FAI-6943854-1

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Surface
(Sand and Gravel)

Fatal Fire Accident
June 14, 2024

Littlerock Quarry
Hi-Grade Materials Co
Littlerock, Los Angeles County, California
ID No. 04-04802

Accident Investigators

Kenneth Pettus
Mine Safety and Health Inspector

Ambrose Murray
Mine Safety and Health Inspector

Originating Office
Mine Safety and Health Administration
Vacaville District
991 Nut Tree Road
Vacaville, CA 95687
Brian Thompson, Acting District Manager

TABLE OF CONTENTS

OVERVIEW

On June 14, 2024, at 2:08 p.m., Andrew Pontious, a 52 year-old firefighter, with 19 years of firefighting experience, died while fighting a fire on a front-end loader. The front-end loader's left rear tire exploded, and the force struck the firefighter.

The accident occurred because Pontious was approximately four feet from the tire when a combustion explosion occurred. The fire on the front-end loader heated the tire and caused a buildup of flammable gases inside the tire, which were ignited. Los Angeles County Fire Department (LACoFD) issued a report, LAC 24-203895, which designated this as a line of duty death.

GENERAL INFORMATION

Hi-Grade Materials Co owns and operates the Littlerock Quarry, a surface sand and gravel mine located in Littlerock, Los Angeles County, California. The mine employs 13 miners and operates one eight-hour shift, five days per week. A bulldozer pushes material into a jaw crusher and a belt conveyor transports it to a processing plant. The mine processes, stockpiles, and sells the material to the construction industry.

The principal management officials at the Littlerock Quarry at the time of the accident were:

Brent Mize	Quarry Plant Manager
Dan Alfrey	Plant Foreman

The Mine Safety and Health Administration (MSHA) completed the last regular safety and health inspection at this mine on February 2, 2024. The 2023 non-fatal days lost incident rate for the Littlerock Quarry was 3.46, compared to the national average of 0.92 for mines of this type.

DESCRIPTION OF THE ACCIDENT

On June 14, 2024, at approximately 4:00 a.m., Ruben Ramirez, Front-End Loader Operator, started his shift by completing a pre-operational inspection on his front-end loader. According to interviews, Rameriez was loading material into customer trucks at the wash-con stockpile in the load out area of the plant when he heard what he described as a "poof." Ramirez looked over his right shoulder and saw white smoke coming from the engine compartment. An unidentified customer truck driver told Ramirez, "Hey you're on fire!" Ramirez turned the front-end loader's ignition switch off and exited with a fire extinguisher. Ramirez emptied the entire fire extinguisher and could not put the fire out. At that point, Ramirez walked away.

According to interviews, at approximately 1:30 pm, Brent Mize, Quarry Plant Manager, pulled into the load out area of the plant and saw the front-end loader on fire. Mize instructed Dan Alfrey, Plant Foreman, to get the water truck over to the front-end loader and try to put out the fire. Cameron Ferris, Water Truck Operator, used his water truck to spray water on the fire from approximately 20 feet away until his water truck was empty. Mize told Ferris to stay away from the front-end loader.

According to interviews, at 1:45 p.m., Mize called 911 and could not get through. At 1:53 p.m., Mize again called 911 and the LACoFD was dispatched to the mine site. At 2:02 p.m., Ferris stated that he went to fill his water truck, and that is when the right rear tire of the front-end loader exploded. No firefighters were near the front-end loader at this time. At 2:06 p.m., LACoFD arrived at the mine site. Mize met the LACoFD at the gate, and they followed him to the fire scene. According to interviews, Mize told the LACoFD "Don't get near the tires." Mize parked his truck at a safe distance and went down to where the fire trucks were positioned. Mize stated that he observed Pontious approximately four feet away from the front-end loader's left rear tire. Pontious was manning a fire hose and spraying water into the engine compartment. Mize screamed to the nearest firefighter, "Get that guy away from the tires!" According to interviews, at 2:08 p.m., Mize stated that the tire immediately exploded, and blew Pontious into the sand pile, approximately 31 feet away from the tire. Carlo Loffredo, Captain of LACoFD Unit 136, determined that Pontious died immediately as a result of the explosion.

