



DEPARTMENT OF FORESTRY AND FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
Statewide Training and Education Advisory Committee
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Attachment 9

Date: October 11, 2019

To: Ronny J. Coleman, Chairman
Statewide Training and Education Advisory Committee
c/o State Fire Training

From: Kevin Conant, Fire Service Training Specialist III

SUBJECT/AGENDA ACTION ITEM:
FSTEP – Fire Control 3: Structural Fire Fighting (2018)

Recommended Actions:
Information/Discussion

Background Information:

This curriculum is being presented to STEAC for information, discussion and providing feedback to staff. SFT Staff is continuing to work with stakeholders on the instructor requirements for Fire Control 3: Structural Fire Fighting (2018). SFT will bring back the curriculum to STEAC in January 2020.

This is an integral course called out specifically in the Fire Fighter I curriculum in preparing the students an opportunity for learning the basics of fire dynamics, chemistry and physics, structural fire behavior and structural fire attack tactics, and for providing the opportunity for demonstrating the skills in preparing a fire fighter in locating, controlling, and extinguishing an interior structure fire.

The concept of developing new FSTEP course curriculum is with the purpose of continuing education and professional development, which was approved by STEAC on April 18, 2014. Accordingly, stakeholders identified the need for the creation of an updated structural live fire training course.

A cadre of experienced subject matter experts with extensive technical expertise in structural live fire training were selected from various agencies and backgrounds with the mission to further develop and validate the content for this FSTEP course.

Cadre Leadership

Kevin Conant, Fire Service Training Specialist III, John Black, Battalion Chief, Santa Clara County Fire Department, Allison Shaw, Cadre Editor, Sacramento State.

Development/Validation Cadre Members

Tim Adams, Battalion Chief, Anaheim Fire Department; Norm Alexander, Captain, Yocha Dehe Fire Department; David Baldwin, Battalion Chief Sacramento Fire Department; Tim Beard, Captain, Sacramento Metro Fire Department; John Flatebo, Firefighter, Corona Fire Department; Josh Janssen, Battalion Chief, CAL FIRE-BDU; James Mendoza, Captain, San Jose Fire Department; Jake Pelk, Captain, Central County FD; Jeff Seaton, Captain, San Jose FD; Mike Taylor, Assistant Chief, Sacramento FD; Kevin Tidwell, Captain, Turlock FD.

Several of the cadre members are State Fire Training Registered Instructors and all have extensive operational experience with structural live fire training. The development of the course required several multi-day sessions, over the course of three years, with additional work by the editor, cadre members and cadre lead to add the finishing touches of editing the course plans. Because this is an FSTEP Course, the development of a Certification Training Standards (CTS) was not required. However, Terminal Learning Objectives (TLO) were established and the supporting Enabling Learning Objectives (ELO) were developed from the authority of the NFPA 1001 Standard for Fire Fighter Professional Qualifications (2019), NFPA 1403: Standard on Live Fire Training Evolutions (2018); FIRESCOPE ICS 500, Structure Fire Operations (2015); and FIRESCOPE ICS 910 Fire Fighter Incident Safety and Accountability Guidelines (2013) and several others references aided as supporting documents in creating the Course Plan.

Analysis/Summary of Issue:

1. The FSTEP Fire Control 3: Structural Fire Fighting (2018) is a 24-hour course, including 15:30 (hours:minutes) of lecture/discussion and 8:30 (hours:minutes) of application/skills.
2. This course meets and exceeds the NFPA 1001 Standard for Fire Fighter Professional Qualifications (2019) and NFPA 1403 Standard on Live Fire Training Evolutions (2018) addressing significant research and development in the study of fire dynamics, chemistry and physics, structural fire behavior and structural fire attack tactics, providing the knowledge and skills that prepare a fire fighter to locate, control, and extinguish an interior structure fire.
3. This course replaces a suite of legacy FSTEP structural firefighting courses: the 16-hour Fire Control 1: Basic Fire Chemistry (1996), the 16-hour Fire Control 2: Basic Operations – Structural (1996), the 16-hour Fire Control 3A: Structural Fire Fighting in Acquired Structures (2009), and/or the 16-hour Fire Control 3B: Structural Fire Fighting in Live-fire Simulators curriculum.
4. The NFPA standards identify the requirement that all fire fighters shall demonstrate a live fire job performance requirement, while improving the process and procedure for conducting live fire training evolutions, ensuring the training objectives are achieved and the exposure to health and safety hazards are mitigated and risk is minimized.
5. This course prepares the student to successfully demonstrate the job performance requirement of a live fire tactics for a structural fire meeting and exceeding the NFPA requirements.

6. In all the activities and skills, the student to instructor ratio is 5:1, allowing for inquiry, coaching, skill mastery and evaluation.
7. Significant changes have been made in the Instructor qualifications, which are outlined in the Implementation Plan.



Structural Fire Fighting

Course Plan

Course Details

- Description:** This course provides the knowledge and skills that prepare a fire fighter to locate, control, and extinguish an interior structure fire.
- Designed For:** Fire suppression personnel
- Authority:** NFPA 1403: Standard on Live Fire Training Evolutions (2018)
Office of the State Fire Marshal
- Prerequisites:** Meet the minimum job performance requirements for Fire Fighter I in NFPA 1001: Standard for Fire Fighter Professional Qualifications related to safety; fire behavior; portable extinguishers; personal protective equipment (PPE); ladders; fire hose, appliances, and streams; overhaul; water supply; ventilation; forcible entry; and building construction (NFPA 1403 (2018))

(or)
SFT Fire Fighter I certification
- Standard:** Attend all class sessions and complete all required activities and skills
- Hours:** Lecture: 15:30
Skills: 8:30
- Hours (Total):** 24:00
- Maximum Class Size:** 25
- Instructor Level:** Primary instructor

Fire Control 3

Instructor/Student Ratio: **Lecture:** 1 primary instructor per 25 students
Demonstrations: 1 primary instructor + 1 assistant instructor (or more) per 25 students
Activities/Skills: 2 primary instructors + enough additional assistant instructors to maintain a 1:5 instructor/student ratio

