DOCKET NUMBER
PROD. & UTIL. FAC. 50 329,330

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the Matter of	)	
	)	Docket Nos. 50-329
CONSUMERS POWER COMPANY	)	
	)	50-330
Midland Plant, Units 1 and 2	)	

DOW RESPONSES TO SAGINAW INTERROGATORIES

The following are Dow's Responses to those Interrogatories served by the Saginaw Intervenors by mail on March 22, 1971 to which Dow is not simultaneously herewith serving notice of its objections:

Interrogatory No. 233

In specific response to Saginaw/Dow Interrogatory No. 233, and in general response to those portions of other Saginaw/Dow Interrogatories seeking information with respect to Dow's plans to introduce evidence at the Hearing:

Dow does not presently intend to call any witnesses or offer any documents into evidence at the Hearing.

Dow expects only to be responsive to requests of the Hearing Board and Applicant and other parties.

To the extent that there may be controversy with respect to issues on which Dow has special expertise, such as the geological effects of brine mining over the years or possible synergistic consequences of the Dow chemical plant location adjacent to the proposed nuclear plant, Dow expects that its personnel will be called as witnesses by Applicant or at the initiative of the Board or some other party.

Dow does expect to continue to participate in a manner similar to its participation to this point, with the purpose of trying to help expedite conclusion of this proceeding.

The identity of any Dow personnel whom Applicant presently intends to call as witnesses, or of any Dow documents which Applicant intends to introduce, will be furnished to Applicant at Applicant's request, and presumptively will be included by Applicant in its responses to the Saginaw/Applicant interrogatories as and to the extent they are answered by Applicant.

Interrogatory No. 240

I. Detection Equipment

A. Type	Manufacturer	Detecting
Ultra-Violet Analyzer	The Dow Chemical Co.	Halogenated Organic

Type	Manufacturer	Detecting
Infrared Analyzer	Mine Safety Appliance Corp.	Organic
	Perkin-Elmer Co.	Halogenated Organ
	The Dow Chemical Co.	Acid Gas
	Perkin-Elmer Co.	Acid Gas
	The Dow Chemical Co.	Halogenated Organ
Photometric	The Dow Chemical Co.	Halogen
	Research Appliance Corp.	Suspended dust
Coulometric	The Dow Chemical Co.	Halogen
	Atlas Electric Co.	Oxidant
Amperometric	Fischer & Porter Co.	Halogen
	The Dow Chemical Co.	Odor
Conductimetric	Beckman Instrument Co.	Hydrocarbons
	Scientific Industries Inc.	Acid Gas
	The Dow Chemical Co.	Acid Gas
	The Dow Chemical Co.	Halogenated Hydrocarbons
Titration Recorders	The Dow Chemical Co.	Halogen
Colorimetric	Wilkens-Andersen Co.	Acid Gas
Radiation Detector	Victoreen Instrument Dividion-Cleveland, Ohio	Gamma Rays
Potentiometric	The Dow Chemical Co.	Halogen
Gravimetric (Dust fall jars)	The Dow Chemical Co.	Particulates
Sulfate candles	The Dow Chemical Co.	Acid Gas
Filtration	Gelman Instrument Co.	Suspended dust

II. Control Equipment

A. Type	Wet Collectors	Controlling
Packed	Scrubber	Odor Control Halogen Control Acid Gas

	Type	Wet Collectors	Controlling
	Venturi	Scrubber	Particulate
	Venturi	Jet Scrubber	Halogen Odor Acid Gas
	Centrifugal	Wash Collector	Soluble Particulates
	Cyclonic	Scrubber	Soluble Particulates
	Demister	Scrubber	Acid Gas Entrainment
	Condensors		Organic Vapor
B.	Type	Dry Collectors	Controlling
	Bag Filter		Organic Dust
	Cyclone		Organic Dust
	Centrifugal	Separator	Organic Dust
	Charcoal		Organics
	Conservation	Vent	Organic Vapor
C.	Type	Chemical Reaction	
	Oxidation		Odor

(E. S. Shannon, Manager, Waste Control, Dow Midland Division)

Interrogatory No. 244

Those employees who have expertise in nuclear technology and who are currently directly associated with matters relating to the Midland power plant are:

(a) Radioactivity Measurements

Fred A. Blanchard, Ph.D. Physics, University of Cincinnati, employed in the Radiochemistry Research Laboratory,

The Dow Chemical Company since 1951.

Irene T. Takahashi, Ph.D. Analytical Chemistry, University of Washington, employed in the Radiochemistry Research Laboratory, The Dow Chemical Company since 1959.

Arthur Kamp, B.S. Chemistry, Clarkson College, Potsdam, New York, employed in the Radiochemistry Research Laboratory, The Dow Chemical Company since 1968.

(b) Industrial Hygiene

Joel B. Charm, M.S. Radiation Biology, Health Physics, University of Michigan, employed in the Industrial Hygiene Section, Chemical Biology Research Laboratory, The Dow Chemical Company since 1968 as Research Environmental Health Engineer.

Lawrence G. Silverstein, M.S. Radiation Biology, University of Rochester, Certified Health Physicist, employed in the Chemical Biology Laboratory, 1955 to 1969, Manager of Safety and Industrial Hygiene, Midland Division 1969 to date.

There are numerous other Dow employees with expertise in various fields of nuclear technology, but who are not involved to any substantial degree in the Midland nuclear project.

Interrogatory No. 250

Yes.

Interrogatory No. 253

See attached Exhibits "A", "B", "C", "D" and "E".

(R. E. Reinker, Manager, Basic Operations, Dow Midland Division)

Interrogatory No. 257

Dow has never contended, and does not now contend, that there will be any affirmative and direct health benefits received from a person being exposed to any radiation which might result from the proposed Midland plant.

Interrogatory No. 261

The site of the proposed Midland plant was selected by Applicant and not Dow. However, Dow believes that the need for process steam was an important factor in siting the plant in proximity to its point of use, because any significant geographical separation between production and use of process steam would involve such substantial capital investment to avoid heat loss as to render such supply uneconomic.

Interrogatory No. 274

No. Applicant has made such projections.

Interrogatory No. 275

(a) Yes; twenty years but cancellable by Dow at the end of the seventh or any succeeding year upon two years prior notice to Applicant; monthly upon receipt of a bill from Applicant.

(b) The contract between Dow and Applicant will automatically terminate on July 1, 1971, if Applicant has

not received a final, unappealable construction permit from the Atomic Energy Commission, unless the termination date is extended as it has been on several previous occasions.

(c) Dow understands that a copy of the Dow/Applicant contract is being produced by Applicant for Intervenors' inspection.

Interrogatory No. 276

None.

Interrogatory No. 277

Dow knows of no such consideration.

Interrogatory No. 278

No.

Interrogatory No. 279

No.

Interrogatory No. 280

Dow knows of no studies indicating that radiation can be either more or less harmful, at the levels to be expected from the Midland nuclear power plant, to persons living or working in the greater Tri City area as a result of having worked or lived in an industrial community such as Midland, Michigan.

(Joel B. Charm, Research Environmental Health Engineer, and Howard Spencer, Research Scientist, Chemical Biology Research Laboratory, Dow Corporate Division)

Interrogatory No. 281

No. Dow has no reason to believe, with respect to the building of the proposed Midland nuclear power plant, that there will be any increased risk of emphysema and lung diseases in the Midland, Michigan area as compared to the other parts of the State of Michigan. (Charm and Spencer)

Interrogatory No. 282

Dow knows of no surveys or studies in Midland or surrounding counties dealing with the incidence of radiation induced leukemia, cancer or other diseases; nor does it have any reason to believe there will be any increased risk of leukemia, cancer and other radiation induced diseases in connection with the proposed Midland nuclear power plant. (Charm and Spencer)

Interrogatory No. 284

No officer of Dow has ever asked Consumers Power to contribute proportionately or to contribute any amount to the cost of the trip to Oak Ridge, Tennessee in 1970, by persons who later became members of intervenor Midland Nuclear Committee.

