Physical Educators). SHAPE America's (Society for Health and Physical Educators) National Standards define what a student should know and be able to do as result of a quality physical education program. States and local school districts across the country use the National Standards to develop or revise existing standards, frameworks, and curricula. ***It is highly recommended that students take their first Physical Education course at their local high school for fundamental knowledge and skills.***

**Physical Education Standards** are embedded throughout the course which includes alignment to 21<sup>st</sup> Century Skills.

The following levels of understanding and in-demand transportable skills are embedded throughout the lessons within each of the units and build upon each other.

Standard 1: Students will demonstrate competency in a variety of motor skills and movement patterns.

Standard 2: Students will apply knowledge of concepts, principles, strategies, and tactics related to movement and performance.

Standard 3: Students will demonstrate the knowledge and skills to achieve and maintain a healthy-enhancing level of physical activity and fitness.

Standard 4: Students will exhibit responsible personal and social behavior that respects self and others.

Standard 5: Students will recognize the value of physical activity for health, enjoyment, challenge, self-expression, and social interaction.

School District Name		
<b>Course Title:</b> Fire Science and Emergency Services	<b>Total Framework Hours:</b> 540 hours	
<b>CIP Code:</b> 430203	<input type="checkbox"/> Exploratory <input checked="" type="checkbox"/> Preparatory	<b>Date Last Modified:</b> April 1, 2022
<b>Career Cluster:</b> Law, Public Safety, Corrections & Security	<b>Cluster Pathway:</b> Emergency and Fire Management Services	

**Course Summary:**

A course that prepares individuals to perform the duties of firefighters and emergency services personnel. Includes instruction in firefighting equipment operation and maintenance, principles of fire science and combustible substances, methods of controlling different types of fires, hazardous material handling and control, fire rescue procedures, public relations, emergency medical services and applicable laws and regulations. Different careers in the Fire Service are also explored. Careers include Firefighter, Dispatcher, Emergency Medical Technician, Paramedic, Dispatcher, Wildland Firefighter, Fire Investigator, and Public Education.

**Units**

Unit 1 Firefighter Orientation and Organization (20)

Unit 2 Firefighter Safety and Personal Protective Equipment (30)

Unit 3 Communications (30)

Unit 4 Fire Hose & Appliances, Nozzles and Streams, Water Supply and Portable Fire Extinguishers (40)

Unit 5 Self-Contained Breathing Apparatus, Structural Search and Rescue, Firefighter Survival (30)

Unit 6 Fire Service Tools & Equipment & Fire Service Ropes and Knots (30)

Unit 7 Fire Behavior & Fire Suppression (60)

Unit 8 Emergency Medical Services (40)

Unit 9 Building Construction, Forcible Entry, & Ventilation (40)

Unit 10 Fire Service Ladders (20)

Unit 11 Hazardous Materials Overview, Hazardous Materials Recognition & Identification, & Terrorism Awareness (40)

Unit 12 Wildland Firefighting (50)

Unit 13 Career Planning/Employability & Personal Success (ongoing throughout course)

Unit 14 Physical Training and Health and Nutrition (80)

Unit 15 Fire Prevention, Public Education, and Fire Cause Determination and Scene Preservation (30)

**Eligible for Equivalent Credit in:** 1.0 Lab Science, 1.0 Physical Education

**Total Number of Units:** 15

**Course Resources:**

National Fire Protection Association (NFPA 1001); Standard for Fire Fighter Professional Qualifications 2013 Edition: NFPA 1582: Standard on Comprehensive Occupational Medical Program for Fire Departments, 2013 Edition: NFPA 472: Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents, 2013 Edition: National Wildfire Coordinating Group Firefighter II standards; Washington State Fire Service Hazmat Awareness and Operations Training; First Responder/ EMS, CPR & First Aid, Federal Emergency Management Agency (FEMA), IFSTA publications.

**Unit 1:** Firefighter Orientation and Organization

**Total Learning Hours for Unit:** 20

**Unit Summary:**

Students will be able to gain an understanding of firefighting through identifying the mission of the fire service, describing how fire departments are organized, and various regulations that apply to firefighters.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

**General**

Students:

- Demonstrate knowledge of the Chain of Command by being placed in companies with one student being the Company Officer, which is a rotating position. Students also take turns being assigned as the Class Commander (Program Ambassador), which is a liaison between the class and Instructor.
- List and describe the ranking system in the Fire Service and how they are identified (helmet color, shirt color, insignias on lapels and badge).
- Identify and describe the different types of Fire Service apparatus, both traditional and specialty, and the different types of Fire Service facilities
- Research local/current news stories that involve issues of questionable ethics and how it damages morale, department reputation and possible economic repercussions and report to class.
- Demonstrate appropriate and professional behavior concerning privacy, confidentiality, and patient personal choices and concerns as observed by instructor, during clinical rotations.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Communicate Clearly: Communicate effectively in diverse environments (including multi-lingual). Students will be placed in diverse companies and will learn to effectively communicate with other classmates, the Instructor, Administrative Staff, guest speakers, and others.
- Collaborate with Others: Demonstrate ability to work effectively and respectfully with diverse teams.
- Interact Effectively with Others: Conduct themselves in a respectable, professional manner. Students will interact professionally and respectfully at all times to everyone including classmates, Instructors, Administrative Staff, guest speakers, and others. Students will have the opportunity to interact effectively with the public at an annual community day and the program's annual fundraiser Santa Pictures.
- Work Effectively in Diverse Teams: Respect cultural differences and work effectively with people from a range of social and cultural backgrounds. Students will work in diverse teams and respect each team member and classmates as unique individuals.
- Produce Results: Be accountable for results. Students will be tasked with creating fire service-related documents for the program. Examples include creating a Class Organization Chart and a Program Mission Statement.
- Financial, Economic, Business, and Entrepreneurial Literacy: Students understand the role of the economy in society by discussing and evaluating how fire departments acquire funding from various sources and steps that are required for various fire departments to acquire necessary equipment and apparatus. Students will also understand how negative or unethical behavior can impact a fire department financially.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 1, students shall be able to:

01. Explain the mission of the fire service. [NFPA 1001, 4.1.1]
02. Describe how fire departments are organized. [NFPA 1001, 4.1.1]
03. Describe the various specializations within the fire service. [NFPA 1001, 4.1.1]

04. Describe fire department SOPs, rules, and regulations that affect a Fire Fighter I. [NFPA 1001, 4.1.1, 4.1.2]
05. Explain ways that fire departments may interact with other organizations and agencies. [NFPA 1001, 4.1.1]
06. Explain the roles and duties of a Fire Fighter I. [NFPA 1001, 4.1.1]
07. Explain and Demonstrate the Chain of Command. [NFPA 1001, 4.1.1]
08. Research and List Career, Volunteer, and Combination departments in Pierce and King County.
09. Evaluate and justify decisions based on ethical reasoning.
10. Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
11. Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
12. Interpret and explain written organizational policies and procedures.
13. Collaborate with classmates in researching or reviewing an Acceptable Use Policy.
14. Responsibilities of Internet use (using the Internet efficiently and ethically for work, identifying the risks of posting personal and work information on the internet, social networking sites, job search sites, taking measures to avoid internet security risks such as viruses and malware)
15. Discuss legal issues associated with locating and retrieving information from the internet.

#### Aligned Washington State Academic Standards

Physical Education		
Science		
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

<b>Unit 2: Firefighter Safety and Personal Protective Equipment</b>	<b>Total Learning Hours for Unit: 30</b>
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**Unit Summary:**  
 Students identify components of protective clothing and equipment including distinguishing between types of personal protective clothing and equipment and explain how to safely use various types of protective clothing and equipment, learn proper inspection and maintenance, and recognize personal limitations for firefighters wearing the protective clothing and personal protective equipment. Students demonstrate and explain the donning and doffing of personal protective equipment as well as the correct procedures for inspection and maintenance of personal protective equipment and clothing.

**Performance Assessments:** (Districts to complete for each unit)  
*Example assessments for this unit include:*

#### General

#### Science

Students:

- Create a climate of safety in the program. Upon entering class each day, students will passport into their assigned company with appropriate methods and will be accounted for throughout class. They will retrieve their structural safety gear at the start of each class day, ensure all components are present and in safe working order, then put it away at the end of class.
- Research NIOSH for Line of Duty Deaths and report to class on findings of investigations to prevent future occurrences.
- Identifies and creates a brochure on safety procedures for ensuring a safe environment which can include:
  - Identify protective equipment and describe it's uses.
  - Recognize traffic and scene control devices.
  - Describe solutions to mitigate potential hazards.
  - Describe procedures for safe operation at emergency scenes.
- Create a presentation that explains the terms personal protective clothing (turnout gear) and personal protective equipment (PPE). Describe the following for each item and demonstrate use:
  - Purpose
  - Characteristics
  - Guidelines for care
  - Limitations of each
  - Conditions that warrant utilizing each
- Assessed in manipulative skills with the following skill sheets taken from IFSTA Training:
  - Establish and operate in work areas at emergency scenes.
  - Use self-contained breathing apparatus (SCBA) during emergency operations (positive pressure).
  - Respond on apparatus to an emergency scene.
  - Establish and operate in work areas at emergency scenes.

### **Physical Education**

Assessed in manipulative skills with the following skill sheets taken from IFSTA Training & Washington State FF-1 Skills assessments:

- Skills Sheet 5-2; Proper lifting & carrying Techniques.
- Fires 104, Physical Fitness Evaluations, includes, 2-miles in 14-18 Mins, 25-50 plus push-ups, and 25-60 sit-ups, timed assessments & percentages.
- IFSTA Skills 1-1, Mounting & Dismounting apparatus for response.
- Skills Sheet 5-1 NFPA 5-1 Don Structural PPE in 1-Minute.
- Skill Sheet 5-2 NFPA- Don a SCBA in one minute.

### **Additional competencies**

- *Use self-contained breathing apparatus (SCBA) during emergency operations.*
- Use movement concepts to develop a plan to improve advanced performance skill in a self-selected skill.
- Assume a leadership role in a physical activity setting.

- Design and implement a strength, conditioning, and nutrition plan that develops balance in opposing muscle groups.
- Illustrate appropriate safe body mechanics, including proper lifting techniques and ergonomics. (See Skills sheet # 5-2).

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Be Responsible to Others: Acts responsibly with the interests of the larger community in mind by keeping the safety of the crew and potential victim(s) in mind while performing search and rescue drills.
- Apply Technology Effectively: Uses technology as a tool to organize, evaluate and communicate information by using radios to contact a designated Incident Commander to report on progress and status of the crew to verify their safety during search and rescue drills.
- Adapt to Change: Works effectively in a climate of ambiguity and changing priorities by evaluating the circumstances given in mock scenarios at various incidents to decide if the risk of saving a victim is worth the safety of the crew, then making decisions based on evaluations.
- Be Self-Directed Learners: Demonstrates initiative to advance skill levels towards a professional level by correcting or reporting unsafe conditions to a superior and learning from each other's mistakes or achievements.
- Access and Evaluate Information: Accesses information efficiently and effectively by researching, interpreting and putting into practice information gathered from a credible source to guide actions safely in a mock chemical fire scenario.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 2, students shall be able to:

01. Describe fire and life safety initiatives aimed at reducing firefighter illnesses, injuries, and fatalities. [NFPA 1001, 4.1.1]
02. Describe the aspects of NFPA 1500 related to firefighter safety and health. [NFPA 1001, 4.1.1]
03. Describe fire department programs intended to reduce firefighter illnesses, injuries, and fatalities. [NFPA 1001, 4.1.1, 4.3.10]
04. Summarize general guidelines for operating safely at structural fire scenes. [NFPA 1001, 4.3.3]
05. Summarize safe practices for riding in fire service vehicles and apparatus. [NFPA 1001, 4.3.2, 4.3.3]
06. Describe how to prevent occupational injuries.
07. Explain emergency procedures to follow in response to workplace accidents.
08. Identify and apply OSHA and other health and safety regulations that apply to specific tasks and jobs in the occupational area.
09. Explain procedures for documenting and reporting hazards to appropriate authorities.
10. Identify, describe and demonstrate personal, shop and job site safety practices and procedures.
11. Demonstrate safe dress and use of relevant safety gear and personal protective equipment (PPE), including wrist rests, adjustable workspaces and equipment, gloves, boots, earplugs, eye protection, breathing apparatus, disposable latex gloves and glasses.
12. Illustrate appropriate safe body mechanics, including proper lifting techniques and ergonomics.
13. Locate emergency equipment in their classrooms, shops, and labs including (where appropriate) eyewash stations, shower facilities, sinks, fire extinguishers, fire blankets, telephones, master power switches, emergency exits, first aid kits, and the closest automated external defibrillator (AED).
14. Demonstrate the safe use, storage, and maintenance of every piece of equipment in the lab, shop, and classroom.
15. Demonstrate proper workspace cleaning procedures.