Restrictions: See Facilities, Equipment, and Personnel requirements (page 4)

SFT Designation: FSTEP

Required Resources

Instructor Resources

To teach this course, instructors need:

Required

- One of the following texts:
 - *Fundamentals of Fire Fighter Skills* (including Instructor's Toolkit DVDs) (IAFC, Jones & Bartlett Learning, 3rd edition, ISBN: 978-1284059656)
 - *Essentials of Fire Fighting and Fire Department Operations* (Stowell, Frederick M., Murnane, Lynne; Brady Publishing, a division of Pearson Education; 6th edition; ISBN: 978-013-3140804)
 - *Fire Engineering's Handbook for Fire Fighter I and II* (including Instructor Guide and Sample Skills Drills DVDs) (Corbett, Glenn; PennWell Corporation; 1st edition; ISBN: 978-1-59370-135-2)
- *Live Fire Training: Principles and Practice* (IAFC, Jones & Bartlett Learning, 2nd edition, ISBN: 978-1284140729)
- Structure Fire Operations (ICS 500) (FIREScope / <https://www.firescope.org/ics-op-guides-job-aids/ics%20500.pdf>)
- NFPA 1403: Standard on Life Fire Training Evolutions (current edition)

Recommended

- *3D Fire Fighting: Training, Techniques, and Tactics* (Fire Protection Publications, 1st edition, 978-0879392581)

Online Instructor Resources

The following instructor resources are available online at

<http://osfm.fire.ca.gov/training/SFTCurriculum>

- Instructor Demonstrations (used by instructor)
 - Instructor Demonstration 1: Dust Explosion
 - Instructor Demonstration 2: Combustion
 - Instructor Demonstration 3: Pyrolysis
- Skills Exercises (distributed to students)
 - Skills Exercise 1: Combustion (required)
 - Skills Exercise 2: Risk Assessment and Door Control (required)
 - Skills Exercise 3: Stretching, Flaking, and Advancing an Attack Line (required)
 - Skills Exercise 4: Water Application (required)
 - Skills Exercise 5: Fire Attack (required)
 - Skills Exercise 6: Transitional Fire Attack (recommended)
 - Skills Exercise 7: Interior Attic Fire Attack (recommended)

Fire Control 3

- Skills Exercise 8: Below Grade (Basement) Fire Attack (recommended)
- Skills Exercise 9: VEIS (recommended)
- Skills Exercise 10: Ventilation (recommended)
- Skills Exercise 11: Portable Water Extinguisher Attack (recommended)
- PDFs (distributed to students)
 - Firefighters Exposure to Smoke Particulates
 - Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction
 - Innovating Fire Attack Tactics
 - NIOSH Study of Firefighters Finds Increased Rates of Cancer
 - Structure Fire Operations (ICS 500)
 - Taking Action Against Cancer in the Fire Service
- Props and Structures: Planning and Preparation (used by instructor)
 - Props and Structures Matrix
 - Acquired Structure
 - Container (Class A)
 - Fixed Facility (Class A)
 - Gas-Fired Prop
 - Scalable Burn Prop
- Planning Aids and Checklists (used by instructor)
 - Acquired Structure Checklist
 - Burn Procedures Checklist
 - Crew Rotation & Accountability (50 students)
 - Crew Rotation & Accountability (30 students)
 - Incident Objectives
 - Incident Organization
 - Live Fire Worksheet
 - Medical Plan
 - Release of Liability / Hold Harmless Agreement

Student Resources

To participate in this course, students need:

- Authorization to attend the training from their fire agency or Accredited Local Academy (ALA) or Accredited Regional Training Program (ARTP)*
- Verification of meeting prerequisite requirements*
- Current fit test documentation
- Cal/OSHA compliant structural personal protective equipment (PPE) and self contained breathing apparatus (SCBA)
- Completed release of liability form

* In accordance with NFPA 1403 (2018) paragraph 4.3.3, participants who received their training from an organization or entity other than the authority having jurisdiction (AHJ) hosting the

Fire Control 3

course must present written verification of having successfully completed the minimum training requirements.

Facilities, Equipment, and Personnel

The following facilities, equipment, or personnel are required to deliver this course:

Equipment*

- **Apparatus:** A minimum of one fully outfitted NFPA compliant engine (type I or type 3)
- **Appliances and tools:** Thermal imager (optional); nozzle selection (determined by AHJ) capable of flowing a minimum 95 gallons per minute (GPM)
- **Extinguishers:** Pressurized water extinguisher; water-pressurized garden sprayer
- **Fuels:** Class A materials (non-gas-fired props); Class B fuel (gas-fired props) per manufacturer specifications
- **Hose:** 1", 1½", or 1¾" fire hose; 2½" or 3" fire hose
- **Hand tools:** Flat head axe; Halligan tool; hydrant wrench; pick head axe; long handle tool (pike pole, roof hook, rubbish hook); sledgehammer; flashlight
- **Ladders:** 10' folding ladder; 14' roof ladder; 24' extension ladder
- **Power tools:** Blower; chainsaw; generator; air compressor with fittings (or equivalent)
- **Protective equipment/clothing:** Full set of protective clothing for structural fire fighting for each student, including: bunker pants, coat, and boots; gloves and helmet; flash hood; face piece; self-contained breathing apparatus (SCBA), two fully-charged air cylinders, and manufacturer-approved SCBA sanitizing agent and cleaning agent; personal alert safety system (PASS)
- **Salvage equipment/materials:** Salvage covers or Visqueen; brooms; scoop shovels; buckets; tubs
- **Simulation equipment/materials:** Live fire training structure compliant with NFPA 1403 (2018); smoke-generating equipment (synthetic/Class A); burn barrels (modified for smoke or crib set)
- **Other supplies/equipment:** Radios; fuel and supplies for power equipment; cleaning and decontamination supplies and equipment; handheld propane torch; dumpster; power cords; lights; hammer; nails; staple gun; nail gun (optional); circular saw; reciprocating saw; fuses/road flares; construction spray paint; tape measure; drill, bits, and screws
- **Rehabilitation:** Shade; water; chairs; SCBA refill capabilities (extra cylinders or refill as needed); decontamination body wipes; soap and water; brushes
- **Water supply:** Adequate water supply per NFPA 1403 (2018) requirements

* See NFPA 1403 (2018) for additional equipment and tool requirements.

