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July 17, 1990

TO: Monroe McCaslin Melvin Hunt

FROM Bill Goolsby

SUBJECT: PROTECTION OF SHOP EMPLOYEES AND COMPLIANCE WITH OSHA REGULATION 1910.134 IN REGARD TO RESPIRATORY PROTECTION OF PERSONNEL THAT ARE EXPOSED TO ASBESTOS DUST RESULTING FROM BRAKE REPAIRS

Attached is an article that covers the requirements for handling, control and the cleanup of dust that results from brake repairs.

This control is not only important to the brake repair personnel but to all personnel that work in the shop area. This material can be brought into the office area through the airways and by tracking this dust into the offices. The asbestos can be taken into the homes in the work clothes of employees.

We should document our controls and stress the importance that the proper steps are taken to protect all employees when brake repairs are being made.

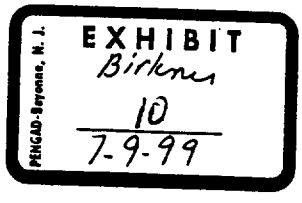
If I can assist you in this effort, please let me know.

BG

Bill Goolsby

Safety Department

cc: Leroy Mallory
Earl Davis



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Brake repair—protecting the worker and the environment

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Brake Repair—protecting the worker and environment

by George Swartz

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Each working day in the United States, throughout industry and in commercial garages, thousands of brake repairs and brake replacements take place on a variety of vehicles. It is estimated that in the United States more than 500,000 brake mechanics in these commercial garages are exposed on a regular basis to potentially harmful asbestos fibers. This figure would not include mechanics repairing brakes on forklifts and other vehicles in a variety of industries.

To bring a vehicle with defective brakes to original equipment standards, replacement of brake pads and/or brake shoes must take place. To protect the mechanics, other employees in the workplace, customers, and even the family members of the mechanics, control of asbestos during brake work is essential. Brake mechanics aren't always aware of the harm that can be caused from asbestos. Studies show that many mechanics haven't been taught the proper methods and procedures for their personal health and safety.

How asbestos affects the body

Most people recognize the word asbestos and know that asbestos is dangerous. Mechanics should know and understand the numerous and important safety factors that are a part of brake repair work. Asbestos is a widely used mineral-based material that is very resistant to corrosive chemicals and heat. The separate fiber composition of asbestos gives it strength and flexibility. The tensile strength of asbestos in its long form can be as much as four times the tensile strength of steel.

Individual asbestos fibers are microscopic, and because the fibers are more buoyant than dust, the fibers can float almost indefinitely in the garage. Many of the fibers are below 10 microns in size. One micron is the equivalent of 1/25,000 of an inch. Particles less than 50 microns cannot be seen with the naked eye. An asbestos fiber that is 0.5 microns in diameter is hundreds of times smaller than the period at the end of this sentence. Is it any wonder that the mechanic doesn't sense any danger when using a compressed air hose to clean a brake drum? The mechanic may not realize that the effects from asbestos may take upward of 20 to 30 years to cause him serious harm.

Studies conducted in garages where mechanics used compressed air for cleaning brakes showed that thousands of fibers can be released near the mechanics' breathing zone by this method. Use of a dry rag, dry brush, or dry sweeping is equally as dangerous to the mechanic. Control of the asbestos fibers at their source is the key to prevention of asbestos-related diseases.

The harm from asbestos fibers comes mainly from inhalation of the microscopic particles contained in the brake dust. These microscopic needle-like particles can bypass the cilia and mucous membranes on the way down to the lung. The cilia are small hairlike structures in the respiratory passage that are in constant motion to help move inhaled particles up and away from the lungs. The most harmful particles are usually smaller than 10 microns in size. The coal miner that comes up out of the mine and blows his nose and notices black particles in his handkerchief demonstrates an example of ciliary action.

