INSTRUCTOR GUIDE

RINGS OF FIRE

Tire Fire Prevention and Suppression

Lesson Plan 10 HAZMAT

TOPIC: Tire Fires as a Hazardous Materials Response

LEVEL:

TIME: 1 Hour

BEHAVIORIAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. To establish emergency response protocol for large tire pile fires

2. To determine the right firefighting techniques for the emergency

3. To recall safety considerations

Standard: According to the referenced text

REFERENCES: Slaughter, Rodney. "RINGS OF FIRE: Tire Fire Prevention and

Suppression" California State Fire Marshal, June 2004.

MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on

CD/ROM, speakers.

PREPARATION:

Due to the potential release of toxic chemicals, first responders should handle the tire fire as a HAZMAT incident with fire. The approach to the incident should be in accordance with tactics common to a hazardous materials response. Specifically, the response must be made Safely, Slowly and Methodically.

PRESENTATION	APPLICATION
	From The Response menu click on the HAZMAT button
	Hazmat Objective Slide
I. HAZMAT OBJECTIVE	
A. To establish emergency response protocol for large tire pile fires	
B To determine the right firefighting techniques for the emergency	
C. To recall safety considerations	
	Hazmat Slide
II. HAZMAT PROCEDURES	
A. HAZMAT procedures follow the acronym "SIN" or rather "SINCIAPCPDDD" as the basic initial on-scene actions at all tire fire incidents.	
B. The goals and priorities of the response must be:	
 Save lives and limit casualties Protect the environment Limit damage to property Restore area to normal as soon as possible 	
C. Standard HAZMAT procedures are to be implemented immediately to ensure public safety, safety for emergency personnel, site operators, and the environment	

PRESENTATION PRESENTATION	APPLICATION
	Safety Slide 01
III. "S" Safety	
A. The initial approach to the fire should be uphill, upwind and upstream at a safe distance so as to not be exposed to any hazard	
B. Initial responders must take into consideration the current and expected weather and wind direction, and the local topography	
C. Personnel should also keep a safe distance from any scene thought to be unsafe because of criminal trespassers or hostile property owners	
D. First responders need to assess the dangers of live wires, HAZMAT or environmental exposures and other possible complications	
E. Other threats to firefighter safety include; tire pile instability, operations around heavy equipment and machinery, snakes and other wild animals living in the tire pile	
F. The incident commander should tour the site's perimeter (if possible) in order to view all angles of the fire, determine the location and rate of fire spread, amount of available fuel and the location of exposures	
G. During this initial survey, a determination should be made whether any persons have been injured or if anyone at the site is in danger	
aunger	Safety Slide 02
H. Working around heavy equipment is a hazard- you can see them better than they can see you!	Cafata Clida 02
I. Beadwire is a trip hazard for personnel working in the pile	Safety Slide 03

PRESENTATION	APPLICATION
	Video – Safety Slide 04: Show the fourth of four sections of the "Rings of Fire" video
	Isolation Side
IV. "I" Isolation	
A. Tire pile fires, like any hazardous materials incidents, require that control zones be setup to minimize hazards to responding fire personnel, law enforcement, consultants, press, and the public.	
B. Control zones are those areas at a hazardous materials incident that are designated based upon safety and the degree of hazards.	
C. The most frequently used terminology for these zones are the hot, warm, and cold zones. These zones are described in more detail	
1. Hot Zone: The hot zone is the area immediately surrounding the tire pile fire, and extending far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone. This zone is also referred to as the exclusion zone or restricted zone in other documents.	
2. Warm Zone: The warm zone or support zone is the area where personnel and equipment decontamination and hot zone support take place. It includes control points for the access corridor and thus assists in reducing the spread of contamination. This zone is also referred to as the decontamination, contaminant reduction, or limited access zone in other documents.	
3. Cold Zone: The cold zone contains the command post and other support functions that are deemed necessary to control the incident.	

PRESENTATION	APPLICATION
	Notification Slide
V. "N" Notifications	
A. State and local emergency response teams should be a component to pre-planning	
B. In the event of a tire fire, local fire fighting efforts for communities may not have sufficient resources to handle such an emergency	
C. Pre-incident plans should contain up-to-date emergency contacts for all local, state, and federal agencies or organizations with expertise or responsibility in the management of environmental disasters	
D. The lists should include phone numbers, facsimile numbers, addresses, and radio frequencies, if applicable	
E. Since emergency management structures differ across state and county lines, each fire department will have to research its own government structure and laws to determine the appropriate agencies to involve	
F. These agencies should participate in, or at least become familiar with, the pre-incident plans.	
G. Examples of concerned agencies would be:	
 State and local Police; Public Works agencies; State Department of Emergency Management; Regional offices of the FEMA; State or Federal Environmental Protection Agency Resources or Forestry; State Fire Marshal office; and Finance, Purchasing and Budget agencies. 	