- 16. Illustrate First Aid procedures for potential injuries and other health concerns in the occupational area.
- 17. Describe the importance of emergency preparedness and an emergency action plan.
- 18. Illustrate procedures used to handle emergency situations and accidents, including identification, reporting, response, evacuation plans, and follow-up procedures.

Aligned Washington State Academic Standards		
Physical Education	PE1.2.HS2: Refine activity-specific movement skills in two or more individual-performance activities. PE2.2.HS2: Use movement concepts to develop a plan to improve advanced performance skill in a self-selected skill. PE2.3.HS2: Create plan to improve performance of a self-selected motor skill. PE2.4.HS2: Apply training principles and knowledge to two or more self-selected activities. PE4.3.HS1: Solve problems and think critically when working with others in physical activity, both as an individual and in groups. PE4.4.HS2: Apply best practices for participating safely in physical activity and exercise.	
Science	HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions	ETS1.B: Developing Possible Solutions	Influence of Science, Engineering, and Technology on Society and the Natural World

Unit 3: Communications	Total Learning Hours for Unit: 30
<b>Unit Summary:</b> Students learn effective communication skills tailored to careers in Fire Science specifically about the different types of communication that occur in the fire department and know the importance of each type. Students practice the steps involved in using radio communication for fire management and apply the Incident Command System to manage mock emergencies and scenarios. This includes learning and describing the elements of a personnel accountability system and the application of the system at an incident, responding to and returning from calls on fire apparatus, in personal vehicles, at the fire station, at other on-duty locations, and during training, and demonstrate techniques for action when trapped or disoriented in a fire situation or in a hostile environment. Students working in fire science will be able to understand all of the latest technology when responding to a variety of emergency situations including radio transmissions and all related computer technology as it pertains to fire management situations.	
<b>Performance Assessments:</b> (Districts to complete for each unit) <i>Example assessments for this unit include:</i>	
<b>General</b>	

#### Students:

- Evaluate factors that contribute to effective communication and interview skills with patients/victims/bystanders in an emergency situation, demonstrating sensitivity to cultural differences and other potential barriers to communication. Apply effective communication and interviewing skills within a practicum setting.
- Understand the principles of and practice skills related to the following emergency communication processes:
  - Handle business calls and reports of emergency.
  - Use a portable radio for routine traffic.
  - Use a portable radio for emergency traffic (i.e., call a mayday).
- Create an incident report.
- Initiating the response to a reported emergency, given the report of an emergency, fire department standard operating procedures and communication equipment, so that all necessary information is obtained, communications equipment is operated correctly and the information is promptly and accurately related to the dispatch center.
- Receiving a business or personal telephone call, given fire department business phone, so that procedures for answering the phone are used and the caller's information is relayed.
- Transmitting and receiving messages via the fire department radio, given a fire department radio and operation procedures, so that the information is accurate, complete, clear and related within the time established by the AHJ.
- Calling a mayday in a simulated emergency and giving appropriate information to Incident Commander when asked.
- Conduct a Personnel Accountability Report (PAR) and quickly determine if all personnel are accounted for.
- Given different types of incidents, students summarize and present to other students.
- Communicate in verbal and non-verbal methods such as relay message, face-to-face, Radio, Hand signals, and flag signals.
- Students will be assessed on manipulative skills through skill sheets provided by the IFSTA Training and your local Technical College:
  - Transmit and receive messages via the fire department radio.
  - Initiate a response to a reported emergency.
  - Receive a telephone call.

#### **Science**

#### Students:

- Research and explain the protocols for handling an emergency call by fire services, emergency services, and public service personnel. Outline the procedure in an informational brochure or public service announcement for community persons. Include basic communication and telecommunication information, types of public alerting systems, and how personnel are notified of an emergency.
- Compare and contrast the various forms of communications within fire services, emergency services, and public safety services or law enforcement at an emergency scene. Explore similarities and differences in radio communications, communication responsibilities of the firefighter, EMT, or police officer at the scene, arrival, and progress reports, use of tactile channels, and evacuation signals and personnel accountability reports. Make a claim about the appropriate communication to use in a given situation and strengthen argument with counterclaim(s) and justification.
- Use tactics and strategies to communicate instructions verbally and by radio. (Knowledge of fire behavior)



- Describe radio equipment and procedures used for internal fire department communications.
- Given a scenario of using a portable radio, handle emergency phone call, short wave radios, (HAM) hand radio and runners to describe the types of communication systems and equipment used to receive and process emergency calls. Simulate when broadcast systems are down. An example: Cyber-attack while a chemical factory is being struck.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Access and Evaluate Information: Evaluate information critically and competently by reviewing multiple sources on firefighter's mistakes over social media.
- Use and Manage Information: Use information accurately and creatively for the issue or problem at hand by simulating emergency calls and how to properly use the information to make a decision.
- Apply Technology Effectively: Use technology as a tool to research, organize, evaluate and communicate by practicing on different styles of reporting systems around our community.
- Work Independently: Monitor, define, prioritize and complete tasks without direct oversight by practicing taking orders and accomplishing them with minimal directive or support.
- Communicate Clearly: Communicate effectively in diverse environments using other means of communication.
- Communicate Clearly: Students will communicate with our guest speaker who will discuss the career, educational requirements, training, roles and responsibilities of a 911 Call Receiver/Dispatcher to inform, instruct, motivate and persuade interested students in pursuing that career.

### **Industry Standards and/or Competencies:**

Upon Completion of Unit 3, students shall be able to:

1. Explain the procedures for receiving nonemergency calls. [NFPA 1001, 4.2.2]
2. Describe the types of communications systems and equipment used to receive and process emergency calls. [NFPA 1001, 4.2.1]
3. Explain the procedures for receiving and dispatching emergency calls. [NFPA 1001, 4.2.1]
4. Describe radio equipment and procedures used for internal fire department communications. [NFPA 1001, 4.2.1, 4.2.2, 4.2.3]
5. Describe and demonstrate how to initiate a response to a reported emergency. [NFPA 1001, 5.2.1]
6. Describe and demonstrate how to receive a telephone call and the ability to operate fire station equipment. [NFPA 1001, 5.2.2]
7. Describe how to transmit and receive messages via the fire department radio and discriminate between routine and emergency traffic. [NFPA 1001, 5.2.3]
8. Activate an emergency call for assistance. [NFPA 1001, 5.2.4]

### **Aligned Washington State Academic Standards**

#### **Physical Education**

#### **Science**

- HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.
- HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Obtaining, Evaluating, and Communicating Information Asking Questions and Defining Problems Planning and Carrying Out Investigations	PS4.C: Information Technologies and Instrumentation ETS1.B: Developing Possible Solutions	Cause and Effect Interdependence of Science, Engineering, and Technology Influence of Engineering, Technology, and Science on Society and the Natural World

Unit 4: Fire Hose & Appliances, Nozzles and Streams, Water Supply and Portable Fire Extinguishers	Total Learning Hours for Unit: 40
<p><b>Unit Summary:</b> Students recognize different classifications and types of portable fire extinguishers, the different classifications of fires and which extinguisher is best for each type of fire. This includes students learning the theory behind fire extinguishment as well as methods of extinguishment. Students describe the fire extinguishment theory and the law of thermodynamics as it relates to specific heat, latent heat, and heat flow, and practice, analyze, and compare advantages, disadvantages, and methods of extinguishment in various situations and scenarios.</p> <p>In this unit, students gain an in-depth knowledge of the types of hoses and skills required for firefighters to safely and efficiently use them. Students also learn proper care and maintenance as well as demonstrate how to connect and use them. Students also learn and then demonstrate those skills using various nozzles and other appliances. Students identify the type, design, operation, required nozzle pressure, and flow of a given selection of nozzles and tips as well as identify terms relating to the principles of fire service hydraulics. Understanding water sources and how to move water from the source to the fire is important knowledge all firefighters need. Students in this unit explore fire hydrants, how they operate, the various types of hydrants and how to use them safely. Students also identify the National Fire Protection Association hydrant color code, describe making a hydrant-to-pumper connection, explain the hazards involved when the hydrant-to-pumper connection is not properly sealed, and describe the apparatus, equipment, and appliances required to provide water at rural locations.</p> <p><b>Performance Assessments:</b> (Districts to complete for each unit) <i>Example assessments for this unit include:</i></p> <p><b>General</b> Students:</p> <ul style="list-style-type: none"> <li>• Demonstrate the proper uses of various appliances during hose evolutions.</li> <li>• Demonstrate the PASS (Pull, Aim, Squeeze, Sweep) technique with a portable fire extinguisher and a simulated Class A fire.</li> <li>• Interpret concepts related to hose loads and finishes, preconnected hose loads, and supply hose lays. Perform the following skills related to these concepts: <ul style="list-style-type: none"> <li>○ Make the accordion hose load.</li> </ul> </li> </ul>	

- Make the horseshoe hose load.
- Make the flat hose load.
- Make the preconnected flat hose load.
- Make the triple layer hose load.
- Make the minuteman hose load.
- Connect to a hydrant using a forward lay.
- Make the reverse hose lay.
- Explain the portable fire extinguisher rating system, then identify the types of portable fire extinguishers and the extinguishing agent characteristics.
- Understand the concepts of and demonstrate proficiency related to selecting and using portable fire extinguishers
- Given a type of fire, select and describe the operation of the proper type of portable fire extinguisher:
  - Operating a portable fire extinguisher using the PASS method of application.
  - Operating a stored pressure water extinguisher.
  - Operating a dry chemical (A B C) extinguisher.
  - Operating a carbon dioxide extinguisher.
  - Inspecting a portable fire extinguisher.
- Attach one end of a fire hose to a source of water and the other to a sprinkler. While performing the process, identify and explain the functions of the most common hose appliances and tools, as well as the types of hose rolls.
- Describe procedures for and safety measures related to handling, advancing, and operating a hoseline in a visual, oral, or graphic presentation. Cite information from textbooks, professional journals, or the NFPA website in the explanation. Perform the following skills with 100% accuracy:
  - Advance the preconnected flat hose load.
  - Advance the minuteman hose load.
  - Advance the triple layer hose load.
  - Advance hose - shoulder-load method.
  - Advance hose - working line drag method.
  - Advance a line into a structure.
  - Advance a line up and down an interior stairway.
  - Advance an uncharged line up a ladder into a window.
  - Extend a hoseline.
  - Replace a burst hoseline.
- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Connect a fire department pumper to a water supply.
  - Couple and uncouple fire hose.
  - Clean and inspect fire hose.
  - Return fire hose to service.
  - Advance hose loads: preconnects and supply lines.

- Demonstrate the procedures to extend a hose line.
- Handle a small sized charged hose line. (1 ¾")
- Handle a medium size charged hose line. (2 ½")
- Operate a Combination Nozzle.

## **Science**

### **Students:**

- Diagram a water supply system to their community recognizing the following systems:
  - Gravity vs pumping systems
  - Water reservoirs
  - Static vs. under pressure
- Identify the different types of portable fire extinguishers and which classes of fire they are effective on. (2-day lesson)
  - Extinguisher agent
    - Chemicals and purpose
  - Fire tetrahedrons
  - Fire triangles
- Illustrate visually or graphically the primary aspects of fire hoses, including their construction, descriptions, sizes, and types of couplings. Perform the following Firefighter I skills: (teaching friction/pressure, turbulent flow/ laminar flow, universal gas law, combustion, and application of water on fire and BTU's, elevation example 10lbs per story on building) (How to calculate in your head how to change pressure with elevation change and size hose, phases of matter and transition of energy)
  - Make a straight hose roll.
  - Make a donut hose roll.
  - Couple a hose - foot-tilt method.
  - Couple a hose - two-firefighter method e. Uncouple a hose - knee-press method f. Uncouple a hose - two-firefighter method.
- Understand how hoses are made, and materials used by evaluating the NFPA 1961 Standards on Fire Hose concerning damage prevention, care for, and maintenance of a fire hose, as well as NFPA 1963 Standard for Fire Hose Connections for care of fire hose coupling. Inspect and clean a fire hose and its connections with 100% accuracy.
- The use of water is an important factor in firefighting. Explain the components of water supply systems and how they can affect the success of putting out a fire, with emphasis on researching alternative, rural, and volunteer water supplies.
- Compare and contrast the two types of fire hydrants, discussing the designs, purpose, operating principles, markings, locations, and testing procedures. Perform the skills of cleaning and inspecting fire hydrants and deploy a portable water tank.
- Research the principles of fire streams and explain the physical and chemical effects, extinguishing properties, and characteristics of water on a fire.
- Compare and contrast the types of fire stream patterns. Discuss advantages and disadvantages of each. Examine the flow rate or pressure. Determine if there is a need for water flow adjustment. Observe pressure loss or gain, and demonstrate how to prevent a water hammer from occurring. Perform the following related skills:
  - a. Operate a solid-stream nozzle.

