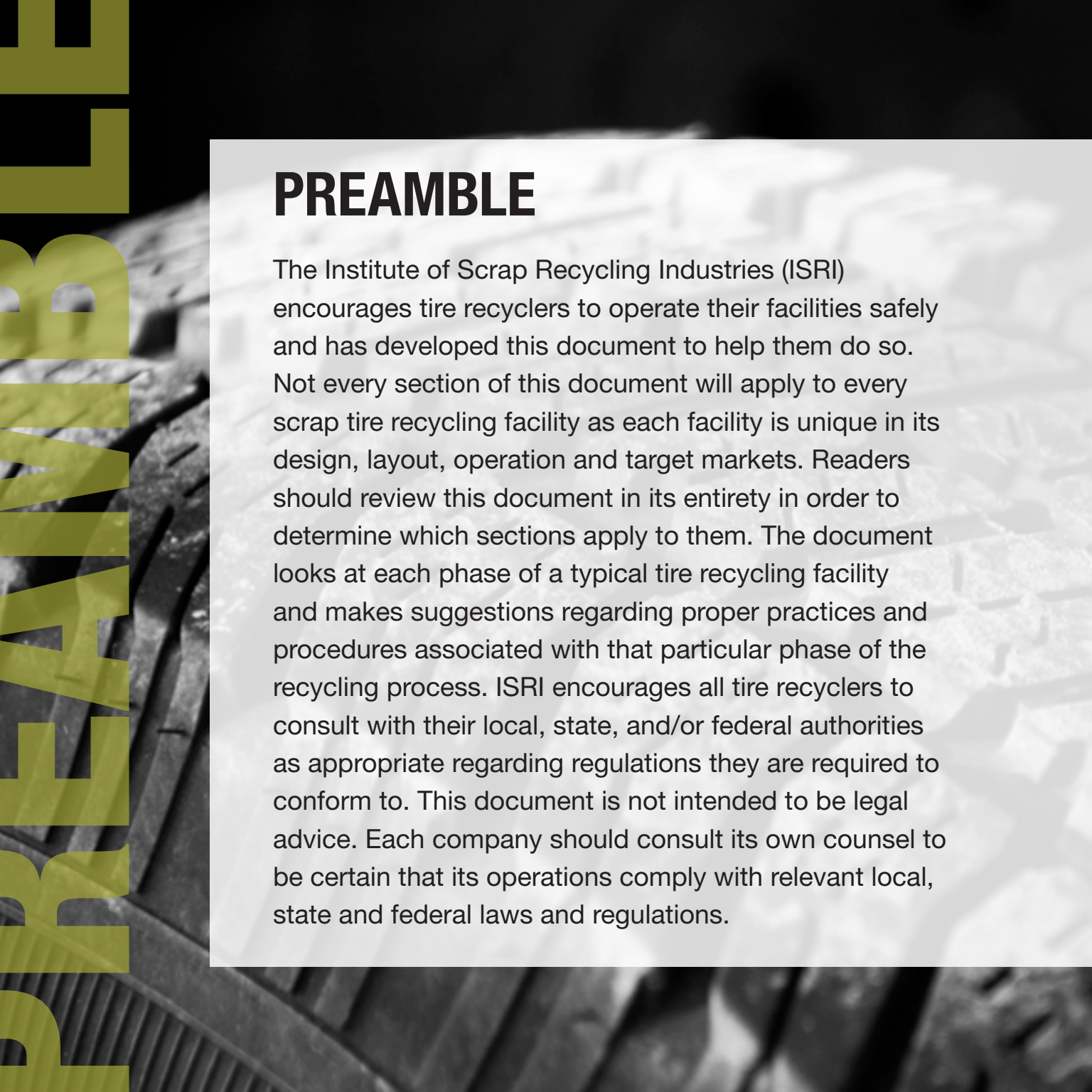
FIRE SAFETY PRACTICES

FOR SCRAP TIRE RECYCLING FACILITIES

ISRI Safety

NEW DAY. NEW CHOICES.



PREAMBLE

The Institute of Scrap Recycling Industries (ISRI) encourages tire recyclers to operate their facilities safely and has developed this document to help them do so. Not every section of this document will apply to every scrap tire recycling facility as each facility is unique in its design, layout, operation and target markets. Readers should review this document in its entirety in order to determine which sections apply to them. The document looks at each phase of a typical tire recycling facility and makes suggestions regarding proper practices and procedures associated with that particular phase of the recycling process. ISRI encourages all tire recyclers to consult with their local, state, and/or federal authorities as appropriate regarding regulations they are required to conform to. This document is not intended to be legal advice. Each company should consult its own counsel to be certain that its operations comply with relevant local, state and federal laws and regulations.

DEFINITIONS

"**Arcing**" is defined as a luminous discharge of electric current that is formed when a strong current jumps a gap in a circuit or between two electrodes.

"**Chip**" is defined as tire material that has been processed to a uniform size, shape and consistency that generally ranges between 1 and 5 inches in any two dimensions.

"**Fines**" are defined as materials that pass a 4.75mm sieve; these materials may include rubber, fiber, inorganic and organic matter, dirt, and other non tire materials.

"**Finished Product**" is defined as any non whole tire material that has been sized and classified as a specification grade feedstock material that is used for the manufacture of other goods.

