

## Chapter 22

# First-aid contests and safety

During its 54 years of operation, management at the aluminum plant in Columbia Falls boasted of its safety programs and accident-free days, but there was no escaping the inherent dangers of an aluminum smelter. Like any industrial manufacturing plant, workers had to deal with falls, electric shocks and fires. And like any metal producing plant, there were hazards of burns, explosions, asbestos and fumes. The carcinogenic threat was higher in aluminum smelters because of carbon burning – particularly with open-topped Soderberg-type anodes like those used in Columbia Falls reduction pots, where fumes from a burning mixture of petroleum coke and coal tar pitch were common in the potrooms. The presence of asbestos fibers from friable insulation used in the basements and blown around the potrooms by thermal currents or even outside wind compounded the threat of carcinogenic fumes. All employees – from the potman and the maintenance worker to the technician, the foreman and the office manager – needed to be educated in how to safely move around the plant and what types of personal protective equipment to wear. They needed to maintain a cautious awareness at all times – not hurrying, not cutting corners, not daydreaming and not acting out of emotion. There was no room for pranks or malicious behavior. But despite the company's best efforts to prevent incidents and protect the health of the workers, serious injuries and diseases occurred.

The Anaconda Company had been operating copper smelters since the late 19<sup>th</sup> century and was well aware of the dangers of hot metal, overhead cranes, loud noises, high voltage electrical equipment and poisonous fumes by the time it fired up its Anaconda Aluminum Co. smelter in the Flathead in 1955. But as late as 1970, the United Steelworkers of America Local 6002 announced its intent to investigate and request a detailed study of health conditions at the 400-acre Anaconda copper and zinc smelter and refinery in Great Falls and Black Eagle, where 2,000 employees worked around fumes. Union representatives claimed workers suffered from a high rate of respiratory diseases. In February 1970, the U.S. Public Health Service, in conjunction with the Montana health department, began a review of occupational health hazards at the smelter and refinery plants. After a tour of the facilities, the agencies said they were understaffed and couldn't analyze conditions or recommend solutions. In 1971, Anaconda Company personnel were questioned during a Montana Senate hearing on a proposed Occupational Health Act seeking to limit airborne concentrations in plants. At the hearing, J.P. Mooney, a Steelworkers representative in Great Falls, said conditions at the copper refineries in 1971 were the same as 30 years earlier. The U.S. Occupational

Safety and Health Administration sent inspectors to the Great Falls plants in 1976 and noted that the half-mask respirators used in the silver-slime treatment plant failed to meet OSHA requirements.<sup>1</sup>

By 1977, Anaconda had spent from \$75,000 to \$100,000 to correct the problems, but OSHA reported that overexposure to silver continued. Health problems at the smelting and refining plants reportedly had existed from the time they began operating. Dangers included gases, fumes and particulates from asbestos fibers, zinc, cadmium, lead, arsenic, copper and other chemicals. In 1950, eight workers were poisoned while working at the zinc plant, and two died after inhaling fumes. In March 1969, a drum operator in the zinc casting plant allegedly became seriously ill and was disabled. The man who took over the drum operation also became ill. In a September 2002 interview, Ed Hanson said he began working in the zinc plant in the 1930s and workers at the time wore masks. Hanson worked 41 years around the plant and called it a “good place to work.” Dan Spragg, however, who worked at the two Anaconda plants in Great Falls from 1965 through 1975, said in a September 2002 interview that he never saw any masks made available for workers. At 58, Spragg suffered from pulmonary fibrosis, walked with a cane and was on oxygen 24 hours a day. “The conditions were bad. Wages were good; benefits were tremendous. But there were terrible working conditions,” he said. Spragg admitted he smoked cigarettes but claimed his disease was caused by breathing dangerous fumes at the plants. He began working for Anaconda pouring zinc into molds and later moved to the wire mill, where copper bars were made into wire. Spragg filed a lawsuit against ARCO, Anaconda’s successor, in 1998. He said he was not warned by the company about the dangers from breathing fumes. Several employees deposed in Spragg’s lawsuit said they were told to wear “gauze masks” in dusty conditions, but after leaving the company they said they learned the gauze masks provided no protection from the chemical emissions. They also said the company had been advised by the government that gauze masks did not provide protection.<sup>2</sup>

Louie Voytoski, who worked as a bricklayer at the Great Falls smelter and refinery for 40 years, said in a September 2002 interview that conditions were fine and he was in good health at 81 years old. “There was pollution, but I don’t think it bothered me too much,” he said. “Old as I am now, I’ve outlived the national average. That smelter couldn’t have done me too much harm.” Della Hitchcock sued the company after her husband Kenneth died in 1996. He had worked in the leaching and casting area in Black Eagle between 1958 and 1972 and later developed pulmonary fibrosis. Hitchcock said in a September 2002 interview that she believed a number of former plant employees had medical problems caused by breathing fumes at the plant, “but I don’t think they have thought about it. I think the rest of them ought to come forward.” Regarding the Anaconda Company she said, “I’m really, really disappointed that they didn’t take care

of their men at all.” Holly Strong, a Great Falls physician specializing in pulmonary and lung disorders, said in a September 2002 interview that she had seen “several cases of pulmonary fibrosis in patients who worked at the smelter, as well as obstructive airways diseases, including emphysema, asthmatic bronchitis and lung cancer.” ARCO Spokesperson and Vice President Sandy Stash said in September 2002 that the company stood by its defense that the plants were safe but wouldn’t comment further. <sup>3</sup>

## **The government watchdogs**

The federal effort to regulate safety in metals processing facilities grew out of the mining industry. In 1891, Congress passed the first federal statute governing mine safety. In 1910, Congress established the Bureau of Mines to conduct research and reduce accidents in the coal mining industry, but the agency was given no inspection authority until 1941. The first federal statute directly regulating non-coal mines came with passage of the Federal Metal and Nonmetallic Mine Safety Act of 1966. The Act provided for the promulgation of standards, many of which were advisory, and for inspections and investigations, but its enforcement authority was minimal. <sup>4</sup> The U.S. Occupational Safety and Health Administration was established under the Occupational Safety and Health Act, which President Richard Nixon signed into law on Dec. 29, 1970. By law, employers were required to provide a workplace without serious hazards, and they were required to follow all OSHA safety and health standards. Employers were expected to find and correct safety and health problems. Employers were also required to make an effort to eliminate or reduce hazards by making feasible changes in working conditions rather than relying on personal protective equipment, such as masks, gloves, or earplugs. Enclosing processes to trap harmful fumes or using ventilation systems to provide clean air were two effective ways to eliminate or reduce risks. <sup>5</sup>

The Anaconda Aluminum Co. smelter near Columbia Falls came under scrutiny four years after the new federal law was enacted. Following OSHA inspections at the smelter from Jan. 21 to Feb. 27, 1975, the company was cited for numerous health hazards to plant workers. They included: 1) Workers were exposed to coal tar pitch volatiles in excess levels, including workers in the cathode reline area, ore truck drivers and members of the pot gas ventilation crew throughout the plant. Workers were not provided suitable respirators. 2) Workers in the pot gas ventilation crew were not provided annual comprehensive medical examinations after being exposed to airborne asbestos fibers. 3) Asbestos waste scrap and debris was not collected and disposed of in sealed impermeable containers in the crucible cleaning areas and on pot gas ventilation crew service carts. 4) Written procedures were not prepared explaining the safe use of respirators in dangerous atmospheres. 5) Workers in the casting house were not properly instructed and trained in the use of self-contained breathing apparatus (SCBA)

for emergency uses. 6) Workers were not given “termination of employment medical examinations” if they were exposed to asbestos fibers. 7) Ventilation crew workers were not given respirators or special clothing when working around asbestos insulation and coverings. 8) Workers who would be exposed to asbestos fibers were not given pre-placement medical examinations. 9) Management did not make a reasonable effort to deal with noise in the cathode reline area. 10) Protective face shields were not used by workers exposed to hot, liquid aluminum in the direct-chill casting pit in the casting house, and heat-resistant clothing was not used by an employee. 11) Inadequate protective clothing was used by maintenance workers in the carbon paste plant when cleaning baghouses used to control coke or coal dust. 12) Inadequate protective clothing was used by truckers throughout the plant. 13) Inadequate protective clothing was used by workers in the cathode reline area. 14) Written standard operating procedures for proper use of respirators were not established or distributed throughout the plant. 15) SCBA apparatus in the First Aid Room was not inspected monthly. 16) Eyewash stations were not available. 17) The overhead crane in the battery room was lifting loads beyond its capacity.<sup>6</sup>