- b. Operate a fog stream nozzle - straight, narrow fog stream, and wide fog stream.
  - c. Operate a broken-stream nozzle.
- Distinguish between the solid-stream nozzle and the fog stream nozzle and the valves that are found in each. Develop a plan for care and maintenance of nozzles, and create a document that explains the plan to a new employee.
- Create a presentation on friction loss which covers:
  - Understanding that friction loss is the loss of energy or "head" that occurs in pipe flow due to viscous effects generated by the surface of the pipe. Friction Loss is considered as a "major loss". "Head" is a very convenient term in the pumping business.
  - Understanding that friction loss is a measure of the amount of energy your piping system loses due to fluids meeting resistance. Energy is carried as fluid flows through your pipes.
- Plan and conduct the head, pressure, or energy lost by water flowing in a pipe or channel as a result of turbulence caused by the velocity of the flowing water and the roughness of the pipe, channel walls, or restrictions caused by fittings.
- Construct the formulas Where FL = Friction Loss in PSI, C = friction loss Coefficient (or friction loss factor), Q = Flow rate in GPM, and L = hose Length.

### **Physical Education**

- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Connect a fire department pumper to a water supply.
  - Couple and uncouple fire hose.
  - Return fire hose to service.
  - Advance hose loads: pre-connects and supply lines.
  - Demonstrate the procedures to extend a hose line.
  - Handle a small sized charged hose line. (1 ¾")
  - Handle a medium size charged hose line. (2 ½")

### **The following are our Manipulative Skill Sheets that involve physical activity.**

- 12-1 Couple & Uncouple hose lines
- 12-2 Inspect, Clean and service fire hose
- 12-3, 4 & 5; Various hose rolls and carries
- 12-6; Accordion Hose load
- 12-7; Preconnect Flat hose load
- 12-8, 9 & 10; Various hose loads and deployments

All skills are times for proficiency and involve teamwork.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Think Creatively: Use a wide range of idea creation techniques to utilize both hose and appliances simultaneously to have multiple hoselines flowing water at the same time.
- Work Creatively with Others: Students will develop, implement and communicate new ideas to others effectively to manage simulated fire conditions with rapidly changing environments.
- Reason Effectively: Students will use various types of reasoning (inductive, deductive, etc.) by using adapters and appliances to connect hose lines of unequal diameters to each other.
- Guide and Lead Others: Students will inspire others to reach their very best via example and selflessness by competing in timed events to better themselves and those around them.
- Reason Effectively: Use various types of reasoning as appropriate to the situation by working with others on the correct placement of hoselines and streams in a given scenario.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

### **Industry Standards and/or Competencies:**

Upon Completion of Unit 4, students shall be able to:

01. Distinguish among the five classifications of portable fire extinguishers. [NFPA 1001, 4.3.16]
02. Distinguish among the various types of portable fire extinguishers. [NFPA 1001, 4.3.16]
03. Describe the process of selecting and using a portable fire extinguisher. [NFPA 1001, 4.3.16]
04. Describe characteristics of fire hose. [NFPA 1001, 4.3.8]
05. Describe the inspection, care, and maintenance of fire hose. [NFPA 1001, 4.5.2]
06. Explain methods of rolling hose. [NFPA 1001, 4.5.2]
07. Describe hose loads. [NFPA 1001, 4.5.2]
08. Describe methods of supplying water for firefighting operations. [NFPA 1001, 4.3.15]
09. Describe methods used to deploy fire hose. [NFPA 1001, 4.3.10, 4.3.15]
10. Describe methods of advancing hoselines. [NFPA 1001, 4.3.7, 4.3.10]
11. Differentiate among types of hose streams and nozzles. [NFPA 1001, 4.3.10]
12. Explain how to operate different types of hoselines, nozzles, and master stream devices. [NFPA 1001, 4.3.7, 4.3.8, 4.3.10]
13. Describe how municipal water systems supply water to communities. [NFPA 1001, 5.3.15]

### **Aligned Washington State Academic Standards**

<b>Physical Education</b>	PE1.2.HS2: Refine activity-specific movement skills in two or more individual-performance activities. PE4.3.HS1: Solve problems and think critically when working with others in physical activity, both as an individual and in groups. PE4.4.HS2: Apply best practices for participating safely in physical activity and exercise. PE5.1.HS2: Choose an appropriate level of challenge to experience success in a self-selected physical activity.
<b>Science</b>	HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more

	<p>uniform energy distribution among the components in the system (second law of thermodynamics).</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
<p>Planning and Carrying Out Investigations</p> <p>Constructing Explanations and Designing Solutions</p> <p>Scientific Knowledge is Open to Revision in Light of New Evidence</p>	<p>PS2.A: Forces and Motion</p> <p>PS3.A: Definitions of Energy</p> <p>PS3.B: Conservation of Energy and Energy Transfer</p> <p>PS3.D: Energy in Chemical Processes</p> <p>ETS1.A: Defining and Delimiting an Engineering Problem</p> <p>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</p>	<p>Energy and Matter</p> <p>Influence of Science, Engineering and Technology on Society and the Natural World</p>

Unit 5: Self-Contained Breathing Apparatus, Structural Search and Rescue, Firefighter Survival	Total Learning Hours for Unit: 30
<p><b>Unit Summary:</b></p> <p>Students study human respiratory and cardiovascular systems to better understand physical requirements and hazards during firefighting, as well as the proper use of a self-contained breathing apparatus. Students practice wearing the self-contained breathing apparatus, learn safety rules, routine maintenance, and demonstrate how to wear the apparatus while performing firefighting skills. Students also demonstrate rescue procedures as well as emergency procedures to be used in the event of failure of the self-contained breathing apparatus, describe the limitations, safety features and function of the open circuit self-contained breathing apparatus, and demonstrate inspection, care, and testing procedures.</p>	
<p><b>Performance Assessments:</b> (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <p><b>General</b></p> <p>Students:</p> <ul style="list-style-type: none"> <li>• Demonstrate how to use a hose line and correctly utilize it to determine the way to safety.</li> <li>• Demonstrate proper MAYDAY protocols and Rapid Intervention Crew procedures.</li> <li>• Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College: <ul style="list-style-type: none"> <li>○ Correctly don and activate SCBA in one minute using the Over the Head Method.</li> <li>○ Correctly don and activate SCBA in one minute using the Coat Method.</li> </ul> </li> </ul>	

- Correctly don and activate SCBA in one minute using the Compartment Mounted Method.
- Inspect an SCBA (to show that it is in a safe condition for immediate use).
- Cleaning and sanitizing SCBAs.
- Use of SCBA during emergency operation: demonstration of various emergency procedures in event of SCBA failure.
- Use SCBA during emergency operation: exit hazardous area before air supply depletion.
- Exit hazardous, vision-obscured area to a safe haven, maintaining team integrity, before air supply is exhausted.
- Force entry into a structure.
- Conduct a search and rescue in a structure.

## **Science**

### **Students:**

- Describe in written form the elements of a gas cylinder and the effects of heat and pressure on closed cylinders.
- Create a presentation describing various methods and carries used to remove victims from a structure, on various floors, during search and rescue operations.
- Compare and contrast the two types of self-contained breathing apparatus (SCBA) used in fire services. Identify the key functions and characteristics of the Personal Alert Safety System (PASS) or Personal Alert Device (PAD) systems and explain why they are required by NFPA 1500 standards. Understand concepts of and perform skills related to SCBA, such as:
  - Don SCBA: Over the head method
  - Don SCBA: Coat Method
  - Don SCBA: Seat-Mount Method
  - Doff SCBA
  - Inspect SCBA May 2021|Page 5
  - Clean SCBA
  - Fill SCBA cylinder from cascade system
  - Controlled Breathing Techniques
  - Exit a constricted opening wearing standard SCBA
  - Change an SCBA-one person method
  - Change an SCBA-two person method

## **Physical Education**

Demonstrate how to safely use various types of protective clothing, safety equipment Self-contained breathing apparatus, (SCBA) during Fire service search & rescue including FF Survival.

- Correctly don and activate SCBA in one minute using the Over the Head Method.
- Correctly don and activate SCBA in one minute using the Coat Method.
- Correctly don and activate SCBA in one minute using the Compartment Mounted Method.
- Use of SCBA during emergency operation: demonstration of various emergency procedures in event of SCBA failure.



- Use SCBA during emergency operation: exit hazardous area before air supply depletion.
- Exit hazardous, vision-obscured area to a safe haven, maintaining team integrity, before air supply is exhausted.
- Force entry into a structure
- Conduct a search and rescue in a structure.
- Solve problems and think critically when working with others in physical activity, both as an individual and in groups.

#### **IFSTA 7<sup>th</sup> ED Skill sheets:**

- 10-1; Proper procedures for SCBA Air emergency.
- 10-3; Conduct a Primary & Secondary Search.
- 10-4; Perform the "Incline rescue drag".
- 10-5; Perform the extremities lift/carry 2-rescuers.
- 10-6; Perform a "Webbing" drag.
- 10-8; Follow a hose line out of a structure.
- 10-9; Perform a reduced profile maneuvers w/o removal of SCBA.
- 10-10; Breach an Interior wall and exit.
- 10-11; Perform a reduced profile maneuvers w/o removal of SCBA mask, using the SCBA first technique.
- 10-12; Demonstrate "Disentanglement from wires or debris.

All of these skills involve a high use of physical exertion, coordination and timed for scores.

#### **Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Manage Projects: by setting and meeting goals, even in the face of obstacles and competing pressures by utilizing SCBAs in a simulated fire environments.
- Guide and Lead Others: by inspiring others to reach their very best via example and selflessness by competing in timed events to better themselves and those around them.
- Communicate Clearly: Effectively call a MAYDAY situation and clearly communicate where they are, their needs, air supply and initiate a rapid intervention crew response to assist them in safely exiting a simulated hazardous environment.
- Collaborate with Others: Demonstrate ability to work effectively and respectfully in diverse teams to search a simulated smoke-filled environment to find a victim and relocate them to safety.
- Be Self-directed Learners: Reflect critically on past experiences in order to inform future progress. Students will reflect on past experiences in order to better their times in donning SCBAs to meet industry standards.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

#### **Industry Standards and/or Competencies:**

Upon Completion of Unit 5, students shall be able to:

01. Describe conditions that require the use of respiratory protection equipment. [NFPA 1001, 4.3.1]
02. Identify SCBA components. [NFPA 1001, 4.3.1]
03. Describe SCBA limitations. [NFPA 1001, 4.3.1]
04. Describe the procedures for donning and doffing SCBA. [NFPA 1001, 4.3.1]
05. Explain the process of inspecting and cleaning SCBA. [NFPA 1001, 4.5.1]
06. Describe methods of refilling, replacing, and storing SCBA cylinders. [NFPA 1001, 4.3.1, 4.5.1]
07. Describe safety considerations for working in and exiting a hazardous atmosphere while wearing SCBA. [NFPA 1001, 4.3.1]
08. Explain best practices to ensure firefighter survival during interior operations. [NFPA 1001, 4.2.4, 4.3.5, 4.3.9]
09. Describe air-monitoring operations. [NFPA 1001, 4.3.21]
10. Describe structural search and rescue operations. [NFPA 1001, 4.3.5, 4.3.9]
11. Describe victim removal methods. [NFPA 1001, 4.2.4, 4.3.5, 4.3.9]
12. Describe MAYDAY protocols. [NFPA 1001, 4.2.4, 4.3.5]
13. Describe emergency evacuation methods. [NFPA 1001, 4.2.4, 4.3.1, 4.3.5, 4.3.9]

**Aligned Washington State Academic Standards**

<b>Physical Education</b>	PE1.2.HS2: Refine activity-specific movement skills in two or more individual-performance activities. PE2.3.HS2: Create plan to improve performance of a self-selected motor skill. PE2.4.HS2: Apply training principles and knowledge to two or more self-selected activities. PE4.3.HS1: Solve problems and think critically when working with others in physical activity, both as an individual and in groups.	
<b>Science</b>	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Using Mathematics and Computational Thinking	ETS1.B: Developing Possible Solutions	Systems and System Models

<b>Unit 6: Fire Service Tools &amp; Equipment &amp; Fire Service Ropes and Knots</b>	<b>Total Learning Hours for Unit: 30</b>
<b>Unit Summary:</b> Students recognize various uses for life safety and utility rope and differentiate among types of knots for using as a hoist and rope rescue. Students also identify extrication tools and equipment and other various fire service tools for pulling, pushing and cutting. Students will be able to describe and demonstrate the procedures for cleaning, inspecting, and maintaining different types of ropes, webbing and tools.	

