U.S. CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD

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PUBLIC MEETING

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FINAL REPORT OF CSB ON THE FIRE AND DUST EXPLOSIONS AT THE CTA ACOUSTICS, INC., PLANT CORBIN, KENTUCKY, FEBRUARY 20, 2003

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TUESDAY, FEBRUARY 15, 2005

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The Public Meeting of the U.S. Chemical Safety and Hazard Investigation Board was held at 7:00 p.m., at the London Community Center, 528 South Main Street, London, Laurel County, Kentucky, Carolyn W. Merritt, Chairman, presiding.

APPEARANCES
Chairman & CEO Carolyn W. Merritt
Board Member John S. Bresland
Board Member Gary L. Visscher
General Counsel Christopher Warner

INVESTIGATION TEAM:
Mr. William (Bill) Hoyle
Investigations Supervisor

Mr. Mark Kaszniak
Chemical Incident Investigator

Mr. Stephen J. (Steve) Wallace
Chemical Incident Investigator
and Recommendation Specialist

PROCEEDINGS

P-R-O-C-E-E-D-I-N-G-S

(7:00 p.m.)

CHAIRMAN MERRITT: Good evening, and welcome to this public meeting of the U.S. Chemical Safety and Hazard Investigation Board, known as the CSB.

I am Carolyn Merritt, and I am Chairman and CEO of the U.S. Chemical Safety Board. And with me this evening are our Board Members John Bresland and Mr. Gary Visscher. Also joining us tonight are our General Counsel Chris Warner and other staff members who have worked very hard to make sure that this meeting comes off and is possible. And for that, we thank them.

Before we begin, I would like to point out some safety features, since this is a meeting about safety, and information about this building. Emergency exits, should we need them, are here and when you came in. And that door right there leads to the outside. And the one in the back also is a fire exit.

If you would, please, if you have pagers or telephones, please put them on mute or turn them off so these proceedings are not disturbed. I thank you for that.

Tonight the subject is the CSB's final report on dust explosion and fire at the CTA Acoustics facility in Corbin on February 20, 2003. Tragically, this incident took seven lives, and injured 37 others. It was the worst workplace disaster in Kentucky since 1989.

All of us at the agency offer our condolences to those who lost loved ones in this accident. To those who suffered injury, we wish you a full recovery.

Tonight's agenda will begin with a presentation of the staff report and recommendations, followed by questions from the Board. At that point, which should be about 8:20, there will be an opportunity for public comment, and all of you are encouraged to participate.

I do ask that you please keep your comments brief and relevant to the investigation. We can accept comments, but not questions.

If you plan on commenting, please register at the sign-in table in the front by about 8:00 o'clock, and I will call on you first.

Following public comments, the Board will consider approval of the final report, and then adjourn around 9:00 o'clock.

Before we hear the staff report, I hope you would allow me to make a few personal comments. The tragedy at CTA occurred just three weeks after the Columbia Space Shuttle disaster that claimed the lives of seven astronauts. The Columbia investigation found that the incident was not a technical mystery, rather, it was a failure to address known hazards and to take corrective actions when warning events occurred during earlier launches.

Like the Columbia accident, the incident at CTA Acoustics was preventable. Unlike the astronauts who accepted the risk of a hazardous venture, CTA employees simply went to work that Friday, expecting to come home at the end of the day unhurt, just as we all do, but around them was the fuel for an explosion. At 7:30 a.m., on February 20, the conditions were in place for tragedy.

For almost two years the Chemical Safety Board has been investigating this incident at CTA Acoustics in an attempt to understand why it occurred, not to find fault, but in order to prevent similar instances from happening in the future.

The purpose of this meeting tonight is to share that knowledge with you the public. And I thank you all for coming here tonight.

I will now recognize any of the Board Members who would like to have any opening statements. Mr. Bresland?

BOARD MEMBER BRESLAND: Thank you, Chairman Merritt. I also would like to extend warm words of sympathy to the victims of this tragedy and to their loved ones.

This is my third visit to the Corbin area. The first time was to visit the damaged CTA facility and attend our first public meeting that was held in Corbin. The second time was to visit the replacement CTA plant. And I am here tonight for our final public hearing.

When we complete our presentation tonight, I hope you will leave with a better appreciation of what happened on that day two years ago. For those of you who are closely affected by the explosion, we hope you will find this information to be useful.

The goal of the CSB is to determine what happened and to make recommendations that will hopefully prevent future accidents like this.

As you will hear this evening, the explosion here in Corbin is one of three similar accidents that we are investigating. Because of these three explosions, we have launched a general investigation of the issue of combustible dust explosions.

So, if any good can come out of the heartbreak and sorrow suffered by the workers and their families at CTA, we hope that in years to come we will not have to investigate accidents like this. We hope that we will not be visiting towns like Corbin and London to explain why a facility was destroyed and why so many lives were lost.

Thank you, Chairman Merritt.

CHAIRMAN MERRITT: Thank you, Mr. Bresland. Mr. Visscher?

BOARD MEMBER VISSCHER: No, thank you.

CHAIRMAN MERRITT: Now I would like to recognize Mr. Bill Hoyle who is our lead investigator on the CTA acoustics incident. Bill will present the staff report.

Mr. Hoyle has been active in the chemical safety and incident investigation field for 22 years. He has extensive experience in incident investigations, process safety management, and emergency response planning. Mr. Hoyle.

STAFF REPORT BY INVESTIGATOR

WILLIAM (BILL) HOYLE:

INVESTIGATOR HOYLE: Thank you, Madam Chair and Board Members.

First, I want to acknowledge the hard work of the investigation team that prepared this report. They include Mark Kaszniak, Stephen Wallace, Francisco Altamirano, Giby Joseph, and Cheryl MacKenzie.

In our presentation this evening we will discuss a brief summary of the incident; we will have an overview of our findings; we will discuss combustible dust hazards; we will explain the production process; we will describe the incident, then our key findings, followed by the root and contributing causes, and finally, our recommendations.

At 7:30 a.m., on February 20, 2003, a fire and series of explosions occurred at the CTA. Seven employees were killed, 37 were injured. The neighborhood was evacuated as a precaution. And a 12-mile section of Interstate 75 was closed temporarily as a precaution.

Ford Motor Company suspended operations at four assembly plants due to lack of acoustic insulation parts normally supplied by CTA.

We took this photograph the morning after the incident. The scene is typical of what we found. This incident was the worse workplace disaster in Kentucky in 14 years.

This was an avoidable tragedy, the result of the explosion of combustible dust -- a hazard that CTA and its raw material supplier were aware of, a hazard that Kentucky state inspectors and insurance inspectors never detected.

The dust that exploded at CTA came from phenolic resin powders manufactured by Borden Chemical in Louisville, Kentucky. Memos and minutes show that CTA managers knew of dust explosion hazard in the facility.

Dust from a similar Borden phenolic resin had exploded at a foundry in 1999, killing three workers. Borden knew about this incident, but did not inform its customers such as CTA that the resin dust could explode catastrophically.

Finally, numerous safety and insurance inspections of the CTA facility failed to detect the combustible dust hazard.

I want now to turn over the next portion of the presentation to Investigator Mark Kaszniak.

Mark joined the Chemical Safety Board after a 20-year career in the private sector as a health and safety specialist at IMC Global, Vigoro Corporation, and Morton International. He also worked for eight years for OSHA, the Occupational Safety and Health Administration.

Mark holds a bachelor of science in chemical engineering, and he is also a certified fire and explosion investigator.

PRESENTATION BY

INVESTIGATOR MARK KASZNIAK:

INVESTIGATOR KASZNIAK: Thank you, Mr. Hoyle.

In order to understand what happened at the CTA Acoustics facility on February 20, 2003, let me first explain a little bit about combustible dusts and their fire and explosion hazards.

Most organic materials, many metals, and even some inorganic materials, when finally divided into small particles and disbursed into the air, will either burn or explode if they contact a sufficiently strong ignition source.

Some examples that may be familiar to you from news sources are coal mine explosions due to coal dust and grain elevator explosions from grain dust.

Like all other fires, a dust fire occurs when a fuel, in this case a combustible dust like phenolic resin, comes in contact with an ignition source in the presence of oxygen.

As you know, the air we breathe provides sufficient oxygen in order to sustain a fire. This is called the fire triangle, which may be familiar to many of you. And removing any one of these elements eliminates the possibility of that fire.