"**Inspection**" is defined as a detailed and documented analysis of all operating components of the shredder and feedstock material. In addition to those that are conducted during routine maintenance operations, inspections must be conducted whenever monitoring activities reveal abnormalities. Inspections should be performed in strict adherence to all safety policies and procedures, with particular emphasis paid to the control of hazardous energy.

"**Monitor**" is defined as observing the operation and condition of the equipment and components needed to operate the shredder. It also means observing the feedstock material from a safe distance to prevent a hazardous situation from developing. This type of observation must be routine and ongoing while the shredder is operating.

"**Raw Material**" is defined as tire derived material that is shredded to 4" or larger.

"**Rough Shred**" is defined as a tire that has gone through a shredding process once with no further reduction in size.

"**Whole Tire**" is defined as a tire that has not been reduced in size. This includes but is not limited to tires that contain rims.

ADDITIONAL REFERENCES

ISRI Resources

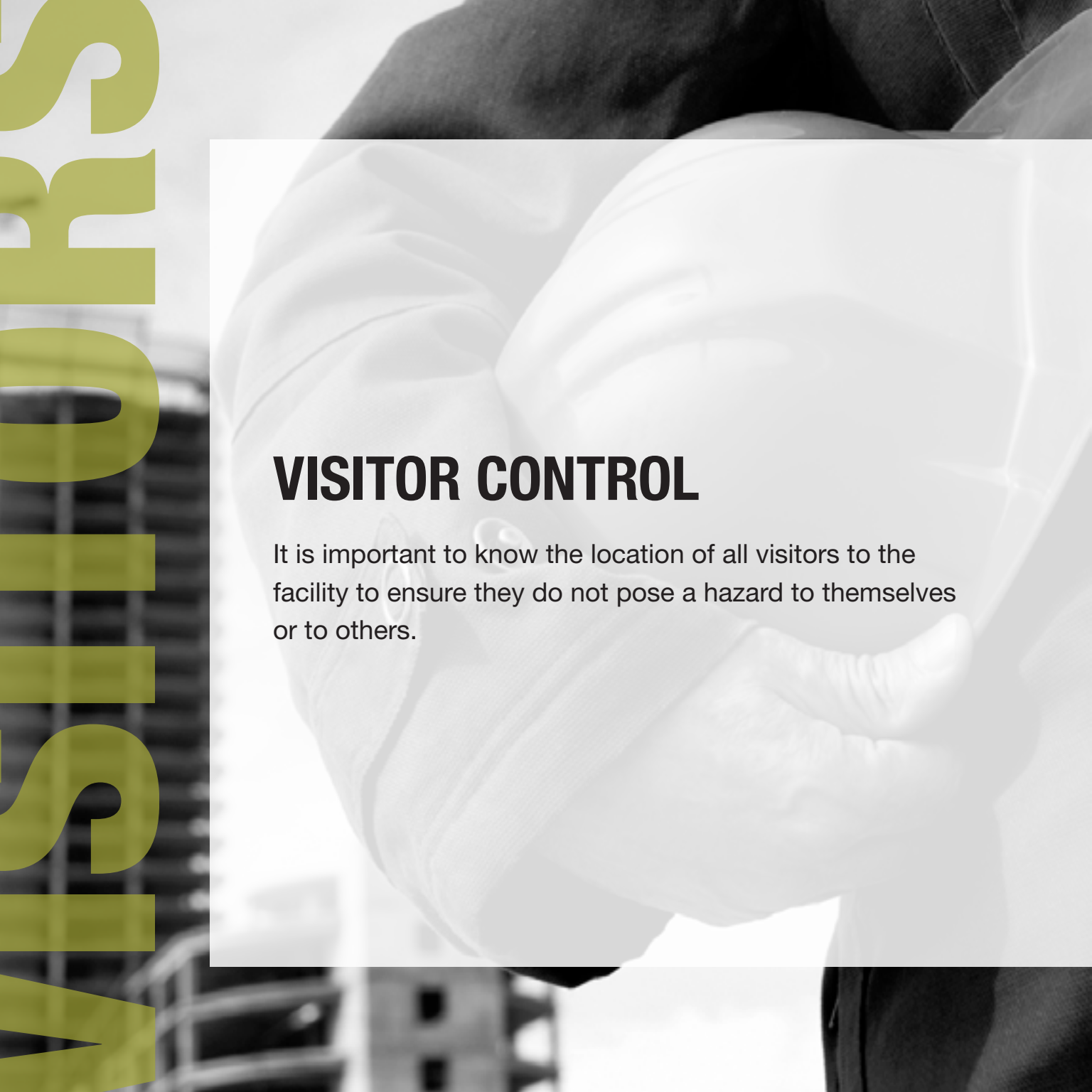
- Safety Manual – http://www.isrisafety.org/assets/files/ISRISafetyManual-BOARD%20APPROVED%2010-09.pdf.

NFPA

- NFPA 1, 2006 Edition, Chapter 33 – Storage of Outside Tires;
- NFPA 654, 2006 Edition, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids;
- NFPA 68, 2007 Edition.

OSHA

- 29 CFR 1910.38;
- 29 CFR 1910.106;
- 29 CFR 1910. 137;
- 29 CFR 1910.146;
- 29 CFR 1910.147;
- 29 CFR 1910.156;
- 29 CFR 1910.158 to 29 CFR 1910.160;
- 29 CFR 1910.163;
- 29 CFR 1910.164;
- 29 CFR 1910.252;
- 29 CFR 1910.301;
- 29 CFR 1910.305;
- 29 CFR 1910.307;
- 29 CFR 1910.308;
- 29 CFR 1910.331 to 29 CFR 1910.335;
- 29 CFR 1910.399.