PRESENTATION	APPLICATION
	Command Slide
VI "C" Command / Management	
 A. Command and Control actions should 1. Size up the incident; 2. Establish safety procedures and tactics to firefighting personnel; 3. Enhance safety decisions for the evacuation of local residents; 4. Enhance decisions for the containment of toxins and the protection of the local environment 	
B. The incident commander should not be reluctant to call in additional resources based on who is going to pay for the resource or services	
C. Funding at the state and federal level will reimburse local cost	
D. In that so many disciplines will be involved in this emergency a systems approach or Unified Command will need to be established to insure that everyone's concerns are addressed and that communications between local, state, and Federal agencies are clear and consistent	
	Identification Slide 01
VII "I" Identification & Assessment	
A. The combustion of waste tires result in the release of chemicals that are known or suspected carcinogens that can be absorbed through the skin, mucous membranes, or the respiratory system.	

PRESENTATION	APPLICATION
B. Exposure hazards associated with tire fires can be introduced by	
 The smoke plume (from the fire), Water run off (from the water used to put out the fire), Soil contamination (from the oil and heavy metal products) 	
C. The byproducts of a tire fire are smoke, pyrolytic oil, ash and carbon black.	
D. The first three pose a serious threat to first responders and the environment	
E. Pyrolytic Oil is free flowing oil that contains the following target compounds: Naphthalene, anthracene, benzene, thiazoles, amines, ethyl benzene, toluene, and various metals such as, cadmium, chromium, nickel and zinc	
	Identification Slide 02
F. Ash contains various heavy metals including lead, arsenic, and zinc	
	Identification Slide 03
G. Smoke: Smoke contains VOCs, SVOCs, PAHs, particulate metals, heavy metals, carbon monoxide, dioxins and furans, sulfur and nitrogen oxides, PCB's and acid gases (hydrochloric, and	
sulfuric)	Identification Slide 04
H. Other agencies will be involved with taking samples and supplying the incident commander with up to date information about toxic levels on and off site	

PRESENTATION	APPLICATION
	Action Slide 01
VIII. "A" Action Planning	
A. There are many issues that need to be considered during a tire fire event to manage the emergency	
1. The primary goal is life safety and to protect human health	
2. Exposure protection, buildings, equipment, and unburned tire piles	
3. Confinement of the fire to the original tire pile	
4. Evacuations of elderly, infants and people with respiratory problems	
5. Extinguishment, once the tire pile has reached a smoldering stage where heavy equipment can be employed to safely pull the tire pile apart	
The state of the s	Action Slide 02
B. Exposure Protection Example- Using master streams to protect unburned tire piles from the radiant heat of the main fire	
	Action Slide 03
C. Exposure Protection Example- Use of helicopter	
D. The initial stages of the fire are best spent on exposure control and containment of run-off oil and water.	

PRESENTATION	APPLICATION
	Action Slide 04
E. Many fire departments used water to confine and extinguish the tire fires because heavy equipment needed to move unburned tires was not available	
1. This practice only slows down the combustion process, creating more smoke, and does not effectively reduce the rate of spread or extinguish the fire	
2. Hose streams should only be used to protect unburned tire piles and other exposures like heavy equipment, buildings, and personnel	
F. Control Burn:	
This technique has been used to minimize hazardous water runoff and groundwater contamination	
2. Allowing the fire to burn, while protecting the exposures, minimizes the impact on air pollution because the free-burning tire fire is in equilibrium and pyrolysis phase and will consume most of the fuel	
3. Free burning therefore reduces toxic and carcinogenic combustion emissions such as benzo(a)pyrene and benzene, as well as toluene, chrysene, zinc oxide, titanium dioxide, carbon monoxide, sulfur dioxide, and hydrogen sulfide	
	Overhead Question: What will happen if you bury the tire fire with dirt or sand?
G. Answer: Earth Cap - Containment:	
1. This technique consists of smothering the burning tire pile with dirt and is not recommended.	

