

**GOVERNOR'S COMMISSION ON WILLOW ISLAND
REPORT TO THE GOVERNOR AND THE LEGISLATURE**

A CHRONOLOGY OF THE ACTIVITIES
OF THE
GOVERNOR'S COMMISSION ON WILLOW ISLAND

On April 27, 1978, fifty-one men lost their lives in the collapse of the cooling tower which was under construction at Willow Island, West Virginia. This was the worst non-mining industrial accident in the United States in nearly three decades.

Six months after the accident, Governor John D. Rockefeller IV signed Executive Order 15-78 creating the Governor's Commission on Willow Island. The Governor's order defines the Commission's primary purpose to be "to analyze and evaluate the findings of the Occupational Health and Safety Administration as to the cause of the tower collapse." The order also authorizes the Commission "to make such other inquiry as it deems necessary to determine the cause of the collapse, and to evaluate the facts and circumstances surrounding the collapse and how it might have been prevented."

Governor Rockefeller appointed nine members to the Commission. They are the Commissioner of the West Virginia Department of Labor, two members of the West Virginia Legislature, two representatives of the Willow Island Disaster Organization, two representatives of organized labor, one representative of the business community and one representative of the general public. The members are listed in Appendix A of this report.

On October 6, 1978, Governor Rockefeller announced the creation of the Governor's Commission on Willow Island. The magnitude of the disaster and the fact that significant questions had been raised made it

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imperative, he said, that an independent commission carefully analyze the findings of the OSHA report to guarantee that every possible step is taken to get to the cause of the accident to help prevent its recurrence.

On March 9, 1979, the West Virginia Legislature passed a bill continuing the Commission and expanding upon its powers, duties and responsibilities. Those powers, duties and responsibilities are:

- (a) To conduct a comprehensive and detailed investigation into the collapse, evaluate the facts and circumstances surrounding the collapse and determine, if possible, the cause or causes.
- (b) To analyze and evaluate OSHA's reports and findings and to report to the Governor and the Legislature.
- (c) To administer oaths, examine witnesses, subpoena persons, documents or other evidence or material as necessary.
- (d) To employ personnel as needed and to set reasonable compensation for such personnel.
- (e) To perform other acts necessary to carry out its responsibilities.¹

At the Commission's first meeting on October 16, 1978, it was decided that the first steps of the Commission's work would be to obtain OSHA's investigation report and to become familiar with the various technical

¹West Virginia Code §5-20-3 (a), (b), (c).

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aspects of the cooling tower construction method used at the Pleasants Power Station at Willow Island. To this end, the Commission directed Chairman Stephen L. Cook to send a letter via certified mail to Dr. Ray Marshall, U.S. Secretary of Labor, making specific requests for information. The letter was sent on October 20, 1978. The requests contained in the letter were as follow:

1. That he expedite the release of OSHA's final report and provide the Commission with a copy of it immediately upon its release, and that he indicate when the report would be issued.
2. That he direct the appropriate OSHA officials to release to the Commission all raw data gathered in the investigation irrespective of whether it was used in the compilation of the final report.
3. That he direct the appropriate OSHA officials to appear before the Governor's Commission on Willow Island on December 12, 1978 in Charleston in a public hearing to answer questions about general OSHA operations in West Virginia, exclusive of the Willow Island accident investigation. A partial listing of such questions was enclosed with the request.
4. That he direct appropriate OSHA officials to appear before the Commission on the same day to answer questions about OSHA's procedures associated with the investigation of the Willow Island accident.

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A partial listing of these questions was also enclosed with the request.

5. That he appoint an individual within his office to act as a direct personal liaison between him and the Commission in order to ensure a maximum amount of communication and cooperation of all parties.

The communication included a request for a reply by November 6, 1978. Since the Commission had received no reply by this date, the Commission directed the Chairman to send Secretary Marshall a telegram making the same requests. Receipt of the telegram was acknowledged, but no reply was made.

On November 22, 1978 the U.S. Department of Labor formally referred its investigative files concerning the cooling tower collapse to the U.S. Department of Justice for appropriate action. The Justice Department subsequently initiated its own inquiry into the disaster. Therefore, United States Attorney Stephen G. Jory of Elkins replied to Chairman Cook's communications of October 20 and November 6 on behalf of his department as well as Secretary Marshall. Mr. Jory's letter is included as Appendix E of this report. His reply, however, was only in reference to request number three. No response was ever made to the other requests. He said only that OSHA officials and representatives of the Department of Justice would attend the Commission's public hearing on December 12. He emphasized that the need to "maintain confidentiality and integrity of our investigation compels us to limit our cooperation . . ." He said that no information related in any way

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to the tower collapse, the ensuing OSHA investigation, or OSHA's procedures therein would be divulged. No information pertaining to the construction design, or patent for cooling towers, or the activities of the OSHA investigators in connection with the investigation could be revealed, he said. This limitation was required, according to Mr. Jory, by the fact that the continuing investigation by the Justice Department in this matter could be jeopardized by the premature disclosure of any information, and that such disclosure could also prejudice the rights of individuals.

With respect to requests number one and two, OSHA was totally uncooperative and did not comply with these requests. With respect to request number three, although OSHA appeared in Charleston at the hearing on December 12, 1978, its representatives were uncooperative in discussing the matters relative to the collapse of the cooling tower, thus rendering their testimony nonresponsive on these issues. With respect to request number four, although OSHA representatives appeared on December 12, 1978, they were uncooperative with regard to this request and adamantly refused to disclose any relevant information on the ground that it would adversely affect criminal prosecution by the federal government. It is noted that no criminal prosecution ever reached indictment, trial, or conviction stage, however. With respect to request number five, other than the appearance of Stanley Elliott, the State Administrator of OSHA, no staff liaison was ever created. Moreover, no one in OSHA was forthright or candid about the disclosure of information except when the Commission, with the assistance of the Governor and the Commissioner of Labor, expressed objections and when the Commission threatened to institute a law suit under the Freedom of Information Act to get access

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to certain information. Even after these efforts and methods were utilized to gain information the Commission is of the opinion that OSHA was not fully cooperative; and the Commission is not certain whether it has, to this day, received all the information to which it is entitled.²

However, even after criminal prosecution was abandoned, when OSHA representatives met with the Commission in March of 1980, OSHA was not candid and refused to answer many questions or had its attorneys attempt to respond to the questions with answers which were neither complete nor sufficient to satisfy the investigative needs of this Commission.

December 12, 1978 Public Hearing

The December 12, 1978 public hearing was held from 10:00 a.m. until 3:15 p.m. with all nine Commission members in attendance. OSHA officials present were Mr. Donald MacKenzie, Field Coordinator; Mr. Stanley Elliott, OSHA's West Virginia Area Director; and Mr. Harold Engel, Associate Counsel. Representing the United States Department of Justice were Mr. Mark J. Vogel, trial attorney; and Mr. Stephen G. Jory.