In August 1975, OSHA representatives met for three days in Kalispell to hear discussion regarding a complaint by the Secretary of Labor that employees at the AAC plant were exposed to airborne pollution. The complaint alleged that the company allowed particularly high concentrations of coal and coke dust, asbestos fibers and coal tar pitch volatiles to result from normal operations at the Columbia Falls plant. The complaint also alleged that the airborne concentrations exceeded allowable levels, that comprehensive medical examinations were not provided to certain workers, and respiratory protective equipment was not adequate.<sup>7</sup> For the period between October 1977 and April 1979, the Anaconda Aluminum Co. and Plum Creek Timber Co. plants in Columbia Falls were cited for more safety violations and fines by OSHA than all other Montana businesses. During this time period, AAC received 103 citations and fines totaling \$7,640, while Plum Creek received 63 citations and fines totaling \$48,635. During the same time period, OSHA visited 257 of Montana’s 20,000 employers and issued citations and fines to more than 150 businesses totaling \$133,005. A spokesman for Plum Creek responded to the report by saying the company was contesting all the fines and had not paid any of them.<sup>8</sup>

### **Safety awareness programs**

The Anaconda Company had implemented a safety program at the Columbia Falls smelter from the very beginning. Oren Barnhart was the chief fire prevention officer at the plant, overseeing fire training, safety patrols and filling fire extinguishers for 29 years. In 1953, he left his construction job at the Hungry Horse Dam and went to work

building the aluminum smelter. "I was right there when they stuck the first shovel full of dirt," he said in a 2005 interview. "They were glad to see us come in for jobs." Barnhart said he had no bad memories of working at the plant. "It was just great," he said. "I really can't think of any worst parts. I just enjoyed working there." He praised the camaraderie between the workers.<sup>9</sup>

One way to promote safety at the plant was to make education and training fun. On May 17, 1958, twelve teams composed of AAC plant workers competed in the smelter's premier AAC First Aid Contest. A total of \$650 in prize money was offered, including \$150 for the first place team. Each team of six workers was tested for their skills in bandaging, artificial respiration, bleeding control and shock treatment. A federal Bureau of Mines official assisted the company with training. The Anaconda Company had sponsored similar contests in Great Falls and Butte.<sup>10</sup> Employees gathered on a large lawn in front of the plant to watch the teams compete. The Columbia Falls High School band provided music, and the company provided light refreshments.<sup>11</sup> The top prize of \$150 went to the electricians' team captained by Dave Sinclair. The second prize of \$100 went to the C-shift team captained by Lloyd Aldrich. Third place went to the watchmen's team captained by Lewis Weaver. The Joseph A. Holmes Award was presented to the Employees Safety Committee for the plant's outstanding safety achievement in 1957. The plant had accumulated more than 1,250,000 man-hours without a lost-time accident, a national record for aluminum plants. Chester H. Steele, vice-president in charge of western operations for the Anaconda Company, presented the National Safety Council Award of Merit to the plant manager, H.G. Satterthwaite.<sup>12</sup>

The second annual First Aid Contest was held in the Columbia Falls High School gymnasium on May 16, 1959. About 250 spectators watched as a dozen AAC teams competed to solve problems involving compound fractures, arterial bleeding, deep lacerations, fractured necks, physical shock and injuries from electrical shock. The winning team with a \$150 prize was the C-shift team of Lloyd Aldrich, captain, Earl McMaster, Jack McMaster, Bill Johnson, Ray Bartlett and W.A. Black. Second place went to a team from the laboratory, and third place went to a team representing maintenance mechanics.<sup>13</sup> The third annual First Aid Contest was held in the gymnasium at the newly constructed Columbia Falls High School on May 7, 1960, with nearly 300 spectators watching the ten 6-man teams compete. The winning team for the second consecutive year was the C-Shift team, which took home the \$150 prize. A close second was the Paint Dobbers team, which collected \$120.<sup>14</sup> Tested skills included artificial respiration, bandaging and treatment for shock.<sup>15</sup> In a separate program, AAC offered prizes for monthly safety suggestions. On May 2, 1960, two transistor radios and a clock radio were given away in the plant's monthly safety award program. The plant

operated the entire month of April without a single lost-time injury for a total of 59 days in a row.<sup>16</sup>

AAC management turned again to monetary incentives on July 1, 1980, when the plant began issuing S&H Green Stamps as part of an employee-safety incentive program. Individual employees without a doctor-treated job-related injury during a calendar month were given 600 stamps. Members of work groups with a similar combined record could receive another 600 stamps. Members of a department that met the record were eligible for another 300 stamps, including the field maintenance, casting, machine shop, service, reduction engineers or cell operations departments. Workers could receive another 300 stamps if the plant as a whole met the record. Foremen were eligible to receive 1,300 stamps if their crew met the record. The company pointed out that the program was successfully used at other Anaconda plants in the country, including a uranium mine near Shirley Basin, Wyo., which saved more than \$1 million by preventing accidents.<sup>17</sup> That same year, AAC safety officer Mike Schultz initiated a new safety awareness program in which he called employees' wives on the phone and asked them if they knew how many days the plant had operated without a lost-time accident. Wives who answered correctly were given 200 S&H Green Stamps. Three out of 14 wives had answered correctly so far.<sup>18</sup> By Dec. 2, 1982, every employee, whether hourly or salaried, could receive 10 books of S&H Green Stamps if 90 days passed without a lost-time accident, 15 books for 180 days, 20 books for 270 days and 25 books for 360 days. An employee would lose three books if the company was charged for a doctor case for that employee within the 90-day period.<sup>19</sup>

Plant management often boasted of its good safety records. In the 1990s, a dry-erase white board was sometimes mounted in the change house or along the smelting plant's center aisle posting the latest numbers, but the messaging began in the plant's earliest days. By April 24, 1956, the plant had completed 100 days of full production without a single accident. Officials explained that this was an outstanding record for a plant with 500 workers in its first year of operation. The plant's full-time safety engineer was Carmen D. Nutter.<sup>20</sup> By Dec. 6, 1957, the plant attained 168 accident-free days for a total of 600,000 man-hours without a lost-time accident. The plant also had a 0.51% absenteeism rate, which compared favorably with the 5.4% national average. The plant had the lowest absentee rate of all industrial operations in Montana and a low turnover rate as well.<sup>21</sup> On April 8, 1958, the plant set a safety record with 1,112,320 man-hours without a lost-time accident. The goal of 1 million man-hours for the 606 employees at the plant was set earlier in March 1958. No fatalities had occurred at the plant since it began operating on Aug. 15, 1955, and several departments had a perfect lost-time accident record since that time. The plant set a new goal of reaching 2 million man-hours without a lost-time accident.<sup>22</sup> By May 1958, the plant broke a national safety

record for the aluminum reduction industry with 1,196,536 man-hours without a lost-time accident. The previous record was held by the Reynolds plant at Longview, Wash. The AAC plant received the Joseph A. Holmes safety award and the National Safety Council's Award of Merit.<sup>23</sup> On June 19, 1958, the plant reached a safety goal by completing a whole year without a single lost-time accident. Satterthwaite set a new goal of 2 million man-hours without a lost-time accident.<sup>24</sup>

In May 1963, AAC received the Award of Merit, the second highest award given by the National Safety Council, in recognition of the plant's outstanding safety record in 1962. The record equaled the plant's previous best all-time record. The plant had received the Award of Merit in 1957 and 1958. Two minor lost-time accidents occurred in 1962, and the plant's accident rate of 1.8 per million man-hours was well below the national average for the aluminum reduction industry.<sup>25</sup> In 1965, the Anaconda Aluminum Co. employed 568 workers at the Columbia Falls smelter; 609 at Terre Haute, Ind.; 656 at the Amarlite plant in Atlanta, Ga.; 95 at Fair Lawn, N.J.; 243 at the container plant in Louisville, Ky.; 194 at the laminating plant in Louisville; and 288 at the rolling plant in Louisville. The Columbia Falls smelter was the third safest, with a lost-time accident frequency of 5.2, which compared well to 19.6 at the Amarlite plant and 14.6 at Fair Lawn. The Columbia Falls plant also scored well on lost-time accident severity with 47.0, the second lowest score, which compared well to 306.0 at the Louisville rolling mill. By far the safest plant was the Terre Haute plant.<sup>26</sup> In early 1966, Archibald Cochran, AAC's retired chairman of the board, sponsored a safety competition between the Columbia Falls, Terre Haute, Louisville and Fair Lawn plants. A large trophy cup would go to the plant with the lowest accident frequency rate for the year. After a year, a smaller trophy cup would be provided for permanent display at the winning plant and the full-size trophy would then be made available for the next year's winner.<sup>27</sup>