When an asbestos fiber makes its way down into the lower reaches of the lung, it's possible for the fiber to settle into an alveoli sac. The alveoli are responsible for the oxygen/carbon dioxide exchange in the lungs. This process helps supply oxygen into our bodies. When the alveoli become blocked with particles such as asbestos, the body reacts by attacking the foreign bodies with macrophages, white blood cells that can chemically consume these intruders. Asbestos, being the strong durable prod-

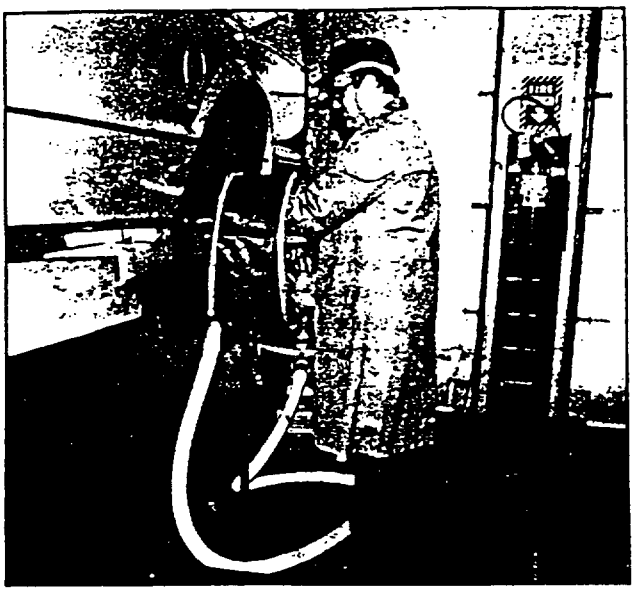

Illustration # 1—HEPA vacuum system and encapsulator captures brake dust prior to any brake maintenance.

uct that it is, cannot always become consumed. The macrophages then die on the asbestos fiber which eventually can block the alveoli sacs. When enough of these sacs become blocked, the victim experiences medical difficulties.

Health effects of asbestos exposure

Asbestosis: When someone has inhaled asbestos, a scar tissue can form in the lungs. Asbestos fibers, after lodging in the alveoli, cause an inflammation of these air sacs. As the inflammation heals, it leaves scar tissue. The scarring, which is called asbestosis, is a gradual process that can take many years before its effects are noticed. Asbestosis causes a gradual shortness of breath. This requires a person to breathe harder and deeper because the scar tissue makes it more difficult to get oxygen into the person's blood stream. The lack of oxygen caused by this condition can lead to heart failure. Studies indicate that repeated exposure to asbestos can cause asbestosis. This condition is irreversible.

Lung Cancer: Lung cancer can develop in a person even in situations where short-term exposure has taken place. Lung cancer is responsible for the largest number of deaths from exposure to asbestos. Each added exposure to asbestos could increase the risk of cancer.

The effects of smoking are well known; smoking can independently cause lung cancer. When smokers are exposed to asbestos, the risks actually multiply. Estimates of the potential harm from the combination of asbestos and smoking range from 30 to 90 percent greater than that of nonsmokers. Smokers, especially mechanics in this case, should be encouraged to quit. Cigarette smoking has a numbing effect on the cilia. This renders these life-saving hairs ineffective for approximately one-half hour after smoking a single cigarette. Lung cancer is a condition in brake mechanics that requires prevention more than early detection or cure.

Mesothelioma: This is a fatal type of cancer of the lining of the chest and stomach cavity. It can be caused by very low exposures to asbestos. Death usually results within a year of diagnosis. This type of cancer has occurred among brake mechanics and members of their families. Steve McQueen, the famous actor, was a victim of this disease.

Additional Cancers: Other cancers which appear to be caused by asbestos include cancer of the voice box, the stomach, and the large intestine.

The latency period involved in these cancers ranges from 15 to 30 years or more. The victim feels fine in many cases prior to the onset of serious medical problems. This false sense of security can lead a mechanic into following poor work practices. Members of management could also fail to enforce basic asbestos control procedures which eventually could lead to harmful exposures.

