

Appendix A: Chronology

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Revised February 26, 2009

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References used in this section:

Paul Srivastava, *Bhopal: Anatomy of a Crisis* (Cambridge, MA: Ballinger, 1987).

Sanjoy Hazarika, *Bhopal: The Lessons of a Tragedy* (New Delhi: Penguin Books India Pvt Ltd, 1987)

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Bhopal Gas Disaster Chronology

The timeline below documents the incidents leading up to and resulting from the 1984 Bhopal Plant Disaster. Use the key below to quickly find information on government measures relating to specific organizations, Indian national legislation, casualties, and economic conditions and profitability. A timeline documenting ensuing legislation can be found at the end of the main chronology.

Key	
brown	= central (India), state (Madhya Pradesh), or city (Bhopal) government measures relating specifically to UCC, UCIL, Bhopal plant, or immediate neighborhood of plant
green	= general India national legislation relevant to conduct of business
red	= casualty-producing plant incidents
violet	= economic conditions relevant to Bhopal plant profitability
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	UCIL= Union Carbide (India) Limited
	UCC= Union Carbide Corporation

1956

Indian Parliament adopts Companies Act of 1956, which requires affiliates of foreign companies to register as separate companies under Indian law and imposes limits on foreign investment and participation in all Indian companies.

Union Carbide reduces its share of ownership in its Indian subsidiary (then called National Carbon Company (India) Limited from 100% to 60% in accordance with new Indian law by registering as an Indian company and selling shares to Indian citizens. All but one or two UCIL board members, all UCIL executives, and all regular or seasonal employees are Indian nationals.

1966

Indian market for fertilizers and pesticides is expanding as government adopts a range of policies, including efforts to increase yields and reduce post-harvest losses of crops to pests, to make India self-sufficient in food. India had depended heavily on outside food aid in earlier part of the decade, and government wished to end this. The domestic production of pesticides in 1966 is 14,000 metric tonnes, well short of what the government wants to supply to farmers.

Union Carbide India Ltd (UCIL) establishes a new Agricultural Products Division to take advantage of growing Indian market for fertilizers and pesticides. Initial activity involves only local formulation (diluting “technical grade” concentrate to make products for sale to users).

UCIL applies for license to carry out the whole production process in India.

1968

Government of India approves UCIL plans to build fertilizer/pesticide formulation plant in Bhopal. State of Madhya Pradesh leases land in the Kali Parade area of Bhopal for the plant to UCIL on a 99-year lease in an area zoned for industrial use. The area around plant is relatively unpopulated at time though there are two lakes nearby and the main Bhopal railroad station was about 2 miles from the plant site. Total population of City of Bhopal is estimated to be about 300,000 (the 1961 census put it at 102,000 but considerable in-migration from surrounding countryside had occurred).

Adoption of India's 4th five-year plan, to run 1969-74. Plan goals include reducing “unwholesome dependency on foreign agencies,” particularly foreign corporations. The Plan outlines goals of requiring foreign investors to enter into joint ventures rather than establish wholly owned subsidiaries, and reaffirms requirements to train and employ Indian nationals at all levels of operation, to use made-in-India equipment and components whenever they are available, and to transfer technology to Indian affiliates. These requirements meant that the government was strongly interested in having chemical plants located within the country develop capacity to undertake all steps from raw material through intermediate chemicals through final product on-site rather than relying on imported intermediates.

1969

Bhopal plant begins operating. Initial operations consisted of making raw fertilizer and formulating (diluting to usable strengths) pesticides with US-origin “technical grade” chemical concentrates. UCIL industrial chemists develop a method of producing alpha-naphthol that UCIL anticipates being able to scale up to economically competitive production volumes.

1970

UCIL is reconsidering its business plan as the large-scale making of alpha-naphthol turns out to be more challenging than it anticipated.

1972

Government of India begins pressing UCC and UCIL to have UCIL plants shift from formulation using US-source chemicals to full production in India. It makes issuing an

operating license for the Bhopal plant conditional on its using domestically-made alpha-naphthol.

Government of India establishes National Committee for Environmental Planning and Coordination.

1973

Indian Parliament adopts Foreign Exchange Regulation Act 1973. Among other strong controls on flows of money in and out of India it establishes a scheme for government control over Indian firms' decisions on hiring foreigners as employees or contractors.