Facilities

- Standard classroom equipped for 25 students
- Whiteboards or easel pads with appropriate writing implements
- Projector with appropriate laptop connections
- Wifi/Internet access (recommended)
- At least one of the following:
 - An acquired structure
 - A non-gas-fired live fire training structure
 - A gas-fired live fire training structure
 - Must also have enough space to burn models (required when a gas-fired live training structure is the only available option)

Personnel*

- Appropriate instructor-to-student ratios for lecture and skills
 - **Lecture:** 1 primary instructor per 25 students
 - **Demonstrations:** 1 primary instructor + 1 assistant instructor (or higher) per 25 students
 - **Activities/Skills:** 2 primary instructors + enough additional assistant instructors to maintain a 1:5 instructor/student ratio

* See NFPA 1403 (2018) paragraph 4.7 for additional information about required personnel.

Unit 1: Introduction

Topic 1-1: Orientation and Administration

Terminal Learning Objective

At the end of this topic, a student will be able to identify facility and classroom requirements and identify course objectives, events, requirements, assignments, activities, resources, evaluation methods, and participation requirements for Fire Control 3: Structural Fire Fighting.

Enabling Learning Objectives

1. Identify facility requirements
 - Restroom locations
 - Food locations
 - Smoking locations
 - Emergency procedures
2. Identify classroom requirements
 - Start and end times
 - Breaks
 - Electronic device policies
 - Special needs and accommodations
 - Other requirements as applicable
3. Review course syllabus
 - Course objectives
 - Calendar of events
 - Course requirements
 - Student evaluation process
 - Assignments
 - Activities
 - Required student resources
 - Class participation requirements

Discussion Questions

1. Determined by instructor

Activities

1. Determined by instructor

Topic 1-2: Participation Requirements

Terminal Learning Objective

At the end of this topic, a student, given a qualifications list, will be able to submit all required qualifications in order to participate in Fire Control 3: Structural Fire Fighting.

Enabling Learning Objectives

1. Identify requirements for course participation
 - Authorization to attend training from fire agency or ALA/ARTP

- Verification of meeting prerequisite requirements
 - Current fit test documentation
 - Cal/OSHA compliant structural PPE
 - Components
 - Required use
 - Capabilities and limitations
 - Completed release of liability form
2. Submit required documentation
 3. Inspect PPE prior to IDLH (immediate danger to life and health) training

Discussion Questions

1. Determined by instructor

Activities

1. Determined by instructor

Instructor Notes

1. In accordance with NFPA 1403 (2018) paragraph 4.3.3, participants who received their training from an organization or entity other than the AHJ hosting the course must present written verification of having successfully completed the minimum training requirements.

Topic 1-3: Reducing Heat-Related Injury and Illness

Terminal Learning Objective

At the end of this topic, a student, given PPE and a live fire training environment, will be able to recognize, report, and mitigate cardiovascular and thermal strain and initiate personnel rehabilitation activities in order to prevent or reduce injury and illness during structural fire fighting.

Enabling Learning Objectives

1. Describe the importance of high aerobic fitness for safely and effectively perform fire fighting training and activity
2. Identify cardiovascular and thermal responses to fire fighting
3. Describe the impact of fire fighting activity and turnout gear on cardiovascular and thermal strain
4. Identify the impact of weather on cardiovascular and thermal strain
5. Identify warning signs for heat illnesses that may occur during fire fighting training and activity
6. Describe how to prevent injury and illness during fire fighting training and activity
 - NFPA 1584: Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises (current edition)
7. Identify risk factors for cardiovascular disease
8. Describe methods to modify or reduce risk factors for cardiovascular disease
9. Identify the goals of onsite rehabilitation

Discussion Questions

1. What are signs of heat-related injuries or illnesses on the training ground?

2. What strategies can you use to prevent thermal insult during live fire training?
3. What cooling activities can you use to mitigate thermal insult during life fire training?

Activities

1. Determined by instructor

Instructor Notes

1. *Live Fire Training: Principles and Practice* has good material.

Unit 2: Fire Dynamics

Topic 2-1: Fire Chemistry and Physics

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to identify, define, and describe fire science concepts and appropriately apply them to interior structural fire fighting activities.

Enabling Learning Objectives

1. Define terminology associated with fire chemistry
 - Fire
 - Energy
 - Pyrolysis
 - Smoldering
 - Flaming combustion
 - Conservation of mass
2. Describe differences between energy and temperature
 - British Thermal Unit (BTU)/joule
 - Celsius, Fahrenheit, Kelvin
3. Describe the concept of power
 - Joule/second = watt
 - Heat release rate (HRR)
4. Describe how physical states of matter influence fire behavior
 - All matter is made of atoms
 - States of matter
 - Gases
 - No fixed volume
 - Atoms spaced far apart and not fixed (can be compressed)
 - Heated gases expand, cooled gases contract
 - Flammable range
 - Too lean (lower explosive and flammability limit)
 - Too rich (upper explosive and flammability limit)
 - Vapor density
 - Solids
 - Fixed volume

- Atoms spaced very close to each other and fixed
- Pyrolysis
- Surface area to mass ratio
- Physical arrangement of fuel
 - Types
 - Physical orientation and proximity
- Liquids
 - Fixed volume
 - Atoms spaced very close, but not fixed
 - Flashpoint
 - Fire point
 - Ignition
 - Piloted
 - Auto
 - Vaporization
- 5. Identify products of combustion
 - Heat
 - Smoke
 - Vapors
 - Particles
 - Gases
 - “Toxic twins”
 - Hydrogen cyanide
 - Carbon monoxide
- 6. Identify methods of heat transfer
 - Conduction
 - Convection
 - Radiation
- 7. Describe the impact of oxygen concentration on life safety and fire growth
- 8. Identify the components of the fire triangle and fire tetrahedron

Discussion Questions

1. How does heat transfer affect your turnouts?
2. What actions can you take to minimize heat transfer?
3. How does opening a front door impact smoke flammability?