It is difficult to convince a healthy twenty-year-old mechanic that he may become ill when he reaches middle-age because of his present poor work habits. Exposure to asbestos—regardless of the level—involves some health risks for the mechanic.

Safe brake handling recommendations

A mechanic can protect himself from the harm of asbestos exposure by following proper work practices. After removing a wheel from a vehicle, the mechanic must use a special vacuuming technique or wet washing method on the brake pads or shoes to prevent inhalation of the dust. Either of these methods must be used before performing any work. Front disc brakes, now used on almost all cars, contain less brake dust than the rear brake shoes which are contained in a brake drum.

Front disc brake pads collect little dust and emit most of the dust into the environment because of brake design. Brake dust on the front disc brakes is emitted while driving and can be washed away while driving in the rain or going through a car wash. The design of the rear brake drums keeps almost all residual dusts and metals contained in the drum. The greatest potential for harm is from work being performed on drum-type brakes, especially during drum removal.

To control brake dust through the vacuuming method, only a **High Efficiency Particulate Air** (HEPA) device can be used. This special vacuum will capture the brake dust, when used properly, and will return 99.97% clean air to the environment. Follow manufacturer's recommendations for care, use, and servicing of the HEPA unit. (See Illustration 1.)

The HEPA vacuum is attached to a portable frame assembly that can be rolled over to the vehicle being serviced. A circular see-through type device, called a shroud or encapsulator, is placed over the brake drum or brake assembly unit and pulled forward against the backing plate. For front brakes, the encapsulator is placed over the caliper which contains the brake pads.

The vacuum is turned on and compressed air is discharged from a small nozzle in the encapsulator to thoroughly clean all of the brake parts. The mechanic inserts his hands in rubber gloves in the unit to conveniently perform the cleaning process. A small hammer can be placed in the encapsulator to tap on a drum that may need special attention during removal. Dust is then

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sucked into the HEPA vacuum before removing the encapsulator from the cleaned brake assembly.

The wet washing method consists of wetting the front calipers or rear drum and brake assembly with a mist to minimize any disturbance of the fibers. To use a wet wash system, a portable container on casters is rolled over to the elevated vehicle after the wheels have been removed. A reservoir of brake cleaning liquid in the portable container is powered by an air hose; this allows the cleaning liquid to continue to circulate through the container. To safely wash the brakes, the liquid comes out of a bristle brush on a handle, or nozzle, and is moved over all of the brake parts. (See Illustration 2.)

The force of any liquid being used as a wetting process must always be light and gradual. A misting of liquid rather than a burst of liquid will help prevent disturbing the fibers. The method used to control asbestos dust should not help to contribute to the problem: Gasoline or flammable solvents must never be used in this process.

Should a brake drum be frozen in place after the wheel is removed, a liquid spray should be used on the outside of the drum before removal to minimize any disturbance of the asbestos fibers. Usually a drum that won't budge is tapped with a hammer to loosen it. If the drum isn't wet, fibers could be disturbed which have the potential of being inhaled by the mechanic. The drum should always be removed slowly while tilting the bottom in or forward to help contain the accumulation of brake shoe material. A light misting of liquid between the drum and brake assembly at this time would help control more of the dust.

Once the brake drum is removed, the dust contained in the drum should then be rinsed out in the container of the wet wash unit. (See Illustration 3.) The brake drum must not be set down on the garage floor without first washing it. The mechanic proceeds to wash down the rest of the brake assembly with a light mist with the liquid falling into the washing container, not on the floor. Washing of the front brakes must also take place at this time.

