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STATE FIRE TRAINING

MISSION STATEMENT
The mission of State Fire Training is to enable the California fire service to safely protect life and property through education, training, and certification.

ACKNOWLEDGMENTS
The Code Development and Analysis Division of the Office of the State Fire Marshal developed the material contained in this guide.

<table>
<thead>
<tr>
<th>Dale Geldert</th>
<th>Ruben Grijalva</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of CDF</td>
<td>State Fire Marshal</td>
</tr>
</tbody>
</table>

RANDY ROXSON
ASSISTANT DEPUTY CHIEF

GINI KRIPPNER, DIVISION CHIEF
CODE DEVELOPMENT AND ANALYSIS
The material contained in this document was compiled and organized through the cooperative effort of numerous professionals within, and associated with, the California fire service. We gratefully acknowledge these individuals who served as principal developers for this document.

Rodney Slaughter, Program Coordinator  
Office of the State Fire Marshal

Todd Thalhammer, Contract Manager  
California Integrated Waste Management Board

Michael Blummenthal,  
Rubber Manufacturers Association

Kent Miller, Stockton Fire Department

Robert Gill, Central Calaveras Fire & Rescue

Terry Welsh, San Bernardino County Fire Department

James Weigand, Stanislaus Consolidated Fire Department

Tom Horton, Sacramento Metro Fire Department

Rich Johnson, North County Fire Authority

Darrin DeCarli, Sonoma County Department of Emergency Services

“We gratefully acknowledge the hard work and accomplishments of those before us who built the solid foundation on which this program continues to grow.”
COURSE STRUCTURE

This class is a revision and update of the original “Rings of Fire” training program produced by the Training Division of the State Fire Marshal’s Office. The rewrite of this class was made possible by a report entitled, “Tire Pile Fires; Prevention, Response, Remediation, Environmental Engineering and Contracting” September 23, 2002, commissioned by the California Integrated Waste Management Board. This base document was dissected by the California Tire Fire Council, a group of fire prevention and training officers, hazmat experts, and scrap tire industry spokespersons for appropriate content to be delivered to first responders, local enforcement agencies and tire dealers and operators.

This program is designed as an 8-hour class. It can be customized to accommodate one or two-hour crew training, or you can use this curriculum in conjunction with other hazardous material or fire code training programs. The opened-ended design of the course materials purposely allows the instructor a great deal of flexibility and course delivery options.

STUDENT PROFILE

TARGET GROUP
First responders, local enforcement agencies, scrap tire dealers, owners and operators.

PREREQUISITES
None

DESired ATTENDANCE TIME FRAME
None
CLASS REQUIREMENTS AND SPACE

The characteristics of the classroom and support facilities have a great impact on the learning environment and the instructor’s success or failure. For this course, it is advisable for the instructor to adhere as closely as possible to the following guidelines.

CLASSROOM EQUIPMENT

- Writing board with markers/erasers
- PC projector
- Projection screen
- VCR or DVD player
- Audio System (Speakers and Amplifier)

MATERIALS

- “Rings of Fire” Instructor Guide
- “Rings of Fire” Video (VHS or DVD)
- “Rings of Fire” Student Text
- “Rings of Fire” Student Handout
- Multimedia slide show on CD/ROM
INTRODUCTION TO THE INSTRUCTOR GUIDE

This publication is intended to serve as an instructor guide and includes lesson plans, a slide index, student activities, and tests. For each topic identified in the course outline, a lesson plan has been developed that contains: a time frame, level of instruction, behavioral objective, materials needed, references, preparation statement, lesson content, and endnotes. Suggested application methods have been identified throughout the lessons for you to use during your presentation.

- **Time Frame**: The estimated duration required for in-class presentation.
- **Level of Instruction**: Identifies the instructional level that the material was designed to fulfill. Obviously, you have the latitude to increase the level based on available time, local conditions, and the students' apperceptive base.
- **Behavioral Objective**: The behavioral objective is a statement of the student's performance desired at the end of instruction. You must ensure that enough information is given in the presentation and/or activities to enable the student to perform according to the goal.
- **Materials Needed**: This should be a complete list of everything you will need to present the lesson, including visual aids, tests, and so on.
- **References**: These are the specific references the curriculum development team used when developing the lesson plan. In addition, references may be listed as additional study aids for instructors to enhance the lesson -- books, manuals, bulletins, scripts, visual aid utilization plans and the like. The corresponding pages in the student supplement are also listed here.
- **Preparation**: The motivational statements in this section connect the student with the lesson plan topic through examples or illustrations relating to their occupation, injury, and even mortality. You may modify this section to better fit your students' environment.
- **Lesson Content**: Includes information used in the four-step method of instruction.

<table>
<thead>
<tr>
<th>Technical Lesson Plans</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>Everything the student participates in</td>
</tr>
<tr>
<td>Everything you say or display</td>
<td>Questions</td>
</tr>
<tr>
<td>Content</td>
<td>Activities</td>
</tr>
<tr>
<td>Notes</td>
<td>Audiovisual Cues</td>
</tr>
</tbody>
</table>

MULTIMEDIA PRESENTATION
The multimedia presentation was developed in a program called “Astound.” You do not need the software or license to run this program. It is suggested that you transfer by clicking and dragging the presentation file from the CD-ROM to a file on your hard drive. While the program will run from the CD, it runs even better off of your hard drive.

The presentation and your lesson plans are set-up to allow you to customize the delivery of this program into short subject courses for one or two-hour crew training or as an eight-hour stand-alone class. To enable this function, a menu slide was added for your convenience to navigate specific subject areas.

When you get to the end of the lesson the slide will automatically advance back to the menu slide. To advance the slides click on the left mouse button. You can also use your left and right arrow keys to advance or go back to a previous slide. To go to another section of the program click and hold your right mouse button and release. A small window displaying all of the slides will appear. To exit this program at any time simply hit the escape key on your computer or you can use the exit button on the “Main Menu.”

There are several unique pens available on your presentation. To change pen color and function use the following key code:

F2 Black Pen—handy for circling or to use to check bulleted items.
F3 Red Pen—handy for slides with a dark background to highlight certain information.
F4 Yellow Highlighter—used like a regular highlighter and not obscure the text.
F5 Pink Highlighter—provides you an option with the yellow highlighter.

To make the pens work, click and hold you left mouse button, and while its held down move the mouse across the slide. Experiment and practice with these pens to customize the delivery of your presentation.
Course Outline

Course Objectives: To provide the student with...

a) Background and history of scrap tire industry
b) Chemical compounds in tire manufacturing
c) Traditional sources of ignition
d) Current codes and regulations
e) Ground rubber operations and hazards
f) Pre-fire planning of outdoor tire storage yards
g) Tire fire behavior
h) Hazardous Materials Response

Course Content .................................................................................................................................

Introduction – Defining the Problem ..............................................................................................0:30
Tire History ......................................................................................................................................0:30
Tire Markets .................................................................................................................................0:30
Tire Storage ...............................................................................................................................0:30
Sources of Ignition .....................................................................................................................0:30
Codes and Regulations ..............................................................................................................1:00
Ground Rubber ..........................................................................................................................0:30
Preplanning .................................................................................................................................0:30
Fire Behavior ..............................................................................................................................0:30
Hazmat Response .......................................................................................................................1:00

Texts and References

## Calendar of Events

<table>
<thead>
<tr>
<th>DAY</th>
<th>TOPIC</th>
<th>TITLE</th>
<th>TIME</th>
<th>ACTIVITY</th>
<th>EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction – Defining the Problem</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tire History</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tire Markets</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tire Storage</td>
<td>0:30 Lecture</td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>Sources of Ignition</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>Codes &amp; Regulations</td>
<td>1:00 Lecture</td>
<td></td>
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<tr>
<td></td>
<td>Lunch</td>
<td>1:00</td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>Ground Rubber</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>Preplanning</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fire Behavior</td>
<td>0:30 Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Hazmat Response</td>
<td>1:00 Lecture</td>
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<tr>
<td></td>
<td>Day 1 Total</td>
<td>7:00</td>
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<tr>
<td></td>
<td>Test</td>
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</table>
INSTRUCTOR EVALUATION

To pass this class, and get an FSTEP certificate, students need to score 70%. In other words, students can only miss 6 out of the 20 questions on this evaluation.

1. California generates approximately 10% of all the scrap tires in the country.

   True - California generates over 30 million and 300 million are generated annually in the U.S.

2. Carbon was added to the tires chemistry, so if a tire does catch on fire it will burn cleaner and faster.

   False - Carbon was added to reduce wear.

3. The pyrolytic oil generated from a tire fire is no more hazardous than crankcase oil.

   False - Pyrolytic oil has a higher concentration of harmful chemicals.

4. The largest market for scrap tires in California is in the production of ground rubber.

   True - California uses 15 million tires in the production of crumb or ground rubber.

5. The amount of heat released by one pound of tire material is 7,400 BTU or 17,242 kilojoules per kilogram.

   False - one pond of tire material generates 15,000 btu per pound or 34,950 kilojoules per kilogram.

6. Outdoor tire storage is typically randomly stacked regardless of code application.

   True - Randomly stacked tires take less effort than other storage methods.

7. Wildland fires are the leading cause of tire pile ignitions.

   False - Historically, arson is the leading cause of tire fires.

8. Local fire departments cannot enforce CIWMB regulations unless adopted locally.
True- Local fire departments can however use national recognized standards according to Title 19.

9. Having other agencies participate in local enforcement is a good idea.

True- A Unified Enforcement program produces better results.


True- NFPA is more complete than the current Uniform Fire Code which only restricts tire pile size.

11. Tire piles of 5,000 or less do not need a permit from the CIWMB.

False- Tire piles of 500 to 5,000 require a minor waste tire permit from CIWMB.

12. The best way to reduce outdoor tire storage (and avoid regulation) is to lease an empty unsprinklered warehouse and store the tires indoors.

False- Unscrupulous operators do this to avoid detection and regulation.

13. Processing operations that produce crumb or ground rubber have a high incidence of fires.

True- from retreading operations to ground rubber facilities, tire fires are common.

14. Large piles of tires can be found in automotive salvage yards, solid waste facilities, property dedicated to tire storage, retreading shops, agricultural areas, and ground rubber facilities.

True- Stock piles of tires can be found in a wide range of places.