A dust explosion requires the simultaneous presence of two additional elements: dust suspension and confinement. A suspended dust burns more rapidly, and confinement allows pressure to build up, thus, resulting in an explosion. This is called a dust explosion pentagon.

Again, if any one element of this pentagon is not present, a dust explosion will not occur. Thus, as you can see, dust explosions are more rare than dust fires, because they require more elements to be brought together.

What we intend to show in this presentation is that based on our investigation of the fire and explosion patterns and eyewitness statements, that three combustible dust explosions occurred at the CTA facility, along with the combustible dust fire.

Another feature of combustible dust explosions that I would like to bring to your attention is the fact that they often occur in a series, cascading rapidly through a facility. This is because combustible dust generally settles in elevated locations, on flat surfaces throughout the facility.

Then some event, either an initial explosion or some other event lofts the dust into the air where it creates a cloud. If this cloud is then ignited by a suitable ignition source, the dust will explode. As the pressure waive produced from this explosion moves faster than its flame front, the pressure wave shakes loose the dust from the building surfaces and the flame following it then ignites this, producing a series of explosions where there is suspension and confinement.

While examining the CTA facility, CSB noticed and observed powdered material that was burned onto building surfaces, and that the explosion damage at the facility was consistent with that produced by other dust explosions.

As a result of this, CSB collected 42 samples from the facility, which had them examined by an independent testing laboratory. This nationally-recognized laboratory sampled these materials and tested them for their explosive properties using a variety of standardized tests.

The results of these tests demonstrate that in the presence of a suitable ignition source, that the phenolic and fiberglass resin combinations will explode when suspended in the air in adequate concentrations.

The video clip that I am about to show you demonstrates some of the explosive potential of the black phenolic resin that was being used at CTA. A small amount of this resin, a couple of teaspoons, has been placed inside the container on the table. The lab technician is about to place a lighted flame at the open top of the container. A blast of compressed air supplied by the hose entering the container will then be used to loft the phenolic resin towards the flame. And then, you will see and hear what happens.

There he is lighting the flame. He is now going to pressurize the air. And then, the air will be injected in the container. This test will repeat in slow motion.

As you can see, the dust visibly flashed. If there had been containment present, there would have been an explosion with using only two teaspoons of this particular phenolic resin.

At the time of the explosions at the CTA facility, there was much more of this dust present on the building rafters and inside the plant.

As previously explained by our Board, the fire and explosions that occurred at CTA were the second of three combustible dust explosions that CSB is currently investigating. The first CSB explosion occurred at the West Pharmaceutical Services in Kinston, North Carolina. This explosion occurred on January 29, 2003, and involved the polyethylene dust, which is also a plastic dust.

As a result of that explosion, six employees died, and 38 others were injured.

The third explosion occurred at the Hayes Lemmerz facility in Huntington, Indiana, on

October 29, 2003. This particular explosion involved aluminum dust. One employee died and six others were injured.

CSB will be presenting the results of this investigation at some point in the near future.

What I would like to do now is describe the CTA production process, followed by a detailed description of the fire and explosion that occurred on February 20, 2003.

The CTA Acoustics plant manufactures acoustic insulation products for industrial and automotive uses. The photo on the right shows some of CTA's automotive acoustic insulation products. These products are formed to specifics to shapes during their use and are used as hood liners and other in areas inside the engine compartments of automobiles and light trucks.

The plant that the explosion occurred at was built in 1972 by the Certain Teed Corporation, who operated it and maintained it for 20 years, before it was acquired by CTA in 1992.

At the time of the incident, 561 employees were employed by CTA at the facility.

This is a simplified plant layout of the

CTA facility on February 20, 2003. The overall size of the facility for your reference is 300,002 square feet, and it was located just outside the Corbin city limits in Laurel County.

Most of the fire and explosion damage was in the production area of the plant. This is where the four production lines labeled on the diagram as Lines 401, 402, 403, and 405 manufactured the acoustical insulation products using the phenolic resins.

Lines 401 and 402 were used to manufacture industrial acoustic insulation products primarily used for duct liner for heating, ventilating, and air conditioning systems. The duct liner came off the lines in rolls. These rolls were then coated on Line 416. No phenolic resin was used on Line 416, and so, it was not damaged in the fires and explosions.

Lines 403 and 405 were used to make the automotive acoustic insulation products. These products came off the production lines in pelts and were hung on racks. Later, these pelts would be moved into the molding department, where they would be formed to their final shapes.

Significant fire damage was found in the raw materials roll and pelt storage areas of the facility. Both the maintenance department and the offices were also damaged by the pressure waves generated by the explosions as they vented through the facility.

Three raw materials: fiberglass, plastic sheeting known as facing, and phenolic resin powder were used to manufacture the industrial and automotive acoustic insulation products at CTA. Only the phenolic resin, however, was a combustible dust. The consistency of this phenolic resin was like that of talcum or baby powder.

The phenolic resin came in the facility in 2000-pound bags called super sacks. A super sack was suspended above a feed hopper on each processing line. A screw conveyor attached to this feed hopper then transported the resin powder to the resin feeder.

Two types of phenolic resin were used in the facility called natural and black. The black resin contained two percent carbon black to produce the desired color for the automotive products. The natural was used on the industrial lines for the HVAC duct liner. Several thousand pounds of phenolic resin were used in the manufacture of CTA's products every month.

Through interviews with employees and analysis of fire and explosion patterns, CSB determined that the initial dust explosion occurred on Line 405. To help you understand how the phenolic resin cloud was generated and how it subsequently exploded, let me explain how the raw materials were produced on this processing line through the aid of this diagram.

Various types of fiberglass were fed into the line by land line feeders, which were then moved into a picker, which opened up the fiberglass and separated out. Another series of conveyors then moved the fiberglass into the resin feeder. At the resin feeder, phenolic resin was metered in on top of the fiberglass. And in the mat former, this phenolic resin was sucked down into the mat to create a resin-impregnated fiberglass mat.

The material that didn't get sucked up in the mat ended up going up through the four vertical pipes and into what is known as the bag house, which was on the roof. The bag house separated out the fine fibers and fiberglass from the air stream, and deposited it in the bottom of the bag house.

Daily cleaning crews then removed this material from the bag house by processing it on a conveyor, through a shoot, through an air lock, where it was deposited into a box on the floor in the blend room. This box would be removed by a forklift truck when it was full.

As the mat exited the mat former, facing was applied above and below the mat to sandwich it before it went into the curing oven. In the curing oven, hot air circulated around this sandwich construction, binding the fiber, namely, heating the fiberglass, heating the resin up so that it partially melted to stick both the facing and the fiberglass together into a firm fiber pad. The firm fiber pad then exited the curing oven, was cut and shaped to size, suspended in the racks, and then later processed in the molding department.

The combustible dust explosions and the fire occurred while the processing lines at the CTA facility were being cleaned, not while they were being operated. Compressed air, chimney sweeps, and metal tools were used by operators to clean excess resin and fiberglass from the processing lines at the beginning of each shift.

These materials were then dumped onto the plant floor, and then swept up with brooms, and placed in a dumpster for disposal. Fans were used to blow dust generated during these cleaning operations away from the operators. The result was that combustible dust disbursed and settled on flat surfaces throughout the facility.

During its investigation, CSB noted a number of pre-incident events that created conditions that led up to the fire and explosions on February 20, 2003. First, the Line 405 bag house was operating inefficiently, creating excessive dust inside the plant.

When this bag house was not operating properly, employees told CSB the phenolic resin dust blew out the base of the mat former and into the facility.

Second, the Line 405 oven door was open because the oven was running too hot. This was due to a malfunctioning temperature controller that operators had been having problems with for the past several weeks. As no spare controller was available at the facility, the oven doors were being opened in order to regulate the oven temperature.

Third, there has been a history of small fires in the ovens. Pieces of phenolic resin and fiberglass broke off the edges of the mats as they passed through the oven and accumulated inside. These pieces, subjected to the continued heat of the oven, would overheat, and then ignite, resulting in a fire. These fires were normally extinguished by operators using garden hoses and portable fire extinguishers.