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

**General**

Students:

- Identify and explain the use of common tools found in the fire service.
- Organize a group of tools by their functional categories.
- Research the common types of fire and emergency facilities, the types and functions of all apparatuses and vehicles used in fire and emergencies services. Develop a graphic illustration of each depicting all equipment and tools found with each type of vehicle.
- Demonstrate the proper method to inspect, clean, and maintain tools and equipment before returning them to service.
- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Tie common knots used in the fire service. (Bowline, Clove Hitch, Figure 8 on a bight, Half hitch, Becket/sheet Bend, Safety Knot)
  - Hoist a tool and/or piece of equipment using the correct knot(s).

**Science**

Students:

- Describe situations that would require forcible entry through a wood, metal, sliding, revolving, or overhead door; a window; a fire door; a gate; and a lock. Identify the tools that would be required for entry and discuss the safety hazards and limitations of each tool. Perform the skills of cleaning, inspecting, and maintaining hand tools and equipment. (The use of leverage/force/simple machines/points of application and forces.)
- Compare and contrast a life-safety rope and a utility rope, addressing applicable NFPA standards, rope materials, strength, and construction. Demonstrate the ability to identify different types of rope, (i.e., a life-safety rope and a utility rope), and demonstrate proficiency in coiling and uncoiling ropes.
- Articulate the importance of maintaining, caring for, and inspecting ropes; perform skills related to NFPA standards for inspecting, cleaning, and storing both types of rope. Determine conditions that would warrant a rope being taken out of service.

**Physical Education**

- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
- Tie common knots used in the fire service. (Bowline, Clove Hitch, Figure 8 on a bight, Half hitch, Becket/sheet Bend, Safety Knot)
- Hoist a tool and/or piece of equipment using the correct knot(s).
- Demonstrate the proper method to inspect, clean, and maintain tools and equipment before returning them to service.
- Demonstrate tools and equipment that are used for pushing or pulling. [NFPA 1001, 5.3.4]
- Demonstrate tools and equipment that are used for prying or spreading. [NFPA 1001, 5.3.4]
- Demonstrate tools and equipment that are used for striking. [NFPA 1001, 5.3.4]
- Demonstrate tools and equipment that are used for cutting. [NFPA 1001, 5.3.4]
- List and describe tools and equipment that are used in response and scene size-up activities. [NFPA 1001, 5.3.4]
- Demonstrate the tools used in forcible entry, interior attack, ventilation, and overhaul. [NFPA 1001, 5.3.4, 5.3.8, 5.3.11, 5.3.13]

**IFSTA 7<sup>th</sup> Ed Skills sheets required with the Unit:**

- 7-9; Hoist an Axe
- 7-10; Hoist a Pike-pole
- 7-11; Hoist a Roof ladder
- 7-12; Hoist a "Dry" hose line
- 9-2; Force entry (With appropriate tools) through an Inward-swinging door
- 9-3; Force entry through an outward-swinging door
- 9-4; Force entry through a door lock

These skills are performed with proper "Full" PPE and SCBA, with the use of "Ropes & Knot's Skills and physical activity without assistance.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Communicate Clearly: Use communication for a range of purposes in which students will locate various tools and equipment, identify the tool and which functioning group it belongs to, then communicate this information to Incident Commander.
- Be Self-directed Learners: Demonstrate initiative to advance skill levels towards a professional level. Students will learn the basic knots in the fire service then advance that skill level to set up a professional level rope rescue system which is assessed by industry professionals.
- Guide and Lead Others: In teams, students will be assigned a knot to learn how to tie it then leverage strengths of others by demonstrating to them and assisting them until they successfully tie it.
- Communicate Clearly: Students will communicate with our guest speaker who will discuss the career, educational requirements, training, roles and responsibilities of a High/Low Angle Special Rescue Technician to inform, instruct, motivate and persuade interested students in pursuing that career.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 6, students shall be able to:

01. Describe the general purposes of tools and equipment. [NFPA 1001, 5.5.1.B]
02. Describe the safety considerations for the use of tools and equipment. [NFPA 1001, 5.5.1.]
03. List and describe tools and equipment that are used for rotating. [NFPA 1001, 5.3.4]
04. List and describe tools and equipment that are used for pushing or pulling. [NFPA 1001, 5.3.4]
05. List and describe tools and equipment that are used for prying or spreading. [NFPA 1001, 5.3.4]
06. List and describe tools and equipment that are used for striking. [NFPA 1001, 5.3.4]
07. List and describe tools and equipment that are used for cutting. [NFPA 1001, 5.3.4]
08. List and describe tools and equipment that are used in response and scene size-up activities. [NFPA 1001, 5.3.4]
09. Describe the tools used in forcible entry, interior attack, ventilation, and overhaul. [NFPA 1001, 5.3.4, 5.3.8, 5.3.11, 5.3.13]

10. Explain how tools and equipment are staged for rapid access. [NFPA 1001, 5.5.1B]
11. Describe the importance or properly maintaining tools and equipment. [NFPA 1001, 5.5.1, 5.5.1.A]
12. Describe how to clean and inspect hand tools. [NFPA 1001, 5.5.1, 5.5.1.A, 5.5.1.B]
13. Differentiate between life safety rope and utility rope. [NFPA 1001, 4.3.20]
14. Describe the various materials and methods used to construct ropes. [NFPA 1001, 4.3.20]
15. Describe the procedures for inspecting, cleaning, and maintaining ropes. [NFPA 1001, 4.3.20, 4.5.1]
16. Describe how webbing is used, inspected, maintained, and stored. [NFPA 1001, 4.5.1]
17. Identify types of knots. [NFPA 1001, 4.3.20]
18. Describe the procedure for hoisting various tools and equipment. [NFPA 1001, 4.1.2, 4.3.20]
19. Explain how ropes and knots are used during rescues and at other emergencies. [NFPA 1001, 4.3.3, 4.3.9]

#### Aligned Washington State Academic Standards

<b>Physical Education</b>	PE1.2.HS2: Refine activity-specific movement skills in two or more individual-performance activities. PE2.3.HS2: Create plan to improve performance of a self-selected motor skill. PE2.4.HS2: Apply training principles and knowledge to two or more self-selected activities. PE4.3.HS1: Solve problems and think critically when working with others in physical activity, both as an individual and in groups.	
<b>Science</b>	HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Using Mathematics and Computational Thinking	ETS1.B: Developing Possible Solutions	Systems and System Models

<b>Unit 7: Fire Behavior &amp; Fire Suppression</b>	<b>Total Learning Hours for Unit: 60</b>
<b>Unit Summary:</b> Students classify the basic principles of fire science and how to extinguish fires, types of fires, energy sources for fires, and terms used by firefighters. Students describe the four products of combustion commonly found in structural fires that create a life hazard, describe the process of thermal layering, and explain the special conditions that occur during a fire's growth. Students also learn heat energy sources and identify the stages of fire development as well as units and conversions of heat measurement, methods of heat transfer, and examples of heat transfer in various emergency situations. Students also explain fire suppression methods for structure fires, vehicle fires, exterior fires, and ground cover fires.	

Students describe the physical states of matter in which fuels are commonly found, such as solid, liquid, and gaseous fuels, explain terms related to the combustion process, and identify narcotic asphyxiant gases and irritants common in smoke.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

### **General**

Students:

- Using media productions, pictures and videos, students identify the various stages a fire is at and potential hazards with each stage
- Using media productions, students identify the various potential deadly hazards for firefighters like flashovers, smoke explosions, and backdrafts
- Demonstrate the three types of fire attack: Direct, Indirect, and Combination attacks
- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Attack a passenger vehicle fire.
  - Extinguish fires in exterior Class A materials.
  - Attack an interior structure fire.
  - Perform horizontal ventilation.
  - Perform vertical ventilation.
  - Overhaul a fire scene.
  - Conserve property.
  - Extinguish incipient Class A, Class B, and Class C fires.
  - Combat a ground cover fire.

### **Science**

Students:

- Analyze the concepts surrounding the science of a fire and document findings in a written report linking information in a cohesive manner, including areas such as:
  - Physical and chemical properties and changes
  - Modes of combustion
  - Classification of fires
  - Fire triangle and tetrahedron e. Heat and transmission of heat
  - Fuel
  - Oxygen
  - Products of combustion
- Analyze the basic components of fire as a chemical chain reaction and the major phases of fire. Examine the main factors that influence fire spread and fire behavior. (FESHE PES 2)

- Identify the physical, chemical, and kinetic changes that occur in a fire. Develop a multimedia informational presentation summarizing these changes and supplemented by relevant explanations of matter, exothermic heat reaction, endothermic heat reaction, heat, measurements of temperature, and sources of heat energy.
- Differentiate between the characteristics of a liquid fuel fire, a gas fuel fire, and a solid fuel fire. Include terminology specific to the science of fire in the explanation. Relate the types of fires in multiple structures such as inside structure, metal structure, or outside structure in an informative essay, citing information from textbooks or professional firefighter journals.
- Summarize the stages of development of a fire in a compartment, examining the factors that can affect fire development. Differentiate between fire resistance, flame spread, and describe the testing procedures used to establish ratings for each. Explain in an infographic the multiple contributors to each stage, including specific terminology, possible preventive measures, and safety interventions. (FESHE Building Construction 6)
- Explain the importance of understanding the concepts of thermal layering, rollover, flashover, isolated flames, hot-smoldering fire, and backdraft. Describe in a written, verbal, or graphic format the preventive measures and firefighter safety measures for each of these situations.
- Firefighters can influence the behavior of a fire. Construct an explanation of the fire control theory, relating concepts of temperature reduction, fuel removal, oxygen exclusion, and chemical flame inhibition in an electronic presentation. (Create a model of construction of a burn house)
- Demonstrate the ability to assemble a team, choose attack techniques for various levels of fire (e.g., attic, grade-level, upper-level, basement) and evaluate and forecast a fire's growth and development.
- Describe in written form the dangerous building conditions created by the fire and fire suppression activities.
- Create a presentation using pictures and drawings that explain the indicators of a building collapse and structural instability.
- With a partner, discuss the suppression approaches and practices for various types of structural fires and prepare to share in small groups.

### **Physical Education**

- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical Colleges & WA State FST:
  - Attack a passenger vehicle fire.
  - Extinguish fires in exterior Class A materials.
  - Attack an interior structure fire
  - Perform horizontal ventilation.
  - Perform vertical ventilation.
  - Overhaul a fire scene.
  - Conserve property.
  - Extinguish incipient Class A, Class B, and Class C fires.
  - Combat a ground cover fire.

### **IFSTA 7<sup>th</sup> Ed Skills Sheets required:**

1. 14-4; Operate a sprinkler system control valve.
2. 14-5; Stop the flow of water from an activated sprinkler head.
3. 14-6; Turn off/secure building utilities.

4. 14-7; Attack a "Simulated" passenger vehicle fire.
5. 14-8; Attack a fire in an exterior "Class-A" materials fire.
6. 14-9; Attack a "Simulated" fire in a small-unattached structure from exterior.
7. 14-11; Attack a "Ground cover" brush fire.
8. 14-12: Construct a fire-line. (Wildland)

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Make Judgments and Decisions: Students will interpret information in pictures and videos of various fires and draw conclusions on which phase the fire is in and where it will spread next based on the best analysis.
- Make Judgments and Decisions: Students will interpret information in pictures and videos of various hostile fire events and draw conclusions on how to prevent these events from happening again and firefighter safety based on the best analysis.
- Work Effectively in Diverse Teams: Students will work together in simulated fire scenes and will respond open-mindedly to different ideas on how to effectively suppress the fire.
- Solve Problems: Solve different kinds of non-familiar problems involving different classes of fire and materials in both conventional and innovative ways.
- Collaborate with Others: Students will demonstrate the ability to work effectively and respectfully in diverse teams to suppress a simulated fire.
- Communicate Clearly: Students will communicate with our guest speaker who will demonstrate the various fire deadly hazards (flashover and Backdraft) and fire/smoke flow in a small doll-sized structure.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 7, students shall be able to:

01. Explain the basic principles of fire science. [NFPA 1001, 4.3.11]
02. Describe how thermal energy impacts fire behavior. [NFPA 1001, 4.3.11, 4.3.12]
03. Explain the function of fuel within the combustion process. [NFPA 1001, 4.3.10, 4.3.11]
04. Explain the function of oxygen within the combustion process. [NFPA 1001, 4.3.11]
05. Explain the self-sustained chemical reaction involved in flaming combustion. [NFPA 1001, 4.3.11]
06. Differentiate among the stages of fire development. [NFPA 1001, 4.3.11, 4.3.12]
07. Explain how firefighting operations can influence fire behavior in a structure. [NFPA 1001, 4.3.11]
08. Describe how building construction and layout affects fire development. [NFPA 1001, 4.3.10, 4.3.11]
09. Explain the concept of the fire triangle and fire tetrahedron. [NFPA 1001, 5.3.11.A]
10. Describe the by-products of combustion. [NFPA 1001, 5.3.11.A]
11. Explain how fires are spread by direct contact, conduction, convection, and radiation. [NFPA 1001, 5.3.12.A]
12. Define Class A, B, C, D, and K fires. [NFPA 1001, 5.3.11.A]
13. Describe the four phases of a solid-fuel fire: ignition phase, growth phase, full developed phase, and decay phase. [NFPA 1001, 5.3.11.A]
14. Describe the conditions that cause thermal layering. [NFPA 1001, 5.3.12.A]