15. The pre-fire plan should include contact info for state and federal agencies.

True- State and federal agencies can order up the resources you will need to combat this emergency.

16. The best way to fight a fully involved tire fire is to protect exposures until the pile is in the smoldering phase and then using heavy equipment pull the tire pile apart and extinguish incrementally.
**True-** Other methods will endanger personnel or exacerbate the impact of the environment.

17. Suppliers of foam products specifically designed for tire fires should be identified, and the amount needed, in your pre-fire plan.

**False-** Foam has not proven to be any better than water on tire fires, with the exception of small tire fires of 500 or less.

18. Tire fires are not a hazardous materials response.

**False-** The products of combustion have a very high health hazard concern for those operating in and around the tire fire.

19. Ground or crumb rubber piles have lower flame lengths and can be extinguished with water applied in a fog pattern.

**True-** Altered tire material has lower flame lengths and is easier to extinguish.

20. Covering a tire pile fire with earth is the fastest way to extinguish a tire fire.

**False-** Burying a tire fire allows it to continue to burn creating more pyrolytic oil and larger environmental impact.
Student Evaluation

Read each statement and circle either true or false if you agree or disagree with the statement.

1. California generates approximately 10% of all the scrap tires in the country.
   True - False

2. Carbon was added to the tires chemistry, so if a tire does catch on fire it will burn cleaner and faster.
   True - False

3. The pyrolytic oil generated from a tire fire is no more hazardous than crankcase oil.
   True – False

4. The largest market for scrap tires in California is in the production of ground rubber.
   True – False

5. The amount of heat released by one pound of tire material is 7,400 BTU or 17,242 kilojoules per kilogram.
   True – False

6. Outdoor tire storage is typically randomly stacked regardless of code application.
   True – False

7. Wildland fires are the leading cause of tire pile ignitions.
   True - False

8. Local fire departments cannot enforce CIWMB regulations unless adopted locally.
   True - False

9. Having other agencies participate in local enforcement is a good idea.
   True – False

True – False

11. Tire piles of 5,000 or less do not need a permit from the CIWMB.

True - False

12. The best way to reduce outdoor tire storage (and avoid regulation) is to lease an empty unsprinklered warehouse and store the tires indoors.

True – False

13. Processing operations that produce crumb or ground rubber have a high incidence of fires.

True - False

14. Large piles of tires can be found in automotive salvage yards, solid waste facilities, property dedicated to tire storage, retreading shops, agricultural areas, and ground rubber facilities.

True – False

15. The pre-fire plan should include contact info for state and federal agencies.

True – False

16. The best way to fight a fully involved tire fire is to protect exposures until the pile is in the smoldering phase and then using heavy equipment pull the tire pile apart and extinguish incrementally.

True – False

17. Suppliers of foam products specifically designed for tire fires should be identified, and the amount needed, in your pre-fire plan.

True - False

18. Tire fires are not a hazardous materials response.
True – False

19. Ground or crumb rubber piles have lower flame lengths and can be extinguished with water applied in a fog pattern.

   True – False

20. Covering a tire pile fire with earth is the fastest way to extinguish a tire fire.

   True - False
Lesson Plan 01
Introduction

TOPIC: The Tire Problem

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Define the outdoor tire storage problem.

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Welcome to the “Rings of Fire” training program. The program you are in today is an update of a training program that was developed ten years ago by the State Fire Marshal’s Office for California Integrated Management Board. With two of California’s largest tire piles going up in smoke in the mid 1990’s we have had the opportunity to collect a lot of data, and in doing so have reconsidered our recommendations for both fire prevention and fire suppression. You will benefit from this program by getting the latest information from a wide range of subject matters experts. So let’s get started!
## I. Introduction

A. Funding for this program provided by the California Integrated Waste Management Board

B. Produced by the Office of the State Fire Marshal

C. Coordinated by the California Tire Fire Council

D. Published by CSU, Chico Instructional Media Center

E. California Tire Fire Council wants you to know that, “it’s not a question of if, but rather a question of when and how much?”

1. The tire council was composed of training Officers, Prevention Officers, and Hazmat specialists
2. Every State in the country has had a tire fire
3. Tire fires are a convenient way of dodging enforcement

F. Program Goal: To provide fire professionals and enforcement officers, along with waste tire owners and operators, up-to-date information so that you can make informed decisions regarding scrap tire piles
## II. Problem Statement

- Tire Volume
- Tire Geometry
- Environmental Impact

A. Tire Volume, Tire Geometry and Environmental Impact-- tires collecting on the side of the road are the beginnings of a huge storage problem

B. Tire Volume
   - 33.3 million tires generated by California
   - Nationally 300 million generated annually
   - 280 million in known stockpiles
### C. Tire Geometry
- The hollow doughnut shape traps oxygen and shields the fire from fire fighting agents
  1. This makes fighting tire fires a problem
  2. Suppression strategy could make the environmental impact worse

### D. Environmental Impact
- Air Pollution
- Soil Contamination
- Water Quality
- Tires provide great habitat!
  a. Tires are a perfect breeding ground for mosquito’s protecting the larvae from natural predators
  b. Mosquito’s bring a wide range of diseases to human populations including the spread of West Nile Virus
  c. Tire casings provide shelter for rodents and other burrowing animals
  d. Rattlesnakes are attracted by the rodents and are a threat to unaware firefighters

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>Rings of Fire Slide 09</td>
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<tr>
<td>Tire Geometry</td>
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<tr>
<td>Rings of Fire Slide 10</td>
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<tr>
<td>Environmental Slide</td>
<td></td>
</tr>
<tr>
<td>Rings of Fire Slide 11</td>
<td></td>
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<tr>
<td>Environmental Slide</td>
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</tbody>
</table>
### III. Main Menu

A. This training program is broken down into three main topical areas;

1. Background
2. Prevention
3. Response
4. Exit

B. Each of these topics is then broken down into three more subject areas

#### APPLICATION

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
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<td></td>
<td>Rings of Fire Slide 12 Main Menu</td>
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</table>

**Instructors Note:**
Read summary and then review evaluation questions
SUMMARY:  
As we go through this training program, we will be able to add to this problem statement “outdoor tire Storage.” From “Tire History” to “Hazmat Response” you will be surprised to learn how just one simple product can be such a complicated subject.

EVALUATION:

1. How many scrap tires are generated in California?  
   Answer: 33.3 million as of 2003

2. Approximately how many tires are in known stock piles across the country?  
   Answer: Approximately 280 Million

3. Why are tire fires hard to fight with conventional suppression techniques?  
   Answer: Tires geometry traps oxygen and the material repels water.

4. What happens if you attempt to put out a large tire pile with water?  
   Answer: You will slow down the combustion process allowing for more pyrolytic oil to generate.

5. What are the most dangerous animals living in a tire pile?  
   Answer: Rattlesnakes and mosquito’s.

ASSIGNMENT:  
Read the first section of the text “Tire History.”
Lesson Plan 02
Tire History

TOPIC: The History & Development of Tires

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:
Condition: Complete evaluation with 70% accuracy
Behavior: The student will . . .
1. Provide a historical perspective to the waste tire storage problem in America.
2. Understand the chemical and structural evolution of the modern tire and how it impacts firefighting efforts.

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: It’s fairly obvious that the wheels of progress in the twentieth century rode a little smoother on air filled rubber tires. Imagine what our lives would have been like, or what our vehicles would’ve looked like if Charles Goodyear hadn’t found a way to stabilize natural rubber through the vulcanization process? In this section we are going to learn about the history of tires so that we can understand why the storage problem exists. We are also going to learn about the tires chemistry and the conversion of that chemistry under fire conditions and how it impacts the environment.
## I. Objective

A. Provide a historical perspective to the waste tire storage problem in America

B. Understand the chemical and structural evolution of the modern tire and how it impacts firefighting efforts

## II. Tire History

A. Used by South American Natives
   1. Water resistant shoes, baskets, boats
   2. Few Industrial uses
   3. Melted in hot weather
   4. Froze in cold weather
   5. Adhered to everything they touched

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td></td>
<td>From the Main Menu click on Background.</td>
</tr>
<tr>
<td></td>
<td>From the Background menu click on the Tire History button.</td>
</tr>
<tr>
<td></td>
<td>History Objective Slide 01</td>
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<tr>
<td></td>
<td>Rings of Fire Slide 02</td>
</tr>
<tr>
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<td>South America</td>
</tr>
</tbody>
</table>
### B. Goodyear experiments from 1830-1839
1. Natural rubber hardened by adding sulfur and treating with an acid gas.
2. Mixture accidentally lands on a stove and creates desired consistency

### C. First used for tires by John Dunlop in Ireland 1888
1. Used a thin rubber sheet covered with fabric to make air filled tires for son’s bicycle
2. Sells concept to Harvey du Cross, Jr. who starts Dunlop Rubber Company

### D. Andre Michelin made first air filled tires for cars 1895
1. Developed for 350 mile race from Paris to Bordeaux
2. Numerous flats made it seem like it might not be useful

### E. 1911 The Hardman Tire and Rubber Company produces first combination tire/tube
1. Air filled inner tube is surrounded by hardened rubber tube, reinforced with fabric
2. Patented in 1903

### F. 1908 Frank Seiberling built a machine that cuts grooves in hard tire surface for traction

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Goodyear experiments from 1830-1839</td>
<td>Rings of Fire Slide 03 Timeline</td>
</tr>
<tr>
<td>C. First used for tires by John Dunlop in Ireland 1888</td>
<td></td>
</tr>
<tr>
<td>D. Andre Michelin made first air filled tires for cars 1895</td>
<td></td>
</tr>
<tr>
<td>E. 1911 The Hardman Tire and Rubber Company produces first combination tire/tube</td>
<td></td>
</tr>
<tr>
<td>F. 1908 Frank Seiberling built a machine that cuts grooves in hard tire surface for traction</td>
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<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
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<tr>
<td>--------------</td>
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</tr>
<tr>
<td>G. 1910 B.F. Goodrich Company adds carbon to reduce tire wear</td>
<td><strong>Overhead Question:</strong> What is the life expectancy of a tire today?</td>
</tr>
<tr>
<td>H. 1920 life expectancy of tire is 13,000 miles</td>
<td><strong>Overhead Question:</strong> What was going on historically that necessitated the making of synthetic rubber?</td>
</tr>
<tr>
<td>I. Answer: It depends on how much you pay for your tires but you can get up to 60,000 miles on new top of the line tires today</td>
<td></td>
</tr>
<tr>
<td>J. Disconnection from Asian and South American Suppliers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Answer: Beginning of WWII</td>
</tr>
<tr>
<td></td>
<td>2. Goodyear Tire and Rubber Company</td>
</tr>
<tr>
<td></td>
<td>3. Began making synthetic tires in 1937</td>
</tr>
<tr>
<td></td>
<td>4. Patented man made substance called Chemigum</td>
</tr>
<tr>
<td>K. By 1950 over half of all tires were man made rubber</td>
<td></td>
</tr>
<tr>
<td>L. Today over 60% of a tire is synthetic</td>
<td></td>
</tr>
<tr>
<td>M. 1954 First car offered with tubeless tire</td>
<td></td>
</tr>
</tbody>
</table>
### PRESENTATION

