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Polychlorinated Biphenyl Inspection Manual

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Appendix F

PCBs in Underground Mines

Underground mines present potential hazards unique to the mining environment and specialized training is needed before an inspector goes underground. However, an understanding of mines is necessary before training is considered. Therefore, this appendix is divided into two major sections, "Use and Distribution of PCBs in Underground Mines," followed by "Training and Safety."

Use and Distribution of PCBs in Underground Mines

As of January 1, 1982, PCBs used in mining equipment must be at a concentration under 50 ppm [§761.30(c)]. The discussion that follows explains how mines use PCBs. PCB electrical equipment may be found in mines because electrical systems in mines follow the same general pattern as any other industry.

General Description of Mines

All underground mines are categorized as either coal mines or metal/nonmetal mines. Each is different in their operation and in their use of electrical equipment. Underground coal is most frequently accessed via a ground-level entry leading to the coal seam. The entry, or "adit," may include an electric trolley for personnel, equipment, or coal transportation, or the transportation may be provided by rubber-tired vehicles. Often, coal is hauled out of the mine separately by a conveyor belt. Either way, all personnel and equipment access is via the adit, which may be level or inclined.

In "room-and-pillar" mining, the working area of the mine is divided into numerous sections by "pillars," or columns of coal, that are left intact during mining for roof support. These columns are left standing until the section is mined out, after which they too may be removed and the roof allowed to collapse. Another type of coal mining is called "longwall" mining, in which several hundred feet of a coal face is mined at once. As the machinery advances into the seam, the roof is allowed to collapse behind it. The transformers that power the underground equipment are located away from active working areas of the mine.

Coal mining also is done by hand, or with the use of hand-held equipment, when the seam is not thick enough for the use of mining equipment. Such "low-seam coal" will not be of concern to the PCB inspector since PCB electrical equipment will not be found underground in such mines.

Metal/nonmetal mines, which produce metal ores containing gold, silver, or lead, or nonmetal resources such as salt and other minerals, often gain access to the ore via adits. More often the access is gained via a vertical shaft. An elevator, which is used to transport both personnel and ore, is operated from a surface-level shaft house that contains electric motors, controls, and a hoist. The shaft may lead to a number of mining levels, much like an elevator in a building. Working levels can be 10,000 or more feet below the surface and constitute miles of drifts. Working levels are typically separated by 100 or more feet of rock. Transportation of material and people in the mine can be by diesel or electric vehicle, train or other means. Mines vary considerably in size, manpower, production capacity, and in the use of electrical equipment underground. Ore may undergo primary crushing and milling underground or on the surface. Whichever applies, ore or concentrates can be hoisted or pumped to the surface or can be transported horizontally, by train, truck or pipeline to the surface.

All mines have fresh air ventilation systems and personnel escape routes that are incorporated into the mining plan. Health and safety compliance is enforced by the Mine Safety and Health Administration (MSHA), which conducts unannounced quarterly inspections of each mine. Federal law provides for mandatory personal safety equipment and training, as discussed later in this appendix.

PCBs in Underground Equipment

Underground mines can have a high demand for electric power, both on the surface and underground. Both coal and metal/nonmetal mines may use high-voltage/high-amperage equipment on the surface for ventilation, shaft equipment, coal or rock loading facilities, and associated ore mills. PCB Transformers can be found at the mine's primary electrical substation (located on the surface), at areas of power use such as an associated mill, shaft house, or ore loading facility, or in the mine's equipment storage area. PCB Capacitors may be found in motor control boxes, transformer locations, loading facilities, or in storage areas.

Underground equipment can also have high-current requirements. Coal mining makes substantial use of electrical coal-cutting machines (such as "continuous miners"), conveyors, mobile loading machines, drilling machines shuttle cars, and water pumps. Metal/nonmetal mines may have a number of electrical applications underground, including vehicles, crushers, pumps, etc. These applications are significantly different from coal and thus these mines are discussed separately below.