Indian Government approves UCC-UCIL Design Transfer Agreement and Technical Services Agreement under which UCC will provide the basic process design of a plant capable of producing SEVIN (a carbaryl pesticide used on cotton and other crops) and training for Indian operators of plant. Design Transfer Agreement limits UCC to provision of the process design and materials specification. Detailing the design and building the plant are to be undertaken by Indians nationals employed by or contracting with UCIL. Government also uses powers to license technology imports to guide selection of suppliers of components for plant to Indian firms as much as possible.

Engineers employed by UCIL who will be involved in plant design visit UCC Technical Center in West Virginia to earn about US plant specifications and start process of adapting them to India's conditions.

1974

Indian Parliament adopts legislation requiring Indian companies partly owned by foreigners reduce foreigners' ownership share. For companies with 60% foreign ownership, the new legal maximum is 50.9%. UCIL complies by the end of 1978 through sale of additional shares of stock offered only to Indians; these shares were held by 24,000 different persons or entities, with the Government of India itself holding 25% of UCIL stock.

Indian Parliament adopts Water (Prevention and Control of Pollution) and Air (Prevention and Control of Pollution) Acts. These establish the central government as the main standard-setter while leaving enforcement to state governments. Both Acts increase penalties for causing pollution but do not specify any emissions or ambient standards.

1975

New Master Plan for City of Bhopal establishes a separate district for "hazardous industry" in an open area 15 miles from center of town, and zone the area where UCIL's plant has been constructed for commercial and light, non-hazardous, industry only. City authorities want UCIL to move its operations to this area.

31 Oct

Indian Government licenses UCIL to produce up to 5,000 tons of carbaryl pesticides a year in Bhopal plant.

UCIL hires Humphreys and Glasgow Consultants Private Limited, an Indian subsidiary of London-based Humphreys and Glasgow, to detail the plant design and supervise construction.

1976

Madhya Pradesh Town and Country Planning Board classifies the UCIL plant as "general industry" rather than "hazardous industry." This allows plant to stay in its established location rather than move to Bhopal's new hazardous industry zone.

1977

Bhopal plant begins production of pesticides and begins \$2.5 million project to expand alpha-naphthol production unit to accommodate Sevin production.

India hit by drought; farmers need loans from government to ride out the loss of harvests. They also cut back on pesticide purchases.

1978

Bhopal plant's new alpha-naphthol unit's components fail soon after startup. \$2 million reconstruction project begun.

Production of pesticides continues using alpha-naphthol imported from UCC's US plants.

UCC and UCIL decide to shift Bhopal plant to methyl isocyanite (MIC) process to produce SEVIN because parent UCC regarded this process as more economical and efficient than its previous way of producing it. New Bhopal MIC unit based on design of UCC's MIC unit in Institute, West Virginia. (See separate page on alternative methods for production of SEVIN or similar carbamate pesticides.)

Winter Progress review of Bhopal project at UCC headquarters. Concerns about cost of building plant and reduced estimates of potential pesticide sales lead to consideration of whether Bhopal project can be scaled back. Decision is to continue as construction is too far advanced.

24 Nov Welding spark ignites nearby chemicals because welder unaware of and supervisor did not point out nearby flammables. Fire causes Rs. 6.2 million (\$730,000) in property damage, but no injuries to workers.

1978-79 20 UCIL engineers sent to UCC's West Virginia MIC plant for training in plant operation and safety.

1979

UCC engineers sent to India for pre-startup inspection of Bhopal plant report multiple deficiencies in safety measures. They also advise UCIL management of need to develop contingency plan for alerting and evacuating nearby population in event of major gas leak. UCIL management later reports it had developed such plans; city and state government officials claimed in 1984 that they were not aware of any such plans.

June UCC Eastern Division brings up question of Bhopal plant at a global strategy meeting because of concern that it, like Institute WV plant, is too large for the market. Proposals to export part of Bhopal plant's production are not adopted because of potential negative effects on UCC subsidiaries in other countries.

UCC sends 8 US engineers and technicians to Bhopal plant to assist with startup and early operation of MIC unit.

1980

Government loans to farmers come due. Farmers shift to less expensive pesticides. Many of the newer pesticides are synthetic pyrethroids that are also safer in Indian conditions than carbaryl types like Sevin.

Indian Government upgrades National Committee for Environmental Planning to cabinet-level Department of Environment. Both national and most state governments (including Madhya Pradesh) have Pollution Control Boards to inspect and enforce environmental laws.

March Government approves UCIL application to retain 1 UCC engineer through 31 May 1981; renews approval through 31 May 1982 and then to 31 December 1982.