VISITOR CONTROL

It is important to know the location of all visitors to the facility to ensure they do not pose a hazard to themselves or to others.

GUIDELINES

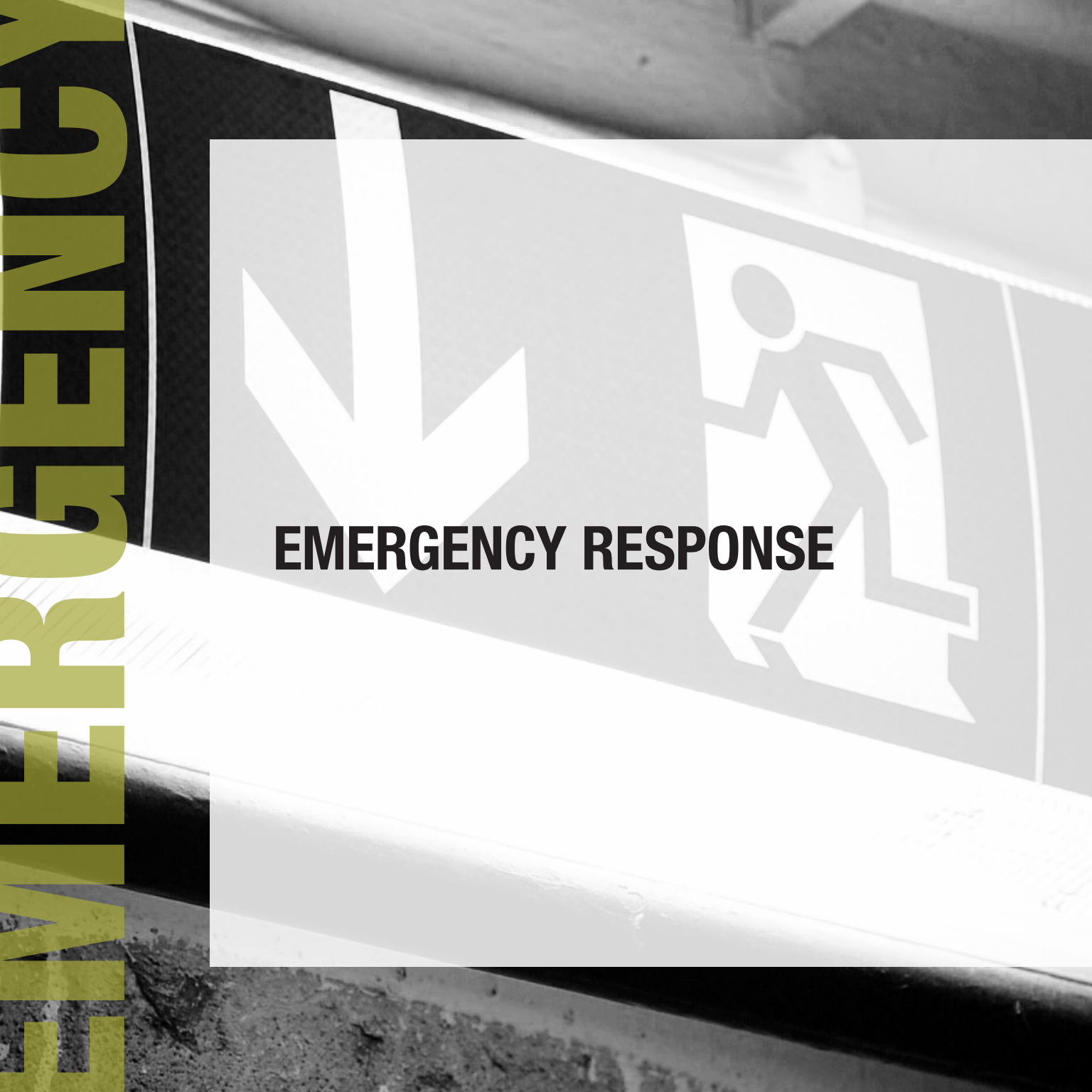
The perimeter of the facility should be controlled by use of fencing, motion detectors, alarm systems, security guards or onsite personnel to minimize the possibility of unauthorized personnel gaining access.

A proper visitor control protocol should be put in place to ensure the identity and location of all visitors at all times.

Visitors should be issued temporary identity cards/easily identifiable hard hats, jackets, etc.

Visitors to the facility should be required to sign in at the office and be informed as to proper safety precautions to use while on the premises, i.e. no smoking or use of open flame.

In lieu of a manned checkpoint, direct all visitors to a safe and secure location for check in.



EMERGENCY RESPONSE

EXTERNAL COMPONENTS OF EMERGENCY ACTION PLAN

Ensure local emergency management agencies have schematics, descriptions, layouts, etc., of equipment, material, and other important information related to the facility as required by state and local regulations.

INTERNAL COMPONENTS OF EMERGENCY ACTION PLAN

Each facility should develop and keep on file an Emergency Action Plan that is specific to the facility's layout, equipment, processes and location.

A facility owner should designate an Emergency Response Coordinator to coordinate the appropriate response during an incident, to ensure all employees are accounted for and appropriate agencies are notified. The coordinator could also serve as the designated person to speak with the media during and after an event.

It is important that employees be trained to understand what they should or should not do during an emergency event.

