# EXECUTION BY GAS CHAMBER Mississippi

FRED A. LEUCHTER ASSOCIATES, INC.

#### ENGINEERING REPORT ON THE GAS CHAMBER AT THE MISSISSIPPI STATE PENITENTIARY Parchman, Mississippi

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Fred A. Leuchter Associates, Inc. 231 Kennedy Drive Unit 110 Boston, Massachusetts 02148 (617) 322-0104

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#### 0.000 INTRODUCTION.

#### 1.000 PURPOSE.

1.001

#### 2.000 BACKGROUND.

The principal investigator and author of this report is a specialist in the design and fabrication of execution hardware and specifically has worked on and designed hardware in the United States utilized for the execution of condemned persons by means of hydrogen cyanide gas. Additionally, the investigator has constructed hardware for electrocution, lethal injection and hanging.

#### 2.001

2.002 The investigator has inspected the Gas Execution Chamber at the Mississippi State Penitentiary, has considered drawings of the chamber, consulted with the skilled operators of the chamber, studied the execution protocol utilized with the chamber and made drawings, and photographs of the chamber.

2.003 The investigator did not design or construct the Gas Execution Chamber at the Mississippi State Penitentiary, nor is he responsible for the protocol utilized there. This chamber was built in the early 1950's by the Eaton Metal Products Company of Denver, Colorado who constructed this gas chamber as they did most of the other chambers in the United States. In the construction of this chamber they utilized design criteria first developed and used in the early 1920's for the Arizona Gas Chamber. The protocol used is wholly Eaton's, with the exception of special tailoring by the states.

**3.000 SCOPE.** The scope of this report includes a physical inspection and quantitative data obtained at the Death House at the Mississippi State Penitentiary, original drawings and specifications and protocol supplied by the Mississippi Department of Corrections, first hand operational information supplied by operating personnel and the investigators own personal knowledge and work in the field.

3.001 Utilizing all of the above data, the investigator has limited the focus of this study to the development of a criteria package for the understanding, design, fabrication and use of execution gas chambers. This package is intended for use by those persons and scholars who would study the history and use of execution gas chambers.

**4.000 HISTORY.** The history of the use of hydrogen cyanide gas for execution purposes and the development of the gas chamber is strictly a United States phenomenon. Prior to 1890 hanging was the legally utilized procedure for execution in the United States. In an attempt to find a more humane procedure, the New York State Assembly accepted electrocution. Many other states followed by accepting electrocution. Others were not satisfied, for one reason or another, and sought a more humane procedure. Because hydrogen cyanide gas was being utilized for fumigation purposes, some states began to look at the possibility of gassing.

4.001 In the early 1920's Arizona passed enabling legislation and contracted with Eaton Metal Products of Denver, Colorado; Casper, Wyoming; and Salt Lake City, Utah to construct their new execution system utilizing hydrogen cyanide gas. Eaton developed a gas chamber to contain the gas, a generator to manufacture the gas and a protocol to safely utilize the new equipment. Eaton subsequently installed

chambers in Arizona, California, Colorado, Maryland, Mississippi, Nevada, North Carolina, Rhode Island and Wyoming. Missouri also utilized gas after the early 1030's but their gas chamber, although as complex as the others, was constructed by someone other than Eaton. Records at Missouri do not indicate who the builder was. The only major difference in all these chambers was whether they were for one or two executees.

4.002 In the years that have passed, most states have changed from gas to safer execution procedures. The only remaining states still utilizing gas are Arizona, California, Maryland and Mississippi and some of these states are considering changing to the safer procedure of lethal injection.

4.003 It is extremely fortunate that although gas handling accidents have occurred, none has resulted in injury or death to gas chamber operational personnel as have accidents involving the use of hydrogen cyanide gas in other industries.

### 5.000 MISSISSIPPI DEATH HOUSE. The Death House at the Mississippi State

Penitentiary is a one and a half story facility measuring some seventeen (17) by twenty (20) feet containing some three hundred forty (340) square feet and some two thousand nine hundred ninety-two (2,992) cubic feet, owing to a ceiling height of some eight feet ten inches (8' 10"). It occupies part of, but is isolated from, the ell shaped Maximum Security Facility containing the maximum security cells for the prison and Death Row. The entire facility is constructed of red brick. It has three steel doors, one from the Death Row area of the Maximum Security Facility opening into the Control Room used to bring the executee into the Death House, a second in the rear of the building for official witnesses which opens into the Witness Room and the third, or main door which opens from the main yard into the Control Room.