#### III. Bias Ply Versus Steel Belt

A. Change from Bias Ply to Steel Belt greatest impact on waste tire industry.
   1. Originally in commercial bias ply tires, cords in a single ply would run in crisscross pattern to provide strength
   2. Modern tires are constructed with steel belt (radial-ply belt)
   3. Or a rigid belt of synthetic fabric (bias-ply belted)

B. Belted tires provide longer wear then Bias Ply
   1. Steel belted tires generally not retreaded
   2. Discarded instead of recycled
   3. Steel in tires is source of heavy metals released during tire fire

#### IV. Chemical Compounds of Tires

A. Tire’s chemical composition
   1. Natural and synthetic rubber polymers
   2. Sulfur and sulfur compounds
   3. Phenolic resin
   4. Oil fillers and Petroleum waxes
   5. Nylon, polyester or rayon fibers and wire

### APPLICATION

- Rings of Fire Slide 04
  Bias ply vs Steel belt
- Rings of Fire Slide 05
  Chemical Compounds 1
## Presentation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>6.</td>
<td>Fatty acids</td>
</tr>
<tr>
<td>7.</td>
<td>Clay, Carbon black and inert materials</td>
</tr>
<tr>
<td>8.</td>
<td>Zinc Oxide and Titanium Dioxide</td>
</tr>
</tbody>
</table>

### B. Fire Conditions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Volatile Organic Compounds</td>
</tr>
<tr>
<td>2.</td>
<td>Polynuclear Aromatic Hydrocarbons (PAH’s)</td>
</tr>
<tr>
<td>3.</td>
<td>Carbon Monoxide</td>
</tr>
<tr>
<td>4.</td>
<td>Heavy Metals</td>
</tr>
</tbody>
</table>

### C. Westley Example

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>141,000 lbs of Benzene</td>
</tr>
<tr>
<td>2.</td>
<td>70,000 lbs of PAH’s</td>
</tr>
<tr>
<td>3.</td>
<td>10,000 lbs of Butadiene</td>
</tr>
<tr>
<td>4.</td>
<td>250,000 gallons of pyrolytic oil recovered</td>
</tr>
<tr>
<td>5.</td>
<td>Oil flowing into creek ignited</td>
</tr>
</tbody>
</table>

## Application

- Rings of Fire Slide 06
  Chemical Comp 2
- Rings of Fire Slide 07
  Chemical Comp 3
## PRESENTATION

D. Oil Comparison

1. Used crankcase oil is a known carcinogen
2. From this comparison is there any doubt that a tire fire is a potential hazardous materials incident?

## APPLICATION

<table>
<thead>
<tr>
<th>Rings of Fire Slide 08 Chemical Comp 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructors Note:</strong></td>
</tr>
<tr>
<td>Compare data on slide between pyrolytic oil and used crankcase oil</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rings of Fire Slide 09 Tire History Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructors Note:</strong></td>
</tr>
<tr>
<td>Give summary and then read evaluation questions</td>
</tr>
</tbody>
</table>
SUMMARY:
Tires are obviously a difficult product to get rid of. Why would anyone decide to specialize in a collection of old and used tires to begin with? The answer is that there is allegedly money to be made from used tires. Many people began collecting used tires in the belief that one day there would be a market for this product. In the next section we will see what that market is and how many tires are being put to good purposes.

EVALUATION:

1. Should water be used to fight a tire fire when rubber is naturally waterproof?
   Answer: If the fire is small enough water works just great on cooling and extinguishing the small tire fire. However using water on large fully involved tire piles is usually not a good idea. Water and foam cannot Penetrate the fire and the cooling effect that you do provide will allow incomplete combustion, thereby releasing more pyrolytic oil than necessary.

2. How does the tires’ grooves effect fire behavior?
   Answer: Opens more surface area to flames and heat

3. What happens to air filled tires in a fire environment?
   Answer: Air filled tires can expand in the heat of the fire and create mini- explosions.

ASSIGNMENT:
None
Lesson Plan 03
TIRE MARKETS

TOPIC: Tire markets and Applications

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Cite how tires are being used in a wide variety of products and civil engineering applications.

2. Identify potential tire storage operations and locations.

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Tires are a lot like icebergs. Ice traps water in a solid form while tires hold oil in a solid form. You only see a portion of the iceberg floating in the ocean. Similarly, with large scrap tires you only see the problem of outdoor tire storage-- you may not see or even realize that there are many legitimate scrap tire dealers, business people and government agencies working to develop markets for our discarded tires and finding a solution to the outdoor tire storage problem.
## Tire Market Objective

A. Cite how tires are being used in a wide variety of products and civil engineering applications

B. Identify potential tire storage operations and locations

## Waste Tire Markets and Usage

A. Many different uses in industries: Sports, Agriculture and Civil Engineering

B. CWIMB estimates 74% of scrap tires in California are diverted to other sources

C. CWIMB and other agencies are continuously encouraging new markets

D. Of these markets we are going to discuss:

   1. Retreading
   2. Ground Rubber
   3. Civil Engineering
   4. Fuel Supplement

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td></td>
<td>From the Background Menu click on the Tire Market button.</td>
</tr>
<tr>
<td></td>
<td>Tire Market Objective Slide 01</td>
</tr>
<tr>
<td></td>
<td>Tire Market Slide 02 Market Pie Chart</td>
</tr>
<tr>
<td></td>
<td>Instructors Note: Review information on pie chart with class</td>
</tr>
<tr>
<td></td>
<td>Tire Market Slide 03 Markets</td>
</tr>
</tbody>
</table>
### III. Retreading

A. The most direct form of reuse / diversion

B. Old casing is removed from the tire, the casing is buffed, and new casing is applied

C. Old tread is used in some other application and the new casing is put back into active service

D. Retreading mostly applies to heavy truck tires

E. The United States Fire Administration and Federal Emergency Management Agency report as of Dec 1998 approx. 38 million passenger car tires and truck tires were retreaded

### IV. Ground Rubber

A. Some examples of uses:
   - Athletic mats and Running tracks
   - Playground chips and Carpet padding
   - Toys and Airplane shock absorbers
   - Stock Feeders and Fences
   - Dock Bumpers and Boots
   - Door mats and Gloves
   - Hockey pucks and Soles for sandals
   - Mud flaps and Speed bumps
   - Roofing materials and Soaker hoses

### Instructors Note:
Pass around samples of crumb rubber products.
B. Another application of ground rubber is in roadway paving
   1. Crumb rubber is mixed with standard paving materials
   2. Rubberized Asphalt Concrete (RAC) or Rubberized Modified Asphalt (RMA)
   3. Crumb rubber from 800 to 1200 waste tires is used per mile of two-lane, 3-inch lift roadway

C. Ground rubber processing for any application involves a steady feedstock of tires on site, fires in ground rubber processing is common

D. Photo Example: EnTire (tire facility) in Nebraska City, Nebraska
   1. Facility located between railroad and major river
   2. Tire shreds are stored in an old grain silo
   3. Heavy precipitation produced conditions for spontaneous combustion

E. Daylight shot of the EnTire firefighting effort!
   1. Several firefighters were sent to the hospital as steam from the water applied to the silo expanded and the silo exploded open
### PRESENTATION

2. Imagine fighting a tire product fire in these winter conditions?

### APPLICATION

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<tr>
<td>Tire Market Slide 10</td>
<td>Civil Engineering 1</td>
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<td>Tire Market Slide 11</td>
<td>Civil Engineering 2</td>
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<tr>
<td>Tire Market Slide 12</td>
<td>Civil Engineering 3</td>
</tr>
<tr>
<td>Tire Market Slide 13</td>
<td>Civil Engineering 4</td>
</tr>
<tr>
<td>Tire Market Slide 14</td>
<td>Civil Engineering 5</td>
</tr>
</tbody>
</table>

#### V. Civil Engineering Applications

A. Artificial reefs, breakwaters, retaining walls, and crash barriers, alternative Daily Cover (ADC), loose fill, slope stabilization, levee slurry walls, landfill leachate collection systems

B. Civil Engineering Applications of Scrap Tires are covered in ASTM Standard 6270

C. Tire Derived Aggregate (TDA)
   - Half the weight of soil
   - Half the pressure of soil
   - Good thermal insulating qualities
   - Better drainage than soil
   - Vibration dampening
   - 56 million tires a year used for C.E.

D. Diagram example of a San Jose Freeway interchange where tires are being used as opposed to dirt and rock in wet clay soils

E. Photo Sample showing the actual use of tire product on the interchange

F. Diagram of a Freeway Retainer wall in Riverside
### VI. Fuel Supplement

- **A.** The largest market for reuse of waste tires both in the nation and in California is the use of tires as a fuel supplement.
- **B.** Pulp and paper mills, cement kilns, and coal co-generation facilities.
- **C.** Nearly 39 percent of all waste tires generated in California in 1999 were used as fuel.
- **D.** While conducting scientific experiments with U.C. Berkeley temperature of our test pile peaked at 1103 degrees Centigrade.
- **E.** The results of these test became the table of separation distances in NFPA 231 D, 230 Annex G and will soon appear in NFPA 1.
- **F.** Tire Derived Fuel, or Tire Diverted Fuel (TDF), is a high quality fuel that can produce up to 15,000 British Thermal Units (BTU) per pound of tire material.
- **G.** Table of Heat Release Values.
- **H.** Tires generally create less ash and sulfur than some types of coal, and when mixed with coal, burn completely minimizing chemical emissions to the atmosphere.