Brake inspection deserves more serious consideration than brake replacement. When considering the number of vehicles that come into garages for servicing, the repair or replacement of brakes doesn't necessarily take

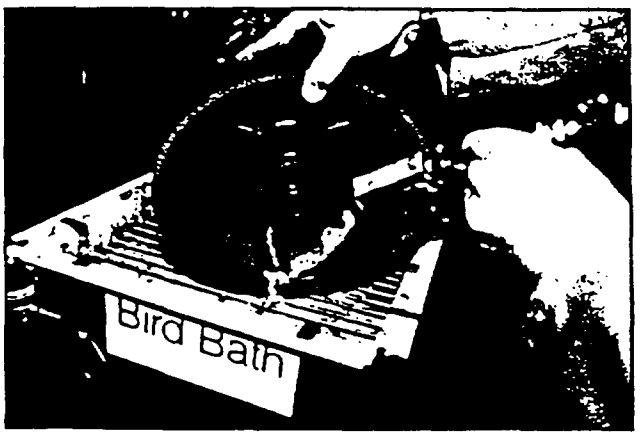

Illustration #3—**Brake drum is washed out with a light liquid spray before setting the drum on the garage floor.**

Illustration #2—**Portable wet wash unit helps with the wetting of brake dust on parts; light misting of liquid helps in controlling airborne dust.**

place on each vehicle. Removal of the drums for inspection purposes, however, does take place on each vehicle. In each case, the mechanic must make every effort during inspections to control the asbestos dust in both front and rear brake pads and brake shoes through HEPA vacuuming or wet washing.

The use of the HEPA vacuuming method may be the best method of controlling brake dust. The wet washing method is effective and less expensive, but could still result in some exposure if not used properly. Consideration must also be given to the costs associated with each method and the level of acceptance by the mechanics. Documented training should be given to each mechanic who performs brake work. Manufacturer's representatives should be capable of providing the training.

Many brake shoe and brake pad manufacturers have switched from asbestos to non-asbestos parts. Manmade materials such as fiberglass are being used as replacements. It's important to remind mechanics that non-asbestos brake pads and shoes must be treated with the same respect as asbestos types. As brake shoes are worn down inside the brake drums, various particles are ground off and retained in the drum. The microscopic non-asbestos particles can still be harmful when inhaled.

HEPA vacuuming or proper wet washing must be used despite the contents of the friction materials. When a vehicle enters a garage, there is no way of knowing what type of brake shoes it's equipped with. Recent studies suggest that manmade fibers can be harmful when inhaled.

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Environmental considerations

When using a HEPA vacuum, the bag of asbestos dust within the machine will eventually need changing. Initially, when placing the paper bag at the bottom of the HEPA unit, a plastic bag supplied by the manufacturer must enclose the paper bag. The plastic bag must be

Brake mechanics in commercial garages are exposed on a regular basis to potentially harmful asbestos fibers.

labeled in this manner:

DANGER
CONTAINS
ASBESTOS FIBERS
AVOID CREATING DUST
CANCER
AND LUNG HAZARD.

When the paper bag is full, simply remove the neck of the bag from the bottom of the vacuum and cautiously close the plastic bag around it and prepare to securely seal the end with tape or a large tie. Required safety equipment must be worn during this process.

Before closing the bag, this would be an appropriate time for the mechanic to place water or surfactant liquid into the plastic bag to contain as much dust as possible. Once securely sealed, the plastic bag should be placed in a large heavy-duty container. The container must contain a 6-mil thick-labeled plastic bag, the appropriate "Danger" label on its outside, and be equipped with a tight-fitting lid.

Depending on a garage's location, federal, state, or local EPA codes would determine how long the bags of asbestos waste could remain on the property. Each state establishes the length of storage time. It is recommended that the appropriate agencies are contacted to determine storage rules. When waste is removed, all EPA requirements and proper document controls must be scrupulously observed. Violations of OSHA or EPA regulations can be very costly.

With the wet washing method, the liquid in the washing assembly must be periodically changed. Some wet washing machine models allow for the proper disposal of a paper-type filter which is a part of the washing tray. Other models allow for the collection of contaminated brake washing liquid in a labeled heavy duty plastic bag. In any case, EPA disposal guidelines must be followed. Dumping of asbestos wastes into drains, out of doors, or mixing it with other wastes must not take place. If the wetting and collection of fibers is not taking place properly, the evaporation of the liquid will only allow for a later dispersal of the fibers.