Interrogatory No. 287

Careful consideration has been given to the effect of train wrecks on the C & O Railroad with regard to

interaction with the Midland Dow plant site.

Credible events considered include the maximum hazard potential associated with a train wreck itself occurring within the fence lines of The Dow Midland plant (i.e., west of Saginaw Road to the junction of the C & O tracks and the Tittabawassee River at State and Main Streets in Midland). The primary potential was considered as well as the likely secondary effects -- i.e., interaction with Dow production facilities.

Conceivable events resulting from a train wreck along the main line of the C & O, where through trains are limited to 20-25 mph passing speeds, include explosions, fires, and puncture of tank cars containing toxic vaporizable liquids.

In the case of explosions, the design criteria for the reactor buildings at the Midland nuclear power plant is for a 2.5 psi positive external overpressure (see PSAR 5.1.1.27, Amendment 8). Using the standard U. S. Government shock-wave explosion parameter curves (TM 5-1300/NAVFAC P-397/ AFM 88-22, Figure 4-12, attached), an overpressure of 2.5 psi at the nuclear plant would require a single explosion of about 2,000 tons (4,000,000 lbs.) of TNT at a point 3,600 feet to the northeast of the plant on the C & O tracks very near to the Saginaw Road C & O crossing. Explosion sites in the C & O yards N.W. of Dean Station also would be about 4,500 ft. north of the nuclear plant and would require about 3,500 tons of TNT for 2.5 psi overpressures. A hypothetical

explosion inside the Dow fence near 11th and G Streets (7,000 ft.) would require about 14,000 tons of TNT to create a 2.5 psi overpressure at the nuclear plant.

No lawful train manifest of any combination of reactive chemicals could produce a single explosion equal to 2,000-2,500 tons of TNT (40 to 50 rail cars). There are no concentrations of reactive, explodable chemicals within the Dow plant with yields of more than a very small fraction of the required minimum in either a single explosion or in a sequence of explosions.

It is, therefore, concluded that no credible train accident with or without interaction with Dow facilities could produce an explosion with forces exceeding design criteria of the reactor buildings at the Midland nuclear power plant.

Large scale fires resulting from wrecks of tank cars containing flammable low-boiling liquids are recorded and credible events. However, even massive involvements of 10 to 15 cars (e.g. Crescent City, Illinois, June 21, 1970) of propane and similar materials involve only areas within a few hundred feet of the right-away. (Radiation heat fluxes from massive fires are insignificant beyond 500-1,000 feet.) It is concluded that no credible fire could occur in the C & O rail yards or on Dow property of physical significance to the nuclear site.

The release of toxic vapors from low-boiling liquids transported regularly in tank cars is a credible event. Puncture of car walls with broken rails or other moving objects can occur as well as damage to valving on the loading dome. The most hazardous chemical transported by the C & O from or to the Dow plant is considered to be chlorine, which is non-flammable and heavier than air. Any chlorine spill upwind of the nuclear plant will presumably produce some concentration of chlorine at the site for a period of time.

The concentration of vapors downwind is readily calculated for various meteorological conditions of wind and temperature, etc. As per Figure 3-6E, F*, the concentration of vapor in gm/m^3 for Class F stability and a three (3) meter/sec. wind at a site 1,200 meters (4,000 feet) directly downwind of a spill will yield a concentration of 5×10^{-4} gm/m^3 per 1 gm/sec. released at a point source. At 3,000 meters (10,000 ft. or roughly the Dow No. 2 gate) the concentration will be about $1.5 \times 10^{-4} gm/m^3$. Accordingly, a point source release rate of about 1.4 lbs/minute will give a concentration of $3 \times 10^{-3} gm/m^3$ at 4,000 feet downwind or about 1 ppm of chlorine which is about the recognized TLV. Higher ppm levels require proportionally higher releases.

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*Workbook of Atmospheric Dispersion Estimates, D.B. Turner, U.S. Public Health Service, Pub. No. 999-AP-26.

Credible chlorine point source or line source release rates of 250 lb./min. or respectively 5-15 lbs./hr./ft.^{2} of a liquid pool are possible. Broken lines may vent several hundred pounds a minute from a warm Cl_2 car. Pools of Cl_2 in a ditch from a punctured railcar will evaporate Cl_2 at rates of about 3 lbs./hr./ft.^{2} on a hot summer day with incident solar radiation alone of 360 BTU/hr./ft.^{2}. Convection from air and conduction from the ground add to the amount. Total emission rates exceeding about 10 lbs./minute/ft.^{2} will produce ppm levels at 4,000 ft. on level ground or 30 lbs./minute/ft.^{2} at 10,000 ft. that would require air treatment at a downwind site to protect personnel from unsafe Cl_2 levels. Spills with continued emissions for several hours are possible where spill depths after release are "inches deep" unless covered with protective foam or pumped up. However, complex incidents involving fires, etc., may preclude immediate preventative measures and downwind facilities need appropriate air cleanup systems or total recycle air systems.

This information has been supplied to Consumers Power Company in order that they can provide such systems. Based on actual experience, Dow foresees no problems in designing appropriate air cleanup systems or total air recycle systems to cope with any such releases, including

warning devices to activate any such systems.

Preventative measures to eliminate the hazard potential of train wrecks and possible subsequent fires, explosions, etc. are already in daily practice. Railroad car design, operation, and maintenance preanticipate minor derailments with no damage to contents. Rail practice in the Dow plant involves about 100,000 switches a year. Activity in the C & O yards is greater. Numerous trains move through the yards daily. No rail incident has ever occurred at the Midland plant site of any significant hazard potential.

In conclusion, with the exception of a release or spill of chlorine or other materials of comparable hazard, no credible accident or chain of events could happen which would begin with an accident on the C & O rail tracks inside the Midland Dow plant boundaries that can create an operational difficulty at the Midland nuclear plant site.

Documents pertinent to the foregoing Response, copies of which are attached as Exhibits F, G and H, are:

Exhibit F: U. S. Dept. of Defense, TM 5-1300/NAVFAC P-397/ AFM 88-22, Fig. 4-12. Shock wave parameters for hemispherical TNT surface explosion at sea level.

Exhibit G: "Freight Train Derailment and Fire, Crescent City, Illinois," Fire Journal, November, 1970.

Exhibit H:"Work Book of Atmospheric Dispersion Estimates", Figure 3-6E,F U.S. Public Health Science Publication No. 999-AP-26.

(W. C. Brasie, Process Specialist, Process Systems Engineering, Dow Midland Division)

Interrogatory No. 288

None, except for stand-by fossil-fuel fired steam boilers with sufficient capacity to supply steam necessary to prevent freeze-up of processing and storage facilities and product or water transfer lines, and to maintain building temperatures above 32°F. Dow knows of no accident likely to occur as a result of the cessation of the equipment specified following a total cessation of the process steam.

Interrogatory No. 292

Dow believes that Interrogatory 292 refers to a meeting between Applicant and Midland City Officials, at which W. L. Tisdale, Dow Assistant Manager of Industrial Relations, Midland Division, and Robert Westjohn, Manager of Dow Plant Security, were present. Dow's acceptance of the conclusion expressed, is based upon its observations of employees leaving the Dow and Dow Corning plant premises at the end of their regular work days at 4:30 and 5:00 p.m. These observations indicate that by utilizing existing traffic flow patterns, conveyance by automobiles transporting the

evacuated employees of the Dow and Dow Corning companies to outside the City boundaries could be accomplished within about one hour.
(W. L. Tisdale, Assistant Manager, Industrial Relations, Dow Midland Division)

Interrogatory No. 293

Coordination of each of the units referred to at Page 2C-30 of the PSAR and in Interrogatory 293, along with Dow Plant Protection, will be accomplished through and under the direction of Dow Emergency Field Headquarters within the Dow plant. The headquarters will be under the supervision of one of the several executives assigned to be in charge of headquarters on a weekly basis. Details of the plan are set forth at PSAR Pages 2C-34 through 2C-36.
(Tisdale)

Interrogatory No. 294

Fortunately, Dow has had no plant-wide evacuation within the last five years, so that there has been no real emergency test of an evacuation plan similar to that which will be introduced with operation of the Midland units.