A substantial segment of the proceedings dealt with the allocation of OSHA's resources in West Virginia and the general impression that the resources were inadequate. It was disclosed that the West Virginia

²By way of example, as recently as the meeting in March of 1980, which was attended by a number of high level OSHA officials, the Commission was led to believe that OSHA had already provided it with all discoverable data, information and reports pertaining to the cooling tower collapse. However, when it became apparent to OSHA that OSHA might be criticized by the Commission in its report at its meeting of May 16, 1980, OSHA suddenly made available a new report disclosing additional facts concerning the cause of the collapse.

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compliance staff had an allocation of 16 persons at the time of the hearing, but two of those positions were vacant. That figure includes the area director who would not normally be making inspections. Of the 14 positions filled at the time of the hearing, seven of those individuals inspected safety matters such as those associated with the cooling tower collapse. The other seven are industrial hygienists who inspect for chemical and dust exposure and other health hazards involving workers.³ OSHA made 498 inspections in West Virginia in 1977, and 420 in 1978, according to testimony at this hearing. OSHA made 284 inspections in West Virginia in 1979 according to "Workers' Health News." There was one compliance officer in West Virginia per 1800 employers who employ 26,400 workers. Since only half of the compliance officers in the state are safety officers, it may be concluded that there was only one safety officer per 3,600 employers.⁴

Thirty-two percent of the OSHA inspections in West Virginia in 1978 were in the construction industry, 46 percent in manufacturing, and four percent in transportation. Of the total 420 inspections, 270 were made in response to complaints. Of the 270 complaint-generated inspections, 77 were in the construction industry. These figures include follow-up inspections.

³p. 131-132 of hearing transcript.

⁴It should be pointed out that the Safety Compliance Inspectors have no duty respecting the mining industry in West Virginia since all inspections of mines are performed by inspectors from the Mine Safety and Health Administration. It should also be noted that there are a substantially greater number of inspectors per employer and per employee in the mining industry than there are in the construction and manufacturing industries in West Virginia.

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Compliance officers typically use 30 percent of their time for administrative purposes, including training, and the remaining 70 percent of their time is effective field time. With approximately 185 workdays per year, according to Don MacKenzie, there were approximately 30 inspections per compliance officer in 1978. There are two kinds of compliance officers. One is a safety engineer where an average inspection takes about 36 hours, depending on the size and complexity of the operation and the number of safety problems it has. The second kind is an industrial hygienist whose average inspection takes about 56 hours. The long time is required for hygienists because of the instrumentation they use and the time involved in monitoring samples.

About 90 percent of the inspections conducted by West Virginia compliance officers are in response to complaints. No explanation for the lack of unannounced or "spot" inspections was given by OSHA other than the fact that OSHA was without sufficient staff and money. The high percentage of complaint inspections is typical of highly unionized states, according to Mr. MacKenzie, and the converse is also true. The lesser the degree of unionization, the fewer the number of complaints received.

At the time of the hearing, there were 23 states that had their own safety legislation which was acceptable to OSHA in lieu of federal administration. These are called 18-B states because they operate under Section 18-B of the Occupational Safety and Health Act. There was some discussion about what would be required of West Virginia in order for it to become an 18-B state. The minimum number of compliance officers would have been 16 or a number equal to that allocated to the state by OSHA at the time. OSHA officials at the hearing would not comment on

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what an optimum number of staff would be. The federal government participates at a 50-50 funding level during the developmental stage of a state's plan and may continue to participate on that level indefinitely, Mr. MacKenzie said. At least two states have dropped their 18-B plans due to the costs. In other states, the federal program has taken over the industrial hygiene portion of the plan because of the inability of the states to recruit and retain qualified people.

OSHA authorities in twenty of the 27 states with federal OSHA enforcement plans have requested additional resources to carry out their responsibilities. OSHA authorities in West Virginia are among them. The total operating budget for the Charleston Area Office in FY 1978 was \$496,686. In January 1979, there were 18 professional positions authorized in West Virginia, including eight Industrial Hygienists, one Safety Engineer, and nine Safety Specialists.

Although testimony at this hearing was not allowed to relate to the investigation at hand, one germane item did surface: The Occupational Safety and Health Act statutorily precludes criminal prosecution for violation of the general duty clause of the Act. Criminal willful violation must be a violation of a specific OSHA standard that results in the loss of human life. Employers cannot be cited for work habits, such as speedups, that cannot be related to specific OSHA standards. These limitations may be found in Section 5(a)(1) and Section 17(e) of the Occupational Safety and Health Act Public Law 91-596.

It is further noted that no criminal prosecution was commenced under state law, nor is there evidence that the matter was presented to a special or regular grand jury convened under state law.

The proceedings of the December 12 hearing were recorded by a court reporter and a transcript is available in the West Virginia Department of Labor research library at 1900 Washington Street, East, in Charleston.

Activities Toward A Better Understanding

In order to become familiar with the various technical aspects of the cooling tower construction methods used at the Pleasants Power Station at Willow Island, the Commission gathered and studied materials from various sources, toured a similar construction site, and observed concrete mixing and testing demonstrations.

On December 6, 1978, Commission members toured a cooling tower construction site in Perry, Ohio, where its facility was being constructed for the Cleveland Electric Illuminating Company, and conferred with design engineers and attorneys of Research-Cottrell concerning the design, function, operation and safety of the scaffolding system, which was utilized at Willow Island. The engineers and attorneys refused to discuss the specifics of the collapse and related theories, but did provide information concerning the scaffolding system. This information was of benefit to the Commission. The scaffolding system and construction techniques were essentially the same as those used at Willow Island, and the tower at Perry was at about the same stage of construction as was cooling tower number two at Willow Island when it collapsed. The experience afforded the Commission a better understanding of the unique scaffolding system and hoisting system and provided an opportunity to observe conditions and the type of equipment and environment the workers encountered at Willow Island while constructing cooling tower number one and cooling tower number two.

The Commission obtained copies of various materials to study to enhance its ability to analyze OSHA's report at such time as it could be obtained.⁶ The Commission also contacted the families of the victims of the disaster in order to determine whether there was any additional information that could be obtained. They sent an investigator to interview persons who witnessed the accident, but had not been interviewed by OSHA. Although little new information was obtained, the witnesses did confirm information already received.

On April 9, 1979, the Commission toured Criss Concrete's St. Marys Batch Plant and observed demonstrations of concrete mixing and its testing. Discussions with Criss personnel and its attorneys as to procedures and operations of the batch plant were held insofar as it was generally related to the cooling tower. However, the personnel and attorneys refused to discuss the specifics of the tower collapse and related theories. In the afternoon of the same day, the Commission observed the processes used by Pittsburgh Testing Laboratories at Willow Island to test concrete strength.

⁶Among those items were OSHA's Field Operation Manual, a study by the General Accounting Office on OSHA's operations in the United States, news articles and press releases; cooling tower construction terminology, definitions and diagrams; OSHA's preliminary findings, Health Research Group Report on OSHA, Compensation Health & Safety Subcommittee Hearings Transcript; the Occupational Safety and Health Act of 1970 including its legislative history, procedures and definitions for issuance of civil and criminal citations and penalties; OSHA's organizational chart, personnel list, and staff levels in the fifty states, and the 1926 Construction Safety and Health Regulations and related resource construction standards.

