

# Evaluating the Use of Third Parties to Measure Process Safety Management in Small Firms

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*(This is an interim report because this research is in progress)*

## ABSTRACT

This paper describes a pilot experiment designed to investigate the use of third party auditors to inspect facilities that use hazardous chemicals in order to evaluate compliance with the Environmental Protection Agency's (EPA's) Rule on Risk Management Programs for Chemical Accidental Release Prevention (Section 112(r) of the Clean Air Act).<sup>(1, 2)</sup> The research examines the market forces and regulatory infrastructure necessary to attract third party auditors, the financial and regulatory incentives necessary for small firms to use third parties, and the potential benefits to employees, shareholders, regulatory agencies and communities.

## 1. INTRODUCTION

Small firms are a great national resource. Over the years, as private chemical firms have increasingly produced socially useful goods and services, small firms have become the employer of greatest resource and the seedbed of much of our innovative technologies.<sup>3</sup>

However, small firms may present significant hazards to employees and the community, as one recent example illustrates. At 8:15 on Friday evening, February 19, 1999, workers at Concept Sciences, Inc. were distilling a batch of aqueous hydroxylamine when it exploded killing five individuals and injuring fourteen. Four of the individuals killed were employees and one was an independent businessman in an adjoining building. The

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<sup>3</sup> Although private firms were present in the early days of the American colonies, such as Paul Revere's silversmith operation, the major incentive for their growth was the limited liability option afforded private corporations by state governments in the 19<sup>th</sup> and 20<sup>th</sup> centuries in order to increase the wealth of the nation. Although the behavior of most firm activity was governed under common law, especially tort actions, the limited financial liability offered shareholders of firms by state governments encouraged firms to be greatly innovative.

blast damaged 11 buildings, caused an estimated \$5.0 million in damages and was heard 15 miles away. <sup>(3, 4, 5, 6, 7)</sup>

Concept Sciences, Inc. was a small firm located in the Lehigh Valley Industrial Park, in Hanover Township, Lehigh County, eastern Pennsylvania. Previously, Concept Sciences, Inc. had occupied a site in the City of Allentown manufacturing small quantities of the free base, aqueous hydroxylamine, and this was the first attempt to scale-up the operation using a 1000-gallon glass still.

Whenever an accident occurs it naturally raises a series of questions:

- What was the operation and what went wrong?
- Was management aware of the hazardous potential of the materials involved?
- Did the regulatory agencies that issued the permits necessary for the firm to operate realize the possible risks inherent in the process?
- Did the Local Emergency Planning Committee (LEPC) understand the potential community impact that the operation posed?
- Did the capital lender for the firm appreciate the risk to its investment?
- Did the insurance company that underwrote the firm's policy understand the risk it was insuring?
- Is there a lesson to be learned from the accident that will help prevent similar occurrences in the future?

At this writing, we still do not know what happened at Concept Sciences, Inc. However, on August 11, 1999, six months after the explosion, the Occupational Safety and Health Administration (OSHA) released a 60-page report citing Concept Sciences, Inc., for 20 violations, some of which were deemed willful and committed with intentional disregard or plain indifference to federal safety standards, and issued a \$641,000 fine. <sup>(8)</sup>

This accident demonstrates that small firms with limited resources can harbor sophisticated technical risks. EPA, OSHA and the U.S. Chemical Safety and Hazard Investigation Board (CSB) <sup>(9)</sup> share this concern. Certainly, one objective of the Risk Management Programs for Chemical Accidental Release Prevention, Section 112(r) of the Clean Air Act (the Rule) is directed at such process risks presented by small firms. Other Federal laws have similar objectives. <sup>(10)</sup> Although hydroxylamine was not included in EPA's list of hazardous substances it is included in OSHA's PSM list.