Another environmental consideration involved in brake replacement involves the rebuilding of used brake shoes. In many cases, used brake shoes are recycled. The rebuilding process requires additional handling of the used brake shoes as it changes hands in a garage, through transportation, and at the rebuilding center. When HEPA vacuuming or wet washing is used, employees throughout the chain of handling are exposed to significantly less asbestos than if no control methods were used.

There is a misconception regarding the use of various aerosol-type solvents as a "wet washing" method. Most of these sprays contain chemicals and are costly. Simple water and detergent can be as effective. When spray cans are used by mechanics, the asbestos dust in a brake drum is not always removed by spraying the liquid; the spray is usually used only on the brake assembly. Many mechanics simply dump the dust from the drum onto a garage floor or into a trash can. The most effective use of these solvent sprays should be to remove grease where necessary, not as the main control for removal of asbestos on brake parts.

Additional safeguards

The use of a respirator by a mechanic may not be necessary if the proper vacuuming or wet washing control method is being used. If respirators are requested by the mechanic or required by the management, only NIOSH respirators can be used. A disposable dust mask is forbidden for use with asbestos. When changing the bag in a HEPA vacuum, a HEPA respirator, rubber gloves, and a paper fiber coverall suit should be worn by the mechanic. A respirator program should be in place at the garage to comply with OSHA regulations 29 CFR 1910.134.

If respirators are used as the only control for asbestos in a garage, the mechanic may be a victim of false security. The respirator could protect him while he's performing his work, but he would eventually have to take it off. Fibers disturbed during brake servicing would still be free-floating and could be inhaled by other mechanics as well as the one that removes his respirator.

Asbestos could also get on the mechanic's clothing, only to transfer it to his personal vehicle on his way home at the end of the day. Brake mechanics should not wear their working clothes home, but leave them at work for special laundering. Capturing of the dust before it can become airborne is the mechanic's greatest security against asbestos-related diseases.

If brake pads or brake shoes require any pre-installation modifications such as grinding or beveling, a HEPA vacuum must be used to collect any particles. A large funnel at the end of the vacuum hose will help ensure the capture of particles during any grinding in the modification process. Any other type of vacuum device must not be used because the microscopic asbestos particles would escape from the vacuum cleaner. Check with the manufacturer of these special machines for proper use, care, design type, disposal of dust, etc.

The HEPA vacuum can also be used in the garage to provide additional removal of dusts. Use the vacuum attachments on boxes, shelves, lights, doors, floors, water fountains, and other surfaces. This special cleaning can be done on a regular basis to ensure a safer workplace.

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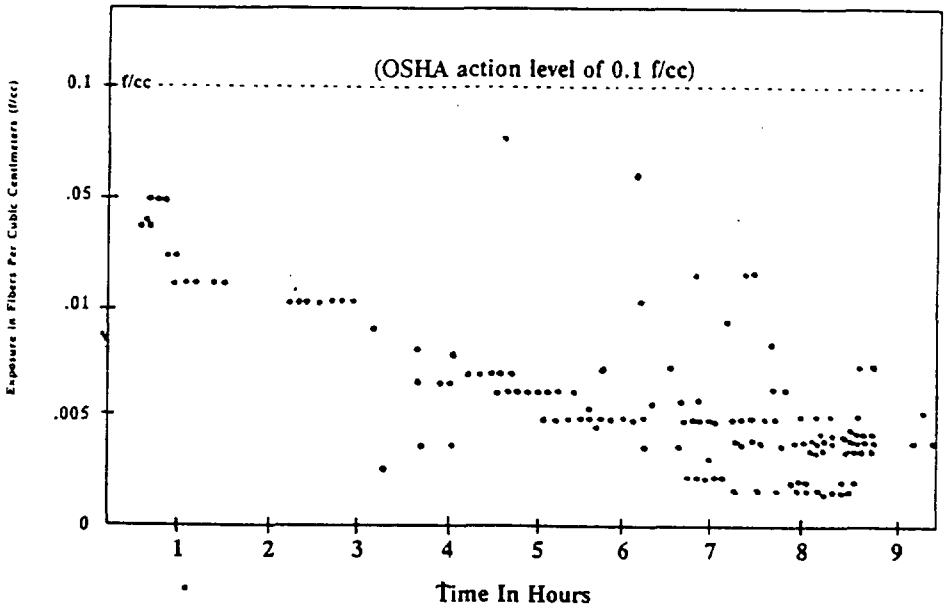

Illustration #4—Graph indicates that wet washing or HEPA vacuuming helps reduce airborne levels of brake dust below OSHA guidelines.