INVESTIGATION OF THE ACCIDENT

On June 14, 2024, at 2:27 p.m., Lori Clifton, Vice President of Planning and Development, called the Department of Labor National Contact Center (DOLNCC) to report a fatal accident. The DOLNCC contacted Troy Van Wey, Supervisory Special Investigator, informing him of the accident. Van Wey contacted Christopher Hensler, Acting District Manager, and Hensler contacted the mine and informed them of their responsibilities. Van Wey contacted Benjamin Burns, Supervisory Mine Safety and Health Inspector, who instructed Kenneth Pettus and Ambrose Murray, Mine Safety and Health Inspector, to travel to the mine and secure the accident scene.

On June 15, 2024, at approximately 9:45 a.m., Pettus and Murray arrived at the mine and Pettus issued an order under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners and preservation of evidence. MSHA's accident investigation team conducted an examination of the accident scene, interviewed miners and mine management, and reviewed conditions and work procedures relevant to the accident. See Appendix A for a list of persons who participated in the investigation.

DISCUSSION

Location of the Accident

The accident occurred at the wash-con stockpile in the load out area of the plant (see Appendix B).

Weather

The weather at the time of the accident was clear and sunny, 99 degrees Fahrenheit, with a slight breeze. Investigators determined that the weather did not contribute to the accident.

Equipment Involved

The equipment involved in the accident was a 2015 Caterpillar 988K front-end loader, company number 79 (see Appendix C). The front-end loader's tires were Bridgestone V-Steel N-Traction (VSNT) 35/65R33 radial with a diameter of 81.7 inches and a width of 35.6 inches. The rear tires were inflated with compressed ambient air between 90 and 100 pounds per square inch (PSI). The front tires were inflated with compressed ambient air to 100 PSI. The front-end loader was not equipped with a fixed fire suppression system. Due to the condition of the front-end loader after the fire, investigators were unable to conduct an examination to determine the cause of the fire.

Investigators determined Pontious was standing approximately four feet away from the front-end loader's left rear tire when the tire exploded. According to the LACoFD, the force of the explosion expelled debris up to 350 feet from the left rear tire (see Appendix D). The left rear tire explosion was more powerful than the right rear tire explosion. Only the rubber and steel cord components of both tires' sidewalls were expelled during the explosion; the multi-piece rim assemblies remained intact.

Examinations

Ramirez conducted pre-operational inspections on the front-end loader, including on the day of the accident. Investigators reviewed past inspections and found that Ramirez marked on the records that leaks were visible. According to interviews, Ramirez stated that motor oil would leak underneath the engine compartment of the front-end loader daily, and he would have to add approximately two gallons of motor oil about every three days. However, investigators could not determine how much oil was present at the time of the accident, or if the oil leak contributed to the fire. Investigators determined the pre-operational inspections did not contribute to the accident.

Training and Experience
Pontious had 19 years of firefighting experience.

Los Angeles County Fire Department Findings
The LACoFD issued a report entitled "Firefighter Line of Duty Death – June 14, 2024 – Unnamed Truck/RV Fire – Incident Number LAC 24-203895" (LAC 24-203895). The LAC-24-203895 report details the sequence of events and discusses the lessons learned from the accident.

The LACoFD determined that the force involved is consistent with a tire explosion, as opposed to a tire blowout. According to "Exploring the chemical aspects of truck tire blowouts and explosions" (Dolez et al., 2007), a reference provided by the LACoFD, there is a distinction between a tire blowout and a tire explosion. A blowout is associated with the mechanical failure of the tire or rim assembly. Blowouts occurring while the vehicle is in motion typically generate pressures around 145 psi. A tire exposed to fire may blowout prior to explosion when the internal pressure increase exposes a mechanical defect within the tire or rim assembly. An explosion is a much more violent event involving flammable gases and is a result of the process discussed below.

There are three steps to the process that may lead to the explosion of tires exposed to heat. First, the air pressure inside the tire will increase as the internal temperature rises. The pressure of a tire inflated to 90 psi can rise to approximately 235 psi during fire exposure. Unless there is a mechanical defect within the tire or rim assembly, the pressure increase due to the expansion of the air inside the tire will not typically lead to failure (blowout).

Second, when the rubber of the tire reaches about 365º Fahrenheit, it will begin undergoing thermo-chemical degradation reactions, collectively called pyrolysis, and release gases within the tire. The gases released can be flammable and add to the quantity of gas already inside, further contributing to the increasing pressure within the tire.