Attempts to Gain Public Assurances

Upon learning that construction at the Pleasants Power Station project at Willow Island would soon resume, the Commission members arranged a meeting between Research-Cottrell officials and OSHA officials. The Commission was of the opinion that such a meeting was necessary because it had been advised that Research-Cottrell might alter some previously-used procedures when construction resumed, and that while OSHA fully intended to monitor construction activities, OSHA had no guarantee that it would be notified in time to have representatives there at the very beginning of actual construction or during site preparation. Since OSHA had not released its report to the Commission or the public, the Commission's demands and inquiry were thought to be necessary to enhance prospects for the safety of the workers.

The meeting took place on April 10, 1979 in Clarksburg. The Commission Chairman clearly stated to both parties that, among other things, the Commission expected Research-Cottrell to agree to provide OSHA with preconstruction and construction plans for the Willow Island project and expected OSHA to agree to review these plans for the Willow Island project and then make a public statement as to their satisfaction that the plans as proposed met existing OSHA safety standards.

Research-Cottrell officials at the meeting explained their understanding of an agreement the company had with Mr. Donald MacKenzie, OSHA Field Coordinator, to adhere to all guidelines sent to them by OSHA concerning cooling tower construction, to notify OSHA officials in advance of the resumption of construction, and to meet with OSHA officials ten days to two weeks before concrete pouring began on the tower veil. Research-Cottrell officials stated a willingness to expand that agreement to include

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the preconstruction phase of work, to submit all information requested in writing by OSHA, and to hold off the resumption of the project until OSHA had a sufficient opportunity to review the material.

In response, Mr. Harold Engel, OSHA Associate Counsel for Regional Litigation, stated that while OSHA would request this material in writing, OSHA would not under any circumstances issue the public assurances the Commission specifically requested, even if the reviewing officials were "internally" satisfied that the proposed procedures and techniques were in conformance with OSHA standards. The Commission is of the opinion that the failure of OSHA to accept the burden of responsibility is not justified. If such assurances cannot be made then the Commission felt that construction should not have been resumed. Mr. Engel also stated, however, that only Dr. Eula Bingham could speak definitively for OSHA on this subject. Therefore, the Commission Chairman wrote to her on April 12, 1979 asking for a written statement as to OSHA's policy concerning public assurances, and asking for a response by April 20. There was no response received until April 30 and even that failed to address the issues the Commission had posed. That letter of response is included as Appendix F of this report.

The Commission views this response authored by Dr. Eula Bingham, Assistant Secretary of Labor, OSHA, as arrogant disregard for the feelings and concerns of the people of West Virginia on this matter. Considering the fact that OSHA's report was still being withheld from public scrutiny, the Commission is of the opinion that requests were totally reasonable and in the public interest. The Commission is aware that no one, including OSHA, could guarantee that no one would be

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killed or injured when construction resumed, but the public and the workers have a right to know that what is proposed, upon the resumption of construction, conforms to existing OSHA standards and to receive assurances from knowledgeable OSHA personnel that the proposed revisions and new procedures, when properly followed, would reasonably insure the safety of workers. This right, in the opinion of the Commission, is not limited to workers at the Willow Island site.

The correspondence from Dr. Bingham received by the Commission on April 30, 1979 stated that OSHA commenced an inspection on April 16, 1979 at the site of cooling tower number two at Pleasants Power Station which would continue until construction of the tower was completed. The inspection, she said, would include periodic on-site visits during which OSHA would look for possible violations of OSHA standards or the general duty section of the Occupational Safety and Health Act [Section 5(a)(1)].

On July 10, 1980 the Commission again requested the public assurances which had been denied. It also requested the name, location, and background information of the engineering specialist OSHA had assigned to assist in the inspections at Willow Island. The requested assurances of worker safety were never fulfilled by OSHA. In September, Mr. David H. Rhone responded to the portion of the request concerning the engineering specialist by providing a biographical sketch of the individual.

Attempts to gain access to information on the educational, training, or experiential backgrounds of other individuals employed in West Virginia by OSHA to do compliance inspections were denied by OSHA which claimed a privilege of concealment under the provisions of the Privacy Act.

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Change in Commission Chairmanship

Stephen L. Cook resigned as Commissioner of Labor effective August 31, 1979 and Lawrence Barker was appointed to that position on September 4. Thus, the position of Chairman of the Governor's Commission on Willow Island was assumed by Commissioner Barker on the date of his appointment.

New Guidelines Issued by OSHA

Subsequent to the Willow Island disaster, OSHA issued a new "Cooling Tower Inspection Manual" which refers to testing of concrete for minimum strength requirements. The manual indicates that strength tests must be performed before forms are removed or scaffolding is jacked to the next level. OSHA had concrete testing requirements, however, prior to the disaster.

The new manual issued on June 15, 1978, states that "these guidelines are based on existing OSHA Construction Safety and Health Regulations and 5(a)(1) of the OSH Act . . ." It further states that "The objective of this report is to furnish OSHA compliance officers a guide to enforcement of current regulations as they apply to construction of reinforced concrete shell cooling towers. It specifically is intended to alert the compliance officers to the need to evaluate the critical safety elements of the overall construction scheme and to check for compliance *with existing regulations* designed to guard against large scale collapse during the construction process." (Italics added.) Again in the section of the manual entitled "Scope", it is stated that "All of the guidelines are based on existing OSHA safety regulations and 5(a)(1) of the OSH Act."

The manual includes an excerpt from "Safety and Health Regulations

for Construction, 29 CFR Part 1926," dated June 24, 1974. In Subpart Q, 1926.700, it is stated that "All equipment and material used in concrete construction and masonry work shall meet the applicable requirements for design, construction, inspection, *testing*, maintenance and operations as prescribed in ANSI A 10.9-1970, Safety Requirements for Concrete Construction and Masonry Work." (Italics added.) In ANSI (American National Standards Institute) A 10.9-6.4.7, copyright 1970, it is stated that "Forms shall not be removed prematurely. The concrete should be adequately set in order to permit safe removal of the forms, shoring, and bracing. Engineer's specifications and local building codes shall be adhered to in determining the length of time forms should remain in place following concrete placement. In addition, *tests shall be made on field-cured concrete specimens in order to insure that concrete has obtained sufficient strength to safely support the load prior to removal of forms.*" (Italics added.)

These references show that without doubt there were enforceable regulations in existence before the disaster and that these regulations required the testing of concrete prior to the removal of forms.

When questioned about other designers and builders of cooling towers, OSHA officials said they were not aware of any other designer or contractor in the industry who makes lifts in less than two-day intervals. Apparently Research-Cottrell employed a speed-up technique that used less concrete curing time and more rapid lifting of scaffolding in the systems than did other designers and contractors.⁷ An analysis

⁷March 17, 1980 meeting minutes.

of each lift at Willow Island suggests that if two days or more curing time had existed, the collapse may not, in all probability, have occurred because the strength of the cured concrete after 48 hours was drastically increased over the preliminary stage.⁸ Since these test requirements were a significant change from the 7-day and 28-day tests the Commission had learned were actually performed at Willow Island on a periodic basis,⁹ the Commission asked its engineering consultant, Dr. Edward F. Byars, then Acting Dean of the West Virginia University College of Engineering, to research the concrete strength tests in existence in the industry and comment upon their reliability. Copies of the request and Dr. Byars's report are included as Appendix H of this report.