Several factors might contribute to the causes of accidents in small firms. One reason might relate to the entrepreneurial spirit of the firm. Small firms probably are inclined to be the risk-takers in our society because they have more to gain than to lose by taking

chances. Automobile drivers with marginal financial resources that operate without liability insurance illustrate the point. One might expect drivers with substantial financial assets to lose, in case of an accident, to be much less likely to take such risks.

In addition to the lack of capital resources, small firms frequently lack the technical skills and constraints, common in the corporate cultures of large companies, necessary to conduct process safety reviews in a complete and systematic a manner. This is not to suggest that small firms do not conduct process safety reviews but that they might be less able or willing to commit their resources necessary to define risk reliably. This is also not to suggest that large firms do not have accidents because we are well aware of the tragedies that have occurred.

## **2. EVOLUTION OF CHEMICAL CONTROL TECHNOLOGY**

The history of the evolution of technology in the chemical industry is one of the most interesting developments in American industry. From operations like DuPont's manufacture of black gunpowder to some of the chronically toxic organic chemicals of the modern period, as technology has evolved so have the standards, codes, and practices used to ensure its safe use. Frequently, as these industry control mechanisms have developed governmental agencies have formalized them into regulatory law. As a result, the growth and complexity of regulations has greatly increased the burden on enforcement agencies of all jurisdictions to ensure compliance. The development of these regulations to ensure responsible safety, health and environment behavior parallels the development of other attempts to control social behavior, such as the legal requirements governing accounting practices for ensuring responsible financial practice, or the requirements governing various medical practices for protecting the health of individuals.

The constant challenge we face in our democratic society is to determine what kind of legal mechanisms we can construct to promote environmental health and safety and how best we can enforce regulations with the resources that are available. Judicious use of third parties to evaluate and promote compliance with regulations might be one way to accomplish this and is the object of the present study.

## **3. EVOLUTION OF THIRD PARTIES TO ENSURE REGULATORY COMPLIANCE**

The use of a third party auditors is not a new concept and there are many references to third party use in both law and literature.<sup>4</sup> In spite of criticism from time to time the use of third party auditors has continued to develop and recently seems to be accelerating.

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<sup>4</sup> In Henry Wadsworth Longfellow's poem, "The Courtship of Miles Standish," 1858, Miles asked John Alden to intercede for him with Pricilla. Unfortunately, that attempt ended in failure. Pricilla's reaction was, "If I am not worth the wooing, I surely am not worth the winning." "Why don't you speak for yourself, John?" We might conclude that Miles suffered from the first case of third party collusion. Some critics of third party audits claim that collusion is still a problem and cite automobile inspections in some states as an example.

The reasons for this evolution are varied and complex. It is not clear if there are general drivers for third party efforts or if each case is unique.

Some firms, especially high-risk firms, might actually seek risk management help from the use of third-party auditors. If such firms thought they could receive sufficient benefits from such risk reduction, they might be willing to accept third party inspections. However, because third-party auditors cannot guarantee that firms will reach a lower probability of an accident, there is some uncertainty that these firms would be willing to accept third party inspection.

Another possibility is that social pressure might play a role in acceptance. If the public views firms who refuse to be inspected as high-risk facilities, the potential loss of public confidence might cause the firm to obtain voluntary inspection in order to keep public attention away from adversely affecting their business.

Another condition relating to the favorable use of third parties might be the societal realization that firms do not cover their accidental costs. Ashford<sup>(11)</sup> has reported for every \$1 of direct cost associated with an accident there is \$4 to \$10 individual social costs not borne by the firm.

While we do not know what is driving this process there seems to be an increasing trend to use third party auditors. It could be a desire to lower the cost of government enforcement and place more of the environmental compliance cost onto the industry, or it could be that there is a lack of confidence in the ability of the government, given limited resources. Despite how poorly the process is understood, there are several indicators to suggest that the use of third party auditors is becoming more acceptable.

The practice of using third parties to audit safe and acceptable performance varies from state to state and from technology to technology. Inspecting pressure vessels, qualifying testing laboratories, approving mechanical devices, such as elevators, automobiles, and airplanes, dealing with underground storage tanks, handling radioactive substances illustrates some of the many instances where third parties auditors find application.