Activities

1. Skills Exercise 1: Combustion

Instructor Notes

1. Skills Exercise 1: Combustion is the student version of Instructor Demonstration 1: Combustion. Demonstrate the task and then walk the students through the activity while asking and answering the questions.
2. Use the following demonstrations to illustrate concepts. Engage students in individual demonstrations as appropriate.

- Solids
 - Instructor Demonstration 1: Dust Explosion (recommended)
 - Instructor Demonstration 3: Pyrolysis
 - Pyrolysis videos
 - Fire Training – What is Fire Pyrolysis?
 - <https://www.youtube.com/watch?v=-vAylSv2lUo>
(posted 6.6.15 / last confirmed 7.11.18)
 - Christmas Tree Fire Safety
 - <https://www.youtube.com/watch?v=lwBiZtfjioU>
(posted 6.25.07 / last confirmed 6.28.17)
- Gases
 - Fire Control 3: Structural Fire Fighting – The Whoosh Box with Captain James Mendoza
 - <https://vimeo.com/271589541>
(password: SFT)
- Combustion
 - Instructor Demonstration 2: Combustion

Topic 2-2: Fire Growth and Development

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to identify and describe fire growth and development concepts and appropriately apply them to interior structural fire fighting activities.

Enabling Learning Objectives

1. Describe the stages of fire
 - Traditional/legacy (time vs. temperature curve)
 - Ignition
 - Incipient stage
 - Fire plume
 - “Mushrooming” (ceiling jet)
 - Hot gas layer
 - Thermal layering
 - Relative underpressure
 - Inlet/intake
 - Relative overpressure
 - Outlet/exhaust
 - Neutral plane
 - Growth stage
 - Thermal radiation (radiant heat flux to the ground)
 - Rollover/flameover
 - Possible flashover
 - Fully developed

- Decay
- Ventilation-limited (time vs. temperature curve)
 - Ignition
 - Incipient
 - Growth
 - Early decay
 - Oxygen depleted
 - Ventilation event (usually fire fighter intervention)
 - Rapid fire growth
 - Fully developed
 - Decay
 - Fuel depleted
- 2. Identify factors that influence fire behavior
 - Fuel
 - Amount
 - Type
 - Arrangement
 - Air
 - Available oxygen
 - Wind velocity
 - Weather
 - Temperature
 - Humidity
 - Wind
 - Fire compartment
 - Construction
 - Thermal properties of the enclosure
 - Energy efficiency
 - Building design/floor plans
 - Square footage and cubic footage
 - Ceiling height
 - Size, number, and arrangement of ventilation openings
 - Fuel type
 - Carbohydrates (cellulosics)
 - Hydrocarbons
 - Heat of combustion
 - Fuel loading
 - Contents vs. structure fire
 - Burn regime
 - Vent limited / air controlled / air limited
 - Fuel limited / fuel controlled
- 3. Describe hostile fire events

Fire Control 3

- Fire gas ignition
 - Rollover
 - Flashover
 - Thermal radiation feedback
 - Smoke explosion
 - Backdraft
 - Gravity current
- Black fire

Discussion Questions

1. How do different construction techniques, materials, furnishings, and interiors impact fire behavior?
2. How does a vent-limited fire growth curve differ from a traditional/legacy fire growth curve?
 - How would you reduce the heat-release rate for each type of fire growth curve?

Activities

1. Determined by instructor

Instructor Notes

1. Demonstrate the fire growth and development principles introduced in this topic using a scalable burn prop, a Class A container or fixed facility, or an acquired structure. See the following props and structures documents for overviews and guidelines:
 - Props and Structures Matrix
 - Acquired Structure
 - Container (Class A)
 - Fixed Facility (Class A)
 - Gas-Fired Prop
 - Scalable Burn Prop
2. Engage students in individual demonstrations as appropriate.
3. ELO 2: Show video
 - New vs. Old Room Fire Final UL
 - <https://www.youtube.com/watch?v=aDNPhq5ggoE&index=34&list=WL>
(posted 12.7.10 / Last confirmed 7.7.17)

Topic 2-3: Characteristics of Smoke

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to read smoke emanating from a structure and use that reading to identify pre-phenomena conditions, fire location, and spread during interior structural fire fighting activities.

Enabling Learning Objectives

1. Describe the composition of smoke
 - Particulates
 - Gases
 - Aerosols

2. Describe the attributes of smoke
 - Volume
 - Velocity
 - Turbulent vs. laminar
 - Density
 - Color
3. Identify the hazards of smoke
 - Cold smoke
 - Black fire
 - Smoke as fuel
 - Flammability range
 - Smoke as poison
 - Carbon monoxide (CO)
 - Hydrogen cyanide (HCN)

Discussion Questions

1. What impact do CO and HCN have on fire fighters and occupants?
2. How do you avoid exposure to CO and HCN?
3. How can recognizing the attributes of smoke assist in tactical decision making?

Activities

1. Determined by instructor

Instructor Notes

1. Recommended resources
 - Video Clip: Art of Reading Smoke Vol1 Sample
 - https://www.youtube.com/watch?v=W8gJosK_BxY
(posted 11.2.16 / last confirmed 7.10.17)
 - DVD: *The Art of Reading Smoke*
 - Dave Dodson / DVD or streaming video / PennWell
(www.pennwellbooks.com)
 - Article: Firefighters Exposure to Smoke Particulates
 - See Online Instructor Resources

Topic 2-4: Water as an Extinguishing Agent

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to identify and describe concepts related to water as an extinguishing agent and apply them to interior structural fire fighting activities.