In his report, Dr. Byars indicated that there is no standard one-day test used to determine the strength of the concrete after 24 hours although there are several tests that can be performed. No one of the tests is considered "standard", however. Since OSHA's Cooling Tower Guidelines do not specify which test is to be performed; the members of the Commission are concerned about the determination of the ability of newly poured concrete to support the weight of workers and scaffolding.

The Commission asked to be apprised of the specific test or tests

⁸Concrete strength chart from March 17 meeting minutes included in this report as Appendix G.

⁹United Engineers and Contractors, Inc., in Document VIII "Specification for Design, Inspection and Testing of Concrete, Concrete Materials, Reinforcing Steel, High Strength Bolting and Compaction of Fill for Pleasants Power Station Unit Nos. 1 and 2," Specification No. 6056-5-3, Section 7.3.6, p. 14, requires a set of concrete cylinders be made for each 100 cubic yards of concrete placed in any one day. Each set consisted of five cylinders, two for testing at seven days, and three for testing at 28 days.

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chosen by OSHA, or by Research-Cottrell and approved by OSHA, for the resumption of construction at Willow Island. To that end, Mr. David Rhone and Mr. William Thomas, OSHA's engineering specialist assigned to Willow Island, met in Philadelphia with Commission Chairman Lawrence Barker on October 19, 1979. To assure the complete cooperation of all parties in this effort, Governor Rockefeller and Chairman Barker had met with Secretary of Labor Ray Marshall on October 2.

OSHA's Report and Files Released

OSHA released a report on the Willow Island disaster in November, 1979. This report, entitled "Investigation of Construction Failure of Reinforced Concrete Cooling Tower at Willow Island, West Virginia," was released to the Commission and to the public on November 2, 1979. It was prepared for OSHA by the Center for Building Technology, National Engineering Laboratory, National Bureau of Standards (NBS) in Washington, and authored by H. S. Lew, S. G. Fattal, J. R. Shaver, T. A. Reinhold, and B. J. Hunt.

After studying the report, the Commission met on November 14, 1979 for review and discussion. Dr. Lew, Mr. Stanley Elliott, Mr. William Thomas, and Mr. Mike Shapiro, Attorney for OSHA's Regional Office in Philadelphia, attended the meeting for the purpose of answering questions about the report. Dr. Lew briefed the Committee by means of a slide presentation on the contents of the accident report. During the meeting, the Commission learned that the NBS report does not encompass all of OSHA's material relating to the accident and that an extensive investigative file exists.

The Commission requested access to that file, access was granted, with the exception of witness lists and statements, and an extensive review of the file followed. A comprehensive index of that file is included as Appendix I of this report.

The Commission members met on March 17, 1980 with OSHA representatives Mr. David Rhone, Mr. Stanley Elliott, Mr. Perry Jones, and Mr. Michael Shapiro (an attorney representing OSHA) for clarification of some of the contents of OSHA's investigative file and to ask questions generated by the review of that file. Answers to many of the questions were refused, evaded or directed to Mr. Shapiro who would not give a forthright answer because of an assortment of claimed privileges. OSHA was uncooperative on many direct questions concerning OSHA and its responsibility for the accident or for negligent administration. Furthermore, OSHA evaded many questions on the causation and maintained that it was only charged with the responsibility of enforcing existing standards and not with the responsibility of worker safety beyond that.

The preamble to the Occupational Safety and Health Act of 1970 states that it is an act "To assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes."

Further, Section (2)(b) of the Act expresses the purpose of OSHA as follows:

Sec. (2)(b). The Congress declares it to be its purpose and policy, through the exercise of its

powers to regulate commerce among the several States and with foreign nations and to provide for the general welfare, to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources ----

(1) by encouraging employers and employees in their efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthful working conditions;

(2) by providing that employers and employees have separate but dependent responsibilities and rights with respect to achieving safe and healthful working condition;

(3) by authorizing the Secretary of Labor to set mandatory occupational safety and health standards applicable to businesses affecting interstate commerce, and by creating an Occupational Safety and Health Review Commission for carrying out adjudicatory functions under the Act;

(4) by building upon advances already made through employer and employee initiative for providing safe and healthful working conditions;

(5) by providing for research in the field of occupational safety and health, including psychological factors involved, and by developing innovative methods, techniques, and approaches for dealing with occupational safety and health problems;

(6) by exploring ways to discover latent diseases, establishing casual connections between diseases and work in environmental conditions, and conducting other research relating to health problems, in recognition of the fact that occupational health standards present problems often different from those involved in occupational safety;

(7) by providing medical criteria which will assure insofar as practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work experience;

- (8) by providing for training programs to increase the number and competence of personnel engaged in the field of occupational safety and health;
- (9) by providing for the development and promulgation of occupational safety and health standards;
- (10) by providing an effective enforcement program which shall include a prohibition against giving advance notice of any inspection and sanctions for any individual violating this prohibition;
- (11) by encouraging the States to assume the fullest responsibility for the administration and enforcement of their occupational safety and health laws by providing grants to the States to assist in identifying their needs and responsibilities in the area of occupational safety and health, to develop plans in accordance with the provisions of this Act, to improve the administration and enforcement of State occupational safety and health laws, and to conduct experimental and demonstration projects in connection therewith;
- (12) by providing for appropriate reporting procedures with respect to occupational safety and health which procedures will help achieve the objectives of this Act and accurately describe the nature of the occupational safety and health problem;
- (13) by encouraging joint labor-management efforts to reduce injuries and disease arising out of employment.¹⁰

It is the opinion of this Commission that these purposes stated in the Act are contrary to the claim of OSHA officials that their charge is only to enforce existing standards.

At the conclusion of the March 17, 1980 meeting, the Commission decided that although there remained some serious unanswered questions, they had explored the avenues and concerns relating to their original

¹⁰Public Law 91-596, Sections 1-2.

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charge and that they would now concentrate their efforts into relaying the information to the Governor and to the West Virginia Legislature as mandated by the Governor's Executive Order and the subsequent enabling legislation.

Commission members met on May 16, 1980 to review a draft of their report to the Governor and the West Virginia Legislature. On that same day, however, OSHA released a second report that provided information outside the scope of the first report prepared by the National Bureau of Standards. This second report is entitled "Analysis of Construction Conditions Affecting the Structural Response of the Cooling Tower at Willow Island, West Virginia," and was authored by S. G. Fattal and H. S. Lew, National Bureau of Standards.

The issuance of the second report forced the Commission to suspend work on its report in order to study the new information. The timing of the release of this report meant that it would be impossible to review the new material and submit findings to the proper authorities within the time limit prescribed by the Governor's Executive Order and the enabling legislation. Consequently, the Commission requested an extension of the Governor's Executive Order. The Executive Order, Number 6-80, was issued on June 30, 1980 extending the Commission until December 31, 1980. A copy is included as Appendix D of this report.