PCBs in Coal Mines. In coal mines, high voltage (1,000 to 13,000 volts AC) from a mine's primary substation is typically cabled underground to smaller distribution substations to provide lower voltage for trolleys, continuous miners, conveyor belts, groundwater pumps, and other equipment. High-voltage cables are normally suspended from the roof, or "top," along primary access routes. Many coal mines have replaced transformers with "mobile power centers." These power centers are rectangular steel enclosures measuring approximately 22 feet long, 6

feet wide, and 3 feet tall. They are mounted on skids and contain a dry-type transformer. Coal mine operators prefer these units because they are designed for rugged use. According to industry sources, about 10 percent of them contain capacitors. Units that were manufactured up until the late 1970's may contain PCB Capacitors. One model that contains PCB capacitors is a 4,160 volt, 500 kV unit manufactured by Hubbel Ensign Company. Other models may have also been manufactured with PCB Capacitors, and there may be no indication on the enclosure that PCBs are located inside. Other manufacturers of mobile power centers include, but are not limited to, Line Power Manufacturing, Pemco, Service Machine Company, MCI Corporation, and Sasser.

Inspecting mobile power centers requires some planning because the units *must* be de-energized in order to look inside. If the mine is in production, it may not be possible to inspect the units that are in service until there is a change in work shift. Mines that operate around the clock normally have three shifts in each 24-hour period, with approximately one-half hour of nonproduction activity per shift. If the mine is on standby, meaning that it is not producing but the mine is being maintained by a small crew, then it should be possible to shut off power to all units for the purpose of inspection. It is reasonable for the inspector to request that the mine operator shut power to the units s/he intends to inspect, and that mine personnel remove the steel cover plates to enable you to look inside, when the unit is not in active service. Shutting power and removing the covers are routine operations. In some models, removal involves unbolting the top panels and sliding them to the side. Access to the inside may vary with the model.

The manufacturer's nameplate should provide information about the type of dielectric fluid in the capacitor. If they are PCB Capacitors, examine the casing and the area below the capacitor. Leaks may be common in these units because of their age and rugged use environment. As usual, follow standard precautions when inspecting electrical equipment. The capacitors will retain a charge after the power has been shut off. Do not place any part of your body within the mobile power center's enclosure.

PCBs were also used as a coolant in the electric motors of continuous coal miners and loaders manufactured by Joy from 1961 to 1973; some 652 of the units were still in service in 1973, requiring some 23,000 kilograms of PCBs per year for "topping off." Electric motors in mine equipment are usually rebuilt every 5 years or less. A mine that has been in uninterrupted operation since 1973 would not be expected to have PCB-filled electric motors today. However, there may be motors in storage. Also, a mine may have closed in the early 1980s and reopened recently, and may therefore contain such motors; or there may be older, disabled equipment abandoned in the mine. There is also evidence that PCB hydraulic fluid was used in mining equipment, although the amount and specific applications are not well documented.

Be aware that EPA has little information concerning the disposition of the PCB Transformers that were used in coal mines prior to the advent of dry-type mobile power centers. However,

there is reason to believe that some mine operators may have abandoned their PCB Transformers in the mine. Economics may have played a role in such abandonment due to the cost of mine labor. Like other equipment, the salvage value of PCB Transformers may have been less than the cost of removal. Also, after the enactment of TSCA and the PCB rules, PCB Transformers became increasingly less attractive on the transformer resale market. It is useful to inquire whether there are any liquid-filled transformers in the mine, even if the mine uses only the mobile power centers. It is possible that there are transformers stored or abandoned in nonproducing sections of the mine.

PCBs in Metal/Nonmetal Mines. Unlike coal mines, metal/nonmetal mines did not replace their PCB Transformers with mobile power centers. In 1981, the U.S. Bureau of Mines estimated that 1,300 PCB Transformers were in use in underground metal/nonmetal mines. This estimate was an extrapolation based on limited data. More recent data from the Centers for Disease Control (CDC), and from EPA's enforcement experience, suggests that this figure may have been low.