On the morning of the incident, the day crews arrived at the facility and began routine cleaning of the processing lines. During this cleaning, the Line 405 crew discovered a plugged area in the ducts leading to the bag house. They removed this plug by breaking it up with a stick and using compressed air. These cleaning activities, coupled with other cleaning activities on the plant floor, created a dust of phenolic resin inside the plant.

Meanwhile, combustible dusts that had previously built up inside the curing oven, overheated and ignited, causing a fire to occur inside this oven. The fire was not discovered by the line operators because they were busy cleaning the line elsewhere.

Then, the dust clog created by the

cleaning activities, blown in the direction of the oven by the fans, was ignited by the flames from the fire burning inside the oven at the open oven door. The result was a combustible dust explosion.

As shown in this overhead figure diagram of Line 405, the first explosion occurred inside the oven in the relatively confined area between the oven and the firewall. The location of this explosion was confirmed by interviews with eyewitnesses in the plant and examination of the explosion damage by CSB.

The firewall across the aisle from the Line 405 oven was partially collapsed. The force from this explosion also shook the facilities, suspending dust into the atmosphere. Employees told CSB that as the dust fell on them from above, the lights of the facility then went out.

When the first explosion occurred, flames shot up into the bag house from the process below. Two employees on the plant roof cleaning the bag house were burned. This photo of the Line 405 bag house shows the fire damage that the bag house sustained. And you can see that on the right side of the photo. This is the area where the employees were working at the time.

A second dust explosion occurred in the confined area above the Line 405 blend room when the falling suspended dust was ignited by the fireball from the first dust explosion as shown in this side diagram of Line 405. The force from the second explosion damaged nearby firewalls and the roofs of both the blend room and the plant. Four employees were injured near Line 405 by these two explosions. Three of these employees were seriously burned, and one later died.

This photo shows the explosion damage at the end of Line 405. As you can see in the foreground, the firewall has been knocked down from the force of the explosion. Also, notice the metal panels above the blend room were blown out, as well as portions of the roof.

This overhead diagram of the production area shows the first and second explosions at Line 405. After the second dust explosion, a fireball, indicated by the red arrow, traveled along the ceiling to other processing lines. These three events happened in quick succession, leaving little time for employees working in various parts of the production area to escape.

When the fireball reached Line 403, it moved into the blend room. Six employees working on this line were severely burned. Four of them later died.

Portions of the fireball continued moving over Line 403, into Line 402. Three employees were burned in the narrow aisleway between Lines 402 and 401. Two of these people later died.

Next, a third explosion occurred in the Line 401 blend room. Three employees working in the blend room were severely injured, while two others received minor injuries. Another 30 employees in other areas of the plant were injured. These injuries varied from first-degree burns, fractures, cuts, bruises, and smoke inhalation from the fire and the force of the explosions.

What you are about to see are three computer simulations developed for the CSB. They show the three combustible dust explosions and the fire spread that occurred at the CTA facility on February 20, 2003. These simulations were used by CSB to evaluate hypotheses concerning the development of the explosions and the spread of the fire. The computer simulation is shown on a scale drawing of the facility, with all the major pieces of equipment in place.

The first simulation is an overhead view. The roof of the facility has been made translucent so that you can see what is going on inside the plant, along with what is going on on the roof. The model follows the visible combustion products produced as the explosions occur and as the fire spreads.

There is the initial explosion, followed by a secondary explosion over 405, leading down to 403, across the roof, down to 402, 401, where it then dissipates in the other end of the facility.

This second simulation is an eye-level view from a vantage point between Lines 405 and 403, as if you were standing inside the plant. Again, the roof of the facility has been made translucent so you can see what is going on inside the plant, as well as what is happening on the roof.

Initial explosion going over Line 405, across the roof to Line 403, and then into the rest of the facility.

The final simulation picks up where the last explosion left off. Again, same parameters as before, only this time, we will be looking at a vantage point of the facility near Line 416, towards Lines 403, 402, and 401.

There is the explosion passing through 403, onward to 402, to 401, and then dissipating out into the other end of the facility.

So how can combustible dust fires and explosions be prevented? As part of its investigation, CSB examined the standards that are applicable to these hazards. CSB found previously-existing standards published by the National Fire Protection Association, or NFPA.

You may already be familiar with the NFPA which develops codes and standards to reduce the loss of life and property. These safety standards are present in our everyday life. Take, for example, this auditorium. NFPA standards were used to determine the location of the exit signs and the size of the door openings and their placement around the facility.

NFPA standards are widely adopted by regulatory agencies such as OSHA and state and local authorities. The primarily safety standard pertaining to this investigation is the NFPA 654, which is the standard for preventing fire and dust explosions from manufacturing and processing and handling of combustible particulate solids.

NFPA 654 addresses dust explosion prevention for industrial facilities such as CTA through safe design, construction, housekeeping, and other practices. The standard was originally developed back in 1943 to prevent dust explosions in the process in the plastics industry, but this was later expanded to include all combustible dust industries.

As you will hear in a moment, during the discussion of the key findings, use and enforcement of NFPA 654 by state agencies and the companies involved would have prevented this incident.

At this point, we would like to turn it back to the Board for questions regarding the fires and explosions.

CHAIRMAN MERRITT: Thank you, Mr. Kaszniak. At this time are there any Board questions? Mr. Bresland?

QUESTIONS BY THE BOARD:

BOARD MEMBER BRESLAND: Mr. Kaszniak, can you compare the energy of this explosion or the dust, the combustible dust involved in this explosion, with other materials that we have been involved with or other explosions that we have been involved with; for example, the explosion at West Pharmaceutical, in North Carolina, which involved polyethylene dust.

INVESTIGATOR KASZNIAK: Sure. The phenolic resin dust is more energetic from an explosion severity standpoint than the polyethylene dust that was used at West Pharmaceutical. It is also more energetic than coal dust that is typically found in coal dust, as well as corn starch, which is typically used in some of the grain elevator facilities. So this dust was slightly more energetic than corn starch.

BOARD MEMBER BRESLAND: In your last slide you talked about the National Fire Protection Association, NFPA, and their code number 654, and you suggested that had the facility complied or used 654 in their operation design, it might have prevented this accident. Can you enlighten us on that as to some examples of what changes would have taken place in the process if they had used the examples set in NFPA 654.

INVESTIGATOR KASZNIAK: Well, NFPA 654 contains a number of features too lengthy to describe here in detail, but I will point out a few for your benefit.

One is the design criteria and the standard. The standard has certain criteria for minimizing flat surfaces in elevated areas, such as on beams and pipes and things like that. If the flat surfaces would have been eliminated in the CTA facility, the dust would have had no place to settle in the higher parts of the facility.

There are also extensive standard operating procedures listed in NFPA 654 for cleaning practices employed at the CTA for proper cleaning practices for facilities that have combustible dust.

As I noted in my presentation, CTA used a variety of methods such as sweeping and using compressed air, along with fans, to clean the combustible dust from the processing areas. All these practices are not recommended by NFPA 654.

NFPA 654 recommends vacuuming as the technique for removing combustible dusts. Any technique that stirs up the combustible dust as you are trying to clean it obviously creates more of a hazard.

BOARD MEMBER BRESLAND: And how would,

legally or administratively, how would NFPA 654 be applied to a facility like this or to a state like Kentucky or the previous case in North Carolina? What would have to happen for that to be in effect?

INVESTIGATOR KASZNIAK: There are two primary mechanisms for application of NFPA 654. One is adoption by state and local fire codes. Here, building facility officials would adopt 654 to apply to specific facilities. And then, when the facilities are designed or modified, those code requirements would be applied.

The other area would be, of course, for the Occupational Safety and Health Administration or the Kentucky Office of Safety and Health to adopt 654 as a workplace safety standard.

BOARD MEMBER BRESLAND: And what is the current status in the state of Kentucky?

INVESTIGATOR KASZNIAK: The state of Kentucky has adopted 654 as part of its fire codes, but due to the long period of time that this facility has existed, those standards were not applicable to this facility when the facility was constructed. So the facility was what is known as grandfathered from those requirements.

As for the OSHA standards, neither federal OSHA or the state of Kentucky have adopted NFPA 654 as a standard for industrial dust explosion prevention.

BOARD MEMBER BRESLAND: I have no more questions.

CHAIRMAN MERRITT: Mr. Visscher?