From May 1979 through June 1979, the Columbia Falls plant operated 47 days without a lost-time accident, the best safety record at the smelter since 1958.<sup>28</sup> On Jan. 23, 1981, a safety mark was reached at the plant when the employees completed more than 1 million man-hours without a lost-time accident. The last time this mark had been reached was in 1958. The company bought gifts for all 1,279 employees.<sup>29</sup> Between Aug. 27, 1980 and June 22, 1981, the plant set a world record with 1,967,023 man-hours without a lost-time accident. "When you take into consideration that the plant operated 24 hours a day, seven days a week, and there are dozens of different heavy-duty job classifications, then almost two million worker hours without a lost-time accident borders on the miraculous," Plant Manager Bob Sneddon said. "However, the company is acutely aware of the high caliber of the Columbia Falls work force and the achievement belongs to them and their dedication to safe working habits."<sup>30</sup> On Feb. 5, 1982, Montana Gov. Ted Schwinden met briefly with Aluminum Workers Trades Council

representatives at their union hall in Columbia Falls and presented a citation to the union and company officials in honor of achieving the safety record.<sup>31</sup> On Oct. 4, 1983, a safety streak of 236 days without a lost-time accident at the plant came to an end. The plant's safety director blamed the end of the streak on the number of returning laid-off workers or new hires as the plant restarted idled potlines. Eleven accidents occurred at the plant from Oct. 4, 1983 through Feb. 2, 1984.<sup>32</sup>

## **A snapshot view**

Safety Alert Bulletins downloaded from the Columbia Falls Aluminum Co.'s website on Oct. 7, 2016, provide a detailed look at the daily hazards that workers at the smelter faced from Feb. 10, 1997 through Aug. 27, 2007. This was an unusual time period and should be put into perspective. The smelter plant operated at full capacity with five potlines and 600 reduction pots in 1997 through 2000, and many efficiency and ergonomic changes and pollution control measures had been implemented by that time. On the other hand, plant morale was not strong as the salaried and hourly workers' profit-sharing lawsuits against the plant's owners were winding down toward a settlement on Dec. 19, 1997. The plant was acquired by Swiss-based Glencore AG on May 21, 1999, but operations continued as usual until the West Coast Energy Crisis forced curtailments at aluminum smelters across the Pacific Northwest in 2000. The plant completely shut down in early 2001 for the first time since the plant started operating in summer 1955. The plant's potlines were fired back up at different capacities from 2002 through fall 2009 when the plant finally shut down permanently. Conditions during the period from 2002 through 2009 created atypical hazards to the plant's workers – dangers posed by restarting reduction pots, a slim operating budget that affected both raw materials and maintenance, new hires who weren't familiar with the plant and its processes, and a new sow casting line. These factors may have exacerbated the dangers normally encountered by the smelter workers, but these safety bulletins reflect the daily hazards the workers faced once they clocked in and went to work.

Plant workers were required to wear personal protective equipment. The type of equipment varied with the location, and the type of equipment was modified over the years. On June 15, 2001, about six months after the plant laid off most of its workers and shut down the potlines for a year during the West Coast Energy Crisis, CFAC issued a bulletin reminding remaining workers about required personal protective equipment. "There have been numerous instances in the recent past where people have been observed without the proper PPE (personal protective equipment). All employees must wear protective clothing and equipment suitable for the job. Different jobs and areas of work require different levels of protective clothing/equipment to be used. Specific



requirements and/or exceptions can be found in the safety and health manual or by referring to the JSA for the work being done.” The bulletin reminded workers that 100% natural-fiber shirts, pants and outer layer of coats were required when entering all areas except the main offices, change house, engineering or purchasing offices. “Long sleeve shirts must be worn with the sleeves rolled down by anyone working in the potlines, casting, field maintenance, shops and utilities, garage, lab and paste plant. Hard-toed safety shoes must be worn by all employees in the pot lines, casting, north area or shops. Hard soled/tennis style shoes are allowed in walk paths only. Employees working in the office areas only do not need hard-toed shoes to walk through the previously stated areas if they are only walking through to get to or from offices and are not exposed to any hazards. Hard hats must be worn in all areas where there is a potential for injury to the head from falling, moving objects and/or where the potential of striking one’s head is present. These areas include but are not limited to the interior of all buildings east of the change house. Authorized eye-protection glasses with side shields or goggles must be worn in the following areas: potlines, casting, field maintenance, shops and utilities, garage, lab, and paste plant. Special equipment, such as spats, gloves, anti-shock gloves, face shields, hearing protection, aprons, mitts, respirators, etc. must be worn where required and are obtainable through the warehouse or your supervisor.”<sup>33</sup>

A change to the personal protective equipment had been issued three years earlier. On June 11, 1998, CFAC issued a bulletin advising workers that side shields on safety glasses were now required. “The CFAC medical department has already begun stocking up on the various sizes and types of side shields to accommodate employees’ needs,” the bulletin said. “These are at no cost to you. Please stop by at your earliest convenience and obtain a set. Should a type needed not be immediately available, they can order most types. We also have a ‘universal’ type that will fit the majority of eyeglasses if a specific type is unavailable.”<sup>34</sup> The rules changed during the West Coast Energy Crisis. On July 8, 2001, with all the potlines shut down for the rest of the year, CFAC issued a bulletin advising workers that long-sleeved shirts were no longer required. “Long sleeves continue to be required for welding and metal cutting or as specified,” the bulletin said. “It is understood that the specified sleeve requirement will be restored prior to a potline startup.”<sup>35</sup>

On April 22, 2002, with Potline 4 restarted, CFAC issued a bulletin warning about the use of improperly fitted respirators. “There are rumors of people wearing respirators that they have not been fit in. This is a violation of CFAC policy and OSHA standard 1910.134,” the bulletin said. “You must be fit-tested for the respirator you are actually wearing. Check with your foreman to see that you have the correct model and size of respirator. Other issues that must be addressed: 1) You must have had a fit test within

the last 12 months; 2) You must be clean-shaven while wearing your respirator; 3) You must perform a fit check each time you put your respirator on.” On March 9, 2007, CFAC issued a safety alert bulletin warning about the need for workers to dress appropriately and wear personal protective equipment. “An employee was burnt on the arm after metal got stuck behind his watch band,” the bulletin said. “Here are some of the preventive actions from this event: Wearing longer sleeves or coat that hang over the cuff of the hand will protect your arms. Wear knit cuff gloves. Jewelry is not recommended while working around molten metal and bath. An untucked shirt will allow molten bath or metal to roll off.” On July 22, 2004, CFAC issued a bulletin warning about wearing proper PPE when tapping. “When employees are exposed to possible metal or bath explosions, typically seen in tapping where the cruce is overfilled and under pressure,” the bulletin said. “Some of the most severe burns occur when metal or bath runs down the shirt sleeve and into the glove where it is trapped, causing burns to the hand and fingers. To prevent this type of injury, it is recommended that employees wear the CFAC potline work shirt with double sleeves and heavy gauge cotton work gloves with knit cuffs tucked up under the shirt sleeve. The gauntlet glove with wide cuff is not recommended for use where exposure to molten bath and metal is possible. Double thickness cotton gloves are available for purchase at Security.”<sup>36</sup>

The heat emitted from reduction pots or molten metal created a dangerous ambient environment, especially in summer time. On April 1, 1998, CFAC issued a bulletin advising workers that warmer weather was approaching and they needed to be prepared for the potential of heat stress. “The heat is upon us,” the bulletin said. “To ensure we do not suffer a heat stress illness, it is very important that we take frequent breaks, drink plenty of water or other approved supplements (one cup every 20 minutes) and monitor our bodies for early heat stress signs and symptoms.” The bulletin included numerous tips to prevent heat stress. On June 10, 2007, CFAC issued another safety alert bulletin warning about heat stress. “A pin puller recently experienced what appeared to be heat stress when he was pulling pins,” the bulletin said. “The air conditioner in the crane being used was not working properly, and the maintenance department was in the process of trying to fix it. The puller started feeling bad and thought he could finish up what he was doing before taking a break, and he ended up getting overheated. Don’t wait until you feel overheated or exhausted when working in high heat environments. There is a good chance that you are already in the early stages of heat stress. If the equipment you are using has an A/C that is not working, consider trying to get another piece of equipment that does or have the faulty A/C replaced or repaired. In the above case, transferring the crane was considered, and due to other circumstances was not done. Take frequent breaks away from the heat and keep yourself well hydrated.”<sup>37</sup>

Hazards posed by coal tar pitch fumes existed in the potlines around reduction pots and in the paste plant where carbon briquettes were manufactured. On Jan. 26, 2004, CFAC issued a bulletin warning about the need to wear a respirator when working in the paste plant. "Recently, a large amount of work has been done on the pitch system in the Paste Plant – pitch lines, pumps, etc.," the bulletin said. "Reminder: A half-face cartridge respirator must be worn when working around liquid pitch material. Pitch leaks, small spills or fumes in a building all require the use of a respirator. Always err to the conservative side and use a respirator when in doubt." On July 24, 2007, CFAC issued a safety bulletin about the hazards of "burning" by exposure to coal tar pitch fumes in the potlines. "A recent case of pitch burn to a pin puller brought to light that all employees may not be aware of the hazards associated with the coal tar pitch that is used as the 'binder' in the anode material," the bulletin said. "Coal tar pitch is a by-product of the steel industry and contains a high volume of volatile hydrocarbons. Coal tar pitch fume and particulate can cause the skin to be highly sensitive to sunlight; feels much like a sunburn. Coal tar pitch fume and particulate is present in emissions above the anode and also is present in pot gases when pots are open." The bulletin advised workers to use barrier cream on their faces and to wear gloves, wash hands and launder clothing.<sup>38</sup> A barrier creams commonly used by workers was Noxzema.