#### **4. THE REASONS BEHIND A THIRD PARTY EXPERIMENT FOR SECTION 112(r)**

When the EPA proposed regulations for the Rule the Wharton School of the University of Pennsylvania entered into a cooperative agreement with EPA's Chemical Emergency Preparedness and Prevention Office (CEPPO) to investigate market-based approaches to environmental policy. The Wharton School is a business school interested in any changes that affect the market place, whether the changes are the result of government regulations, the availability of capital funds, actions of public interest groups, the role of insurance in mitigating risk, or changes in organizational dynamics and global markets.

At the time, EPA estimated that 66,000 facilities would be subject to the Rule and that many of the regulated facilities were small firms.<sup>(12, 13)</sup> The first subject the Wharton

researchers investigated was to visit representative small firms in New Jersey and Delaware to determine if these facilities knew about the proposed regulation and if they had the financial resources and technical skill necessary to comply. We selected these states because both have chemical process safety regulations in place. After Union Carbide's chemical release at Bhopal, Delaware became the third state in the United States to have a professionally based chemical release program <sup>(14)</sup>, followed by California and New Jersey <sup>(15)</sup>, and the first to regulate flammables and highly reactive materials. The Delaware program was used as a model by OSHA when it developed its standard on Process Safety Management (PSM) and Delaware worked closely with EPA during the development of its Accidental Release Prevention Rule and its List of Regulated Substances. Both Delaware and New Jersey had been monitoring regulated facilities for chemical process safety for the last ten years and we assumed that we would receive a better reception in these facilities and that their management would be better informed about the proposed Rule and their necessity to prepare a Risk Management Plan. We found that some of the facilities we visited were not informed about the impending environmental regulations and without considerable assistance from outside sources had limited resources to comply. <sup>(16, 17)</sup>

The second subject we investigated was the role of the community in enforcing the Rule. The Rule presented several ambiguous or unsettled risk-management issues. One issue was how the Rule would be enforced. States could choose local enforcement or elect to rely on Federal enforcement. Whether state or Federal enforcement was chosen, communities would face substantial challenges if they were to fulfill their role in enforcing the Rule. It would be incumbent on them to receive and review the risk-management information which the Rule directed firms to release. Communities would need to determine what levels and types of company information and performance they would consider acceptable or unacceptable, and whose judgment on these issues they would trust. They would have to decide how best to review and report assessments of risk information and to whom they would report. These issues require negotiation and coordination to resolve. These efforts must be coordinated across boroughs, cities and counties, and often even across State lines. The Rule requires full compliance within three years and many communities were not aware of the challenges they would face in 1999, when the Rule went into effect. Consequently, we approached individuals in Philadelphia's City agencies and its Local Emergency Planning Committee (LEPC) about the possibility of forming a working group to consider implementation of the Rule. They were asked for their thoughts on assembling a group of community leaders to design appropriate mechanisms.

The City helped assemble a project review committee composed of members from environmental groups, state agencies, community groups, industry and the EPA Region III office. This group had numerous steering committee meetings and as a result developed a draft project proposal, a final copy of which was sent to senior members of the City administration for review. <sup>(18)</sup> The recommendation was for the City to get representative stakeholders together to plan for handling the worst case information that would be released in two years. However, given the unfunded nature of the Rule and the backlog of work facing the City, nothing was done.

The third subject the Wharton researchers investigated was how might EPA ensure compliance with the Rule if conventional enforcement agencies would not accept delegation. Many public officials, such as Mayors of large cities and Governors of various states, were appearing before the US Congress at the time to complain about the economic burden that unfunded federal mandates were placing on cities and states with their regulatory requirements. To explore potential solutions to this challenge Wharton conducted a series of nine roundtable meetings to determine if agencies that did not have specific expertise to enforce the Rule could use a market-based approach. The participants in these meetings were diverse stakeholders representing various interest groups. These cases offer various examples of outreach, technical assistance, audits, inspections, and enforcement.