BOARD MEMBER VISSCHER: Thank you, Madam Chair. Just a couple questions about the presence of the dust that you have described. You've describe it as dust, at least with regard to the secondary explosion and the kind of rolling fireball, as being present on flat surfaces. In your investigation, was the dust visible or primarily invisible to the employees? Were they aware that the dust was there? Both the management and employees.

INVESTIGATOR KASZNIAK: The dust was present at the facility. CTA had a cleaning program for cleaning the floor level of the plant on a regular basis, as well as cleaning the processing lines.

Unfortunately, some of the dust settled in the upper areas of the plants on rafters and on beams, and these were not cleaned as frequently as the processing lines were cleaned. So the dust would have been visible on these beams. Without going up into those upper reaches of the facility, it would be difficult to tell just exactly how much dust was up there.

But as Mr. Hoyle will present in the key findings, it does not take a great quantity of dust in order to create a dust explosion hazard, especially when it is disbursed over a wide area.

BOARD MEMBER VISSCHER: So the dust that fueled this explosion and fireball was primarily in the rafters and sort of along the ceiling line, the roof line?

INVESTIGATOR KASZNIAK: Well, at the CTA facility there are various I-beams and building roof trusses that support the roof and horizontal pipes, and ductworks from the ovens, and a lot of different horizontal pipes that are up high in the facility, as well as the areas on top of the blend rooms where dust could accumulate. These areas are above eye level, and thus, not subject to the normal cleaning requirements.

BOARD MEMBER VISSCHER: You mentioned just kind of in passing that the bag house was not operating efficiently. To what extent was that a significant cause of the dust being present? Was it largely due to the fact that the dust was present because the bag house was not operating efficiently, or were there other sources?

INVESTIGATOR KASZNIAK: Well, the bag house itself during the operation of the plant when it wasn't operating efficiently -- and we are not saying it was operating inefficiently all the time, but at least the day prior to the explosion and other periods that we can document, there were periods of inefficient operating at the facility.

When it was operating that way while the production lines were being run, dust would emanated out of the mat former, and thus, contribute to that which was being suspended in the air. To the point where this dust would settle on elevated surfaces, it was contributory to the dust in the facility.

The other means of, you know, the dust getting into the facility was the fact that during the cleaning process itself they were using improper methods for cleaning, and thus, they were generating this dust during the cleaning itself, and putting it into higher areas of the facility by using compressed air, dry sweeping, and the like.

CHAIRMAN VISSCHER: Thank you.

CHAIRMAN MERRITT: In your presentation you talked about a fire in the oven. I understand from the report that this oven is a forced-hot-air oven, and that there actually isn't a flame in the oven. Can you explain to me again how this material or how an open flame would have occurred in the oven.

INVESTIGATOR KASZNIAK: Yes. You are correct -- this is a forced-air oven. The flame is heating the air up in the air intake exhaust, so there is no flame normally present in the oven.

However, as this sandwiched mat went through the oven, it is in a very fragile condition until it gets heated and fuses together. It is basically fiberglass fibers with phenolic resin on top of it being fed through on a conveyor.

As it gets fed through the facility, parts of this mat stick onto that conveyor, and the edges in particular, come off, and they stick on the conveyor or they fall to the bottom of the oven, creating accumulations.

The oven is designed as a single pass-through device, meaning that the mat goes through once, becomes firm, and then it is cut into place.

These materials that fall off inside the oven or stick to the conveyor go around and around again, being subjected to the heat of this oven.

There is also a lubricating oil used on this conveyor, which then mixes with this material as well. And as a result, the material stays in the oven for prolonged periods of time, continually heating, until it overheats, and then bursts into flames.

We noted several, in the history of the plant, several small fires that occurred inside the oven, you know, on a regular basis. And as a result, these would normally be put out by the operators as they were watching the processing lines. In this case, everybody was busy cleaning elsewhere, and there was nobody watching the oven, which was still on at the point where this line was being cleaned.

CHAIRMAN MERRITT: Okay. Thank you. If there are no other questions, then, I would like to introduce Mr. Hoyle who will talk about the key findings.

KEY FINDINGS, ROOT AND
CONTRIBUTING CAUSES BY
INVESTIGATOR WILLIAM (BILL) HOYLE:

INVESTIGATOR HOYLE: The investigation

team identified 11 key findings. I will discuss each of those.

First, combustible phenolic resin dust fueled the fire and explosions. We ruled out natural gas leaking as a cause of the fire and explosions. We examined blast and fire patterns, as well as conducted many interviews, and all of these clearly establish that the facility had experienced a dust fire and explosions.

We examined the natural gas system because natural gas fueled the ovens. We conducted tests of the piping and the components of the natural gas system to ascertain was there any leak that could have released natural gas into the facility. And our testing concluded that there was no leak into the facility.

In addition, the operators working the line that day, none of them when we interviewed them reported smelling natural gas, which has an odor in it and is easily detected.

Second, the Line 405 was operated with the oven doors open due to a malfunction of temperature control equipment. Combustible material inside the oven caught fire, and the flames then ignited a dust cloud outside the oven.

As Mark has explained, we determined that the incident initiated on Line 405. This determination is consistent with the conclusion of investigations conducted independently of ours, those conducted by the Bureau of Alcohol, Tobacco, and Firearms, as well as the Kentucky State Fire Marshall.

Here is a picture of the open oven door on Line 405. This door is approximately four feet by four feet in diameter. As has been explained, fire is not normally present in the oven. However, there was a history of small fires associated with this oven. We have already explained that those are normally put out, but on the morning of the incident, there was no one stationed at the oven, because they were cleaning the line, who would have detected it and put it out. In fact, there were a number of water hoses and fire extinguishers situated in close proximity to the oven because of the frequent fires.

Third key finding: Lack of effective firewalls and blast-resistant physical barriers allowed the fire and explosions to spread to non-production areas of the facility.

We have here a picture of a collapsed

firewall between Lines 403 and 405. The walls were not designed to withstand explosions. And the production area was not effectively equipped with venting to vent explosive forces so as to help the walls to not be toppled in an explosion event.

Fourth: Borden Chemical did not explicitly communicate the explosive hazard of phenolic resins to CTA. Material safety data sheets provided by Borden to CTA noted that the material was combustible, but they did not warn that the phenolic resin could explode.

Borden's material safety data sheets referred customers to the combustible dust safety standard NFPA 654. However, CTA did not have a copy of that standard and was not aware of its requirements.

Fifth: Borden Chemical did not communicate to CTA the safety lessons from the 1999 Jahn Foundry dust explosions that involved a similar Borden phenolic resin powder. In that incident, three employees were killed, nine others were injured.

This is a picture of the Jahn Foundry. After this incident, a task force at Borden drafted a "Dear Customer" letter to warn their phenolic resin customers about the explosion hazard in light of the foundry explosion.

Borden also planned to send a copy of the joint Massachusetts OSHA and State Fire Marshall Investigation Report into that incident, but that report would be attached to the letter. Borden never sent the letter or the report to their phenolic resin customers -- including CTA.

In addition, Borden did not modify their material safety data sheets for phenolic resin powder to explicitly warn of the explosion hazard.

Six: CTA management was aware of the explosive potential of dust, but did not implement effective measures to prevent explosions or communicate the explosion hazard to the general workforce.

Company memos and minutes of meetings from 1992 through '97 showed discussions about the explosive potential of dust in the facility. The CTA fire brigade training manual warned of fire and explosion potential when dust accumulates. Job safety analyses on line-cleaning activities warned against cleaning with compressed air, as it would suspend the dust in the air and create a dangerous situation.

Next: Inefficient bag house operation and improper production-line-cleaning activities disbursed combustible dust and deposited it on elevated flat surfaces where it accumulated.

Interviews with many employees revealed that the area around the production lines was very dusty during the cleaning activity. In addition, the Line 405 bag house was not operating efficiently and was releasing excessive dust into the facility, in particular, the night before the incident.

The combustible dust safety standard NFPA 654, warns against use of compressed air for cleaning, because it actually increases the risk of fire and explosions. It was so dusty during the line-cleaning activity that operators used large room fans to blow the dust away from them.

Eight: Lack of housekeeping on elevated flat surfaces allowed the combustible dust to build up to unsafe levels.

As Mark has explained, this included I-beams, ductwork, pipes in the top of the blend rooms. It does not take very much dust to trigger powerful explosions.

NFPA 654 states that dust layers of one-thirty-second of an inch can create hazardous conditions. One-thirty-second of an inch is less than the thickness of a dime.