7 of the 8 UCC engineers and technicians sent from West Virginia return home. The remaining engineer continues to serve as plant manager until June 1982, then remains as a consultant.

Fall A second UCC engineer team visits the Bhopal plant and repeats warnings about lack of contingency plan.

1981

Rebuilt alpha-naphthol unit started up; fails again and is shut down. Alpha-naphthol imports continue.

Bhopal plant returns a modest profit for the year.

National census puts City of Bhopal population at 895,815. Significant populations of recent arrivals from the countryside have settled in shanty towns near UCIL plant.

June UCIL/UCC review of Bhopal plant operation shows the variable cost of producing alpha-naphthol in Bhopal is 4x the US cost and the variable cost of producing SEVIN in Bhopal are

3.5x US costs. UCC and UCIL are both aware that new-formula pesticides coming onto market in India and other countries are likely to reduce demand for SEVIN.

UCC wants UCIL to import MIC from UCC plant in West Virginia; Government of India refuses permits because it wants the making of MIC undertaken in India.

24 Dec 1 supervisor and 2 workers exposed to phosgene leak during a maintenance operation; one of the workers dies from effects of phosgene inhalation. UCIL management says he was at fault for removing his gas mask; workers claim supervisors gave insufficient warnings. Accident reported to UCC; UCC response plan includes additional training and some design changes.

1982

uncertain UCIL notes growth of shantytowns near the Bhopal plant and asks the city to establish a "greenbelt" zone around it to prevent further shantytown expansion. City does not act.

10 Feb 25 workers injured when a pump seal fails and significant quantities of MIC, phosgene, and hydrochloric acid gases escape into plant. Some treated on-site; 16 sent to local hospital.

Feb Workers help a local journalist get into plant; he observes and writes about poor condition of plant and lax safety routines. Local newspaper publishes the story but its warnings that a massive leak is likely are ignored.

India Labor Department investigates the Dec 1981 fatal accident and recommends corrective measures.

Bhopal plant is operating at less than half capacity because of weak market for its products. Local competitors making cheaper pesticides continue gaining market share.

Spring Either UCIL asks UCC to send engineering team to inspect plant, or UCC does on own initiative (accounts vary, usually consistently with author effort to show UCC was or was not in close control of plant during the post-disaster litigation).

22 April 3 electricians suffer minor burns when one drops a screwdriver into an electrical panel and it short-circuits. State inspectors recommend better insulation of circuits.

May UCC engineers inspect Bhopal plant, issue Operational Safety Survey on conditions in plant, warn there is real danger of a runaway reaction; suggest measures to avert danger.

UCIL management reports to UCC on follow-up, saying they will undertake all suggested measures, but do not act on the recommendation to increase the range of the firewater spraying system from 15 meters to 35 meters so it can reach the top of the MIC vent pipe. The last UCIL communication on follow up, dated 26 June 1984, says all changes have been made except one to the SEVIN feed tank, which will be completed when the needed control valve is delivered in about a month.

- Summer Jagannathan Mukund, Indian citizen trained at Institute WV plant, replaces US national Warren Woomer as plant manager.
- UCIL has to admit failure of efforts to scale up alpha-naphthol production; alpha-naphthol unit shut down as too unprofitable to run. Worker transfers begin.
- Aug **Splash of liquid MIC at plant injures a chemical engineer.**
- Sep UCIL applies for extension of its Foreign Collaboration Agreement with UCC through December 1987 so it can continue importing alpha-naphthol.
- Fall Indian government approves UCIL application for renewal of Foreign Collaboration Agreement with UCC, but only to 1 Jan 1985.
- 6 Oct **Leaks of MIC, hydrochloric acid, and chloroform injure 3 workers seriously enough to require brief hospitalization; 15 others less affected are given first aid at plant. Some panic in neighboring shantytown.** State inspectors note several violations of normal operating procedures and recommend measures including red tags on equipment that should not be used.
- Labor unions complain to Madhya Pradesh Ministry of Labor about conditions in plant. Also begin occasional public demonstrations.
- Madhya Pradesh state labor ministry inspectors inspect plant but they are mechanical engineers with limited competence to assess safety of chemical plants. Labor Ministry officials do enter complaints with courts, but these will not be taken up for some time owing to long list of pending suits.
- Madhya Pradesh minister of labor says the plant is safe and berates opposition for its worries during question time in a December session of the state legislature.
- 31 Dec Warren Woomer, the last remaining American employee, leaves Bhopal plant.