15. Describe the conditions that lead to flame over, flashover, smoke explosions, and backdrafts. [NFPA 1001 5.3.11.A & 5.3.12.A]
16. Explain the science behind fire suppression. [NFPA 1001, 4.3.10, 4.3.11]
17. Describe methods for suppressing structural fires. [NFPA 1001, 4.3.8, 4.3.10, 4.3.13]
18. Explain the role of firefighters with regards to supporting fire protection systems during fire suppression. [NFPA 1001, 4.3.13, 4.3.14]
19. Explain the duties of firefighters related to building utilities. [NFPA 1001, 4.3.18]
20. Describe the process of attacking a vehicle fire. [NFPA 1001, 4.3.7]
21. Describe the process of attacking fires in exterior Class A materials. [NFPA 1001, 4.3.8]

### Aligned Washington State Academic Standards

<b>Physical Education</b>	<p>PE4.3.HS1: Solve problems and think critically when working with others in physical activity, both as an individual and in groups.</p> <p>PE4.4.HS2: Apply best practices for participating safely in physical activity and exercise.</p> <p>PE5.1.HS2: Choose an appropriate level of challenge to experience success in a self-selected physical activity.</p>
<b>Science</b>	<p><b>PS1 Matter and Its Interactions</b></p> <p>HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.</p> <p>HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.</p> <p>HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.</p> <p>HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*</p> <p>HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.</p> <p><b>PS3 Energy</b></p> <p>HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).</p> <p>HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).</p> <p>HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.</p>

	<p>HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</p> <p>HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</p> <p>HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
<p>Developing and Using Models</p> <p>Science Models, Laws, Mechanisms, and Theories</p> <p>Explain Natural Phenomena</p> <p>Engaging in Argument from Evidence</p> <p>Scientific Investigations Use a Variety of Methods</p>	<p>PS1.A: Structure and Properties of Matter</p> <p>PS3.C: Relationship Between Energy and Forces</p> <p>PS3.D: Energy in Chemical Processes</p> <p>ETS1.A: Defining and Delimiting an Engineering Problem</p> <p>ESS2.A: Earth Materials and Systems</p> <p>ESS2.C: The Roles of Water in Earth's Surface Processes</p> <p>ESS2.D: Weather and Climate</p>	<p>Energy and Matter</p> <p>Stability and Change</p> <p>Cause and Effect</p> <p>Influence of Science, Engineering and Technology on Society and the Natural World</p>

Unit 8: Emergency Medical Services	Total Learning Hours for Unit: 40
<p><b>Unit Summary:</b></p> <p>Students recognize the major functions of first responders providing emergency medical care and describe patient confidentiality, infection control, and patient assessment. This unit also covers bleeding control and shock management where students explore and practice their duties in simulations aligned with the types of incidents they are expected to respond to. Students learn and describe the elements of a personnel accountability system and the application of the system at an incident, identify common types of accidents or injuries such as those occurring at the emergency scene and demonstrate techniques for action when trapped or disoriented in a fire situation or in a hostile environment. Students analyze and practice their response procedures using identified protocols.</p>	
<p><b>Performance Assessments:</b> (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p>	
<p><b>General</b></p> <p>Students:</p> <ul style="list-style-type: none"> <li>When emergencies occur, fire, emergency medical services (EMS), and public safety personnel are required to follow standard operating procedures (SOPs) and "authorization to practice" guidelines. Define the terms SOP and authorization to practice, explain the various types of SOP, and relate why an SOP should follow the priorities of life safety, incident stabilization, and property conservation intention. Based on the</li> </ul>	

primary responsibilities of each department, develop an SOP for a fire department, an EMS department, and a public safety situation. Include code enforcement, public information, and public and private protection systems.

- Participate in at least one health fair, clinic, or screening in order to practice and gain proficiency in performing related skills.
- During an emergency situation both private and public organizations and agencies can be involved. Identify these organizations or agencies; describe their functions, the kinds of careers available within each, the scope of their services, and jurisdiction issues that could arise.
- Describe the Emergency Medical System that serves their community.
- Compare and explain the roles and responsibilities of an EMT-Basic and an EMT-Paramedic.
- Explain HIPPA laws and how it protects a patient's privacy.
- Demonstrate how to properly don and doff EMS personal protective equipment (Gloves and Glasses)
- Identify the types of traumatic wounds (external bleeding) encountered and demonstrate the proper treatment for each.
- Identify an open or closed fracture and demonstrate the proper splinting techniques for each.
- Demonstrate how to properly maintain C-spine stabilization and patient immobilization on a backboard.
- Identify common medical emergencies by using the SAMPLE method.
- Demonstrate proper 1 person Adult, Child, and Infant CPR techniques. (Industry Certification, ASHI)
- Demonstrate proper 2 person Adult, Child, and Infant CPR techniques. (Industry Certification, ASHI)
- Demonstrate the proper usage of an External Automatic Defibrillator. (Industry Certification, ASHI)
- Correctly triage a 10 patient multi-casualty incident and report findings back to Incident Commander (student will act in this role).
- In teams, students set up a treatment area and transportation corridor in a given multi-casualty incident.
- Define the terms consent, implied consent, abandonment, and the Good Samaritan Law.

## **Science**

Students:

- Use computer programs, resources, medical library journals and the Internet to research information on diseases.
- Research and write a paper about a disease or injuries (treatments included), with specific guidelines from the instructor.
- Read and summarize research about developmental changes that occur in the elderly. Students will then share their findings with the class using visual aids.
- Develop a treatment plan (based on research) of a specific disease or injury, discussing care skills as they apply to each body system.
- Demonstrate knowledge and awareness of preventative health behaviors specific to a group other than their peers. Students will lead a wellness project that could be presented to that specific group. The project should address the prevention of illness, reduction of health risk factors, alternative health practices, and strategies for individuals to manage their own health status.
- Complete a fictional case study of a burn victim, including history and physical exam.
- Compare fictional case studies of fracture victims, including history and physical exam.
- Participate in a large group simulation and video production to demonstrate cardiovascular circulation. Red balloons are used to represent arterial blood and blue balloons are used to represent venous blood. They must carry and exchange balloons while navigating through a group of classmates representing different anatomical structures in the heart.

- Research medical texts and peer-reviewed journals to explain the pathophysiology and abnormal anatomy and/or physiology surrounding diseases, disorders, and/or syndromes of one of the major body systems (i.e., the nervous system, digestive system, or the abnormal secretion of hormones by the endocrine system). Students will need to explain how these abnormalities can affect one's physical health, outlining signs and symptoms, underlying causes, clinical manifestations, diagnostic procedures, evaluation, and treatment. Students should differentiate between the diseases in a pediatric, adult, and elderly person.
- Identify the three degrees of burns and demonstrate the proper treatment of each.
- Identify Blood Borne Pathogens, ways of potential exposure, and how to report an exposure. (Industry Certification, ASHI)
- In teams of two, students perform a patient assessment and obtain two sets of vital signs (blood pressure, pulse, and respirations), and assess what is wrong with the patient (Instructor will be patient).

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Reason Effectively: Use various types of reasoning (inductive, deductive, etc.) as appropriate to the medical or traumatic emergency situation to correctly assess the patient's condition and giving the appropriate treatment.
- Use Systems Thinking: Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems by having students respond to a simulated multi casualty incident and work in teams to triage patients, set up a treatment and transport areas, and have them effectively interact with each other.
- Collaborate with Others: Demonstrate the ability to work effectively and respectfully with diverse teams by working together and demonstrating skills in a stressful medical incident involving a patient who needs CPR.
- Access and Evaluate Information: Students will evaluate and competently obtain critical information from a patient to construct a professional-level Medical Incident Report using SOAP format to present to groups or an instructor.
- Communicate Clearly: Students will communicate with our guest speaker who will discuss the career, educational requirements, training, roles and responsibilities of a Paramedic to inform, instruct, motivate and persuade interested students in pursuing that career.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 8, students shall be able to:

01. Describe the role of the fire service in providing emergency medical care. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
02. Explain patient confidentiality requirements. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
03. Identify communicable diseases that first responders commonly encounter. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
04. Explain ways to prevent the spread of communicable diseases during emergency medical care. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
05. Explain the process of patient assessment. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
06. Describe Cardiopulmonary Resuscitation (CPR). [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
07. Describe methods of controlling bleeding. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
08. Explain shock management. [NFPA 1001, 6.1.1, 6.1.2, 6.2.1]
09. Describe the steps needed to provide infection control. [NFPA 1001, 6.1.1]

10. Describe the steps needed to secure a victim's airway. [NFPA 1001, 6.1.1]
11. Describe the steps needed to provide rescue breathing to a victim. [NFPA 1001, 6.1.1]
12. Describe the steps needed to clear a victim's airway of a foreign obstruction. [NFPA 1001, 6.1.1]
13. Describe the steps needed to perform cardiopulmonary resuscitation (CPR) on adult, child, and infant victims. [NFPA 1001, 6.1.1]
14. Describe the steps used to manage shock. [NFPA 1001, 6.1.1]
15. Explain the steps needed to control external bleeding.
16. Explain the steps needed to perform basic management of burns.
17. Explain the steps needed to provide manual stabilization of the cervical spine and securing a patient to a backboard. [NFPA 1001, 6.1.1]
18. Discuss triage and scene management at a multi-casualty incident. [NFPA 1001, 6.1.1]

### Aligned Washington State Academic Standards

#### Physical Education

#### Science

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

#### Disciplinary Core Idea

#### Crosscutting Concept

Constructing Explanations and Designing Solutions  
Asking Questions and Defining Problems  
Analyzing and Interpreting Data  
Obtaining, Evaluating, and Communicating Information

ETS1.A: Defining and Delimiting an Engineering Problem  
ETS1.C: Optimizing the Design Solution  
LS2.D: Social Interactions and Group Behavior  
LS4.D: Biodiversity and Humans  
LS4.A: Evidence of Common Ancestry and Diversity

Systems and System Models  
Structure and Function  
Science is a Human Endeavor Patterns  
Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	LS4.D: Biodiversity and Humans	Influence of Science, Engineering, and Technology on Society and the Natural World
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## Unit 9: Building Construction, Forcible Entry, & Ventilation

**Total Learning Hours for Unit: 40**

### Unit Summary:

Students learn that building science is the collection of scientific knowledge that focuses on the analysis of the physical phenomena affecting buildings meaning building physics, architectural science and applied physics are terms used for the knowledge domain that overlaps with building science. Students evaluate how building construction features and materials contribute to the spread of fire as well as how heat affects structural components and materials. This includes understanding the concepts from material science: the engineering discipline that studies the physical and chemical properties of materials (e.g. brick, plywood, insulation, drywall, anything buildings are made out of that might interact with moisture and heat in ways that may need to be considered).

### Performance Assessments: (Districts to complete for each unit)

*Example assessments for this unit include:*

#### General

Students:

- Locate fire department lock boxes throughout the Skills Center.

#### Science

Students:

- Define the term ventilation as used in fire service; discuss reasons for fire-ground ventilation, principles of ventilation, considerations that affect the decision to ventilate, and challenges to ventilation in modern buildings. Review scenarios (including graphics) surrounding each and construct strategies to improve ventilation.
- Explain theories surrounding vertical ventilation and the related safety precautions. Discuss warning signs of unsafe roof conditions, roof coverings, roof openings, and factors that reduce effectiveness when implementing vertical ventilation. Compare these findings to the same parameters associated with basement ventilation.
- Compare and contrast the ventilation techniques associated with various types of roofs, including flat, pitched, arched, concrete, and metal roofs. Clarify the differences between a trench ventilation maneuver and a strip ventilation maneuver. (ventilation below)
- Infer from research the concepts surrounding horizontal ventilation, considerations for use, weather conditions that should be considered, internal and external exposures, and precautions against setting horizontal ventilation. Develop an informational essay sharing this information with peers.
- Argue the advantages and disadvantages of forced and hydraulic ventilation using positive-pressure or negative-pressure ventilation in a building filled with flammable or toxic gas that must be ventilated quickly and safely.

- Demonstrate using "The Irons" to perform Forcible Entry on a door prop. (leverage)
- In given scenarios, students explain how they would perform Forcible Entry on various doors and windows found at the Skills Center.
- Explain why tactical ventilation is performed at a structure fire.
- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Forced Entry into a structure. (Door)
  - Perform horizontal ventilation on a structure. (Positive Pressure Forced Ventilation)
  - Perform vertical ventilation.
- Explain the relationship of oxygen concentration to fire growth.
- List and describe the principles, advantages, limitations and effects of mechanical ventilation vs hydraulic ventilation
- List and explain the effects of a backdraft and methods to prevent a backdraft.