### Application

- Tire Market Slide 15
  - Civil Engineering 6
- Tire Market Slide 16
- Tire Market Slide 17
  - Heat Release
- Tire Market Slide 18
  - Heat Release 2

**Instructors Note:**
Discuss slide for Heat Release Values.
### PRESENTATION

I. Three cement kilns in California used 4.1 million tires as supplemental fuel

J. Tires were used because they have higher heat energy by weight and they reduce emissions of certain regulated pollutants

K. Additionally, the steel belts in many tires produce minor amounts of iron ore, which is used in the cement making process

L. Coal co-generation plants can burn shredded tires with the coal to produce energy

M. The CIWMB funded emissions tests at two coal co-generation plants in northern California revealing that these two coal co-generation plants could use 1-2 million tires per year

### VII. Combustion Byproducts Barriers to Reuse / Recycling

A. The CIWMB and other agencies across the nation are continually encouraging the development of new markets

B. One barrier to use of waste tires for recycling purpose is the byproducts of burning tires

C. Markets, however, have been identified for many of the combustion products

D. Table 5 below shows some of the uses for the major combustion byproducts

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<table>
<thead>
<tr>
<th>Tire Market Slide 19</th>
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</thead>
<tbody>
<tr>
<td>Co-generation</td>
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</table>

**Instructors Note:**
Background photo is of the Westley, Calif. Co-generation Plant.
### PRESENTATION

E. Byproduct Use/Market
- Calcium sulfate (gypsum) - Agricultural additive for clay soils
- Zinc oxide (from fly ash) - Smelting, fertilizer and cattle feed companies
- Iron oxide (from furnace) - Cement production

### APPLICATION

Instructors Note:
Give summary and then read evaluation questions

Tire Market Slide 20
Market Questions
SUMMARY:
In order to completely understand the tire situation and all the economic aspects involved, it is important to view the tire storage problem from different perspectives. This section highlights a few of the alternative uses for waste tires. Remember that the tires you replace on your family car or emergency response vehicle all contribute to the problem.

EVALUATION:

1. Name three uses for waste tires?
Answer: Material in new products, civil engineering applications and as fuel or fuel supplement.

2. How much energy is generated from a pound of tire material?
Answer: 15,000 btu per pound or 34,950 kilojoules per kilogram

3. Where could you locate a large feedstock of waste tires?
Answer: Retreading shops, ground rubber facilities, outdoor storage yards, automotive wrecking yards and some retailers

ASSIGNMENT:
None
Lesson Plan 04
TIRE STORAGE

TOPIC: Tire Storage Methods Impact on Firefighting

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Identify storage methods and processes
2. Determine which storage method is best from a firefighting perspective

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Effective disposal options are continually being sought for the hundreds of millions of tires that are discarded each year. Currently there are no federal laws or regulations specifically governing waste tires. Although responsible means for disposal, such as recycling, reuse and energy-recovery have become more common, the tire dumps of the last forty years continue to present environmental and safety hazards that will continue into the foreseeable future.

Waste tires are not desirable in standard landfills because, when buried, the tires tend to trap air and “float”, which interferes with future landfill reclamation operations. As permitted landfill space diminishes, it is necessary to limit the types of accepted material to those better suited to future reclamation.
Tires isolated from the waste stream must also be separated from other types of combustible materials that may ignite at a lower temperature and threaten the tire pile.

The way tires are stored can significantly impact fire fighting efforts. Tire pile size, configuration, and storage method can all contribute to problems for command and control of an outdoor tire pile fire. In this section we will review the scrap tire industries storage practices.
I. **Objective**
   
   **A.** Identify methods
   
   **B.** Determine which storage method is best from a firefighting Perspective

II. **Laced Stacks**
   
   **A.** Whole tires stacked in an overlapping or herring bone pattern
   
   **B.** This “laced” stacking takes advantage of space, exposes less surface area of the tires to a fire, and may be used as a retaining wall for randomly stacked tires
   
   **C.** The biggest problem or danger with a fire in a laced stacked is that the tires are more difficult to pull apart without bringing a whole section of tires down
   
   **D.** Bagel Cut Laced Pile- cut side faces down to keep water collecting to control mosquito’s

III. **Barrel stacks**
   
   **A.** Whole tires stacked on top of one another

---

**PRESENTATION** | **APPLICATION**
--- | ---

From the Background Menu click on the Tire Storage button.

Tire Storage Objective Slide 01

Tire Storage Slide 02 Laced

Tire Storage Slide 03 Bagel-cut

Tire Storage Slide 04 Barrel stack
### PRESENTATION

| B. Typically this is used for used tires that have been graded as reusable tires |
| C. These graded tires may be resold, retreaded, or exported to foreign dealers |
| D. A fire in barrel stacked tires generates flames in a whirlpool effect straight up into the air |
| E. Lateral extension of the fire is possible, but does not extend as fast as randomly stacked tires |

### IV. Random Stacks

| A. This is the most common storage method where tires are simply tossed into piles |
| B. This method requires little effort or handling by a site operator but also requires the most storage space |
| C. Randomly stacked tires are a greater fire risk because they expose more tire surface area and create greater volumes of air between tires than other stacking methods |

| V. Bundling and Baling |
| A. In one method, up to 18 whole tires, approximately 11 feet, can be compressed into 30-inch bundles |

### APPLICATION

| Tire Storage Slide 05 Random stack |
| Tire Storage Slide 06 Tire bale 1 |
| Tire Storage Slide 07 Tire bale 2 |
### PRESENTATION

1. This process clearly reduces the space required to store tires and reduces interior spaces decreasing potential wildlife and insect habitats.

2. However, studies have shown that even after 6-months of compression, when the bundled tires are released the tires spring back to their original shape.

3. In a fire, the steel wires holding the tire bundle together are broken by high temperatures and pressure from the bundled tires.

4. As the tires quickly return to their original size and shape, oxygen and fire are drawn into the interior space of the tires fueling the fire like a bellows.

### APPLICATION

B. Another baling method involves bailing approximately 100 tires into a large square bale. The bale measures about 10’ by 10’ by 4’.

1. These bales weigh a ton.

2. They are used for engineering applications such as on the banks of waterways or arroyo’s and then covered with cement to hold the banks and tire bundle in place.
### VI. Shredding

A. In this process tires are ripped and shredded into smaller pieces by a shredding machine.

B. One pass through a shredding machine yields ‘single pass’ or ‘chunk’ tire material.

C. If this material is run through the shredding machine several times, 2” Tire Derived Fuel (TDF) is produced.

D. Shredding reduces tire volume—eliminating interior air space, and prevents water collection and breeding of mosquitoes and other wildlife.

E. Shredded and ‘chunk’ tire pile fires tend to be less intense and create less smoke than whole tire pile fires.

F. The flame height is no more than 1 to 3 feet and can be extinguished with a fog pattern hose stream.

### APPLICATION

- Tire Storage Slide 11
  - Chunked

- Tire Storage Slide 12
  - Shreds

- Video - Slide 13: Show first of four sections of the “Rings of Fire” video

- Instructors Note:
  Give summary and then read evaluation questions

- Tire Storage Slide 14
  - Storage Questions
**SUMMARY:**
This chapter provides the emergency responder with an overall history and background of the waste tire business. This background information will be useful as you interact with scrap tire dealers and begin to enforce site specific fire prevention measures or should you become involved with managing an outdoor tire pile fire.

**EVALUATION:**

1. What is the typical method for outdoor storage of waste tires?
   Answer: random piles

2. Does storage configuration affect fire behavior?
   Answer: Yes

3. What storage method would you prefer if a tire pile was on fire?
   Answer: Shredded or Barrel stacked

**ASSIGNMENT:**
None
Lesson Plan 05
IGNITION SOURCES

TOPIC: Historic Sources of Ignition

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Further define the extent of the waste tire problem.
2. Identify historic sources of ignition.

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Any discussion of fire prevention for waste tire piles should be prefaced within the historical context of tire fires around North America. Arson is the leading cause of tire fires. When enforcement of state and local laws gets the attention of waste tire pile owners- the piles suddenly catch on fire. Tire piles are also an attractive target for juvenile arsonists. Other sources of ignition include lightning strikes, grass and brush fires, and ignition sources such as welding or smoking in and around the tire pile.
## PRESENTATION

<table>
<thead>
<tr>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>From the Main Menu click on Fire Prevention. At the Fire Prevention Menu click on Ignition Sources button. Sources 01 Objective</td>
</tr>
</tbody>
</table>

### Objective

A. Further define the extent of the waste tire problem.

B. Identify historic sources of ignition.

### Sources

A. Wildland fires

B. Lightening Strikes

C. Accidental Starts

D. Arson

### Sources

A. Wildland Fires

1. 1978 grass fire from the foothills swept through Roseville, California destroying 750,000 tires.