1983

Various cost-cutting measures undertaken. Staff morale declines through the year as layoffs and resignations take effect. Experienced workers leave and are replaced by less experienced workers from other units of Bhopal plant or other UCIL plants.

Madhya Pradesh State Pollution Control Board requires companies to declare what they are emitting into the air. UCIL declared carbon dioxide only, not the other gasses (including phosgene and MIC) that occasionally leak. Board lacks sufficient inspectors to follow up, even after animals die from drinking water from a stream just outside the plant polluted by fluid runoff from the plant.

Sep Chief of National Pollution Control Board visits plant area while in Bhopal. Orders UCIL to fix flaws in effluent evaporation pond that permit leaks onto adjacent land. UCIL complies.

Fall Proposal to salvage investment in Bhopal plant by converting part of it to produce new carbofuran pesticide and supply it to India and other markets are rejected as economically unfeasible by UCC.

Dec Jumper pipe connected between pressure valve header and relief valve header on MIC tanks to simplify maintenance.

Bhopal plant manager Jagannathan Mukund given UCC safety award for operating 12 months without serious incident.

1984

Bhopal plant operating at 1/5 capacity owing to weak demand. Losses near \$4 million since 1980.

Successive reductions in personnel mean only 1 supervisor and 6 workers are present on each shift in the MIC unit (company guidelines state that the MIC unit should have 3 supervisors and 12 workers on each shift).

Training of supervisors and workers has become less rigorous.

April Madhya Pradesh government legalizes the shantytowns that have grown up just outside UCIL plant since 1978 by granting dwellers certificates of ownership of the land they occupy. Bhopal population estimated to be close to 900,000 and the shantytowns are notably larger than they had been in 1981.

May UCC approves UCIL proposals to write off the alpha-naphthol unit, sell rest of Bhopal plant while retaining MIC unit, reduce UCC ownership share of UCIL to 40% so UCIL can be more independent. Neither the UCC share reduction nor the plant sale had been carried out by December.

Jun/Jul Bhopal Town Planning Board lists 18 factories as "obnoxious" and therefore to be monitored particularly carefully. UCIL's Bhopal plant was not included on the list.

Sep UCIL engineers inspect plant, report to UCIL top management that 1.) gas scrubber is functioning poorly, 2.) there are poor communication between plant production and maintenance staff, 3.) workers lack instruction on what to do in the event of a runaway reaction, 4.) safety meetings are held only half as often as specified in company rules.

UCC engineers survey MIC plant in Institute, West Virginia. They report concerns about some aspects of plant operation there and possibility of a runaway reaction in the MIC storage tanks (larger than the tanks installed in the Bhopal plant).

- Oct UCC considers idea of dismantling Bhopal plant and shipping equipment to Brazil or Indonesia. Asks UCIL to draw up feasibility study and cost estimates. UCIL reports back 29 Nov. Question of what to do is pressing because the plant will have no source of alpha-naphthol when UCIL's Foreign Collaboration Agreement with UCC expires on 1 Jan 1985.

- 7-22 Oct Remaining phosgene and methylamine stocks at Bhopal plant are used up in making a last batch of MIC. 42 tons are put into Tank E610; about 20 tons into Tank E611. UCIL plan is to withdraw it a ton at a time in November and December and react it with alpha-naphthol to produce SEVIN. The storage tanks are isolated and the MIC production unit is shut down for maintenance after the batch is finished; MIC unit production workers are assigned to other tasks.

- 31 Oct Curfew imposed in Bhopal after inter-communal riots sparked by news Sikh guards had assassinated Prime Minister Indira Gandhi. Plant activities curtailed for several weeks because curfew affects ability of second shift to leave work and of third to arrive for work on time are affected.

- Nov MIC drawn down in small batches.

- Last week According to later testimony of plant workers, the position of second-shift maintenance of Nov supervisor was eliminated.

- 2 Dec Condition of plant safety systems at start of second shift.

Safety System	Condition on 2 Dec 1984
vent gas scrubber (uses caustic soda to neutralize toxic gas exhaust from MIC plant and storage tanks before release thru vent stack or flare)	on standby since MIC not in active production but could be activated by plant operators in event of need
flare (burns toxic gasses to neutralize them)	insufficient capacity to burn large volumes of escaping gas; shut down in November for replacement of a corroded pipe; MIC process vents rerouted to the vent gas scrubber while repairs proceed
refrigeration system (keep MIC at temperatures of 0-5 degrees C (32 to 42 degrees F where it is less reactive)	shut down June 1984 and coolant (Freon) drained for use elsewhere in plant
firewater spray pipes (to control escaping gasses, cool over-heated equipment or douse fires)	functional but insufficient height to reach top of vent stack
safety valve between MIC storage tanks and MIC holding tank in SEVIN production area	operational; designed to hold MIC in at normal pressures and release it if pressure too high.