## **Potroom hazards**

Potmen and others were periodically reminded of the dangers of working around reduction pots. On Feb. 13, 1998, CFAC issued a bulletin warning workers of potential hazards posed by point-feeders operating at the same time that compressed air from the anode-effect suppression system was activated. Point-feeders were a new technology installed on some reduction pots as a way to control how alumina was fed to the molten bath. A pneumatic arm drove a steel pin through the pot crust and then allowed a measured amount of alumina to enter the open hole. Anode effects were common to all types of aluminum reduction pots and occurred when gas built up between the anode and the bath, partially blocking the flow of electrical current and causing the voltage and heat of the reduction cell to climb to dangerous levels. CFAC's pots were equipped with an anode-effect suppression system that was automatically triggered by high voltage. "On Feb. 10, 1998, the point feed system at Pot 152 in the north half of Room 1 broke the crust," the bulletin said. "Shortly thereafter, the anode effect suppression (AES) system began to operate, spewing molten bath out of the pot which landed on a vehicle parked approximately four feet from the pot. A small fire ensued. Fortunately, no one was injured." Employees who needed to work on pots with point feeders were advised to deactivate the automatic anode effect suppression system while doing their work. "Engineering and Process Control will pursue methods to rectify this unsafe condition," the bulletin said.<sup>39</sup>

On March 29, 2000, CFAC issued a bulletin warning about asbestos components found on the anodes of reduction pots. "We have discovered asbestos containing material located on each pot's anode crossbeam and near the main jack," the bulletin said. "Be cautious not to disturb this material. Notify your foreman or superintendent if anode work needs to be done that has the potential to disturb this asbestos." On Oct. 6, 2000, CFAC warned about traffic hazards in the potlines when the skirt crews were working. The cast-iron skirts circled the base of the anodes and helped to prevent pot gases, particulates or hot material from leaving the pots. The skirts periodically needed replacing as they burned up under the extreme heat. "Cones are now being used by the skirt-changing crews to warn traffic of this hazardous area," the bulletin said. "It is difficult for the Skidsteer operators to see behind them while working on the pots, and many vehicles are driving behind them thinking they can pass safely." <sup>40</sup>

On Aug. 9, 2002, CFAC warned workers about using the incorrect tool to break a pot crust, which could result in a back injury. "We recently had an employee get injured while trying to break a hole in a pot," the bulletin said. "The employee was not using the proper tool for the job. An old air lance was being used, and to get enough leverage he was working with his hands above his head, which placed him in a bad ergonomic position for the task. The proper tool for breaking holes in a pot is the Case Skidsteer and should be used whenever possible if it is available. If the Case is not available and a hole must be opened in a pot, we should use the ACBs (automatic crustbreakers) and then ensure that we use the proper hand tool (a bar) and focus on a good ergonomic position. If the tool is too long or too short, it may place your body in a bad ergonomic position, increasing your chance for injury." <sup>41</sup>

On Nov. 1, 2002, CFAC issued a bulletin warning about placing objects on the crust of reduction pots. Potline 4 had been recently restarted and some of the CFAC workers were new hires. "Last night shortly after shift change, we found an empty aerosol can someone had thrown on the pot crust on the back side of Pot 506," the bulletin said. "We cannot stress enough, just how dangerous this could be to some unsuspecting person who might be sealing this pot about the time the can explodes. We in the potlines take this kind of unsafe behavior very seriously. Anyone caught putting any foreign objects onto a pot crust that has an explosion potential, like aerosol cans, pop cans or bottles, may be subject to immediate discharge." On Jan. 26, 2005, CFAC issued another bulletin warning about throwing objects onto the crusts, where they would eventually come into contact with molten bath when the crust was broken. "This week we found a pop can laying in the ore under the ACB breakers. This is a direct violation of the Plant Safety and Health Manual under Special Rules by Department Production Areas Section 7. Don't put others at risk. Do not toss trash onto pots." <sup>42</sup>

Potmen spent the most time around reduction pots and needed to maintain a constant state of cautious alertness. Maintenance employees who only occasionally worked on reduction pots needed to be reminded about their hazards. On Dec. 6, 2003, CFAC issued a bulletin warning workers about walking around reduction pots. "Do not walk on end plates that have heat hoods on them," the bulletin said. "If you were to step wrong on the rubber apron, it could pull you into the cathode." On July 28, 2004, CFAC warned workers about being near a reduction pot when the automatic crustbreakers were operating. "On Thursday, July 22, 2004, a potline unit member was sitting on his cart by Pot 911 waiting for the schedule to break on the front side," the bulletin said. "When the ACB broke through the pot crust, it sent up a plume of fine ore dust. This, coupled with wind blowing in through the truck door behind the pot, caused the employee to become engulfed in a cloud of ore dust. The employee ended with a lot of ore dust in his left eye, which caused considerable irritation. The employee continued to seal his schedule, and as he was doing this he also starting rubbing his eye. The result was a severe abrasion to his left cornea." The bulletin also noted that, "Side shields are mandatory here at CFAC. They have significantly reduced eye injuries caused from foreign bodies since they have become required PPE. So please make sure you are wearing yours." On March 19, 2007, CFAC again reminded workers about the hazards posed by the crusts that formed around the edge of reduction pots. "Two instances have been reported of employees 'standing on the crust of pots,'" the bulletin said. "At no time should anyone stand on the crust of a cell. The crust is extremely unstable. When the crust collapses, the foot (or more) will enter the molten bath causing severe burns at a minimum. An injury of this type will be life altering and possibly life threatening."<sup>43</sup>

Potmen were tasked with putting out periodic anode effects, and they were provided with an air lance and lodgepole pine poles to handle the job. A hole was made in the crust, and either an air lance was thrust through the hole so air could be injected into the pot to extinguish the anode effect, or a wooden pole was thrust through the hole to extinguish the anode effect. On April 11, 2006, a bulletin was issued warning about the proper care and use of blowdown equipment used to extinguish the anode effects. "During a routine safety inspection on Feb. 16, 2006, a blowdown pipe was found that did not have the air release holes (to prevent blowback) at the end of the pipe," the bulletin said. "Holes were subsequently drilled to remedy the situation. On another routine inspection conducted on April 10, the same blowdown pipe was found to have had the holes covered by duct tape. This is a very serious safety violation. Deliberately disabling this pressure release mechanism could lead to blowback of material that has the potential for injury. It could also be considered a willful violation according to OSHA regulations."<sup>44</sup>

On Feb. 2, 2007, a bulletin warned about hazards posed when putting a lodgepole pine pole into a reduction pot to quench an anode effect. "On Friday, Feb. 2, an employee suffered a minor burn as he was putting out an anode effect," the bulletin said. "As he was inserting a pine pole, some bath blew back at him and hit his face shield. A piece of the bath went down his shirt, and he got a small burn on his left abdomen where the bath came to rest. During the investigation, some discussion took place about ways to minimize the chance of this occurring: 1. Ensure the air lance or pine pole is dry before inserting it into the molten bath; 2. Stay out of the line of fire – stand to the side and insert the pole or lance into the pot at an angle and not perpendicular to the ore rail as shown." On March 3, 2007, CFAC issued a bulletin warning about the proper use of an air lance to quench anode effects. "An employee received a minor burn to his nose recently while banging an air lance on the floor to clean the bath off of it and straighten it," the bulletin said. "A hot piece of bath rebounded from the floor, got under the face shield, and came to rest on his nose and respirator." <sup>45</sup>

Water contacting molten bath or metal was an explosive hazard – the rapid expansion of the water into steam could carry molten material in all directions. On March 28, 2002, CFAC issued a bulletin warning about the use of wet or cold tools around hot metal or bath, citing an incident on March 20, 2002. "A serious incident occurred when a technician placed a cold (possibly damp) tool in Pot 716," the bulletin said. "The bath spray caused 2nd and 3rd degree burns to the hands, face and neck." The bulletin advised workers to treat all tools as cold and to pre-warm them before use. It also advised workers to keep snow out of the potlines because snow could cause explosions and also conducted electricity, and to avoid standing near someone who was working the crust of a pot. On Aug. 17, 2006, CFAC issued another warning about wet equipment being used around the reduction pots. "On Aug. 17, 2006, a tapping crew found water dripping out of the tapping cruce air fittings just prior to tapping metal. The investigation found that the tapping hose had been left outside in the courtyard where rain water made its way into the hose. Action Items: 1. Don't store any tools or equipment that may come in contact with molten bath or metal outside; 2. Look around to see what is being stored outside your areas; 3. Store tools and equipment not being used in the proper location; 4. JSAs and work practices will be updated; 5. Any tools or equipment that has been left outside for any reason must be treated as being wet. As we're all aware, moisture getting trapped inside molten metal and/or bath can cause a serious explosion. It was very fortunate that this was discovered by the tapper prior to tapping." <sup>46</sup>

