U. S. CHEMICAL SAFETY AND
HAZARD INVESTIGATION BOARD

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HOEGANAES PUBLIC MEETING
Gallatin, Tennessee
The Epic Event Center

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Wednesday
November 16, 2011

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6:00 p.m.

BEFORE:

The Honorable Rafael Moure-Eraso
Chairperson
The Honorable John S. Bresland
The Honorable Mark Griffon

INVESTIGATIVE TEAM:

Johnnie Banks, Lead
David Chicca
Maria Mazzocchi
Marc Saenz

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P R O C E E D I N G S

(6:04 p.m.)

CHAIRPERSON MOURE-ERASO: Turn off your cell phones so that we don't get interrupted with musical interludes, please.

Good evening and welcome to the Public Meeting of the U.S. Chemical Safety Board, the CSB. I am Rafael Moure-Eraso, Chairperson of the Board. And we meet today, Board Members Mr. John Bresland to my left and Mr. Mark Griffon to my right.

Also joining us is our General Counsel, Chris Warner, and the CSB staff members whose efforts have facilitated this meeting. They will be introduced by name by the investigator in charge before their presentation.

The CSB is an independent, non-regulatory federal agency that investigates serious chemical accidents. The investigations examine all aspects of chemical actions, including physical causes related to

equipment assigned as well as inadequacies in regulations, industry standards, and safety management systems.

Ultimately we issue safety recommendations, which are the science to prevent similar accidents in the future.

The purpose of today's meeting is to present the investigation team's finding and their draft safety recommendations into three combustible dust incidents that occurred in the Hoeganaes facility here in Gallatin, Tennessee.

We will also hear from a panel of experts in combustible dust. And I will introduce the members of the panel later on.

Before we begin, I'd like to point out some safety information. Please take a moment to note the locations of the exits from the meeting room, two in the back there and two to my left. The exits here and also that lead directly outside in case of an emergency.

I also ask that you please mute the

cell phones, as I said before, so that proceedings cannot be disturbed. Thank you.

Everybody checked their phones? Good.

I would like to acknowledge the CSB Investigation Team, who will be presenting today the draft report for us today. They will describe their findings on the combustible dust fires and explosions that occurred in the Hoeganaes facility. And they will propose new measures for preventing future explosions.

Combustible dust fires and explosions are devastating, preventable, and often fatal. They are fatal tragedies.

At this time I would like to mention the name of the five workers from Hoeganaes that died on the three accidents. They were Mr. Rick Lester, John Eric Holsey, Wiley Sherburne, Vernon Corley, and Fred Tuttle. I would like to ask all of you to have a moment of silence to remember the

workers that were killed as the result of these accidents.

(Pause) Thank you.

As we move forward with our investigation, our thoughts were never far from the families of those who were killed or were terribly injured. We were all too aware of the devastating impact that these accidents have had in their community. Those explosions often cause loss of life and terrible economic consequences.

In 2006, the CSB completed a study of combustible dust fires and explosions in the United States which identified 281 incidents that occurred between 1980 and 2005. These incidents killed a total of 119 workers and injured more than 700. The study findings resulted in a recommendation to the U.S. Occupational Safety and Health Administration, OSHA, to develop a standard that comprehensibly addresses combustible dust explosions.

In 2008 a huge fire and explosion fatally injured 14 workers of the Imperial Sugar Refinery in Port Wentworth, Georgia. In 2009 the CSB issued its final report into this devastating accident and once again called OSHA to move forward with the promulgation of a combustible dust standard. In 2009, OSHA responded to our recommendation and agreed to develop a combustible dust standard that is currently underway.

Following the team's presentation, the Board will hear from a panel of outside experts. After the presentation from each panelist, there will be an opportunity for myself and my fellow Board members as well as the panel to ask questions to the experts.

After the panel portion of this meeting, we'll be opening the floor for public comments. If anyone in the audience wishes to comment publicly, please sign up at the tables in the checking area to my left. And I will call your name at the appropriate time.

Please notice that we will have to limit public comments to five minutes each. This is basically series of times. If you take more than five minutes, you are going to be taking time from the person after you.

I would like also thank the Hoeganaes Investigation Team from the CSB for their strong commitment and dedication to their work. And I will also thank you, the audience, for being proactively interested in a hazard that is often overlooked until it is too late.

I will now recognize my other Board members for any opening statements.

Mr. Bresland.

MR. BRESLAND: No, I don't have any.

CHAIRPERSON MOURE-ERASO: Mr. Griffon?

MR. GRIFFON: Hi, I have a very short statement. But I do want to offer my condolences to the family, friends, and

coworkers of the victims.

I also want to reinforce what Rafael mentioned that these tragic accidents all three were very preventable. And we're really hopeful that what we've done here reinforces and that lessons are learned both by Hoeganaes and also nationally.

We think it's far overdue for federal regulations of combustible dust. And we're hoping that our report supports that push for OSHA to promulgate regulations on combustible dust. So thank you for all attending.

CHAIRPERSON MOURE-ERASO: Thank you, Mark.

So our next item in the agenda is I would like to introduce Mr. Johnnie Banks, which is the Team Lead of the CSB investigation group for Hoeganaes that is going to introduce himself and the panel -- the team, not the panel, I'm sorry, but the Investigative Team from CSB.

Mr. Banks.

MR. BANKS: Mr. Chairman, Board Member Bresland, Board Member Griffon, Mr. Warner, ladies and gentlemen, good evening.

The Hoeganaes Investigative Team is prepared to present our findings from our investigation of a series of incidents which occurred at the Hoeganaes facility in Gallatin, Tennessee. These incidents occurred on January 31st, 2011; March 29th, 2011; and May 27th, 2011. And led to a total of five fatalities and three injuries to Hoeganaes' employees.

Before I start, I'd like to introduce the Investigative Team which includes Mr. David Chicca, Ms. Maria Mazzocchi, and Mr. Marc Saenz. And Ms. Lucy Shell Tyler, who unfortunately will not be with -- joining us this evening for this presentation.

I'd like to take this opportunity to provide an overview of the agenda for

tonight's proceedings. We'll begin with the team's presentation of investigation findings. The team will then entertain questions from the Board. Next there will be a panel discussion of relevant issues by our invited panelists. The public will then be invited to offer comments. And finally the Board members will then conduct other CSB related business prior to closing the session.

We're here this evening because of a long-standing CSB interest in combustible dust incidents and the fact that three such incidents occurred at the Hoeganaes facility over a very short period of time.

These incidents involve material very similar to that which I'm holding in this jar -- iron dust. This meeting was convened this evening to provide feedback and technical information to the community and our findings to the Board for their consideration.

The intent is also to provide technical information that explains the

characteristics and the nature of the material found to be involved in each of the incidents in the investigations.

Our presence also allows an opportunity to hear any feedback or concerns expressed by the community or the workforce affected by these tragic incidents.

Finally this presentation allows for the introduction of recommendations aimed at preventing reoccurrence, not only at the Hoeganaes facility but throughout the iron and steel powder industry.

At this time I'd like to show a brief summary of some of the dust-related cases the CSB has investigated in its brief history.

[A video is played reporting on explosions of combustible dust in various locations.]

MR. BANKS: We'll begin to investigate the team's presentation. We'll present a company overview that discusses the

Hoeganaes Company and its corporate relationship, a facility and process overview that examines the process at the Hoeganaes facility in Gallatin, Tennessee. We'll also show a series of animation stills that will illustrate the approximate relationship between equipment and the workers at the time of each incident. And we'll then present our key findings and round out the presentation with introduction of proposed staff recommendations.

Hoeganaes is a world-wide producer of atomized steel and iron powders. It has facilities in the United States, Germany, China, and Romania. Corporate headquartered in Cinnaminson, New Jersey, the company is subsidiary of GKN, a multi-national engineering company based in the United Kingdom. GKN's primary businesses are a powdered metallurgy, aerospace and driveline industries. In 1999, GKN acquired Hoeganaes.

The Hoeganaes Gallatin facility is

located about 30 miles northeast of Nashville and employed about 180 workers at the time of the incidents. Since becoming operational in the 1980s, the facility significantly increased its output by over 550 percent, totaling about 300 thousand tons of powdered metal.

In examining the powdered metal process, CSB investigators learned that Hoeganaes receives and melts scrap steel and processes it to meet predetermined customer specifications. The iron is sprayed and cooled into a coarse powder. The coarse powder is then processed in annealing furnaces with hydrogen. The material is then crushed and milled into fine powdered metal product.

The next portion of the presentation will discuss the incidents that occurred at the Hoeganaes facility. The first segment shows that will now show is a series of animation stills of the first three 2011 incidents. This incident occurred on January

31st, 2011 and resulted in two worker fatalities.

[An audio/slide presentation is given.]

MR. BANKS: The CSB deployed a team to investigate the incident. And they arrived onsite shortly thereafter. In touring the facility and the site of the incident, the team observed significant quantities of iron dust on flat surfaces throughout the facility.

The team learned that the bucket elevator where maintenance work was being performed at the time of the incident was out of service. It was not cast in fine iron dust particles present inside the elevator. The elevator motor had exposed wiring. It was not properly grounded as required by the National Electric Code. When operators attempted to restart the motor, significant quantities of iron dust lofted into the air from several ignition sources.

The next series of slides will

examine the second incident which occurred nearly two months later on March 29th, 2011, when another iron dust flash fire occurred. This incident resulted in an injury to one worker.

[An audio/slide presentation is given.]

MR. BANKS: Key points for the March 29th incident included observations of CBS investigators of even after the January incident investigators observed iron powder accumulations throughout the facility. Significant accumulations of iron powder were observed on above ground horizontal surfaces. Much of this fuel was observed on flat surfaces near multiple ignition sources following reports on hot surfaces near the furnace. It was noted that the iron dust cloud formed next to an open flame furnace. This event occurred even after the January fatal incident.

The third incident we'll discuss

tonight occured two months after the second incident on May 27th, 2011. The CSB again deployed to a hydrogen explosion in iron dust flash fire that claimed the lives of three employees and injured two others.

[An audio/slide presentation is given.]

MR. BANKS: I might add that with the release of this report when the report proves that there will be animations that will accompany it and they'll be a bit more detailed than these that we've presented here tonight.

CSB investigators determined that the hydrogen fueled the initial explosion of May 27th. Hydrogen is used to remove oxides and to prevent oxidation from the iron powder in the furnaces. The hydrogen is routed to the furnaces via pipes in an underground trench. The source of the hydrogen is provided to Hoeganaes by an offsite provider.

The hydrogen leak that fueled the

explosion was caused by a corroded hydrogen vent pipe located under the trenches. CSB investigators found that there was no system in place to ensure the pipe was inspected and maintained. Also there was no system to ensure flammable testing was performed prior to opening the trench to inspect a leak where flammable gases were being conveyed.

And looking at the hydrogen explosion and secondary dust flash fires, we found that no company procedures to respond to and mitigate suspected gas leaks were present and that the processes near band furnaces did not have appropriately rated electrical equipment for use near flammable gases.

We also discovered that hydrogen explosion overpressure lofted and ignited accumulations of iron powder.

Now Mr. Chicca will take over the proceedings from this point and will discuss the combustible dust testing that was conducted.

MR. CHICCA: Thank you, Mr. Banks.

What I'd like to do first is show an excerpt from the CSB dust setting video. This is going to explain how dust explodes.

[An audio/video presentation is given.]

MR. CHICCA: CSB determined that iron powder was the fuel source in the January and the March 2011 flash fire incidents. And the third incident, the hydrogen explosion lofted and ignited iron powder that had accumulated on elevated surfaces. The CSB collected samples of this iron powder during our investigation of the facility and submitted it for testing.

In the next portion of this presentation, I'd like to show a video of a combustibility demonstration performed in a laboratory to show a progression of a flame through a cloud of a combustible dust sample that we collected at the Hoeganaes facility.

Before I start, tests like these are typically performed in closed vessels. But this test was modified to show how the dust would automatically ignite when dispersed over an ignition source. We'll see several videos in this demonstration at various speeds.

[A visual presentation is given.]

MR. CHICCA: Notice this next segment. The dust auto-ignites moments after being released.

[A visual presentation is given.]

MR. CHICCA: This was just one ounce of iron powder collected at the Hoeganaes facility. It was 17 inches above this flame source. And it produced this intense flame.

Some of you may have noticed some flame-resistant clothing situated next to this fire in some of the tests. It was about nine inches away and it experienced some minor localized thermal damage.

In addition to this demonstration, CSB conducted additional dust testing to determine dust explosibility. One test known as the 20 Liter Test Method as specified by the National Fire Protection Association standard for combustible dust or NFPA 484. The facility is required to follow NFPA 484. The 20 Liter Test is required by the standard to characterize dust explosibility.

Another test known as the 1 meter cubed test is also used to determine dust explosibility. CSB commissioned both, the 20 liter and the 1 meter cubed test. Additional information in NFPA 484 states that the operator of a facility may elect to perform the 1 meter cubed test. The 1 meter cubed test is known to produce results that are less conservative for certain types of dust.

These tests are intended to predict what would happen if the dust were to ignite at the facility. However each test has its limitations. At the end of this presentation,

the panel will discuss the differences between these two.

These values in the table are reported or calculated as a result of these tests. And they characterize the behavior of a dust sample. The Kst, or the dust deflagration index, is the estimate of an explosion severity. Therefore the higher the Kst, the more energetic an explosion. T-max or the maximum explosion over pressure is important for a design of safety features in combustible dust areas. The explosion severity is a calculated value that OSHA uses to determine whether or not a combustible dust can be considered a Class II electrical classification hazard.

The pressure ratio is another calculated value that determines whether or not a dust is explosible.

So the dust that we collected from the Gallatin facility displays these results in this table. And we found that this dust is

explosible when tested in the 20 meter chamber. It is also ignitable.

CSB also commissioned a 1 meter cubed test with a sample obtained from the back house long after the plant had been shut down. But this sample did not ignite.

For references, the Kst value of 19 is relatively low. But the panelists can discuss this later.

There was also the combustible dust testing concluded that iron powder at Hoeganaes is combustible and presented a serious flash fire hazard. Though the dust in the 1 meter cubed chamber did not ignite, the 20 meter test results, in addition to the severity of the injuries from these incidents, proved the dust was the fuel source for the January and March incidents and a secondary fuel source during the May Hoeganaes explosion.