Enabling Learning Objectives

1. Identify concepts associated with water as an extinguishing agent
 - Heat
 - Latent heat of vaporization
 - Sensible heat
 - Specific heat of water

Fire Control 3

- Specific heat of steam
- 2. Describe how water and steam impact the fire tetrahedron
 - Removes (transfers) heat
 - Stops pyrolysis
 - Reduces oxygen percentage
 - Interrupts chemical chain reaction
- 3. Describe gas cooling
 - Droplet size
 - Hang time
 - Flow rate
 - Attack angle
 - Cone angle
 - Application duration
- 4. Describe surface cooling
 - Stop pyrolysis
 - Extinguish smoldering combustion
- 5. Describe cooling capacity
 - Raising water to vaporization temperature
 - Vaporization of water
- 6. Describe gas expansion and contraction
 - Fire gas/smoke
 - Steam

Discussion Questions

1. Can you push fire with water application?
 - Why or why not?
2. What value does steam production have in fire attack?
3. Why is it important to achieve full extinguishment?

Activities

1. Determined by instructor

Instructor Notes

1. Recommended resources for Discussion Question 1
 - Video: Governor's Island
 - <http://www.firecompanies.com/modernfirebehavior/governors%20island%20online%20course/story.html>
(last confirmed 5.23.18)
 - Document: Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction (section 9.11 Pushing Fire, page 203)
 - See Online Instructor Resources

Unit 3: Tactical Fire Ground Considerations

Topic 3-1: Fire Ground Command and Control

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to identify the components of RECEO-VS and SLICE-RS and apply them to interior structural fire fighting activities.

Enabling Learning Objectives

1. Describe the three basic levels of command
 - Strategic (overall incident direction)
 - Tactical (assigned operational objectives)
 - Task (specific tasks assigned to companies)
2. Describe “leader’s intent”
 - Task (goal or objective)
 - Purpose (why the task needs to be done)
 - End state (how it should look when successfully completed)
3. Identify the components of RECEO-VS
 - Strategic objectives
 - Rescue
 - Exposure
 - Confinement
 - Extinguishment
 - Overhaul
 - Actions of opportunity
 - Ventilation
 - Salvage
4. Identify the components of SLICE-RS
 - Tactical priorities (sequential)
 - Size up
 - Locate fire
 - Identify and control flow path
 - Cool from a safe location
 - Extinguish fire
 - Actions of opportunity
 - Rescue
 - Salvage
5. Describe the relationship between leader’s intent, RECEO-VS, and SLICE-RS

Discussion Questions

1. What is the difference between strategy and tactics?
2. How do you utilize RECEO-VS and/or SLICE-RS?
3. What is “leader’s intent”?

Activities

1. Determined by instructor

Instructor Notes

1. ELO 1 references FIRESCOPE ICS 500 Structure Fire Operations basic command configuration
2. Recommended video: Principles of Modern Fire Attack – SLICE-RS Overview
 - URL: <https://www.youtube.com/watch?v=X80yseC2fmQ>
(posted 4.14.14 / last confirmed 7.10.17)

Topic 3-2: Size Up

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to perform a 360-degree survey and risk assessment to identify building construction, occupancy type, and hazardous materials, and evaluate smoke and fire presentation, potential victim reports, and survivability profile in order to safely implement tactical operations.

Enabling Learning Objectives

1. Identify information available prior to incident
 - Weather conditions
 - Time of day
 - Staffing levels
 - Pre-fire plans
2. Identify information obtained during 360 walk around at incident
 - Life hazards
 - Potential victim reports
 - Survivability profile
 - Occupancy type
 - Building construction and materials
 - Building entry and egress
 - Smoke and fire presentation
 - Hazards
 - Incident stabilization
 - Property conservation
 - Environmental protection
3. Describe how to perform size up activities
 - Observe and evaluate critical factors
 - Structural triage
 - Smoke conditions
 - Fire conditions
 - Lack of progress (ongoing size up)
 - Communicate via radio to command and incoming units
 - Unit designation of unit arriving on scene
 - Confirmation of location and conditions
 - Life hazards and exposures
 - Brief building description

- Brief description of action taken
 - Establish orientation (“A side”)
 - Declaration of strategy and potential
 - Obvious safety hazards
 - Identification and location of Incident Command
 - Resource requests (if needed)
 - Perform continuous size up throughout incident
4. Perform size up

Discussion Questions

1. What is the intent of a 360 walk around?
2. What should you look for during initial size up?
3. What happens if you can't complete a full physical 360 walk around?

Activities

1. Determined by instructor

Instructor Notes

1. Use FIRESCOPE ICS 500 Structure Fire Operations as a reference
2. Recommended video: Principles of Modern Fire Attack: SLICE-RS: Size Up & Locate the Fire
 - <https://www.youtube.com/watch?v=JbnuzpBHTOE>
(posted 9.1.15 / last confirmed 7.11.17)
 - Covers Topic 3-2 and 3-3

Topic 3-3: Locate the Fire

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to locate an interior structure fire using visual indicators.

Enabling Learning Objectives

1. Identify visual indicators to make an informed decision about fire location
 - Visible fire
 - Smoke condition
 - Smoke presentation
 - Thermal images of high heat
 - Visible neutral plane
 - Low
 - Mid-opening
 - High
 - Soot stained windows
2. Locate a fire

Discussion Questions

1. How can thermal imagers be used to locate a fire?
2. Does your organization use thermal imagers for exterior size up?
 - Why or why not?

3. What indicators help locate a fire from the exterior?

Activities

1. Determined by instructor

Instructor Notes

1. Recommended video: Principles of Modern Fire Attack: SLICE-RS: Size Up & Locate the Fire
 - <https://www.youtube.com/watch?v=JbnuzpBHTOE>
(posted 9.1.15 / last confirmed 7.11.17)
 - Covers Topic 3-2 and 3-3

Topic 3-4: Identify Flow Paths and Manage Air Tracks

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to control the flow path and manage the air track during an interior structure fire that so that ventilation is carried out safely and in coordination with suppression activities.