Fire suppression equipment, such as sprinkler systems, fire extinguishers, water supply pumps, etc., should be inspected and tested on a periodic basis to ensure proper operation. Follow all applicable state/local ordinances and manufacturer's recommendations regarding periodic testing of fire suppression equipment.

An emergency response drill should be conducted on a regular basis and, to the extent possible, coordinated with local fire response personnel.

All of the above items should be documented and available to responsible parties.

STORAGE

Scrap tire processing introduces several potentially significant fire hazards. These hazards may exist during all phases of storage, processing and transportation. History has proven that once a pile of rubber products reaches a certain internal temperature, it becomes progressively more difficult to cool it. Once the threshold temperature is reached, runaway heating begins and a fire becomes likely, if not inevitable. Once a pile ignites, the fire can grow dramatically, with tremendous speed and with potentially devastating results. A critical component of fire prevention involves emergency preparedness. Procedures should be implemented that incorporate adequate space between piles to ensure a fire in one pile cannot propagate to adjacent piles. Similarly, adequate space should be maintained between piles and operating facilities to minimize any life hazard in the event a fire occurs.

As state and local fire codes and other statutes may impact a facility's layout and storage requirements, it is important to consult with your state and local regulatory bodies to ensure compliance. Additionally, consultation with the local fire department is also important.

STORAGE RECOMMENDATIONS

Scrap tire piles should range between 2,500 to 5,000 square feet in size.

All material should be spaced approximately 20 to 50 feet away from buildings, additional piles, equipment, property lines, etc.

Fire lanes or roads should be approximately 20 to 50 feet wide and maintained to provide sufficient access in the event of an emergency.

- If this distance cannot be met, a suitable alternative should be implemented to ensure all appropriate safety standards are met.

Fire department personnel should have adequate access to water supplies.

Fire suppression equipment such as hoses, on site fire trucks, water tankers, etc. should be readily and easily accessible.

Consider the use of a water "wetting agent" or other additives to enhance the fire suppression capabilities of water for extinguishing fires in large storage areas.

Precautions should be taken to prevent the radiant heat of a fire from igniting surrounding areas.

Sufficient storage capacity should be available to provide for safe storage even during max. production demands triggered by market fluctuations, delays in shipment, etc.

Establish a "must move date" for all material based on size and composition to minimize fire risk.

Ensure all material is sized and stored in like groups, mixing of sizes can create monitoring and cleanliness issues.

All material should be stored in an area away from objects that can attract lighting.

Suggested storage methods include, but are not limited to:

- Bulk Storage Piles–It is common practice to store finished products in rows prior to shipment.
- Trailers–Storage of finished product in trailers prior to shipment should be managed appropriately.
- Bins, Sacks or Totes–Although this method of storage may be considered the least threatening, hazards may still be present. Storage of material prior to shipment should be managed appropriately.

TEMPERATURE MONITORING

The internal temperature of all material should not exceed 120ºF at a depth of six feet.

The monitoring of the pile should be recorded on a regular basis and properly documented.

A rise in temperature in either the interior or exterior of the pile should be noted, especially in the context of variances in ambient temperature.

As material will generally produce heat from the interior to the exterior of a pile, internal temperature monitoring with a suitable device, i.e. a compost probe or other appropriate device, is desirable.

Suggested cooling strategies include pneumatic conveying, auguring, and agitating or stirring material periodically.

FOREIGN MATERIAL IN STORAGE PILES

Materials such as chemicals, oils, batteries, etc. should not be in or near piles.

Manage the amount of fines present as appropriate.

Separation and segregation techniques and procedures should be put in place to ensure foreign materials are filtered out before processing.

Employees should receive proper training on management of pile contents and structure.

HEAVY EQUIPMENT

Particular care should be given to removal of dust and oily residue buildup and inspection of components to reduce the potential of equipment starting a fire.

Ensure that all equipment contains a fire extinguisher in good working condition.

Equipment that contains fuels or oils should have a mobile spill kit on board.

Weekly and monthly inspections should be recorded, with special note of items that are defective or in need of repair. Any items that are repaired or replaced should also be documented.

An employee should not operate any piece of equipment until they have been trained in the proper and safe use of that equipment, including but not limited to, daily inspections and maintenance, safe operation around equipment and other employees and the safe operation on a given site.

All training must be documented as required by your state and local agencies.

Heavy equipment should be stored a minimum of 50 feet away from material and other flammable substances, such as fuels, oils, chemicals, grass and weeds or other items that might easily ignite or propagate a fire.

ACTS OF GOD

Rubber products should be stored in a manner that reduces potential Acts of God, such as employing lightning suppression protocols.

RAW MATERIAL AND WHOLE TIRES

Raw material piles containing shredded material should not be compacted.

FINISHED PRODUCT

Clean, processed tire wire, if stored in a pile, should be stored in an area that has minimal exposure to lightning strikes. Piles of tire wire need to be kept at a lower height due to its nature of acting as a lightning rod.

Tire wire will generate heat as it begins to oxidize. Monitoring should be done on this material daily to ensure that there is not excessive heat buildup due to oxidation. Temperatures above 120ºF should be avoided.

SHREDDING

There are two different types of shredders: Primary and Secondary. Primary shredders reduce whole tires to a “chip” or a “rough shred” while secondary shredders further shred and reduce the particle size of the material produced by the primary shredder. Both primary and secondary shredding is generally accomplished using low speed, hi torque machines utilizing twin, counter rotating shaft/blade arrangements. Occasionally single shaft or medium to high speed units are utilized for this part of the operation, and although this is acceptable, it is not as common. In operating either a primary or secondary shredder, potentially significant hazards exist and care should be exercised while the machinery is being utilized.