PRESENTATION	APPLICATION
2. Once smothered, the fire will continue to smolder for weeks or months and generate a continuous source of pyrolytic oil	
3. It is also possible for the smoldering tire fire to periodically break out into open flames creating an unpredictable and hazardous environment for emergency personnel	
4. Additionally, due to oil residues, this method can result in significant soil and water contamination	Overhead Question: Why shouldn't water be used on
	a large tire fire?
H. Answer: Extinguishment:1. Water is generally utilized to fight Class A fires which include absorbent materials such as wood, paper, and cloth.	
2. By contrast, tires and shredded tires do not absorb water, but instead repel it	
3. Experience at tire piles has shown that master water streams produce much greater runoff without significantly improving fire knockdown	
4. Instead, fog streams may be more effective for dousing separated burning product piles	
5. Fog streams are very effective in fighting shredded or crumb rubber pile fires	
6. At tire fire sites where water extinguishment has been successful, excavation equipment was used first to separate the burning materials into small manageable piles	
7. The fire was doused with hand-lines, and a front-end loader was used to move the material to be submerged to complete the overhaul	

PRESENTATION	APPLICATION
	Overhead Question: Why and when would you use foam on a tire fire?
I. Answer: Foam Fire Suppressants:	
Foam suppressants are most effective in extinguishing small tire fires	
2. Heavy machinery is used to disseminate a larger tire pile into a smaller manageable fire	
3. In this technique water is used to cool the fire, and then foam is used to douse the fire	
4. Foam is particularly useful in suppressing oil fires that are common with tire fires	
J. Non-Standard Firefighting Equipment	
1. Because a tire pile fire is very different from a typical structure fire, non-standard fire fighting equipment is necessary to effectively combat the fire	
2. Non-standard fire fighting equipment includes a variety of heavy equipment and HAZMAT trained equipment operators	
3. Four types of equipment are usually needed on tire fires including excavators, bulldozers, front-end loaders and dump trucks	
4. With these specialized machines, the operation can be more efficient and effective	

PRESENTATION	APPLICATION
	Action Slide 05
K. Cost of Extinguishment	
1. USEPA spent \$2.5 Million on the Westley Tire Fire	
2. Tracy Fire Department spent \$450,000 on the Tracy Fire	
3. These figures do not include clean-up costs for either site	
4. The difference is in firefighting strategies, Westley wa actively extinguished with water and foam, tracy was allowed to burn itself out	
	Protective Equipment 01
IX. "P" Protective Equipment	
A. Tire fires are hazardous and require dermal and respiratory protection for all personnel responding to and working in the vicinity of the tire fire.	
B. The use of personal protective gear is mandatory for tire fires.	
C. The following is a list of standard PPE:	
 Helmet; Turnout Coat; Turnout Pants; Nomex Hood; Latex Gloves (under firefighter gloves to provide secondary protection against absorption of chemicals); Firefighting Gloves; Boots; Self contained breathing apparatus (SCBA) and Tyvex Suits (optional) 	

PRESENTATION	APPLICATION
	Protective Equipment 02
10. Additionally, heavy equipment operators need to be trained on safety equipment and SCBA	
	Containment Slide 01
X. "C" Containment & Control	
A. Surrounding and/or isolating unburned tire piles usually accomplishes exposure reduction of burning tire products	
B. If the exposure can be eliminated, then the fire department has protected the exposure and contained the scope of the incident	
C. All of the challenges can be managed through the development of an effective pre-incident plan	
D. In many of the case studies, fire departments attempted to use water to confine and extinguish the fires with "surround-and-drown" tactics because the heavy equipment needed to move unburned tires was not immediately available	
E. Therefore, the initial stages of the fire are best spent on exposure control and containment of run-off oil and water	
F. Water is best used to keep unburned tires from burning rather than to extinguish the burning tires	
	Containment Slide 02
G. Once adequate separation is obtained with excavators and bulldozers, an earthen berm can be built around the burning tire pile	
1. The earthen berms should be at least one half the height of the tire pile, provided that the angle of repose of the pile is not such that material from the top can tumble out of the confining berm	

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2. With the berm complete, the tire fire can be considered contained and extinguishment can become the main focus.	
3. A berm can also be used where adequate separation is not possible; NFPA recommends berms 1 1/2 times the tire pile height.	
4. However, because heavy equipment and loads of earth must be moved into position to build berms, it is difficult to accomplish this if adequate separation is not available during a fire.	Protective Actions Slide
XI. "P" Protective Actions	
A. During the initial response to a tire pile fire, it is essential that the threat to the surrounding community be assessed quickly	
B. The incident commander should consider evacuation of civilians, as a life safety consideration	
C. Nearby homes, commercial buildings or public places should be considered for evacuation depending on the amount and direction of the smoke plume	
D. Any area likely to be contacted by direct smoke should be evacuated as a precaution	
E. Consider closing roads or transportation routes affected by thick smoke	
	Decontamination Slide
XII. "D" Decontamination and Cleanup	
A. Decontamination is the physical and/or chemical process of reducing and preventing the spread of contamination from persons and equipment used within the hot zone of the tire pile fire	