### **Physical Education**

- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
- Forced Entry into a structure. (Door)
- Perform horizontal ventilation on a structure. (Positive Pressure Forced Ventilation)
- Perform vertical ventilation.
- Demonstrate using "The Irons" to perform Forcible Entry on a door prop.

### **IFSTA 7<sup>th</sup> Ed Skill Sheets:**

- 9-5; Force entry through a Padlock.
- 9-6; Force entry through a Window.
- 9-7; Force entry through a wood frame wall.
- 9-8; Simulate breaching a masonry wall with hand tools.
- 9-9; Simulate breaching a metal wall with a rotary saw.

### **Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Work Effectively in Diverse Teams: Respect cultural differences and work effectively with people from a range of social and cultural backgrounds towards a common goal to transport and operate hand tools to force entry through a simulated locked door prop.
- Collaborate with Others: Demonstrate ability to work effectively and respectfully with diverse teams and with industry professionals as they instruct the various ways to perform forcible entry on various doors.
- Be Flexible: Deal positively with praise, setbacks and criticism from Instructor and industry professionals as students practice Forcible Entry and Ventilation skills.
- Apply Technology Effectively: Use technology as a tool to research, organize, evaluate and communicate the different types of building construction found in their communities and throughout Washington State.
- Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 9, students shall be able to:

01. Differentiate among types of building construction. [NFPA 1001, 4.3.12]
02. Describe the construction of floors, ceilings, and walls. [NFPA 1001, 4.3.4, 4.3.12]
03. Explain how basements and stairs may impact firefighting operations. [NFPA 1001, 4.3.12]
04. Compare the construction of different roof types. [NFPA 1001, 4.3.12]
05. Describe the construction and operation methods of different types of doors. [NFPA 1001, 4.3.4]
06. Describe the construction and operation methods of different types of windows. [NFPA 1001, 4.3.4]
07. Describe the basic principles of forcible entry. [NFPA 1001, 4.3.4, 4.3.11]
08. Describe methods of forcing entry through doors. [NFPA 1001, 4.3.4, 4.3.9, 4.3.11]
09. Describe methods for forcing entry through windows. [NFPA 1001, 4.3.4, 4.3.9, 4.3.11]
10. Describe methods for breaching walls. [NFPA 1001, 4.3.4, 4.3.9]
11. Explain why tactical ventilation is performed at a structure fire. [NFPA 1001, 4.3.11, 4.3.12]
12. Describe safety considerations related to tactical ventilation. [NFPA 1001, 4.3.11, 4.3.12]
13. Describe horizontal ventilation. [NFPA 1001, 4.3.11]
14. Describe vertical ventilation. [NFPA 1001, 4.3.12]
15. Describe considerations related to the ventilation of basements and other special compartments. [NFPA 1001, 4.3.11, 4.3.12]

**Aligned Washington State Academic Standards****Physical Education**

PE2.4.HS2: Apply training principles and knowledge to two or more self-selected activities.  
PE3.1.HS2: Evaluate benefits of a physically active lifestyle as it relates to college or career productivity.  
PE4.3.HS2a: Assume a leadership role in a physical activity setting.  
PE4.4.HS2: Apply best practices for participating safely in physical activity and exercise.  
PE5.1.HS2: Choose an appropriate level of challenge to experience success in a self-selected physical activity.

**Science**

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.  
HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (Demonstrate with a scenario)  
HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.  
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.\*  
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.



Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations Scientific Knowledge is Open to Revision in Light of New Evidence Engaging in Argument from Evidence	PS1.A: Structure and Properties of Matter ETS1.A: Defining and Delimiting an Engineering Problem ETS1.C: Optimizing the Design Solution PS3.B: Conservation of Energy and Energy Transfer ETS1.B: Developing Possible Solutions	Energy and Matter Cause and Effect Influence of Science, Engineering and Technology on Society and the Natural World Scientific Knowledge Assumes an Order and Consistency in Natural Systems

## Unit 10: Fire Service Ladders

**Total Learning Hours for Unit: 20**

### Unit Summary:

Students identify types of ladders and the parts of a ladder. Students demonstrate proper ladder climbing techniques while transporting tools and equipment or assisting a person with a simulated injury by using proper and safe practices. Students also describe methods for raising and lowering a ladder and working from a ladder. Students describe and demonstrate inspection and maintenance procedures for different types of ground ladders and describe procedures for conducting an annual service test on ground ladders.

### Performance Assessments: (Districts to complete for each unit)

*Example assessments for this unit include:*

### General

Students:

- List the uses of Fire Service ground ladders.
- Identify the components of both a straight ladder and an extension ladder.
- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Demonstrate the one firefighter low-shoulder ladder lift and carry.
  - Demonstrate the two-firefighter low-shoulder ladder lift and carry.
  - Demonstrate the two-firefighter arm's length on edge ladder lift and carry.
  - Demonstrate the three-firefighter flat-shoulder ladder lift and carry.
  - Demonstrate the three-firefighter arm's length flat ladder lift and carry.
  - Set up ground ladder – two firefighter flat raise from a low-shoulder carry.
  - Set up ground ladder – two firefighter beam raise from a low-shoulder carry.
  - Perform horizontal ventilation.

### Science

Students:

- Understand and demonstrate the use of extension ladders with proper height, distance and climbing angles.
- Compare and contrast materials used to manufacture different types of ladders and the purpose of each ladder.

### **Physical Education**

Students will demonstrate safe practices for using, carrying, and placing a ground ladder.

Students also demonstrate methods for raising and lowering a ladder, working from a ladder, and assisting victims down a ladder.

Assessed on personal growth in Ladders throughout the year with Skills assessments provided by IFSTA Training and the local Technical College:

- Demonstrate the one firefighter low-shoulder ladder lift and carry.
- Demonstrate the two-firefighter low-shoulder ladder lift and carry.
- Demonstrate the two-firefighter arm's length on edge ladder lift and carry.
- Demonstrate the three-firefighter flat-shoulder ladder lift and carry.
- Demonstrate the three-firefighter arm's length flat ladder lift and carry.
- Set up ground ladder – two firefighter flat raise from a low-shoulder carry.
- Set up ground ladder – two firefighter beam raise from a low-shoulder carry.
- Perform horizontal ventilation.

### **IFSTA 7<sup>th</sup> ED Skill sheets required:**

- 8-2; Carry a ladder-one FF low-shoulder method.
- 8-3; Carry a ladder-two-FF carry.
- 8-4; Raise & lower a ladder using one -1 FF method.
- 8-5; Raise & lower a ladder with 2-two FF method.
- 8-6; Reposition a ladder.
- 8-7; Properly climb & leg-lock on a ground ladder
- 8-8; Deploy a roof ladder on a pitched roof.
- 8-9; Assist a victim down a ground ladder

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Collaborate with Others: Demonstrate ability to work effectively and respectfully with diverse teams to safely carry, transport, raise, and lower various ground ladders found in the fire service.
- Adapt to Change: Adapt to varied roles and jobs responsibilities while working together in diverse teams to safely carry, transport, raise, and lower various ground ladders found in the fire service.
- Interact Effectively with Others: Students will learn to know when it is appropriate to listen and when to speak when working together as a team to safely raise and lower a ladder.

- Be Flexible: Students will learn to deal positively with praise, setbacks and criticism while working with Fire Service ladders.
- Reason Effectively: Students will use various types of reasoning (inductive, deductive, etc.) to correctly select the appropriate ladder and raise as appropriate to the given situation.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

### Industry Standards and/or Competencies:

Upon Completion of Unit 10, students shall be able to:

01. Identify the parts of a ladder. [NFPA 1001, 4.3.6]
02. Differentiate among types of ladders. [NFPA 1001, 4.3.6, 4.3.11, 4.3.12]
03. Describe the process of cleaning, inspecting, and maintaining a ladder. [NFPA 1001, 4.5.1]
04. Describe safe practices for using ladders. [NFPA 1001, 4.3.6, 4.3.11, 4.3.12]
05. Describe the process of carrying a ladder. [NFPA 1001, 4.3.6, 4.3.11, 4.3.12]
06. Describe the proper procedure for placing a ground ladder. [NFPA 1001, 4.3.6, 4.3.9, 4.3.11, 4.3.12]
07. Describe ways to secure a ground ladder. [NFPA 1001, 4.3.6]
08. Describe methods for raising and lowering a ladder. [NFPA 1001, 4.3.6, 4.3.11, 4.3.12]
09. Describe how to safely work from a ladder. [NFPA 1001, 4.3.9, 4.3.10, 4.3.11, 4.3.12]
10. Describe methods to assist a victim down a ladder. [NFPA 1001, 4.3.9]

### Aligned Washington State Academic Standards

<b>Physical Education</b>	PE1.2.HS2: Refine activity-specific movement skills in two or more individual-performance activities. PE2.2.HS2: Use movement concepts to develop a plan to improve advanced performance skill in a self-selected skill. PE4.3.HS1: Solve problems and think critically when working with others in physical activity, both as an individual and in groups. PE4.3.HS2a: Assume a leadership role in a physical activity setting.	
<b>Science</b>	HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>

**Unit 11:** Hazardous Materials Overview, Hazardous Materials Recognition & Identification, & Terrorism

**Total Learning Hours for Unit:** 40

### Unit Summary:

Students learn what is hazardous materials and how to handle various accidents and hazards on the scene. Students learn and describe the procedures for terminating utility services to a building, learn and explain hazards that exist, and describe procedures to be used in electrical emergencies, learn and

describe safety procedures for fire service lighting equipment, and learn and demonstrate the procedures for the use of safety equipment such as seat belts, ear protection, eye protection, and other safety equipment provided for protection while riding on apparatus. Students also understand and discuss personal protective equipment, product control, and decontamination as they relate to hazardous materials incidents.

In this unit students learn and apply local, state and federal regulations for safety and hazardous materials. Students practice personal safety procedures and apply protocols for handling hazardous materials in various scenarios and learn to recognize the most common types of accidents and injuries as well as potential long-term health considerations for firefighters.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

### **General**

### **Science**

Students:

- Given a scenario, create an incident action plan that recognizes that a hazardous material has been released at an incident and the impact exposure of different gasses and chemicals on firefighter's personal safety.
- Create a mock scenario surrounding potential involvement with hazardous materials. Within the scenario, outline the incident priorities, management structure or jurisdiction, and incident mitigation protocols such as analyzing the situation, planning the appropriate response, implementing the incident action plan, and evaluating progress. The use of the Emergency Response Guidebook is recommended.
- In teams, students use the Emergency Response Guidebook to create a hazardous materials incident. They will present their incident to the class and other teams will use their ERGs to identify and set up a plan for that incident. The team giving the scenario will assess other teams working on the scenario.
- Given a scenario, students recognize a potential incident of terrorism, describe how they would respond to scene, and set up a plan to manage incident.
- Using the Emergency Response Guidebook, identify the strategic goals and tactical objects of incidents related to a hazardous situation, including but not limited to the following components:
  - Isolation and scene control
  - Notification
  - Identification
  - Protection of responders and the public
  - Decontamination
  - Rescue
  - Spill control and leak contamination
  - Fire control
  - Crime scene management and evidence preservation
  - Recovery and termination

- Create a table to identify and describe the characteristics of hazards.
  - Building collapse
  - Toxic fumes
  - Hazardous materials
  - Pressurized flammable gasses
- Summarize the Awareness-Level and Operations-Level responsibilities surrounding hazardous materials and describe the type of personal protective equipment (PPE) that should be utilized during each. Demonstrate the skills of donning and doffing appropriate PPE.
- Identify the respiratory protection that is required at a hazardous scene where chemical, biological, or radioactive materials are present. Identify the agencies that provide safety guidelines and limitations for each type of respiratory protection.
- Hazmat situations increase the potential for health hazards. Explain the following types of hazards, strategies for identifying the hazard, the required PPE, health implications, and follow-up care.
  - Thermal
  - Radiological
  - Asphyxiation
  - Chemical
  - Etiological/Biological
  - Mechanical
  - Illicit laboratories
- Research the potential outcomes associated with hazardous material incidents as determined by their properties and behavior, such as physical state, vapor pressure, boiling point, vapor density, solubility, specific gravity, persistence, and reactivity.
- Describe the boiling liquid expanding vapor explosion (BLEVE) signs and effects.
- List the methods for identifying content and how to identify safe havens before approaching flammable gas cylinder fires.
- Discuss the water stream usage and demands for pressurized cylinder fires.
- Recognize and identify hazardous materials awareness as provided through IFSTA current edition and FEMA certification.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Reason Effectively: Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation. Students will navigate thru given scenarios involving hazardous materials and use various types of reasoning as the situation changes.
- Apply Technology Effectively: Students will use technology (phone applications, CAMEO software, ERG) to research, organize, evaluate and communicate pertinent information to appropriate individuals at a simulated hazardous materials incident.
- Collaborate with Others: Students will demonstrate the ability to work effectively and respectfully with diverse teams by setting up hot, warm, and cold zones and a decontamination station.
- Communicate Clearly: Use communication for a range of purposes by requesting the appropriate amount of resources needed for incident management and inform dispatch on incident updates and changes.