2. But light flashy fuels like grass fires do not always ignite tires, it usually takes a heavier fuel exposure for a longer period of time.
INSTRUCTOR GUIDE

RINGS OF FIRE
Tire Fire Prevention and Suppression

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Lightening Strikes</td>
<td>Ignition Sources Slide 05 Lighting</td>
</tr>
<tr>
<td>1. In 1999 seven million tires in Westley, California</td>
<td></td>
</tr>
<tr>
<td>2. Tire mountain in Colorado had two lightening strike fires</td>
<td></td>
</tr>
<tr>
<td>C. Accidental Starts</td>
<td>Ignition Sources Slide 06 Accidental</td>
</tr>
<tr>
<td>1. In 1990 30,000 tires on a site of 750,000 caught on fire</td>
<td></td>
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<tr>
<td>2. The fire started in a storage shed that the tire pile was stored against</td>
<td></td>
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<tr>
<td>3. over a million gallons of water were used to extinguish the blaze</td>
<td></td>
</tr>
<tr>
<td>D. Arson is the leading cause of tire fires</td>
<td>Ignition Sources Slide 07 Arson</td>
</tr>
<tr>
<td>1. In 1990 the Hagersville, Ontario fire of 12 million tires was started by teens as a Halloween prank</td>
<td></td>
</tr>
<tr>
<td>2. Other arson related fires include the Inwood, West Virginia fire started by the security officer who happened to be a volunteer firefighter</td>
<td></td>
</tr>
<tr>
<td>E. Between 1996 – 1998-- 59 tire fires were reported across the country involving approximately 20 million tires stored outdoors</td>
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</table>

Ignition Sources 3
# Tire Fire History Table

## IV. Six signs that company is in trouble

A. Experience has shown that there are a number of indicators or a combination of indicators of an impending tire fire

B. There are historic cases of government crackdowns on outdoor tire storage facilities where the aggrieved owners have opted to burn their piles instead of addressing the notice of correction

C. You can anticipate a potential tire fire catastrophe by closely monitoring the waste tire owners and operators

D. Six signs that a tire company is in trouble

   1. Increasing Piles in height, width, and volume.
   2. Permit/code violations- cited by inspection/enforcement authority.
   3. Change in ownership – a shell game for owner liability.
   4. Company files for bankruptcy – can they afford to clean-up the pile?
   5. High personnel turnover – inexperienced new employees.
   6. Loss of permit – due to code violations

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>F. Tire Fire History Table</td>
<td>Ignition Sources Slide 09 Fire History 2</td>
</tr>
<tr>
<td>IV. Six signs that company is in trouble</td>
<td>Instructors Note: Highlight the historic tire fires of 5 million or more and discuss table with class</td>
</tr>
<tr>
<td>A. Experience has shown that there are a number of indicators or a combination of indicators of an impending tire fire</td>
<td>Ignition Sources Slide 10 Signs of Trouble</td>
</tr>
<tr>
<td>B. There are historic cases of government crackdowns on outdoor tire storage facilities where the aggrieved owners have opted to burn their piles instead of addressing the notice of correction</td>
<td></td>
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<tr>
<td>C. You can anticipate a potential tire fire catastrophe by closely monitoring the waste tire owners and operators</td>
<td></td>
</tr>
<tr>
<td>D. Six signs that a tire company is in trouble</td>
<td></td>
</tr>
<tr>
<td>1. Increasing Piles in height, width, and volume.</td>
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INSTRUCTOR GUIDE

RINGS OF FIRE
Tire Fire Prevention and Suppression

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<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tr>
<td></td>
<td><strong>Instructors Note:</strong> Using a dry erase board or flip chart have your class design their own code for the safe outdoor storage of tires. Identify as many fire prevention requirements as possible.</td>
</tr>
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<td></td>
<td><strong>Instructors Note:</strong> Give summary and then read evaluation questions</td>
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<tr>
<td></td>
<td>Ignition Sources Slide 11 Questions</td>
</tr>
</tbody>
</table>
SUMMARY:
This section outlines the traditional sources of ignition in a tire pile. By being aware of the information presented here, you can appreciate the circumstances that could lead to a tire fire and be able to develop preventative measures before it begins. We’ll then be able to compare our class developed code against those developed nationally and by the State of California.

EVALUATION:

1. What is the typical source of ignition in tire piles?
   Answer: Arson

2. How can you protect tire piles from lightening strikes?
   Answer: NFPA has a standard on lightening rods

3. What measures should be taken to prevent accidental starts?
   Answer: Remove sources of ignition along with any combustible material from the vicinity of the tire pile.

ASSIGNMENT:
Read the Fire Prevention section of “Rings of Fire.”
Lesson Plan 06
CODES AND REGULATIONS

TOPIC: National and State Regulations

LEVEL: I

TIME: 1 Hour

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Recognize the benefit of a unified enforcement plan.

2. Apply state regulations and national standards to outdoor tire piles.

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Prevention of tire fires is paramount because of the potential size, environmental impact, duration, and cost of a major fire. A successful fire prevention program begins with the development of a rapport between the fire prevention officer and the waste tire owners or operators. Additionally developing a working relationship with other agencies including the local County Health Departments and local planning commission for Air and Water Quality Control Boards are all key to a successful fire prevention program.
# Objective

1. Recognize the benefit of a unified enforcement plan.
2. Apply state regulations and national standards to outdoor waste tire piles.

## Enforcement

A. The single best deterrent for waste tire pile fires is an active enforcement program

B. Primary code enforcement and development falls to the CIWMB, local fire service and local health departments

1. The authority and framework for enforcement is set forth in the California Public Resources Code

2. CIWMB regulations require the local fire department to approve fire safety plans for all waste tire storage facilities and local health departments to implement vector controls

C. The CIWMB regulations, including fire prevention regulations are in Title 14 of the California Code of Regulations

D. Local fire service can not enforce these regulations unless they are adopted locally by ordinance
### PRESENTATION

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<tbody>
<tr>
<td>E.</td>
<td>SFM is working collaboratively with CIWMB on a statute that would give the SFM authority for fire prevention in Title 19 CCR</td>
</tr>
<tr>
<td>F.</td>
<td>Local fire departments can use (if locally adopted) several national standards Uniform Fire Code and/or NFPA</td>
</tr>
<tr>
<td>G.</td>
<td>Other enforcement authority is granted to local health departments for vector control</td>
</tr>
<tr>
<td>H.</td>
<td>Unified enforcement can be accomplished through an environmental crimes task force or an association of local agencies all trying to ward off potential problems</td>
</tr>
<tr>
<td>I.</td>
<td>The agencies involved in a unified enforcement program can vary but can include, hazardous materials investigators, building officials, fire officials, law enforcement, Integrated Waste Management Board, Department of Health, District Attorneys office, and elected officials</td>
</tr>
<tr>
<td>J.</td>
<td>When faced with impossibly large tire piles many people find it hard to imagine that a facility can be brought into compliance</td>
</tr>
<tr>
<td>K.</td>
<td>But as this before and after picture shows, tire piles can be broken down into smaller much more manageable piles</td>
</tr>
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### APPLICATION

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<tr>
<td>Codes &amp; Regs Slide 03 Unified Enforcement</td>
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<tr>
<td>Codes &amp; Regs Slide 04 Front Range tire</td>
<td></td>
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<tr>
<td>Codes &amp; Regs Slide 05 Front Range tire 1</td>
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<tr>
<td>PRESENTATION</td>
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<td>--------------</td>
<td></td>
</tr>
<tr>
<td>L. There are no Federal regulations pertaining to storage and disposal of waste tires</td>
<td></td>
</tr>
<tr>
<td>M. At the State level, 48 states currently have some law or regulation regarding disposal and management of waste tires</td>
<td></td>
</tr>
<tr>
<td>N. While each state has its own program, some common features</td>
<td></td>
</tr>
<tr>
<td>1. Licensing or registration requirements for waste tire haulers, processors and some end users</td>
<td></td>
</tr>
<tr>
<td>2. Manifests for waste tire shipments</td>
<td></td>
</tr>
<tr>
<td>3. Limitations on who may handle waste tires</td>
<td></td>
</tr>
<tr>
<td>4. Financial assurance requirements for waste tire handlers</td>
<td></td>
</tr>
<tr>
<td>5. Market development activities</td>
<td></td>
</tr>
<tr>
<td>O. The legislative responsibility lies with each individual state</td>
<td></td>
</tr>
<tr>
<td>P. The Environmental Protection Agency (EPA) does, however, have a number of programs and initiatives to help reduce the millions of waste tires across the nation</td>
<td></td>
</tr>
<tr>
<td>Q. National Standards include:</td>
<td></td>
</tr>
<tr>
<td>1. 2002 NFPA 230, Annex F “Guidelines for the outdoor storage of tires</td>
<td></td>
</tr>
<tr>
<td>2. 2000 Uniform Fire Code Sections 1103.3.6 “Outside Storage of Tires”</td>
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</table>

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<th>APPLICATION</th>
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<tbody>
<tr>
<td>Codes &amp; Regs Slide 06 National Standards</td>
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<tr>
<td>PRESENTATION</td>
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<tr>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>O. State Regulations</td>
</tr>
<tr>
<td>1. California Integrated Waste Management Board</td>
</tr>
<tr>
<td>Title 14 Public Resource Code</td>
</tr>
<tr>
<td>2. Pending Legislative Approval California State Fire Marshal</td>
</tr>
<tr>
<td>Title 19 Public Safety Code</td>
</tr>
<tr>
<td>P. California regulations integrate the more restrictive requirements</td>
</tr>
<tr>
<td>of UFC and NFPA</td>
</tr>
<tr>
<td>Q. This table shows the radical differences between tire pile size in</td>
</tr>
<tr>
<td>the two codes</td>
</tr>
<tr>
<td>R. This is an aerial shot of Tire Mountain in Colorado, which</td>
</tr>
<tr>
<td>national standard do they subscribe to?</td>
</tr>
<tr>
<td>Answer: NFPA</td>
</tr>
</tbody>
</table>

### III. Unpermitted vs. Permitted Waste Tire Pile Sites

A. Unpermitted sites are tire piles that have been dumped on a property with or without the knowledge of the property owner
   1. Generally hidden and unknown to enforcing agencies
   2. Tire piles can often be hidden as brush and shrubs grow up around and through the tires thus adding an additional fuel source to this potentially dangerous condition
### PRESENTATION

3. No control of indigenous wildlife in the vicinity of the tire piles adding to the threat of disease

4. Access to these sites is often very limited, thus enhancing fire-fighting challenges

5. The most critical issue associated with unpermitted sites is the absence of knowledge that these sites exist and where they are located

### Application

B. Permitted sites on the other hand, have a known location and operation

1. In many cases the owner operator has applied for a business license locally along with a permit from the CIWMB

2. The fire department becomes involved when asked to sign-off on a fire protection plan required by CIWMB before a site permit can be issued

3. Tire piles under 500 tires do not need a permit

4. Tire piles from 500 to 4,999 need a minor waste tire pile permit

5. Tire piles over 5,000 need a major tire pile permit

### IV. State Regulations

A. Emergency Response Plan

1. The operator of the waste tire facility shall maintain a copy of the “Emergency Response Plan” at the facility

2. At the time of permit issuance the approved Emergency Response Plan shall be forwarded to the local fire authority by the permittee

---

Codes & Regs Slide 12
Emergency Response Plan
3. The plan shall be revised as necessary to reflect changes in operations of the waste tire facility or with additional requirements of the local fire authority.

4. The local fire authority and the CIWMB shall be notified in any changes to the Emergency Response Plan within 30 days of the revision.

B. Fire Control Measures

1. This section mandates that certain measures are taken at each qualifying facility to minimize the risk of fire.

2. Communication equipment shall be maintained at all facilities, if they are staffed by an attendant, to ensure that the site operator can contact local fire protection authorities in the event of a fire.