Enabling Learning Objectives

1. Define terminology associated with flow path and air track
 - Flow path
 - Air track
 - Access
 - Coordination
 - Ventilation
 - Fire attack
 - Control entry
 - Pressure
 - Vertical flow
 - Horizontal flow
 - Laminar flow
2. Identify inlets/intakes and outlets/exhausts
 - Unidirectional vs. bidirectional
 - Actual vs. potential
3. Describe how to control flow path and manage air track
 - Directions
 - Vertical ventilation
 - Horizontal ventilation
 - Door control options
 - Compartmentalization
 - Interior and exterior doors
 - Control devices
 - Smoke curtains
 - Wind control devices (WCD)
 - Natural ventilation

- Prevailing winds
 - Construction features
- Mechanical ventilation
 - Blower/fan
 - Hydraulic
 - Ejector
- 4. Describe the impact of venting a fuel-limited fire
- 5. Describe the impact of venting a vent-limited fire
- 6. Describe the differences between:
 - Existing ventilation
 - Unplanned ventilation
 - Tactical ventilation
- 7. Describe the importance of coordinating ventilation with fire attack
- 8. Identify how flow path and air track impact tactical decision making
- 9. Control flow path and manage air track

Discussion Questions

1. How do the speed and direction of wind impact tactical actions?
2. How do horizontal and vertical ventilation impact fire growth?
3. What does a “smoke tunnel” indicate?
4. What are the consequences of uncoordinated ventilation?
5. How do you manage the ventilation profile?

Activities

1. Skills Exercise 10: Ventilation (recommended)

Instructor Notes

1. Demonstrate the ventilation principles introduced in this topic using a scalable burn prop, Class A container or fixed facility, gas-fired prop, or an acquired structure. See the following props and structures documents for overviews and guidelines:
 - Props and Structures Matrix
 - Acquired Structure
 - Container (Class A)
 - Fixed Facility (Class A)
 - Gas-Fired Prop
 - Scalable Burn Prop
2. Engage students in individual demonstrations as appropriate.
3. Use recommended activities with smaller groups or more advanced students
4. Show videos
 - ATF FRL - Understanding the Modern Fire Environment: Flow Paths, Fuels and Ventilation
 - <https://www.youtube.com/watch?v=8qsz0GHbYL8&feature=youtu.be> (posted 4.14.14 / last confirmed 7.10.17)
 - Principles of Modern Fire Attack: SLICE-RS: Identify and Control the Flow Path

- <https://www.youtube.com/watch?v=ATuCxWj6AW8&list=PLLLoaO4uE111OsyF7SY7WEZjAorZhraQs&index=3>
(posted 9.1.15 / last confirmed 7.10.17)
- 5. Recommended resource: Innovating Fire Attack Tactics
 - See Online Instructor Resources

Topic 3-5: Cool From a Safe Location

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to apply water to improve fire conditions of an interior structure fire to create safer entry conditions.

Enabling Learning Objectives

1. Describe the importance of extinguishing exterior fires before entry
2. Describe how to improve (cool) interior conditions
 - Water application from the exterior
 - Duration
 - Straight stream
 - High angle
 - Ceiling vs. windowsill
 - Maintain exhaust opening
 - Water application from the interior
 - Surface cooling
 - Gas cooling
3. Identify factors that may contraindicate an exterior attack
 - Topography
 - Weather
 - Construction features
 - Occupants
 - Animals
 - Viable rescues
 - Time delay
 - Forcible entry
 - Access issues
4. Explain how to use interior walls and objects for shielding
5. Cool atmosphere before making entry

Discussion Questions

1. What does “cooling from a safe location” mean in your organization?
 - Safe location vs. speed vs. “best” location
2. How does water application (stream pattern and technique) impact fire conditions?
3. What is a transitional fire attack?
 - What conditions make transitional fire attack more difficult?

Activities

1. Skills Exercise 6: Transitional Fire Attack (recommended)

2. Skills Exercise 11: Portable Water Extinguisher Attack (recommended)

Instructor Notes

1. Use recommended activities with smaller groups or more advanced students
2. Show video
 - ISFSI YouTube - Principle of Modern Fire Attack: SLICE-RS: Cool from a Safe Location
 - <https://www.youtube.com/watch?v=I1uAJ2TAUCA>
(posted 9.1.15 / last confirmed 7.11.17)

Topic 3-6: Extinguish the Fire

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to extinguish a fire by managing hose, assessing risk at the entry point of a fire, applying water using different techniques until extinguishment is achieved, ventilating, checking for fire extension, preserving evidence for fire investigation, confirming fire extinguishment, and implementing overhaul.

Enabling Learning Objectives

1. Describe hose management techniques
 - Line selection
 - Stretching (outside)
 - Flaking (outside)
 - Friction points
 - Advancing (inside)
 - Preloading
 - Friction points
 - Managing corners
 - Managing stairwells
2. Describe how to assess risk at the entry point to determine “go/no go” status
 - Smoke conditions
 - Heat conditions
 - Fire conditions
 - Building construction
 - Incident duration
3. Describe fire suppression process
 - Deployment
 - Hose line
 - Personnel
 - Entry
 - Door control
 - Advancement
 - Create or protect safe immediate environment while advancing to fire
 - Cool travel path
 - Gas cooling (emphasis during travel)

- Surface cooling
 - Coordinate ventilation with water application
 - Stream reach and penetration
 - Straight vs. fog
 - Gallons per minute
 - Water duration
 - Example: anchor, sweep, terminate
 - Natural barriers and shielding
 - Extinguishment
 - Attack fire
 - Surface cooling (emphasis during extinguishment)
 - Gas cooling
 - Direct attack
 - Indirect attack
 - Combination attack
 - Coordinate ventilation with water application
 - Stream reach and penetration
 - Straight vs. fog
 - Gallons per minute
 - Water duration
 - Example: anchor, sweep, terminate
 - Natural barriers and shielding
4. Describe post-fire knockdown activities
- Continue appropriate ventilation
 - Check for fire extension
 - Preserve evidence for fire investigation
 - Conduct overhaul
5. Identify additional considerations for above grade and below grade fires
- Features
 - Unprotected structural members
 - Structural integrity
 - Excessive storage
 - Living space
 - Void space
 - Probability of higher neutral plane (above grade)
 - Probability of lower neutral plane (below grade)
 - Actions
 - Keep spaces vent limited until water application
 - Penetrating nozzle
 - Distributor/cellar nozzle
 - Protect contents (salvage operations)
 - Consider dangers of advancing through the flow path

Fire Control 3

6. Extinguish fire
7. Implement overhaul procedures

Discussion Questions

1. What considerations go into “go/no go” decisions?
2. When is gas cooling most appropriate?
3. When is surface cooling most appropriate?
4. Why is it important to control the environment throughout the suppression process?
 - What environmental factors can the suppression team control?
5. What types of natural barriers and shields can be used during structure fires?