- Collaborate with Others: Assume shared responsibility for collaborative work, and value the individual contributions made by each team member. Students will work together to assist a team member don and doff a Level A (fully encapsulating) Hazardous Material suit.
- Communicate Clearly: Students communicate with our guest speaker who will discuss the career, educational requirements, training, roles and responsibilities of a Hazardous Materials Technician to inform, instruct, motivate and persuade interested students in pursuing that career.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

### **Industry Standards and/or Competencies:**

Upon Completion of Unit 11, students shall be able to:

01. Define a hazardous material. [NFPA 1001, 5.1.1 & 6.1.1]
02. List the common locations that may contain hazardous materials. [NFPA 472, 5.1.1.2]
03. Describe the roles and responsibilities of awareness-level personnel. [NFPA 472, 5.1.1.1, 5.1.1.2, 5.1.1.3, 6.6.1.1.2, 6.6.1.1.3, 6.6.1.1.4]
04. Describe the roles and responsibilities of operations-level personnel. [NFPA 472, 5.1.1.1, 5.1.1.2, 5.1.1.3, 6.6.1.1.2, 6.6.1.1.3, 6.6.1.1.4, 6.6.1.2, 6.6.1.2.1]
05. Describe the roles and responsibilities of technician-level personnel. [NFPA 472, 6.6.1.1.3]
06. Define boiling point, flash point, fire point, ignition temperature, flammable range, vapor density, vapor pressure, specific gravity, water miscibility, corrosivity, pH, and explain how these principles affects hazardous materials. [NFPA 472, 5.2.3, 6.6.1.1.2]
07. Describe alpha, beta, and gamma particles, their potential effects on the human body, and how to avoid exposure. [NFPA 472, 5.2.3, 6.6.1.1.2]
08. Describe the differences between contamination and secondary contamination. [NFPA 472, 5.2.3, 6.6.1.1.2]
09. List the types of weapons of mass destruction. [NFPA 472, 5.2.3, 6.6.1.1.2]
10. Describe how nerve agents, blister agents, choking agents, convulsant chemicals, and irritants damage the human body. [NFPA 472, 5.2.3, 6.6.1.1.2]
11. List the four ways chemicals can enter the human body. [NFPA 472, 5.2.3, 6.6.1.1.2]
12. Explain the differences between chronic and acute health effects. [NFPA 472, 5.2.3, 6.6.1.1.2]
13. Describe how to identify a placard and label. [NFPA 472, 5.1.2.2, 6.6.1.1.1]
14. List the nine Department of Transportation chemical families. [NFPA 472, 5.2.2, 6.6.1.1.2]
15. Explain how to use the North American Emergency Response Guidebook. [NFPA 472, 5.2.2, 6.6.1.1.2]
16. Describe the NFPA 704 hazard identification system. [NFPA 472, 5.2.2, 6.6.1.1.2]
17. List the information about a hazardous material found on material safety data sheets. [NFPA 472, 5.2.1.5, 5.2.2, 6.6.1.1.2]
18. Explain when shipping papers are utilized. [NFPA 472, 5.2.1.5, 5.2.2, 6.6.1.1.2]
19. Describe the role of CHEMTREC during a hazardous materials incident. [NFPA 472, 5.1.2.2, 5.2.2, 6.6.1.1.2]
20. Describe the role of the National Response Center during a hazardous materials incident. [NFPA 472, 5.1.2.2, 5.2.2, 6.6.1.1.2]
21. Define the term Terrorism. [NFPA 472, 5.2.1.6, 6.6.1.1.2]
22. Describe the signs of a potential terrorist incident. [NFPA 472, 5.2.1.6, 6.6.1.1.2]
23. List the types of Terrorism. [NFPA 472, 5.2.1.6, 6.6.1.1.2]
24. Identify potential terrorist targets in your jurisdiction. [NFPA 472, 5.2.1.6, 6.6.1.1.2]
25. Describe how to respond to a terrorist incident. [NFPA 472, 5.2.1.6, 6.6.1.1.2]
26. Describe the dangers posed by explosive devices. [NFPA 472, 5.2.1.6, 6.6.1.1.2]
27. Explain the difference between chemical and biological agents. [NFPA 472, 5.2.1.6, 6.6.1.1.2]

28. Describe the need for decontamination of exposed victims and response personnel. [NFPA 472, 5.2.1.6, 6.6.1.1.2]		
<b>Aligned Washington State Academic Standards</b>		
<b>Physical Education</b>		
<b>Science</b>	<p>HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.</p> <p>HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.</p> <p>HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. (BLEVE)</p> <p>HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.</p> <p>HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem</p> <p>HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</p>	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Planning and Carrying Out Investigations Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena Scientific Investigations Use a Variety of Methods	PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions PS2.B: Types of Interactions LS2.B: Cycles of Matter and Energy Transfer in Ecosystems PS4.A: Wave Properties PS4.B: Electromagnetic Radiation	Energy and Matter Stability and Change Cause and Effect Systems and System Models Influence of Science, Engineering and Technology on Society and the Natural World

<b>Unit 12: Wildland Firefighting</b>	<b>Total Learning Hours for Unit: 50</b>
<b>Unit Summary:</b> Students demonstrate their knowledge of wildland fires by making scenario-based decisions to ensure the least damage (fire control) and casualties. Students identify the hazards associated with ground fires, identify types and features of ground fires and demonstrate controlling/extinguishing fires using the appropriate fire lines, hose, tools and water application. Students also discuss and describe environmental factors such as changing climates that could impact fires and firefighting safety. Students work to attain their Wildland Firefighter II Certification.	

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

**General**

Students:

- Assessed through competencies and manipulative skills as outlined by National Wildfire Coordinator Group (NWCG) Wildland Fire Behavior (S-190). (S-130)
- Demonstrate their knowledge of Wildland Fires by making scenario-based decisions to ensure the least damage (fire control) and casualties. Students also work to attain their Wildland Firefighter II Certification.
- Successfully complete the components of S-130 and S-190 (Basic Wildland Fire Training Course) for Industry Certification. (Red Card)
- Demonstrate how to properly deploy an emergency fire shelter.

**Science**

Students:

- Identify and discuss the fire triangle, as it pertains to wildland fires.
- Connect the contributing factors that indicate the potential for increased fire behavior and compromised safety.
- Describe causes of extreme fire behavior (long-range spotting, crowning, and fire whirls) due to weather, fuels, topography, or S190
- Complete National Wildfire Coordination Group (NWCG), S130, L180, or equivalent (wildland firefighting).
- Explain the "LCES" (Lookouts, Communications, Escape Routes, and Safety Zones) and how it relates to standard firefighting orders and watch-out situations.
- Explore concepts of fire line construction to proper standards, applying various methods.
- Discuss the holding actions on a fire line, using various methods.
- Discuss fire suppression techniques with the use of water vs. without the use of water.
- Describe environmental factors such as temperatures and wind that could impact firefighter safety.
- Identify the hazards associated with ground cover fires, identify types and features of ground cover fires and demonstrate controlling/extinguishing fires using the appropriate fire lines, hose, tools and water application.
- List the parts of a wildland fire and fuel classifications as they relate to wildland fires.
- Discuss in small groups the methods used to approach and attack wildland fires for containment or suppression.
- Create a presentation to show the safety principles and practices commonly used for wildland fire containment and suppression.
- Demonstrate how the exposures are protected from spreading wildland fires.
- Demonstrate the steps to:
  - Determine exposure threats based on wildland fire spread.
  - Construct a fire line.
  - Extinguish a wildland fire using hand tools.
  - Maintain the integrity of established fire lines against a spreading wildland fire
  - Suppress a contained wildland fire with water.



### **Physical Education**

- Successfully complete the Wildland Physical Agility Test (Complete 3 miles in 45 minutes wearing 45 pounds (simulated pack).

### **Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Access and Evaluate Information: Evaluate information critically and competently by reviewing past wildland fire and review techniques used.
- Use and Manage Information: Use information critically and competently by reviewing past wildland fires and applying the 10 Standard Firefighting Orders & 18 Watch Out Situations lists to understand the rights and wrongs of those incidents.
- Make Judgement and Decisions: Interpret information and draw conclusions based on the best analysis by reviewing how topography, weather, and time of day affect the Incident Action Plan.
- Make Judgement and Decisions: Reflect critically on learning experiences and processes by reviewing past fatal wildland fires and mistakes made to learn from and be better educated on safety.
- Work Creatively with Others: Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas by creating fictional wildland fires from ignition to extinguishment. Students will work together to create an Incident Action Plan and manage resources to work towards a common goal.
- Communicate Clearly: Students will communicate with our guest speaker who will discuss the career, educational requirements, training, roles and responsibilities of a Wildland Firefighter to inform, instruct, motivate and persuade interested students in pursuing that career.
- Guide and Lead Others: Inspire others to reach their very best by leading by example by returning apparatus and equipment back in service immediately after use.

### **Industry Standards and/or Competencies:**

Upon Completion of Unit 12, students shall be able to:

01. Explain what the LCES (Lookouts, Communications, Escape Routes, and Safety Zones) system is and how it relates to the Standard Firefighting Orders.
02. Construct fire line to required standards using various methods.
03. Strengthen, reinforce, and use holding actions on a fire line.
04. Extinguish the fire with or without the use of water.
05. Complete assigned tasks in a safe and efficient manner.
06. Given an assignment in a wildfire environment, describe factors in that environment which could impact safety.
07. Obtain industry certifications; ICS-100, ICS-200, ICS-700. (Through FEMA)

### **Aligned Washington State Academic Standards**

<b>Physical Education</b>	PE4.4.HS2: Apply best practices for participating safely in physical activity and exercise. PE5.1.HS2: Choose an appropriate level of challenge to experience success in a self-selected physical activity. <i>NWCG Wildland Physical Agility Test.</i>
<b>Science</b>	HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

	<p>HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.</p> <p>HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</p> <p>HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.</p> <p>HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</p> <p>HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</p> <p>HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems (lessons learned from past fire seasons)</p> <p>HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
<p>Planning and Carrying Out Investigations</p> <p>Constructing Explanations and Designing Solutions</p> <p>Engaging in Argument from Evidence</p> <p>Scientific Knowledge is Open to Revision in Light of New Evidence</p> <p>Analyzing and Interpreting Data</p> <p>Scientific Investigations Use a Variety of Methods</p>	<p>PS1.A: Structure and Properties of Matter</p> <p>PS2.B: Types of Interactions</p> <p>PS3.B: Conservation of Energy and Energy Transfer</p> <p>PS4.A: Wave Properties</p> <p>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</p> <p>PS3.D: Energy in Chemical Processes</p> <p>ETS1.B: Developing Possible Solutions</p> <p>ESS2.C: The Roles of Water in Earth's Surface Processes</p> <p>ESS2.D: Weather and Climate</p> <p>ESS3.B: Natural Hazards</p> <p>ESS3.D: Global Climate Change</p>	<p>Systems and System Models</p> <p>Energy and Matter</p> <p>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <p>Stability and Change</p> <p>Cause and Effect</p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <p>Structure and Function</p>

<b>Unit 13:</b> Career Planning/Employability & Personal Success	<b>Total Learning Hours for Unit:</b> (ongoing throughout course)
<b>Unit Summary:</b>	

Students understand industry expectations for employability and professional standards. Students review and discuss the importance of their skills, talents, values, and interests that translate into possible jobs or careers thus matching skills to existing jobs or careers and then matching career goals and education's needs to financial needs. Students discuss the steps in developing a professional growth plan for team building and leadership skills. In culminating activities throughout the year, students identify and practice techniques for functioning within a group environment and demonstrate model leadership in classroom activities and/or fire management system scenarios.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

**General**

Students:

- Create a high school and beyond plan which identifies their career pathway.
- Create a career portfolio which will include: a resume, an application, personal references, an assessment of personal strengths for success in the field of firefighting, Firefighter 1 Skills Sheets, and high school and beyond plan.
- Participation in Mock Interview Day.
- Participation in post high school planning workshops and Plan Your Future Day.
- Overall evaluation in end of the year Mock Hiring Testing process that includes the application process, a standard firefighter entry level written exam, and an oral board interview conducted by professional members from local fire departments.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Work Independently: Students will monitor, define, prioritize, and complete tasks without direct oversight by individually completing assigned homework, study guides, and review questions by the assigned due date.
- Manage Goals and Time: Students will utilize time and manage program workload efficiently by displaying the ability to complete assignments, tasks, workouts, and assessments by a designated time from the Instructor.
- Use Systems Thinking: Students will analyze how parts of a whole interact with each other to produce overall outcomes in complex systems by mock Firefighter 1 assessment standards and mock hiring process.
- Make Judgement and Decisions: Students will effectively analyze and evaluate evidence, arguments, claims and beliefs by applying for industry certifications, and applying to colleges, and fire departments.
- Communicate Clearly: Students will articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts by presenting reports in front of the class, as a team, using visual aids that matches the topic being verbally presented.
- Responsible to Others: Students will act responsibly with the interests of the larger community in mind by logging outside hours worked including school community events (ABC Day and Santa Pics) and a Ride Along with a local fire department.