On May 17, 2007, CFAC issued another safety alert bulletin warning about wet materials. "On Thursday, May 17, an employee was using a Case to break a hole when molten bath blew back at him," the bulletin said. "Upon investigation of the incident, it

was uncovered that some wet material had been placed on the pot prior to the event. The wet material had been placed in the bath bin at the south end of Room 8 when cleanup was occurring behind the pin room. Then the material was placed on the pot by the operator. Luckily, since the employee was in a Skidsteer, he did not get burned. The incident does raise the need for everyone to understand the extreme danger created by wet material going into the molten bath. Wet material, whether it is ore, bath, pot bottom, metal, or whatever has no place in the potlines. Never haul wet material into any of the bins or other storage areas for these materials. Remember: Molten bath/metal and any kind of moisture do not mix. This can cause severe explosions which can lead to serious injury or worse.”<sup>47</sup>

## **Vehicle traffic problems**

Many accidents at the CFAC plant were traffic incidents caused by vehicles in need of repair or by bad drivers. But sometimes plant equipment posed the dangers to vehicles and their drivers. On April 1, 2000, CFAC warned workers about the hazards posed by overhead doors. “We recently had a close call where an overhead door fell because of a mechanical failure, narrowly missing a vehicle and operator passing through it,” the bulletin said. “When using these doorways you should never pass under the door when it is still moving. Be safe by taking the time to make sure it had come to a stop before going through.” On Aug. 16, 2000, CFAC issued a bulletin reminding workers about the need to operate vehicles safely. “On July 24, 2000, an employee was walking down the center aisle and was narrowly missed by a Kalamazoo,” the bulletin said. “The employee stated that he had to leap out of the way to avoid being hit by the Kalamazoo. Fortunately, no one was injured. Traffic control in our plant is necessary to avoid injury and property damage. Everyone, from the vehicle operator to the pedestrian, should take a defensive approach while in route to your chosen destination.”<sup>48</sup>

On March 9, 2005, CFAC issued a bulleting warning about vehicle traffic in the center aisle near the casting department. “On Saturday, March 5, we started charging furnace three with basement scrap. We are hoping to have it all processed through furnace three in the next 3-4 weeks,” the bulletin said. “This process includes loading and pushing scrap into mix furnace three, right at the center aisle. On most days, we will be doing this for a few hours in the morning and a few hours in the afternoon. We use one of the big Hysters to haul the scrap to the furnace and push it in. During those times, we block the center aisle with the Hyster, as it is driving north and south across the center aisle. This can create a safety risk for any vehicle that attempts to drive through casting during this process. Vehicles trying to ‘gun’ around the end of the Hyster are putting themselves and the Hyster operator at risk for injury. We would like to be proactive about this now before something happens.”<sup>49</sup>

On Aug. 26, 2002, CFAC warned about unsafe vehicle operation, especially by new workers who were hired when the plant started back up again. "There have been several vehicle accidents and/or near misses in the last couple of months," the bulletin said. "This is a critical safety issue and growing trend that must be addressed before someone gets killed. We have several crews operating on day shift only that have not in the past. This change has caused some added traffic to Potlines and Casting center aisle. We also have more personnel operating vehicles that have not been an operator in the past." A different kind of vehicle hazard existed outside the smelter building. On May 17, 2005, CFAC issued a safety alert bulletin about the dangers posed by railroad cars. "Long strings of railcars are now arriving at the plant with greater frequency than in recent months," the bulletin said. "This has raised concern for the potential of employees attempting to cross between the couplers or underneath the cars. Persons may never cross between or underneath railcars. The entire string of cars can roll at any time, making the risk involved with such an action too great to chance. Incidents involving railcars often result in severe or fatal injuries. Be safe. Cross between cars only at designated rail crossings. Be sure that the cars are uncoupled at the crossing. No warning lights or sounds are present. Crossing may be done safely."<sup>50</sup>

On Dec. 30, 2002, CFAC reminded workers about the need to check out vehicles before using them. "A recent event resulted in minor damage to a Kalamazoo when an operator used undue haste and did not conduct a pre-operation inspection before using a Hyster," the bulletin said. "All employees must do a pre-operation vehicle inspection before operating any vehicle. Make sure to document the inspection findings on the vehicle daily inspection report and let your foreman know of any problems. Follow up with your foreman if a vehicle is not getting the repairs it needs. Don't operate an unsafe vehicle. Don't assume that just because the vehicle came out of the garage that it is safe to operate. The employee operating the vehicle takes full responsibility for the safety of the vehicle." This warning applied to equipment other than wheeled vehicles – including pin cranes. On July 18, 2000, CFAC warned workers not to operate equipment that was out of use for maintenance reasons. "On July 17, 2000, a pin crane had the 'Caution - Do Not Operate' sign removed, and an employee started using the crane," the bulletin said. "This is a serious violation of company policy. You should never operate a crane with the 'Do Not Operate' signs in place no matter what the circumstance is. These signs are put there to protect the maintenance personnel that are servicing the cranes."<sup>51</sup>

## **Pot tapping operations**

One of the most dangerous jobs at the smelter was tapping. A specialized airtight crucible was used to draw molten aluminum out of reduction pots. The tapping truck



lowered the crucible over a pot's crust so that a pipe extending from the crucible entered the molten aluminum. High pressure air running through a fitting in the cap of the crucible established a venturi effect that created a vacuum in the crucible. Molten aluminum was sucked up the pipe and into the crucible. The tapper could look through an eyepiece to see if the crucible was full. The molten metal was then poured from the tapping crucible into a hot metal crucible for transport to the casting department. On Feb. 10, 1997, CFAC issued a bulletin about an unusual incident involving a tapping crucible. "On Feb. 9, 1998, while tapping in Room 6, a flame shot out of the eyepiece of the tapping crucible," the bulletin said. "Upon investigation, a reddish-brown paste and black liquid material was found in the aspirator. We have identified four other aspirators with the same type of material. An active investigation is currently being conducted. Air sampling results for oil and water mist indicate that the source for the accumulation of the material is not the plant air system. Until a solution to this issue has been identified, tappers must remain very cautious while performing tapping operations."<sup>52</sup>

Potmen and maintenance workers were told to maintain a safe distance from pots that were being tapped. On March 31, 1998, CFAC advised workers to stay at least one pot distance away from tapping operations. "Recently, the safety department has received several complaints regarding employees working in close proximity to tapping operations," the bulletin said. "The purpose of this alert is to remind employees that the safety manual requires all employees not involved with tapping or pin pulling operations to stay at least one pot away. In addition, when you are required to work in the same room as that of the tapper, make every attempt to work behind, rather than in front, of the tapping operation to avoid exposure to the hot metal hauling traffic areas. For your own protection, adherence to this policy must be followed." On March 18, 2002, CFAC issued a bulletin warning about blowbacks during tapping, citing an incident on March 14. "A serious incident occurred when a tapper began to remove metal from Pot 334," the bulletin said. "The crucible had been used five hours earlier to tap metal from 332, rattled at the start of the shift and preheated over the flame bake on 335. After a few seconds of suction, the tapping board blew back, causing severe burns to the tapper." Tapping crew workers were advised to treat all tapping crucibles as cold at the start of a shift, which could cause moisture to accumulate in the crucible.<sup>53</sup>

Tapping equipment was periodically repaired or replaced as hot bath or metal wore down the components. This included the crucibles themselves, which were completely rebuilt at the plant's fabrication shop. On Aug. 20, 2002, CFAC issued a bulletin warning about the dangers of using a "green" crucible that had recently been rebuilt. "A green transfer cruce was recently taken from the fabrication shop and put into the transfer cruce storage area in the south of Room 7," the bulletin said. "A green cruce is one that has just been bricked or poured with castable and has not been baked in an oven to

remove the moisture. This is an extremely dangerous situation due to the content of moisture in green castable. If molten aluminum were to be poured into a green cruce, the metal would cover the moisture in the bottom of the cruce preventing the steam from escaping. The pressure would quickly build and rapid expansion of steam could cause an explosion that would throw the molten aluminum into the air.”<sup>54</sup>