The thermo-chemical degradation reactions are complex and typically both exothermic and endothermic. The heat from the fire can lead to interior surface burning (smoldering) of the tire rubber lining material which also generates heat and additional gases. The exothermic nature of the interior surface burning is often not visible externally and can allow the continuation of pyrolysis inside the tire even if the external heat source is removed, including after the exterior fire has been extinguished. The gases produced inside the tire are ignitable with a heat release rate comparable to natural gas, gasoline vapors, etc.

A combustion explosion of the tire can occur once the flammable concentration reaches or exceeds its lower explosive limit (LEL). Ignition can occur if the mixture reaches its auto ignition temperature, or if a credible hot ember from interior surface burning is dislodged into the mixture. The actual LEL will depend upon the specific composition of the flammable gas mixture but can be as low as about one percent fuel in air by volume. As the concentration rises above the LEL, the severity of the explosion once ignition occurs, will also increase. The explosion can generate blast waves at pressures over 1,000 psi and project fragments outward at high velocities that travel great distances. These "missile" effects can also cause serious or fatal

injuries. The explosive process can occur within tires inflated with ambient air regardless of the presence of a rim assembly.

"Methodology for assessing safe distances in case of explosions of dump truck tires in an open pit" (Kobylkin and Arzhanov, 2021) identifies the safe pressure for a person in front of a blast wave at 1.5 psi or less. Pressures exceeding this value will typically cause injury such as eardrum rupture. Once the blast wave pressure reaches about 14 psi, fatal outcomes are possible, and an injury will almost certainly be fatal at pressures above 43 psi or more.

The force of the explosion in this accident expelled debris up to 350 feet from the left rear tire. The left rear tire explosion was more powerful than the right rear tire explosion. Only the rubber and steel cord components of both tires' sidewalls were expelled during the explosion; the multi-piece rim assemblies remained intact.

SAFETY MEASURES TO PREVENT ACCIDENTS

The LACoFD report provides a risk management process for firefighters and methods for using specific tire dimensions to calculate explosive energy, a safe distance from air blast effects, and the maximum distance wheel fragments may travel. These calculations were utilized by the LACoFD in developing explosive hazard zones (see Appendices E, F, and G).

CONCLUSION

On June 14, 2024, at 2:08 p.m., Andrew Pontious, a 52 year-old firefighter, with 19 years of firefighting experience, died while fighting a fire on a front-end loader. The front-end loader's left rear tire exploded, and the force struck the firefighter.

The accident occurred because Pontious was approximately four feet from the tire when a combustion explosion occurred. The fire on the front-end loader heated the tire and caused a buildup of flammable gases inside the tire, which were ignited. LACoFD issued a report, LAC 24-203895, which designated this as a line of duty death.

Approved By:

_____ _____

Brian Thompson Date
Acting District Manager

ENFORCEMENT ACTION

A 103(k) order was issued to Hi-Grade Materials Co.

A fatal accident occurred on June 14, 2024, at 2:08 p.m. This order is being issued under the authority of the Federal Mine Safety and Health Act of 1977, under Section 103(k) to insure the safety of all persons at the mine and requires the operator to obtain the approval of an authorized representative of MSHA of any plan to recover any person in the mine or to recover the mine or affected area. This order prohibits any activity in the affected area. The operator is reminded of the obligation to preserve all evidence that would aid in investigating the cause or causes of the accident in accordance with 30 CFR 50.12.

APPENDIX A – Persons Participating in the Investigation

Hi-Grade Materials Co

Lori Clifton	Vice President of Planning and Development
Brian Ouellette	Western Quarries Manager
Chris Wear	Fleet Manager
Brent Mize	Quarry Plant Manager
Dan Alfrey	Plant Foreman
Ruben Ramirez	Front-End Loader Operator
Cameron Ferris	Water Truck Operator
Chris Bean	Field Mechanic