We found in our investigation burned material on flat surfaces, but because of the extensive fire and explosion damage, as well as the use of fire water to put out the fire, we were not able to determine the thickness of the dust layer in the facility that was present at the time of the fire and explosion. However, we did observe several inches of dust material buildup on the top of the Line 405 blend room.

Next: The Kentucky Office of Occupational Safety and Health conducted wall-to-wall inspections of the facility in 1989, '93, and 2000, but did not issue citations regarding combustible dust hazards.

As was said earlier, federal OSHA, as well as Kentucky Occupational Safety and Health, have a comprehensive safety standard to address combustible dust in the grain industry. However, neither have adopted a combustible dust safety standard to apply comprehensively to industrial facilities.

The fire marshall: Now moving from the

state occupational safety and health group to the state fire marshall's office. The fire marshall in Kentucky has the authority and the responsibility to enforce fire safety standards at existing facilities.

The fire marshall conducts annual inspections of high-occupancy facilities. That includes daycare centers, nursing homes, schools, and other similar locations. However, the state fire marshall does not routinely inspect industrial facilities such as CTA.

This leads to our next key finding: The Kentucky State Fire Marshall's office had not inspected the CTA facility since it was constructed in 1972.

And our final key finding: Despite frequent inspections, none of CTA's insurers identified phenolic resin dust as an explosion hazard in the last eight years since 1995.

F.M. Global, one of CTA's insurance carriers, conducted five inspections in the two years prior to the incident, but did not detect the combustible dust hazard.

Next, I am going to present the root and contributing causes that we identified in our investigation. These are the underlying causes, and the purpose is to identify opportunities for prevention. Please note that the causes are not listed in any particular order.

A root cause is typically a management system failure such as faulty design or inadequate training that leads to an unsafe act or condition. A major incident usually has multiple root causes, and removing any root cause prevents the incident from occurring.

A contributing cause is typically a management system deficiency that increases the likelihood of the severity of an incident.

The first root cause: CTA management did not implement effective measures to prevent combustible dust explosions. Management did not communicate the explosive hazard of the phenolic resin dust to its employees. CTA did not obtain or use the combustible dust safety standard NFPA 654, which was referred to them in the Borden Chemical Material Safety Data Sheet.

Second: CTA cleaning and maintenance procedures for production lines did not prevent the accumulation of unsafe levels of combustible dust.

As we have described already, the cleaning methods actually increased the dispersion of dust, and then the housekeeping program did not keep it from building up.

Third: The CTA incident investigation program did not ensure that all oven fires were investigated and that the underlying causes were identified and resolved.

We have already explained there were frequent fires in the ovens, but not all of these fires were investigated by CTA management. And their underlying causes were not identified, and corrective actions to prevent them from happening in the future were not taken.

There were a number of fire reports on Line 405 in the months prior to the incident. And in several cases, there were no recommendations to prevent future fires.

Next: Certain Teed's building design and CTA's building modifications did not effectively address the fire and explosion hazards associated with combustible dust. Although not a legal requirement in 1972 when CTA built the facility, the combustible dust safety standard NFPA 654 was available to provide safety guidance in the design of the facility. In particular, minimizing flat surfaces to prevent the accumulation of combustible dust would have prevented the spread of the fire to Lines 401, 402, and 403.

Moving now to contributing causes. First: The Borden Chemical product stewardship program did not explicitly convey to CTA the explosive hazards of phenolic resin powder.

Product stewardship refers to a chemical manufacturer's activities to promote the safe use of their products by their customers. This was not adequate in the case of Borden Chemical and CTA.

The Line 405 oven lacked fire detection devices and automatic sprinklers. As Mark explained, combustible material accumulated in the oven, caught on fire, and then ignited.

Third, CTA did not have effective procedures for evaluating the hazards associated with the non-routine operating conditions on Line 405. Operating the oven with a malfunctioning temperature controller and with the doors open was a non-routine situation. However, the hazards of operating in this manner were not recognized, nor were they controlled.

This concludes the presentation of the

findings of our investigation. And we are glad to take Board questions, if there are any.

QUESTIONS BY THE BOARD:

CHAIRMAN MERRITT: Thank you, Mr. Hoyle. One of the things you just said is that CTA built the building. Is that correct? Or was that building built prior to CTA's ownership?

INVESTIGATOR HOYLE: I believe I said Certain Teed. Certain Teed built and designed the building in 1972, and then operated it for the next 20 years.

CHAIRMAN MERRITT: And then it was purchased by CTA?

INVESTIGATOR HOYLE: Yes, it was bought by CTA in 1992.

CHAIRMAN MERRITT: Okay. Thank you. Do the other Board Members have questions?

BOARD MEMBER VISSCHER: Just briefly.

CHAIRMAN MERRITT: Mr. Visscher?

BOARD MEMBER VISSCHER: Thank you. Briefly, if you would explain a little bit with regard to following up on the Chairman's question there about the building and why it did or did not follow or have the building modifications that addressed those issues at the time it was built.

INVESTIGATOR HOYLE: Right. In 1972, the NFPA 654 code did not apply to the construction of the CTA facility, because at that time the standard only applied to the plastics industry, not to automobile parts manufacturing. It later was expanded in its scope to apply to industrial facilities of whatever type that handled combustible dust.

But nonetheless, this was a facility designed to use phenolic resin powder, which is a combustible dust, and it is necessary to design that in a safe manner. And the NFPA 654 was available and would have provided good guidance in the design of the facility that would have prevented the spread of the fire and the explosions if it had been used. However, it was not a legal requirement at the time of construction.

BOARD MEMBER VISSCHER: But it would be at the present time, I take it.

INVESTIGATOR HOYLE: If the plant were to be built, --

BOARD MEMBER VISSCHER: Today.

INVESTIGATOR HOYLE: A new facility was built handling combustible dust today, that would be a requirement in the state of Kentucky.

BOARD MEMBER VISSCHER: Thank you.

CHAIRMAN MERRITT: One of the things that we do at CSB is to try to identify how this might be prevented in other places. And in your comment, then, if other industries or other people who are using combustible dust now who may have facilities were to look at the 654, then what we are saying, if they would do that and apply the standard, whether it applies to their facility or not, those are good guidelines for preventing this accident from happening again. Is that correct?

INVESTIGATOR HOYLE: Absolutely. That would be one of the conclusions of our investigation.

CHAIRMAN MERRITT: Thank you. Mr. Bresland?

BOARD MEMBER BRESLAND: I have a couple of questions about material safety data sheets or MSDS's. But perhaps before I ask those questions, could you just take 30 seconds to educate us and the audience on what a material safety data sheet is. I have one in front of me here, but maybe there are people in the audience who might not understand exactly what it is and what it is supposed to do.

INVESTIGATOR HOYLE: Very good. These are safety information sheets that are provided by the manufacturers of hazardous chemicals to the customers, to the purchasers of those materials or to the users. And they lay out the hazards of the material, which may be reactivity, may be flammability, may be a toxic hazard. And it will specify what are the hazards and what are the precautions that a facility and employees need to take to protect themselves. And these are widely used in industry, and are actually a requirement under the Hazard Communication Standard of the Occupational Safety and Health Administration.

BOARD MEMBER BRESLAND: Are those the MSDS from Borden for the particular products or the raw materials that were used at the CTA facility? What does it say about explosions and explosion hazards?

INVESTIGATOR HOYLE: Okay. The material safety data sheet for the phenolic resin powder used on Line 405 prepared by Borden Chemical does state that the dust from the material is a combustible dust. And it furthermore refers the customer, in this case CTA, to use the guidelines in NFPA 654.

As I've said earlier, CTA did not have a copy of 654. And in examining the material safety data sheet, it never explicitly warns that the dust can be explosive or could result in the kind of catastrophic explosions that occurred at CTA.

BOARD MEMBER BRESLAND: Now, I understand from your presentation that there was an explosion at the Jahn Foundry in 1999, involving a similar material made by Borden, and Borden considered making some changes, or they considered putting out another communication about the hazards of the material. What happened to that? Was it ever sent out? Or if not, do you know why it wasn't sent out?

INVESTIGATOR HOYLE: Well, an internal task force at CTA [sic] developed a "Dear Customer Safety Correspondence Letter," and it planned to attach an investigation report to send to their phenolic resin powder customers.