OSHA'S INVESTIGATION

The specific evaluation by the Commission centered upon OSHA's reports entitled "Investigation of Construction Failure of Reinforced Concrete Cooling Tower at Willow Island, West Virginia" and "Analysis of Construction Conditions Affecting the Structural Response of the Cooling Tower at Willow Island, West Virginia." They were authored by Dr. H. S. Lew, et al., of the Center for Building Technology, National Engineering Laboratory, National Bureau of Standards. They will be referred to here as NBSIR 78-1578 and NBSIR 80-2010, respectively. Also evaluated were the reports submitted to OSHA by Safety Consultants, Inc. of Richmond, Virginia by Mr. S. Ty Looney; a report by Mr. John R. Smith of Law Engineering Testing Company of Washington, D.C.; a report by Mr. John A. Miller and Associates of Ardmore, Pennsylvania; and some of the contents of OSHA's investigative file. Other factors considered by the Commission included the design of the scaffolding, the placement and removal of bolts, the hoisting system, speed-up technique, the rapid elevation of lifts, the curing time of the concrete, the quality of supervision by the various parties, the strength and type of cable, the quality of the concrete mixture, and a number of other elements.

The Looney, Smith, and Miller reports apparently were written in mid 1978 reasonably soon after the time of the accident in April, 1978. These early reports¹¹ concentrated on the hoisting mechanisms and

¹¹These reports, as well as the NBS reports, are filed in the West Virginia Department of Labor research library at 1900 Washington Street, East in Charleston and are open to public inspection.

hoisting cables and came to the tentative conclusions that the cause of the accident was with the hoisting mechanisms and/or cables. This is in conflict with the NBSIR 78-1578 report, but the early reports seemed somewhat sketchy in detailed analysis. NBSIR 78-1578 seems to discount any possibility that there was a hoisting cable failure prior to the initiation of the collapse. The report does address the problem of cable failure due to tensile overload as a result of the first phases of the collapse. This was concluded in the later analysis due to the nature of the cable marks on the top of the remaining veil.

NBSIR 78-1578 resulted from a rather complete and extensive investigation of the construction failure at Willow Island. NBS was asked by OSHA to carry out a detailed study aimed at determining the most probable cause of the collapse. The investigation included on-site inspections, laboratory tests of construction assembly components and concrete specimens, and analytical studies.¹² The report concluded that "the most probable cause of the collapse was due to the imposition of construction loads on the shell before the concrete of lift 28 had gained adequate strength to support these loads."

A close study of this report and a careful questioning of Dr. Lew at the November 14, 1979 meeting of the Commission left members with the feeling that this was a thorough investigation and study. It utilized state of art methods of analysis and was done in a professional manner.

¹²NBS conducted laboratory tests of the concrete anchor bolts, hoist cable, chain hoist, and grip hoist; examined the hoisting system and scaffolding system; and performed analyses of the shell and loads.

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NBS fulfilled OSHA's request most adequately, but Commission members question the need for this work to have taken over a year.

This report was received by the Commission in late 1979. Considering the scope of the investigation and analysis, the report was probably written in early 1979.

Even though the Commission is confident that the report was thorough and presents a well-documented conclusion to the logical physical cause of the collapse, there is the question as to whether or not OSHA, independently or in conjunction with NBS, should have gone further into the root causes. OSHA apparently failed, until months after NBSIR 78-1578 was requested, to extend its request to asking NBS to make some determinations about why that cause presented itself, what might have been done to preclude such a disaster, and what can be learned from this tragedy and the NBS analysis of it to help prevent a future recurrence. The Commission questions whether there was compliance to standards.

It appears that no investigation has been conducted into the human elements that may have been factors in the cause of the collapse. Questions remain unanswered in terms of where, when, why and by whom the various actions were taken on the days and hours before the collapse that caused all of the physical elements to converge and result in this disaster. It may be that because of time and the magnitude of the disaster, many of those human elements are obscured forever.

OSHA's report released on May 16, 1980, NBSIR 80-2010, addresses three separate aspects of the collapse. This investigation shows that failure would initiate in lift 28 if the concrete strength in that lift

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is 1,000 p.s.i. or less; and to maintain a safety factor of 2.0, the concrete strength in that lift should be 4,000 p.s.i. The study also reveals that even if an additional bolt had been introduced between each exterior jumpform beam and the tower, the stresses would not have been relieved enough to prevent failure of lift 28. Finally, the report shows that if the ground anchor point of the static line had been kept at the location occupied just prior to its last move to a location near the center of the tower, the stresses in the shell due to construction loads would have been relieved to the extent that failure of lift 28 would probably not have occurred.

The Commission is compelled to ask questions about some aspects beyond these reports which deal with the reasons this tragedy occurred. Some of the significant questions that remain unanswered are:

What caused the "imposition of the construction loads"?

Were these construction loads abnormal?

Were the loads that caused the failure distributed properly in accordance with the original design?

Were the loads concentrated due to improper construction techniques, omission of procedures or components, or other construction or design failings?

Why was the concrete not allowed to gain adequate strength before the construction loads were applied?

Why was the concrete not tested for adequate strength prior to removal of forms and imposition of construction loads?

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What effect did interconnection of all of the individual scaffolding planks, as opposed to independent unconnected planks of scaffolding, have upon the number of deaths?

Had the units been self-lifting and not interconnected would 51 persons have perished?

Until these questions are answered to the Willow Island Commission and to the public, no report on the Willow Island disaster can be considered complete or OSHA's task performed.

OSHA's Stated Purpose

A philosophical question arises from OSHA's stated purpose in their investigation. Their avowed purpose in this and in all accident investigations is to discover any apparent violations of federal safety and health standards.¹³ This Commission maintains that no set of standards or guidelines, no matter how extensive, can cover all potential situations. A more appropriate purpose might be to expand their activity to include searching for the overall cause of accidents and determining means of avoiding them in the future.

Although the "general duty" clause of the Occupational Safety and Health Act provides some flexibility, there can be no criminal prosecutions for violations cited under that clause.

It is the opinion of some Commission members that OSHA should set standards for curing times and composition of all concrete mixes which are utilized in construction of elevated projects, and require approval of these procedures by appropriate state and federal authorities.

¹³OSHA's purpose may be found in Public Law 91-496, Section 2(b) and on page 19 of this report.

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Concrete

To gather information about the compressive, tensile, and bond strengths and the stiffness of the concrete of lift 28 at the time of the collapse, NBS obtained samples of the constituent materials for the concrete from the supplier of the concrete for tower unit number two and from OSHA. Samples were obtained by OSHA personnel on May 2, 1978 and by NBS personnel six weeks after the collapse. Analysis of both the physical and chemical properties of both the NBS samples and the OSHA samples concluded that neither conformed to ASTM (American Society for Testing and Materials) standard requirements for Type II cement. The NBSIR 78-1578 states that it may be concluded that the cement obtained from the concrete supplier would not have met ASTM standards.

There are recognized industry standard tests for strength of concrete at seven days and 28 days. Concrete strength is very difficult to predict at 24 hours; and although there are several 24-hour tests, none of them has been adopted as an industry standard or recognized as best.

Dr. Edward F. Byars's report to the Commission on concrete tests, included as Appendix H to this report, states that concrete strength is very difficult to ascertain at 24 hours.