Dow's experience in emergency plans, however, will be helpful in assisting Applicant to develop the emergency and evacuation plans in connection with the proposed Midland units. Each of the 600-800 units within the Dow plant has

its own written emergency plan, which is updated as frequently as required, but at least once every two years. These several hundred different plans are coordinated and supervised by the Dow Plant Emergency Committee, which reports to the General Manager, and which is assigned the function of being sure that Dow plans and procedures are current and implemented.

From time to time during the last five years there have been limited problems, including loss of service water due to a water main break which in turn caused electrical outage, loss of utilities due to lightning and fire. The reports of these episodes are voluminous.

In addition, the following simulated problems have been covered in developing Dow's emergency plans at its Midland plant:

A. Hydrocarbon fires and explosions

B. Chlorine leaks and leaks of other corrosive materials

C. Loss of utilities (electrical power, cooling water)

D. Flammable gas releases

E. Tornados

(Tisdale)

Interrogatory No. 295

(a) Applicant.

(b) Dow has not seen the subject document.

(c) Dow does not know who the civil authorities will be; see page 2C-34 of Preliminary Safety Analysis Report (Amendment 2, dated May 28, 1969) for the "authorities" designated by Dow.

(d) Yes. Letter, 1/22/70, Harold Bosscher to Robert D. Allen, attached as Exhibit I.

Interrogatory No. 307

In locating future production, storage, or other facilities at its Midland site, Dow will give consideration to whether such facilities could create a potential hazardous exposure to Applicant's Midland nuclear power plant.

If there is any such potential, Dow will consult with Applicant before siting the facility.

See memoranda of J. F. Maddox, dated 12/17/69 and 8/12/70, attached as Exhibits J, K and L.

Interrogatory No. 308

(a) and (b) To the best of Dow's knowledge, Applicant has made no final determination on the number of tertiary heat exchanger units.

(c) See Amendment 18, dated September 15, 1970, to Preliminary Safety Analysis Report.

(d) Dow has no information with which to answer this interrogatory other than that contained in the Preliminary Safety Analysis Report.

Interrogatory No. 311 (e)

See Responses to Interrogatories 253, 287, 295 and 307.

Dated New York, New York

March 29, 1971

Respectfully submitted,

KAYE, SCHOLER, FIERMAN,
HAYS & HANDLER
Trial Attorneys for The
Dow Chemical Company

Exhibit "A"

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

STATE OF MICHIGAN

AIR POLLUTION CONTROL COMMISSION

NOTICE OF DETERMINATION

In the matter of an application for a variance dated October 18, 1968 and entered into the record of the meeting of the Commission of December 17, 1968, the Dow Chemical Company of Midland, Michigan, with reference to the installation of control devices and all other installations and procedures necessary in the control of air pollution from the aforesaid corporation's manufacturing operations in the state of Michigan.

WHEREAS, the Commission considered this application at meetings of record held on December 18, 1968 in the City of Lansing, Lansing, Michigan, and on April 29, 1969 in the City of Midland, Midland, Michigan, and on June 17, 1969 in the City of Lansing, Lansing, Michigan; and

WHEREAS, the statements made and filed with the Commission by the Dow Chemical Company and the statements made and filed by the Commission staff appear in the minutes of the aforesaid meetings; and

WHEREAS, the action and determination of the Commission on this application appears in the record of the Michigan Air Pollution Control Commission meeting of June 17, 1969; therefore

PURSUANT to the powers and duties of the Michigan Air Pollution Control Commission as provided in Act 348, Public Acts of 1965, the Michigan Air Pollution Control Commission adopted the following order of determination:

The Commission approves of a variance for a six month period with the following stipulations:

1. The Dow Chemical Company, either alone or jointly with Consumers Power Company, shall submit a detailed report revealing the proposed nuclear base power plant construction schedule and indicating whether the schedule is being satisfied. The report shall also indicate any unusual conditions which can conceivably delay the construction project.

2. The company shall investigate on a thorough search basis the availability of low sulfur coal in the event that its use becomes necessary in the future.

3. As the result of recent promulgation of ambient air quality criteria for sulfur oxides by the federal government study techniques should be applied in Midland so that the prevailing levels of sulfur dioxide can be determined in different sections of the community.

4. The Commission requests that the Dow Chemical Company initiate a more extensive series of air pollution measurements than those conducted up to the present time and take steps to enable the implementation of temporary control measures so as to effect reductions in the release of air pollutants from the power plant facilities should such measures ever become necessary.

PRESENT AND VOTING:

John C. Soet, Acting Chairman
Commissioner James A. Kelly
Commissioner Stanley Quackenbush
Commissioner Richard Rasmussen
Commissioner George Reicks
Commissioner Arthur E. Slaughter
Commissioner Merle Solomon

R. Gerald Rice

Chairman
R. Gerald Rice, M.D.

6-19-69

EXHIBIT "B"

STATE OF MICHIGAN
DEPARTMENT OF PUBLIC HEALTH
MICHIGAN AIR POLLUTION CONTROL COMMISSION
3500 N. LOGAN, LANSING, MICHIGAN 48914

WILLIAM G. MILLIKEN, Governor
R. GERALD RICE, M.D., Director
Acting Director

January 29, 1970

Mr. R. E. Reinker
Basic Operations
The Dow Chemical Company
Midland, Michigan 48640

Dear Mr. Reinker:

This is in reference to the application of the Dow Chemical Company dated January 20, 1970 for an extension of the variance granted to the company by previous action of the Michigan Air Pollution Control Commission on June 17, 1969.

The Michigan Air Pollution Control Commission acted on your application at a meeting of record of January 20, 1970 and approved an extension of the expired variance for a six month period terminating on July 20, 1970 with the provision that the Dow Chemical Company appear before the Commission for a progress review at the end of the variance period.

Sincerely,

John C. Soet
Chairman
AIR POLLUTION CONTROL COMMISSION

JCS:rp

EXHIBIT "C"

WILLIAM G. MILLIKEN, Governor
[illegible], Director
Maurice S. Reizen, MD

STATE OF MICHIGAN
DEPARTMENT OF PUBLIC HEALTH
MICHIGAN AIR POLLUTION CONTROL COMMISSION
3500 N. LOGAN, LANSING, MICHIGAN 48914

September 29, 1970

Mr. R. E. Reinker
Manager
Basic Operations
The Dow Chemical Company
256 Building
Midland, Michigan

Dear Mr. Reinker:

This is to inform you of the action of the Michigan Air Pollution Control Commission with reference to your application for an extension of a variance granted to the company on January 20, 1970 with an expiration date of July 20, 1970.

At a meeting of record of the Commission on September 22, 1970 the Commission adopted the following resolution:

> The Michigan Air Pollution Control Commission approves of a six month extension of the variance beginning on September 22, 1970 and ending on March 22, 1971, contingent on the development of an alert or action program so that immediate and appropriate action can be taken in the event of a contaminant buildup.

Sincerely,

John C. Scot
Chairman
AIR POLLUTION CONTROL COMMISSION

JCS:rp

EXHIBIT "I"

WILLIAM G. MILLIKEN, Governor
MAURICE S. PETERS, M.D., Director

STATE OF MICHIGAN
DEPARTMENT OF PUBLIC HEALTH
MICHIGAN AIR POLLUTION CONTROL COMMISSION
3500 N. LOGAN, LANSING, MICHIGAN 48914

March 18, 1971

Mr. R. E. Reinker
Manager
Basic Operations
The Dow Chemical Company
256 Building
Midland, Michigan

Dear Mr. Reinker:

The Michigan Air Pollution Control Commission will meet in Lansing on April 19 and 20, 1971 at the Capitol Park Motel.

The Commission respectfully requests that you attend this meeting for the purpose of submitting a progress report on your company's air pollution control program which should include a description of the "alert" program which you are putting into action.

The item of business concerning your plant has been placed on the agenda for 2:30 p.m., April 20, 1971. We should appreciate receiving confirmation of your plans to attend.