There are 2 competing versions of events on December 2nd between 9 and 11 pm. The first is preferred by most authors who have studied the events; the second is offered by only a few. *See note at end for more information about the controversy.

Divergent accounts of how water entered Tank E610

Version 1: water-washing of pipes

Version 2: sabotage

8-9 pm, Second-shift production superintendent orders MIC plant supervisor to flush several pipes running from the phosgene system to the scrubber via the MIC storage tanks. MIC unit workers are in charge of the flushing, but maintenance department is responsible for inserting the slip bind (a solid disk) into pipe above the water washing inlet as plant manual requires. These take 30 minutes-2 hours to install. The MIC unit workers were apparently not aware that installation is a required safety procedure, and slip bind is not installed first. Temperature of MIC in tanks is between 15 and 20 degrees C .

9:30, Water washing begins. One bleeder valve (overflow device) downstream from the flushing was blocked so water did not come out as it was supposed to. It accumulated in the pipes. A worker shut off the water flow but the plant supervisor ordered that the washing resume. By then water had risen past a leaking isolation valve in the lines being washed and got into the relief valve pipe 20 feet above ground.

by 10:30 pm, Water has flowed from the relief valve pipe through the jumper pipe into the process pipe through valves normally kept open. Water gets through an open blow-down valve that is part of the nitrogen pressurization system. It is unclear whether the valve had been left open or had failed to fully seal when last closed. Water then flows into tank E610 via a normally-open

Water washing proceeded as described but none of the water used for washing traveled far enough down the right pipe to enter Tank E610.

isolation valve.

10:30-10:45 pm, Second shift goes off work; third shift comes on. Washing continues after second shift worker briefs third shift worker on progress of the job.

around 10:30 pm, A disgruntled worker removes a pressure gauge on a pipe leading to Tank E610 and connects a water hose to the coupler. Water enters Tank E610

Shared account of responses to detection of problems

11 pm: Third shift control room operator notices pressure gauge connected to Tank E610 has risen from a reading of about 2 psi at the start of the shift to 10 psi. This is within the normal 2-25 psi range, so arouses no concern. Control room lacks any reliable way of monitoring tank temperature.

About 11:30pm: Workers in area notice MIC smell, see MIC leak near the scrubber. Find MIC and dirty water coming out a branch of the relief valve pipe on the downstream side of the safety valve, away from the tank area. They set up a water spray to neutralize the leaking MIC and inform control room personnel of situation and their actions. They then take their regular tea break, continuing to discuss the situation and what they should do next.

3 Dec

About 12:15am: Control room operator notices control room pressure indicator for Tank E610 reads 25-30 psi

About 12:30am: Control room operator notices needle on pressure indicator for Tank E610 is pinned to the maximum reading of 55 psi. Control room operator goes out to tank area to check gauges on tank. While in tank area he hears a safety valve pop, hears rumbling in tank, and feels heat emanating from it. Returns to control room to engage the gas vent scrubber. Caustic soda does not flow as it should. A cloud of gas escapes from the scrubber stack.

By 12:40am: Plant supervisor suspends operation of the MIC plant, turns on the in-plant and external toxic gas sirens. External sirens audible in nearby neighborhoods are turned off after about five minutes. Operators turn on the fire water sprayers but water cannot reach the gas cloud forming at the top of the scrubber stack. Efforts to cool Tank E610 with the refrigeration system fail because the Freon had been drained. Gas escapes for about 2 hours.

Before 1am: Plant supervisor realizes tank E619, the designated spare, is not empty, so workers cannot relieve the pressure in E610 by transferring any MIC to E619.

By 1 am: gas smell is obvious outside the plant; nearby residents awake at the time or awakened by noise and smelling the gas odor start fleeing in panic.

1:30am: Bhopal police chief informed of leak and panic by an on-duty officer who ran to his house; no significant police mobilization follows.

About 2:30am: Bhopal plant external siren for warning the neighborhood is turned on again.