3. Adequate equipment to aid in the control of fires must be provided and maintained at the facility at all times.

4. At a minimum the following items shall be maintained on site and in working order:
   a) One dry chemical fire extinguisher,
   b) One 2.5-gallon water extinguisher,
   c) One 10-foot long pike pole,
   d) One round point shovel, and
   e) One square point shovel.
   f) One dry chemical fire extinguisher with a minimum rating of 4A:40BC shall be carried on each piece of fuel-powered equipment used to handle waste tires.

5. This equipment is to be used by on-site personnel.

6. On-site personnel have the best opportunity to keep a small fire from becoming a catastrophe.
### PRESENTATION

7. An adequate water supply shall be available for use by the local fire authority. The water supply shall be capable of delivering at least 1,000 gallons per minute (gpm) for three hours in facilities with fewer than 10,000 waste tires, or 2,000 gpm for three hours if the sum of altered or whole tires exceeds 10,000 waste tires.

8. The fire authority has the option to require additional tools and equipment for fire control and the protection of life and property. This may include the availability of earth moving equipment or other approved means of controlling a fire.

### APPLICATION

<table>
<thead>
<tr>
<th>Codes &amp; Regs Slide 14</th>
<th>Fire Control Measures 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codes &amp; Regs Slide 15</td>
<td>Access</td>
</tr>
</tbody>
</table>

### C. Facility Access and Security

1. This section mandates that certain measures be implemented at each qualifying facility to provide access to emergency vehicles, maintain security from unauthorized persons, and provide signage with a minimum amount of information.

2. Signs - at the facility entrance that gives the name of the operator, the operating hours, and site rules.

3. Attendant – an attendant shall be present when the facility is open for business if the facility receives tires from a source other than the site operator.

4. Access - An access road to the facility must be maintained passable for emergency equipment and vector control vehicles at all times. Unauthorized access must be strictly controlled.
## PRESENTATION

D. Facility Access and Security

1. No storage within 10" of property line
2. Separated from vegetation and combustibles by 40'
3. Fire Lanes between piles
4. Controlled Ignition Sources
5. No smoking, welding etc.

E. Storage of Waste Tires

1. Waste tires shall be restricted to individual piles, which include stacks and racks of tires that do not:
   a) Exceed 5,000 square feet.
   b) Exceed a volume of 50,000 square feet.
   c) Exceed a height of 10 feet.
   d) Exceed a height of 6 feet when a tire storage unit is located within 20 feet of the property boundary.
   e) Waste tires shall not be located within 10 feet of any property line or perimeter fencing.

2. The minimum distance between waste tire piles and between waste tire piles and structures that are located either on-site or off-site shall be as specified in the Separation Table

## APPLICATION

- Codes & Regs Slide 16
  - Separation Distances
- Codes & Regs Slide 17
  - Storage Limits
F. New Waste Tire Facilities

1. Shall not be sited in any area where they may be subject to immersion in water during a 100 year storm unless the operator demonstrates to the board that the facility will be designed and operated so as to prevent waste tires from migrating off-site.

2. Shall not be located on sites with grades or other physical features that will interfere with firefighting equipment or personnel.

3. Tires must be removed from rims immediately upon arrival at the facility.

4. The site shall be designed and constructed to provide protection to bodies of water from run-off of pyrolytic oil resulting from a potential tire fire.

Instructors Note:
Compare state regulations with class developed regulations to see how closely they match
V. Site Visits

A. After viewing each of these slides identify code violations

B. San Luis Obispo County- trees in the middle of pile, underground storage tank, 55 gallon drum, fencing

C. American Canyon- pile consists of tires and other material like compressed cylinders, 55 gallon drum, tires stored on rim, and weeds and upholstery stuffing

D. Rio Linda- tires stored to close to access road, in a drainage ditch, under power lines

E. Shasta County- tires stored in wildland areas, no water supply, lots of dry vegetation in the summer in an area known for fires

F. Redding- Inner tubes made from butyl rubber are easier to ignite than tires, should be separated from tire pile as well as increased separation from building

Instructor Note:
This series of slides provides students a chance to apply specific regulations to a variety of site problems

Codes & Regs Slide 20
Site Visit

Codes & Regs Slide 21
Site Visit 1

Codes & Regs Slide 22
Site Visit 2

Codes & Regs Slide 23
Site Visit 3

Codes & Regs Slide 24
Site Visit 4

Codes & Regs Slide 25
Site Visit 5
### PRESENTATION

G. Perfect storage- container storage keeps water from collecting in tires, maintains a smaller number of tires, is protected from arsonist.

H. Indoor Storage

1. Though not in the scope of this program, it is important to note that some waste tire dealers have attempted to avoid outdoor storage regulations by filling warehouses with waste tires.

2. Waste tires stored indoors should meet conditions set forth in “The Standard for Storage of Rubber Tires,” National Fire Protection Association, NFPA 231D-1989 edition, unless the local fire authority determines that different requirements are necessary to meet the intent of the above referenced fire control standard.

### APPLICATION

- Codes & Regs Slide 26
  - Site Visit 6

- Codes & Regs Slide 27
  - Indoor Storage

- Video - Slide 28: Show second of four sections of the “Rings of Fire” video

- Instructors Note:
  - Give summary and then read evaluation questions

- Codes & Regs Slide 29
  - Code Questions
SUMMARY:
An aggressive and consistent unified code enforcement program will help your department avoid potential tire fires. With your understanding of industry storage and processing practices along with code specific information you can work out a site specific pre-plan, so that problems can be headed off before they develop.

EVALUATION:

1. Can the local fire authority enforce the CWIMB regulation?
   Answer: Only if adopted as a local ordinance

2. Which national standard is more restrictive for tire storage?
   Answer: Uniform Fire Code

3. Why shouldn’t tires be stored on a grade or a slope?
   Answer: Hinders firefighting operations, allows for the pyrolytic oil to escape

ASSIGNMENT:
None
Lesson Plan 07
GROUND RUBBER

TOPIC: Fire Prevention in Tire Processing Facilities

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Develop recommendations for inspecting facilities that reduce tires to useable rubber product.

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Tire processing facilities help reduce the number of tires stored outdoors. But the operation requires a large feedstock of whole tires on site. Fires in the processing facility, from the heat generated from the machine and the presence of combustible fibers, are common. The altered tire material in the form of shreds, ground or crumb rubber is a material that can also be a fire problem. This section looks at what the industry is doing to prevent fires in processing facilities. New regulations exist in the ICC International Fire Code, with other recommendations coming soon in NFPA 1 Fire Code.
### I. Objective
Develop recommendations for inspecting facilities that reduce tires to useable rubber product

### II. Introduction

A. Tire processing operations like chipping, retreading or grounding require piles of waste tires as a feedstock.

B. The operation reduces waste tires to shreds or crumb rubber

C. Fires in these facilities are common

D. This slide shows the crumb rubber operation including shredding and grinding and the collection of tire fiber which is also recycled

### III. Regulations & Industry Recommendations

E. Ten foot fence around the material storage area.

F. Rubber piles 30 to 60 feet from the perimeter fencing.

G. No ignition sources such as welding, smoking etc. near the rubber pile.
### PRESENTATION

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<tr>
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<tbody>
<tr>
<td>H.</td>
<td>This picture shows a fire operation at a crumb rubber facility in San Bernardino County</td>
</tr>
<tr>
<td>I.</td>
<td>Rubber pile should be frequently rotated off-site</td>
</tr>
<tr>
<td>J.</td>
<td>Altered tire material is known to spontaneously ignite and should be kept sheltered from precipitation</td>
</tr>
<tr>
<td>K.</td>
<td>In the processing line clean out rotor assembly</td>
</tr>
<tr>
<td>L.</td>
<td>The same San Bernardino operation showing the butler building and the extent of fire damage note tire material to the left and crumb rubber stored in the bin to the right</td>
</tr>
<tr>
<td>M.</td>
<td>Install dust collection system</td>
</tr>
<tr>
<td>N.</td>
<td>Keep processing area clean and clear of combustible materials</td>
</tr>
<tr>
<td>O.</td>
<td>Install fire suppression system</td>
</tr>
<tr>
<td>P.</td>
<td>Provide access doors or ports to duct system every 10 feet</td>
</tr>
<tr>
<td>Q.</td>
<td>The American Conference of Governmental Industrial Hygienists recommends a duct velocity of 2,500 to 3,500 feet/minute to prevent fine rubber particles from settling and plugging system</td>
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### APPLICATION

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<tr>
<td>Ground Rubber Slide 05 Fire Operations</td>
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<td>Ground Rubber Slide 06 Facility</td>
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<td>Ground Rubber Slide 07</td>
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<td>Ground Rubber Slide 08</td>
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<tr>
<td>Ground Rubber Slide 09</td>
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<td>PRESENTATION</td>
<td>APPLICATION</td>
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</tr>
<tr>
<td>R. Experience suggests 5,000 to 5,500 feet per minute is needed to keep ductwork clean</td>
<td>Ground Rubber Slide 10 Processor conveyor belt</td>
</tr>
<tr>
<td>S. Airflow sensors should be installed in ductwork to monitor velocity.</td>
<td>Ground Rubber Slide 11</td>
</tr>
<tr>
<td>T. Photo shows a close-up of the San Bernardino operation with shredder and conveyor belt</td>
<td></td>
</tr>
<tr>
<td>U. Automatic shutdown of fans and manual shut-off switches near equipment operator should be installed to keep from feeding air to a duct fire.</td>
<td></td>
</tr>
<tr>
<td>V. Fire suppression systems need to have the ability to flood the ductwork with water or steam to displace oxygen and cool hot pieces of rubber.</td>
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</tr>
<tr>
<td>W. Bag house dust collection systems require cloth bags that are pretreated by the manufacturer to remove small fibers from the woven cloth.</td>
<td></td>
</tr>
<tr>
<td>X. Nomex bags are recommended</td>
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</tbody>
</table>
## Presentation

### Y. Alternative Means of Protection

1. While these regulations and recommendations specify the minimum fire safety requirements of a waste tire facility and waste tire processing operation.