Workers needed to know about the status of all new or repaired equipment – including vehicles. On Jan. 10, 2003, CFAC issued a bulletin warning about an improperly operating tapping truck. “During the course of a meeting this morning, it was mentioned that 503 tapping truck has problems with downward movement in the hoist,” the bulletin said. “When pushed ‘full down,’ the downward movement abruptly halts and must be reset. The garage was aware of the problem and is working hard to find a solution. The problem stems from attempting to make the truck safer. If a hydraulic line fails on the new tapping trucks, the crucible will slowly move to the ground (same speed as if the lever is full down). Implementing the correct ‘velocity fuse’ will cause the crucible to stop moving down if a line fails. This eliminates the risk of tipping the cruce or truck.” The bulletin noted that the improperly operating truck would continue to be used. “Because of a few problems with tapping trucks in general, 503 is in service today. Assuming everything goes according to plan, the Garage will attempt to try another solution on Monday, Jan. 13, 2002,” the bulletin said. Until cleared by the garage foreman, “503 truck is to only be used to tap metal. The high potential exists for sucking air into the cruce when the downward movement stalls. This is extremely dangerous when tapping bath. The board can blow off and bath to blow out from the spout.”<sup>55</sup>

Molten bath or metal was hauled around the plant in transfer crucibles by a vehicle commonly called the “hot metal truck.” The dangers posed by the hot metal truck ranged from splashing molten material to vehicle crashes. On Feb. 13, 2003, CFAC issued a bulletin warning about near misses between the hot metal truck and other vehicles. “There have been some close calls as a result of the hot metal trucks passing each other at the entrance to the East Ore Silo,” the bulletin said. “Ore trucks entering here have to stick the front of the ore truck out about six feet into the aisle to check for traffic. The mirrors do not help this problem much.” On Oct. 8, 2004, CFAC reminded workers to following guidelines when filling a crucible with molten bath. “Recently an employee was burned as a result of overfilling a bath cruce,” the bulletin said. “Taking the time to follow established guide lines for this job may have prevented this event. Review JSA on bath/metal tapping with employee affected. Metal tapping boards are mandatory for tapping. Wearing the proper PPE helped reduce the injury burn. Wrap/extinguisher gel blankets are located in Casting and Line 5 office. Safety is everyone’s responsibility. Make sure that any safety item is reported and is put on your departmental safety fix it list.”<sup>56</sup>

In a May 28, 2007 safety bulletin, CFAC warned about mechanical failures to hot metal trucks. "The forks on hot metal trucks can break and spill metal on floors," the bulletin said. "Truck operators will check the forks and straps daily. The Garage will check forks weekly. Maintenance will check on how forks are being repaired. Keep a safe distance way from hot metal trucks. Don't park near the center aisle around hot metal traffic. Hot metal truck drivers need to follow fleet safety rules. Hot metal truck speeds must be reduced when driving near pedestrians or other vehicles." On Aug. 27, 2007, CFAC used colorful language to emphasize the hazards posed by hot metal trucks transporting crucibles of molten aluminum from the potlines to casting. "In this corner, coming in at 1,600 degrees and weighing around 3,500 pounds, we have a cruce of molten metal. And in this corner, at a cool 98.6 degrees and weighing in between 200 and 1,000 pounds, we have some people standing in or near center aisle. Don't go rounds with the hot metal. The metal will win every time. Don't be KO'd," the bulletin said. "The exposure to the hazards associated with the transport of molten metal cannot be minimized. Around 600,000 pounds of metal goes from the potlines to casting every day, and all of it goes through some portion of the center aisle. There have been cases of metal spills occurring during the trip to casting."<sup>57</sup>

The molten aluminum from the 600 reduction pots at CFAC was transported by the hot metal trucks to the casting department where it was stored in molten form in holding furnaces and then poured into the direct-chill molds to create large sheet ingots or T-bars. The casting department employees, who worked in a large pit below the casting furnaces, were required to wear special personal protective equipment to protect them from molten materials. On July 23, 1998, CFAC warned about excessive bath in the molten metal causing hazards in the casting building. "Excessive bath in the casting furnaces may create safety risks for casting personnel. In fact, since Jan. 1, 1997, three D.C. helpers have received burns to their face or neck while removing bath out of plugged furnace holes," the bulletin said. "Preventing burns to casting personnel is a team effort. Tappers and firemen are encouraged to work diligently to reduce the amount of bath in the furnace that can plug the furnace hole. Tappers must skim the bath out of cruces. Firemen must rake the bath before it has the ability to plug the hole." On July 18, 2002, CFAC warned about the hazards to visitors touring the casting building while it was operating. "Tours and visitors to Casting risk being struck with molten metal at the beginning and ending of drops," the bulletin said. "Tours and visitors should stay well back from pouring pits when the pouring crew has their face shields in the down position."<sup>58</sup>

In the plant's final years of operation, CFAC started casting aluminum sows rather than sheet ingot or T-bar. On June 3, 2005, CFAC warned about the hazards posed in the casting area during this new process. "On Thursday, June 3, we experienced a small

'pop' when pouring into the sows on the north side of casting. Two out of the three sows we poured into did this," the bulletin said. "On Friday, June 4, it happened again to three out of the six sows poured into, only this time with a significant explosion, throwing molten metal 25 feet in every direction. The casting employee working in that area happened to be far enough that he did not get burned, but witnessed it happen." CFAC management investigated the matter and came up with a probable cause. "We are no longer using the torches to pre-heat the sow molds. We have converted to using peanut oil to flash heat the sow when the molten metal is poured in. During this last week of high humidity, 90-100%, we believe the cast iron sows have absorbed moisture into them, causing the explosions." <sup>59</sup>

## **Electrical shock hazards**

Electrical shock hazards existed at the smelter plant in numerous ways, ranging from high voltage equipment in the switchyard to the 600 volt DC power in the basement potline busses to the 480 volt three-phase motors and contactors. The steel frames of the reduction pots themselves were charged, but workers could touch them and make repairs so long as they didn't also touch ground – which included the steel frame of the potroom buildings about 20 feet away. Power to run the pots ran from the rectifier building to the potrooms in large aluminum buss bars which connected 120 pots together in a series circuit for each potline. The power was brought up from the basement through aluminum "flexes" that allowed the anodes to be moved up and down. On July 31, 1997, CFAC issued a bulletin warning workers about the potential for electrical shock when working around reduction pots. "On July 31, 1997, a reline employee received an electrical shock while cleaning a flex on a pot," the bulletin said. "Fortunately, no injury to the employee occurred." The bulletin suggested finding a way to insulate the man lifts used for such work, but it noted that the cause was likely wet gloves. A typical man lift used a steel platform that was raised and lowered by a standard forklift. A set of controls for raising and lowering were attached to the platform. <sup>60</sup>

On Nov. 13, 1998, CFAC warned about the hazards of contacting a reduction pot and the frame of the building at the same time. "On Nov. 8, 1998, a briquette truck operator received an electrical shock while unplugging a briquette truck spinner," the bulletin said. "The employee had completed the task and placed the bar onto the back-wall and simultaneously contacted the briquette truck hand rail and experienced an electrical shock. The operator noticed sparks from his gloves, his knees buckled and his body was thrown back approximately four feet. Fortunately, the event did not result in more serious injury." A safety investigation followed. "The employee stated that he had been trained regarding the back-wall electrical hazard and that the root cause of this event

was personal error,” the bulletin said. “The employee did not notice that the truck was in contact with the pot and made contact between the back wall and the truck. Wet gloves from handling briquettes may have contributed to this event.” As the potlines were fired back up following the West Coast Energy Crisis, workers were reminded of electrical shock dangers. On March 13, 2002, CFAC warned that “with the energizing of pots in Line 4, the potential of shorting out will now again exist,” the bulletin said. “As this hazard may exist in both rooms, we should remember to not contact any pot and back wall at the same time. This same principal should be followed for the flue system, metal grating, and all metal to metal. Act as if both rooms are energized. The use of grounded power tools, etc. is prohibited. DC shock will again be in place. All workers in basement R-7 and R-8 will be required to wear rubber gloves unless there is a written exception for that job task.”<sup>61</sup>

Despite the warnings, back-wall incidents continued. On Oct. 18, 2004, CFAC again issued a safety alert bulletin warning about electrical hazards around reduction pots. “Just about everyone who has worked in the potlines has had an episode with shorting out with one or another of the many combinations of possible shorts that exists in our plant,” the bulletin said. “The most recent incident involved the slab truck and a pot panel door. On Tuesday, Oct. 12, 2004, while pulling a slab, the truck came in contact with a pot panel door that apparently had not been securely latched. The short was quite severe in that the panel door welded itself to the panel box and slab truck. Other recent events include unplugging a briquette truck with a steel bar and a pot raking tool, both coming in contact with the back wall. We must constantly remind ourselves of the potential for shorting out. Make sure pot panel doors are securely shut and pot room tools are safely stored, etc.”<sup>62</sup>