About 3am: Army engineer units with trucks are mobilized after a retired brigadier general requests help evacuating workers from his factory near the UCIL plant (but not under the strongest gas concentrations). Army unit then expands operations to assist general populace by transporting injured to hospitals and clinics. Some mobilization of city ambulances. Medical personnel hearing of situation head to hospitals and clinics.

Before 8am: Madhya Pradesh governor orders closure of plant plus arrest of plant manager and 4 other employees.

Afternoon: Head of India Pollution Control Board informed of accident. Efforts to learn details from Madhya Pradesh Pollution Control Board fail because phone calls cannot get through. Phone conversation with UCIL office in New Delhi (also unable to get phone calls through to the plant) provides some information about possible causes.

Late afternoon: Indian Central Bureau of Investigation takes control of plant and UCIL records there. CBI agents begin interviewing plant supervisors and workers; bar entry by anyone else, including other UCIL employees.

Dec Many government offices and businesses in Bhopal closed; dead buried or cremated in accordance with their families' religious traditions; initial treatment of injured proceeds.

18-19 Dec Under government supervision the MIC still in storage at the UCIL plant is neutralized by combining with alpha-naphthol to make finished pesticides. Local population leaves town as a precaution.

1985

July Madhya Pradesh government rejects UCIL application for renewal of operating license. Plant closed.

1985-98 Some work on cleanup of plant site by UCIL.

1994

UCC sells its share of UCIL to McLeod Russell (India) Limited. McLeod Russell renames UCIL Eveready Industries India, Ltd.

1998

State of Madhya Pradesh takes over plant site from Eveready Industries.

*Note on the two versions of how water reached storage tank 610.

Timelines of the alternate possibilities are constructed from the works of several Indian authors who collectively used interviews with plant staff, court depositions by plant staff, interviews with local residents and officials, UCIL executives and UCC technicians, and UCIL or UCC documents obtained during the post-disaster litigation. Most of the detail comes from Paul Srivastava, *Bhopal: Anatomy of a Crisis* (Cambridge, MA: Ballinger, 1987), and Sanjoy Hazarika, *Bhopal: The Lessons of a Tragedy* (New Delhi: Penguin Books India Pvt Ltd, 1987), who take different views but are careful to acknowledge areas of uncertainty. The initial exposition of the water-washing explanation was provided in an Indian government report, S. Varadarajan et al. "Report on Scientific Studies in the Factors Related to Bhopal Toxic Gas Leakage (New Delhi: Council of Scientific and Industrial Research, Dec 1985). The sabotage theory was developed by consulting engineers from Arthur D Little, Inc. commissioned by UCC to investigate the causes. It was publicly laid out in Ashok S. Kalelkar, "Investigation of Large-Magnitude Incidents: Bhopal as a Case Study," in I.Chem.E. Symposium Series No. 110 The Institution of Chemical Engineers 1988, p 561.

Version 1 in the timeline, favored by local and international trade union representatives, local activists, the Indian government, transnational environmental and consumer organizations, and most technical experts (see *Chemical and Engineering News* 4 July 1988) is based on known water-washing activities. Proponents of version 2, favored by UCC after its investigators were able to visit the plant in early 1985, point out that the water washing occurred a good distance away from the storage tanks and there is no evidence water ran through the connections from the washing area to the storage tanks. They also point to evidence that the pressure gauge on the pipe leading into Tank 610 was noticed to be missing when tank area was surveyed before 10 am on Dec 3rd and a replacement gauge was installed. (The most thorough summary of this version is Themistocles D'Silva, *The Black Box of Bhopal* 1993 who does state clearly that he was a UCIL employee – though not at the Bhopal plant – in the 1980s.) Even if sabotage were involved, no commentator thinks the saboteur was trying to cause a catastrophic gas leak; knowledge of safety hazards among the workers was spotty enough that very few of them understood the full effect of introducing water into the MIC storage tanks.

The controversy was sharpened in the course of the extremely acrimonious litigation between the Government of India and UCC. UCC first raised the sabotage allegation in 1985 and repeated it in 1988 but never named the suspected saboteur. A worker believing he is the suspect publicly challenged UCC to name the suspect and denied he had any involvement in the sabotage. UCC planned to wait until the trial before the Indian Supreme Court to do so; out-of-court settlement made that unnecessary and it never publicly revealed the full basis of its suspicions. In a FAQ section of its website on Bhopal (www.bhopal.com) Union Carbide's answer to the question of if there was sabotage why hasn't the company named anyone, it says the name is known to Indian enforcement authorities. While a useful way to avoid libel suits, the continuing refusal to provide a name response is interpreted as weakening UCC's claim by those who reject the sabotage theory.