5.001 The Lethal Gas Chamber, which occupies the proximate center of the Death Chamber, and the associated plumbing and hardware comprising the gas execution system was installed by the Eaton Metal Products Company in October of 1954. It was reconditioned by Eaton in 1982. This system is the typical Eaton Lethal Gas Chamber and differs from the other Eaton installations only by virtue of the fact that this has a single seat where some others have two. The design and construction of the Eaton Lethal Gas Chamber the original installation in Arizona in the early 1920's.

5.002 The Execution Chamber (room) is divided into three rooms by two partitions. The first partition bisects the chamber in the longest direction. This wall begins at the distal ends of the room and joins at the center surrounding the Gas Chamber at its midpoint, effectively placing half of the Gas Chamber in each room. This wall is in reality a riveted steel bulkhead. It runs vertically from floor to ceiling. This wall separates the work area from the Witness Room. The second wall is fabricated of mortar, brick and plaster and runs perpendicularly from the steel bulkhead to the outside wall in the work area. It has a door and window and separates the Chemical Room from The Control Room. The Chemical Room has a trap door in the floor at the far end which accesses, via a ladder, a pit beneath the lethal gas chamber. In this pit is located the necessary plumbing for the lethal gas chamber and the gas generator. The Chemical Room contains a sink, counter, the acid mixing pot, the inlet valve and the necessary plumbing for the introduction of the acid/water and ammonia into the gas generator of the lethal gas chamber. The floor of the entire facility is painted concrete.

**6.000 THE LETHAL GAS CHAMBER.** The lethal gas chamber is of welded and riveted steel construction. It is hexagonal in shape but with the corners replaced with the base of an equilateral triangle whose theoretical third angle would have been the original corners of the hexagon. The base of this triangle measures some 7". Thus, each corner is actually two seams instead of one, each seam being one of the base angles of the equilateral triangle. The roof of the chamber is fabricated by a continuation of the side segments at pitch of some 31 degrees from the horizontal. The height of the roof is some 23" above the top of the chamber. The chamber measures some 6'2" in diameter from corner to corner and some 8' 10" high at the center. The floor of the chamber is steel. The floor area of the chamber is some 29.7 square feet and the volume of the chamber is some 263 cubic feet.

6.001 The lethal chamber has five gasketed windows of bullet proof glass set in riveted steel frames measuring 36" high by 25" wide. The tightness of the window gaskets is controlled by a series of nuts around the window frame which are loosened when the chamber is not being used to extend the life of the gaskets. Three windows open into the Witness Room and two into the Control Room. The door aperture is 77" high by 34" wide and is oval in shape. A shaped neoprene gasket surrounds the opening which seals against a ribbed clamshell like door. Closure of the door and sealing is effected by means of a wormscrew assembly which is turned by a nautical type wheel. The wormscrew is threaded through a curved bar which is fastened on one side to the hinge assembly and the other to a latching frame (dog). As the worm is turned it bears against the gasket and sealing the aperture. The door is hinged in two places on the left side outside the chamber. The intake air valve is mounted at the base of the chamber to the left of the door on the outside. It is piped clockwise (to the left) around the chamber to air intake grilles in the

facets of the hexagon sides. This comprises the air intake manifold system. There is one grille for each side (hexagon facet), except at the location of the door. An ammonia injection system is connected to the air intake manifold to neutralize any gas residue in the chamber and prevent any un-neutralized air-gas mixture from leaking back into the air intake manifold. A shroud completely covers the manifold piping for the intake air.

6.002 At the exact center of the top of the lethal chamber the exhaust valve and the 7" diameter exhaust piping exit the chamber and continue on through the exhaust fan and the roof to the exhaust stack. The exhaust stack is some 13.5' above the roof. The Air Exhaust Valve is controlled by a lever and a mechanical connection external to the chamber and to the left of the door. The exhaust fan is coaxial to the exhaust piping above the chamber and is mounted on a frame on the roof of the chamber. The exhaust flue turns 90 degrees at the top of the chamber and enters the exhaust fan where it again turns 90 degrees to exit the building. There is a mechanical plumbing vent from the gas generator under the chamber which connects to the exhaust system just prior to the exhaust fan. This vent passes through the floor of the gas chamber and the roof of the gas chamber. The exhaust above the lethal chamber. The exhaust fan has a back-up motor in the event that the prime motor fails.

6.003 There are three explosion proof lighting fixtures mounted on the ceiling of the chamber spaced at 120 degrees, the first being centered directly in line with the door. These fixtures are mounted at 90 degrees to the surface of the ceiling with the inlet being nearest the perimeter of the chamber and the lamp being nearest the center of the chamber. Mounting these at 90 degrees to the surface allows for more head clearance when standing in the chamber. Additionally, there is an inlet and an outlet for both a mechanical stethoscope and an electronic heart monitor. These are to the right of the door as viewed from the outside. There is also mechanical linkage for controlling the sodium cyanide pellet drop into the gas generator and opening the vent valve which enters the right side of the chamber and traverses the floor to center of the chamber. A single chair occupies the center of the chamber directly over the gas generator. This chair is fabricated of steel and has head, arm and leg restraints. The chair is painted with black acid resistant paint. The chamber interior and exterior has been painted with aluminum acid resistant paint.

6.004 The lethal gas chamber is also equipped with a manometer which reads the pressure in the chamber in inches of mercury. This enables the operators to determine if there is a pressure leak in the chamber at any time. There is also a shelf within the chamber upon which is placed a watch glass of phenolphthalein solution which is used as an indicator as to the presence of gas in the chamber. When the chamber is clear of gas the color of the phenolphthalein turns bright red.

6.005 The Gas Generator and plumbing system occupies the Lethal Gas Chamber, the Control Room, the Chemical Room and the pit beneath the gas chamber. The Chemical Room contains the start of the system and the gas generator in/under the lethal gas chamber is the termination of the system which dumps into a special sewer line.

6.006 The Chemical Room contains Acid Mixing Pot (9), trap #1, Ammonia Injector and Injector Valve (8) Inlet Valve (3), two water spigots at the Mixing Pot location and a sink with running water elsewhere in the room.

6.007 The Control Room contains Outlet Valve (4), being the only item not affixed to the lethal chamber. Affixed to the chamber are Fan damper lever for Air Exhaust Valve (5), Ammonia Injector and Manifold Ammonia Injector Valve (7), Air Valve Lever and Air Intake Valve (2), Gas Valve Lever (1) which controls Gas Generator Valve (10), Gas Generator Vent Stack Valve (A) and Cyanide Briquet Container (B), Packing Gland (11), Manometer (6), Vent Stack (C) and the Exhaust Fan which has a second back-up motor in the event that the prime motor fails. Additionally, the switches for the emergency exhaust fans for all three rooms (Control, Witness and Chemical) are located here.

6.008 The Pit beneath the Lethal Chamber contains trap #2, Gas Generator (D), two drain systems and one water supply system. All piping for the acid and gas drain and vent system is stainless steel. All piping for the sink drain and vent system is galvanized. All water supply lines are galvanized. The main drain is 4" black iron. This drain is not part of the prison's normal sewer system but rather a drainage tank and system which allows the hydrocyanic acid to biodegrade harmlessly into the environment.

6.009 There is an emergency exhaust fan system to clear all three rooms in the event of a gas leak and emergency lighting in all three rooms, as well. Further, in the event of a power failure, there is a back-up generating system which will supply electricity to insure that the exhaust fan does not stop and the vacuum drop in the chamber causing a leak of lethal gas.

Note: Numbers in parentheses are Eaton's numbers. Letters in parentheses are the investigator's. Number designations for Valves (numbers 3 and 4) are transposed in Eaton's text but not in the Eaton Drawing. They are correct in all other locations. 6.010 The Gas Generator is comprised of the Gas Generator (D), Gas Valve Lever (1), the associated actuation linkage and Packing Gland (11), Gas Valve (10), Gas Generator Vent Stack Valve (A) and Cyanide Briquet Container (B). Gas Valve (10) is utilized as a seal for testing the integrity (pressure test) of the chamber, as well as, the mechanism for controlling the Cyanide Briquet (pellet) drop, while the actuator additionally controls the opening of the Gas Generator Vent Stack Valve (A). When Gas Valve (10) is closed, the Gas Generator Vent Stack Valve (A) is open, and conversely.

6.011 The Two Ammonia Injectors and their associated Injector Valves (7) and (8) are operated in the following manner. They consist of a glass bottle filled with ammonia with a rubber stopper. Through two holes in the rubber stopper two tubes are inserted. The outlet tube is immersed in the ammonia (goes deep into the bottle) and is connected to the Injector valve which is in turn connected to the lethal chamber air intake manifold or the piping directly beneath the Acid Mixing Pot (9), before Inlet Valve (3). The pressurizing tube barely enters the bottle and has a rubber pump ball on the other end. Air is pumped into the bottle utilizing the rubber pump ball which creates pressure on the surface of the ammonia, forcing it out of the outlet tube, when the respective Injector Valve (7) or (8) is open, into the system.