Activities

1. Skills Exercise 2: Risk Assessment and Door Control (required)
2. Skills Exercise 3: Stretching, Flaking, and Advancing an Attack Line (required)
3. Skills Exercise 4: Water Application (required)
4. Skills Exercise 5: Fire Attack (required)
5. Skills Exercise 7: Interior Attic Fire Attack (recommended)
6. Skills Exercise 8: Below Grade (Basement) Fire Attack (recommended)

Instructor Notes

1. Use recommended skills exercises with smaller groups of more advanced students.
2. Show videos
 - ULfirefightersafety – Eave Attack Vented
 - https://www.youtube.com/watch?v=AH_cEa9poFc
(posted 1.6.14 / last confirmed 7.11.17)
 - ULfirefightersafety – Attic Fire Tactics – Gable Attack Vented
 - <https://www.youtube.com/watch?v=Rg1oMlezdqQ>
(posted 1.6.14 / last confirmed 7.11.17)

Topic 3-7: Perform Rescue and Salvage Operations (Actions of Opportunity)

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to perform civilian rescue operations and salvage operations in coordination with suppression activities.

Enabling Learning Objectives

1. Identify considerations that impact rescue operations
 - Cooling and compartmentalization increases survivability
 - Impact of rescue on overall fire conditions
 - Evaluating credibility of information provided
2. Describe different search types
 - Primary search
 - Immediate rapid search for life
 - Area closest to fire seat
 - Area above fire floor
 - Secondary search
 - Thorough, more comprehensive search

- Performed by separate search crew from primary search
 - Often done after initial attack
 - Ensures all areas are covered
 - Targeted search (VEIS) process
 - Vent
 - Enter
 - Isolate
 - Search
3. Identify factors that have the potential to extend or reduce available search time
- Extend search time if:
 - Smoke begins to lift
 - Visibility improves
 - Smoke lightens due to steam
 - Sound/feeling of a hose line stream hitting the ceiling beneath
 - Any decrease in heat
 - Reduce search time if:
 - Smoke does not lift
 - Smoke increases in density and color
 - Rolling black smoke moves down from ceiling to floor level
 - Increase in heat
 - Visible fire in room or extension to area through floor
 - Weakening or “spongy” floor
 - Engine company has difficulty locating fire
 - Any type of water supply issue
4. Describe salvage operations
- Perform simultaneously with fire fighting operations

Discussion Questions

1. What do you consider actions of opportunity?
2. In which situations would you prioritize search over suppression activities?
3. Which search methods does your organization use?
4. How can actions of opportunity change your tactical priorities?

Activities

1. Skills Exercise 9: VEIS (Vent, Enter, Isolate, Search) (recommended)

Instructor Notes

1. Use recommended activities with smaller groups or more experienced students
2. Show videos
 - ISFSI YouTube – Principles of Modern Fire Attack: SLICE-RS: Rescue
 - https://www.youtube.com/watch?v=gq13D_NRQIE-
(posted 9.1.15 / last confirmed 7.11.17)
 - Byran Martin – VES (short version)
 - <https://www.youtube.com/watch?v=cV5ZU5Th1fU&index=22&list=WL>
(posted 3.30.11 / last confirmed 7.11.17)

Unit 4: Additional Tactical Fire Ground Considerations (Recommended)

Topic 4-1: Additional Tactical Fire Ground Considerations

Terminal Learning Objective

At the end of this topic, a student, given an assignment, will be able to demonstrate fire ground operations often performed by first responders during interior structure fires.

Enabling Learning Objectives

1. Describe fire ground operations for first responders
 - Rapid intervention crew (RIC)
 - Roof survival
 - Large volume structures (i.e., box stores, arenas, etc.)
 - Forcible entry
 - Rule of Air Management (ROAM)
 - Thermal imaging operations
 - Ground ladder operations
 - Drags and carries

Discussion Questions

1. What information should be included in a mayday call?
2. How does staffing affect your ability to complete tactical actions?

Activities

1. Determined by instructor

Instructor Notes

1. This recommended unit can be used with more advanced students, or as additional training opportunities while groups of students rotate through the required skills exercises.
 - There are no terminal or enabling learning objectives for these items. It is the instructor's responsibility to develop fire ground talking points.
 - All skills exercises and instructor demonstrations must be completed in accordance with AHJ policies and procedures.
2. Recommended video
 - Ncosfm – NFA Mayday Video
 - <https://www.youtube.com/watch?v=ISobWWcNUZU>
(posted 10.22.12 / last confirmed 7.17.17)

Unit 5: Health and Safety

Topic 5-1: Decontamination and Equipment Maintenance

Terminal Learning Objective

At the end of this topic, a student, given PPE, gear, and an assignment, will be able to complete the decontamination process, properly maintain PPE and gear, and identify potential cancer reduction actions in order to maintain short- and long-term fire fighter health and safety.

Enabling Learning Objectives

1. Identify the importance of the decontamination process
2. Identify potential cancer reduction actions
 - Use SCBA from initial attack through overhaul completion
 - Failure to wear SCBA in active and post-fire environments is the most dangerous voluntary activity in the fire service today
 - Perform gross field PPE decontamination to remove as much soot and particulates as possible
 - Do not disconnect from breathing air until after gross decontamination
 - Immediately remove as much soot as possible from head, neck, jaw, throat, underarms, and hands while still on the scene
 - Change and immediately wash clothes after a fire
 - Shower thoroughly after a fire
 - Clean PPE, gloves, hood, and helmet immediately after a fire
 - Do not take contaminated clothes or PPE home
 - Do not store contaminated clothes in vehicle
 - Decontaminate fire apparatus interior after fires
 - Keep bunker gear out of living and sleeping quarters
 - Avoid using tobacco products
 - Use sunscreen or sun block
3. Identify requirements for maintaining equipment
 - Inspect
 - Pre and post incident
 - Maintain
 - Gross decontamination
 - Cleaning
 - Inspection
 - Repair
 - Follow AHJ requirements

Discussion Questions

1. Why is it important to decontaminate your gear and your body?
2. What steps can you take to help protect yourself from exposure to carcinogens.