The recommendation from the series of roundtable meetings was to explore in a pilot experiment the use of third party auditors to ensure compliance with the Rule. This recommendation was based on the success of the use of third party auditors in other examples in the past, especially in pressure vessels, and the optimism that conditions could be found to develop a third party strategy for ensuring compliance with the Rule.

## **5. THE DESIGN OF THE THIRD PARTY EXPERIMENT FOR SECTION 112(r)**

As a result of the roundtable recommendations Wharton became part of a task force, consisting of CEPPO, EPA Region III, and the State of Delaware's Department of Natural Resources and Environmental Control (DNREC) <sup>5</sup> to investigate the possibility of using third parties to ensure compliance with the Rule. Some of the initial challenges the group faced were:

- What kind of financial and regulatory incentives do we need to encourage regulated facilities to use third parties?
- What kind of financial and legal incentives do we need to encourage third parties to participate?
- What kind of legal procedure do we need to develop select, approve, and evaluate third party auditors?
- How do we evaluate the pilot from the standpoint of the facility, the third party auditor, the enforcement agency and the community?

One of the early suggestions for finding a legal incentive for facilities to voluntarily use third party auditors came from regulatory counsel in CEPPO and EPA's Regional III office. Counsel suggested that facilities subject to a third party audit and found to be not

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<sup>5</sup> State of Delaware, Department of Natural Resources and Environmental Control (DNREC) is the state agency that is the implementing agency for the Extremely Hazardous Substances Risk Management Act.

in compliance would have an opportunity to come into compliance with the potential for reduced or no penalties if they met the criteria of the enforcement agency's audit policy or the EPA Audit or Small Business Policy. This regulatory incentive was subject to the facility not being guilty of egregious behavior.

One of the early suggestions for finding a financial incentive for facilities to voluntarily use third party auditors was made by Zurich American. It suggested if an insurance company could establish that a facility was in compliance with the Rule, it might conclude it had a reasonable risk management program in place and might be a better insurance risk. Consequently, the insurance company might lower its premium, which would provide the financial incentive to have a third party audit. Because it seemed that small facilities would be reluctant to pay a fee for a voluntary audit fee, audits as part of an insurance company's pro bono service was attractive and promised to be financially sustainable.

As a result of these incentives the Task Force developed a series of hypotheses as a basis for the experiment, hypotheses which they would hope to prove in the pilot.

- Regulated facilities will be willing to have third party audits for compliance with the Rule if they perceive some potential benefits - financial, technical, regulatory or social.
- Enforcement agencies will select regulated facilities to participate in the pilot based on their willingness to participate and the probability that their audits will provide information needed to evaluate third party use.
- Third party auditors will participate in the pilot on a *pro bono* basis in the hope that third party audit services can attract new business or add value to existing offerings.
- Enforcement agencies will select third party auditors on the basis of their audit experience and professional criteria and will train them to conduct specific audits.
- The results of third party audits in the pilot will be made available to the enforcement agency.
- Enforcement agencies will be willing to evaluate the completeness of each third party auditor in the pilot by examining their audit reports and by conducting confirmatory audits of a sampling of participating facilities.
- Facilities in the pilot that are found to be not in compliance with the Rule will have an opportunity to come into compliance with the potential for reduced or no penalties if they meet the criteria of Delaware's Extremely Hazardous Substance Risk Management Act or the EPA Audit or Small Business Policy.

An assumption that would not be proven in the pilot would be that facilities that comply with the Rule probably have better risk management programs, better Risk Management Plans (RMP), and fewer accidental chemical releases than facilities that do not. This assumption is based on the history of the formation of the Rule and would not be demonstrated statistically with the small number of facilities used in pilot experiment. Nevertheless, it seemed like a reasonable assumption.