Sincerely,

John C. Soet
Chairman
AIR POLLUTION CONTROL COMMISSION

JCS:bbh

Exhibit "D"

WILLIAM G. MILLIKEN, Governor
MAURICE S. REIZEN, M.D., Director

STATE OF MICHIGAN
DEPARTMENT OF PUBLIC HEALTH
MICHIGAN AIR POLLUTION CONTROL COMMISSION
3500 N. LOGAN, LANSING, MICHIGAN 48914

March 9, 1971

Dear Mr. Reinker -

3/12/71 -
Talked to Sub-Comm. of State Board received approval to postpone - we must be in April.

Mr. R. E. Reinker
Manager
Basic Operations
The Dow Chemical Company
256 Building
Midland, Michigan

Dear Mr. Reinker:

The Michigan Air Pollution Control Commission will meet at the Capitol Park Hotel in Lansing on March 16, 1971.

In view of the fact that your variance will expire in March the Commission respectfully requests that you appear at the time of its March 16 meeting for the purpose of bringing it up-to-date on air pollution control progress being achieved at your facility. You may wish to mention the alert or emergency control program which you have been asked to develop and the action you are taking in this regard. Also, you are advised to prepare a letter requesting a variance. This can be directed to the Commission before the meeting or submitted at the time of your appearance.

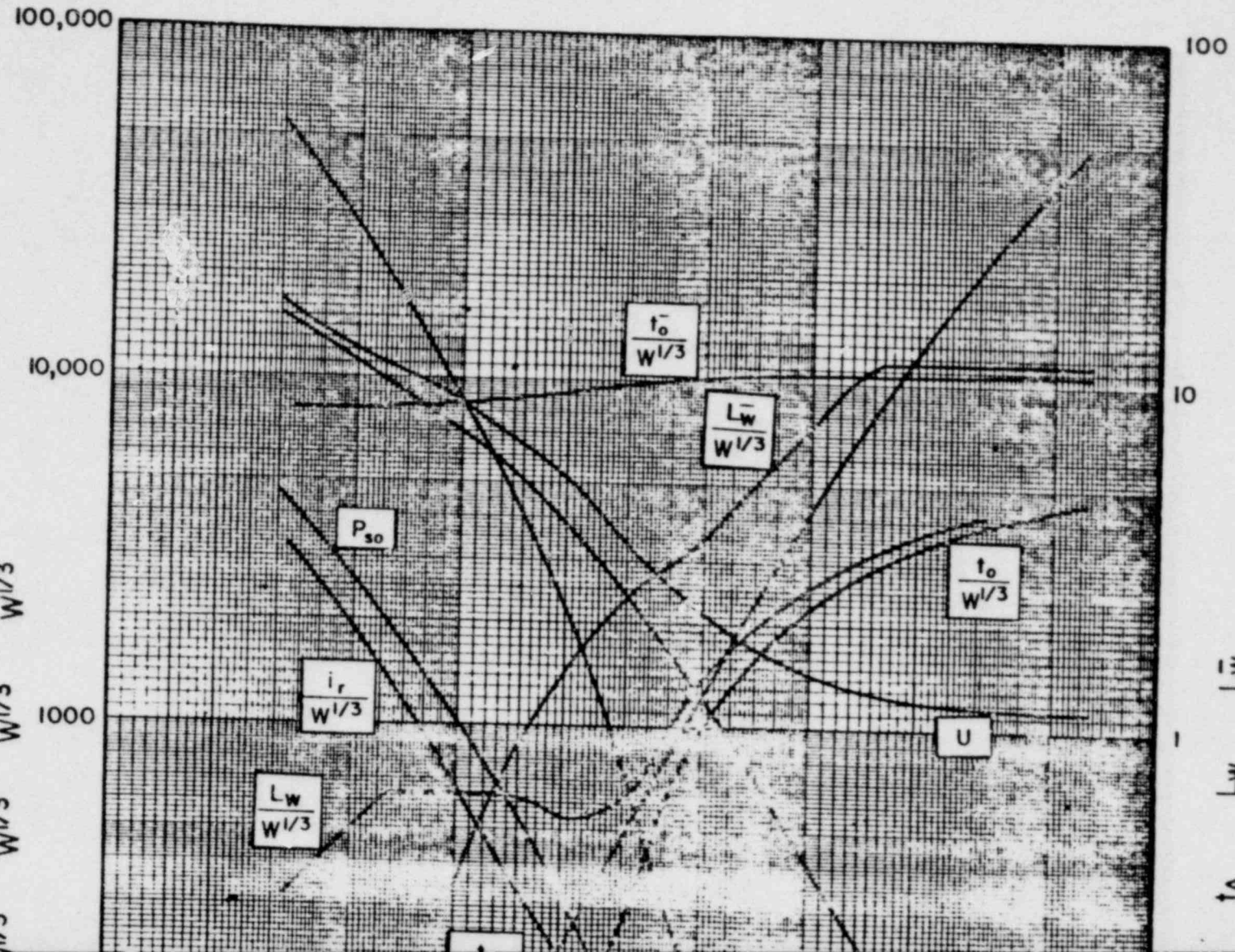
The item of business concerning your plant has been placed on the agenda for 10:30 a.m. We should appreciate receiving confirmation of your plans to attend the meeting.

Sincerely,

John C. Soet
Chairman
AIR POLLUTION CONTROL COMMISSION

JCS:rp

Exhibit 5



Surface explosion at sea level.