Metal/nonmetal mines will most likely have one or more shaft houses leading to different sections of the mine. If there is a shaft house or mine section that is not in operation, inquire about the location of electrical equipment there. Although it may not be possible to inspect the equipment, such information may be useful should an enforcement action be taken.

Ask the mine representative to show you the location of all liquid-filled capacitors and transformers. It is useful to examine the mine map before going underground, since the transformer locations may be indicated there. Transformers are typically located near the shaft entry at each level, or in a larger mine may be distributed throughout the mine section. Additional indication of transformer location can be determined by the size of the conductors. If you see large-gauge conductors leading somewhere, inquire about the equipment they serve and whether there are additional transformers there.

Additional Inspection Tips

It may be worthwhile to contact MSHA prior to inspection for information and planning purposes (you may also need to contact MSHA for specific certification and training, as described in the next section). For example, MSHA personnel can tell you how much time it may take to inspect a particular mine, what the shift schedules are, the general compliance policy of the owner/operator, and who you should expect at the entry conference. MSHA can also tell you whether the mine is in active operation or on standby and can supplement information provided in the PCB Checklist for many mines.

Most mines should have a mine map indicating the locations of electrical substations. It is helpful to review this map during the entry conference when planning your inspection underground.

Frequently, mines will keep scrap equipment in outdoor storage yards for spare parts. These areas may contain PCB Transformers, older mobile power centers with PCB Capacitors, electric motors, containers of PCB hydraulic fluid, and other equipment with PCBs. Inspecting this area before entering the mine can give you a sense of the equipment being used underground. Inspectors should also inquire about underground storage areas, particularly in large or old mines.

Training and Safety

Inspections at mines are essentially the same as inspections at any facility that uses or stores PCB electrical equipment. The main difference is the equipment and training needed to enter a mine. This section describes the equipment and training requirements.

General

MSHA accident data indicates that mining is one of the most hazardous industrial occupations in the United States. While mine safety is strictly regulated under Federal and State law, there are hazardous conditions in an operating mine that are not encountered in other facilities. Specialized training is needed for EPA inspectors. This section will identify the regulatory training requirements for mine entry, and where the inspector can obtain training.

Equipment

30 CFR Parts 48, 57, and 75 set forth a number of health and safety requirements for both coal and metal/nonmetal mines. This section describes the general requirements that apply to persons who enter a mine.

- **Breathing Devices**

  - Self-Contained Self-Rescuers (Coal)

    Under 30 CFR 75.1714, all persons who enter an underground coal mine must carry or have within easy reach a self-contained self-rescuer (SCSR). These units are carried on the belt and provide oxygen in the event of fire. The units produce oxygen via a chemical reaction; some units may have oxygen tanks. Oxygen production continues for at least one hour, providing the user more time to reach the surface through the designated escape passageways. Training in the use of this equipment can be provided by the mine operator, or by the local MSHA office.

- **Self-Rescuers (Metal/Nonmetal)**

  Under 30 CFR 57.15030, all persons who enter an underground metal/nonmetal mine must carry a self-rescuer (SR). Unlike SCSR's, these units merely convert carbon monoxide to carbon dioxide. They are smaller and easier to operate than SCSR's. However, they cannot be used in coal mines. The mine operator or the local MSHA office can provide training in the use of this equipment.

- **Steel-Reinforced Footwear**

  Persons entering a mine must, at a minimum, wear boots with steel-reinforced toes. In some States the law requires full reinforcement from the toe to the top of the instep.

  EPA inspectors normally carry steel-toe boots. The inspector may want to consider obtaining fully-reinforced boots, and if the mine is wet, to use boots made of a waterproof material.