Members of that task force, when interviewed, explained that they sent the plan and the letter to their legal counsel, internal legal counsel, but the letter and report were never sent to the customers.

CHAIRMAN MERRITT: You, I think, mis-spoke. You said CTA did the material safety data sheet. It was Borden.

INVESTIGATOR HOYLE: It was Borden. I meant to say Borden. My apologies.

BOARD MEMBER BRESLAND: So this material was involved in an explosion in 1999. The material safety data sheet today, the most recent one, what does it say about explosive hazards of this material?

INVESTIGATOR HOYLE: Subsequent to the 1999 explosion, the task force at Borden considered modifying the material safety data sheet and to examine whether more explicit warnings would be desirable. However, they did not recommend changes to the material safety data sheet. And at the time of the incident at CTA, the material safety data sheet had not been modified to call more attention to the explosion hazard, even after the 1999 incident at Jahn Foundry.

BOARD MEMBER BRESLAND: In your opinion, is the MSDS missing an important piece of information?

INVESTIGATOR HOYLE: Yes. In fact, you will hear shortly Steve Wallace will be speaking about that. But, yes.

One of our conclusions is that the warnings on the MSDS were inadequate.

BOARD MEMBER BRESLAND: Because when I look at your root and contributing causes, I am somewhat concerned about the fact that a contributing cause relates to the Borden MSDS, but it is not a root cause. And I think perhaps we could think about maybe moving in the direction of being a root cause rather than a contributing cause. But we can talk about that a little later.

INVESTIGATOR HOYLE: Okay.

BOARD MEMBER BRESLAND: By coincidence, I just received this week's copy of Chemical and Engineering News, which is the magazine of the American Chemical Society. And there is a three-page article on material safety data sheets. Just one quick quotation from the article.

The person who is quoted in the article says -- and he is an expert on MSDS's, and has written articles for the scientific journals about MSDS's. He said: "No MSDS is better than a wrong MSDS."

So one with incorrect information or missing information is worse than not having an MSDS at all, in his opinion.

CHAIRMAN MERRITT: I have a question about the housekeeping issue. One of the things you mentioned was that dust accumulated on flat surfaces. Did CTA have a schedule for cleaning these flat surfaces, and was that schedule maintained on a regular basis?

INVESTIGATOR HOYLE: Okay. Well, the elevated surfaces near the roof were supposed to be cleaned twice a year during a plant shutdown. However, based on our review of documents and interviews in the case, we have found that the schedule had been -- the actually cleaning of the elevated surfaces likely was not occurring as was intended. And in fact, it may not have occurred in some time, even though it was supposed to take place every six months.

CHAIRMAN MERRITT: In the analysis of work practices, were there any procedures that were recommended to be done, and were those procedures for doing jobs safely actually implemented at CTA?

INVESTIGATOR HOYLE: Can you give me an example of your question or paraphrase it.

CHAIRMAN MERRITT: Well, in a lot of instances companies use job hazard analyses to identify how to do a job safely.

INVESTIGATOR HOYLE: Okay. Okay.

CHAIRMAN MERRITT: Was this ever identified as a potential unsafe situation?

INVESTIGATOR HOYLE: In particular, there were job safety analyses of the use of compressed air for cleaning. And in one occasion that I mentioned earlier, one job safety analysis of the use of compressed air warned that this could, in fact, create a combustible or an explosive cloud of dust. It naturally warned that compressed air should not be used for cleaning. However, in our investigation, we found that compressed air was routinely used for cleaning in the facility.

CHAIRMAN MERRITT: And were the workers ever trained not to use compressed air because of the findings of this job hazard analysis?

INVESTIGATOR HOYLE: We did not find any evidence that they were trained to not use compressed air.

CHAIRMAN MERRITT: Thank you.

INVESTIGATOR HOYLE: Let me next recommend our presenter for the recommendations of our investigation. Stephen Wallace, prior to joining the CSB, was a manager of Health and Safety for West Lake Chemical. He has a bachelor of science in chemical engineering from the University of Kentucky, in Lexington, and he is a registered professional engineer in Tennessee.

RECOMMENDATIONS BY INVESTIGATOR

STEPHEN J. (STEVE) WALLACE:

INVESTIGATOR WALLACE: Thank you, Mr. Hoyle. Good evening.

The tragedy that happened at CTA Acoustics did not have to occur. As part of this investigation, we have developed recommendations to prevent recurrence of this type of incident in the future.

Our recommendations are not based solely on legal requirements. They are based also on good industry practices.

I want to note that we have a complete package of recommendations to a number of recipients, because, as was mentioned earlier, there were a number of opportunities when these deficiencies could have been caught but were not.

In some cases I will summarize the recommendation. But the full text of the recommendation is in the draft of the report.

So we would like to propose the

following.

We would like to propose that CTA Acoustics develop a comprehensive dust safety program using good practice guidelines such as NFPA 654, which is the standard for handling dust in this industry.

This is based on a number of findings that Mr. Hoyle just outlined. Principally, good practices were not built into the design of the plant. Modifications to the plant presented opportunities when these deficiencies could be caught, and they were not. And also, there were several warnings during the operation of the facility, and those opportunities to find these deficiencies were not utilized either.

Along with this recommendation, we have several subparts. Part of a comprehensive program will minimize surfaces where combustible dust could accumulate in the design or modification of the plant. It will also ensure that phenolic resin handling facilities are designed to prevent the spread of fires or explosions involving combustible dust.

We also recommend that CTA Acoustics prevent the unsafe accumulation and dispersion of combustible dust by frequently cleaning process areas, including the areas above production lines. And we have had quite a bit of discussion about that issue already.

We propose that they minimize the dispersion of combustible dust by using appropriate dust-cleaning methods and tools.

We further propose that they address the dangers of combustible dust and the prevention of dust explosions in their hazard communication training program. Many people will know this as the HazCom Program.

Based on the finding that the event likely occurred because there was a fire in the oven, we recommend that CTA Acoustics conduct hazard assessments of ovens to ensure that fire detection and suppression systems are adequate, and that they use such good practices as NFPA 86 to do so.

Based on the finding that a loss of control in the process resulted in unsafe operating practices, we propose that CTA Acoustics develop procedures to maintain safety during non-routine operations, such as operating the line with the oven doors open because the control system is not functioning properly. That was one of the most glaring examples of this that we found.

We also propose, based on the finding that the fires were common, but the underlying causes were not identified and solutions proposed, we recommend that CTA Acoustics revise their investigation program, and that they ensure that the underlying causes of events such as fires are identified and that corrective actions are implemented. In some cases, the only resolution that was noted was that the fire was extinguished, but there was no proposal to prevent future fires.

Also, based on the finding that Certain Teed was involved in the initial plant design, we have two recommendations. First, we propose that they evaluate their facilities that handle combustible dust, and ensure that good practice guidelines such as NFPA 654 are followed. We want to prevent these type of incidents at facilities such as CTA and Certain Teed facilities.

And in order to pro-actively ensure that facilities with Certain Teed designs in the future are designed safely, we propose that they ensure that their company design standards incorporate good engineering practices to prevent dust explosions. And such good practices would, of course, include NFPA

654.

As we discussed, the Board found that phenolic resin used at the CTA facility was manufactured by Borden Chemical. To more effectively communicate this hazard, we propose the following recommendations.

We propose that Borden Chemical ensure that MSDS's or material safety data sheets for phenolic resins include, at a minimum, warnings that dust from these products can be explosive -- explicitly include that in the material safety data sheets.

Further, we propose that Borden Chemical develop and distribute educational material in addition to material safety data sheets to inform customers of the explosion hazard of phenolic resin dust, in addition to MSDS'S, additional educational materials to give even more context for this hazard for their customers.

Finally, to Borden Chemical, to prevent this type of incident in other facilities that use this material, we propose that they communicate the findings and recommendations of this report to their customers that purchase phenolic resin.

As was noted previously, a number of organizations had some type of oversight role with this facility. The next list of recommendations will address some of those organizations.

First, to the Kentucky Office of Occupational Safety and Health we recommend that they develop and distribute an educational bulletin on the prevention of combustible dust explosions so that facilities in the state of Kentucky that are handling combustible dust will have some guidance from Kentucky OSHA on what to do.