SAFETY PRECAUTIONS

Observe proper lockout/tagout procedures prior to inspecting or performing any maintenance on these items.

Refer to the manufacturer's recommendations for proper installation and maintenance procedures.

A proper employee training program should be established to ensure employees understand any hazards associated with the procedures or materials to be operated and handled.

Smoking should be prohibited at all times in the shredding area.

SHREDDER MAINTENANCE

Good housekeeping in the shredding area is essential to reduce potential fuel loads and/or friction elements. Regular cleaning of the shredding area should be performed throughout the workday and before a shutdown period of extended length. Housekeeping activities should be sufficient to prevent buildup of material or contaminants in the area.

The shredder cutting chamber and bearing temperatures must be monitored regularly throughout the workday to ensure that material does not accumulate in these areas to prevent excessive heat buildup due to friction or sparks. Such material accumulation can be a possible fuel source for a fire. If buildup of material is observed, clean or repair the affected equipment as necessary and appropriate.

Proper maintenance of the shredder head is important to reduce the potential of fire from worn or improperly adjusted components.

Blades should be inspected and re-torqued as appropriate to minimize friction created during processing.

Inspection of Drive Components

For electromechanical or hydraulically driven shredder heads inspect;

- Electrical connections for loose or damaged components;
- Hydraulic components for leaks and excessive wear; and
- Belts, clutches, gear boxes and other mechanical components.

WATER SUPPLIES

Water supplies and delivery systems for the shredding area should be inspected and tested regularly.

If a water mist system is installed, it should be monitored and inspected periodically to ensure proper flow and spray pattern is maintained to minimize heat buildup and dust.

ELECTRICAL MAINTENANCE

Loose, worn or broken electrical components may heat up or arc, thereby creating an ignition source.

Electrical connections should be checked on a regular basis and repaired or replaced as necessary.

Refer to the appropriate National Electrical Code as applicable. It is advised that you consult with your local electrician or electrical engineer for advice and/or guidance.

All electrical outlets should be mapped. Such maps and technical diagrams should be updated as necessary.

MECHANICAL MAINTENANCE

Observe proper lockout/tag out procedures prior to performing any maintenance on the equipment located in the shredding area.

Inspect drive components, such as belts, clutches and gear boxes to ensure proper maintenance has been performed and equipment can be operated without causing excessive heat buildup or other failure which could cause a fire.

Bearings should be inspected and monitored for proper operation to minimize potential heat buildup from a failure.

HOT WORK PROGRAM

Required whenever torching, welding or grinding operations are performed.

Should be followed when maintenance on equipment is required.

Where applicable, turn off dust collection equipment to mitigate dispersion of sparks.

When possible avoid cutting, welding, grinding 2-4 hours before the end of the day.

Refer to Appendix A for additional information.

SCREENING

Screening of processed rubber is common practice and in many facilities products are screened multiple times. There are many different types of screens used such as trommels, disc screens, shaker screens and “rotex” type screens. The volume and quality of products and the desired size generally determine the appropriate equipment for a given operation. Regardless, the potential hazards associated with this equipment will be similar and should be monitored and managed in a similar manner.

SCREEN MAINTENANCE

During processing, rubber and fiber dust is released into the surrounding areas. Sufficient dust control and housekeeping in the screening area is important to reduce potential fuel loads and/or friction elements.

- Refer to the Dust Control section of this document for more recommendations.

Screening equipment and associated components should be inspected periodically for buildup of material around moving parts, such as shafts or bearings, which can cause heat buildup or sparks due to friction, thereby creating a possible ignition source.

- Observe proper lockout/tag out procedures prior to inspection or performing any maintenance on these items.
- Inspect drive components, such as belts, clutches and gear boxes to ensure proper maintenance has been performed and equipment can be operated without causing excessive heat buildup or other failure which could cause a fire.
- Bearings should be inspected and monitored for proper operation to minimize potential heat buildup from a failure.

SAFETY PRECAUTIONS

Observe proper lockout/tag out procedures prior to performing any maintenance on these items.

Refer to the manufacturer's recommendations for proper installation and maintenance procedures.

A proper employee training program should be established to ensure employees understand the potentially hazardous nature of the procedures and materials to be operated and handled.

Smoking in the screening area should be prohibited at all times.

ELECTRICAL MAINTENANCE

Loose, worn or broken electrical components or connections may heat up or arc thereby creating an ignition source.

Electrical connections must be checked on a regular basis and repaired or replaced as necessary.

Refer to appropriate National Electrical Code as applicable. It is advised that you consult with your local electrician or electrical engineer for advice and/or guidance.

All electrical outlets should be mapped. Such maps and technical diagrams should be updated as necessary.

HOT WORK PROGRAM

Required whenever torching, welding or grinding operations are performed.

Should be followed when maintenance on equipment is also required.

Where applicable, turn off dust collection equipment to mitigate dispersion of sparks.

When possible avoid cutting, welding, grinding 2-4 hours before the end of the day.

Refer to Appendix A for additional information.

SEPARATION

During the separation processes, materials such as steel, fiber or other contaminants are separated from the rubber stream for reprocessing or disposal. For many operations, separation is an integral part of tire processing. The most common method of separating ferrous material is to utilize magnets, although some facilities also incorporate metal detectors for non-ferrous material. The potential risks associated with processing and handling these materials requires maintenance of systems and equipment be kept up to assure optimal performance at all times. Ignition sources such as sparks, static electricity & friction can create a potential fire hazard. Proper conveying, handling, storage and disposal of these materials will significantly reduce the exposure of a fire hazard.