For electricians, millwrights and ironworkers, an organized system was established to ensure that equipment was properly disconnected from power before repairs began. The electrical lockout-tag out procedure would begin with an electrician familiar with the equipment disconnecting it from power and then placing a personal lock on the disconnect switch or breaker to keep it from being reconnected. A gang lock system allowed many more workers to place their personal locks on the disconnect mechanism so that the equipment could not be re-connected until all locks had been removed. On Oct. 8, 2004, CFAC a case where the wrong disconnect mechanism was locked out. “On July 4, 2004, it was discovered that mixer No. 3 oil cooling system was electrically locked out instead of mixer No. 5 oil cooling system resulting in a shock hazard and potential electrocution injury,” the bulletin said. “Assure that the correct equipment is identified on the lockout clearance (electrical or mechanical) prior to tagging. The qualified individual issued the clearance must assure that the potential energy hazard is removed from equipment. Review often the lockout-tag out procedure at CFAC.”<sup>63</sup>

## **Cranes and overhead loads**

Overhead cranes lifting extremely heavy loads were common to the smelter plant. Each potroom had rails that ran the length of the 1,080-foot long buildings to allow passage of bridge cranes and pin cranes. To get a crane from one potroom to another, the crane would run to the north end of any of the 10 potrooms and roll onto the transfer car in the North Crane Bay area. The transfer car would then roll along east to west on tracks at ground level until it lined up with another potroom's north end. The bridge crane or pin crane then would roll off the transfer car into a different potroom. On Jan. 21, 1999, CFAC issued a bulletin warning workers about driving vehicles underneath the transfer car while it was carrying 50-ton cranes in the North Crane Bay area. "It has been determined that being within the perimeter of the four legs of the transfer car while the 50-ton cranes are carrying a load is a very serious at-risk practice. This includes all pedestrians and vehicles," the bulletin said. "Starting immediately, no one shall pass within the area of the four truck legs of the transfer car while the cranes are carrying a load. You must either wait for the transfer car to pass or detour around. The only exceptions to this will be the crane operators, the transfer car operator and the riggers." The North Crane Bay was also where spent cathodes were turned upside down and emptied before being taken to Shed 11 to be rebuilt. On June 15, 2007, CFAC warned workers to stay away from the area when cathodes were dumped. "Tape and/or chain and signs are placed around the work area to warn away all traffic," the bulletin said. "Do not drive or walk through this area while barricades are in place. If going outside north of Rooms 8 and 9, use eye contact with driver of the large Taylor (Big Red) forklift. Visibility behind this vehicle is very limited."<sup>64</sup>

Staying clear of heavy crane loads was a general policy for most industrial plants. At CFAC, the 50-ton cranes were equipped with radio controls so the operator could stand way back when two 50-ton cranes were used together to remove a hot anode or cathode for replacement. But if the radio controller wasn't functioning, the operator needed to rely on the pendant control. On Aug. 24, 2006, CFAC issued a safety alert bulletin warning reminding workers about the dangers posed by cranes with overhead loads. "Recently we've had a couple of near misses that involved work being done overhead and working under suspended loads," the bulletin said. "It has made us aware of the potential for serious injury. In these cases, people have been observed working and/or passing underneath others who are working overhead, while others have passed too close or directly underneath a suspended load. Please stay clear of overhead work and be aware of overhead hazards. Those performing work overhead should carefully barricade the immediate area to keep others clear of the work being performed. Remember that operating a pendant-controlled crane or hoist can place you in a

position that is too close to an overhead load. Use extreme caution during this type of operation and consider relocating the controls as an option.”<sup>65</sup>

On May 25, 2007, CFAC issued a safety alert bulletin reminding workers about the hazards of pin crane operations. “Several close call incidents involving pin cranes have occurred over the last few weeks,” the bulletin said. “This alert is intended to inform all employees of these hazards and the need to keep away from the pin cranes as much as possible.” The bulletin noted that pin crane operators had limited visibility in all directions from inside the cab and the cranes operated back and forth over a five-pot distance on a regular basis. “The ‘two pot rule’ is in the process of being revised and will be communicated when completed,” the bulletin said. Workers also were warned about overhead hazards. “There have been cases where a pin head or the jaws of the crane have malfunctioned and a pin or rack of pins can drop,” the bulletin said. “Never approach a crane when a pin is being transferred from the anode to crane or vice versa. Never approach a crane when a rack of pins is being transferred from the stool to crane or vice versa. Several years ago, the pin hole paste dispenser fell from one of the cranes. Because of the strong magnetic fields and the surrounding environment, when things do fall from the crane they can end up landing quite far from the point of release. Stay at least two pots distance away from an operating pin crane.” The bulletin also warned about burning hazards posed by pulling steel pins from the Soderberg-type anodes. “When pins are pulled, unbaked anode paste can leak into the molten bath causing a ‘pin leak’ or ‘pin blow,’ which can spew hot pitch and bath back up through the hole and over a wide area around the hole,” the bulletin said. “When pins are being set, a ‘push through’ can occur which may cause hot gas and smoke to be blown out the burners or under the skirts. Never perform work on any pot that is in the process of pin pulling or setting. Wait until the pins are set and the crane is out of the area.”<sup>66</sup>

## **Beneath the pots**

One of the most dangerous places at the CFAC smelter was the potline basements, where workers faced the danger of molten bath or metal overflowing from a reduction pot or electrical hazards posed by 600 volt DC buss and grounded flue ducting. On Oct. 8, 1997, CFAC described an electrical shock incident in a potline basement. “On Sept. 25, 1997, a pipefitter received an electrical shock while changing out a nipple on an air line in the basement,” the bulletin said. “The air line was located within two feet of the pot buss and flex. Fortunately, no injury to the employee occurred.” The bulletin advised workers to use insulated hand tools. On June 15, 1998, CFAC warned about electrical shock hazards in the basements following a pot run out. “On May 18, 1998, Pot 558 ran out into the basement,” the bulletin said. “The pot metal ran onto the flue causing the flue support to drop the flue line against the buss tabs. During the response to this

event, employees made contact with the flue system not realizing the potential electrical hazard. Since the flue system is grounded, contact with the buss could energize the flue system and create a life-threatening shock hazard.” One proposed solution was better personal protective equipment. On Feb. 6, 2001, CFAC issued a bulletin reminding workers of new special requirements when working in the potline basements. “Remember that when working in the basements that we are required to wear voltage-rated rubber gloves,” the bulletin said. “This policy applies to all jobs unless there is an approved exception written. Things to remember: Clean your rubber gloves regularly; check gloves for holes before using at least daily. Voltage-rated rubber gloves are always to be worn with an outer glove. Leather or cotton mill gloves both will work.”<sup>67</sup>

On Aug. 29, 2006, CFAC reminded workers that yellow safety cones placed in the potroom indicated that workers were present below in the basement. “Employees who will work in the basement must first place basement cones on the main floor and notify the pot operator in that section,” the bulletin said. “Basement cones must be limited to five-pot sections, with exception to basement cleaning crews and when traveling through to replace bulbs. Basement cones must be yellow with basement work warning and flashing lights. The following activities may not be performed within the coned off area: tapping, hot metal hauling, hole breaking, bath tapping, hauling liquid bath, end works, rand breaks, burner cleaning, packing red shell pots, raking, skimming, skirt work, jack-slipping, pot bottom digging and removing hot anodes. Employees are trained to understand the electrical shock potential. Insulated hand tools and wearing voltage-rated rubber gloves is mandatory unless exceptions are noted in your JSA procedures. The line supervisor must be notified if an employee enters the basement to perform work alone. Any employee working alone will be checked on by their supervisor once per hour. All basement mobile equipment must have overhead protection. All measures shall be taken to provide barrier between shock and water hazards when feasible to do so.”<sup>68</sup>

Sometimes safety incidents just piled up in one short period of time, resulting in a reminder from management. On Sept. 15, 2000, about a week before one of the plant’s potlines was shut down, CFAC issued a safety alert bulletin warning workers about the recent high number of accidents at the plant. “We’ve had such a large number of events in such a short time that I am concerned about our collective safety focus,” the bulletin said. “In the past few days we have experienced the following events, just to name a few: Ore truck bumps barricade and pushes it into basement; fork truck backs out of skim room into metal hauler with full crucible; pin crane hits strong-back on pot; fork truck with mast too high hits overhead door; employee runs scooter over barricade in protected area under JLG; scooter runs into parked briquette truck; tapper burned while



attempting to rotate a hot muck bit in Teledyne (serious injury); employee strained shoulder replacing flue pipe insulator (serious injury); potman trips on board and falls on ore rail of pot (serious injury). Since we all want to leave here in as good a condition as we come each day, please stop a minute, watch, look, listen, think and be careful.”<sup>69</sup>