2. The CCR allows the local fire authority having jurisdiction to evaluate alternative means of protection.

3. Local conditions and new technology may allow for other ways to protect tire piles and operations from a fire.

## Application

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<tr>
<th>Ground Rubber Slide 12</th>
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**Instructors Note:**
Give summary and then read evaluation questions.

| Ground Rubber Slide 13 Questions |
INSTRUCTOR GUIDE

RINGS OF FIRE
Tire Fire Prevention and Suppression

SUMMARY:
Altered and processed tires present a unique kind of situation in pre-planning and in fire prevention. Not only do you need to concentrate on the whole tires stored on site, but you must also look after the processing line itself, and the piled or bagged material at the end of the process. Whether whole, shredded or ground rubber from tires will always present a unique firefighting problem to the fire service.

EVALUATION:

1. A local fire inspector should look at which areas of a ground rubber operation?
   Answer: The feedstock area of incoming tires, the machinery processing the tires, and the pile of shredded or crumb rubber stockpiled in the end.

2. Why is it important for the equipment operator to be able to shut down dust collection fans?
   Answer: To provide a quick response to any potential problems

3. What technology would you recommend to a ground rubber operator concerned about the temperature of a ground rubber pile? Thermal imaging or thermocouples
   Answer:

ASSIGNMENT:
None
Lesson Plan 08
PREPLANNING

TOPIC: Pre-Fire Planning Tire Storage Areas

LEVEL: I

TIME: 30 Minutes

BEHAVIORAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Develop a site specific pre-fire plan of an outdoor tire facility

Standard: According to the referenced text

REFERENCES:

MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Preplanning is essential in effective tire fire management. Pre-incident plans are developed to identify the special considerations and hazards of a particular site or property so that responding units will know what to expect and how to proceed during initial operations. Pre-plans must accommodate the agency's standard guidelines and specify exactly how those guidelines are to be applied should a fire break out at a given location. All outdoor tire and rubber products storage facilities should be considered high-risk storage sites and pre-planned accordingly. Included within the pre-incident plan is information and resource material useful to the incident commander. In the case of a tire fire, these resources would include maps of the area, information on the hydrographic conditions of the soil, water supply contingency plans, emergency contacts and a variety of other important considerations.
I. **Objective**- Develop a site specific pre-fire plan of an outdoor tire facility

II. **Pre-Incident Plan**

A. Included within the pre-incident plan is information and resource material useful to the incident commander

B. Anticipated assignments for mutual aid companies and organizational charts specifying the anticipated control sectors

C. The means of maintaining fire ground and incident management strategies (Incident Command System), should be anticipated

D. The following common elements of tire fires that need to be considered and included in the pre-incident plans includes:

1. The anticipated establishment of a functional incident management system, to include command and control of all responders and workers.

2. The early recognition of tire fires as potential hazardous materials (HAZMAT) incidents, with considerations given to treating them as such.

3. Information regarding the site's location, layout, size and composition. Also information regarding access and egress routes, the physical infrastructure of the roads and other "access" considerations.
<table>
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<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tr>
<td>4. Information management plans, to include resource request tracking forms, video recording of incident progression, and financial reimbursement requests.</td>
<td></td>
</tr>
<tr>
<td>5. Access to local, state and federal agencies or organizations with environmental and/or emergency management responsibilities</td>
<td></td>
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<tr>
<td>6. Access to local and regional contractors with specialized equipment</td>
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</table>

**III. Site Location, Size, Layout, and Composition**

A. The exact location and size of the tire storage yard or dump should be determined

1. Often difficult to perform since many sites are located in remote areas or accumulate as the result of illegal dumping

2. Maps of the site should be updated and made available in the pre-incident plan

3. Ingress and egress plans for apparatus and personnel should be included

4. The development of additional access points should be planned with the means of maintaining or expanding accesses provided

5. The possible locations for a command post and any usable on-site buildings may also be identified.

B. Photograph of Royster tire facility in Tracy Calif. Note the site is in a sand and gravel quarry with uneven topographical features

Preplanning Slide 03

Preplanning Slide 04
### PRESENTATION

C. Topographical, aerial and soil composition maps should be obtained and updated to show hydrants and water supply sources, accesses, interior lanes or passages, and fuel load configurations.

D. Photograph of Royster- facility had no water supply!

E. Schools, homes, and transportation routes near the site should be identified as "high risk" exposures and considered in pre-incident planning should evacuation or pollution control become necessary.

F. The location of any utilities on or near the site should be identified so responders can quickly shut off power to electrical or gas lines and prevent the run-off of contaminated water into storm drains or plumbing systems.

G. The condition of roads and access routes should be considered to avoid a common problem of first-arriving units becoming stuck in mud or unable to exit a narrow access.

H. Tire Pile Configuration

1. The composition of the tire pile should be considered since important differences exist in developing suppression strategies.

### APPLICATION

| Application | Preplanning Slide 05  
| Topography |
| Preplanning Slide 06  
<p>| Water Supply |
| Preplanning Slide 07 |
| Preplanning Slide 08 |</p>
<table>
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<th>PRESENTATION</th>
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<tr>
<td>2. Shredded or &quot;chip&quot; tire piles present different challenges than whole tires, as would the existence of plastics, metals, refuse or hazardous chemicals/waste.</td>
</tr>
<tr>
<td>3. Additionally, the age of the pile and the local climate may affect the amount of rodent and insect infestation of the particular site.</td>
</tr>
<tr>
<td>4. Older tires maybe checked and cracked from exposure to the weather making them easier to ignite</td>
</tr>
<tr>
<td>5. Photograph of a portion of Westely Tire Pile, note all tires are off-rim and there appears to be no other material salvaged with the tires</td>
</tr>
</tbody>
</table>

**IV. Identification of State and Local Emergency Response Teams**

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 management of environmental disasters

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<tr>
<td>Preplanning Slide 09 Tire Pile</td>
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<tr>
<td>Rings of Fire Slide 10</td>
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</tbody>
</table>
### PRESENTATION

D. The lists should include phone numbers, facsimile numbers, addresses, and radio frequencies, if applicable.

E. Outside agencies should participate in, or at least become familiar with, the pre-incident plans.

F. Examples of concerned agencies would be:
   1. State and local Police;
   2. Public Works agencies;
   3. State Department of Emergency Management;
   4. Regional offices of the Federal Emergency Management Agency (FEMA);
   5. Regional, State or Federal Environmental Protection Agency (EPA);
   6. State Division of Natural Resources or State Forestry Agency;
   7. State Fire Marshals office; and
   8. Finance, Purchasing and Budget agencies.

G. The pre-incident plans should assign the various government agencies to appropriate sections in the command system.

### APPLICATION

Preplanning Slide 11
Heavy Equipment

#### V. Identification of Local and or Regional Response Contractors

A. Identification of local and or regional response contractors is a necessary component of pre-planning for a tire fire response.

B. A current list of contractors should be maintained at all times.

C. Having contractors identified and coordinating their use in simulated drills with the local fire authority will provide the necessary training to manage the emergency and make informed decisions.
### D. Contractors commonly utilized in a tire pile fire include:

1. Providers of heavy equipment including but not limited to front-end loaders, track excavators or dozers;
2. Construction and wood supply companies;
3. Equipment repair and maintenance contractors;
4. Fill dirt and gravel contractors;
5. Canteen or food services providers;
6. Sanitation or "Porta-John" companies;
7. Public and private universities - departments of ecology, environmental engineering, etc.;
8. Foam/chemical additives manufacturers;
9. Oil reclamation and clean-up companies; and
10. Aerial photography and Infrared reconnaissance sources (sometimes provided by State Police or a university).

### VI. Initial Tire Fire Response

A. In order to establish and maintain command and control of all response efforts associated with a tire pile fire, a unified command (UC) should be established where all aspects of the incident can be calculated and communicated

B. Remember that tire fires involve active participation from multiple federal, state, and local agencies 24-hours a day for several months
## INSTRUCTOR GUIDE

### RINGS OF FIRE
Tire Fire Prevention and Suppression

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tr>
<td>Video - Slide 14: Show the third section of four sections of the “Rings of Fire” video</td>
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</tbody>
</table>

**Instructors Note:**
Give summary and then read evaluation questions

Preplanning Slide 15
Questions
SUMMARY:
A clear, well thought out pre-fire plan is very important in dealing with outdoor tire storage. The guidelines in this section will help you make these kinds of preparations. In the event of a fire, the advance work you did on this preplan will help the incident commander manage valuable resources more effectively.

EVALUATION:

1. What are your primary concerns for a tire pile fire?
   Answer: access, water supply, separation distances between piles, environmental impact, and the number of resources it will tie up.

2. Should those concerns be part of the problem?
   Answer: Yes! All considerations should be made in the preplan

3. Why is it important to know the age and exposure of a tire pile?
   Answer: Older tires tend to crack under the sun making them easier to ignite

ASSIGNMENT:
None
Lesson Plan 09
FIRE BEHAVIOR

TOPIC: The Effects of Fire Behavior on Firefighting

LEVEL: I

TIME: 30 Minutes

BEHAVIORIAL OBJECTIVE:

Condition: Complete evaluation with 70% accuracy

Behavior: The student will . . .

1. Identify the stages of a tire fire

2. Identify the burn characteristics of whole and altered tire material

3. Encourage site operators to take an active role in fire prevention and protection

Standard: According to the referenced text


MATERIALS NEEDED: PC projector, projection screen, VCR, multimedia slide show on CD/ROM, speakers.

PREPARATION: Basic concepts of combustion involve the transition of a material from a solid to a liquid to a vapor. This is true with tires as it is with almost any combustible material. One distinguishing difference between wood fires and tire fires is in a tire’s ability to absorb radiant heat and to then transfer that heat to the internal steel belts and bead wires found in most modern tires. In this section we will explore how a tire pile burns and how it affects firefighting operations.
## Objective

A. Identify the stages of a tire fire

B. Identify the burn characteristics of whole and altered tire material

C. Encourage site operators to take an active role in fire prevention and protection

## Tire Fire Dynamics (Stages of Combustion)

A. The tire’s ability to absorb heat makes them more difficult to ignite than wood fires, but this same quality makes tire fires more difficult to extinguish than wood fires.

B. Tire fires typically progress through three stages: the Incipient or Ignition and Propagation Stage; the Free Burning Stage; and the Smoldering Stage.