Although there presently is no "standard" one-day concrete test as far as industry is concerned, it is evident that much thought has been given to the problem. Dr. Byars advises that adequate tests have been devised and OSHA is requiring them to be made to determine the strength of concrete prior to the removal of forms and the

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imposition of loads.

Bolts

OSHA's files indicate that employees at the construction site had been directed or permitted to remove bolts in the scaffolding and formwork system which were critical to the safe resistance of construction loads. The lower bolts connecting the jump form beams to lift 27 were removed before placement of concrete was begun on April 27, 1978. This removed 50 percent of the bolts anchoring the form and scaffold system to the older concrete in the structure. This action also removed all of the bolts which could effectively help resist inward overturning moment imposed on the system.

While the collapse was not initiated because of problems with the scaffolding formwork system, according to the NBS reports, it does appear that the system was inadequate to resist horizontal and vertical loads when the collapse began. The NBSIR 78-1578 and 80-2010 conclusions were partly based upon computer models of the configuration of the scaffold that is believed to have existed immediately prior to the collapse. NBS established a comparative computer model to determine the probable strength of the scaffolding system with the bolts in place. NBSIR 80-2010 indicates that introduction of the additional bolts alone would not have prevented the collapse.

Some Commission members believe, however, the State of West Virginia and OSHA should make it a criminal offense for any person, firm, corporation, etc. in the construction industry to permit the removal of any anchoring or supporting bolts which are an integral part of the jumpform beams and scaffolding system prior to the time the concrete has cured.

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Scaffolding

The NBSIR 78-1578 shows that the collapse did not initiate due to failure of any component of the scaffolding system. The report did not address the possibility of problems with the design of the scaffolding system.

There seem to be two theories on the adequacy of the scaffolding system design, neither of which has been given any professional study or analysis.

One theory is that instead of the system being interconnected around the entire perimeter of the cooling tower, an alternative would be to design a series of independent scaffolding sections. Therefore, when the concrete collapsed at cathead gantry number four, perhaps only one or two sections of scaffolding would have fallen. While the accident would still have been tragic, there may have been substantial savings of life.

An opposing theory is that the scaffolding design that existed at Willow Island actually added stability to the system by virtue of the fact that it was tied together into a ring around the tower. The fact that the circumference of the tower was, at that point, smaller at the working area where the scaffolding was than it was at the bottom, would cause the ring of scaffolding to divert the weight downward instead of outward or inward. Consequently, the stress on the various components would not be as great, and the design would be adding stability.

Supervision, Training and Trade Secrets

A major shortcoming in OSHA's investigation of the Willow Island disaster is the lack of any report on what human elements were causal

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factors in the tower collapse, and how those elements might be altered in future construction of this nature in order to prevent a similar disaster.

OSHA regulations required that tests be made to insure concrete has reached sufficient strength to safely support the load prior to removal of forms. People in authority on a given job must make the decisions as to what tests are performed, and how the results are evaluated, the length of time forms will remain in place to allow the concrete to gain strength, and when the forms will be moved up for the next pour. People must decide what elements of the construction design can be omitted safely. People must decide when an anchor point of a hoist system will be moved and what stress changes will result. People must decide how much cement can be poured in a given time period without jeopardizing the structure and the workers' safety. Someone must decide whether forms are to be moved up for the next pour or will remain a longer period of time in order for the concrete to gain more strength.

The Commission recognizes the impracticality of OSHA developing regulations or guidelines for each of these possibilities, but it does not seem unreasonable for employers to accept responsibility for such decisions made by their authorized personnel at the job site.

Each worker at Willow Island apparently knew how to perform a specific job or function, but no one at the site had overall knowledge of the entire project. Because of the word-of-mouth training that is a natural part of the work environment and because there were no written specifications available for reference, workers could inadvertently make gradual modifications that might compromise the design and cause conditions beyond the limitations of the materials.

There were no written specifications on the job as to what critical safety checks were to be made and when and by whom. OSHA's own investigation showed that very few Research-Cottrell personnel on the site knew how the system operated or was supposed to operate or what the significance was of concrete testing.

A general standard cited in 29 Code of Federal Regulations, Section 1926.21(b), specifies that employers are to train and instruct their employees on the particular hazards of their employment so they can work safely and minimize their risks. It appears that this was not done at Willow Island.

This Commission finds no evidence that there were inspectors or supervisors of any kind on the job whose responsibility it was to check the work and make the determination either to proceed with the work or to give the concrete more time to gain strength. Although Pittsburgh Testing Laboratories personnel tested the concrete, it was not necessarily done before the formwork was removed, and nothing in their contract would seem to indicate they would have any authority to shut the job down if they found problems.

The lack of written design specifications for the cooling tower at the site seems to be commonly practiced in the construction industry in order to protect trade secrets. It is not unreasonable to expect, however, that those in the construction industry could develop written criteria for each job for critical safety checks which would not jeopardize the company's trade secrets.

According to OSHA personnel, Research-Cottrell is the only contractor in the industry of which they are aware that pours one total ring of concrete on top of another ring in a 24-hour period during cooling tower

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construction. All others they know of wait at least 48 hours between pours from cured concrete to fresh concrete.

It appears that not only were there inadequate safeguards in the rapid construction methods of the cooling tower, but also there was a lack of supervision over and training of the employees.

OSHA'S WEST VIRGINIA STAFF

Commission members studied and discussed at great length the adequacy of OSHA's compliance staff in West Virginia. The education and previous experience required of compliance officers indicate that OSHA's standards are sufficiently high. Even more impressive is the quality and quantity of training provided for these employees. The evidence indicates that OSHA is interested in developing and maintaining a high level of knowledge and expertise among the members of the compliance staff but lacks the financial means or staffing to accomplish its goal. OSHA upgrades its staff to keep abreast of constantly changing industry and the corresponding changes in the kinds of hazards to which workers are exposed, but the diversity in the thousands of industries makes total competence by so few inspectors an impossibility.

The number of compliance officers allowed to West Virginia is inadequate, if not absurdly low, to accomplish the goals of OSHA. At the time of the Willow Island disaster, there were seven safety officers and five industrial hygiene officers. On March 17, 1980, Mr. Rhone said OSHA had authorized a 30-40 percent increase in the Charleston Area staff. Their budget calls for 25 people. They have, at this writing, 22 people, two of whom are specialists in construction.

OSHA's own benchmark figures for minimum staff requirements indicate that West Virginia should have 16 safety compliance officers and 30 industrial hygienists.

While it is not in the specific charge of this Commission to evaluate OSHA's staffing patterns, the Commission members feel it is necessary to

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make some comment because the lack of staff is significantly related to the occurrence of the tower collapse.

The Commission is of the opinion that employers must assume responsibility for maintaining a safe and healthful work environment. It is also agreed that there will probably never be adequate resources for OSHA to check every worksite. An OSHA inspection might, however, have prevented this accident by enforcing testing requirements prior to the removal of the concrete forms.¹⁴

A critical question then arises: Where else is there another time bomb waiting to go off in some other industry that is not checked by OSHA because no accident of a major proportion has ever happened to call attention to that industry? OSHA inspected the Willow Island site in connection with the requirement for toeboards on scaffolding. While this is an important item to be checked, it is suggested that compliance officers should visit sites questioning what the worst possible things that could happen would be and watching for elements that could contribute to these things occurring. On a cooling tower, the worst possible thing that could occur is probably the structure collapsing. Items that could conceivably contribute to a collapse are the items with which OSHA officers should begin their inspections.