It is important to note that Kentucky has its own occupational safety and health administration, and they have regulatory oversight for manufacturing facilities in Kentucky. They did conduct inspections at CTA prior to this explosion.

Based on the finding that Kentucky OSHA inspects manufacturing facilities, we propose that they enhance their training program for compliance officers on the recognition and prevention of combustible dust explosion hazards in particular.

The company that insured CTA at the time was Factory Mutual. Factory Mutual conducts audits of facilities that it insures. We propose that Factory

Mutual also incorporate the findings and recommendations of this report in their training of their staff.

The Kentucky Office of Housing, Buildings, and Construction has oversight responsibility for new and modified, significantly modified, facilities as part of the permitting process. To that end, we propose to the Kentucky Office of Housing, Buildings, and Construction that they incorporate the findings and recommendations of this report into the training for their staff.

Further, to allow facilities with combustible dust to be identified so that high-risk facilities of this type can be pro-actively inspected, we propose that the Kentucky office identify sites that handle combustible dust when facilities apply for new or modified construction permits, and that they then use that information to help prioritize establishments that will be inspected by the fire marshall.

And in the interest of sharing the lessons learned in a broader sense to these four organizations, the American Chemistry Council, formerly known as the Chemical Manufacturers

Association; to the International Code Council; to the National Fire Protection Association, which, as has been mentioned, is the organization that has developed 654; and to the Society of Plastics Industry, we recommend that they communicate the findings and recommendations of this report to their membership.

Finally, as has been noted a number of times, this is the third incident that our Board has investigated involving combustible dust. This is the second one that has involved multiple fatalities.

I believe West Pharmaceutical had six fatalities, and this has had seven. These are tragedies which do not have to continue occurring.

The CSB has determined that a number of issues involved in these explosions and these incidents are common. And so, therefore, the Board has decided to conduct a comprehensive study of the problem of dust explosions. To that end, there will be a public meeting that will be held in Washington, D.C., in May of this year, at a time and date to be announced later.

And for anyone interested in attending or getting more information on that, you can find more information at our web site, which is simply www.csb, which stands for Chemical Safety Board, .gov, which is short for government. Again, www.csb.gov.

At this time, I think the Team and I would be glad to answer any questions about the recommendations.

QUESTIONS BY THE BOARD:

CHAIRMAN MERRITT: Yes. Thank you, Mr. Wallace. Do any of the Board Members have questions?

BOARD MEMBER BRESLAND: No.

BOARD MEMBER VISSCHER: Thank you.

CHAIRMAN MERRITT: I have one. Just kind of popped up in my thinking while you were talking.

Do we know what practices Borden is using at their own facilities with regard to these phenolic resins to prevent dust explosions?

INVESTIGATOR WALLACE: Well, I will answer that this way. We didn't do an investigation of Borden facilities. However, in conversations with them, it appears that they are using the good practices of 654. But again, I add the caveat that we did not do investigations at those facilities.

Borden was certainly aware of it because they put NFPA 654 on their MSDS's. So I am going to answer your question a bit evasively to say we can't say for certain. But they are aware of NFPA 654. I would hope that they are using NFPA 654.

CHAIRMAN MERRITT: Just something that came across my mind, and wonder what they are using.

INVESTIGATOR WALLACE: It is a good question. Yes.

CHAIRMAN MERRITT: If there are no further questions, then, at this time we would like to turn to our public comment period. And if you have registered for a public comment, we would ask you to come forward.

Mr. Horowitz, did we have any registered for comments? I'm sorry. I've got it here. Thank you.

Mr. Colonna, if you would, please come to the podium. Speak your name and spell it, please, and then also tell us what your affiliation is.

PUBLIC COMMENT BY

GUY COLONNA:

Madam Chair, Members of the Board, my name is Guy Colonna, C/o/l/o/n/n/a. I am the assistant vice president for Chemical Engineering and Fire Protection Applications at the National Fire

Protection Association. I am also the staff technical and administrative liaison for the committee that develops NFPA 654. That is our committee on handling and conveying of dust vapors and gases.

First, before I go too far, again, I would like to express my sympathies and condolences to this community in your loss, and inform you that my goal for being here, for NFPA's goal for supporting this activity, is the same as what the Chemical Safety Board is looking to do with having this public meeting. And that is to gain an understanding of the incident, the causal factors, and to be able to take that information, in my case, back to the committee, because the NFPA committee process, I, as staff, don't write these documents. We have a committee of experts. They are similar in backgrounds and talents. They have come from industry the same as the Safety Board staff and the Board Members. So they are gathered together and assembled onto these committees, and develop the 300 codes and standards that NFPA has in what is what is called a consensus process. And that process is open.

And we have recently, as a result of the Chemical Safety Board's interest in the number of dust explosion incidents, and the fact that NFPA 654 is a fairly comprehensive document that is identified as having the types of guidelines that would contribute to a safe operation in these kinds of industries, we have been able to invite the Chemical Safety Board to one of our recent meetings, during which the committee was revising NFPA 654.

So NFPA and the committee that develops NFPA 654 is committed to improving the content in that standard where it needs to be. So we are anticipating the results from the final report that is being presented here, so that the committee can examine those findings and compare them to the requirements in our current standard, and determine as demonstrated if there is any need for any changes to improve the requirements that are in there and establish the safe practices that are going to reduce the potential for the various conditions that Mr. Kaszniak identified as being required to have a dust explosion. They're fairly complex, and you have to have a number of things. And the provisions in NFPA 654 are developed in a way to reduce all of those factors from coming together.

The other aspect that I think you have

heard is that there is perhaps within the industry in general a lack of awareness about NFPA 654, even though it or its precursor dates back to the 1940s. And to that end, at the request or recommendation of the Chemical Safety Board, I have been able to take NFPA 654 and make it available on our web site in what is our free access, on-line availability.

And the goal there is to, I think, get to Mr. Wallace's recommendation to NFPA, which is that we do what we need to do through our membership to promote the awareness and of both the findings this incident, but also promote the awareness of NFPA 654 so that those industry operating those types of facilities can do what they need to do to not have the recurrence of this type of event.

So, thank you for the opportunity to be here.

CHAIRMAN MERRITT: Thank you very much. Next, we have Mr. Burman Hackard.

MR. BURMAN HACKARD: No comment.

CHAIRMAN MERRITT: I'm sorry? No comment. Are there any other members of the public who would like to speak at this time? Yes, sir. Please state your name and affiliation.

MR. VAN COOK: Do you want me to go up here?

CHAIRMAN MERRITT: Please.

PUBLIC COMMENT BY

VAN COOK:

MR. VAN COOK: Yes. I am Van Cook, Executive Director for the Office of Housing, Buildings, and Construction for the State of Kentucky. I met with Mr. Wallace in our office. I also am a graduate of the University of Kentucky Engineering School.

And one thing that really glares at me is, from my knowledge of plant, they normally have a safety engineer or an engineering staff that are responsible for some of these duties. I haven't heard anything about did they have a safety engineer or an engineering staff at this facility.

CHAIRMAN MERRITT: Thank you. I would be glad to ask that question.

MR. VAN COOK: Okay. The other thing is, the State Fire Marshall's office is under my office. And in their defense, normally, when -- insurance inspectors, as you can see, every six months were doing this plant. The state fire marshall's office takes those inspections as in you all are familiar with the boiler inspections in the state of Kentucky. There are approximately 14,000 boilers in the state, and 8,000 are done by insurance companies, and 6,000 by state employees.

So I think and one thing is, these plants are being inspected by people who have a vested interest because they are going to have to pay out the claims, that we always took those as, you know, as an expert. These people are trained as well as any people we have.

And in their defense, the state budget, as you know, is pretty tight, and we don't have enough inspectors right now to inspect all the facilities, but we talked to Mr. Wallace, and we are trying to identify these facilities. As of right now, we have no idea how many there are. And we are going to look at identifying these facilities and start inspecting them.

They have not been one of our priorities, because we haven't had any problems before. But we do appreciate Mr. Wallace coming up and talking to us about it.

QUESTIONS BY THE BOARD:

CHAIRMAN MERRITT: Thank you very much. And if I could direct a question, then, to the Team. Could you explain whether there was or was not a safety staff and safety engineering at the CTA facility at the time of this incident?

INVESTIGATOR KASZNIAK: The CTA facility had a safety manager who was responsible for safety conditions at the plant. CTA also employed a number of engineers at the facility. Their duties were primarily confined to the development of the products that CTA was producing.