Prior to the 2011 incidents, Hoeganaes performed their own testing in 2009

and in 2010 of iron powder in their facility. This was a result of an insurance audit recommendation. The testing results concluded that some of the samples taken were explosible and the values that Hoeganaes received were actually quite similar to what we received during our testing of the 20 liter chamber.

The phenomena of metal dust hazards is not new. And it has been addressed as early as the 1940s in National Fire and Protection Association publications. The CSB alone has investigated five combustible dusts incidents, two of which involved combustible metal dust.

Here is a list of current and completed investigations involving combustible dust in addition to Hoeganaes, two of which include metal dust. As you can see in 2003 there were three incidents resulting in 14 fatalities. And in 2008 an incident at a sugar refinery resulted in an additional 14 fatalities.

The agency is currently investigating the fifth incident listed at AL Solutions, where an explosion involving titanium powder claimed the lives of three.

In response to three fatal incidents from 2003, the CSB issued the Combustible Dust Study. And in addition to examining the causes of the three dust incidents, the report also identified 281 dust fires and explosions in the U.S. between 1980 and 2005. These resulted in 119 fatalities, 718 injuries. Twenty percent of these incidents were fueled by metal dust.

Within the Hoeganaes Corporation, there were previous incidents involving the same fuel source as the 2011 incidents. In 1992 a hydrogen explosion and dust fire at a furnace in the Hoeganaes Riverton facility severely burned a worker who then died two years later. In 1996 at the Gallatin facility, an iron dust fire in a dust collection system injured a worker.

During interviews, Hoeganaes representatives told the CSB investigators that there were multiple dust flash fires during their employment at the facility that did not result in injuries. Despite these incidences, Hoeganaes did not mitigate that hazard. Since Hoeganaes did not control the combustible dust hazard, operators were forced to tolerate the conditions at the facility. And over time these flash fires incidents became normalized since they did not result in any serious injuries until the January 2011 incident.

There was no training program in place to ensure all employees understood the severity of the hazard when iron dust powder was lofted near an ignition source.

I'd now like to take some time to discuss the conflict of the hierarchy of controls. The hierarchy of controls is a concept widely recognized in industry by health and safety professionals to control

workplace hazards. It was developed by the National Safety Council in the 1940s and later adopted by the Occupational Safety and Health Act of 1970. Its principles are incorporated into the OSHA standards and programs.

This is a hierarchical order of control methods used in a plant or within a process to prevent or mitigate worker injury or exposure.

This upside down triangle visually depicts the hierarchy of controls. The effectiveness of the control methods is greatest at the top.

Inherently Safer Technologies, or IST, is a more recent concept added to the hierarchy. This is the preferred and most effective method that avoids the hazards rather than controlling them, such as eliminating the hazard during a design process or substituting a fuel source or toxic chemical for a less hazardous option.

An example of this would be if

Hoeganaes were to eliminate or substitute their iron powder. Now because this facility intentionally makes iron powder, this IST may not be feasible and the hazard needs to be managed rather than eliminated.

The next level of the hierarchy is engineering controls. These are design options that automatically reduce risks. Examples would include well sealed powder conveyance systems, appropriately sized dust collection equipment, and the elimination of ignition sources.

Hoeganaes conveyance systems leaked dust. Dust collection equipment was under-maintained and not capable of collecting the large quantities of fugitive dust released into the facility. And several of these sources were present throughout the facility.

The middle level of this triangle is administrative controls. These include training or workplace practices that manage the hazard. Administrative controls are less

effective because they rely on worker or manager action and oversight to ensure the controls are effectively working to control the hazard.

Examples include housekeeping, flammable gas monitoring, and preventative maintenance. Hoeganaes lacked effective administrative controls to manage the hazard associated with dust and hydrogen.

There was no housekeeping program in place to handle the significant dust accumulations. And there was no policy of flammable gas monitoring or preventative maintenance to ensure flammable hydrogen gas did not enter the workplace in the presence of ignition sources.

The last and least effective measure to prevent worker injuries is the reliance on personal protective equipment, or PPE. PPE is needed when the higher control methods fail, but should be relied upon as the only level of protection between the worker

and the hazard. PPE is equipment or clothing worn to shield the worker from exposure. Examples include flame resistant clothing, or FRC, a hard hat, and safety shoes.

The Hoeganaes employees were wearing flame resistant clothing, but it offered very little protection against the thermal heat produced by these incidents.

In summary, engineering controls are recognized throughout the industry as the preferred method of dust exposure and prevention above housekeeping and personal protective equipment. Hoeganzes lacked effective and appropriately maintained engineering controls to prevent iron dust accumulations.

Before we continue, the team would like to receive any questions the Board may have at this time.

CHAIRPERSON MOURE-ERASO: Mr. Chicca, I would like to start the question to you or to anyone in the panel. If you knew,

describe engineering controls as design options that -- risk. I wonder if you could illustrate for us or describe for us three of those options that come to mind and that you saw in your investigation that will be applicable to the situation there.

MR. SAENZ: A couple of examples of engineering controls, the first rule is to keep the hazardous material inside the equipment. So one and the best option would have been to maintain the equipment to make sure that it is well sealed so that the dust does not come out of the equipment where the workers are in the workplace.

So over time the equipment starts out as new and over time the seams in the equipment start to leak. And there are typically gasket materials in there that will help maintain that seal. And the gaskets get old and worn. They need to be replaced. The bolts need to be tightened back up. And those kinds of maintenance measures the mechanical

integrity program will keep the dust inside the equipment.

Another example is having a dust collection system. The dust collection system that they had was to remove the finest of particles from inside the equipment to pull it away. Sometimes this is done for quality control reasons rather than for hazard control.

Another way of dealing with the material that does leak out is to have a dust collection system that actually helps clean the air that's in the workplace so that the dust particles that are being released over time do not accumulate on surfaces. That falls in as an engineering control that addresses the issue of housekeeping.

Another issue that was present at Hoeganaes their dust control, dust handling, system was actually inside the building where the workers were. Because those systems collect the finest particles, those are the

most energetic, most likely to explode particles. And they actually had a past incident with this.

And so those dust collection systems are best sited outside of the area so that the workers are not going to be exposed to that if there is a fire or explosion inside the dust collection system itself.

CHAIRPERSON MOURE-ERASO: Thank you very much.

Any other questions of the Board Members?

MR. BRESLAND: In your presentation you mentioned an incident in the Hoeganes facility in Riverton, New Jersey in 1992, which is 19 years ago. Are you aware of any other incidents that have occurred since then?

And then a follow up to that would be when did Hoeganzes become aware of the hazards of combustible dust at a facility like this making powdered metal?

MR. CHICCA: As I mentioned, there

was another incident at the Gallatin facility where a dust collector caught on fire. That was in 1996. But it's safe to say that at least in the '92 incident -- and Mr. Cholin can speak to this -- I don't believe Hoeganaes suspected iron dust as the fuel source. Even though Mr. Cholin can explain later, it most likely was.

And this sort of denial is present throughout all of industry that iron dust isn't dangerous or certain metal dusts aren't dangerous. And I think that Hoeganzes also has this problem.

But as I mentioned there have been numerous incidents. They just haven't gone reported because there are no injuries. And so the employees of this facility and they really just begin to what we call is a normalization of deviants. So even though the happen, they don't recognize them as the hazard they could be. It was "I survived," instead of, "I could have been killed." And

so Hoeganaes didn't respond because these weren't reported.

But I think it's safe to say that management understood this especially after their own dust testing which proved that it was explosible which they did in 2009 and 2010.

MR. BRESLAND: You mentioned the incident involving hydrogen, the leak of hydrogen which resulted in an explosion. What sort of mechanical integrity program or what sort of program did they have to ensure that the hydrogen lines in the facility were appropriately tested and checked? And what size was the hole in the hydrogen line that you discovered?

MR. CHICCA: Well, to answer your first question, we didn't find any preventive maintenance program for the specific line in question. And the hole -- and we're not exactly sure how big it was at the time of the incident because it was considerably larger

obviously after the explosion.

MR. SAENZ: The hole when we examined the pipe was approximately seven inches by three inches, three and a half inches, something like that. It's a pretty good sized hole in a pipe. A mechanical integrity program is intended to test and inspect piping systems to maintain those piping systems in good operating condition so that particularly for flammable gases so that they don't have leaks such as the one that was the source of fuel for the third incident.

MR. BRESLAND: In the scheme things, how hazardous is hydrogen?

MR. SAENZ: Hydrogen is one of the two most hazardous of the flammable gases. Hydrogen and acetylene both burn at thousands of degrees temperature. Iron dust, I might add, also burns approximately that same temperature, couple thousand degrees. So hydrogen is actually listed in some standards as an extremely flammable gas. There aren't

but a handful of gases that are listed as extremely flammable.

MR. BRESLAND: So based on that, what would your expectations be of a mechanical integrity program for hydrogen piping?

MR. SAENZ: It's extremely important to have a good mechanical integrity program to maintain the hydrogen piping because even a small leak of hydrogen can cause a severe fire. Part of the problem with hydrogen is that it does burn so hot that in normal daylight conditions, the flame can appear as a very pale blue and in many cases seem invisible. So if you have a hydrogen leak that's even just a small leak but the hydrogen is burning, someone could walk past that, never see the flame, and be severely burned by it. So it's extremely important to maintain that pipe.

MR. BRESLAND: And just to repeat again, what was the program of the Hoeganaes

facility for maintaining this line?

MR. SAENZ: They didn't have one.

CHAIRPERSON MOURE-ERASO: Thank you. Mr. Griffon?

MR. GRIFFON: I just want to follow up on Mr. Bresland's first question. I don't believe this was mentioned in the presentation. But in your report you talk about an audit that was done. I think it's noted as a routine audit in November of 2008. And I would just ask if someone could describe what was the purpose of that audit and what did they find?

I think I'm getting at this point of it seems like not only were there several near misses and flash fires prior to these incidents, but also there was other information that the company might have known that they should have addressed these hazards. So I just wish you would describe that survey and what they found in that survey?

MR. CHICCA: Sure. If I recall

correctly, it was just a basic insurance audit. They were just doing a risk assessment. And during their inspection of the facility, they made a note of the amount of dust that was in the facility. And they recommended that tests be done to determine whether or not it was ignitable or explosible. And that particular insurance auditor was told that testing was going to be done.

And the insurance audit further recommended that should the iron dust be found explosible, that someone should be contracted to eliminate that hazard. That of course didn't happen. But that was the nature of that audit.

MR. GRIFFON: And I guess I have the benefit of looking at the test. And it even says the potential for explosions should be analyzed. And that was sort of the follow-up. Did they follow up on this? Did they do testing as a result of these recommendations?

MR. CHICCA: The testing was done.

That was the testing that was done in 2009 and subsequently another test was done in 2010. That was a result of that audit. But the subsequent recommendation to eliminate the hazard should it be found explosible, which their samples were found explosible, was not done by the time of the incidents.

MR. GRIFFON: And I guess that was my last follow-up was the findings of the tests were -- at least some of the materials they sampled were found to be explosible. Thank you.

CHAIRPERSON MOURE-ERASO: Okay, thank you very much. We'll continue with the presentation.

MR. SAENZ: At this time I will present an analysis of the applicable industry codes and standards. The Occupational Safety and Health Administration, or OSHA, issues and enforces standards and programs for workplace safety and health. OSHA issued a combustible grain dust standard in 1987. And since then

combustible grain dust incident fatalities have decreased by 60 percent. However, OSHA has not issued a combustible dust regulation for general industry.

As mentioned earlier in the presentation, in 2003, the CSB investigated three major combustible dust incidents. Based on these incidents, the Board launched a nationwide study of combustible dust hazards. And based on that study you've seen the video excerpts.

In 2006, based on the completed study, the CSB recommended that OSHA develop a new regulatory standard to prevent combustible dust fires and explosions. OSHA issued an advanced notice of proposed rulemaking in 2009. That's the process that begins the making of the new regulation. They've held various stakeholder meetings. And their next meeting is scheduled for December of 2011. However, to date, no final rule has been published.

As an interim measure to address combustible dust, the CSB also recommended that OSHA develop a national emphasis program to address dust while the regulation was being developed. OSHA issued a Combustible Dust NEP in October 2007. The NEP is not a regulation. It is an inspection tool like a series of questions that compliance officers in the field can use and apply to existing standards to apply existing standards to facilities that handle dust. It can be applied to all dust processing operations, but specifically targets certain industries by industrial classification codes or NAICS codes.

The NAICS code for Hoeganaes unfortunately was not listed in the NEP as a targeted industry with dust-producing operations.

The Tennessee Occupational Safety And Health Administration, or Tennessee OSHA. Tennessee operates under a State worker safety plan. States can develop individual worker

and safety and health programs as long as they are at least as effective of the comparable OSHA standards. The plans are approved and monitored by federal OSHA. States can also adopt federal standards and programs directly rather than develop their own.

For example, Tennessee OSHA adopted the Combustible Dust NEP in 2008. State OSHA plans have the authority to add industry codes to the state adopted NEP. But Tennessee did not recognize that the NAICS code for Hoeganaes was missing. And therefore Hoeganaes wasn't targeted for inspection by Combustible Dust NEP because Tennessee OSHA did not add the industry code for Hoeganaes to the program.

The National Fire Protection Association is an industry consensus organization that develops and maintains standards and codes related to fire prevention and response. Various federal, state, and local authorities have adopted NFPA codes and

standards.

As with any consensus standard, when a particular standard is not a regulatory requirement, individual companies can adopt the standard as part of their own policies and procedures.

NFPA 484 is a particular standard. It is a standard for combustible metals. It contains provisions for protecting people and facilities from metal fires and explosions. It specifically addresses metals. The standard addresses facilities that produce, handle, or store combustible metals and alloys.

The city of Gallatin had not adopted NFPA 484. And, therefore, they could not enforce it. Also Hoeganaes did not voluntarily adopt NFPA 484. Had Hoeganaes applied the provisions of NFPA 484, the conditions that led to these incidents could have been mitigated.

NFPA 484 specifies test methods for

characterizing dust combustibility and explosibility. It addresses design and engineering controls to prevent dust accumulation and includes guidelines for housekeeping programs.

I'm now going to show you a video to give you an idea of the amount of dust accumulation in the Hoeganaes facility as well as an understanding of the normal operation of the bucket elevator and the behavior of the dust in the facility.

[A video presentation is given.]

MR. SAENZ: This is a light path from a flashlight. If you look up in this area at the top of the screen, you can see a dust cloud up there above the bucket elevator. It's a little hard to see from this angle. This is a view of the axle that turns the upper drum on the bucket elevator. This is just a horizontal scene from the bucket elevator and it shows how during normal operations, the dust falls down from there.