The Task Force concluded that one additional requirement necessary to conduct the pilot would be that someone in authority in each facility would have read and understood the policies of the experiment.

## **6. THE DESIGN OF THE THIRD PARTY EXPERIMENT**

### ***6.1. The Rational for a Pilot Experiment in Delaware***

One of the legal challenges the Task Force faced was determining what criteria it might use to select third party auditors and what legal responsibility EPA might have if an accidental release occurred after a satisfactory third party audit has been conducted. Because of the legal and reputational consequences that such a release could be damaging to the agency, EPA was reluctant to establish criteria for third party auditors in the pilot experiment. As a result, and for purely practical reasons, the Task Force decided to base the pilot in Delaware (Under the Delaware Code, DNREC can use trained and tested representatives<sup>19</sup>). Furthermore, facilities and communities in Delaware are close to Wharton and EPA Region III headquarters and can be visited for evaluation purposes with minimum commute from Philadelphia.

### ***6.2. Extension of the Third Party Pilot into Pennsylvania***

In addition to the facilities selected in Delaware for third party auditing the Task Force would like to include facilities in Pennsylvania and has chosen Allegheny County and Philadelphia County as jurisdictions for additional study. At this time, Allegheny County has applied for delegation but Philadelphia has not. This difference in enforcement might provide additional information on facilities and the likelihood of their compliance with the Rule.

### ***6.3. Selection of Third Party Auditors in Delaware***

The selection of auditors for the pilot was legally and administratively the responsibility of DNREC. The Task Force received recommendations from a number of trade and professional organizations of individuals that they thought would be good third party auditors and DNREC selected candidates based upon their industrial audit experience and professional credentials. A total of eight individuals were selected from three different background sources: insurance, professional consultants, and government business assistance agencies. The auditors agreed to participate in the pilot on a *pro bono* basis.



All candidates had auditing experience, primarily in environmental or industrial hygiene. Only one had conducted audits specific to the Rule or the OSHA Process Safety Management (PSM) Standard. The most experienced auditor had 29 years of auditing experience. Professional credentials included:

- Professional Engineer (PE),
- Certified Industrial Hygienists,
- Certified Safety Professionals (CSP),
- One Doctor of Jurisprudence with experience in environmental compliance auditing,
- Chief Boiler Inspector, certified by the National Board of Boiler and Pressure Vessel Inspectors,

The auditors had a wide range of academic backgrounds, including: BA Liberal Arts, BS Environmental Science, BS Biomedical Engineering, BA Biology with a JD in Law, BS Chemistry, BS Chemical Engineering with an MBA, and MS Engineering. The audit experience, professional credentials and work experience varied considerably among the auditors. The background and credentials represented in this pilot may well be representatives of the available pool of auditors nationwide.

#### ***6.4. Training of Third Party Auditors in Delaware***

Stationary sources subject to the Rule range from the simplest (small chlorination processes) to the most complex (large refineries). Training auditors to conduct compliance inspections for all covered facilities was beyond the scope of this pilot project. Training was limited to two business segments, small chlorination processes and facilities using anhydrous ammonia refrigeration systems. These two business segments represent an estimated 50% of the stationary sources subject to the Rule in Delaware and are probably similar to the national distribution.

DNREC's Accidental Release Prevention Group conducted a two-day training session with the assistance of EPA's Region III Office of Solid Waste and Emergency Response (OSWER). DNREC, which has been conducting process safety compliance inspections for ten years, developed the syllabus and training materials. The training consisted of:

- Process description for the chlorination processes,
- Process description for ammonia refrigeration systems, and
- An Audit checklists for:
  1. Auditing the Risk Management Plan (Desk Audit)
  2. Conducting and Onsite Audit of Chlorination System
  3. Conducting an Onsite Audit of Ammonia Refrigeration System
  4. Final Report

In testing the verified understanding of the training, the Delaware Code requires that compliance inspections for accidental release prevention “*shall be conducted by trained and tested state personnel or representatives.*”

Following the training session Wharton developed a questionnaire to allow the auditors to comment on the training. The responses were tabulated by the Risk Management and Decision Processes Center and found to be most favorable.