FERROUS/NON-FERROUS SEPARATION

Magnets & Metal Detectors

Safety Precautions

- Observe proper lockout/tag out procedures prior to inspection or performing any maintenance on these items.
- Refer to the manufacturer's recommendations for proper installation and maintenance procedures.
- A proper employee training program should be established to ensure employees understand the potentially hazardous nature of the procedures and materials to be operated and handled.
- Smoking in the separation area should be prohibited at all times.

Separated Wire

Separated wire will generally contain a small amount of rubber and fiber, especially if it is extracted from passenger tires. The rubber attached to the wire has the potential to be a fuel source for a fire.

- When performing maintenance in an area where separated wire is present, care should be taken to ensure that sparks from welding and grinding do not come in contact with this material.
- If the wire material cannot be removed or protected from sparks, the area should be soaked with water prior to maintenance to reduce fire potential.
- After maintenance is performed, and prior to restarting machinery, the area should be thoroughly inspected for "hotspots" or residual smoldering materials and be handled appropriately.

Electrical Maintenance

- Loose, worn or broken electrical connections or components may heat up or arc thereby creating an ignition source.
- Electrical connections must be checked on a regular basis and repaired or replaced as necessary.
- All electrical outlets should be mapped. Such maps and technical diagrams should be updated as necessary.
- Refer to appropriate National Electrical Code as applicable. It is advised that you consult with your local electrician or electrical engineer for advice and/or guidance.

Mechanical Maintenance

- Observe proper lockout/tagout procedures prior to performing any maintenance on these items.
- Periodic cleaning to prevent accumulation of wire on the various components is essential to prevent heat buildup from friction or the wire penetrating electrical components and causing sparks.
- Inspect drive components, such as belts, clutches and gear boxes to ensure proper maintenance has been performed and equipment can be operated without causing excessive heat buildup or other failure which could cause a fire.
- Bearings should be inspected and monitored for proper operation to minimize potential heat buildup from a failure.

Hot Work Program

- Required whenever torching, welding or grinding operations are performed.
- Should be followed when maintenance on equipment is also required.
- Where applicable turn off dust collection equipment to mitigate dispersion of sparks.
- When possible avoid cutting, welding, grinding 2-4 hours before the end of the day.
- Refer to Appendix A for additional information.

Electromagnets

- Safety Precautions
- Monitor temperatures when in operation.
- See the recommendations under "Magnets & Metals Detectors" on this page for more information.

FIBER AND DUST SEPARATION

Fiber or dust separation is an integral part of tire processing plants that perform rubber granulating or grinding activities. Fiber and/or dust separation usually involves a large air source that allows lighter, undesirable material to be removed from the denser product material. Due to its light weight, dust and fiber can pose significant control issues. **Dust can be highly flammable, and possibly explosive.** Moving this material by air through pipes and equipment may generate a static charge and/or produce sparks that lead to fire. Ensure that spark or fire suppression systems incorporated into equipment are functioning properly. Note instances where static electricity has been observed.

- Refer to the Dust Control section of this manual for more details on fiber and dust collection.

GRANULATION

Typically granulation is considered second stage processing. Material produced in the second stage is smaller than 1 inch in size. Significant amounts of wire and fiber are also removed at this stage. Second stage processing is usually accomplished with medium to high rpm speed equipment. Fire hazards at this stage can be caused by friction and sparks that are generated from wire contained in the material. Tertiary grinding requires the material to be further reduced in size. Various types of high-end machinery such as a “cracker mill”, cryogenic freezing, or steel rollers can be utilized.

SECOND STAGE AND TERTIARY PROCESSING

Spark Detection

- Consider installing a spark detection and suppression system on the exhaust duct from the granulator to prevent any burning material from being conveyed downstream.
- The spark detector can also be interlocked with a deluge valve to extinguish the fire in the granulator (based upon a single or multiple spark count).
- Periodic inspection and testing should be performed to ensure optimal performance of this fire safety equipment.

Water Suppression

- Ensure pipelines are constructed of material appropriate for use in fire suppression systems.
- Periodic checks of spray nozzles need to be conducted to ensure sufficient flow and proper spray patterns.
- Water mist systems used for cooling the grinder should be maintained for proper functioning.
- Water supply lines should be inspected regularly for damage or restrictions which may affect proper operation.
- The water supply, whether private well or city supplied, should be checked periodically to ensure sufficient flow is present for the mist system.
- Refer to manufacturer's recommendations for proper procedures.

Electrical Maintenance

- Loose, worn or broken electrical connections or components may heat up or arc thereby creating an ignition source.
- Electrical connections must be checked on a regular basis and repaired or replaced as necessary.
- All electrical outlets should be mapped. Such maps and technical diagrams should be updated as necessary.
- Refer to appropriate National Electrical Code as applicable. It is advised that you consult with your local electrician or electrical engineer for advice and/or guidance.

Mechanical Maintenance

- Observe proper lockout/tag out procedures prior to performing any maintenance on these items.
- Periodic cleaning to prevent accumulation of wire on the various components is essential to prevent heat buildup from friction or the wire penetrating electrical components and causing sparks.
- Inspect drive components, such as belts, clutches and gear boxes to ensure proper maintenance has been performed and equipment can be operated without causing excessive heat buildup or other failure which could cause a fire.
- Bearings should be inspected and monitored for proper operation to minimize potential heat buildup from a failure.