There's so much accumulated that with just a normal vibration, the dust falls down off of that horizontal surface.

There's a certain amount of dust that can accumulate on a particular surface. And beyond that, there's a certain angle that it won't achieve higher than that. So the fact that that dust is falling off of there indicates that it's reached its maximum accumulation there.

The International Code Council, or ICC, is a member-focused association that develops codes for public and industrial safety. They develop building safety and fire prevention codes. There are no particular regional limitations to them. They truly do operate internationally.

The ICC codes are adopted statewide or in local jurisdictions in all 50 of the United States. The ICC also offers code assistance, certification and training to council members.

The ICC among various codes develops and maintains the International Fire Code, or IFC. The IFC establishes minimum requirements for residential and industrial fire protection -- for fire prevention. The IFC can be adopted and enforced by local and state jurisdictions. The IFC is adopted by the State of Tennessee and the City of Gallatin.

In terms of addressing combustible dust-producing operations, the IFC briefly lists general requirements for preventing dust explosions, such as housekeeping to clean up any dust that does accumulate and eliminating sources of ignition. In particular, Chapter 22, Section 4.1 states that the fire code official is authorized to enforce applicable provisions of NFPA 484 and other NFPA dust codes and standards.

Note that the language "is authorized to enforce" is not a clear mandate that the wording such as "shall enforce" would

carry. The State of Tennessee specifically excludes optional or voluntary provisions of adopted fire codes.

So although the 2006 IFC is adopted by the State of Tennessee, the legislation states that, "It shall not be construed as adopting any provision of the cited publications which establishes an optional or recommended, rather than mandatory, standard or practice." Because the IFC language states "is authorized to enforce," it can be interpreted as a voluntary portion of the standard and, therefore, not enforceable in the State of Tennessee.

So although the IFC language was unclear about NFPA 484, the City of Gallatin could have enforced the housekeeping and removal of ignition sources of the IFC itself. So because NFPA 484 was cited in there and it sounded like that might be optional or voluntary, they weren't obligated to enforce that. However, they could have enforced the

housekeeping and ignition source removal portions of the IFC itself.

In particular, the Gallatin Fire Department inspected the Hoeganaes facility two weeks prior to the third incident in May. They did not recognize iron dust accumulations as a fire hazard. And they did not inspect the facility against the general requirements of the IFC for combustible dust.

Now I will present the key findings from the investigation. First, significant accumulations of iron powder fueled flash fire incidents at the facility. Hoeganaes management personnel were aware of metal powder combustibility hazards but did not mitigate the hazard through engineering controls and housekeeping. Hoeganaes lacked employee training and procedures for flammable gas leaks.

OSHA did not include the Iron and Steel Mills Industry Classification Code for Hoeganaes as a targeted industry for the

Combustible Dust NEP.

The 2006 International Fire Code, which was adopted by the City of Gallatin, does not require jurisdictions to enforce NFPA standards for the prevention of dust fires and explosions.

The State of Tennessee and the City of Gallatin do not enforce optional or recommended standards or practices of the IFC.

The Gallatin Fire Department inspected the Hoeganaes facility after the first two iron powder flash fires and did not address combustible dust hazards present at the facility just weeks before the third fatal hydrogen explosion and dust flash fire.

Instead of utilizing engineering controls and administrative controls such as dust collection systems and housekeeping programs, Hoeganaes relied on flame resistant clothing to protect workers from iron dust flash fires.

And finally GKN and Hoeganaes did

not provide corporate oversight to ensure that the Gallatin facility was adequately managing combustible dust prior to and throughout the succession of serious incidents at the Gallatin facility.

Now Investigator Mazzocchi will discuss the proposed recommendations.

CHAIRPERSON MOURE-ERASO: Thank you. That was Mr. Marc Saenz, a part of the Investigation Team.

So the next presenter is going to be Ms. Maria Mazzocchi. So, Maria.

MS. MAZZOCCHI: Thank you. This evening I will present an overview of what CSB recommendations are and the staff proposed recommendations as a result of our investigation. The recommendations are subject to change after consideration by the Board.

As an overview, CSB recommendations are the primary tool to improve industrial safety programs and practices.

Recommendations are targeted towards federal and state regulatory improvements, industry and company practices, and trade association standards and outreach.

Recommendations are intended to directly address incident findings and causes and to focus on management system improvement to prevent recurrence. The CSB Recommendations Department monitors progress of recommendations and updates their status on our website.

Based on our key findings introduced earlier, I will now present the proposed recommendations.

Recommendations 1, 2, and 3 are addressed to federal OSHA. First, develop and publish a proposed rule for a Combustible Dust Standard within one year of the approval of this case study.

Second, we propose to ensure that the forthcoming OSHA Combustible Dust Standard includes coverage for combustible metal dust,

including iron and steel powders.

And, third, we propose to OSHA to revise the combustible dust emphasis program to include facilities that produce, handle, process, or generate iron and steel powders or dusts.

We propose to Tennessee OSHA to revise the combustible dust emphasis program to include facilities that produce, handle, process, or generate iron and steel powders and dust.

The following three recommendations to the Hoeganaes Corporation are opportunities to address implementation of the hierarchy of controls.

First, conduct periodic independent audits of the Hoeganaes Gallatin facility for compliance with the applicable National Fire Protection Association codes and standards for combustible dust, electrical classifications, hydrogen, and flame resistant clothing.

Our second recommendation to the

Hoeganaes Corporation is to develop training materials that address combustible dust and plant-specific metal dust hazards and to train all employees and contractors, and also to require periodic refresher training for all employees and contractors.

We also recommend that Hoeganaes implement a preventive maintenance program, as well as leak detection and mitigation procedures for all flammable gas piping and processing equipment.

We propose the following recommendation to the International Code Council. Revise international fire code Chapter 22, Combustible Dust Producing Operations, to require mandatory compliance and enforcement with the detailed requirements of the National Fire Protection Association standards cited in the chapter.

We propose the following to the Metal Powder Producers Association. Communicate the findings of this CSB case

study to all your members, such as through a safety article in an upcoming monthly newsletter.

We propose the City of Gallatin to require all facilities coverer by the International Fire Code Chapter 22 to conform to National Fire Protection Association standards for combustible dust.

Finally, we propose two recommendations to the Gallatin Fire Department. First, ensure that all industrial facilities in the City of Gallatin are inspected at least annually for compliance with the International Fire Code. And, last, implement a program to ensure that fire inspectors and response personnel are trained to recognize and address combustible dust hazards.

Members of the Board, these are our proposed recommendations. We believe that, if they are approved by the Board and adopted by the recipients, accidents will be prevented

and lives will be saved.

This concludes the Team's presentation to the Board. At this time we'd like to answer any questions the Board may have. Thank you.

CHAIRPERSON MOURE-ERASO: Thank you very much, Ms. Mazzocchi.

I would like to ask any Board members if they have specific questions of this part of the presentation.

Mr. Griffon?

MR. GRIFFON: I have a question that probably came up during Marc's presentation. So he may be able to address this. It's basically under a slide that said that, had Hoeganaes applied the provisions of NFPA 484, the conditions that led to these incidents could have been mitigated. And I emphasize the last word, mitigated.

I guess I'm concerned, you know, we certainly push for prevention. And I'm wondering. There is an allowance under NFPA

484 for what's termed retroactivity or some people refer to it as grandfathering, whereby existing facilities are only required to do certain parts of the standard.

And I guess my concern is if this NFPA 484 is enforceable by the City of Gallatin, does it go far enough? Are we -- does it not allow for some of those engineering controls and some of that prevention that we'd like to see?

MR. SAENZ: In any case if a facility voluntarily adopts the NFPA 484 code into their own policies and procedures, then they can apply all the parts of the code and introduce all various types of controls into their system to prevent these incidents from happening.

However, if the code is adopted by a regulatory authority, the authority having jurisdiction, the code does have a statement about grandfathering. And so facilities that already existed would be exempted from making

changes in according to certain parts of the code. So you're correct that they wouldn't.

If the City of Gallatin now adopted NFPA 484, wouldn't necessarily have to provide all provisions of NFPA 484. They wouldn't have to follow all of them. It would still improve the facility, but if the facility were to voluntarily adopt a code, then they could follow all the provisions of 484 and do the best job at preventing these incidents.

And the word mitigate is in this sense used as a technical term. Mitigate means to lessen the consequences of the incident. But it's -- obviously if you can keep the material inside the equipment and not let it out in the first place, which a lot of the engineering controls are intended to do, then there won't be an incident outside the equipment and people won't be exposed to it.

Again we mentioned earlier the moving of the dust collector system outside, that's also another important piece there.

Because if there's an explosion inside the dust collector system, that could rupture it or vent into the work area and expose workers. So that is one of the engineering controls that would need to be followed as well.

MR. GRIFFON: Is that engineering control, moving the dust collector, would that be enforceable under the retroactivity provisions?

MR. SAENZ: I'd have to look at it to make sure.

MR. GRIFFON: We also have that on our panel. So maybe I follow up to that.

I raise this because I guess I'm concerned and I think many are concerned about the coverage of older facilities. And I think this points out I think this debate is also going on on the OSHA rulemaking process. If NFPA standards are adopted, it still doesn't answer some of these questions about the grandfathering issue. So that's the point --

MR. CHICCA: If I may, and correct

me if I'm wrong. But the authority having jurisdiction, in this case the Gallatin Fire Department, if they did have any authority to enforce NFPA 484, if during their inspection of the facility they felt there was an immediate danger from a hazard that they're exempted from by the grandfathering clause, they can still enforce that if they can prove it's an immediate danger.

In our case, we can prove that tons of iron dust lying around is an immediate danger. So there's perhaps the potential for the authority having jurisdiction to enforce even the grandfathering exempted clauses.

CHAIRPERSON MOURE-ERASO: Mr. Bresland?

MR. BRESLAND: On Slide 63, you say that Tennessee specifically included -- excluded optional or voluntary sections of the code. Do we know any about the history of why they would do that in Tennessee?

MR. SAENZ: Unfortunately, we don't

have that detail. But it is this language right here that excludes that.

MR. BRESLAND: Okay. Question about the issue of the responsibility of management, meaning the management of the facility, the corporate management of Hoeganaes, or the corporate management of GKN in the United Kingdom?

I guess I'm particularly bothered by this series of incidents that have occurred at this facility. I'm just thinking about my history in the chemical industry where I worked for 35 years. During that 35 years, I never worked in a facility which had a fatality. I'm not taking my credit for it. But I'm just saying that the company had programs in place that prevented fatalities.

So now I see a facility where you have had five fatalities in one facility in five months. I just find that to be very, very disturbing. And I just -- it just makes me wonder about the corporate, the managerial

oversight of this facility. And do we have any information on that, either at the Hoeganaes corporate level of Jersey or the GKN corporate level in the United Kingdom? Cause I think something -- something serious is missing here.

MR. SAENZ: From our investigation we found very little interaction with GKN, the UK headquarter group with Hoeganaes, in terms of the corporate entity. We still didn't find very much interaction. I mean we find it just as surprising.

The Plant Manager of the facility here at Gallatin, the Plant Manager reported to a Vice President who was up in New Jersey. So it wasn't far for a communication to have occurred from one place to the other.

MR. BRESLAND: Okay, thank you.

MR. BANKS: And I might add that after the series of incidents occurred, there was a presence at the facility from representatives from the corporate

headquarters in an attempt to put their arms around the magnitude of these incidents.

MR. SAENZ: Especially during the third fatal incident, there was a big presence.

CHAIRPERSON MOURE-ERASO: Can't hear.

MR. SAENZ: For the third incidence there was some corporate presence.

MR. CHICCA: A significant corporate presence in order to try and fix the hydrogen problem.

CHAIRPERSON MOURE-ERASO: Okay, I have a couple of questions. When the company found out about the combustibility of iron after the tests that they conducted, I presume, what changes do they take? Did they do something around training, I believe? Can you talk to us about that?

MR. CHICCA: All that we've been able to find as a result of their combustible dust testing and when they got the results

back that this dust was explosible and clearly dangerous. All they improved their existing training program.

But even in our investigation, we found that their training program wasn't even specific to iron dust. It was in general combustible dust and these are the hazards to be aware of. And it wasn't as robust as you would have expected given that result.

And at least from our standpoint until the incidents occurred, there hadn't been any engineering controls or administrative controls put in place as a result of that testing.

CHAIRPERSON MOURE-ERASO: And one of your recommendations, I believe Recommendation No. 6 is Slide No. 81. You said that the company -- you recommended the company develop training materials that addressed combustible dust, etcetera, etcetera. And required refresher training and so on.

Could you, sir, describe for me how do you think that that particular training might have some effect on preventing flash fires and explosions?

MR. SAENZ: When workers in a facility have appropriate training, they become aware of the hazards and the particular need to control those hazards and what steps need to be taken to control those hazards to minimize the risk of having an incident.

So for example, if in this case with the iron dust, workers are made aware of the severity of the fire hazard from this dust when it becomes a cloud and ignites as we have seen in these incidents, they will become more diligent in their efforts to avoid situations or practices that can create those kinds of situations. So the appropriate training has to be specific to the chemicals involved.

And there is a federal hazard communication standard put out by OSHA that addresses these issues. But the specific

hazards of the material at hand need to be in that training.

Unfortunately, they received generalized combustible dust training, perhaps similar to our dust explosion video that we showed earlier which would discuss combustible dust. But not all combustible dusts behave exactly the same way. And in this particular case with the iron dust, the fire hazard is quite severe, even from a small amount of iron dust.

CHAIRPERSON MOURE-ERASO: But wouldn't you think that even with the best possible training of the combustibility of this dust, the type of situation that you showed us that you even filmed and photographed during your investigation shows a situation in which the machines were generating tremendous amounts of dust constantly and there were all the possibility of this dust becoming airborne and heightened situations.

And I understood a little -- that the best possible training to the workers would have kind of addressed that situation of the type of organizational work and the system of production that was happening in the plant at the time of the incident.

MR. SAENZ: Yes, you have a very good point there. Again we would go back to the hierarchy of controls. Training comes in under administrator controls. So anything about the equipment, the keeping the material inside the equipment and away from the people, would take precedence over training.

Training is a way of putting administrative controls into place, changing procedures, changing how people work. And that is not as high a level of prevention as you would get from the engineering controls which are mentioned in the NFPA standard.

MR. CHICCA: Which we have to attempt to address.