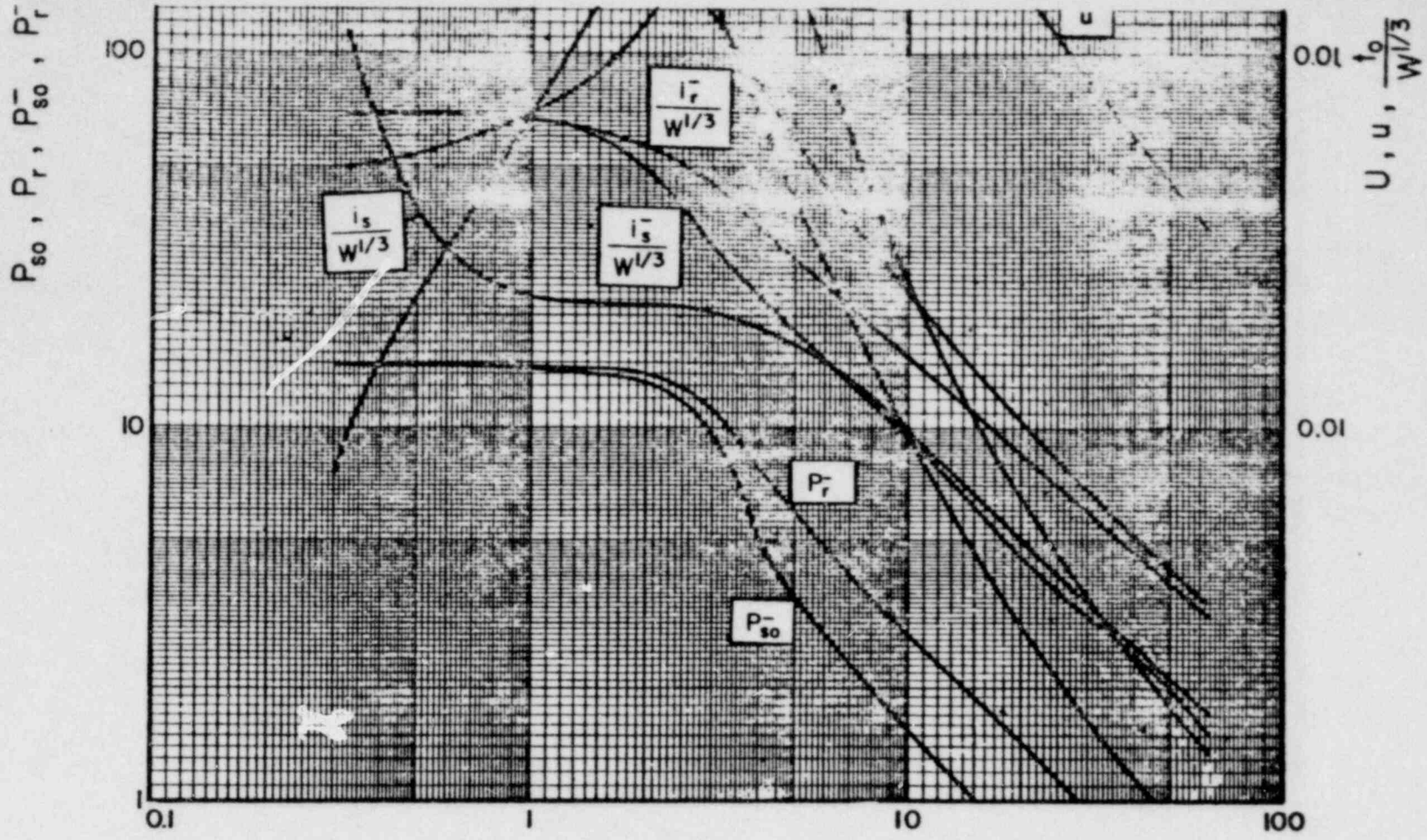


Figure 4-18. Shock-wave parameters for hemispheri

P_{so} = Peak Positive Incident Pressure, psi
P_{so}^- = Peak Negative Incident Pressure, psi
P_r = Peak Positive Normal Reflected Pressure, psi
P_r^- = Peak Negative Normal Reflected Pressure, psi
$i_s/W^{1/3}$ = Scaled Unit Positive Incident Impulse, psi-ms/lb$^{1/3}$
$i_s^-/W^{1/3}$ = Scaled Unit Negative Incident Impulse, psi-ms/lb$^{1/3}$
$i_r/W^{1/3}$ = Scaled Unit Positive Normal Reflected Impulse, psi-ms/lb$^{1/3}$
$i_r^-/W^{1/3}$ = Scaled Unit Negative Normal Reflected Impulse, psi-ms/lb$^{1/3}$
$t_A/W^{1/3}$ = Scaled Time of Arrival of Blast Wave, ms/lb$^{1/3}$

$t_o/W^{1/3}$ = Scaled Positive Duration of Positive Phase, ms/lb$^{1/3}$
$t_o^-/W^{1/3}$ = Scaled Negative Duration of Positive Phase, ms/lb$^{1/3}$
$L_w/W^{1/3}$ = Scaled Wave Length of Positive Phase, ft/lb$^{1/3}$
$L_w^-/W^{1/3}$ = Scaled Wave Length of Negative Phase, ft/lb$^{1/3}$
U = Shock Front Velocity, ft/ms
u = Particle Velocity, ft/ms
W = Charge Weight, lbs
R = Radial Distance from Charge, ft
Z_G = Scaled Ground Distance, ft/lb$^{1/3}$

FREIGHT TRAIN DERAILMENT AND FIRE

Crescent City, Illinois

LAURENCE D. WATROUS, *Supervisor, NFPA Fire Record Department*

ON JUNE 21, 1970, THE TRAIN that had passed daily for years through the center of the little community of Crescent City derailed, causing fires and explosions that destroyed the business district and many surrounding homes.

The photo above is by Anderson, Watseka, Illinois.

Toledo, Peoria and Western Railroad Train No. 20—P2 left Peoria, Illinois, with 56 loaded cars and 46 empties on its way to Effner, Indiana, for interchange with the Penn Central Railroad. The train, pulled by four diesel locomotives, was supposed to pass through Crescent City about 6:20 am; but somewhere between

Peoria, 90 miles west of Crescent City, and Gilman, six miles west of Crescent City, the journal bearing on the left lead wheel of the lead truck of a hopper carrying sand developed a hot box.

A man waiting for the train to pass at the grade crossing of U.S. Routes 45 and 54 at the east edge of Gilman noticed flames coming from the journal box as the train went by. When he saw tank cars following the burning hot box he got out of his car and tried unsuccessfully to attract the attention of the train crew. Unable to warn them, he returned to his car and drove to a nearby truck plaza, hoping to find State Police, who were often there. He was too late. As he entered the plaza's office the attendant was receiving a call from Crescent City reporting the wreck and requesting help from the State Police.

Officials say that the train was traveling between 41 and 49 miles per hour when the axle at the left lead wheel of the sand car burned off. With the wheel gone and the truck support hanging down just below the top of the tracks, the car continued for a considerable distance. When it reached the Route 49 grade crossing at the west edge of Crescent City, the hanging support struck the boards placed next to the tracks that formed the grade crossing and forced the wheels of the lead truck off the tracks. After the wheels and the truck support had bumped along the ties for about 1,000 feet the car encountered a switch track for a siding. The hanging wheels and the support caught in the switch track, which formed a large mass of weil-braced steel that forced the entire truck and the car off the track. As the sand car left the tracks it uncoupled from the head end of the train. Figure 1 shows the location of the derailment.

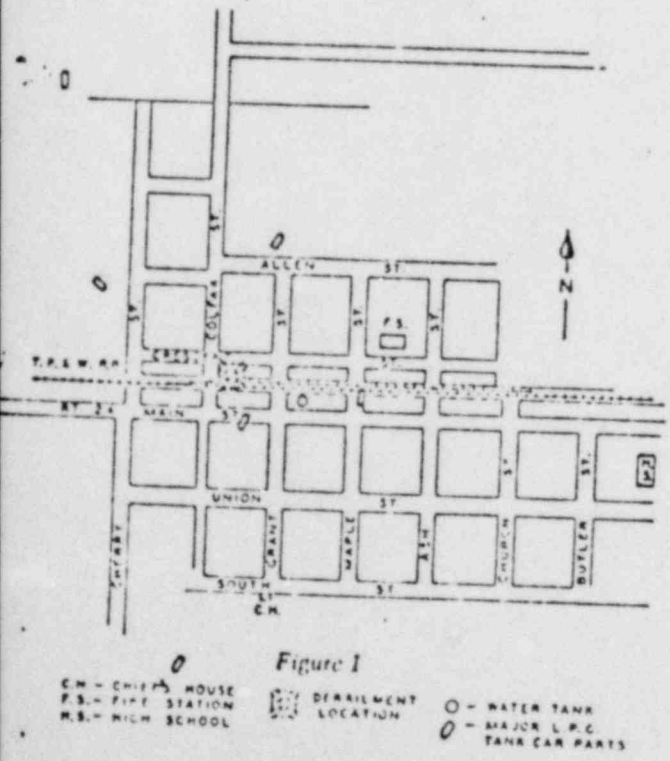


Figure 1

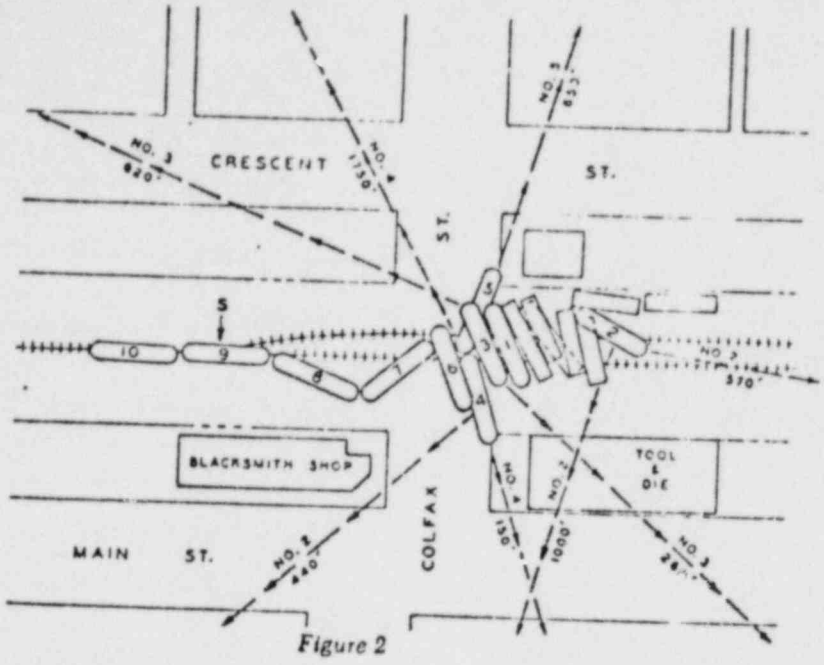


Figure 2

The location of cars after derailment. The arrows indicate the direction and the distance major portions of tanks traveled upon exploding. S is the location of the switch that caused the derailment.