### ***6.5. Selection of Facilities in Delaware***

In Delaware, at this writing, six chlorination process owner or operators and twelve ammonia refrigerated system owner or operators have submitted Federal Risk Management Plans. Some of these facilities are not eligible to participate in the pilot project because of past compliance history. DNREC has yet to approach the stationary sources that will agree to participate and to do so to test the strength of their prevention programs in the spirit of cooperative compliance that has already been established.

As a result, it might not be possible to test the hypothesis that regulated stationary sources will be willing to have third party audits for compliance with the Rule because they perceive some potential benefit. The State of Delaware has conducted audits and inspections for the past ten years and the regulated stationary sources have already been inspected one or more times. Additionally, Delaware Code requires that all regulated facilities be inspected once every three years. However, the possibility of an improved relationship benefit with DNREC or the community could be a factor and one that we will have to evaluate.

In anticipating compliance with the Rule, the State of Delaware engaged in extensive outreach with the regulated community by conducting workshops and by providing one-on-one assistance to implement accident prevention programs and to develop and submit Risk Management Plans. We do not know what influence this will have on facilities agreeing to participating in the pilot.

### ***6.6. Selection of Facilities in Pennsylvania***

At this writing facilities in Allegheny County and Philadelphia have not yet been selected. Region III Office of Solid Waste and Emergency Response (OSWER) with the assistance of personnel from the local enforcement agencies, the County of Allegheny Health Department Air Quality Program and the City of Philadelphia Department of Public Health Air Management Services, will do the selection. Selection of auditors will be governed by the agencies responsible for these programs.

### ***6.7. Evaluation of Third Party Audits***

In Delaware, the auditors will give the results of the audit to DNREC's Accidental Release Prevention Group (ARP). The results of the inspections will be compared to previous inspections. The ARP will follow-up by visiting the stationary source to discuss the results of the inspection by the third party auditors. In some cases, it may be necessary to conduct a partial or full inspection to verify the results.

For facilities outside of the State of Delaware, DNREC will visit the stationary source to discuss the results with the owner or operator and conduct selective partial or full onsite inspections as required. These inspections will be conducted with the approval of, or in conjunction with, the local agency. EPA Region III's Office of Solid Waste and Emergency Response (OSWER) has also offered to assist in the evaluation of these audits.

## **7. FINDINGS FROM THE THIRD PARTY PILOT EXPERIMENT**

What do we hope to learn in the pilot? We hope to answer the questions raised above and determine if the use of third parties to ensure compliance with the Rule is a sensible way to reduce chemical releases for small firms. We would hope to determine the benefit to the following stakeholders in a cost-effective manner.

### *Evaluation of Benefits to Facilities*

### *Evaluation of Benefits to Third Party Auditors*

### *Evaluation of Benefits to Enforcement Agencies*

### *Evaluation of Benefits to Communities*

With the exception of communities that have a large chemical or petrochemical industry presence, we do not expect interest in chemical safety matters by the general public.<sup>(17)</sup> Indeed, companies seeking to communicate with their neighbors have resorted to open houses, plant tours, give-aways and public displays in an effort to stimulate interest with only limited success. This of course could change quickly should a disaster occur, such as the explosion at Concept Sciences described earlier.<sup>6</sup> The media, LEPCs and local emergency responders, on the other hand, are more likely to be interested in activities, which might affect public safety, such as compliance audits. Therefore, this pilot experiment will focus on these entities in communities in which the third party audits are connected.

The investigators will seek interviews with LEPCs and emergency responders including but not limited to those with jurisdiction over the inspected facilities, using a set of open-ended questions designed to determine:

- Level of interest and concern for chemical safety in the community,
- Level of understanding of the regulations driving the third party inspection program,
- Reaction to the concept on non-government inspectors evaluating regulatory compliance,
- Suggestions for improving public understanding of the benefits of the inspection program, and

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<sup>6</sup> Reporting on the explosion at Concept Sciences, Inc., the local newspaper, The Allentown Morning Call, published 125 articles in the six-month period following the accident.

- Reaction to a firm's voluntary participation in the third party inspection program.

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- <sup>8</sup> George J. Tomchick, Jr., U.S. Department of Labor, OSHA Citation Report on Concept Sciences, Inc., Inspection Number 302328760, August 8, (1999).
- <sup>9</sup> <http://www.csb.gov/1999/news/n9903.htm>, Internet Homepage for the U.S. Chemical Safety and Hazard Investigation Board.
- <sup>10</sup> Two other Federal laws related to prevention of accidental chemical releases are the Occupational Safety and Health Administration (OSHA) Process Safety Management (PSM) Standard (*Federal Register*, February 24, 1992, p. 6356) and Title III of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) also known as the Emergency Planning and Community Right to Know Act (EPCRA)). For a discussion of the provisions of EPCRA see M.S. Baram, "Risk Communication Law and

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<sup>11</sup> N. Ashford, "The Encouragement of Technological Change for Preventing Accidents: Moving Firms from Secondary Prevention and Mitigation to Primary Prevention," Center for Technology and Industrial Development, Massachusetts Institute of Technology, April (1993).

<sup>12</sup> Under the final version of the Rule (*Federal Register*, October 20, (1993), p. 54190-54219) the number of regulated facilities was estimated to be approximately 66,000. Earlier versions of the rule estimated over 100,000 facilities.

<sup>13</sup> The passage of "The Chemical Safety Information, Site Security and Fuels Regulatory Relief Act," Public Law 206-40, on August 5, (1999) has since reduced the estimate of 66,000 further by eliminating flammable fuels. We do not know the official number of regulated facilities at this time but approximately 15,000 facilities filed Risk Management Plans by the deadline for reporting on June 21, (1999).

<sup>14</sup> Extremely Hazardous Substances Risk Management Act, Delaware Code, Chapter 77, June 19, (1988). Regulation for the Management of Extremely Hazardous Substances, September 25, (1989). See also, R. A. Barrish, "An Overview of the Delaware Regulations for the Management of Extremely Hazardous Substances," Spring National Meeting, March 18-22 (1990), Orlando, Florida, American Institute of Chemical Engineers, New York, New York.

<sup>15</sup> The statute for the Toxic Catastrophe Prevention Act (TCPA) was passed January 8, (1986); the original passage of the TCPA Rule in New Jersey was June 20, (1988). The current official Toxic Catastrophe Prevention Act appeared in the July 20, (1998) New Jersey Register. The current TCPA Rule incorporates portions of 40 CFR 68 by reference.

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<sup>17</sup> P. J. McNulty, L. C. Schaller, and K. R. Chinander, "Communicating Under Section 112(r) of the Clean Air Act," *Risk Analysis*, **18**, 191-197, (1998).

<sup>18</sup> I. Rosenthal, P. J. McNulty and L. D. Helsing, "The Role of the Community and Risk Communication in the Implementation of EPA's Proposed Rule on Risk Management Programs for Chemical Accidental Release Prevention," *Risk Analysis*, **18**, 171-179, (1998).

<sup>19</sup> Title 7, Delaware Code Chapter 77, Section 7710.

(d) *Inspection protocol* – All inspections shall be conducted by trained and tested personnel or representatives. All inspections shall be conducted within the limits of a through Risk Management Program Inspection Protocol issued by the Department and adopted after a public hearing. The protocol shall consist of specific questions, facilities characteristics, required risk management components, physical observations and interviews.

(e) *Inspection training program* - The Department shall have a training program to periodically educate and test state employees or representatives responsible for inspecting regulated facilities.