State of California Mining and Tunneling Unit

Matt Switzer	Associate Engineer
Charlie Wilson	Associate Safety Engineer

Los Angeles County Fire Department

Carlo Loffredo	Captain

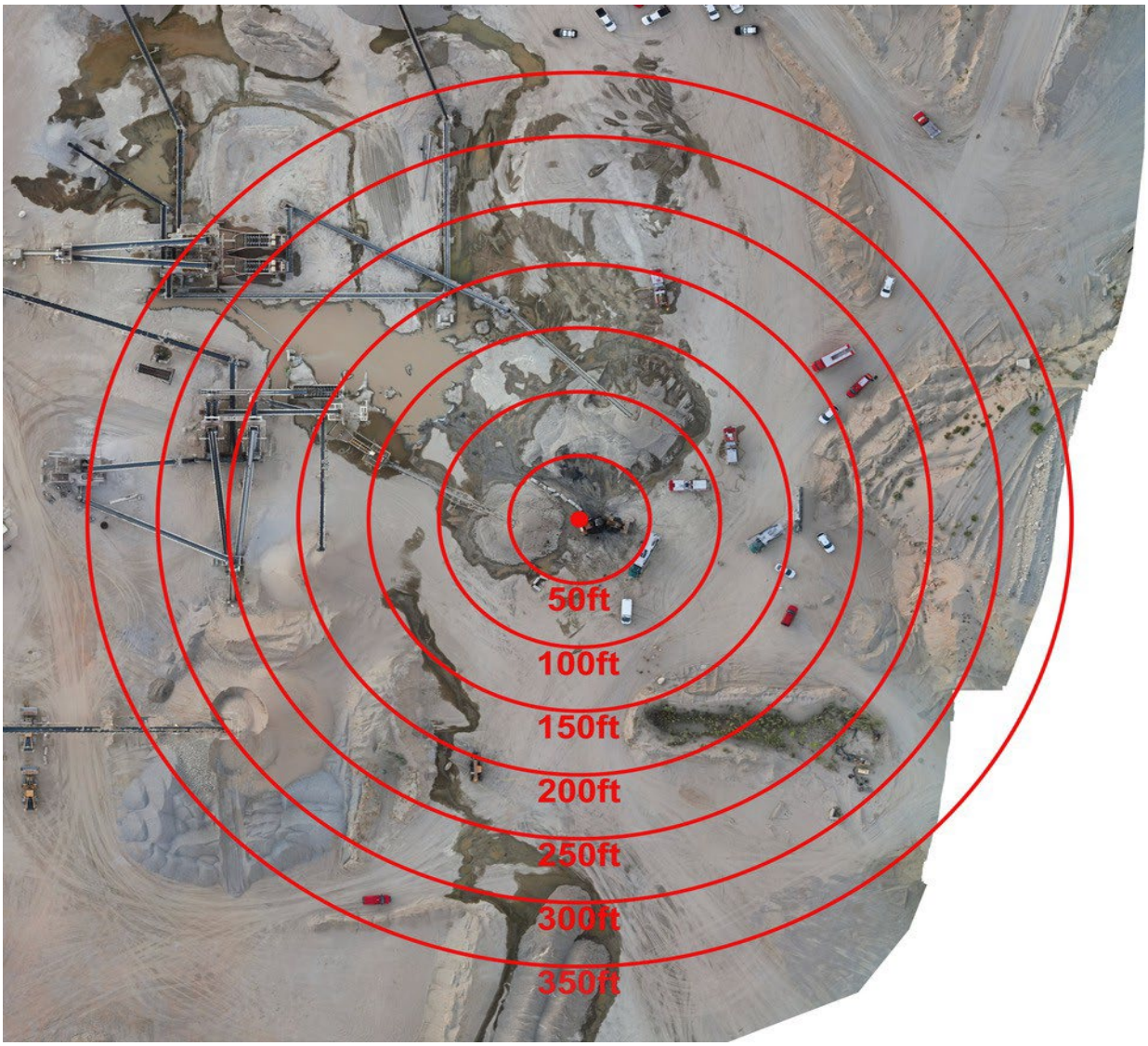
Mine Safety and Health Administration

Kenneth Pettus	Mine Safety and Health Inspector
Ambrose Murray	Mine Safety and Health Inspector

APPENDIX B – Aerial Map

APPENDIX C – Caterpillar 988K Front-End Loader's Left Rear Tire

APPENDIX D – Aerial View of Mine Illustrating Maximum Distribution of Debris



Provided by LACoFD

- Situation Awareness: Upon recognizing a fire involving a large vehicle, determine which hazards are present from a safe location. Establish the incident priority: life, environment, or property.