MR. BANKS: Our other two

recommendations to Hoeganaes is attempt to address them fixing the engineering controls.

CHAIRPERSON MOURE-ERASO: Thank you.

MR. BANKS: And I might add that our expectation would be that if there was a development of more rigorous training that the company is acknowledging that there is a presence of material that requires more rigorous training and send the message to the workforce that the presence of this dust or this material isn't going to be tolerated and encourage folks to point out where that the problems are. The best message of where the problems are, are on the workforce, the folks that are doing this work day-to-day.

MR. GRIFFON: I just wanted to follow up on Mr. Bresland's question about the organization. You know, I mean I guess, I wonder -- and this sort of goes beyond your hierarchy of controls above the engineering controls and to the question of what has the

company done? I hear things about training and making the workers be more cognizant of the hazards and things like that, some things on engineering control.

But I guess my question goes to the higher level of what has the company done in terms? It seems pretty clear to me that for years they've not recognized this as a real risk. And I don't know that initiating training programs and vacuuming up dust occasionally addresses that higher level of change that I think needs to take place to make sure they turn this around.

So do you know if any -- I heard last night that some of the families mentioned that they have done some work on the hydrogen side. But do you know of anything that they've done to sort of -- at the organization level to sort of address the -- how they are addressing this risk of dust hazard in the plant?

MR. CHICCA: Since the third

incident, they have installed a couple of engineering controls in terms of -- they've enclosed some of their conveyance equipment. Originally they had, I guess, certain exit ports that would openly dump into a container. And now, for example, they've enclosed that connection. So now it doesn't pour directly into the air and into the container is an example of one of the things they've done.

Since we've been there in August, we haven't had the opportunity to see what additional engineering controls they've put into place. Certainly that particular example I've given is not enough.

And we did notice that they had an increased level of vacuuming. And I would hope that is not necessarily permanent that that is there to remove the build-up that they've had over their lifetime of operations and that they will, at least after following our recommendations, properly enclose all their equipment. And then they won't have to

vacuum.

But as we understand it right now from our last tour in August, they're vacuuming. And they've done a couple of engineering controls. That's all we can share.

MR. GRIFFON: And I won't harp on this question, but I'm wondering if the company has changed any policies or made any organizational changes, not so much the engineering changes and specifics. But for instance you know just something like near-miss reporting and when they have these near-miss flash fires, are they going to institute a policy where they investigate even the smallest flash fire even if no one is hurt.

I mean I think that's what I'm wondering is if you see any evidence or if you -- I don't know if you examine that part of it. But is there any evidence that you have that they're instituting different policies or making sort of corporate changes?

MR. CHICCA: As far as I -- we haven't looked into that.

CHAIRPERSON MOURE-ERASO: Thank you very much. So this has been an excellent presentation. And you answer questions very well I believe. And I think that we all deserve a short break of 10 minutes. So don't touch that dial. We're going to hear final testimony of experts in 10 minutes.

So please stand up. Stretch your legs. There is some coffee and refreshments in the back, some water.

(Off the record at 7:36 p.m. and back on the record at 7:48 p.m.)

CHAIRPERSON MOURE-ERASO: Thank you very much. So the program continues. First of all, I would like to thank our panelists for their tremendous effort of moving from their different parts of the country to here to Gallatin, Tennessee, to the place where these incidents happened.

And the way that we're going to

proceed is we're going to have three panelists first addressing the different issues. And then we'll open the floor for questions of the Board and the Investigation Team to the panelists. And then we invite the second and third panelists and we'll follow the same procedure.

The first panel includes Professor Paul Amyotte at the Dalhousie University in Canada. And the second member of the panel is Dr. Robert Zalosh from Firexplo. And the third is Mr. John Cholin from Cholin Consultants.

So I'd like to call Professor Amyotte as the first panelist. Professor Amyotte.

DR. AMYOTTE: Mr. Chairman, members of the Board, ladies and gentlemen. I'd like to begin by expressing my condolences to the families of the men who died as a result of the incidents that we are discussing this evening and to all who have been injured or

otherwise adversely impacted by these events. Although my presentation is by necessity technical, I want to assure you that it is not lacking in compassion.

I also want to thank the U.S. Chemical Safety Board for inviting me to be here and to give this presentation.

In accordance with the requirements of the Tennessee Board of Architectural and Engineering Examiners, I first declare that I am registered as a Licensed Professional Engineer in the Province of Nova Scotia, Canada. And I'd like to talk a little bit about dust explosion testing.

I've had the opportunity to review the results of the Hoeganaes iron dust laboratory scale explosibility testing that was commissioned by the Chemical Safety Board. We saw those results this evening. These tests were conducted using a 20 liter chamber in accordance with American Society for Testing and Materials, or ASTM, test method

E1226.

The results in terms of maximum explosion pressure, Pmax, and size normalized maximum rate of pressure rise, Kst, are generally consistent with my expectations for such data in terms of the comparison to available data bases and the published literature. The test results are also generally consistent with my own experience in 20 liter testing with metal dust such as iron and steel.

I've also had the opportunity to review the CSB's description of the three incidents involving iron dust which occurred at the Hoeganaes Gallatin facility during 2011. That analysis is in my opinion consistent with generally accepted principles of causation of dust flash fires and explosions.

For example, as we saw this evening, the fuel oxidant mixing criteria was met in the January 31st incident by restart of

a bucket elevator, in the March 29 incident by mechanical force, and in the May 27th incident by primary hydrogen explosion. All of these scenarios are consistent with known means of an inadvertent dispersal of dust layers and generation of dust clouds in industry.

My direct experience in dust explosion testing is with laboratory scale chambers on the order of 20 liters in volume. To see that 20 liter chamber in particular has been described by its developer, Richard Sevec, as being more convenient and less expensive than the standard referenced one cubic meter chamber. And there's no doubt, the one cubic meter testing involves increased capital and operating costs over 20 liter testing.

So attractive economics and ease of operation cannot of course form the sole basis for the acquisition of explosion data. Standardization of 20 liter apparatus to yield dust explosibility data that correlate with

those acquired in the standard one cubic meter vessel must be undertaken. And this is stated unambiguously in ASTME1226, previously mentioned standard test method for dust cloud explosibility.

Recent papers in the process safety literature have addressed the important issue of overdriving in the 20 liter chamber. Now overdriving is a phenomena in which the energetic chemical igniters use to initiate a dust explosion in closed vessel testing can raise the temperature and pressure of the dust cloud prior to ignition.

And it should also be noted that these igniters act as multi-point ignition sources by sending a shower of sparks through the ignition volume.

While overdriving is typically not a concern in a larger one cubic meter test volume, it can be problematic in yielding false positives in smaller test chambers. So to clarify dust explosibility in these

instances, the use of a lower ignition energy or larger test volume is recommended.

I believe that these recent publications should be carefully considered by the dust explosion research and testing community. In the Pmax and Kst data are given for various dusts showing generally poor correlation between the 20 liter and one cubic meter chambers. These discrepancies are especially disconcerting given that one of the dusts is like a podium of material known to yield comparable explosion data in -- and I would emphasize -- calibrated and standardized 20 liter and one cubic meter chambers.

The matter is made all the more critical, given the suggestion of a possible Kst cutoff value in the 20 liter chamber to account for overdriving.

While it's interesting to note this recent emphasis on the Kst parameter as a measure of dust explosibility, it's also worth noting that Kst finds its primary use in the

sizing of explosion relief vents and the design of explosion isolation and suppression systems.

A more appropriate measure of whether a dust is explosible is the maximum explosion pressure, Pmax. In fact it is this parameter that is used as the explosion threshold in ASTME1515, the standard test method for determination of the minimum explosible concentration, or MEC.

ASTME1515 clearly addresses the issue of overdriving by requiring the use of a 2.5 kilojoule or 5 kilojoule ignition energy in a 20 liter chamber rather than the 10 kilojoule energy stipulated by ASTME1226. So the distinction should be quite clear. These are two different standards with two different purposes.

To conclude, I'd like to comment on the use of subjective qualifiers to describe ranges of values for Kst. In short it is my opinion that such descriptors at best are of

limited use and at worst can provide a false sense of security. And I'm referring to the ST classification system and its corresponding use of the terms weak, strong, and very strong, depending on the value of Kst.

For example, ST1 dusts have Kst values in the range of 1 to 200 bar meters per second. And are sometimes said to yield "weak" or "weak to moderate" explosions. Such dust include the following materials that are involved in dust explosion incidents investigated by the CSB -- granulated sugar, aluminum, polyethylene, phenolic resin, and now iron.

Given the significant loss of life, injuries, equipment and other asset damage, and business interruption that occurred in these incidents, including those at the Hoeganaes facility, it's completely inappropriate to call such dust, such materials "weakly explosible."

I would ask that the full text of

my written submission which contains additional thoughts and is fully referenced be entered into the record of this public hearing.

Thank you very much, Mr. Chairman.

CHAIRPERSON MOURE-ERASO: Thank you very much, Dr. Amyotte.

Our next panelist is Dr. Robert Zalosh from Firexplo. Dr. Zalosh is also a member of the NFPA 484.

Dr. Zalosh.

DR. ZALOSH: Thank you, Mr. Chairman, for the invitation to participate in the expert panel this evening. I've prepared the following responses to questions posed to me by the CSB staff for purposes of panel discussion. I will start with my observations during my plant visits.

I toured the Hoeganaes production facility in February to assist the CSB staff in its investigation of the January 31st flash fire incident and again several days after the

May 27th explosion. On both occasions I was guided by Hoeganaes personnel and accompanied by CSB investigators.

During my February visit, the plant was in production. Whereas it was shut down during my viewing of the May 27th explosion site and surrounding area. My visit in February started with a viewing of the bucket elevator 12 head area near the roof of the production building. My impression of that is that tight confined area was a difficult place to work even for a short period of time. And the climb down the ladder narrow mezzanine aisles and stairways produced challenges for workers trying to egress rapidly, especially when they were injured or otherwise in danger.

As we toured other production areas and equipment in February, I observed suspended dust being emitted from the dust collection duct and the collector media repulsed periodically with compressed air. I also observed many surfaces and floor areas

with extensive dust accumulations. When I viewed the annealing furnaces, I cringed at the sight of the hydrogen flames in areas not far from the accumulated and suspended dust.

Another impression I had from my first visit was that almost all the Hoeganaes employees I met really wanted to know what caused the January 31st flash fire and how future fires could be prevented. Hardly any of them realized that the powders they were making every day were capable of burning so intensely and producing fatal burn injuries. Many of them had experienced small smoldering fires but did not appreciate how intensely a dust cloud could burn when ignited.

My impression during my early June visit was that all the piping in the floor trench was severely corroded and sorely in need of repair or replacement. I was also astonished to learn that the hydrogen supply to the furnaces was not shut off as the workers proceeded to look for the gas leak.

Next I will summarize the laboratory tests conducted on Hoeganaes dust samples. During that February visit, we collected steel dust samples representative of the dust involved in the first incident and from the dust collector in the production building.

After the second incident, CSB staff collected samples of dust that had accumulated in the area where the second incident occurred.

Four of the samples were tested in the 20 liter sphere to determine the dust explosion pressure Pmax and normalized rate of pressure rise, Kst. The Pmax values of the four samples tested in the 20 liter sphere ranged from 1.8 bar gauge to 3.5 bar gauge. These values are sufficiently high for all the floor samples to be classified as combustible dust.

But the values are sufficiently low to raise concern about whether these tests

will support flame propagation and explosion development in a much larger vessel. Therefore, additional tests have been conducted in a one cubic meter test vessel having 50 times the volume of the 20 liter test vessel.

In order to have enough dust for the one cubic meter test, CSB staff obtained a much larger sample of Hoeganaes field dust from a dust collector in August.

The one cubic meter test -- vessel test -- did not result in flame propagation. The reason for the negative result in the one meter cube test vessel is subject to conjecture but has also been observed with several other dusts that produced relatively low Pmax and Kst values in 20 liter sphere testing. Additional tests and analysis are needed to fully resolve the discrepancy between the results from the two test vessels using steel dust samples.

Although the laboratory closed

vessel explosion test produced inconsistent results, additional tests demonstrate the Hoeganaes dust cloud fire hazard produced clear and convincing results. These fire tests were conducted by ejecting steel dust samples out of a nozzle situated above a propane burner. As soon as the dust particles left the nozzle, they were ignited by heat from the burner and produced an intense fireball and residual jet flame as shown in the video.

Measurements of the radiant heat flux near the steel dust flames combined with analysis of the radiant energy being emitted from the flames showed that the burning steel dust produced thermal loads far in excess of the thermal fluxes used in certification testing of flame resisting garments such as those worn by metal industry employees in production areas. This suggests that metal industry employees, engineers, safety officials, and management are probably working

with a false sense of confidence about the ability of these flame resistant garments to protect workers exposed to metal dust fires.

In my opinion, these people should reassess their current dust fire and explosion protection measures and place much greater emphasis on steel dust fire prevention measures in their plants. I hope the CSB report in the Hoeganaes incidents will motivate this renewed dedication to improve steel dust fire explosion prevention, including safe documented procedures for furnace leak pipe inspection and leak detection.

Thank you, Mr. Chairman.

CHAIRPERSON MOURE-ERASO: Thank you, Dr. Zalosh.

Our third panelist is Mr. John Cholin with Cholin Consultants.

Mr. Cholin.

MR. CHOLIN: Good evening, Mr. Chairman, members of the Board, Investigation

Team, and ladies and gentlemen. As you said, my name is John Cholin. And I first want to express my condolences to those who were injured and to those who have suffered the loss of the loved one as the result of the dust explosions that occurred at the Hoeganaes facility. My heart aches for you.

As a professional engineer in the discipline of fire protection engineering, I have committed much of my life to the effort of preventing this type of incident that has taken five lives you now mourn the loss of. I mourn that loss with you.

As I mentioned, I'm a fire protection engineer. And for the past 30 years I've been involved in managing hazards associated with combustible particulate solids, including combustible dust. I serve on a number of NFPA technical committees that write the standards regarding combustible dust. I teach seminars on dust explosion hazard management for the Society of Fire

Protection Engineers, Georgia Tech, OSHA, and until recently the National Fire Protection Association.

Over the past 30 years, I have come to believe that all these types of events -- dust explosions -- are preventable. The only thing that is lacking is the recognition of the problem and the willingness to manage it.