# 7.000 LETHAL GAS CHAMBER FUNCTION. The function of a Lethal Gas Chamber is

simple in theory, but complex in actual usage. Essentially, the executee is sealed into a chamber which is inwardly pressurized (evacuated) causing any leak of dangerous hydrogen cyanide gas to be inward. By means of an external actuator, sodium cyanide pellets (briquets) are dropped into warm, dilute sulfuric acid within the chamber. Hydrogen Cyanide gas is generated within the chamber due to the chemical reaction of the sodium cyanide and the sulfuric acid. The released gas surrounds the executee and terminates his life. After a sufficient time has elapsed, the chamber is ventilated completely, with air in excess of 80 degrees Fahrenheit, many times over, and the subject is removed after proper neutralization with ammonia. The prussic acid, residual to the chemical reaction, must be disposed of. The Chamber must be neutralized by washing with ammonia and caustic soda or chlorine bleach. Care must be taken in handling the corpse, cleaning the chamber and gas generator and evacuating the gas to see that no one other than the executee is killed.

7.001 The Mississippi Lethal Gas Chamber is operated in the following manner. First, it is tested to determine if all of the plumbing is clear and tight. This is done by opening Inlet Valve (3) and Outlet Valve (4) and running tap water into the Acid Mixing Pot (9) for five minutes. This determines that there are no blockages in the plumbing. Then Valve (4) is closed and tap water is run into the acid Mixing Pot filling the Gas Generator (D) to the floor level of the Lethal Chamber. The piping in the pit is then inspected to determine that there are no leaks. The Gas Generator Valve (10) is then closed by utilizing Gas Valve Lever (1), trapping the water above the valve at floor level. Then open Outlet Valve (4) and allow the water to drain into sewer, since Gas Valve Lever (1) has opened the Gas Generator Vent Stack Valve (A).

7.002 Next, is the vacuum test. First, the Packing Gland is checked and the window frames tightened onto the gaskets. Close and seal the door. Place some water around Air intake Valve (2) (to insure a tight seal) and Close Valve (2) by actuating Lever (2). Open Air Exhaust Valve (5) by means of Fan Damper Lever (5) and start exhaust fan. This will pull a vacuum on the chamber. We now must monitor the Manometer (6) to determine if it remains constant or indicates there is a leak. If there is no leak, the following is done to effect an execution. Turn the fan off and open the Air Intake Valve (2). This relieves the vacuum. Open the door. The heat must be turned on and the Death House brought to and maintained at a temperature of over 80 degrees Fahrenheit to prevent condensation of the hydrocyanic acid in the interior of the gas chamber, making clean-up extremely dangerous. Hydrogen cyanide gas condenses at 78.3 Degrees Fahrenheit (25.7 degrees Celsius) and the intake air in the control room must be kept above this temperature.

7.003 Utilizing Gas Valve Lever (1), the Gas Generator Valve (10) should be opened and closed to eliminate any water trapped above the floor in the last test. The Sodium Cyanide briquet container above the valve should be thoroughly dried so that no moisture will reach the cyanide briquets until the execution begins. The door gasket, the window frames, the Packing Gland, the Manometer inlet and the two heart monitor connections are coated with petroleum jelly as a guard against leakage. Two or more gallons of distilled water are poured into the system to insure that traps #1 and #2 are full. All chemicals (acid and water as well as caustic soda) are mixed and readied. Outlet Valve (4) should be closed to seal the system from the drain and Inlet Valve (3) should be closed to contain the acid/water mixture until ready. The Gas Generator Valve (10) should be verified as closed and the locking pin installed through the hole in the Gas Valve Lever. The sodium cyanide briquets should now be placed in the briquet container above the valve. The Acid should be mixed with warm distilled water and placed in Acid Mixing Pot (9). Air Intake Valve (2) should be closed. The Ammonia Injectors should be made ready by closing the Injector Valves and by pumping up the pressure. The watch glass of Phenolphthalein solution is placed on the shelf within the chamber. The executee should be strapped into the chair in the chamber. The doctor tapes the mechanical stethoscope and the electronic heart monitor to the executee's chest. The door closed and sealed. The doctor verifies that the two heart monitors are working. The Air Exhaust Valve (5) should be closed and the Exhaust fan should be started. The vacuum should be monitored on the Manometer (6). Inlet Valve (3) should be opened allowing the acid/water mixture into the gas generator and then closed. The Acid Mixing Pot (9) should be completely filled with tap water to prevent backflow of gas. The Lethal Chamber is now ready for the execution.