C. The Free Burning Stage can be further separated into the Compression Stage and the Equilibrium and Pyrolysis Stage.
III. Ignition and Propagation Stage

A. Once a tire has ignited and a flame front has been developed, constant radiant heat will begin to affect the surrounding tires.

B. It is generally accepted that tires will begin to decompose in the presence of radiant heat between 410°C and 538°C.

C. An initial burn rate of approximately 2 square feet every five minutes in the windward direction is generally accepted for tire pile fires.

D. The rate accelerates 50 percent after the first ten minutes of burn time.

E. During this stage the fire has little forward and downward pressure as the surrounding tires are absorbing most of the heat.

F. In this stage the tire pile should be pulled apart, using hand tools (if practical) or heavy equipment, separating the burning tires from the rest of the pile.

IV. Free Burning: Compression Stage

A. The flattening of tires as they lose their shape characterizes the beginning of the compression stage.

B. Open flaming and forward pressure is produced during this stage with increased amounts of heat and smoke.
### PRESENTATION

C. The heat contributes to the collapse of the tires building downward pressure

D. Protecting exposures, buildings, equipment and other tire piles is the best course of action

E. At this point, in very large tire pile fires, the surrounding air cannot quickly absorb the heat from the fire.

F. With large, high-piled tire pile fires, inward collapse may begin within thirty minutes to one hour after initial ignition.

### V. Free Burning: Equilibrium and Pyrolysis Stage

A. A tire pile fire reaches equilibrium when the level of fuel conversion is approximately equal to the available amounts of heat, fuel, and oxygen.

B. At this point the tire pile fire has low open surface flames with much of the fire deep-seated or internal.

C. This results in very high internal temperatures (approximately 1,100°C) and slower and more complete fuel consumption.

D. Continue to protect exposures, allow the fire to consume as much fuel as possible

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### PRESENTATION

E. Fire spread during this phase is influenced by the tire product configuration.

F. Whole tire piles will tend to burn down into the middle of the pile because the shape of the tires allows heat and gas to rise vertically, bringing oxygen up with the cool air, through the pile from below.

G. After whole tires have burned, the covering formed by the remaining steel cords effectively break-up water streams, producing steam before the water affects the burning tire pile.

H. Fire tends to spread over the surface of shredded tire and crumb rubber piles.

I. This results in a ceramic clay-like covering that deflects water and prevents water penetration from dousing the fire, allowing the internal fire to continue burning.

### VI. Smoldering Stage

A. As tire pile fires burn during the smoldering stage, products of incomplete combustion are released.

B. Of particular concern is pyrolytic oil, which will begin to pool and run-off and/or leach into the soil

C. Pyrolysis is defined as a chemical change brought about by the introduction of heat.

   1. In tire pile fires this occurs when tires breakdown in the fire and release pyrolytic oil.

   2. Downward pressures then push this oil out of the fire.

### APPLICATION

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| Fire Behavior Slide 10 |
### PRESENTATION

3. During a tire pile fire, the average passenger tire releases up to 2.0 gallons of pyrolytic oil

D. The smoldering phase allows for a safe and aggressive attack on the fire

E. Pull the smoldering pile apart using heavy equipment and incrementally extinguish the fire with water or foam

F. It is possible for the heat from the tire pile fire to ignite the pyrolytic oil creating a secondary flowing oil fire

G. Other products of concern released during this stage of a tire pile fire include carbon monoxide, polynuclear aromatic hydrocarbons and volatile organic compounds

H. As the rate of propagation of the fire slows along the edges, the outer surfaces cool trapping intense heat internally

I. At this point it can be extremely hazardous to open up the fire, as emissions of fire gasses are released at a high rate and can flash up at high speeds as available oxygen increases

### APPLICATION

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### VII. Site Operators

A. Site operators provide the first line of defense at a tire pile site since they are usually onsite at the onset of a fire before emergency responders arrive.
### PRESENTATION

B. With sufficient training and knowledge, the staff at the facility has the ability to respond to a fire emergency in a prompt, positive, and effectively manage the emergency until fire fighters arrive on site.

C. Listed below are several fire prevention practices that each tire pile facility should adopt, to minimize the breakout of a large tire pile fire:

1. Conduct a Fire Safety Audit;
2. Appointment and Organization of Supervisory Staff;
3. Develop Emergency Procedures;
4. Fire Drill Procedures and Training;
5. Maintenance of Building Facilities and Fire Protection Equipment;
6. Alternate Measures for Temporary Shutdown of Fire Protection Equipment or Systems;
7. Control of Fire Hazards;
8. Maintaining Fire Department Access for Fire Fighting and Related Fire Suppression;
9. Preparing Schematic Diagrams and Site Plans; and

### VIII. Fire Fighting Techniques Owner/Operators

A. In general, the approach to fighting a tire pile fire is the same as fighting most other fires. The general approach includes the following:

1. Rescue/Evacuation;
2. Exposure Protection;
3. Confinement;
4. Extinguishment; and
5. Overhaul

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<td>B. In many other types of fires, the exposure, confinement, and extinguishment phases can occur almost simultaneously with good tactics of hose line placement</td>
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<td>C. However, with tire fires, each phase of the fire must be completed before the next phase can begin</td>
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<td>D. Until the exposure of unburned tires is removed, the fire cannot be contained, and until it is contained, it cannot be extinguished</td>
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<td>E. Extinguishment must be complete before overhaul can begin because of the tendency for tires to retain heat and re-ignite</td>
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<td>F. Tire fires rarely involve life-threatening rescue efforts, but many require evacuation of residential areas in the vicinity</td>
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<td>G. The speed and direction of the wind will dictate the extent of evacuation, and conditions may change during the course of the tire fire, which may warrant a change in the evacuation plan</td>
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<td>H. Evacuation efforts can often be delegated to police or other agencies</td>
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Instructors Note:
Give summary and then read evaluation questions

Fire Questions Slide 15
SUMMARY:
Understanding the behavior and being able to identify the stage of a tire fire will be extremely useful when choosing the strategy and tactics for this type of emergency. Note that every stage of a tire fire has its inherent hazards to personnel and equipment.

EVALUATION:

1. What stage is a tire fire in when the tires begin to compress?
Answer: Free burning Stage

2. What is pyrolytic oil and why should you be concerned about it?
Answer: A product of incomplete combustion-- heat from the fire transforms the tires 2 gallons of oil from a solid to a liquid

3. Should your department help tire operators develop an effective site safety plan?
Answer: Yes! Tire yards are relatively unsophisticated operations. Help from local authorities would greatly improve fire safety.

ASSIGNMENT:
None
Lesson Plan 10
HAZMAT

TOPIC: Tire Fires as a Hazardous Materials Response

LEVEL: I

TIME: 1 Hour

BEHAVIORAL 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


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.
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

II. HAZMAT PROCEDURES

A. HAZMAT procedures follow the acronym “SIN” or rather “SINCIAPCPDDDD” as the basic initial on-scene actions at all tire fire incidents.

B. The goals and priorities of the response must be:

   1. Save lives and limit casualties
   2. Protect the environment
   3. Limit damage to property
   4. 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

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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

H. Working around heavy equipment is a hazard- you can see them better than they can see you!

I. Beadwire is a trip hazard for personnel working in the pile
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.
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:

1. State and local Police;
2. Public Works agencies;
3. State Department of Emergency Management;
4. Regional offices of the FEMA;
5. State or Federal Environmental Protection Agency
6. Resources or Forestry;
7. State Fire Marshal office; and
8. Finance, Purchasing and Budget agencies.
### 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

### 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.

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<td>VII “I” Identification &amp; Assessment</td>
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## PRESENTATION

B. Exposure hazards associated with tire fires can be introduced by

   1. The smoke plume (from the fire),
   2. Water run off (from the water used to put out the fire),
   3. 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

F. Ash contains various heavy metals including lead, arsenic, and zinc

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)

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

## APPLICATION

```
Identification Slide 02
Identification Slide 03
Identification Slide 04
```
### 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

B. Exposure Protection Example- Using master streams to protect unburned tire piles from the radiant heat of the main fire

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.

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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:

   1. 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

G. **Answer**: Earth Cap - Containment:

   1. This technique consists of smothering the burning tire pile with dirt and is not recommended.

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**Overhead Question:**
What will happen if you bury the tire fire with dirt or sand?
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.

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.

**Overhead Question:** Why shouldn’t water be used on a large tire fire?
### I. **Answer**: Foam Fire Suppressants:

1. 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

### APPLICATION

**Overhead Question:**
Why and when would you use foam on a tire fire?
## 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 was actively extinguished with water and foam, Tracy was allowed to burn itself out

## 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:

1. Helmet;
2. Turnout Coat;
3. Turnout Pants;
4. Nomex Hood;
5. Latex Gloves (under firefighter gloves to provide secondary protection against absorption of chemicals);
6. Firefighting Gloves;
7. Boots;
8. Self contained breathing apparatus (SCBA) and
9. Tyvex Suits (optional)
10. Additionally, heavy equipment operators need to be trained on safety equipment and SCBA

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

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.

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

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
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.

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.

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Decontamination takes place within the “Warm Zone” or “decontamination area”</td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>Disposal Slide 01</td>
</tr>
</tbody>
</table>

| 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**

<table>
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<tr>
<th>D. Previous experience at tire fire piles has indicated that the pyrolytic oil can be recycled at several types of reclamation plants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td>F. Pyrolytic oil must be sent to an oil recycling facility.</td>
</tr>
</tbody>
</table>

**XIV “D” Documentation**

<table>
<thead>
<tr>
<th>A. This final section describes documentation and preparation of reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. This report will be thoroughly reviewed and dissected by a variety of interested parties ranging from government officials to investigators representing private parties.</td>
</tr>
<tr>
<td>C. Documentation of site activities, chronologies of events, and proper laboratory documentation, are all critically important during a tire fire.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

**APPLICATION**

| Disposal Slide 02 |
| Documentation Slide |
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:
1. Site Background;
2. Fire Cause and Tire Fire Dynamics;
3. Potential Threats;
4. Agency Response and Unified Command Structure;
5. Fire Suppression Tactics;
6. Health and Safety;
7. Environmental Sampling and Monitoring; and
8. 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

I. This section presents the acronym “SINCIAPCPDDDD” 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

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**Instructors Note:** From the Response Menu return to the Main Menu Summarize the lecture and click the exit button to end slide show.
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

2. 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