UNITED STATES OF AMERICA

CHEMICAL SAFETY AND HAZARD

INVESTIGATION BOARD

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PUBLIC MEETING ON

BP TEXAS CITY REFINERY INVESTIGATION

Thursday, October 27, 2005

Doyle Convention Center

2010 5th Avenue, North

Texas City, Texas

The above-entitled public meeting was conducted at 6:00 p.m.

BEFORE:

CAROLYN W. MERRITT, Chairman

APPEARANCES:

CAROLYN W. MERRITT, Chairman and CEO
JOHN S. BRESLAND, Board Member
GARY L. VISSCHER, Board Member
CHRISTOPHER WARNER, General Counsel
MATTHEW T. DOYLE, Mayor, Texas City
DIANNA KILE
DON HOLMSTROM, Lead Investigator
GIBY JOSEPH, Investigator
JOHNNIE BANKS, Investigator
MARK KASZNIAK, Investigator

PUBLIC SPEAKERS:

CHRIS KIGHTLINGER
JOHN WAGNER
HARRY FILLIP
MIKE WRIGHT
SONNY SANDERS
YOTASHA BARKER
DAVID WILSON
GRETCHEN BRUNER
ART KELLY
JACK PLOSS
JOE BILANCICH

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P R O C E E D I N G S

CHAIRMAN MERRITT: Good evening, ladies and gentlemen. I'd ask everybody to come in please and close the door.

This community meeting of the U.S. Chemical Safety and Hazard Investigation Board will now come to order. I'm Carolyn Merritt. I'm chairman and CEO of the U.S. Chemical Safety Board. And with me tonight are our general counsel, Chris Warner; fellow Board members Gary Visscher and Mr. John Bresland.

I thank you all for being here this evening, to this most important meeting. Before I begin my opening comments, however, and in the interest of safety, I'd like to point out the exits, should there be an emergency. The ones in the back lead directly outdoors, and there is another exit behind us that leads to the outside.

I'd also ask that you turn off your cell phones, pagers, blackberries, anything else you might have that could disturb these proceedings.

I want to welcome you to the Doyle Community

Center in Texas City. I wish to thank the City, and in particular Mayor Matthew Doyle, for inviting us to use these wonderful facilities.

At this point, I would like to ask, Mayor Doyle, if you have a few words you'd like to say to us before we continue.

MAYOR DOYLE: Chairman Merritt, Board, I want to thank you all for being here, especially, but most of all I want to thank the community that's here to witness this tonight.

I think the most important thing that we'll find, at the tragedy of March 23, the CSB was on the ground the very next day, BP and their investigation group were there, along with OSHA and many other people.

And when we found out the emergency issuance that the CSB did to have the blue ribbon panel manned, someone like James Baker leading it up, I don't have to tell you, that's a man of great integrity, and the other members are all impeccable people that will be able to served in that blue ribbon committee.

That committee will probably come up with some different conclusions. When you have that many great minds in one place, they're always a few differences of opinion. But at the end of the day, the best thing that's

going to happen for the petrochemical workers, for the City of Texas City, and industry in the whole, will be that it's going to be a safer environment for us to work in.

The 23rd was a tragic day, and because of that though, when bad things happen, good does come out of it, and because of the CSB, that is going to take place. And we appreciate them being here tonight, and I appreciate you being here too. