

Health and Safety Issues on Brick, Refractory and Insulation

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ABSTRACT

The steam and power generating industries, like most, have to pay close attention to health and safety issues pertinent to its industry components. Each component of the boiler island has some special and unique issues that must be addressed. Brick, refractory, and insulation are no exception. They have very specific health and safety issues on just about every type of refractory and insulation material available on the market today. Not to mention the health and safety issues associated with the materials of products no longer manufactured but still found on existing construction. These industries must know about the health and safety issues associated with the products to be installed at their facilities. They must also familiarize themselves with those products that exist on their boilers. Proper material selection and proper preventive practices will prevent any potentially dangerous and health threatening issues. Paying close attention and following all health and safety requirements will protect the health and safety of those working in and around brick, refractory and insulation materials.

BACKGROUND

Those in the steam and power generating industries are mindful of the health and safety issues associated with the products to be installed at their facilities. They must also familiarize themselves with those products that exist on their boilers. For example, it's imperative to know ahead of time as to what products were installed on the steam/heat generating units prior to doing a retrofit. Exposure to potential law suits can be avoided simply by educating yourselves and your labor crafts. Learn to follow closely to the health safety requirements for all products whether new or existing. Only by following all health and safety requirements can you protect the health and safety of the people working in and around brick, refractory and insulation materials.

TERMINOLOGY

Some terms of importance to know:

1. Asbestosis - Chronic lung inflammation caused by prolonged inhalation of asbestos particles - asbestos fibers have barbs that attach to the lung tissue.
2. Carcinogens - Any chemical, biological, or physical agents that can potentially cause cancer. A product can be labeled a carcinogen if it causes a statistically significant increase in anomalous (abnormal) cell growth when applied to previously unexposed organisms.
3. Hexavalent Chromium (CR+6) Carcinogen material found in chromium compounds after the chromium based refractory material has been fired

during operation.

4. M.S.D. Sheets - Material Safety and Data Sheets

5. RCE - Refractory Ceramic Fiber

BRICK

During brick installation the silica dust is created by the use of power saws cutting the bricks. Silica dust is a serious health threat. Use wet saws whenever possible when cutting brick. This will help to cut down on the dust. Also, respirators or air masks should always be used. In cases where a lot of brick will be cut makes it imperative to have exhaust fans installed. Ear and eye protection are always recommended. The high level of noise made from the power saws and the flying air particles demand protection from exposure to this intense environment.

REFRACTORY

The National Institute for Occupational Safety and Health (NIOSH) and the Environmental Protection Agency (EPA) have been keeping the Steam and Power Generating Industries informed as to what products are being classified as a carcinogen or hexavalent material for many years. However, it will be up to those working in, around, and for the Steam and Power Generating Industries to be aware of what, where, and how to protect themselves and those people working on site. For example:

Some refractory materials being used in boiler settings contain chromium compounds as part of the refractory mixture. During operation some of the chromium compounds will be converted into a

hexavalent Chromium. This means that the initial installation of the refractory material did not represent a health problem. However, when the refractory needed to be removed it presented a serious health problem. During operation of the unit some of the chromium compounds in the refractory may be converted to CR+6. Therefore, when the refractory material is removed it creates a dust that may contain the hexavalent chromium. As a result, inhaling the CR+6 increases the risk of lung cancer and may also cause other health hazards.

Another serious problem is those refractory products that contain crystalline silica. Crystalline Silica, when converted to dust, presents a potential health hazard if inhaled over a period of years. It is recommended by many of the boiler manufactures and refractory material manufacturers that when removing or installing refractory material containing crystalline silica (or any chromium base product) that you follow these recommendations:

1. Provide training, education, and equipment to any personnel who may be in contact with refractory.
2. Provide proper monitoring of the removal process.
3. Wear proper masks to prevent inhaling the refractory dust
4. Wear proper protective suits to prevent the refractory dust from any contact with the skin.
5. Dispose of the material in accordance with local, federal, and or state regulations.

Proper health and safety practices recommends that you check maintenance, purchasing, and supplier records as well as the original bril specifications prior to any project.

CERAMIC FIBER INSULATION

The above list also includes some ceramic fiber products that contained chrome. Most Refractory Ceramic Fiber (RCF) products do not contain a chrome material but have been classified per the *Seventh Annual Report on Carcinogens* as products with sufficient evidence for the carcinogenicity of ceramic fibers in experimental animals. However, no data has been made available on the carcinogenicity of ceramic fibers to humans. OSHA regulates ceramic fibers under the Hazard Communication Standard as a chemical hazard in laboratories. A chemical hazard in laboratories is defined as simply refractory materials to be used with caution. OSHA has established a permissible exposure limit for respirable cristobalite dust of 0.05 milligrams per

cubic meter for an 8-hour time-weighted average exposure. Cristobalite is formed when a refractory ceramic fiber material is exposed to temperatures above 1800 degrees F (982 degrees). The RCF product undergoes a physical transformation from a glassy state to a crystalline state and this transformation is accompanied by the formation of crystalline silica in the form of cristobalite.

In general, all RCF products not containing chrome should be handled with care. The ceramic fibers in the manufactured product are extremely sharp and can cause skin and upper respiratory irritation. The skin irritation can be caused if the broken ends of the ceramic fibers become embedded in the skin. The upper respiratory irritation is a reaction your body has to the sharp ends of the broken fibers.