Again, this facility was an auto parts manufacturing operation and industrial products facility that was using the chemical as part of that processing. So the focus of the facility was not on safety engineering -- it was on manufacturing of their products.

CHAIRMAN MERRITT: I have another question that might follow on that. If you were to get a material safety data sheet that said you had a combustible material, would that raise much concern with regard to looking -- you might get 25 material safety data sheets a month of products that you purchase. When you are looking through them as a safety engineer, would you pick that one out as one that would be particularly necessary to take caution about?

INVESTIGATOR KASZNIAK: The material here was listed as a combustible dust, which is a term that is not defined outside the NFPA 654 standard. The OSHA hazard communication standard does not define combustible dust, and so the word "combustible" to CTA was taken at its ordinary meaning as something that would burn.

The lack of other explicit hazard warnings on the MSDS, you know, did not alert them to the explosive properties of the material. So CTA treated the dust like any other combustible material, as something that would burn. Which, they had good experience with; they had a lot of fires involving this material inside the ovens. And so, they were very aware of its combustible properties. It was the explosive properties that we found were lacking throughout the CTA facility.

MOTIONS AND VOTING:

CHAIRMAN MERRITT: Then, if there is no other public comment at this time, I would like to -- yes, I would like to ask whether or not one of the

Board Members would like to make a motion concerning the acceptance of this report and recommendations.

BOARD MEMBER BRESLAND: Before we get to that, Madam Chair, I would like to get back to the issue of contributing causes and root causes.

And as I said before, I do have a concern about the Borden MSDS and its role in possibly preventing an accident like this from happening. My issue here is that there was a Borden explosion in 1999 that killed three people. The MSDS back then and the current MSDS is not explicit about the issue of the explosibility of the material. And I feel that we will never know the answer to this question, but could I ask the question. Well, had there been a very explicit communication from Borden about the explosion and an explicit change in the material safety data sheet, would that have prevented the accident from happening? Or would have it gone in the direction of preventing it from happening?

Obviously, we won't know. We can never tell the answer to that question. But I guess my intuition and my gut feeling is that it certainly would have -- it should have made a difference if you got a letter saying, look, this stuff can explode, you better be careful with it.

So my thoughts on this would be -- and I would be willing to make a proposal that we change the number one contributing cause, which refers to Borden, to a root cause, which gives it a higher level of importance in the report in terms of signifying what we think were the reasons for this accident happening -- one of the reasons for the accident happening, not diminishing in any way, of course, the fact that there were issues around the CTA facility and the management of the CTA facility in the way that they handled the dust.

CHAIRMAN MERRITT: By Robert's Rules, I believe you would make that into a motion, and then we can discuss it if there is any discussion.

BOARD MEMBER BRESLAND: Well, the motion I would make would be to amend the report as currently written, the draft report, by deleting the first contributing cause in Section 12.2 of the report regarding Borden Chemical, and moving that language to Section 12.1, which refers to root causes.

CHAIRMAN MERRITT: Is there a second?

BOARD MEMBER VISSCHER: I second the motion.

CHAIRMAN MERRITT: Thank you. Okay. Is there any discussion from the other Board Members with regard to this amendment?

BOARD MEMBER VISSCHER: Just briefly, Madam Chair.

CHAIRMAN CAROLYN MERRITT: Mr. Visscher.

BOARD MEMBER VISSCHER: Thank you. I want to clarify. I think what we are saying is that Borden was probably more familiar -- should have been more familiar, certainly, of the properties of the material than was CTA. And furthermore, it was familiar with the experience at the Jahn Foundry. And on that basis, it had some degree of obligation to education its customers. We maybe disagree a bit on whether the MSDS itself was technically compliant or not. And that is not really our role in any case.

But we do think that if Borden had emphasized more directly with customers such as CTA, it is likely, it is possible, that CTA might have paid more attention to it. So, in that sense, and with that purpose, I support the amendment to give it even more emphasis in this report.

CHAIRMAN MERRITT: Thank you. Then, I would like to read this, then. The motion would be to amend the CSB/CTA Acoustics Investigation Report, Number 2003-09-1-KY, by (1) deleting the first contributing cause in Section 12.2, Contributing Cause Regarding the Borden Chemical Company; moving this language to Section 12.1 Root Causes, and inserting it as a root cause of the incident. Does that describe the --

BOARD MEMBER BRESLAND: Yes.

CHAIRMAN MERRITT: Then, I would like to call for a vote. Board Member Bresland?

BOARD MEMBER BRESLAND: Yes.

CHAIRMAN MERRITT: Board Member Visscher?

BOARD MEMBER VISSCHER: Yes.

CHAIRMAN MERRITT: And I also vote to approve that amendment.

At this time, then, I would like to call for a motion to accept the Investigation Report and the Recommendations. Is that motion proposed?

BOARD MEMBER BRESLAND: Okay. The motion I would propose would be that they approve the CSB Investigation Report as amended by the Board on February 16 [sic], 2005, Number 2003-09-1-KY, regarding a series of explosions and fires that occurred on February 20, 2003, at CTA Acoustics, Inc., Plant in Corbin, Kentucky.

CHAIRMAN MERRITT: Is there a second?

BOARD MEMBER VISSCHER: I second.

CHAIRMAN MERRITT: Is there any discussion on this between the Board Members?

BOARD MEMBER VISSCHER: Only that the motion had the wrong date on it, I think. It's February 15.

CHAIRMAN MERRITT: February 15.

BOARD MEMBER BRESLAND: You're correct. Yes. Do I have to read it again? I'll do it.

CHAIRMAN MERRITT: Then, I will call the question. The motion has been made and seconded to approve the CSB Investigation Report as amended by the Board, on February 15, 2005, Number 2003-09-1-KY regarding a series of explosions and fires that occurred February 20, 2003, at the CTA Acoustics, Inc., Plant in Corbin, Kentucky.

With that, --

BOARD MEMBER BRESLAND: Call the vote.

CHAIRMAN MERRITT: Pardon?

BOARD MEMBER BRESLAND: Call the vote.

CHAIRMAN MERRITT: I will call the vote.

Board Member Bresland?

BOARD MEMBER BRESLAND: Approve.

CHAIRMAN MERRITT: Board Member Visscher?

BOARD MEMBER VISSCHER: Approve.

CHAIRMAN MERRITT: And I also approve it.

CLOSING COMMENTS BY

CHAIRMAN CAROLYN W. MERRITT:

CHAIRMAN MERRITT: With that action, then, that brings us to the close of this meeting.

Before we close, however, I would like to, on behalf of the Board, I would like to thank the entire CTA Investigation Team: Bill Hoyle, Mark Kaszniak, Francisco Altamirano, Giby Joseph, Cheryl MacKenzie, and Steve Wallace, for your excellent work on a very difficult and but a very high-quality report. You have done a very thorough and comprehensive job and under very challenging circumstances. Thank you.

The full report on this incident will be available from our web site at csb.gov in the near future, along with a transcript and video recording of tonight's proceedings.

The incident at CTA was the deadliest that this Board has investigated in its seven-year history. Like other events we have examined, there are many opportunities to prevent this tragedy. It is important that when managers are aware of serious hazards, they take measures to control them, including changes to design and operations of their process, if necessary.

It is also essential that workers be fully informed about material hazards, and that it is the responsibility of management to do so.

In addition, warning events must be thoroughly investigated and their causes corrected. It is unsafe to have fires in a production area at any time. Investigating the recurring oven fires at CTA could have eliminated a major ignition source before tragedy struck.

Lastly, it is unfortunate that so many safety inspections of the plant failed to identify the dust hazard, which, in hindsight, seemed so obvious.

We recognize that inspectors at the federal, state, and local level often lack the regulatory tools and training to identify and cite combustible dust hazards. That is an important reason why we are pressing ahead with our national study on combustible dust hazards. I encourage all of you to follow the progress of this study, including our upcoming meeting in Washington this May.

While our investigation of this event is now concluded, the tragedy at CTA still has important implications for national policy. My hope is that we will continue to learn from this disaster for a long time to come. And the Board commits to spread the lesson that was learned here so that it does not happen again. That is our debt to those who lost their lives here.

With that, this meeting is adjourned. Thank you all.

(Whereupon, the proceedings went off the record.)