Dust deflagrations and the explosions they produce are not a mystery. We in the fire protection engineer community have known how to manage dust explosion hazards for decades. That knowledge has been reduced to nationally recognized consensus standards that are published by the National Fire Protection Association, also known as NFPA.

Many of my colleagues and I spent many days each year writing the language that goes into those standards, bringing the standards up to date with the most recent and broad experience we can garner. And over the 30 years that I've been involved in

combustible dust hazards, I have yet to investigate a dust explosion or dust deflagration incident that would not have been prevented if the design and operational criteria established in the relevant NFPA standard had been applied to the facility.

This bears repeating. I have never investigated a dust explosion that would not have been prevented if the facility had complied with the relevant NFPA standard.

In the mid-1990s, I investigated and reconstructed the dust deflagration incident at the Hoeganaes facility in Riverton, New Jersey, that resulted in the severe injury and the ultimate death of an employee in that facility. It involved a hydrogen reduction furnace.

Using the forensic information developed by the scene investigators, we were able to show using the principles of physical chemistry and physics that the hydrogen deflagration flame exiting from the furnace

could not have impinged upon the employee victim. Instead, we concluded that his burns were the result of a secondary deflagration involving the iron dust that had been allowed to accumulate on upward facing, horizontal surfaces within the building, including beams, pipes, electrical conduits, and lights.

We concluded that the initial hydrogen deflagration jarred the building, knocking the iron dust off its resting place and it was ignited by the burning hydrogen. The iron dust propagated the flame front through the interior of the building where it then engulfed the employee victim.

Regrettably, the lessons taught by the Riverton, New Jersey, incident were not heeded. It seems that a very similar incident has occurred in the Gallatin, Tennessee, facility. Perhaps almost 20 years later now those lessons will be heeded.

Virtually all metals if they are reduced to a fine particulate will burn. The

only exceptions I know of are platinum, gold, and silver. All of the rest can yield a flame front under the right conditions. This includes lead, manganese, magnesium, aluminum, titanium, zirconium, copper, lead. Those are the one that come to mind immediately.

But the burning metals produce metal oxides as a combustion product, not combustion product gases such as water vapor and carbon dioxide like most other common combustibles. The metal oxides store more heat and are able to give that heat up more rapidly than combustion product gases. The burns suffered by victims are commensurately more severe.

I believe the injuries and deaths suffered at the Gallatin facility could have been prevented. Applying the design operational criteria of the relevant NFPA standard would have substantially reduced the probability of occurrence and the probability of employee injury from such an event. That

was the case back in the early 1990s at the Riverton incident. And that appears to be the case in this Gallatin, Tennessee, event.

The NFPA codes and standards have been providing the necessary guidance for hydrogen management in this area for literally decades. The NFPA standards are in a continual process of improvement. The NFPA process provides for a regular refinement and updating by a broad cross section of the relevant industry to ensure that the standards reflect the current state of the art.

Different standards exist for different types of dust because those different types of dust pose subtly different types of hazard in different types of facility. But the principles remain the same. Manage the potential dust explosion hazards and keep the facility free of accumulated fugitive dust that can propagate a secondary deflagration. The overwhelming majority of dust explosion victims are victims of

accumulated fugitive dust.

I've seen news media reports suggest that dust deflagration hazards that led to the explosion at the Gallatin facility are doomed to remain until OSHA promulgates a regulation. In my view I don't think that's true. OSHA can cite any facility exhibiting a dust explosion hazard under the General Duty Clause, Section 5A1 of the OSHA Act, using failure to comply with the relevant NFPA standard as the basis for the citation. And OSHA is doing that, and it's working. No one is waiting for a new regulation.

In closing let me reiterate my condolences to those of you who have been injured in this event. It is my hope that one day we will have rendered injurious dust explosions something of the past. When we have, I shall be able to rest.

CHAIRPERSON MOURE-ERASO: Thank you very much, Mr. Cholin.

So I would like to offer the floor

for questions from the Board and the Investigative Team if they want so.

Any questions for the Board? Mr. Bresland?

MR. BRESLAND: Just holding up on Mr. Cholin's comments, does there really have to be a regulation? I mean there are standards out there that may or may not apply to a particular facility. But if you read the standards and you understand that there is a hazard, what's to stop them -- what's to stop a company from complying with those whether there's a regulation or not?

MR. CHOLIN: There's nothing to stop a company from complying with a relevant NFPA standard. As a matter of fact, as a consulting engineer, I routinely take bits and pieces out of non-enforceable NFPA standards and apply them to the problems that my clients have in order to develop a fire protection strategy.

It takes a commitment from top

management. If you have a company with a culture of commitment to excellence and a commitment to employee safety, then they will find the kind of engineering guidance they need to manage their hazards.

MR. BRESLAND: You described the New Jersey incident that you investigated. Do you see a similarity between that incident and the one that occurred 20 years, 19 years, later here in Gallatin?

MR. CHOLIN: Yes, I do see similarities in the one -- I haven't read the report obviously because it hasn't been promulgated as yet. But in the presentations here, we've seen iron dust being ignited and propagating a deflagration engulfing employees. Iron dust deflagrates. Just in my own practice, I can think of six different iron dust deflagrations that I've investigated.

MR. BRESLAND: Okay, thank you.

CHAIRPERSON MOURE-ERASO: Mr.

Griffon?

MR. GRIFFON: I just have a -- this might be getting into the reads on the testing a little bit. But I'm curious. There was mentioned that the Professor Amyotte mentioned that the Pmax values is a better -- and make sure I get this right -- a better test of the explosivity that could be used for these, as some have defined them, as minimally combustible dust with lower Kst values. And you said that ASTME1550, which I'm not familiar with. But I was wondering if that approach, that test, is cited in NFPA standards or you applied often or to what extent is that applied in the field?

DR. AMYOTTE: I'm really not qualified to say whether it's cited in any NFPA standards. I think others can. But it's the test that the ASTM standard test determining minimum explosible concentration which by definition you need that amount of dust to have an explosion. If you go up to as

high a concentration as you can go in the 20 liter chamber, it'd be up to 3,000 grams per cubic meter, and the dust does not explode, you don't have a minimum explosible concentration under those conditions.

To me that's the true test for explosibility because that standard calls for -- it's the same test -- the same test vessel, the same test conditions in the 20 liter Sevec chamber as for Kst, except you back off on the ignition energy, 10 kilojoules for Kst to determine the minimum explosible concentration, the ignition energy is now 5 kilojoules or which gives it perhaps a more conservative MEC value or you can go to 2.5 kilojoules.

So when you determine the Kst, you're trying to determine this parameter that's used, as I said, to size an exposure relief vent. You have a very strong air blast dispersing the dust, a very short ignition delay time. So you have a very well mixed and

stirred turbulent dust cloud. And then you hit it with these 10 kilojoules worth of energy. So there's no question that you have to overcome the ignitability limitations of the dust.

So it's really Kst determination is the worst case scenario. You're really trying to determine what is this parameter that I can use to size an exposure relief vent. To me that's not a test for explosibility, will the dust explode or not? The relevant standard I believe, if you're going to talk about dust explosiblity, is the ASTME1515.

I recently had occasion to converse with a colleague in Europe when they talk about determining whether a dust will explode. They use 2 kilojoules energy in the 20 liter chamber and then an explosion over pressure criteria, not Kst to determine whether a dust is explosible.

MR. GRIFFON: So just to follow up on that, I've seen some literature that

suggests that the -- and I think you said it as well, that the meter cube test is the preferred test. I think NFPA in 484 mentions the -- I think I'm getting this right -- the more reliable test for the low Kst value of dust than the 20 liter.

And I guess my concern has been that if someone says, well, I'm looking at the standard and I want to do the most reliable test, they get a negative test with the meter cube test, Kst of zero. Then they can conclude that it's not a hazard.

And I'm concerned that that is -- I mean based on what you're saying that's a misinterpretation. But I'm concerned that some might draw that conclusion by following sort of the literature and other and even the NFPA and not follow up with -- but do you have an opinion on that?

DR. AMYOTTE: I guess I would share somewhat similar concern, but my real concern is someone who provides information on dust

explosibility to industry to 20 liter testing, I'm not a regulator. I'm not a standard setter. So I'm going to sit here and I'm going to tell you, I'm far more concerned of those false negatives than I am false positives.

And you'll find that, I believe, that uniformly people who work in the industry and provide explosibility data to industry, before I tell anyone that this dust will not explode, I really have to think about it.

So there's nothing wrong with 20 liter data, absolutely nothing. You can go to the manufacturer website, their calibration round robin testing that's underway right now and you'll see the results for 34 20 liter chambers throughout the world, Kst and Pmax comparing with one cubic meter data very nicely. Now that's for a relatively high Kst value.

You have to standardize and calibrate the 20 liter chamber to reproduce

the data that you get in a one cubic meter chamber. And you have to be very aware what the potential for overdriving with low Pmax, low Kst dust as in the case of iron dust. And if you're concerned to the extent that you may in fact be producing a false positive, you can back off on the ignition energy in the 20 liter chamber.

If you're still into the MEC test, if you're still concerned, do one cubic meter testing. That's basically my point.

MR. GRIFFON: And are you aware of -- because I've seen a lot of tests -- not a lot, but some tests that compares 20 liter to the meter cubed. And are you aware of data that shows three correlation on the, say, less than 50 Kst values for the meter cubed compared to the 20 liter or the energy source?

DR. AMYOTTE: No, the comparative data in the ASTME1226 and the 1515 standard are -- well, E1226 are for higher Kst --. There's no question that the issue of low Kst

dust is a concern in 20 liter chamber. The fact is that many of the dusts I would say of the thousands of tests we've done in our Sevec 20 liter chamber most of the Kst's are high. I mean they're not down in the range of iron dust.

MR. GRIFFON: And the last question because I know this is getting over my head on this technical subject, but you mentioned -- you're more concerned about false negatives than -- and I would say I am as well for the meter cubed testing I'm worried about the false negatives. And has there been any testing around -- because there's been a lot of literature talking about the overdriving issue on the smaller chamber. Is there any literature to examine the false negatives on the larger chamber test?

DR. AMYOTTE: Bob can perhaps comment more on this. But I think that my experience is mostly in 20 liter testing. My understanding of the one cubic meter data is

that there is really not a concern with overdriving. You can do tests for Kst with 10 kilojoules, 20, 30 kilojoules energy in the one cubic meter chamber. And the volume is simply too large to overdrive it.

So I think if a dust is -- it's generally accepted that if a dust will explode, you don't get a measurable pressure -- explosion overpressure in the one cubic meter chamber, then it's non-explosible.

MR. GRIFFON: So the issue -- I've heard that the issue of false negatives in the one cubic meter chamber is a concern.

DR. AMYOTTE: Bob, do you have a comment on that?

DR. ZALOSH: My experience has been a little bit different than Paul's in terms of the one cubic meter. There've been many tests with iron dust in 20 liter chambers with -- even with low ignition energies.

The OSHA Salt Lake Tech Center, for example, uses a two and a half kilojoule

ignition energy and goes in an effort not to overdrive the 20 liter sphere. And still the -- there is a fairly consistent discrepancy in between the results for the 20 liter sphere and the one cubic meter test vessel for the kind of dusts that we're -- that are at the Hoeganaes facility. So it is an open issue.

Another complicating factor that we haven't articulated just very quickly is the nature of the sample, where it's taken from and what sort of condition it has and to the extent that there might be an oxide layer formation.

And also there are different methods of dispersing the dust in the one cubic meter. Most of the characterization of the one cubic meter has been with an apparatus, a perforated tube, that vents to generate a more uniform dust cloud than the other method of characterizing it. And then you have differences in settling. There are issues with both test vessels.

And I think that -- besides needing more work to resolve them, I don't think either one provides the direct characterization of the flash fire hazard that you need to see with your own eyes to visualize. And I would like -- I for one would like to see a different test to characterize the hazard of the flash fires that have happened in this facility rather than fight the battle of the 20 liter versus the one cubic meter.

MR. GRIFFON: I'll just finish by saying I think you mentioned an open issue. And I think that's sort of been my position. That I -- and what I'm urging our team to consider recommendations on closing this issue. And I'm not exactly sure where we might recommend. I think there's some ASTM committees possibly that can look further into this or possibly NFPA research group or something like that.

The reason I think it's important

is that, having attended the dust symposium in Detroit, I heard a lot of industry folks asking the question. Well, which one? I'm hearing 20 liter, meter cubed. Which one do I go with? And I think hopefully people would take the most conservative approach. But I'm not sure that we can just assume that. So I think that it's something that I'm going to urge that we add as a recommendation and do more follow-up on.

MR. ZALOSH: One final quick point. The issue that -- discuss the overdrive refers to the propagation of the explosion away from this shower of sparks and ignition source. And that's where the disagreement and the inconsistencies lie. But there is no inconsistency with regard to the metal dust in that the individual dust particles are capable of burning and producing these flash fires.

So I think it's unfortunate if we get bogged down in the propagation issue when we know for a fact that the burning of the

individual dust particles can produce fatal burn injuries and there's got to be something done to deal with that.

CHAIRPERSON MOURE-ERASO: Thank you. I have a couple of very practical questions. This is to Dr. Amyotte. You said that the classification of the Kst's that you -- that is currently practiced giving false sense of security. And I do think that is indication of that weak to strong and very strong or something similar to that. And I think you said that there are specific examples like sugar and iron that aren't classified as weak and that has killed dozens of people in our experience.

So I wonder if you can make a particular recommendation of how could this be changed to avoid this false sense of security in this classification of weak to strong and very strong?

DR. AMYOTTE: I would just say with respect on use of those words, you know, the

ST classification system is probably thirty or so years old. I think it originated with Barton in Germany in his pioneering work. It has some values.

We like to categorize things. You know 1 to 200, 201 to 300, greater than 300. But fine, but then to put -- and I think at one time venting correlations were sort of based on the ST class, maybe not so much the actual Kst value.

But then to put these subjective qualifiers on, I think as soon as we start something -- all of the dust and table in the drafting part that I saw that have been investigated by the CSB are ST1 dust.

We saw a video tonight of the Imperial Sugar Refinery explosion. I would not call that weakly explosible, the result of a weakly explosible dust. So that's really my point that these subjective, qualitative qualifiers can provide a false sense of security.

I also have some strong opinions on the explosion severity in grouping parameters together and such. But being a university professor, I can talk 50 minutes at a time and I'll stop right now.

CHAIRPERSON MOURE-ERASO: Mr. Cholin.