Hot Work Program

- Required whenever torching, welding or grinding operations are performed.
- Should also be followed when maintenance on equipment is also required.
- Where applicable turn off dust collection equipment to mitigate dispersion of sparks.
- When possible avoid cutting, welding, grinding 2-4 hours before the of the day.
- Refer to Appendix A for additional information.

DUST CONTROL

Dust control is an integral part of tire processing, especially when performing secondary or tertiary grinding. Large quantities of fines and fiber are generated during processing and need to be managed.

Extreme caution should be exercised when working in a dust control area due to the extreme explosive nature of the material. The equipment, as well as the dust, can pose an extreme explosive hazard and care should be practiced when working in and around this equipment.

HOUSEKEEPING

A housekeeping program should be implemented to minimize buildup of dust. Employees need to be trained in proper cleaning procedures. Housekeeping activities should be sufficient to prevent buildup of material or contaminants in the area.

- Accumulations of fugitive dust on surfaces should be removed on a regular basis in a manner that minimizes the generation of dust clouds.
- Vacuuming is one method of dust removal. Personnel should be aware that vacuuming a hot ember into vacuum may create a high explosion risk.
- When using compressed air to blow down equipment, use less than 30psi, and take extreme care not to create a dust cloud.
- When moving dust or fiber with a broom or scrapers, it is advisable to use stainless steel or aluminum tools to minimize the potential of creating a spark.

DUST COLLECTORS CONTAINING FILTRATION MEDIA

Dust collectors on grinders serve the dual purposes of removing excess dust from the grinder and providing airflow to help reduce heat buildup in the grinder. The dust collector should be of sufficient size to provide the proper airflow for heat extraction and dust collection.

Dust and other undesirable materials are collected and transported to a central location for reprocessing or disposal using various techniques. It is not uncommon to pick up sparks or embers at the dust source and transport them along with the dust through the system. Proper installation and operation of the dust collection system can significantly reduce the potential for fires. A fire or explosion in a Bag House can occur due to sparks or burning material (fluff or dust) that is transported from the process area to the dust collector through exhaust (pneumatic) ducting.

Safety Precautions

- Dust Collectors and Baghouses should be located outside the building whenever possible.
- Dust Collectors must be properly vented for explosions as per NFPA 68.
- The use of a backdraft damper or other isolation device upstream of the dust collector should be considered to prevent explosion propagation back into the plant.
- Observe proper lockout/tag out procedures prior to inspection or performing any maintenance on these items.
- Smoking in the dust collection area should be prohibited at all times.
- If engineering controls cannot adequately control dust concentrations within guidelines established by OSHA, respirators should be used.
- Utilize a spark detection and suppression system to detect and suppress sparks or burning particulate in the duct work to prevent ignition of a fire or explosion in the collection unit.
- Consider installing a deluge valve and nozzles that can be automatically activated by heat detectors in the Bag House or by manual release.
- Follow appropriate confined space practices as outlined by OSHA.
- Refer to manufacturer's guidelines for changing filter bags.
- Refer to the manufacturer's recommendations for proper installation and maintenance procedures.
- A proper employee training program should be established to ensure employees understand the potential hazardous nature of the procedures and materials to be operated and handled.

Inspections

- Collector and ductwork should be inspected regularly for proper air flow and buildup of dust material. Sufficient air volume and conveying velocities must be maintained to prevent material accumulation in the ductwork.
- A program should be established for periodic inspections of the filter cleaning components for proper adjustment and operation.
- If the dust collector system is equipped with a fire suppression system, periodic testing should be performed to ensure proper operation of associated components.
- Air lock bearings and seals should be inspected on a regular basis.
- A program should be established for periodic monitoring of pressure gauges.

Electrical Maintenance

- Ensure that dust collectors, cyclones, fans, ductwork and associated equipment are properly grounded to eliminate the buildup of static electricity.
- If a section of duct is connected via plastic or rubber hose, ensure that grounding is accomplished on both sides of the connection.
- Note instances where static electricity has been observed and develop a program to eliminate as much static as possible.
- Loose, worn or broken electrical connections or components may heat up or arc thereby creating an ignition source.
- Electrical connections must be checked on a regular basis and repaired or replaced as necessary.
- Refer to appropriate National Electrical Code as applicable. It is advised that you consult with your local electrician or electrical engineer for advice and/or guidance.
- All electrical outlets should be mapped. Such maps and technical diagrams should be updated as necessary.

Mechanical Maintenance

- Observe proper lockout/tag out procedures prior to performing any maintenance on these items.
- Inspect drive components, such as belts, clutches and gear boxes to ensure that proper maintenance has been performed and equipment can be operated without causing excessive heat buildup or other failure which could cause a fire.
- Bearings should be inspected and monitored for proper operation to minimize potential heat buildup from a failure.

Hot Work Program

- Required whenever torching, welding or grinding operations are performed.
- Should be followed when maintenance on equipment is required.
- Where applicable turn off dust collection equipment to mitigate transmittal of sparks.
- When possible avoid cutting, welding, grinding 2-4 hours before the end of the work day.
- Refer to Appendix A for additional information.

CYCLONES

Cyclones are cylindrical dust collectors without filtration media, used to separate material from the airstream by means of centrifugal force. They are usually placed in front of the Bag House.

Inspections

- Air lock bearings and seals should be inspected on a regular basis.
- A program should be established for periodic monitoring of pressure gauges.

CONVEYING

Conveying material throughout the processing system is essential to the proper operation of a facility. For most applications, rubber belt conveyors or screw conveyors are the best choice. Another option is to use airflow for smaller size products, as it allows a more compact and simpler system to be utilized.

SAFETY PRECAUTIONS

Observe proper lockout/tag out procedures prior to inspection or performing any maintenance on these items.

Refer to the manufacturer's recommendations for proper installation and maintenance procedures.

A proper employee training program should be established to ensure employees understand the potentially hazardous nature of the procedures and materials to be operated and handled.

Smoking in the conveying area should be prohibited at all times.

ELECTRICAL MAINTENANCE

Loose, worn or broken electrical connections or components may heat up or arc thereby creating an ignition source.

Electrical connections must be checked on a regular basis and repaired or replaced as necessary.

All Electrical outlets should be mapped. Such maps and technical diagrams should be updated as necessary.

Refer to appropriate National Electrical Code as applicable. It is advised that you consult with your local electrician or electrical engineer for advice and/or guidance.

MECHANICAL MAINTENANCE

Observe proper lockout/tag out procedures prior to performing any maintenance on these items.

Inspect drive components, such as belts, clutches and gear boxes to ensure proper maintenance has been performed and equipment can be operated without causing excessive heat buildup or other failure which could cause a fire.

Bearings should be inspected and monitored for proper operation to minimize potential heat buildup from a failure.

Repair or place as necessary any defects that are noted and record this information.

APPENDIX A – HOT WORK

USE WHEN PERFORMING TORCH CUTTING, WELDING, GRINDING, OR PLASMA CUTTING

Before undertaking any procedure the following should be done:

Identify potential hazards

- Aerosolized particles
- Back strain
- Burns
- Explosive atmosphere
- Heavy falling objects
- Fire
- Flammable gases or vapors
- Hazardous fumes
- Hot environment
- Oil and Hydraulic fluids
- Repetitive motion injuries
- Sharp objects/edges
- Bright flash
- Flash burn

Prepare Area

- Clean area of debris

Ensure a trained spotter has appropriate fire suppression equipment

- Water supplies
- Fire extinguishers

After undertaking any hot work the following procedures should be done:

- Inspect area
- Clean up area

SUGGESTED PROTECTIVE EQUIPMENT

- Hard hats
- Safety glasses
- Steel toe/steel shank work boots with metatarsal guards
- Oil resistant clothing or covering
- Fire retardant gloves
- Fire retardant coveralls or other form of full body work clothing
- Fire retardant long sleeved shirt
- Eye/face shielding that provides protection from ultraviolet light (shade ratings of 4 to 6, depending on the thickness of the material being cut)
- Respirator (unless the absence of a respiratory hazard can be proven)
- Hearing protection as needed

TORCH SPECIFIC PRECAUTIONS

Approved protective equipment must be installed into the fuel gas piping or hose to prevent

- Backflow of oxygen into the fuel gas supply system
- Passage of a flash back into the fuel gas supply system
- Excessive back pressure of oxygen in the fuel gas supply system

SAFETY PROCEDURES

Portable fire extinguisher must be plainly marked and readily available in close proximity to hot work operations.

Managers and operators should analyze torch cutting operations to determine the level of potential exposure to hazardous materials. These materials include, but are not necessarily limited to:

- Lead
- Cadmium
- Beryllium
- Carbon monoxide
- Chromium
- Iron oxide
- Magnesium oxide
- Mercury vapor
- Nickel
- Nitrogen dioxide
- Zinc oxide

Where hazardous levels exist, workers should be protected and monitored in accordance with the corresponding regulation(s).

Compressed gas cylinders must never be moved via magnet.

Areas must be reasonably free of flammable or combustible materials.

APPENDIX A – HOT WORK

SAFETY PROCEDURES

Establish a written procedure for handling and storage of compressed gases that includes, at a minimum:

- Maximum cylinder pressure
- Maintenance of cylinder labels and markings

Store cylinders

- Away from heat;
- Away from combustible materials in general;
- Away from oil, grease or any petroleum products;
- With valve protection caps in place;
- With valves closed;
- Valve end up;
- Oxygen cylinders stored separately from fuel gas cylinders or other combustible materials;
- Oxygen and fuel gas cylinders must be separated by either:
  - A physical separation of 20 feet;
  - A noncombustible barrier at least 5 feet high having a fire resistive rating of at least one-half hour.

Remove regulators before moving or transporting cylinders.

For cylinders not having fixed hand wheels, a key, handle or nonadjustable wrench must remain on the valve stem when cylinders are in use. For a multiple cylinder installation, only one such device is required for each manifold.

Cylinders may not be placed in a location where they might become part of an electrical circuit.

Written procedures should be developed for use of compressed gas cylinders, and those procedures should address:

- Cylinders, valves, couplings, regulators, hoses and apparatuses must be kept free of oil, grease or other petroleum products.
- Cylinder valves should be operated only by hand, and closed only handtight.
- Before connecting to a regulator to a cylinder valve, the valve should be opened slightly then closed immediately to clear the surfaces of debris.
- Stand to one side when opening the cylinder valve.
- An acetylene cylinder valve should be opened no more than one-half of one turn of the spindle.
- Only a friction spark lighter may be used to light a torch.

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