LP-Gas tank car sequence: (1) No. 2's head punctured the side of No. 1, about 6:20 am. (2) No. 2 proceeded over the top of cars to rest on top of freight cars. (3) Liquid escaped from No. 1 and ignited. Hose streams were applied. (4) The relief valve on No. 3 relieved from exposure fire and torch was directed at No. 2. (5) No. 2 exploded, about 7:10 am. (6) No. 3 exploded. (7) No. 5 exploded. (8) No. 4 exploded. (9) No. 7 exploded. (10) No. 6 was cracked open by a piece of No. 7. (11) No. 8 exploded and drove No. 9 back one car length.

The sand car – the twentieth car from the locomotives – took the next 15 cars with it. In their order in the train, the derailed cars were three hopper cars containing sand, one flatbed car with farm machinery on it, one boxcar containing lead bars, one boxcar with rolled paper, and then 10 tank cars each containing 34,000 gallons of propane (see Figure 2). Two other tank cars containing propane remained on the tracks.

One of the derailed tank cars rode up and over the pile, ending up near the lead edge of the pile, just east of Colfax Street (Car 2 in Figure 2). As it passed over the derailed cars it tore a hole in another tank containing propane (Car 1 in Figure 2), causing the release of gas that produced the first fireball. This first fireball ignited a nearby house to the north of the tracks and a tool-and-die business to the south.

About this time Fire Chief Carlson was getting out of bed. He heard a strange bumping sound and went toward the window to see what the noise was. Before he reached the window there was a sound like "a thousand jet planes taking off together" and the sky lighted up. In his house, three blocks from the accident site, he could feel the heat of the fireball through the window. He

immediately activated the siren to alert his 20-man volunteer fire department.

The fire fighters responded to the scene with their two pieces of apparatus. One piece stopped at a hydrant at Colfax Street, just north of Main Street, and put a 2½-inch hose line into operation, cooling the cars and controlling a fire that was originating somewhere in the pile-up. The other piece of apparatus was positioned near the intersections of Grant and Main Streets to attack the fire involving the tool-and-die business. Those fires were not very large when the Fire Department arrived, but mutual aid was requested from surrounding communities because of the number and types of cars involved in the derailment.

Within a very short time the fire fighters realized that the electricity was out and that the public water supply pumps were not feeding the system.[1] The pumper at Grant and Main Streets relocated to an area beneath a 60,000-gallon water tank that stood about 500 feet east of the derailment. That pumper drafted from a six-inch-diameter shallow well and pumped into the system to maintain some semblance of water supply.

The fire fighters thought they were making progress on the fire, as it seemed relatively small, when at 7:10 am one of the LP-Gas tank cars exploded. One piece of the tank rocketed past the fire fighters standing near the water tank. The flying tank broke off utility poles 12 to 15 feet above the ground. It hit the ground 500 feet from where it had started and bounced another 75 feet, ending up in the middle of North Maple Street. The force of the blast blew the men into the street, along with railroad ballast, ties, and track.

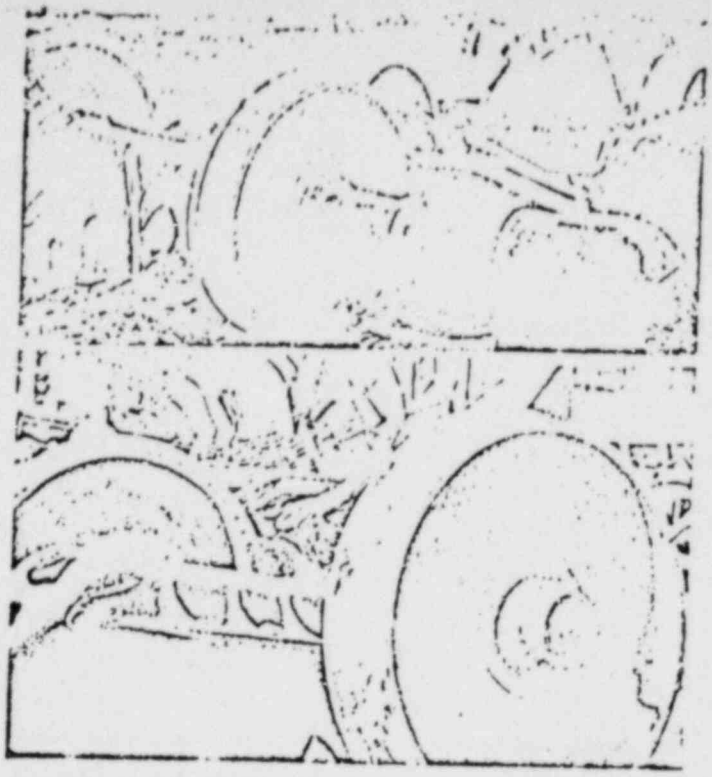
Police and private cars were immediately put into service to transport the injured to nearby hospitals. Mutual-aid fire departments that had responded regrouped and attacked the fire again. Portable drafting tanks were set up, as Crescent City's water supply had become nearly useless because of main breaks and the electric power outage. Every possible container was used to haul water from surrounding communities to the fire area for deposit in the portable tanks.

FIRE-FIGHTING

East

One mutual-aid company set up a portable pump to supply hand lines while the tanker shuttled water. Shortly after they were set up, an explosion blew a piece of tank car within 125 feet of where the men were operating. Three nearby houses were ignited when this blast occurred; however, when the tank stopped sliding toward the men they were able to advance quickly and douse the flames.

[1] The electric power had been put out of service by the accident.



Top, axle as it should be with journal box removed (foreground of photo); above, burned-off axle that caused the accident.

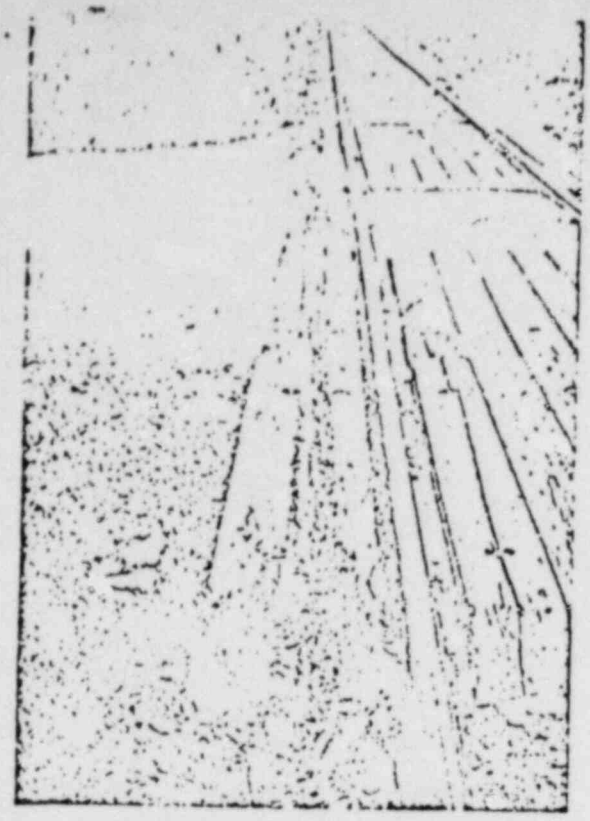
South

Other companies set up south of the fire and took their water supply from a portable tank. They hand-laid 2½-inch lines up to the back of the burning business buildings fronting on Main Street. Those lines kept the fire from spreading from the business area southward; but a wind from the north was blowing heat, smoke, and burning embers toward the fire fighters.