- **Lamps**

  Miners carry battery-powered cap lamps that attach to the hardhat. Hardhats intended for mining use have a clip to which the lamp is attached. The battery is carried on a belt.

- **Tags**

  All persons entering an underground mine must leave their identification tag at the mine's main office. The tag is usually made of brass and is stamped with the person's name and social security number. Alternatively, the inspector can leave a slip of paper at the mine office with the same information. This records the inspector's entry into the mine in the event of a mine emergency.

- **Hardhats**

  Hardhats are required when on mine property. Hardhats intended for mining have a clip to which the cap light is attached. In some mines, a distinctively-colored hardhat is required for all visitors, as they are for all new miners, which the mine's management may want to provide for inspectors.

- **Eye Protection**

  All persons are required to wear safety glasses, goggles or face shields or other suitable protective devices when in or around are area of a mine where a hazard exists which could cause injury to unprotected eyes.

Training and Supplies

Under 30 CFR 48.31, mine operators must provide training for new miners in the following areas:

- Hazard recognition and avoidance
- Emergency and evacuation procedures
- Safe working procedures
- Self-rescuer and respiratory devices
- Such other instruction as determined by the MSHA District Manager.

This training is focused on personnel who will be working in the mine and thus exposed to hazards associated with mine production activities. **Other than training in the use of SCSRs or SRs, there are no similar training requirements for EPA inspectors or other temporary visitors in the mine.** An inspector can obtain this training at the mine just prior to an inspection. Mine opertors can often supply all necessary equipment except for boots. The principal safety precaution for all mine visitors is to accompany a mine representative at all times, however, the inspector may still be asked to sign a release absolving the company of any liability should the inspector be injured. In general, EPA's policy is that inspectors should not sign such releases. In addition, before an EPA inspector enters a mine, s/he should become familiar with mine operations and general safety procedures. The following sections describe the training resources available to the EPA inspector.

Mine Safety and Health Administration. MSHA District, Subdistrict, and Field Offices can be consulted for training prior to conducting an inspection.[1] MSHA can provide training in the use of SCSRs (coal) and SRs (metal/nonmetal), and the equipment should be available on loan.[2]

[1] The EPA Regional Office should have a copy of the MSHA Directory; alternatively, the MSHA Headquarters Office can provide the inspector with the local MSHA contact for training purposes. The inspector may contact the Coal Mine Safety and Health Division at (703)235-9423 and the Metal/Nonmetal Mine Safety and Health Division at (703)235-1565.

[2] A training video entitled "An Efficient Method for Donning the SR-100," a type of SCSR, has been distributed to the Regional Pesticides and Toxics Branches.

The inspector may also borrow hard hats, cap lamps, and utility belts, and obtain information on vendors that supply name tags. In addition, the MSHA local office may be able to provide mine-specific training in hazard recognition and avoidance, and the mine's emergency evacuation procedures.

MSHA also operates the National Mine Health and Safety Training Academy, which is an excellent training facility in Beckley, West Virginia. The facility offers a wide range of training courses. These courses are offered free or at low cost to government inspectors and the facility provides room and board. EPA inspectors should take "Introduction to Mining" offered by the Academy to become familiar with the various mining operations and general safety procedures. The Academy continually develops and modifies is safety training programs, and may suggest additional training courses depending on the timing and availability of the courses offered. The address and telephone number are as follows:

U.S. Department of Labor
Mine Safety and Health Administration
National Mine Health and Safety Academy
1301 Airport Road
Beaver, West Virginia 25813-9426

(304) 256-3257

U.S. Environmental Protection Agency. There are several EPA inspectors who have experience in underground mine inspection. In addition to the training available through MSHA, it may be possible for the experienced inspectors to train new inspectors in the field. Contact the Office of Enforcement and Compliance Assurance/Office of Compliance/Compliance Assessment and Media Programs Division/Compliance Monitoring and Water Programs Branch, for further information.