PRESENTATION	APPLICATION
B. Decontamination takes place within the "Warm Zone" or "decontamination area"	
C. The entire process of decontamination should be directed toward confinement of the contaminant within the hot zone and the decontamination corridor to maintain the safety and health of response personnel, the general public, and the environment	
D. Although decontamination is typically performed following exit from the hot zone, the determination of proper decontamination methods and procedures needs to be considered before the incident, as part of the overall pre-incident planning and hazard and risk evaluation process.	
E. No entry into the hot zone should be permitted until appropriate decontamination methods are determined and established based on the hazards present, except in those situations where a rescue may be possible and emergency decontamination is available.	
	Disposal Slide 01
XIII. "D" Disposal	
A. The role of the emergency responders in this phase is usually limited to support in the form of exposure protection.	
B. The overall costs of site remediation is extremely high.	
1. The Westley tire fire clean-up cost was \$15 million	
2. The Tracy tire fire clean-up cost was \$12 million	
3. Both sites had approximately the same number of tires involved in the fire, the difference was fire suppression strategies	
C. Tires, metal, and other hazardous and non-hazardous debris from a tire fire burn site must be disposed of at a site approved by the CIWMB.	

PRESENTATION	APPLICATION
	Disposal Slide 02
D. Previous experience at tire fire piles has indicated that the pyrolytic oil can be recycled at several types of reclamation plants.	
E. Recycling of pyrolytic oil is discouraged in the State of California, because the California Environmental Protection Agency (Cal-EPA) classifies pyrolytic oil as a "hazardous waste" under California's hazardous waste regulations.	
F. Pyrolytic oil must be sent to an oil recycling facility.	
	Documentation Slide
XIV "D" Documentation	
A. This final section describes documentation and preparation of reports	
B. This report will be thoroughly reviewed and dissected by a variety of interested parties ranging from government officials to investigators representing private parties.	
C. Documentation of site activities, chronologies of events, and proper laboratory documentation, are all critically important during a tire fire.	
D. This information is not only necessary to assist the incident commanders and lead agency to determine if the response is effective, but also to be able to accurately present information to the press, public, and government agencies.	
E. Documented chronology of events, combined with laboratory data, with properly completed chain-of-custody documentation (including sample date and time), is crucial to dissemination of the information to nearby residents and business owners who have been exposed to contaminants from the fire.	

PRESENTATION	APPLICATION
 F. At the completion of fire-fighting efforts, the lead agency should prepare and publish a detailed report which at a minimum includes the following information: Site Background; Fire Cause and Tire Fire Dynamics; Potential Threats; Agency Response and Unified Command Structure; Fire Suppression Tactics, Health and Safety; Environmental Sampling and Monitoring; and Preliminary Site Assessment Results, if available. 	
G. The report should also contain a section that presents in an objective manner lessons learned during the tire fire event.	
H. The purpose of this review is to determine what approaches and tactics worked well, and which did not	
	HAZMAT 2
I. This section presents the acronym "SINCIAPCPDDD" or "SIN" which describes the HAZMAT procedures for actions related to a tire fire	
J. HAZMAT procedures are to be implemented immediately in order to ensure public safety, safety for emergency personnel, site operators, and the environment	
	HAZMAT Questions Slide
	Instructors Note: From the Response Menu return to the Main Menu Summarize the lecture and click the exit button to end slide show.

INSTRUCTOR GUIDE

RINGS OF FIRE

Tire Fire Prevention and Suppression

SUMMARY:

We have covered quite a bit of material here today. Think of how little you knew or thought you knew about tires and tire fires. We've come a long way to defining the problem, how society is trying to fix the problem, and what we as first responders must do in the meantime. I'm sure that this information will serve you well into the future.

EVALUATION:

1. What is the best response protocol for a tire fire?

Answer: Hazardous Materials Response

1. What is the best method to extinguish a tire fire?

Answer: Allow to burn to a smoldering stage then using heavy equipment pull apart the pile and incrementally extinguish.

2. How much foam should you order when the sales rep calls during a tire fire?

Answer: Trick Question—only as much as you identified in your preplan!

3. What are the major safety concerns during a tire fire?

Answer: Safety of first responders, public safety, and the threat to the environment.

ASSIGNMENT:

None