Some progress was being made when about 9:30 am another LP-Gas tank exploded, sending the men running for cover. Lines had been dropped and preparations had been made to remove the apparatus when still another tank blew, again sending the men for cover. They returned to their apparatus and moved them. When they were about two blocks south there was another blast. About 10:15 am the final blast sent them scurrying for cover for the last time.

North

On the north side a portable tank was set up and fire fighters extinguished a house fire near the tracks. Lines were laid to within 75 feet of the tracks and used to cool the tanks. The nearest water supply was in Gilman, eight miles away -- too far to be reliable. When the water ran out the officer ordered his men away, leaving the equipment and apparatus there in case water should



The truck support hit this grade crossing, gouging the road and resulting in derailment of the lead wheels.

arrive. About ten minutes after the water had run out a tank exploded; traveled through a wood-frame garage, then a house; caromed off another house; knocked down two trees; and ended up inside a third house about 650 feet from the tracks. The men returned to their apparatus and backed them out, leaving their equipment behind. The paint on the cabs of the apparatus was beginning to burn.

That explosion, the last one, occurred about 10:15 a.m., by which time most of the fire force was well away from the accident site. Fearing further explosions, officials decided to let the remaining fires burn for a while.

At 11:05 am the railroad sent a locomotive to remove the cars that remained on the tracks. The two LP-Gas tank cars still on the tracks were left there until 7:05 pm, when a second engine removed them.

Tank cars that were burning were allowed to burn. The last fire went out on Tuesday, June 23. In all, one tank car had been torn open, six cars had exploded, and three had burned at the relief valves or where holes had been punctured in the tanks by the explosions or by flying bits and pieces.

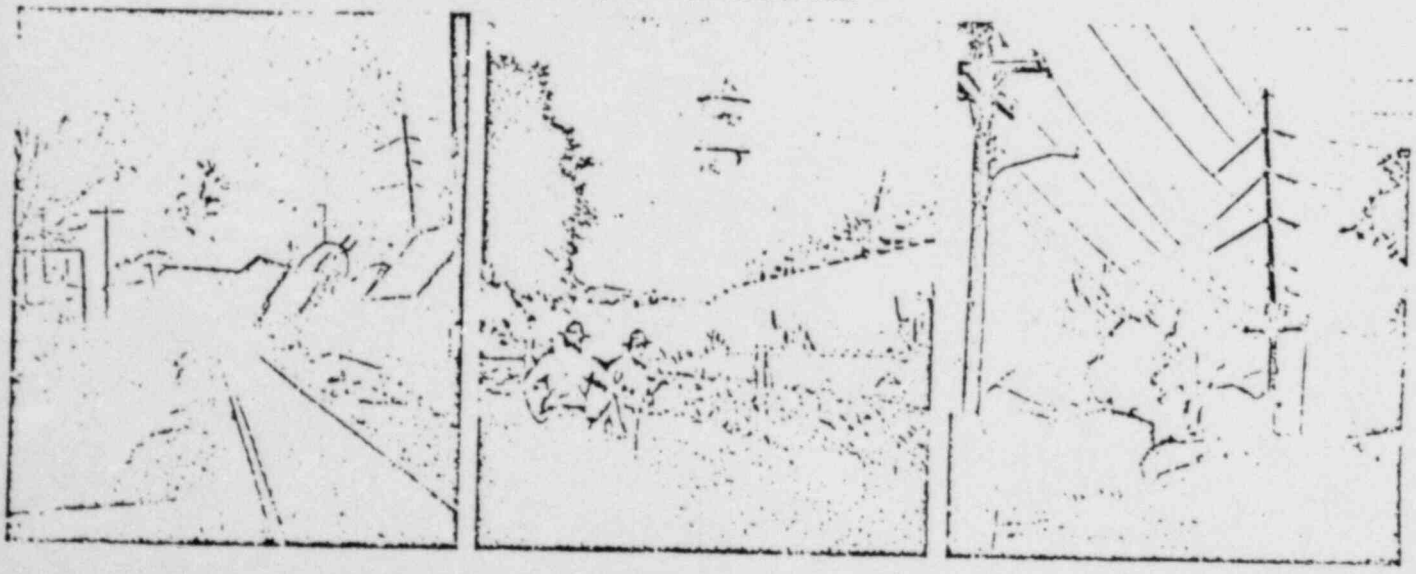
Thirty-four fire departments, supplying 250 men and 58 pieces of apparatus, worked at the fire scene. Twelve non-fire-related companies supplied tank vehicles to transport water. Civil Defense and Red Cross personnel set up a disaster center at the east edge of town at the high school. On Sunday and Monday 1,000 to 1,500 people were fed at the disaster center, and some used the sleeping facilities provided there.

Sixty-four people received treatment at one of the many area hospitals that accepted patients from the disaster. Several had to remain in the hospital more than two weeks because of the severity of their burns. The Illinois State Police, who started evacuating the town shortly after their arrival at 6:30 am, can take credit that there were no fatalities.

The Illinois State Highway Department sent nine trucks and five loader-grader units to help in the cleanup operations. Its equipment was used to remove burned-out buildings and to fill in open foundations.

(Continued on page 30)

Left, view from the east side of the derailment: The LP-Gas tank car in the foreground traveled over the pile, tearing another tank and thus causing the first fireball. At 7:10 am, shortly after this photo was taken, the tank car in the foreground exploded.
Center, view from the west side of the derailment: Two LP-Gas tank cars are still on the tracks.
Right, view from the north side of the derailment, at Colfax and Crescent Streets.



Freight Train Derailment and Fire (continued from page 13)

Chanute Air Force Base sent personnel for both fire-fighting and help in cleanup. Air Force personnel assisted in the reconstruction of the water supply and sanitary systems and supplied a generator to provide electric power for the pumps for the water supply system until the normal supply could be returned to service.

Many of the fire departments commented on the lack of a command post at the scene. The major reason for this difficulty was the size of the problem, along with the fact that the chief of the Crescent City Fire Department was one of the first to be taken to the hospital for burns. Without supervision, each fire company attacked a section of the fire almost individually. The extent of the fire, the constant threat of explosions, and the presence of different fire department radio frequencies prohibited any one chief from getting the full picture and taking command.

Many injuries resulted from the firemen's not wearing protective clothing or their wearing inadequate clothing. For example, the chief of Crescent City was about 1½ blocks away from the blast and behind 2½-story brick buildings when he was burned. The heat from the fireball came down on top of him and his men. Without gloves, their hands were burned. As they ran several of the men lost their helmets because they were not wearing their chin straps, and they suffered head burns. Others received arm burns because their coats did not have wristlets sewn in.

Crescent City will never forget June 21, 1970. Twenty-four individual living quarters (apartments and dwellings) and 18 businesses (about 90 per cent of the business district) were destroyed. Many other buildings received varying degrees of damage. The damage was so great that the city was declared a disaster area (consequently the Small Business Administration could offer loans at 3 per cent interest). Unofficial reports indicate that the damage went as high as three million dollars. Illinois Governor Richard B. Ogilvie, a tank commander in Europe during World War II, reportedly remarked that Crescent City resembled a small French town that had just been bombed. △

Industrial Fire Problems Exchange (continued from page 21)

assume many risks for which insurance will no longer be available.

7. Risk management teams will have to redouble their efforts to develop and implement effective loss prevention practices and procedures.

All the technical "know-how" to control fire will have to be applied every day of the Seventies. Our risk management team will require greater efforts from our security management and from our industrial fire protection staff. Disastrous fires cannot be tolerated.

All of us in our respective areas of work have the responsibility to protect our "going thing," our company and its business activity. None of us wants to experience loss and have to revert to an insurance policy to collect for that loss. We agree that there are things we can do to manage assets more effectively, to challenge the Seventies and offer ourselves as more effective risk managers.