MR. CHOLIN: Yeah, the Kst on the qualitative basis tells you how the deflagration is going to behave. Actually the personnel entry record for low Kst dust is far worse than high Kst dust. With a low Kst dust, the pressure increases relatively slowly. The building can stretch. And as the building stretches, it is literally channeling the flame front down corridors through doorways into adjacent compartments. And that's where other people are.

With a high Kst dust, the pressure rises very rapid. The building relieves. There isn't time for the flame front to go down through the building and impinge upon

other people. The building relieves and the flame front goes up into the stratosphere.

This weak and moderate and severe classification came from that U.S. Bureau Mines report that was reduced to MNAB353. It has been shown to be wrong. It was shown to be wrong decades ago. It's still in the federal database there. That document is there.

But none of the NFPA standards embrace that classification method any more. The absolute last standard to embrace it was NFPA 499 -- this this last revision cycle. But it takes a long time for the governmental infrastructure to catch up with the engineering community that's looking at the research and writing the standards.

CHAIRPERSON MOURE-ERASO: A question that I would like to direct to Dr. Zalosh is you say that the flame resistant clothing that you find in your visit to Hoeganaes. If a --it would be a false sense

of confidence to people that were wearing it with terrible results. I wonder if you can conceive, given the circumstances of this particular incident, there could have been any flame resistant clothing that would have protected the people that died in this situation?

DR. ZALOSH: There are more substantial levels of flame resistance than are possible to wear. The basic approach to the flame resisting clothing that's worn by most of the workers in the metal industry is that they want to have some level of flame resistance, but yet not have something that's either uncomfortable or hinder their movements that they won't -- that they want something that they can wear for the entire duration of the shift.

Whereas, the kind of workers that somebody's doing -- opening electrical boxes who have a much more, much higher level of heat flux resistance, but that clothing is

just intended to be worn for a short period of time. So you can achieve higher levels of protection. But the issue is is there something that can allow -- give you that high level of protection and yet be worn for a longer period of time.

Or another way of looking at it is can you separate the more hazardous operations from the less hazardous operations and encourage the folks who are in greatest jeopardy in the more hazardous operations to wear the higher levels of heat flux resistance for at least for that short period of time when they're doing those kinds of operations? There's a lot of work to be done to sort out how these other more resistant PPE garments can be worn.

CHAIRPERSON MOURE-ERASO: Thank you. Is there any questions across the investigation panel to the other panel?

MR. SAENZ: I had a comment. On the last question about the flame resistant

clothing, there are various tests for characterizing the performance of flame resistant clothing. But I think as we mentioned earlier, that is the last resort because at that point the person is already being exposed to the hazard. And the clothing is there to minimize the consequences to its ability to do so.

However, the engineer controls and the administrative controls are a better way of protecting the workers. So as Dr. Zalosh was mentioning, administrative controls can be put in place to separate out the higher hazard operations from the lower hazard operations. And that people can be put into higher levels of PPE when they're going to be performing specific tasks. That's an administrative control.

But is there some other way to accomplish the same task without having to expose the person to that level of hazard?

For example, in many chemical

facilities, there are flammable chemicals contained inside the equipment. But before we allow someone to open that equipment, we have a procedure that clears or cleans out, washes out the equipment itself. So that at best there's some very small residual amount or concentration of the hazardous chemical inside. Before you open equipment, there are ways of clearing the equipment so that people are not then exposed to the hazardous chemical, in this case the iron dust.

CHAIRPERSON MOURE-ERASO: Thank you. Any other comments from the panel?

MR. BRESLAND: Just follow-up one comment or one question on the FRC. The FRC, in the refining industry, the auto refining industry, you see people wearing or people wear FRC clothing routinely day in and day out. How does the level of protection for that type of FRC compare to the level of protection that we see here at Hoeganaes? Would it be about the same or higher or lower?

DR. ZALOSH: Well, if they're wearing the flash fire resistant PPE garments that are covered by NFPA 2112 standard, then they would comparable because there's just one level of fire protection for the flame resistant garments.

However, as I was alluding to in response to Dr. Moure-Eraso's question, these are flash resistant garments which are inherently heavier, provide a more substantial level of heat flux resistance. But that's the kind of thing where the electrical workers would just don when they're going to open a high voltage cabinet. And they're not wearing it eight hours a day. So that's where the possibility of improved protection exists. But how do you use it wisely I guess is open to question.

MR. BRESLAND: I guess a follow-up to that is then would someone who had Hoeganaes who's wearing FRC, would that give them a false sense of protection from the

potential hazard of a dust explosion?

DR. ZALOSH: Well, let me give a specific example. The operation involved in the first incident of viewing with the head of a bucket elevator and opening up a access door with buckets full of this powder and then starting it up, that's an example of an inherently hazardous operation. And so I wouldn't want to see people doing that without an improved level of fire resistant clothing if they indeed have to do that kind of operation in close proximity more so than obviously workers had here.

So that's where I think there are opportunities for improved protection even though the PPE, I agree with what's said, is the last line of defense.

CHAIRPERSON MOURE-ERASO: Okay, thank you. We could go all night. But I believe we would like to thank you very much. I would like to thank Dr. Amyotte, Dr. Zalosh, and Mr. Cholin. We feel this is very useful

for us to have this opportunity to hear of your wisdom and your knowledge of this. And again, thank you.

And we're going to continue the program right away. So I'm going to ask you if you could allow the next panel to come in. Thank you very much.

And I will introduce you to the next panel. We are very pleased that the National Fire Protection Association is represented here and is going to be with us. We have Mr. Guy Colonna from the National Fire Protection Association that is going to be a member of the panel. The second member of the panel is Mr. Bruce Johnson for the International Code Council. He's going to be seated on the panel. And we have also for this second panel, have invited Ms. Tammy Miser from the United Support and Memorial for Workplace Fatalities that unfortunately didn't arrive and she won't be on the panel. So on the panel here we only have Mr. Johnson and

Mr. Colonna.

So I'm going to call first off Mr. Johnson from the International Code Council. Mr. Johnson.

Excuse me. I have been informed that Ms. Tammy Miser, her car broke down and she couldn't come. But in her place we have Chris Shorbone. That is from one of the families of one of the persons that died in the Hoeganaes incident that also will be talking to us at this time.

So again, we'll start with Mr. Johnson.

MR. JOHNSON: Thank you and good evening, Mr. Chairman, members of the Chemical Safety Board, the Investigator Team, and members of the public that are here this evening.

First of all on behalf of the ICC, I'd like to express our sincere condolences to the families of the five employees who have lost their lives in the Hoeganaes incidents

and also to the families of those who were injured.

The International Code Council is a member-focused association dedicated to helping the building safety community and construction industry provide safe, sustainable, and affordable construction through development of codes and standards used in the design, build, and compliance process. Most U.S. communities and many global markets choose the International Codes.

The International Codes, or I Codes, are developed through a governmental consensus process. It is an open inclusive process that allows input from all individuals and groups. While everyone can participate in the process, final decisions are made by ICC's voting members, governmental members who with no vested interest beyond public safety represent the public's best interest.

The consensus process through which ICC develops and maintains comprehensive and

balanced codes is designed to protect the public's health and safety and welfare as well as protect our planet by encouraging water and energy conservation and other sustainability methods.

The ICC process allows all jurisdictions regardless of size to benefit from the expertise of thousands of professionals who participate in the development of the model codes available for adoption at the state and local level. The cost to include this expertise and manage this process would be prohibitive for any single jurisdiction.

The I Codes are updated every three years. We are accepting code change proposals for our Group A Codes, which includes the International Building Code, or IBC, through January 3rd of 2012. And for our B Group Codes, which includes the International Fire Code, or IFC, through January 3rd, 2013.

Code change proposals, all

interested organizations and stakeholders, including governmental agencies such as the Chemical Safety Board, are encouraged and welcome. Information about submitting code change proposals is available on our website. And staff can provide technical assistance to anyone unfamiliar with the process.

The ICC Board of Directors approved an emergency code change request from the Chemical Safety Board addressing safety concerns with flammable gas purging at its annual conference in 2010. The ICC has code action committees created to develop new code change proposals. And our Fire Code Action Committee is currently working to address recommendations from the Chemical Safety Board following the investigation of the Clean Energy Plant explosion caused by a practice called gas flows (phonetic).

As noted earlier and with regard to the Hoeganaes facility incident and the hazards associated with combustible dust, the

IFC has always included safety requirements that address the known hazards of various types of combustible dust. We appreciate the Chemical Safety Board recommendations and the Hoeganaes facility investigation reported tonight to enhance requirements in the IFC related to preventing combustible dust fires and explosions like clearly requiring compliance with the applicable NFPA standards.

Based on the supplemental information in the IFC commentary, the requirement for enforcement of these appropriate NFPA standards is certainly the intent of the IFC and Chapter 22.

And just going off my written testimony, addressing a few comments, one of the things that greatly concerns me was the note on the investigative report that a fire department investigation inspection of the facility was conducted just prior to one of the incidents. And clearly the provisions in Chapter 22 dealing with combustible dusts are

something that should be part of an inspection.

And to that end, the IFC has 46 operational permits. And those are intended to focus fire inspectors on known hazards association with operational processes or products, processes within the commercial environment. And one of those required operational permits is for combustible dust-producing operations. So that's clearly should be on the radar of all fire inspectors. And we try to encourage that by our training programs.

And then lastly just to address a comment from Board Member Griffon, the issue with retroactive requirements and grandfathering is always very sensitive. One of the things that we've done with the 2009 addition of the IFC and it's continued to 2012 is there's an especially designated chapter that's called Retroactive Construction Requirements.

In the 2012 IFC that's Chapter 11 that specifically deals with retroactive construction requirements that are imposed on buildings upon the adoption of the IFC intended to apply to all building without grandfathering. And that's a short chapter, but it addresses very specific known hazards dealing with fire and other safety issues for both first responders and the public that are clearly intended to be retroactive.

And possibly if there's concerns about the engineering practices that could be part of that chapter, that could be something else that the IFC Code Action Committee could look at for the next cycle.

So thank you for the opportunity to be here tonight and present comments on behalf of the International Code Council.

CHAIRPERSON MOURE-ERASO: Thank you, Mr. Johnson.

The next panelist is Mr. Guy Colonna from the National Fire Protection

Association. Mr. Colonna.

MR. COLONNA: Good evening. Thank you, Mr. Chairman Eraso, CSB Board Members, CSB staff, members of the panel, ladies and gentlemen.

Again, I'm Guy Colonna, Division Manager of the National Fire Protection Association. And I've worked at NFPA for over 25 years. I've responsibilities for the NFPA Industrial and Chemical Engineering Department and serve as Staff Liaison to several NFPA technical committees responsible for documents dealing specifically with hazard recognition, evaluation, and control in industrial facilities where combustible particulate solids, including combustible dust, are manufactured, handled, and stored.

NFPA appreciates this opportunity to participate in this hearing and to be able to highlight those NFPA codes, the standards related to dust hazard processes.

Before proceeding, I want to

express my sympathies to the families and colleagues of the victims from the incidents that occurred at the Hoeganaes plant earlier this year.

Let me provide a brief background of NFPA. Description of the relevant codes and standards that address dust hazard processes and conclude with a discussion of how these documents could be effective in identifying and controlling processes that store, handle, or use combustible dust or other combustible particulate solids.

NFPA is a non-profit membership organization that develops voluntary and consensus codes of standards that are adopted by state and local jurisdictions throughout the United States and the rest of the world. NFPA develops more than 300 codes and standards intended to minimize the possibility and effects of fire and other risks.

The NFPA codes and standards are developed through a process that is accredited

by the American National Standards Institute, ANSI, as a fair, open, and balanced consensus process. To develop our codes and standards, we convene more than 250 technical committees made up of about 5,000 individuals representing the stakeholders and diverse interest categories.

NFPA codes and standards provide a comprehensive set of requirements applicable to safety and the built environment. Many NFPA codes and standards appear as mandatory references cited in the federal regulations, such as the U.S. Department of Labor, OSHA, DOT, DHS, and EPA. All NFPA codes and standards meet the criteria mandated by Congress in Public Law 104113, the National Technology Transfer and Advancement Act.

As noted earlier by the CSB staff, many of the NFPA documents form the basis for treatment of the subject of combustible dust hazards within various model fire and building codes. Our fire code, NFPA-1 represents the

most comprehensive means within the NFPA codes and standard system by which to address the storage, handling, and use of hazardous materials, whether liquids, gases, or solids.

As noted by the CSB staff in their report of findings, the International Fire Code published by the International Code Council also references the various NFPA standards applicable to combustible dust hazard processes within Chapter 22 and authorizes fire officials to enforce those.

NFPA currently develops nine specific documents that apply to dust hazard processes. Each addresses two hazards, the potential for fire due to the combustible nature of the particulate and a more devastating consequence resulting for the potential for the dust to form a dust cloud and to produce a combustible dust explosion.

Several documents apply to a specific dust type, such as agricultural food or grain, woodworking, coal, or combustible

metals. While some are more broadly constructed so that their application encompasses all dust and combustible particulate solids not otherwise addressed by a specific standard.

In the case that the iron dust fueled fires occurring at Hoeganaes on three instances during 2011, NFPA 484, the standard for combustible metals, is the most applicable standard. And this is the 2012 edition.

NFPA 484 addresses the hazards of combustible metals and like all the NFPA combustible dust standard establishes the basis for safety as a core set of requirements. First, control the formation for creation and the subsequent release of the dust. Second, identify and control all ignition sources. Third, where the explosion cannot be prevented, then protect the facility through construction and application of explosion prevention and protection measures so that the explosion pressures cannot spread

beyond the initial site of the explosion.

Tied closely to the first requirement is that of housekeeping. All these elements come together to create an effective fire and life safety plan when a plan is executed by a trained workforce. The need for trained workers cannot be overlooked. The hazards in an industrial workplace require constant attention by management and the workers to ensure that, if a plan is developed, that it is followed.

That is why all the combustible dust standards include safety management elements, hazard analysis or hazard assessment, management of change procedures, emergency plans, and training for employees as well as contractors and subcontractors.

The safety management elements are so important that in the recently published 2012 edition of NFPA 484, such critical procedures as housekeeping, management of change, control of ignition sources, and

emergency preparedness are all retroactive. So no matter when compliance with NFPA 484 is established, these essential elements are always applicable.

Code enforcement rests with the authorities having jurisdiction. NFPA works with those jurisdictions adopting our documents to support their understanding and implementation. Over the past eight years, NFPA has on several occasions assisted various jurisdictions with specific training on application of the combustible dust standards. This is included in the Commonwealth of Kentucky with training of their inspectors on the provisions of NFPA 654 as well as training on all of dust standards for Georgia, Massachusetts, and Wisconsin.