7.004 The Emergency exhaust fans are now verified as operational. A monitor is stationed at the Manometer. A monitor is at each chamber window, Air Intake Valve (2) and the chamber door with a hand held gas detector which senses Hydrogen Cyanide Gas to 10 ppm (parts per million). The emergency breathing apparatus (air packs) are verified as being immediately available to those present in the Death House. The execution can now proceed. The manometer (vacuum) is verbally verified and Air Intake Valve (2) is visually verified as closed. Additionally, special hydrogen cyanide first aid kits are on hand in the Death House, special emergency physician's medical kits and two resuscitators are on hand at the infirmary, and two emergency ambulances are on stand-by inside the prison. The guard tower at the entrance sallyport of the Maximum Security Facility is evacuated as a precaution to wind carrying the expelled air-gas mixture to the tower and killing the guard stationed there. This is the only time that this most important security post is abandoned.

7.005 On command from the Warden, the execution is begun and the witness curtains are opened. The locking pin is now removed from the Gas Valve Lever and the Gas Valve Lever (1) is thrown, opening Gas Generator Valve (10) which drops the cyanide pellets into the acid solution beginning the generation of the gas. The monitors verify that the vacuum is holding and that there are no leaks detected. After several minutes, the executee will be dead and the doctor will verify this fact. The doctor will wait several more minutes and inform the warden that the subject is dead. (Total time normally ten [10] minutes.) The warden will then order the chamber to be cleared of gas and the witness curtains closed.

7.006 The Gas Valve Lever (1) will be returned to closed position which will close the Gas Generator Valve (10) (which will prevent any further gas from entering the chamber) and open the Gas Generator Vent Stack Valve (A) (preparing the Gas Generator for draining). The Fan Damper Lever will be thrown, opening the Air Exhaust Valve (5). The Air Intake Valve (2) will be opened and the Manifold Ammonia Valve (7) opened. The Chamber will begin exhausting the air/gas mixture and the ammonia will begin to neutralize the hydrogen cyanide and protect against any leakage back through the Air Intake Valve (2). The chamber will be cleared (according to tests) in one minute (Eaton says three). This exhaust procedure will continue for fifteen (15) minutes (at Eaton's instruction) to guarantee at least five full air changes. Open Outlet Valve (4) allowing the prussic acid residue to pass into the sewer. Open Inlet Valve (3) allowing water in Acid Mixing Pot (9) to pass into the plumbing and flush the system while opening Ammonia Injector Valve (8) to insure no back-flow of poison gas. Pour Caustic Soda solution into Acid Mixing Pot (9) and flush continuously with tap water for fifteen minutes or more. Both Ammonia Injectors (Valves 7 and 8) should be turned off in ten (10) minutes.

7.007 After at least fifteen minutes of venting the chamber, the phenolphthalein solution should be checked for its characteristic red color, indicating that the chamber is clear. If the Chamber is clear, two operators, wearing full chemical suits with air- packs and rubber gloves, will open the chamber and verify with gas detectors. (Earlier, gas masks with hydrocyanic acid and ammonia canisters were utilized.) The operators in the chemical suits ruffle the executee's hair to eliminate any trapped gas and then spray the executee and the chamber with ammonia. The doctor, now wearing a chemical suit with air-pack, makes the final pronouncement of death. The executee is now undressed and washed with a caustic soda or ammonia solution and is removed from the chamber and re-dressed in different clothing. His body is then ready for removal by the undertaker, who works on the body, thereafter, with rubber gloves. The clothing worn by the executee at the time of execution is placed in a plastic bag and sealed, after which, is disposed of, generally by incineration. The Gas Generator Valve (10) is now opened by throwing Gas Valve Lever (1). The Lethal Chamber and all its contents are washed with caustic soda (walls, floor and ceiling) and the residue flushed into the Gas Generator at the base of the chamber and thence down the drain. The ammonia is dumped into the drain from the Ammonia Injectors and they are washed and dried. Gas Generator Valve (10) is then closed by throwing Gas Valve Lever (1) and the plumbing continuously flushed for another ten (10) minutes. Upon completion of the clean-up, approximately an hour after the execution ended, the Death House is secured with the exhaust fan left running.