Re-starting a potline posed a wide number of potential hazards. On March 11, 2002, CFAC issued a bulletin warning about various injuries that could result from cutting in new reduction pots following the long plant shutdown. Two recent injuries were related to bad ergonomics and tripping on an uneven floor. “The last two visits were burn related (same pot),” the bulletin said. “Bath was broken into a cell and exploded back out. Use extreme caution when adding bath or breaking bath into a cell. This is especially true for the cells that are currently building bath. Assume the bath is cold and take every precaution to stay away from the cells when possible. Proper PPE prevented these incidents from becoming much worse. When working around molten material, spats, face shields, aprons, respirators, double sleeves and standard work boots/cotton clothing are required.”<sup>70</sup>

On Dec. 20, 2002, CFAC issued another warning about new pots. “Twice in the last three months, a new pot has started to ‘rumble’ approximately 1-2 hours after bath cut-in,” the bulletin said. “One instance included a significant amount of bath burping out of the pot. The problem cleared up within approximately one hour and hasn’t repeated on the same cell. Bath erupting out of pots is a severe safety hazard. If you hear or see this occurring, immediately contact your supervisor. The supervisor will then call out additional staff to inspect the situation. These events have a potential to cause severe injuries. We are currently reviewing both incidents in detail. For example, ramming paste, cathode blocks, cut in procedures, soda ash, bath moisture and flame-bake heating will all be investigated.” The bulletin called for using traffic cones to indicate a new pot for at least four hours. “If at all possible, stay away from the vicinity of a new cell, especially during bath or metal cut in,” the bulletin said.<sup>71</sup>

While the room temperature in the potlines buildings could soar during summertime, it was a different story on some winter days. Winter hazards were wide ranging, from vehicles or people sliding or slipping to giant icicles forming on potroom roofs. On Dec. 11, 2000, CFAC issued a general cold weather warning. “As winter approaches there are a number of conditions we all should be more focused on. Road conditions may be slippery due to snow and ice, so we need to slow down and give yourself a little more time to and from work,” the bulletin said. “There may be ice build-ups in various places throughout the plant. Try to keep this in mind and avoid these areas if at all possible. When not possible, take all precautions when working on slick surfaces. Cold weather

means cold tools, so take a bit more time before we put any tools into pots or any molten metal or bath.”<sup>72</sup>

On March 21, 2005, CFAC again alerted workers to winter hazards. “Snow and ice formation on building roofs are causing some hazardous conditions. Look before moving under sloping roofs for dangerous ice and snow accumulation. Store equipment away from areas that have the potential for falling snow or ice. Report any dangerous conditions to your supervisor. Parking lots, walkways, courtyard and roads have slipping hazards.” A year later, CFAC informed workers of a winter-caused incident. “On Wednesday, Feb. 22, 2006, there occurred a vehicle accident in the intersection at the NW corner of Potroom 1 due primarily to icy roadway conditions,” the bulletin said. “Though there was no personal injury and little vehicle damage, the potential for personal injury and/or vehicle damage was huge. Be aware that this particular intersection has historically been a hazardous one. Approach and proceed with extreme caution especially during hazardous road conditions. Be aware of icy driving conditions throughout the plant, being particularly cautious at all intersection.”<sup>73</sup>

With all the dangers posed by hot materials, overhead cranes and electrical shock, CFAC workers also had to contend with an old worn-out public water-supply system. On June 14, 2006, CFAC issued a safety alert bulletin warning that the plant’s drinking water was contaminated. “CFAC’s monthly drinking water sample tested positive for coliform last Friday and was re-tested yesterday,” the bulletin said. “The re-test samples also tested positive, so a Montana Department of Environmental Quality drinking water advisory will be posted and distributed throughout the plant when we receive the language from MDEQ. The coliform tests indicated that the contamination is not E. coli, therefore a boil water order will not be in effect at CFAC. Coliform is a class of bacteria that is present throughout the environment. A positive coliform test indicates possible contamination and a potential health risk. We are currently sampling all of the production wells and the head tanks to determine the source of the coliform. Once the source has been found, it will be decontaminated with chlorine. We may also need to decontaminate the head tanks and distribution system.”<sup>74</sup>

Company-generated safety reports and statistics don’t tell the whole story. Sometimes anecdotal information straight from the workers completes the picture. That was the idea behind an independent field project conducted in 1969 by a University of Montana student who also was a Catholic priest and a high school science teacher. The student investigator started hanging out at a bar in Columbia Falls which was frequented by off-duty Anaconda Aluminum Co. smelter workers. He started up friendly conversations and then steered the talk to working conditions at the aluminum plant. Health issues often surfaced, he discovered, including respiratory problems. The workers told the student

investigator that AAC maintained an in-house health plan and facility, and medical records and data were kept confidential and out of the public eye. A common theme discovered by the student was that workers kept quiet about safety or health risks in order to keep their high-paying jobs, but some retired early with respiratory problems.

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<sup>1</sup> Sonja Lee, "Former Anaconda Co. workers still debating health hazards, Some sue, others back The Company," Great Falls Tribune, Sept. 21, 2002 [AL3246]

<sup>2</sup> Lee, Sept. 21, 2002 [AL3246]

<sup>3</sup> Lee, Sept. 21, 2002 [AL3246]

<sup>4</sup> For more information, see "History of Mine Safety and Health Legislation," U.S. Mine Safety and Health Administration online, Oct. 18, 2016

<sup>5</sup> For more information, see "History of Mine Safety and Health Legislation," U.S. Mine Safety and Health Administration online, Oct. 18, 2016

<sup>6</sup> U.S. Department of Labor, "Citation and notification of penalty issued to Anaconda Aluminum Co. on April 10, 1975," FOIA request, Dec. 16, 2003 [AL3499]

<sup>7</sup> Orin Bleken, "OSHA charges Anaconda Co.," Hungry Horse News, Sept. 4, 1975 [AL1329]

<sup>8</sup> "Area firms lead OSHA violations," Hungry Horse News, June 28, 1979 [AL0501]

<sup>9</sup> Richard Hanners, John Van Fleet and Heidi Desch, "Columbia Falls Aluminum Company celebrates 50 years," Hungry Horse News, Aug. 15, 2005 [AL3926]

<sup>10</sup> "AAC teams to demonstrate first aid," Hungry Horse News, May 9, 1958 [AL1671]

<sup>11</sup> Photo of 1958 picnic and celebration with caption, Hungry Horse News, July 10, 1980 [AL0597]

<sup>12</sup> "Honor AAC men for first aid, safety," Hungry Horse News, May 23, 1958 [AL1675]

<sup>13</sup> "C-Shift wins AAC first aid contest," Hungry Horse News, May 22, 1959 [AL1729]

<sup>14</sup> "Nearly 300 spectators at AAC first aid contest," Hungry Horse News, May 13, 1960 [AL2051]

<sup>15</sup> "Invite public to annual AAC first aid contest," Hungry Horse News, April 29, 1960 [AL2047]

<sup>16</sup> "Award prizes for safety at AAC," Hungry Horse News, May 6, 1960 [AL2048]

<sup>17</sup> Brian Kennedy, "Green Stamps boost safety," Hungry Horse News, June 5, 1980 [AL0594]

<sup>18</sup> "Employees set safety record, lost-time accidents," Hungry Horse News, Nov. 6, 1980 [AL0611]

<sup>19</sup> "Safety string stands at 25 days," Hungry Horse News, Dec. 2, 1982 [AL2497]

<sup>20</sup> "AAC plant has 100 safe days," Hungry Horse News, April 27, 1956 [AL1576]

<sup>21</sup> "Flathead industry strives, AAC rates high for job safety," Hungry Horse News, Dec. 6, 1957 [AL1652]

<sup>22</sup> "AAC tops million accident free hours," Hungry Horse News, April 11, 1958 [AL1664]

<sup>23</sup> "AAC sets national safety record," Hungry Horse News, May 2, 1958 [AL1669]

<sup>24</sup> "AAC employees work injury-free year," Hungry Horse News, June 20, 1958 [AL1679]

<sup>25</sup> "AAC wins honors for safety," Hungry Horse News, May 10, 1963 [AL2164]

<sup>26</sup> "Anaconda Aluminum safety scoreboard," Anaconda Aluminum Courier, 1965 [AL2869]

<sup>27</sup> "Establish Cochran safety trophy," Hungry Horse News, Jan. 28, 1966 [AL2250]

<sup>28</sup> Hungry Horse News, Nov. 6, 1980 [AL0611]

<sup>29</sup> "Anaconda tops 1 million-hour safety mark," Hungry Horse News, Jan. 29, 1981 [AL0621]

<sup>30</sup> "AAC sets world record," Hungry Horse News, July 23, 1981 [AL0640]

<sup>31</sup> Brian Kennedy, "Friday was a busy day for Gov. Ted Schwinden when Columbia Falls was capitol for a day," Hungry Horse News, Feb. 11, 1982 [AL2469]

<sup>32</sup> "1983's safety streak peaked at 236 days," Hungry Horse News, Feb. 2, 1984 [AL2558]

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<sup>34</sup> CFAC website, Oct. 7, 2016 [AL5354]

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