Notice the contending versions of events between 9 and 11 pm on December 2nd only provide different explanations of how water got into MIC storage tank 610. Everyone who has studied the disaster agrees the injuries to neighboring residents were caused by an unneutralized cloud of leaked gas that escaped

through the vent, and the reaction producing this cloud was triggered by water contamination. Though the concrete shielding of the storage tanks cracked above Tank 610 (indicating its temperature got above 400 degrees F), the tank itself was found to be uncracked when inspected after remaining contents were neutralized and removed in mid-December 1984.

There is no substantial disagreement about the conditions of the safety systems that night or on the responses of the supervisors and workers after the small MIC leak was noticed around 11.30. Nor is there any significant disagreement about the inadequacy of contingency plans for in-plant response and evacuation of neighboring settlements, the poor communication about hazards with city and state authorities, or the insufficiency of warnings to surrounding settlements when the gas cloud formed. Descriptions of the extent and timing of action by city officials, state officials, army units in Bhopal, and national government officials also vary very little; controversy about government response is focused on the adequacy of actions in the days, months, and years following the disaster.

Bhopal Gas Disaster Chronology: Ensuing Litigation

1985

March UCC and Government of India investigatory teams conclude independently that runaway chemical reaction causing MIC gas cloud was caused by water getting into Tank 610.

March Indian Parliament adopts Bhopal Disaster Relief Act making Indian government the sole legal representative for all victims of the Bhopal disaster.

US Federal District Court consolidates all lawsuits pending in US about Bhopal gas leak into one case, *Union of India v. Union Carbide Corporation*.

Rest of year Victims and victim advocates complain about lack of effective relief.

UCC stock declines; total stock value of company in December put at approximately \$3 billion. UCC sells off assets (mainly petrochemicals and consumer product divisions) for \$3.5 billion and borrows \$2.8 billion to fend off \$5.1 billion takeover bid by GAF (General Aniline and Film, another specialty chemical maker)

1986

Government of India lawyers and UCC lawyers begin discussion of an out-of-court settlement. Union Carbide proposes a settlement amount of \$350 million under arrangements that it estimates will generate a fund for Bhopal victims of between \$500-600 million over 20 years. Government rejects this offer as insufficient. Indian and foreign activist groups supporting victims have already publicized their own estimates contending that damages are at least \$3 billion if loss of animals, loss of income from inability to work, loss of business in the weeks after the gas release, and related damages are also taken into account.

April U.S. Occupational Safety and Health Administration proposed a \$1.4 million fine against Union Carbide Corp, based on results of its September 1985 inspection of five of 18 plant units at Institute, West Virginia. OSHA alleges 221 violations of 55 health and safety laws, listing 72 of the 221 as "serious" (the category for violations creating conditions in which there is substantial probability of death or significant injury).

May US Federal District Court rules on a preliminary motion in *Government of India v. Union Carbide Corporation*; invoking *forum non conveniens* doctrine it determines that trials relating to injuries suffered in the Bhopal disaster should be held in India.

Sep Government of India proceeds against UCC in District Court in Bhopal, seeking \$3 billion in total compensation for 630,000 persons in Bhopal area.

Dec Bhopal District court orders UCC to hold \$3 billion in unencumbered assets as collateral while lawsuit pending. This is to prevent conscious run-down of assets, rumors of which were rife in USA and India at the time.

UCC offers \$50 million, then \$80 million in compensation, amounts derived from typical Indian settlements. Amounts widely criticized, viewed as insulting by victim groups, rejected by Government of India.

1987

Jan US Court of Appeals upholds US District Court ruling that Bhopal disaster litigation should proceed in India rather than the USA.

Rest of year UCC sells off last petrochemicals and consumer products divisions.

1988

Victim lawsuits continue in Indian courts. State of Madhya Pradesh also files criminal charges against Warren Anderson, then CEO of UCC, and several UCIL executives or plant supervisors for their roles in causing the disaster.

1989

Feb Under prodding by Indian Supreme Court, UCC and Government of India agree to a \$470 million settlement of all Bhopal gas leak-related claims. Supreme Court endorses settlement, making it binding on both parties. It also grants immunity against criminal charges arising from the gas leak.

The \$470 million is paid to the Government of India as sole legal representative of the victims.

