**Case Scenario:** **Death on a Steel Mill Electric Arc Furnace**

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**Expert's Job Assignment:** To assist with the case by the plaintiff widow against a third party industrial company and various contractors.

## Case Synopsis

Maintenance work was being done on a three phase AC electric arc furnace that was about 30 feet in diameter. It was shut down for some extensive repairs. There were many different crafts and contractors working on different aspects of the repairs and many of them were out of sight of others.

The deceased was welding on the support section of one of the three electrode arms that hold and carry current to the main electrodes that do the melting in the furnace. The clamping section had been removed so that he could get access to the damaged area that was to be repaired, and it was being held up about 10 feet above him by an overhead crane, by means of a chain assembly on the main crane hook. The removed clamping section was an assembly of aluminum and copper that weighed over two tons.

By means of a spurious electrical signal the control circuit for the furnace sent a signal to raise all three electrode arms. The stored energy in the hydraulic accumulators did just that: all three electrode support posts rose up to their full height. In doing so one of the other arms hit the suspended clamping section and dislodged it from the overhead crane. It fell and killed the welder below.

## Expert analysis

1. The control system for the furnace required that there be a large hydraulic accumulator for each phase electrode in order to be the source of a large volume of oil so as to move the electrodes faster that the hydraulic pumps could supply the oil. These were piped to the electrode cylinders through 4 inch diameter pipes.
2. One of the times that this speed was needed was if the power were to fail. At that time it would be necessary to lift the electrodes so that they would not get frozen into the molten steel in the furnace. Thus there was a signal from the circuit breaker that fed the high voltage to the furnace transformer such that if the circuit breaker were to open the hydraulic system would operate to lift the electrodes.
3. There was an electrical contractor that was working on the circuit breaker. In their work they needed to open and close the circuit breaker. When they opened it the signal was sent and the electrodes moved as described above.
4. All of the motors, controls, and electrical power to the furnace drive and hydraulic equipment had been opened, locked out, and tagged out as normal safety rules require. Note that OSHA rules in 29 CFR-1910-147 (the rules for Lockout and Tagout) require that sources of power be locked out. Control circuits are not adequate to do the job.
5. The three large 4 inch diameter pipes each had a one-quarter-turn shut-off cock in the line at the main hydraulic panel. Each one had locking hasps on them so that locks could be affixed to lock them shut. All three of the valves were open at the time of the accident.

**Expert Opinion**

The primary responsibility for the accident lay with the plant owner and the general contractor. The general contractor was also the original manufacturer of the furnace. Neither company did the training required to ensure a safe working environment.

1. The deceased welder was a good worker, but he had never worked in a steel mill, nor any kind of factory before this accident. He had always worked on heavy over-the-road machinery. Thus he knew nothing about the dangers of a steel mill.
2. The OSHA rule section 29 CFR 1910.147 (c) (7) (iv) states: "The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training." There were no such records of **ANY** training having been given to this man.
3. A portion of the specifications for the job stated: "Supplier will supply the following items:" and continues with, "Training Courses for operation and maintenance personnel." These were never supplied.
4. An employee of the owner described the proper method of locking out the hydraulic system. He had been working alongside the deceased immediately before the accident. If the lockout of the hydraulic valves had been done as he describes the accident would never have happened. This owner's representative should have known that the procedure was not done properly and called a halt to it.