Many industries, ours included, and perhaps your company also, have adopted the "profit center" principle of management. The plant manager has many of the prerogatives of an entrepreneur, and he is judged largely by the results shown on the last line of the plant's profit-and-loss statements. In many instances he may find it difficult to justify the return on investment for a capital expenditure for loss prevention, such as making an addition to a sprinkler system, upgrading carbon dioxide equipment, providing smoke-venting or draft curtains or a fire wall, or complying with other important recommendations of the insurance carriers.

But instead of placing too much emphasis on "profitability," perhaps we and our risk management team should recommend to the plant manager that greater consideration be given to accountability – accountability for continuity of operations and accountability for continuity of an adequate insurance program. After all, he is accountable for the protection of a portion of the corporate consolidated operating statement and the corporate balance sheet. He must protect it against fortuitous loss, i.e., all loss other than those losses of a business nature. He evaluates his plant's risks. With the help of the risk management team, he determines what risks can be reduced, how hazards can be controlled, what loss prevention and safety measures must be taken. He is responsible for developing and coordinating all the aspects of loss prevention, which provide a high degree of assurance that the plant will enjoy continuity of operations.

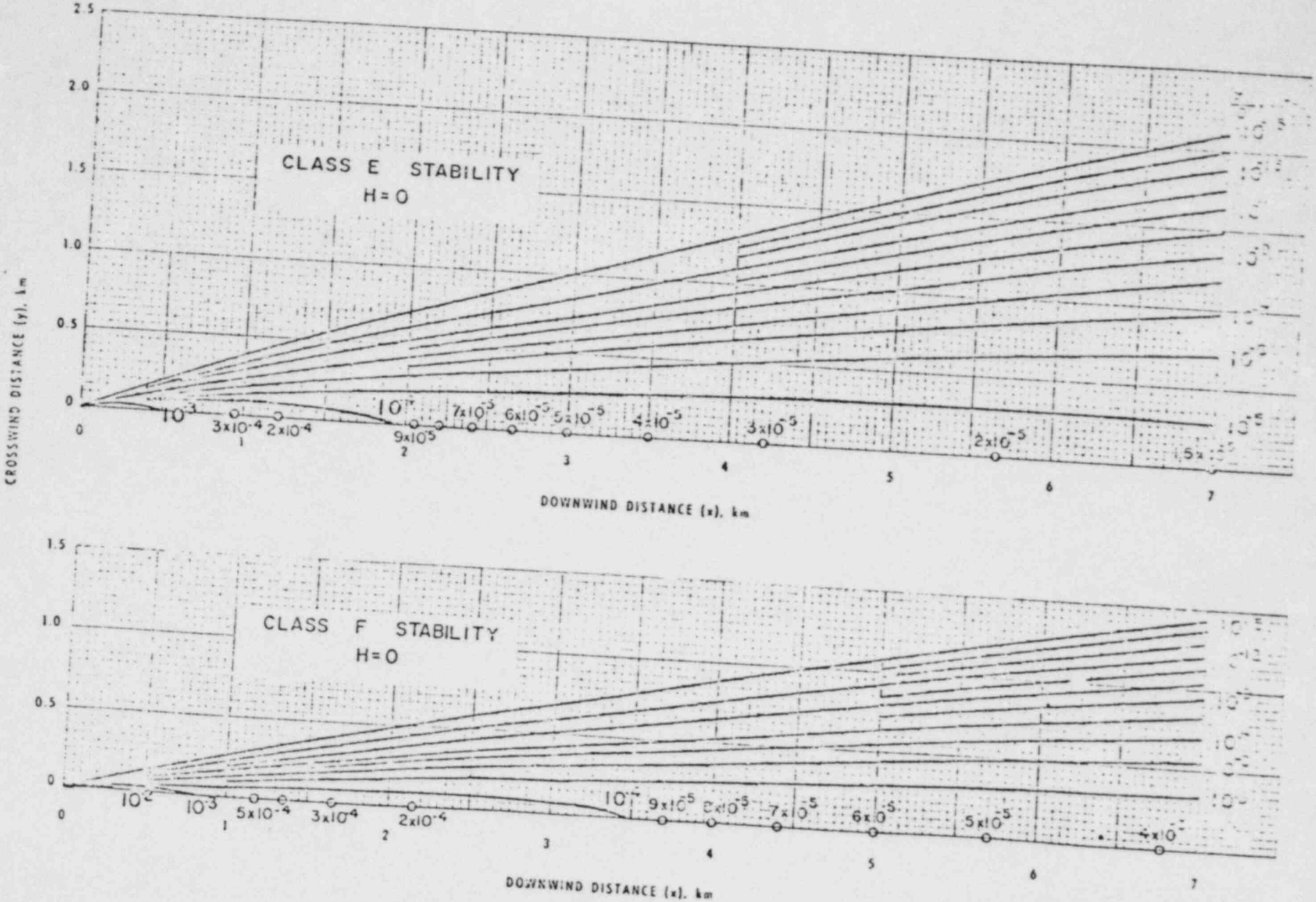


Figure 3-6E, F. Isopleths of χu Q for a ground-level source, E and F stabilities.

THE DOW CHEMICAL COMPANY
MIDLAND DIVISION
MIDLAND, MICHIGAN 48640

January 22, 1970

Mr. Robert D. Allen
Consumers Power Company
212 W. Michigan Avenue
Jackson, Michigan 49201

Dear Mr. Allen:

The Dow Chemical Company is agreeable to Consumers Power Company using the following statement in its application for licensing of the Midland Nuclear Plant and will comply with the provisions thereof:

> "Consumers Power Company will be cognizant at all time of persons within that portion of The Dow Chemical Company property which falls within the plant exclusion zone.
>
> Consumers Power Company will exercise the right to remove any persons from this Dow property when conditions warrant the removal of persons from within the exclusion zone."

Sincerely,

Harold Boschcher
General Manager
Midland Division

elh

bcc: R. E. Reinhcr
J. O'Connor

THE DOW CHEMICAL COMPANY

December 17, 1969

H. Bosscher, Midland Division Admin., 47 Bldg.
R. E. Reinker, Basic Operations, 256 Bldg.
H. A. Starks, Midland Division Admin., 47 Bldg.
J. N. O'Connor, Legal Department, 2030 Bldg.

Consumers Power Company needs a statement from us, relative to siting of future plants in Midland, to include in their application for licensing.

I submitted the attached statement to them after discussing with Jim O'Connor.

J. F. Maddox

In locating future production, storage, or other facilities at the Midland site, Dow will give consideration to whether such facilities could create a potential hazardous exposure to Consumers Power Company's nuclear power plant.

If there is any such potential, Dow will consult with Consumers Power before siting the facility.

J.F.M.
12/17/69

MIDLAND DIVISION
August 12, 1970

R. N. Chapman
Fire Protection Engineering
47 Building

A statement given to Consumers Power Company by Dow relative to location of new facilities is attached.

In reviewing fire and explosion hazards of new facilities or revisions of existing facilities, will you give consideration to the potential exposure to the nuclear power plant.

If there should be any questions, please contact me.

J. F. Holden
Nuclear Power Project
256 Building
636-3635

plw

Att.

cc: W. L. Tindale, 470 Bldg.
R. E. Rathbun, 255 Bldg.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In The Matter of	)	
CONSUMERS POWER COMPANY	)	Docket Nos. 50-329
(MIDLAND PLANT UNITS 1 and 2	)	50-330

STATE OF MICHIGAN
COUNTY OF MIDLAND

James F. Maddox being duly sworn disposes and says that he is Manager, Nuclear Energy Project, Basic Operations, Midland Division, The Dow Chemical Company, and that he has read the foregoing Responses to Interrogatories submitted by Intervenors Saginaw Valley Nuclear Study Group, et al, and that the same are true to his personal knowledge or upon the basis of his information and belief. Where another Dow employee has furnished information in specific response to one of the said interrogatories, that persons name and title are included at the end of the Response.

J. F. Maddox

Sworn to before me this 29th day of March, 1971

JOYCE E. PLYER
Notary Public, [illegible] County, Michigan
Acting in and for the County Midland
My Commission Expires July 31, 1972

Notary Public