7.008 The following day the step-down maintenance is performed. An inspection is made to determine if everything is dry. The fan is then turned off. The equipment is then stored in its proper place. All valves are closed and then opened to half position to eliminate pressure on the packing. The nuts on the window frames are loosened to eliminate pressure on the gaskets. The door to the chamber is left open so there is no pressure on the gasket. The Air Exhaust Valve will not be closed to eliminate pressure on the gasket. The Death House in now made permanently secure.

7.009 Prior to the next usage, all valves will be checked, the window gaskets will be tightened and the Packing Gland will be re-packed. The Chamber will be again tested according to the procedure outlined above.

7.010 The two man Lethal Gas Chambers Built by Eaton were identical in design and construction to the one man chamber at Mississippi except that they had two seats and redundant plumbing systems requiring that all chemical procedures had to be completed twice. Some of these chambers required that the cyanide pellets (often called "eggs") be placed in a gauze sack and dipped into the acid solution in the generator below the chamber by a trip mechanism similar to the one in Mississippi except that it was suspended from the chain instead of being fastened to the floor. This was changed to the newer type system utilized in Mississippi because it was safer in that no one had to handle the gauze sack after the execution.

7.011 The chemicals used by Mississippi are an approximate 37% sulfuric Acid Solution (acid and distilled water) and an approximate 16 ounces of sodium cyanide. This requires twelve (12) pints of distilled water and six (6) pints of acid (98%) resulting in 18 pints of dilute sulfuric acid reacting with 24 briquets of sodium cyanide. This results in two (2) cubic feet of Hydrogen cyanide gas at the 10 psi (approximate) operational pressure or an amount of approximately 7500 ppm.

# 8.000 DESIGN CRITERIA FOR A LETHAL GAS CHAMBER.

8.001 Required: Design a Lethal Gas Chamber to utilize hydrogen cyanide gas for the execution of convicted criminals, knowing the gas is extremely deadly, explosive and condenses at 78.3 degrees Fahrenheit.

8.002 The chamber and all inlets, whether electrical or mechanical, must be sealed to prevent leakage. The door must be gasketed with some type of pressure seal as utilized on water-tight doors at sea. The windows, if any, must be gasketed and sealed. Further, the chamber must be operated at a pressure less than the outside ambient pressure (vacuum) to insure that any leak would be inward.

8.003 Because the gas is explosive, all lighting and electrical hardware in the chamber must be kept at a minimum and all lighting fixtures must be explosion proof. Any mechanical hardware must be prevented from causing a spark, as well as, the occupant who must be restrained from causing an explosion. The concentration of the gas at the generator or at its source is almost 100%, much greater than its 6% lower explosion level (lel).

8.004 Either the gas is to be generated, supplied from tanks or a non-pressurized lab bottle. If it is to be generated, mechanical means must be suppli3 9.001 Prepared this 6th day of December, 1989 at <sup>3</sup> e supplied from tanks, a heated water jacket must be used to vaporize it from a liquid (its form in the tank). The simplest means is to generate the 3 Malden, Massachusetts. <sup>3</sup> st all be explosion proof. Further we must see that the heater never causes an electrical spark.

8.005 We must have a system for exhaustin3 3 tallest object to dissipate the gas before it can harm anyone. This requires an inlet valve and an exhaust valve, both gasketed, and an exhaust fan 3 <sup>3</sup> s in a short span of time. The intake air must be heated to a temperature of greater than 78.3 degrees Fahrenheit (25.7 degrees Celsius) to pre3 <sup>3</sup> strong base to the intake air to neutralize any leakage backwards to the operators.

8.006 After the usage we must have a system or procedure to neutralize the executee's body of hydrocyanic acid and to purge the chamber of the same. This requires the washing of the subject, as well as, the chamber with a strong base while wearing protective suits and gas masks or air supplies.

8.007 Further we must have some type of indicator for gas leakage, as well as, an air exhaust system to protect the operators. We require special hydrogen cyanide medical kits, resuscitators and doctors trained to handle an emergency.

8.008 We must restrict the hydrogen cyanide gas and the residual prussic acid from unsuspectingly coming into contact with others not concerned with the operation.

9.000 CONCLUSION. The reader of this report should be able to immediately grasp the necessity for the utilization of these tried and tested principles for lethal gas chamber design. Most of them are common sense.

9.001 Prepared this 6th day of December, 1989 at Malden, Massachusetts.

Fred A. Leuchter Associates, Inc. Fred A. Leuchter, Jr. Chief Engineer TOOLS OF "CORRECTIONS"