We also provided funding for enforcing officials to assist them in their attendance at the 2010 NFPA Fire Protection Research Foundation Combustible Dust Symposium. The safe practices found in NFPA

484 as well as in the other NFPA standards for combustible dust reflect the current state of the art and the expertise of a broad contingent of industry, professional engineers, equipment manufacturers, researchers, and enforcers.

The challenge for us all is to effectively disseminate the information, provide training as needed, and to ensure consistent enforcement. NFPA is committed to assist where appropriate in these activities. NFPA has a history of working effectively with the CSB. NFPA also has a history of acting quickly to revise its codes or standards if warranted.

Most recently NFPA reacted to a CSB recommendation to address the unsafe practices of conducing gas flows to clean gas-fired power plant piping and developed a new standard in only five months once the new committee was appointed.

During the past 12 months, all the

combustible dust standards have been in various stages of revision. You can monitor the work of our technical committees by going to our website. I am also available to provide any additional information you may need.

We offer our assistance to you in implementing the recommendations that are being developed. We encourage your continued input to our technical committees and the standards development process.

Thank you for your attention to this important matter. I look forward to comments and participation as we move forward from this meeting to ensure the safety of all who work in these vital industries.

Thank you, Mr. Chairman.

CHAIRPERSON MOURE-ERASO: Thank you, Mr. Colonna. The next panelist is Ms. Chris Sherburne that is the widow of Mr. Wiley Sherburne that died in one of the incidents in Hoeganaes.

I would like to especially recognize the five that you are here. We know about the pain and difficulty that is to relive this terrible moments of the death of your your husband. And we really thank you for your assistant and for your willingness to address us and to talk to us about this.

So, Ms. Sherburne.

MS. SHERBURNE: I've been asked to explain how our lives have been affected by this. I don't know that you can actually do that. Everything was changed that morning. We carried him back to the hospital. The first thing the doctors told us walking in the door was that he was burned on 95 percent of his body and we don't think he's going to make it. There's nothing you can say to that. You don't say anything.

What you do those days after is sort of float through it. You don't know what you're doing. You've got to live your life a whole new way. Everything is changed.

There's no normal. Your normal is gone. And you just go day-to- day.

With so many children involved in these -- operate two big incidents, every day there's something that they say or something that they do that it's heartbreaking. And there's no answers for the questions that they say, they ask or the statements that they make.

I think Cody and I have got to the point to where we're past the floating-through stage and working toward finding our new normal. It's a hard thing to do. And I wish I could explain it. Unless you are where we all are, you never understand.

I appreciate everything that the CSB has done, their diligence. Getting these hopefully regulated so nobody is where we are. I really appreciate that. I appreciate John Bresland. He's very nice and very caring. And it's really made a difference. It's been very helpful. And I appreciate all you all

being here.

CHAIRPERSON MOURE-ERASO: Thank you very much, Ms. Sherburne.

I would like now to open the floor for questions for the Board members from the public.

MR. GRIFFON: I think first I need to say thank you to Chris for coming to the panel. I mean this is why we're all here and this is the importance of it. And it certainly reminds us -- if we could ever forget, it certainly reminds us that it's human beings and not numbers. And this is why we do our job and this is why the team took such painstaking work in doing our investigation, so we also hope we can make a difference and save others from these tragedies. So thank you for participating in the panel.

I think that was important to say before I get to these sort of techy questions and much very serious situation.

I do have a couple of questions for Guy on the NFPA. Some of them you might have heard from the last panel. And I know that it's also we're running quite overtime. So I probably will ask just one or two here.

But I was curious, following up from the last panel, does the NFPA require different controls for different classifications of dust? And I guess I raise that in the context of some comments from the last panel where they pointed out -- and our experience also at the CSB -- that these quote "weak" dust resulted in some catastrophic accidents and loss of life. So I just wondered how the NFPA deals with the classifications, whether it's different sort of controls for different classifications of dust?

MR. COLONNA: Mr. Griffon, the simple answer is no. The standards are based on a certain -- using for example the ST1, ST2, and ST3 classifications. And that

dictates that you do more or less. That doesn't exist in any of the five dust -- the five primary dust standards.

Where that type of strategy could be employed is where all those standards have requirements for doing a hazard assessment or hazard analysis. And based on that hazard analysis, my conclusions may be that I am dealing with a dust that is less of the explosibility problem and more of the flash fire problem. That may guide me to implement different control measures based on that conclusion. But to actually be driven by such a classification scheme, that one or some other one, it would be derived, that doesn't exist.

And another thing again from again reacting to comments from several on the previous panel about the whole concept of the qualitative words that are put to those three classifications and answering questions as advisory service for staff of the people that

are using our codes and standards, one of the common ones I get is asking whether there is a threshold such as below 50 bar meters a second for Kst that I don't have to do anything.

And that demonstrates still a lack of understanding and it's the answer or the concept that John Cholin provided in describing the different phenomenalogical behaviors of the lower Kst dust versus the higher Kst dust. It's all relative because we're taking about milliseconds worth of time over which this combustion process is occurring.

And the low Kst dusts are just driving at pressure to reach the confinement of the vessel or the building at a slower speed relative to the millisecond speeds that affect the higher Kst values. They're still going to hit the walls of that facility or the structure of that enclosure. And when they reach it and they're going to exert that pressure, they're going to burst that

container.

So it's always interesting that people are looking for that kind of a threshold. I liken it to kind of the flammable liquids behavior where we know that 100 percent of the LFL or the LEL means I have now achieved the right fuel air mixture. And so we've established a safeguard 10 percent in a lot of applications or maybe 20 percent in some industrial facilities. That doesn't exist for the combustible process that way.

MR. GRIFFON: Thank you. And just to clarify for me, I've heard some comments that some are asking. And this is sort of an OSHA rulemaking process that for these lowly -- quote unquote -- for these lowly combustible metal dusts that provisions and NFPA 654 might be more applicable than NFPA 484 even though 484 is the metal dust standard. And it leads me to believe that those are lower controls.

Maybe I'm misunderstanding. But if you can clarify that and shed some light on

that.

MR. CLONNA: Actually the -- with the 2012 changes in 484, some of the changes that have been implemented are starting to line up more with, at least in the management system, requirements that 654 has. And 484 doesn't have a layer thickness threshold which implies that any accumulation of the combustible metals triggers some kind of behavior. I.e, you need to control your process. You need to establish housekeeping to determine what the rate is and maybe implement other controls.

The problem for metals is not only their combustion but also their reactivity and also, as Dr. Zalosh pointed out, the intense temperatures at which the combustion occurs once you get the individual particle and once you initiate that combustion.

But in terms of stating that you can go to one standard versus the other because one may be viewed as less rigorous, I

don't believe that that's the intent of what's going on.

MR. GRIFFON: But your opinion on this question of accumulation, you would think that for the iron dust that we've had in this situation, you'd think that a more rigorous standard would be applicable on OSHA to consider that? Is that your opinion?

MR. COLONNA: I think again as John Cholin pointed out, it doesn't really matter what layer of thickness exists in any of our dust standards, all of the incidents you've investigated or OSHA has reported or any of the insurance companies have reported over the last 25 years haven't been anywhere near whatever those layer thickness threshold should be. They have been well in excess of that.

So we don't really know how valid those layer thicknesses are other than the research that led to suggest that the types of dust that 654 deals with which are the

chemical and plastics as little as one-thirty-second of an inch over as little as five percent of a facility can get -- if able to be lofted and suspended concentrated and find an ignition source will yield a significant propagation of a combustion and result in an explosion.

MR. GRIFFON: And last question cause it is getting late, the last panel it was mentioned that this ASTME1550 with the Pmax testing, is that referenced in 484 --

MR. COLLONA: Yeah.

MR. GRIFFON: -- for the combustibility testing?

MR. COLLONA: That again is for the MEC concentration. So where the MEC is referenced in 484 or any of the dust standards, ASTME1550 is the test standard to which you would determine the MEC concentrations. And, therefore, as Dr. Amyotte was relating, that's also where you get that Pmax opportunity.

MR. GRIFFON: Thank you, Professor.

CHAIRPERSON MOURE-ERASO: Mr. Bresland.

MR. BRESLAND: Thank you, Mr. Chairman. I'd also like to express my sympathy to Ms. Sherburne. You did say something that really struck me, and I wrote it down -- the issue that you're going through and the fact that you have to find a new normal in your life. That was a very poignant thing to say. And certainly I hope that you're able to find that normal and move on with your life.

Question for Mr. Johnson, the subject has been discussed this evening of the inspection by the Gallatin Fire Department about noticing it. You're someone who has a lot of experience with fire departments. You've been a fire fighter yourself according to your -- if you go into a particular fire department -- I'm not talking about Philadelphia or New York City, but go into a

smaller fire department than say in Gallatin or some small town where it might be a volunteer fire department, how much would the fire fighters know there about NFPA codes, about ICC codes, about dust codes? Is it -- are they more concerned about the sort of the more concrete issues of putting fire out?

MR. JOHNSON: I think that's a great question. And certainly there is a wide disparity when we see that. And as Guy had mentioned, one of the challenges that we had is trying to get good training out there so that there's an understanding and consistent application of codes and standards across the country.

But I think to that end, I would suggest a couple of things. A simple checklist to go in if that's maybe facility driven so when you're looking at a certain type of occupancy classification with known hazards, a simple checklist I think is a great tool to be looking for fire code violations or

the things that are addressed in the fire code and to draw your attention to those.

But I think more intuitively -- I do a lot of training of firefighters at all levels. And I think that a firefighter that's been on the job for a while where they may really shy away from codes and code enforcement because it's not a sexy part of what firefighters do. But intuitively if something looked like it's a problem, I think firefighters can recognize that. Where I think they're more reluctant is to say, oh, I'm not exactly sure where the code is where I find that section, how I cite it. So I might shy away from it. But I think they intuitively can recognize those hazards. And that's what the inspection really should be focused on.

MR. GRIFFON: Thank you.

CHAIRPERSON MOURE-ERASO: One last question to Ms. Chris Sherburne. I wonder if you can recall for us -- I understand that

your husband has expressed concerns about the working conditions in relations to the dust in the factory. And I wonder if you can recall for us what was he described the situation to you?

MS. SHERBURNE: One of the things he talked about in all the electrical boxes, there was always powder in it. There would be arcing where you're walking out through the plant itself. And any electrical box they opened, powder would be in it, always.

CHAIRPERSON MOURE-ERASO: Thank you. And is any questions that you have? Yes.

MR. BANKS: Well, I'd like to thank all the panelists this evening for taking time to participate in this, but especially to Ms. Sherburne. You were a vision of courage and strength tonight. And I think you represented all the families. You were voice for those who didn't have the strength or the willingness to speak. And I just want to

thank you for your unfailing support of our efforts from the very outset.

As I shared with you, we meet folks under very trying conditions. And there's a spirit within you that has kept all of us going. And I just want to take this opportunity to thank you for everything that you've done for us to investigate, understand what happened here. And as I shared with you last night, I hope that you find some value for having participated in this process.

And as Board Member Bresland shared, the very notion of embarking on a journey of establishing a new normal is something that I think that few people on this planet can understand. And I really appreciate your being open to share that with us so that we can all go back and reconsider how we live our lives and the challenges that you're facing and help us to do our job that much more diligently and be that much more committed. So thank you.

CHAIRPERSON MOURE-ERASO: I would like to thank the panel. And we will continue with the rest of the program. Thank you very much.

The next item on the agenda is public comments from the people that's accompanying us here. I have a list of the people that would like to address things -- to address some things to this meeting. The first person that I have is Ms. Anna Fendley, a health and environment technician from the United Steelworkers from Pittsburg, Pennsylvania. So I would like to ask Ms. Fendley if she would step up. It was her statement. Go ahead.

MS. FENDLEY: Good evening. Again, my name is Anna

Finley. I'm here representing the leadership and the 850,000 members of the United Steelworkers. I first want to offer our condolences to the workers and the families and their friends who are affected here. I

also want to thank everyone at the Chemical Safety Board for their work.

A few years ago, the Steelworkers supported the CSB's recommendation to OSHA for a combustible dust standard. And I am here again to offer our support for a recommendation to OSHA to finish their combustible dust standard. We have many members who work in facilities with combustible dust hazards.

In fact just a little earlier today, there was an explosion at a facility in Nevada. Two of our members were seriously burned and are in the hospital in medically induced comas. Based on the initial information we have, we believe it was a combustible dust explosion.

That example from today and the three incidents that we're discussing here are just a few examples of the types of devastation that can occur after these incidents. We believe that the existing

system of NFPA code implementation and enforcement do not provide adequate worker protection.

We also believe that OSHA's national emphasis program in the use of housekeeping and -- standards are not sufficient. And because there is no OSHA standard, OSHA inspectors are not even adequately trained to recognize combustible dust hazards.

In our experience only some employers are sufficiently addressing combustible dust. And equally importantly workers on the shop floor are not trained to recognize combustible dust hazards and where they don't feel like they can report them to management to have them addressed.

We've seen that when there is a federal OSHA standard for a hazard, employers and employees go to great lengths to understand the hazard and the requirements and resources are actually put into

achieving compliance. Without a combustible dust standard, many employers will not and are not committing the resources needed.

An OSHA standard would save workers' lives and protect jobs. The local economy in Port Wentworth, Georgia, slumped after the explosion at Imperial Sugar because the plant did not run for several months. It had to be demolished and rebuilt. The same thing happened after the West Pharmaceuticals facility explosion in 2003 in Kingston, North Carolina.

Many of the country's industrial workplaces and our members are in small towns where these facilities are the primary employer. And an OSHA standard would save those towns the devastation of the loss of life and the loss of income that occurs after a major incident.

As a key stakeholder on this issue, we sincerely hope that the CSB agrees that combustible dust is a critical issue for

worker safety. And we again support a recommendation to OSHA for a standard. Thank you.

CHAIRPERSON MOURE-ERASO: Thank you. Thank you very much, Ms. Fendley. I think you were especially eloquent on what is the meaning of a federal standard and what good could it do, especially around the country where, you know, in small facilities like the ones we are here dealing with in Hoeganaes.

The second person I have on my list is Mr. John Morawetz. John Morawetz is representing the International Chemical Workers Union Council and is also representing the United Food and Commercial Workers. He comes from Cincinnati, Ohio. And we really appreciate him coming here to talk to us.