36 special courts established in Bhopal to deal with applications for compensation.

Value of UCC stock rebounds somewhat with news of settlement.

UCC CEO Robert Kennedy (replaced Anderson in 1987) completes reorganization of UCC into a holding company with 3 main divisions: chemicals and plastics, industrial products, carbon products.

1990

Oct 2 groups of victims file class action suits in Texas alleging that India failed to represent them adequately because of government agencies' ownership of UCIL stock, and therefore did not secure them sufficient compensation. Consistent with norms of mutual respect for court decisions, US courts refuse to review the Indian Supreme Court's ruling.

Nov Government of Madhya Pradesh submits final list of names of victims to be compensated for injuries suffered in gas leak to Indian Supreme Court. Total deaths attributable to gas exposure put at 3,828.

1991

Oct Indian Supreme Court confirms compensation settlement, issues ruling modifying certain parts of 1989 judgment. These include UCC establishment of a trust fund to support a new hospital in Bhopal to treat victims' ongoing health problems and revoking immunities from criminal charges.

District Sessions Court in Bhopal reinstates charges of "culpable manslaughter not amounting to murder" and lesser charges relating to voluntary infliction of harm against Warren Anderson and 8 UCIL executives or supervisors.

1992

Apr UCC establishes the trust fund.

1993

Mar NY Times reports that India has paid 700 Bhopal claims; government attributes delay to complexities of verifying the claims given chaotic record keeping at the time. Victim advocates blame on government incompetence.

Oct US Supreme Court declines to review federal court decisions in 1990 cases dismissing suits against India.

1994

Apr Indian Supreme Court approves UCC plans to sell its 50.9% share of UCIL; proceeds to be given to Trust Fund for hospital in Bhopal.

Nov UCC completes sale of UCIL to McLeod Russell (India) Ltd. of Calcutta for approximately \$93 million.

Dec UCC provides initial payment of proceeds into Trust Fund.

Ten-Year Impact of Bhopal Disaster on UCC

	year ending 31 Dec. 1984	year ending 31 Dec. 1994
total assets	\$10,518 million	\$5028 million
capital	\$7962 million	\$2479 million
net sales	\$9608 million	\$4653 million
net income	\$323 million	\$379 million

R&D spending	\$265 million	\$136 million
employees	98,666	12,004

[from UCC annual reports]

1999

Jan UCC completed payments to Trust Fund, which now totals \$100 million. Construction of hospital is complete and physicians and other staff being recruited.

2000

Mar Class action suit, Bano v. Union Carbide Corporation, filed in US Federal Courts by Haseena Bi and other organizations representing residents of Bhopal seeking compensation for gas-leak related injuries and for further harm from exposure to contaminants afterward under US Alien Tort Claims Act.

Aug US District Court dismisses Bano case.

2001

Trust Fund-financed Bhopal Memorial Hospital and Research Centre begins treating patients.

2004

July Indian Supreme Court orders government to release all additional settlement funds to the victims. Indian newspapers report after all claims were paid there was still about \$327 million in the fund because of interest earned while the money was in escrow pending distribution.

Nov Indian nationals file Janki Bai Sahu v. Union Carbide Corporation in US Federal District Court. Suit seeks compensation for personal injuries claimed to be result of exposure to contaminated water and remediation work at former UCIL plant after the gas leak.

2005

Apr Indian Supreme Court grants Indian Government Welfare Commission for Bhopal Gas Victims request for an extension of deadline on distribution of remaining funds and extends it to April 30, 2006. Indian newspapers report that approximately \$390 million remains in the fund.

Dec US Federal District Court dismisses two of the three compensation claims raised in the Janki Bai Sahu case.

2006

Sep Indian newspapers report that the Welfare Commission for Bhopal Gas Victims has completed paying out all claims to listed victims of initial gas leak.

Nov The Second Circuit Court of Appeals in New York upholds the dismissal of claims in Bano vs. Union Carbide Corporation.

Federal District Court dismisses remaining claim in Janki Bai Sahu case.

2007

Mar A group of Indian citizens files a new class action suit, Jagarnath Sahu et al. v. Union Carbide Corporation and Warren Anderson, seeking compensation for damage to six individual properties allegedly polluted by contaminants from the Bhopal plant, as well as the remediation of property in 16 colonies [squatter settlements] adjoining the plant. Federal Courts issue a stay [suspension] of proceedings pending resolution of appeal in Janki Bai Sahu case as the issues in litigation are so similar.

<End>