Follow manufacturer's guidelines while performing this work.

Additional personal protective equipment should be worn by mechanics. Bump caps provide mechanics with head protection while working under a vehicle. The mechanic should also be wearing ANSI safety glasses with side shields and steel toe boots at all times while in a garage.

An additional safeguard should be the control of eating and drinking in the garage. Mechanics should have a separate location, away from the work area, for this purpose.

OSHA requirements

In June, 1986, OSHA lowered permissible asbestos exposure limits by a factor of 10. The former limit was 2.0 f/cc; the new limit is 0.2 f/cc with an action level of 0.1 f/cc. These numbers represent 200,000 or 100,000 fibers in a cubic meter of air in the workplace. OSHA requires that personal air sampling takes place at least once in each place of work to determine levels of asbestos. This is accomplished by the standard industrial hygiene methods of workers wearing personal sampling pumps for an entire shift in the garage. Full day, as well as 30-minute excursion sampling during brake drum removal, is required by OSHA.

Worker exposure records must be retained by the employer for 30 years, and any medical records must be retained for the employee's period of employment, plus 30 years. Prevention must be stressed in a garage to minimize any exposure to asbestos.

An on-going study of brake dust in garages

Illustration #4 represents the results of an on-going air sampling project at brake repair operations. The horizontal line on the graph represents time in one hour increments up to eight hours. The vertical line represents asbestos readings from zero to 0.1 f/cc, (the OSHA action level). The results of the study demonstrate that where proper methods of HEPA vacuuming or wet washing are used, employee exposure should be below 0.1 f/cc. It's important to note that during this project, compressed air was never used by mechanics to blow asbestos dust off any brake assembly; this practice is forbidden by OSHA.

During this ongoing study at 44 brake repair garages throughout the United States, mechanics wore personal sampling pumps while completing brake repairs. Over 142 separate samples were taken. NIOSH and OSHA sampling methods were followed as required. Air flow remained constant at two liters of air each minute for each sampling pump. Proper pump calibration, details of specific work being completed by the mechanic and personal information on each mechanic were recorded.

All of the samples were forwarded to an accredited laboratory for analysis. A detailed report was then forwarded to each facility to communicate to management and each employee the results of the sampling. The phase contrast microscopy analytical method was used on each sample by the laboratory to determine fiber count on the 25 MM cassettes.

Another result of this study has indicated that approximately 85 percent of mechanics being sampled smoke cigarettes.

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Conclusion

NIOSH has recommended that asbestos be controlled to the lowest detectable limit. OSHA, in its opening statements of the new asbestos standard, stated that "OSHA is aware of no instance in which exposure to a toxic substance has more clearly demonstrated detrimental health effects on humans than has asbestos exposure. The dis-

eases caused by asbestos exposure are life-threatening or disabling." Science knows more about asbestos than any other toxic material. Despite the abundance of medical evidence for this deadly dust, why do many brake mechanics continue to ignore the risks on the job?

Garage mechanics can ensure their personal safety, and those around them, by practicing proper control methods while performing brake repair. Of all exposures to asbestos in the workplace, the control of asbestos during brake work is probably the simplest of all to achieve. Asbestos control is much simpler in a garage because of the dust being isolated at the calipers and drums of the vehicles. The process required for removal of asbestos from pipes, boilers, ceilings, and floors is much more difficult. Mechanics must be willing to invest these few extra minutes—very special minutes—for their safety while performing brake work.

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