- Hazard Assessment: Assess the conditions to determine which hazard(s) (compressed natural gas, liquified natural gas, hydrogen, lithium-ion batteries, tires exposed to fire, etc.) are present. Information sources include placards, fire conditions, reports from vehicle operators, etc.

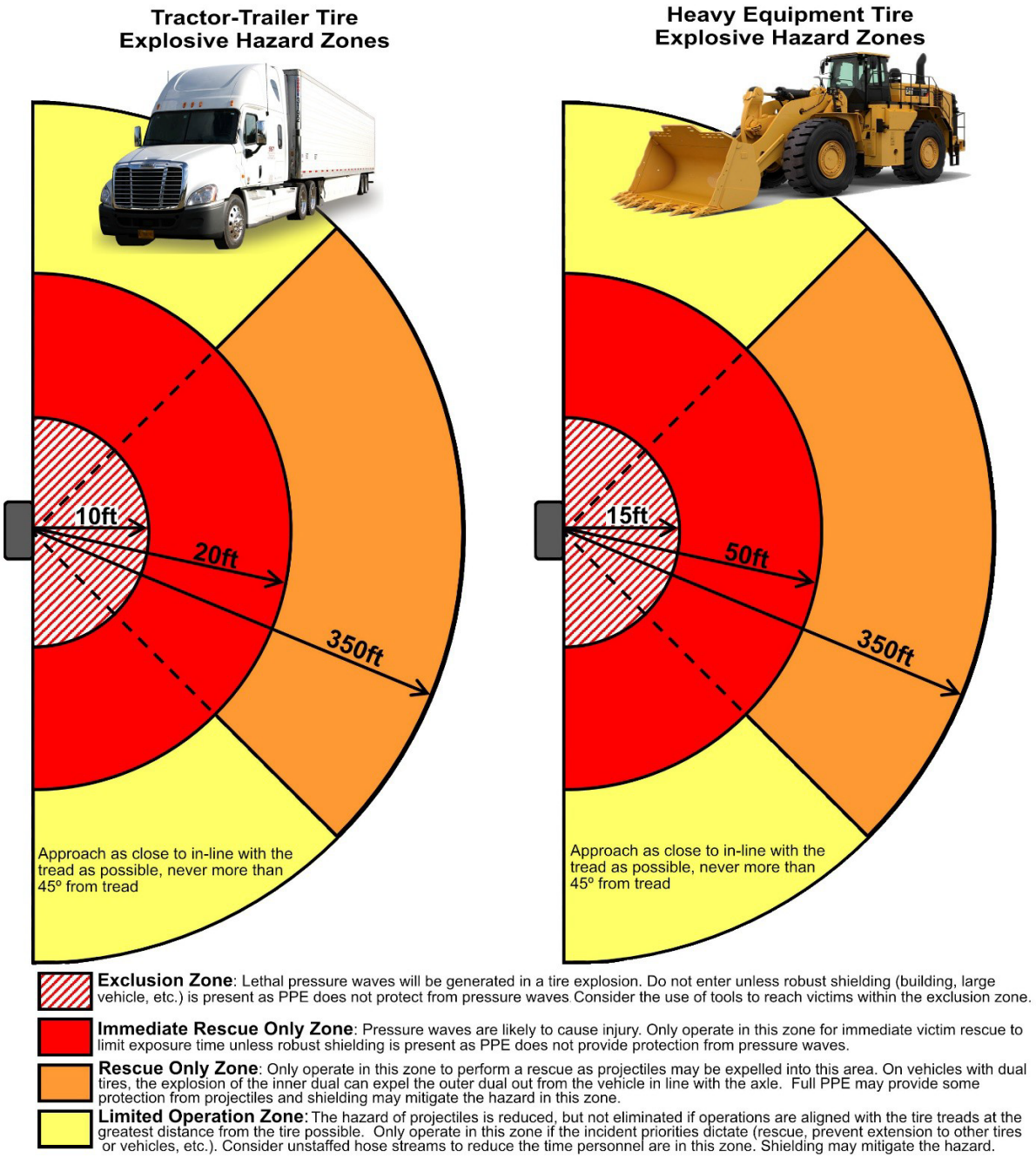
- Hazard Control: Develop your plan by determining the appropriate and available hazard control(s) (distance, approach angle, etc.) and mitigation strategies. The incident priority, specifically life, will dictate the appropriate level of risk.