**Industry Standards and/or Competencies:**

Upon Completion of Unit 13, students shall be able to:

- Complete, discuss, and analyze the results of personality, career interest, and aptitude assessments.
- Explore the career clusters as defined by the U.S. Department of Education and summarize the career opportunities in a cluster of personal interest.

- Create a personal career portfolio including academic, certification and technical-skill requirement, career opportunities, expected wages, skills and aptitude necessary and the impact of technology on careers of personal interest.
- Determine academic/training or certification requirements for transition from one learning level to the next and explore opportunities for earning credit/certifications in high school such as advanced placement, tech prep, International Baccalaureate, college in the high school, military and apprenticeship opportunities.
- Develop and analyze tables, charts, and graphs related to career interests and make oral presentation regarding the career pathway of your choice.
- Develop an awareness of financial aid, scholarships, and other sources of income to support postsecondary education/training and discuss the impact of effective college and career planning.
- Identify how performance on assessments such as the SAT®, ACT®, ASVAB®, and COMPASS® impact personal academic and career goals.
- Prepare a personal budget reflecting desired lifestyle and compare and contrast at least three careers of interest in regards to salary expectations and education/training costs.
- Apply knowledge gained from individual assessment to a set of goals and a career plan.
- Develop strategies to make an effective transition from school to career.
- Identify industry certification opportunities.
- Demonstrate the components of a fire department's hiring process (Application, Written Exam, CPAT, and Oral Board Interview).

#### Aligned Washington State Academic Standards

##### Physical Education

##### Science

##### Science and Engineering Practice

##### Disciplinary Core Idea

##### Crosscutting Concept

#### Unit 14: Physical Training and Health and Nutrition

**Total Learning Hours for Unit: 80**

##### Unit Summary:

Students discuss and know the importance of a balanced diet. Which includes eating the right amount of calories and nutrients to maintain a healthy weight. Better nutrition related to stronger immune systems, lower risk of non-communicable diseases (such as diabetes and cardiovascular disease), and longevity. Students also learn the need for strong aerobic capacity for the rigors of the everyday job, which can include running upstairs, climbing ladders and more. This is all while carrying up to 75 pounds of PPE, depending on the job. Departments can test for aerobic capacity in a variety of ways.

##### Performance Assessments: (Districts to complete for each unit)

*Example assessments for this unit include:*

##### General

## **Science**

Students:

- Explain the importance of proper nutrition and a physical fitness program as it relates to career longevity and safety.
- Completion of a health journal that will chart nutrition, sleep, stress, and exercise and an overall self-reflection piece.
- Collect and analyze personal health data over time: i.e., Pulse, respiration per minute, blood pressure, weight, sleep log, diet log, exercise/activity log/steps, urine collection and dipstick analysis at home.
- Collect nutrition data on foods eaten.
  - Measure McMush Lab - methods for testing for macromolecules in foods students eat. (Google McMush Lab)
  - Read and research nutrition labels. What do they really mean? Research current FDA regulations for nutritional labels.
- Research how a scientist gathers genetic, protein, environmental, and RNA data. What does the analysis reveal? What questions can be asked? How can the information be used, now and in the future, to improve one's health and wellness?

## **Physical Education**

- OSPI Physical Education Assessment (*Assessment needed if not completed at the student's local high school.*)
- Baseline physical ability competency completed at beginning and end of the program.
- Participation level in daily physical training in the gym and outside during manipulative drill time.
- Monthly progress in the physical fitness standards set forth by the local Technical College Fire Service program and outlined in the Articulation agreement. Students have the final assessment for grade and college credit in May.
- Assessed on nutrition thru quizzes, online research and reports to class, and personal reflections.
- Completion of a health journal that will chart nutrition, sleep, stress, and exercise and an overall self-reflection piece.
- Explain the importance of proper nutrition and a physical fitness program as it relates to career longevity and safety.
- Assessed through daily physical training (various stretching exercises, calisthenics, and jogging in increasing distances).
- Complete two modified Candidate Physical Training Agility Tests and show improved time for the second event.
- Assessed through relay races using skills learned throughout the school year.
- Create a workout schedule with appropriate exercises to ensure their continued improvement.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Produce Results: Students will actively participate in all physical training components of program, being reliable and punctual to achieve maximum benefits.
- Guide and Lead Others: Students will lead physical training sessions and inspire others to reach their very best via example and selflessness.
- Be Self-directed Learners: Students will demonstrate commitment to learning proper nutrition and physical fitness as a lifelong process.
- Collaborate with Others: Students will demonstrate the ability to work effectively and respectfully with diverse teams by being placed into different teams to achieve various goals during physical training.

- Apply Technology Effectively: Students will use technology as a tool to research and create new and relevant workouts and skill drills, organize the class into manageable groups, evaluate the effectiveness of the task at hand and communicate learning objectives and outline of tasks to be performed.
- Healthy Literacy: Understanding preventative physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction by studying various documentaries and researching various subjects relating to the health of an individual and how to remain healthy.

### **Industry Standards and/or Competencies:**

Upon Completion of Unit 14, students shall be able to:

- Meet physical fitness standards as outlined in the articulation agreement Local Technical College and University Alaska Fairbanks (U of AF) and their respected Fire Service Programs. (CPAT) Candidate, Physical, Ability, Test. with the local Technical College and their Fire Service Program.
- Document daily physical training.
- Participate in nutrition education.
- Understand the relationship between proper nutrition and hydration as it relates to performance in the Fire Service.
- Decipher and understand the ability to make nutritional choices of food labels.
- Understand essential nutrients needed for maximum performance.

### **Aligned Washington State Academic Standards**

<b>Physical Education</b>	<p>PE2.3.HS2: Create plan to improve performance of a self-selected motor skill.</p> <p>PE3.1.HS2: Evaluate benefits of a physically active lifestyle as it relates to college or career productivity.</p> <p>PE3.5.HS2a: Analyze recovery heart rate in relationship to fitness level and overall health.</p> <p>PE3.5.HS2b: Analyze types of muscular strength, muscular endurance, and flexibility exercises for personal fitness development.</p> <p>PE3.6.HS2: Use training principles (overload, specificity, progression, rest, and recovery) to design a personal workout.</p> <p>PE3.7.HS2: Participate regularly in a variety of self-selected fitness activities outside of school.</p> <p>PE3.8.HS2: Design and implement a strength, conditioning, and nutrition plan that develops balance in opposing muscle groups and supports a healthy, active lifestyle to maintain or improve body composition.</p> <p>PE4.4.HS2: Apply best practices for participating safely in physical activity and exercise.</p> <p>PE5.1.HS2: Choose an appropriate level of challenge to experience success in a self-selected physical activity.</p> <p>PE5.3.HS2: Evaluate opportunities for social interaction and social support in a self-selected physical activity.</p>
<b>Science</b>	<p>HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</p>

	<p>HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.</p> <p>HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.</p> <p>HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.</p> <p>HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions Asking Questions and Defining Problems	LS1.C: Organization for Matter and Energy Flow in Organisms LS2.B: Cycles of Matter and Energy Transfer in Ecosystems LS1.A: Structure and Function LS3.A: Inheritance of Traits ETS1.B: Developing Possible Solutions	Energy and Matter Cause and Effect Influence of Science, Engineering, and Technology on Society and the Natural World

Unit 15: Fire Prevention, Public Education, and Fire Cause Determination and Scene Preservation	Total Learning Hours for Unit: 30
<p><b>Unit Summary:</b> Students recognize a firefighters' role during overhaul, salvage, and scene preservation. This unit covers post fire duties, which include handling debris, determining the cause, restoring the premises, and security surveillance during and after the fire. Students also discuss programs and procedures that target reducing fires and life safety hazards through inspections, education and public relations.</p> <p><b>Performance Assessments:</b> (Districts to complete for each unit) <i>Example assessments for this unit include:</i></p> <p><b>General</b> Students:</p> <ul style="list-style-type: none"> <li>Create a disaster guide for community members in a specific public building, outlining the following: <ul style="list-style-type: none"> <li>Primary and secondary exits from the building.</li> <li>Designated gathering places in the event of an emergency; procedures to be followed.</li> <li>Other essential instructions or information.</li> </ul> </li> <li>Creation of a Fire Inspection Safety checklist and implementation of such form.</li> <li>Creation of a public education program on Holiday Safety and presentation to a live audience.</li> </ul>	

- Creation of a class newsletter as a means to communicate class activities with parents
- Participation in marketing events (ABC Day and Santa Pics) while promoting fire safety education.
- Using media products, identify a fire's point of origin.
- Demonstrate Chain of Custody as it relates to an arson investigation.
- Observations made on possible clues and factors on a simulated arson fire.
- List the common motives of arsonists.
- Assessed by practical skills performed during inspection practice, pre-incident survey presentations and fire safety presentations.
- Demonstrate ability to survey and make recommendations for safety in a variety of tools and equipment. Write reports of findings and justify the recommendations.
- In teams, students create materials and presentations to be given to visitors (the public) in of the fire station.
- Assessed on manipulative skills through skill sheets provided by IFSTA Training and the local Technical College:
  - Illuminate the emergency scene.
  - Turn off building utilities.

## **Science**

### Students:

- Follow procedures to work safely around materials. Demonstrate fire inspection practices and procedures including data collection and analysis and plans review for fire and life safety education practices. Locate and select the appropriate tools and equipment. Critique the readiness of the tools, use the tools to accomplish the desired tasks, and then return the tools and accessories to their proper storage locations. (FESHE Fire Prevention 5)
- Investigate the guidelines governing youth CERT teams regionally and nationally. Utilizing skills and competencies from Emergency Preparedness, Disaster Medical Operations, Hazards Identification, Search and Rescue, and Disaster Psychology, work in a team to create a comprehensive school emergency preparedness student plan, in conjunction with the school administration. Identify roles and responsibilities for all team members. Compare and align guidelines with the school disaster plan, if applicable. Include information on the following:
  - Incident Command System
  - On-scene management
  - Protocols for specific types of disasters and responses
  - Communication procedures
  - Resource management plans
  - Drills and training
  - National Incident Management System (NIMS) compliance, at least IS-700, IS-800, ICS-100
  - Mobilization guidelines
  - Forms and documentation
  - Protocols for dealing with the media
  - Participation in community disaster incidents beyond the school



- Participate in a Mock Disaster Drill. Involve community emergency preparedness personnel if possible to help design and set up the scenarios for various stations and observe teams at work during the actual drill to evaluate the responses. Conduct a post drill review to collect feedback from observers and team members. Craft an informational essay of expertise and areas in need of improvement through further training. Design a plan to provide team members with that training.
- Assess fire, heat and smoke patterns for determination of fire origin while protecting physical evidence and evaluate for complete extinguishment.
- Disclose obvious signs of fire origin and cause and list the techniques for preserving fire cause related evidence.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Communicate Clearly: Students will communicate with our guest speaker who will discuss the career, educational requirements, training, roles and responsibilities of a Fire Investigator to inform, instruct, motivate and persuade interested students in pursuing that career.
- Reason Effectively: Students will use various types of reasoning (inductive, deductive, etc.) as appropriate to solve problems involving fire scene preservation, finding the point of origin and other fire cause determination situations.
- Communicate Clearly: Students will use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade) the general public during marketing events to promote fire safety and education.
- Work Creatively with Others: In teams, students will develop a fire safety inspection checklist, and in their teams implement the checklist by performing an actual fire inspection and communicate their findings to others effectively.
- Create Media Products: Students will create a Holiday Safety Presentation to a community group and understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments to promote fire safety in the home.

**Industry Standards and/or Competencies:**

**Aligned Washington State Academic Standards**

**Physical Education**

**Science**

HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

	HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	ETS1.B: Developing Possible Solutions PS1.B: Chemical Reactions PS1.A: Structure and Properties of Matter PS3.B: Conservation of Energy and Energy Transfer PS3.D: Energy in Chemical Processes	Patterns Structure and Function Systems and System Models Connections to Engineering, Technology, and Applications of Science