OSHA staff has been increased about 30 percent across the nation in the last two years. In West Virginia the increase has been about 40 percent. It is the opinion of the members of this Commission that the new level is still grossly inadequate.

¹⁴ANSI Standard A 10.9-6.47.

THE 18(b) OPTION

There is one additional item that, while not a specific charge of this Commission, will be made a part of this report because it was discussed extensively by the members in the months they worked together and which is intrinsically related to the nature of this report. That item is the consideration of whether a federal plan or a state plan would be more effective for the protection of workers in West Virginia and a more efficient use of the taxpayers' money.

The Occupational Safety and Health Act of 1970 was enacted by Congress because state job safety and health programs across the nation were inconsistent and most were considered ineffective. Despite the poor records of many of the states, Congress was not in favor of giving sole responsibility to the federal government in cases where states wanted to retain control. Therefore, section 18(b) of the OSH Act provides that any state which desires to assume responsibility for the development and enforcement of occupational safety and health standards relating to issues covered by corresponding standards under section 6 of the Act may submit a plan for doing so to the Assistant Secretary of Labor.

In developing their own plans, states must:

1. Designate an agency responsible for administering the plan.
2. Provide for the development and enforcement of safety and health standards which are "at least as effective in providing safe and healthful employment" as federal standards.

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3. Provide for the right to enter and inspect workplaces which is as effective as the federal procedures and prohibit advance notice of inspections.
4. Guarantee that the designated agency will have legal authority and qualified personnel necessary to enforce the health and safety standards.
5. Provide adequate funding.
6. Provide a comprehensive safety and health program for state and local government employees.
7. Require employers to make reports to OSHA in the same manner as if the plan were not in effect.
8. Provide whatever reports are required by the U.S. Secretary of Labor.

When the state has assured OSHA that it will meet these criteria as well as the requirements of OSHA's implementing regulations, OSHA may approve the state's plan as a developmental plan. The state then has three years to develop standards and enforcement capabilities "at least as effective" as the federal program. During that three years, OSHA and the state conduct concurrent inspection programs. At the end of three years, if the state has enabling legislation, an operational appeals system, standards as effective as OSHA's, and a sufficient enforcement staff, the state and OSHA may sign an agreement giving the state "operational status" which allows it to take over enforcement of some or all of the standards.

If OSHA agrees that the plan is technically complete, it may certify the state plan; but for a minimum of one year after certification, OSHA will continue to monitor the state's performance and may continue concurrent

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inspections. After OSHA is satisfied that the state has an effective job safety and health program, it may issue final approval (called an 18(e) determination) for the program and OSHA will cease enforcement altogether or continue it in areas which the state has decided not to enforce. If at any time OSHA's monitors discover the state plan is not keeping pace with the federal program, OSHA can withdraw approval of the state's plan and resume federal enforcement.

States are required to adjust their plans as OSHA makes changes in the federal standards.

OSHA may provide states up to 50 percent of the operating funds for their programs for the developmental stage after the initial approval has been made.

No state plan had been given final approval before 1979 because OSHA had not developed specific criteria to use to determine whether the states' plans were as effective as OSHA's. A U.S. Supreme Court decision in 1978, however, forced OSHA to develop specific criteria for approval of state plans, especially in the areas of staffing and funding levels. A number of states have withdrawn their plans for various reasons and allowed the federal program to resume.

North Dakota and New Jersey withdrew their state plans in the early 1970's because of the failure to pass enabling legislation. William Clark, director of labor standards in New Jersey, said his state withdrew its plan reluctantly but in the best interest of the state's workforce.

Colorado's plan terminated on June 30, 1978 when the state legislature decided to stop funding it.

Wisconsin withdrew its plan in 1975 because the state assembly eliminated the funding of 63 enforcement positions in the state planning agency. The lack of funding was attributed to "economic and political factors." The federal takeover in Wisconsin marked the end of 60 years of job safety coverage by the state. In 1911, Wisconsin was the first state to enact a comprehensive job safety plan and establish an agency to administer it. Mr. John Zinnas, former head of the department, said that after the advent of OSHA, the state was less effective in inspecting workplaces than it had been before OSHA because of the mandated procedures of the federal government. The number of inspections, he said, had been reduced to one-third that of pre-OSHA days.

In August 1979 OSHA announced plans to withdraw the approval of the Wyoming plan on grounds that, among other things, the state's system of criminal sanctions against violators was "potentially less effective" than OSHA's civil sanction scheme.

OSHA announced in April 1980 plans to withdraw the approval of Indiana's plan. OSHA alleged that Indiana has a consistent pattern of poor performance in critical program areas. One of Dr. Bingham's major complaints was the state's lack of a sufficient number of industrial hygienists. A state AFL-CIO official said the federal government was partially responsible for this deficiency because every time Indiana got its hygienists trained, the federal government hired them away.

Kentucky's labor commissioner noted in November 1978 that Kentucky's illness and injury rates appeared to be steadily declining, but charged that the success of their state plan was achieved, "not because of any encouragement or assistance from OSHA, but in spite of

OSHA's never-ending, oftentimes arbitrary, and inconsistent monitoring techniques." He said that the semiannual evaluation reports they receive from OSHA concerning the state program are usually too voluminous, untimely, contain inaccuracies, and "frequently draw unfortunate and misleading conclusions."

This Commission will not submit a recommendation either for or against adoption of a state plan for the protection of workers in West Virginia.¹⁵ It will, however, caution that there are a great many considerations which should be given careful thought and research before any action is taken. The experiences of other states indicate that adequate funding and sufficient numbers of qualified personnel are major items among those considerations.

¹⁵At the meeting of May 16, 1980, it became quite apparent that the members of this Commission were divided on the issue of whether or not West Virginia should adopt a State Plan. There was also divergent thought as to whether or not West Virginia should establish a labor safety investigation board independent of and in addition to OSHA.

RECOMMENDATIONS

1. OSHA and the State of West Virginia must develop better tools for investigating the causes of industrial accidents which result in the loss of life, to the end that such accidents be prevented as far as humanly possible. Private enterprise must be afforded the means to fully co-operate in such investigations without jeopardizing their private positions in litigation. Also such investigations cannot be frustrated by actual or exaggerated claims of exposure to criminal or civil litigation.
2. The Governor and the Legislature should memorialize the Congress of the United States to increase the enforcement powers of OSHA with respect to the general duty clause of OSH Act. Whether criminal sanction, injunction or civil penalty, the clause should be strengthened especially as other more specific regulations may be weakened.
3. The Governor and the Legislature are requested to fully exercise or cause to be exercised the respective powers of the executive and legislative departments to:
 - a. Develop within the Executive branch a full capability to investigate any industrial accident resulting in the loss of life.
 - b. Insure the full exercise by the law enforcement authorities of the respective counties of all their rights, duties and powers in the event of an industrial accident resulting in the loss of life.