Activities

1. Determined by instructor

Instructor Notes

1. Reference one or more of the following
 - NIOSH Pocket Guide to Chemical Hazards (<https://www.cdc.gov/niosh/npg/>)
 - NIOSH Study of Firefighters Finds Increased Rates of Cancer (see Online Instructor Resources)
 - Taking Action Against Cancer in the Fire Service (see Online Instructor Resources)
 - Video: MU Fire and Rescue Training Institute – The Silent Killer – Firefighter Cancer
 - https://www.youtube.com/watch?v=fyZ_HQM9Z_c
(posted 2.22.16 / last confirmed 7.17.17)

Topic 5-2: Reporting Exposure, Injury, and Damaged Equipment

Terminal Learning Objective

At the end of this topic, a student, given methods of exposure reporting and an assignment, will be able to report exposure and injury in accordance with federal, state, and AHJ requirements.

Enabling Learning Objectives

1. Describe the importance of exposure and injury reporting
 - Maintain personal health and safety
 - AHJ requirements
 - Cal/OSHA requirements
 - Legal requirements
2. Identify how and/or where to report exposure
 - California Professional Firefighters (CPF) database
 - California State Firefighters Association (CSFA) database
 - AHJ-specific exposure reporting requirements
 - Personal documentation
3. Identify how and/or where to report injuries
 - Notify supervisor
 - Follow AHJ requirements
 - Follow Cal/OSHA reporting requirements
4. Identify how and/or when to report damaged equipment
 - Notify supervisor
 - Follow AHJ requirements

Discussion Questions

1. Which injuries should be reported and when?
2. What documentation does your agency use for injury or exposure?
3. Why is it important to report damaged equipment?

Activities

1. Determined by instructor

Instructor Notes

1. None

Final Draft

Time Table

Segment	Lecture Time	Activity Time	Total Unit Time
Unit 1: Introduction			
Topic 1-1: Orientation and Administration			
Lecture	0:30		
Activity: Determined by instructor		0:00	
Topic 1-2: Participation Requirements			
Lecture	0:15		
Activity: Determined by instructor		0:00	
Topic 1-3: Reducing Heat-Related Injury and Illness			
Lecture	0:15		
Activity: Determined by instructor		0:00	
Unit 1 Totals	1:00	0:00	1:00
Unit 2: Fire Dynamics			
Topic 2-1: Fire Chemistry and Physics			
Lecture	3:30		
Skills Exercise 1: Combustion		0:30	
Topic 2-2: Fire Growth and Development			
Lecture	2:30		
Activity: Determined by instructor		0:00	
Topic 2-3: Characteristics of Smoke			
Lecture	0:30		
Activity: Determined by instructor		0:00	
Topic 2-4: Water as an Extinguishing Agent			
Lecture	1:00		
Activity: Determined by instructor		0:00	
Unit 2 Totals	7:30	0:30	8:00
Unit 3: Tactical Fire Ground Considerations			
Topic 3-1: Fire Ground Command and Control			
Lecture	0:30		
Activity: Determined by instructor		0:00	
Topic 3-2: Size Up			
Lecture	0:25		
Activity: Determined by instructor		0:00	
Topic 3-3: Locate the Fire			
Lecture	0:25		
Activity: Determined by instructor		0:00	

Fire Control 3

Segment	Lecture Time	Activity Time	Total Unit Time
Topic 3-4: Identify Flow Paths and Manage Air Tracks			
Lecture	0:25		
Activity: Determined by instructor		0:00	
Topic 3-5: Cool From a Safe Location			
Lecture	0:25		
Activity: Determined by instructor		0:00	
Topic 3-6: Extinguish the Fire			
Lecture	0:25		
Skills Exercise 2: Risk Assessment and Door Control		1:00	
Skills Exercise 3: Stretching, Flaking, and Advancing an Attack Line		0:45	
Skills Exercise 4: Water Application		1:00	
Skills Exercise 5: Fire Attack		0:30	
Topic 3-7: Perform Rescue and Salvage Operations (Actions of Opportunity)			
Lecture	0:25		
Activity 3-7: Determined by instructor		0:00	
Unit 3 Totals	3:00	3:15	6:15
Unit 4: Additional Tactical Fire Ground Considerations (Recommended)			
Topic 4-1: Additional Tactical Fire Ground Considerations			
Lecture	2:00		
Activity: Determined by instructor		0:00	
Unit 4 Totals	2:00	0:00	2:00
Unit 5: Health and Safety			
Topic 5-1: Decontamination and Equipment Maintenance			
Lecture	1:00		
Activity: Determined by instructor		0:00	
Topic 5-2: Reporting Exposure, Injury, and Damaged Equipment			
Lecture	1:00		
Activity: Determined by instructor		0:00	
Unit 5 Totals	2:00	0:00	2:00

Fire Control 3

Segment	Lecture Time	Activity Time	Total Unit Time
Lecture, Activity, and Unit Totals	15:30	3:45	19:15

Course Totals

Total Lecture Time (LT)	15:30
Total Skill Exercise Time (ST)	3:45
Flex Time (for longer required or additional recommended skills exercises)	4:45
Total Course Time	24:00

Note: Skills and activity time will vary depending on the number of students in the program. It is important to remember that the suggested skill hours are for up to 25 students.

The Course Totals time reflects actual teaching/lecture and skills exercise time. With an additional one-hour meal period per day and a 10 minute break for every 50 minutes of teaching or skills time, the total scheduled time for this course is four days.

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