- Decision Point: Validate the plan, brief personnel, and engage.

- Evaluate: Observe progress and changes and reassess strategy if necessary.

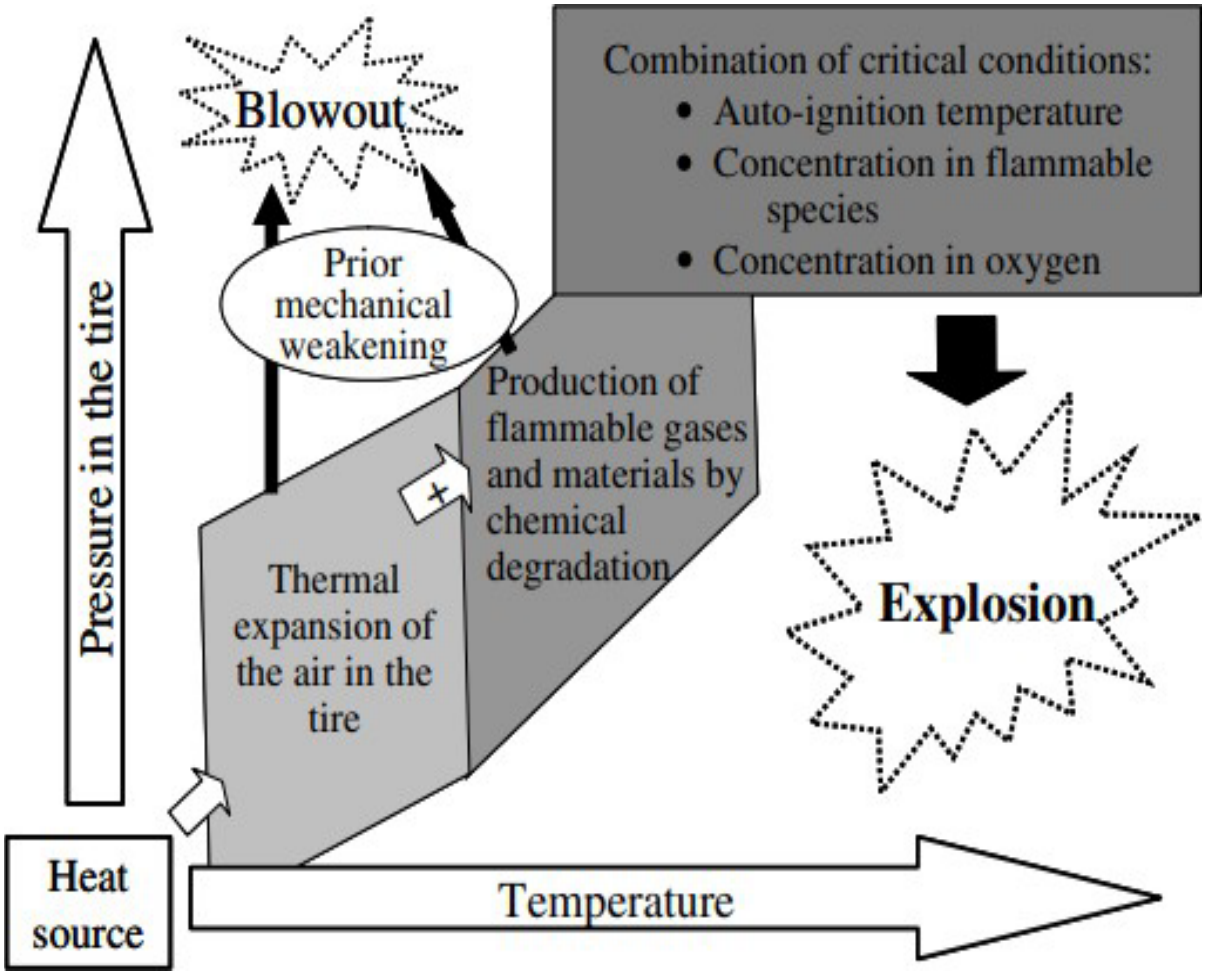
Provided by LACoFD

APPENDIX F – Tractor-Trailer/Heavy Equipment Tire Explosive Hazard Zone



Provided by LACoFD

APPENDIX G – Process Leading to Tire Blowout or Explosion (Dolez et al., 2007)



Provided by LACoFD