To prevent the skin and respiratory irritation you should do the following when handling ceramic fiber and refractory materials:

1. Wear long-sleeved clothing and gloves.
2. Wear head and eye protection including a respirator or masks to prevent inhaling dust.
3. Wash any exposed skin surface with soap and cold water after handling the ceramic fiber material and only wash in one direction.
4. Wash RCF-soiled clothing frequently and separately from other clothing.
5. Refrain from smoking, eating or drinking while working near RCF.
6. Keep RCF work areas clean to prevent accumulation of debris on the floor surface.
7. Use High Efficiency Particulate Air filters (HEPA) for clean up tasks. If using HEPA filters are not feasible, wet sweep or use dust-suppressing compounds.
8. Refrain from using compressed air to clean work clothes and other contaminated surfaces.
9. Refrain from using power tools to cut or drill RCF products.

It is recommended by the ceramic fiber insulation manufactures that you follow the above suggestions and pay close attention to the manufacture's MSD sheets for optimizing safe installation practices. Use extreme caution at all times especially if fibers accumulate on the skin. Do not rub or scratch. Never remove fibers from the skin by blowing with compressed air. If the fibers can be seen penetrating the skin, the fibers may be removed by applying and then removing adhesive tape. The fibers will adhere to the tape as it is pulled out of the skin with the least

amount of harm to the body.

PARTING AGENTS

Many refractory applications require the application of a parting agent to prevent the refractory from sticking to a tube, pipe or anchor during installation. One such parting agent is coal tar emulsion. Coal tar emulsion products have become another health and safety issue. These products contain ingredients made from crude oil and mineral ores such as Bitumastic Super Service Black paint and are classified as a carcinogen and must be avoided. Do your homework by checking the manufacture's MSD sheets for optimizing safe installation practices. Avoid the hazardous materials and select parting agents that won't pose a health issue on site.

INSULATION

Insulations, like refractories and brick, require special handling during installation and removal. The fibers that make up any "vitreous" or glassy filaments are extremely sharp and can cause skin and upper respiratory irritation. The skin irritation can be caused if the broken ends of the ceramic fibers become embedded in the skin. An upper respiratory irritation is another reaction your body will have to the sharp ends of the broken fibers that are inhaled. To prevent the skin and respiratory irritation you should:

1. Wear long-sleeved clothing and gloves.
2. Wear head and eye protection including a respirator or masks to prevent inhaling dust.
3. Wash any exposed skin surface with soap and cold water after handling the insulation material and only wash in one direction.
4. Wash soiled clothing frequently and separately from other clothing.
5. Avoid breathing the dust when installing insulation products.
6. Use some dust collection method or apparatus to capture the dust or provide adequate ventilation during installation.

Follow the above as well as the recommendations by the manufacture's MSD sheets for optimizing safe handling and installation practices.

Any insulation material that contains Crystalline Silica has been classified as a probable cause of cancer. Breathing of dust from such products and materials may cause lung damage. Exposure to the dust may also cause irritation to the skin, eyes, and respiratory track. Wherever possible, avoid tearing or ripping any batt, blanket, or roll type insulation by hand. The insulation material should be cut with a

sharp knife.

In years past insulation was manufactured using an asbestos base material. These materials have been classified as carcinogen materials. Special attention and careful removal practices must be followed. Your maintenance, purchasing, and supplier records along with your original insulation specifications should be reviewed to determine whether and where the asbestos containing products were used. Also, check with your state and national environmental protection agency for proper codes, rules and regulations for disposal and handling of asbestos bearing materials.

The use of asbestos bearing materials in the steam & power generating industry were stopped as early as 1972 and as late as 1975 so you must be careful and know what products were used and where at your facility. Listed below are some of the more common product descriptions used at a steam generating facility that contained products (before 1972) are:

Calcium Silicate Block
Calcium Silicate Pipe Cover
85% Magnesia Block
Medium Temperature Block and Pipe Insulation
High Temperature Block or Board Insulation
JM Superex Block
Asbestos Rope
Millboards
Plastic or Cement Finish Materials
Mastic Finish

CONCLUSION

Proper material selection and preventive practices will prevent potentially dangerous and health-threatening issues. Familiarize yourself with all installed materials. Read your MSD sheets; review your original brick, refractory, and insulation specifications, and always follow the recommendations by OSHA and the material manufacture. The manufacture's handling and installation recommendations will allow optimum health and safety on site. Paying close attention to all health and safety requirements will prevent a hazardous environment. Those working in the steam and power generating industries need to be informed of the health and safety issues when working in and around brick, refractory and insulation materials.

REFERENCES

[1] Environmental Protection Agency Federal Regulations - 40 CFR Part 61, Subpart M, Regulation §61.140 - §61.155;

[2] Ohio Environmental Protection Agency State Regulations - OAC 3745-20-01 - OAC 3745-20-08;

[3] Asbestos Industrial Code Rule 56, State of New York Department of Labor, Division of Safety and Health, October 1991.

[4] Peters, George A, Peters, Barbara J., Sourcebook on Asbestos Diseases: Medical, Legal, and Engineering Aspects Volume 2, pp. 39-120.

[5] NIAC(National Insulation and Abatement Contractors) Association , Hazard Classification Guide for Asbestos Abatement and Insulation Products, March 1993 edition, Alexandria, VA.

[6] Babcock & Wilcox Plant Service Bulletin PSB-43B, Refractories, Plastics, Insulation or Textiles Containing Chromium Compounds, July 9, 1992.