- c. Encourage an attitude of co-operation by Federal authorities, including a specific recognition by Federal authorities of a parallel and surviving right of state authorities for civil and criminal investigatory duties in the case of industrial accidents resulting in loss of life.
4. The President of the United States, the Congress, and the Governor and the Legislature of this State should take all necessary steps to insure that regulatory authority is willing and able to share the responsibility for resumption of work at a hazardous work site where loss of life has occurred. Specifically, OSHA should be empowered and required to give public assurances that when work is resumed the work procedures, if followed, will produce a reasonably safe work environment. And the State and Federal governments should have and exercise the power in a proper action to enjoin work in the absence of such an assurance.

The fundamental responsibility of regulators is not to point criticism after the fact but help prevent the occurrence and reoccurrence of disasters by concrete action for which the regulators themselves should not fear to be held fully responsible and accountable.

5. The Congress and the President of the United States should insure the ability of OSHA to operate, to fill its mandate, and to ensure safe work places in this and in other states, genuinely responsive to the people of the several states. The Commission is of the opinion that OSHA has been so overwhelmed by public bickering about its role and so circumscribed by limitations upon its internal and public operations that it is often prevented from addressing

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its fundamental mission of assuring safe work sites throughout the country.

6. The ultimate OSHA public reports on the causes of the disaster (NBSIR 78-1578) (NBSIR 80-2010) appear to be technically superb documents demonstrating extensive and intensive investigation of the efficient probable causes of the accidents and cannot be seriously challenged in the area of expertise they address. The Commission accepts their respective conclusions and applauds their thoroughness.
7. The Commission regrets the delays it and the public endured in the release of these studies; it commends to the President, the Congress, the Governor and the Legislature such changes in law regulation custom or practices as will avoid such delays in the future and trusts that the people of no state will ever be accorded such treatment again in the name of privacy and privilege.
8. The ultimate failure of the OSHA report is that it does not address the why and the who questions, the answers to which when read with the answers to the what questions would give the complete stories. NBSIR 78-1578 and 80-2010 tell what happened; at least they tell what happened with more certainty than any other source. They are well-documented and convincing. OSHA stopped there. Why was the scaffold raised on uncured concrete?
Who is responsible?
Surprisingly OSHA does not answer; the prosecuting authorities in Pleasants County did not ask. Public justice, federal and state, is

silent -- and finished. The Commission finds that the failure to fully investigate and answer these questions is not justified.

With respect to such questions, the Commission urges the Governor and the Legislature to cause the respective powers of the Executive and Legislative departments to be used to the fullest extent practicable to insure that the unanswered questions Why? and Who? be answered - by OSHA in its pre-eminent federal domain, and by responsible states and local officials where possible.

The Commission is compelled to say here that it was unable to answer these questions for three reasons:

1. The claim of federal privilege, pre-emption and privacy.
 2. The excessive delay and institutional limitations of OSHA (for which its local officials are without blame.)
 3. The exceedingly short time remaining under the Commission's legislative mandate and statutory investigative powers after the long-awaited OSHA report was first made available.
9. OSHA should consider authorizing mandatory curing times and load tests for elevated concrete construction before removal of forms. OSHA should contract for a professional review of speed-up techniques in construction posing risk to life. OSHA should address the impact of trade secrets on safety procedures and requirements, and if necessary, request assistance from the Congress in assuring that such secrets do not permit, wittingly or not, the evasion of duties to provide a safe workplace.

OSHA should develop mandatory safety checklists and require them to be utilized in high hazard employment.

10. OSHA offices in West Virginia need full staff availability and utilization; the Commissioner of Labor ought to be authorized to evaluate staffing requirements periodically, publish and transmit the same to the Legislature and Governor; each should undertake to assure that the federal government is doing fully the job it has pre-empted from the state.
11. The State should develop its full capability to investigate worksite accidents threatening or resulting in the loss of life. Its criminal statutes are doubtless not pre-empted by this federal legislation and such capability should be made helpful to local law enforcement authorities. This implies a viable oversight function which West Virginia should not shirk.
12. The Commission commends to the Governor, the Legislature and the President and Congress of the United States, a review of the difficulties OSHA faces as evidenced by its constraints in and handling of the Willow Island Disaster.
13. The primary efficient cause of the disaster was the lifting of the scaffold before lift 28 had cured to a sufficient strength to bear the load placed on it by the scaffold. The load was then adversely affected also by the change in the hoist system outlined by the National Bureau of Standards 1980 report. The OSHA reports satisfactorily include all other matters thought in earlier published reports to be contributing factors. (These excluded items include missing bolts, some deficiency in the concrete, any weakness in the scaffold or hoist systems and like "causes" previously assigned.)

Such an explanation does not touch the human errors of judgment that must be said to be the root causes of the disaster. Both OSHA and the State of West Virginia ought to pursue these root causes.

IN CONCLUSION

It became obvious late in the Commission's work that, despite publicity and vague indications to the contrary, there is no one complete and final report from OSHA on the disaster. OSHA's work includes numerous documents, files, and reports. It is our understanding that OSHA has released its final reports, but would not consider the case or any aspect of it completely closed should any additional evidence surface.

In addition to enforcing their concrete testing requirements, OSHA is placing emphasis on tests being performed on concrete one day after it is poured. The Cooling Tower Guidelines and the restatement of the regulations requiring concrete tests to be performed may be indications that OSHA is expanding its activities to include searching for accident causes and means of preventing accidents.

As stated at the beginning of this report the purpose of the Commission is to analyze and evaluate the findings of the investigation by OSHA as to the cause of the collapse and to evaluate these conclusions to determine how this tragedy could have been avoided and what contribution the Commission's findings can make to avoid such tragedies in the future.

Our conclusions can be summarized as follows:

1. While with the exception of the local OSHA representative our task was made difficult by the refusal on the part of the Director and her associates to cooperate with the Commission we accept the final conclusions as describing

the probable cause of the disaster.

2. Since the OSHA conclusion placed the primary blame on the fact that the concrete was not sufficiently cured to bear the loads imposed on it; since OSHA has, and has had included in its inspection regulations, a requirement for testing prior to imposing such loads, since OSHA failed not only at the Willow Island site but also at any similar site to determine whether their regulations with regard to concrete testing were being followed (even though OSHA inspected the site for a safety violation); the Commission therefore concludes that had OSHA enforced its own regulations this tragedy could have been avoided.
3. If the responsible parties from the private sector had observed OSHA's regulations, the tragedy could also have been avoided.
4. With regard to Commission conclusions as to how similar tragedies can be avoided in the future we strongly suggest agencies such as OSHA that are charged with safety enforcement direct the thrust of their work to tragedy prevention, determining first what serious safety hazards exist in various kinds of construction work sites, what regulations cover those hazards, and whether those regulations are being followed as required. This change in emphasis will require qualified compliance inspectors who understand the

Industries they are inspecting. Budgeting of these positions should have first priority on the funds available.

5. It is the opinion of this Commission that the OSH Act is inadequate in that it should permit criminal prosecution under the general duty clause.