Mr. Morawetz.

MR. MORAWETZ: Thank you, Mr. Chairman. Again condolences to the whole community here.

There are various estimates how many people die on the job. It ranges in the thousands. It means that every working day 10, 15 workers leave their families in the morning don't come home. And it's from well-known hazards like you're here today. It's unacceptable. It shouldn't happen.

Part of that is clearly a combustible dust standard. The Board has done admirable work from the 2003 explosions and your 2006 report summarizing many accidents of the same kind. OSHA has begun that process, but it's bogged down. Exactly why it's hard to say. But they should move it forward. There's a step to the Small Business Administration that's publishing the standard.

We support you in your recommendations that you've added, that you have included in this report. And OSHA basically needs to get moving on that.

OSHA, I should say, is a very scientific process. It's an open process.

It's a political process. It takes much too long. I wish it were shorter. But in particular, it should not be longer.

And there are rules afoot in Washington, D.C. that would basically say that it's going to be harder. There are moves afoot to actually tell OSHA in their budget that they can't spend money on standards like combustible dust. And those moves aren't acceptable and you should be aware of them.

There are moves that would basically make it a very political process that would say that Congress would have to vote on certain standards that OSHA sets forward. And again this process of OSHA has, not the CSB, is a process that I think is very time consuming. It's -- I don't really quite say it's a fair process. But at least at this point it should not be a longer process with more complicated review by Congress.

Before I worked for the Chemical Workers, I worked for the Molders Union. We

investigated two fatalities, or I did personally. It was back in the `80s, a confined space fatality at a facility that actually had five fatalities of different causes over 20 years.

And one question you may want to look in the final report is this series of events. And again I don't see the full report where you have the -- you've got the New Jersey incident. You had the test a couple of years ago of explosibility.

Then you had the January incident. And I'm wondering what happened from January to March to May to the other two incidents? Clearly it was very clear at this facility something was wrong and something should have been done.

I'd also just close it, two other points that have come up in this discussion. One is you talk about training in Recommendation Slide No. 6. And there's one other slide about recommendations in terms of

dust.

In my day job we do a lot of trading for the consortium of unions. And as much as I believe in training, in and of itself, it's not the only part of the puzzle. You need a comprehensive safety health program. Many speakers and Board members and staff have mentioned it. And I think that should be reflected in the recommendations.

And the other one is not I'm an explosive expert, but the bottom line in all these tests are, as some few people on the panel have mentioned, are much more worried about the false negatives than the false positives. And if there's any example of which test we should use, you have the clear example of what happened at this facility. And that to me says everything. The tests don't dictate what we should do. It's incidents like this that tells what we should move forward on. Okay, thank you all for your time.

CHAIRPERSON MOURE-ERASO: Thank you. Thank you, Mr. Morawetz.

Is there any other members of the group here on the following that would like to make a statement?

Hearing none, I would like to thank Ms. Fendley and Mr. Morawetz for their statements.

Again I would also like to thank very, very deeply the panelists for their participation. And also to the Board members here and the Investigative Team that have done such a thorough work to address this tragedy.

All of us share a strong interest in preventing these tragic explosions from occurring. Our hope is to make sure that workers, that the community, and the American civil response personnel are not forced to experience an incident similar to this one.

After returning to D.C., we will revise the report with consideration of the comments for today's meeting. The Board will

vote on a final product and it will be released to the public.

I would like to thank all of today's participants, especially the hearing panelists as well as the audience for your attention.

With that, I would like to introduce the Managing Director, Dr. Daniel Horowitz, who will be facilitating the next portion of this meeting.

Dr. Horowitz.

DR. HOROWITZ: Thank you, Dr. Moure. There are a few routine business items to attend to prior to adjournment. And these are calendared voting items from the past several months. The Board is a commission under the Government in the Sunshine Act and is obliged to transact a certain amount of business in public.

The first item of business is Notation Item 823. This vote relates to various previous CSB safety recommendations

from the Board's investigation of the dust explosion at the Imperial Sugar Company in February 2008 in Georgia. And as we heard earlier, this explosion had a catastrophic impact, fatally injuring 14 employees in the dust explosion.

The CSB investigation determined that the plant had large accumulations of sugar dust throughout the plant and on elevated surfaces. Those accumulations were plainly visible in pre-incident photographs and were inches deep.

CSB investigators further determined that Imperial Sugar had insured the facility with the Zurich Services Corporation, a major risk insurer. Insurance auditors from Zurich had inspected the plant during the year prior to the fatal blast but failed to note the combustible dust hazard or recommend changes to Imperial's operations. The combustibility hazard of sugar dust had been known in industry for many decades.

In response the CSB's final report in September 2009 recommended that Zurich train all its risk engineers who regularly audit industrial facilities to recognize combustible dust hazards. The Board also recommended that Zurich provide dust awareness materials to its client companies.

Zurich has generally concurred with the recommendation; however, it has declined to provide any supporting materials to demonstrate the adequacy of these efforts. Zurich has asserted that the materials in question are all proprietary.

CSB staff have explained that they routinely handle such proprietary materials during their investigations and that genuinely proprietary materials enjoy protection under law from unwarranted public disclosure.

To date, however, these efforts by the CBS staff to obtain proof of the implementation of the recommendations have been fruitless.

In December 2010, the CSB staff recommended that the Board designate the recommendation status as open, unacceptable based on Zurich's failure to provide the requested documentation. That recommendation was voted on by the Board. But in January it was calendared by then Board member William Wright whose term expired on September 22nd.

The item remains ripe for consideration by the Board and the CSB staff continue to recommend that the Board designate the recommendation as open, unacceptable and communicate once again to Zurich the importance of providing supporting documentation as many hundreds of other recommendation recipients have regularly done. The full text of the staff recommendation is contained in the Board members' briefing books.

Thank you, Mr. Chairman.

CHAIRPERSON MOURE-ERASO: Thank you, Dr. Horowitz.

And are there any questions from the members for the staff in relation to this matter?

MR. BRESLAND: Where would I find this in the briefing book?

DR. HOROWITZ: It is Notation Item 823.

MR. BRESLAND: Where is the voting document on this?

DR. HOROWITZ: Let me ask one of the staff members to -- Mr. Bresland, the voting matter is the same vote, No. 823, that was considered by the Board in December. And this is to designate the recommendation as open, unacceptable, and seek further information from Zurich.

CHAIRPERSON MOURE-ERASO: Any other questions?

MR. BRESLAND: Sorry, Mr. Chairman, we're just -- it may have been omitted from Member Bresland's book. We're just looking for it. Oh, it may not have been. Maybe I'm

not looking at the right place.

I just want to make a comment here before we get into the vote on this. It's that normally we get or we're supposed to get a two-week notice on voting items like this. I received this on Monday evening at 7:00 o'clock, a two-day notice. So it doesn't give us a lot of time to consider them. I'd certainly appreciate if we're doing this in the future that we get the appropriate and correct amount of notice in advance or for votes like this.

DR. HOROWITZ: Sure, we'll certainly oblige, Mr. Bresland. I would note it was actually in the federal register notice as one of the items.

CHAIRPERSON MOURE-ERASO: Any other comments or discussion. So let me reiterate that a vote on this Item No. 823 is a vote to designate the recommendation to Zurich Services, which is the recommendation 2008-05-I-GA-10 as open, unacceptable.

As the Chairman, I concur with this staff recommendation and I recommend a yes vote on this item. I order a recorded vote and I would like to proceed with it.

Mr. Griffon?

MR. GRIFFON: I vote yes.

CHAIRPERSON MOURE-ERASO: Mr. Bresland?

MR. BRESLAND: I vote yes.

CHAIRPERSON MOURE-ERASO: And as I said, I vote yes. So Item No. 823 is approved.

Dr. Horowitz will continue with the next item of business.

DR. HOROWITZ: Yes, sir, Mr. Chairman, very briefly another calendared item since the last public meeting was to designate the recommendation to OSHA on banning gas explosives open, unacceptable. Staff have since modified the recommendation to the Board and suggested a further letter to OSHA Secretary Michaels asking for clarification

whether OSHA intends to proceed with any rulemaking. And that letter was sent, as you know, under your signature on Monday. So staff does not recommend a vote on that matter tonight.

In addition, notation items No. 826, 826(a), and 845 were all calendared by former Member Wright before his term expired. These relate to the budget and action plan for 2011. These items appear to be moot.

The next item that is ripe for consideration is Item No. 836 which proposed for Board approval a CSB Human Capital Plan. This item was circulated for a vote in March and was calendared by former Member Wright. Developing such a plan is a requirement of the Federal Office of Personnel Management, or OPM. It was also recommended as an improvement by the Office of the Inspector General.

CSB's plan is included in the Board members' briefing books and was previously

circulated to the Board members a number of months ago. It was developed by a combination of CSB staff members and external experts over a period of months. It was reviewed independently by OPM and adjudged to be excellent. It's also been reviewed, as I mentioned, with the Board and any comments have been addressed. Staff recommends approval of the plan, Mr. Chairman.

CHAIRPERSON MOURE-ERASO: Thank you, Dr. Horowitz. And I ask are there any questions from the Board in relation to this item?

MR. GRIFFON: No.

CHAIRPERSON MOURE-ERASO: As there are no questions, let me reiterate that the Item No. 836 is a vote to approve the Human Capital Plan as originally presented. As the Chairman, I concur with the staff recommendation and I recommend a yes vote of this item. I order a recorded vote.

Mr. Griffon?

MR. GRIFFON: I vote yes.

CHAIRPERSON MOURE-ERASO: Mr. Bresland?

MR. BRESLAND: I vote yes.

CHAIRPERSON MOURE-ERASO: Item No. 836 is approved.

Dr. Horowitz, what is the next item of business?

DR. HOROWITZ: Mr. Chairman, you may want to state your vote also for the record.

CHAIRPERSON MOURE-ERASO: For the record my vote is yes.

DR. HOROWITZ: Mr. Chairman, the next and final item of business is Notation Item No. 829. This was proposed in February 2011 by then Board Member William Wark and was calendared by the Chairman and Board Member Griffon. He had proposed an amendment to Board Order 28 Executive and Administrative Functions of the Board. Specifically the amendment would purportedly block certain

personnel moves pending the completion of the Human Capital Plan which the Board has just done and would otherwise have sought to shift certain personnel authorities from the Chairman to the Board as a whole.

Mr. Chairman, the staff has not formally analyzed the proposed amendment in light of various federal statutes reposing personnel authority in the head of the agency. The staff notes, however, that the item is now moot at least in part since the Board has just voted to approve the agency's Human Capital Plan. Mr. Wark's term expired in September, so he's not here to explain the proposed amendment.

Mr. Chairman?

CHAIRPERSON MOURE-ERASO: Thank you, Dr. Horowitz. Are there any questions of members for the staff on this item?

MR. BRESLAND: Are we voting on the 829? Are we not voting on?

CHAIRPERSON MOURE-ERASO: Yes, we

are. That's what we are doing. Yes.

MR. BRESLAND: I thought Daniel just said it was moot.

CHAIRPERSON MOURE-ERASO: Parts of it, parts of it.

DR. HOROWITZ: Member Bresland, part of 829 is contingent -- or the purported restrictions were contingent -- on approval of a Human Capital Plan. So that section of 829 would be moot.

MR. BRESLAND: Well, I certainly have a serious comment on this one. I think this particular vote was probably one of the more controversial votes in the history of the Chemical Safety Board. As you said, it was calendared.

And the reason this vote came up historically was it had to do with the hiring of a particular person at the Chemical Safety Board. But the Board felt -- the Board as a whole felt that they had the authority to vote on. That was the reason for this particular

vote.

As you recall it was -- you calendared it 829 or Chairman Moure calendared it, 829. It was followed immediately by vote 829(a), which was approved by the Board by a vote of either three to zero or three to two, I don't remember which. That vote for whatever reason has not appeared on our website.

But the Chair after a vote was taken didn't get -- went outside and got a legal opinion which according to the opinion negated that particular vote.

I don't have any opinion. I don't have any thoughts on the validity of that opinion. But since then that whole issue was turned into a series of complaints to the Inspector General and to the office of Special Counsel in Washington.

And my feeling is that rather than vote on this now, we should wait until those issues are resolved by the Inspector General

and by the Office of Special Counsel because I think they are very serious issues that deserve serious consideration by those entities.

CHAIRPERSON MOURE-ERASO: Your comments are noted and the original comments.

Mr. Griffon?

MR. GRIFFON: I plan to vote no on this item. But with the understanding that basically my goal out of this is to return to the provisions as outlined in Board Order 28 for the Board governance. Order 28 amended on August 8, 2006. So I think that's my main goal in a no vote on this item.

CHAIRPERSON MOURE-ERASO: As Dr. Horowitz pointed out, this is my comment, you know, Item No. 829, I agree with Mr. Bresland is problematic. Those provisions that appear in 829 would have restricted the personnel authority of the Chairman in ways I believe could seriously impact the productivity of the agency.

Any staff organization like the CSB needs to have clear lines of accountability and authority. Ultimately the Board controls the substantive work of the agency, including the reports, the studies and other policies. As Chairman, I wouldn't have it any other way. And I consider the Board members' inputs to be indispensable.

But on the way to producing those critical safety products that we hope meet the high standards of the Board, there needs to be staff accountability and every staff member in the agency needs to have just one boss. Put simply, we cannot have a professional staff that answers to five masters on a daily basis.

That has been the governing theory here since at least 2002 when the late Carolyn Merritt was appointed as the Agency Chair and continuing during Member Bresland's distinguished tenure as well, as Board Chairman from the 2008 to 2010.

For those reasons, I recommend a no

vote on Item 829. A no vote is to disapprove the amendments proposed by former Member Wark and to leave Board Order 28 in its current form as adopted on August 8, 2006.

Is there any more discussion about this issue?

Hearing no discussion, let me reiterate that a no vote on Item 829 is a vote to disapprove the item. On this item, I order a recorded vote.

Mr. Griffon?

MR. GRIFFON: I vote no.

CHAIRPERSON MOURE-ERASO: Mr. Bresland?

MR. BRESLAND: I vote yes.

CHAIRPERSON MOURE-ERASO: And I vote no. Thank you. Item No. 829 is disapproved and Board Order 28 stands as adopted by the Board on August 8, 2006.

I thank the audience for your attendance this evening. And this meeting stands adjourned.

(Whereupon, this meeting was adjourned at 9:40 p.m.)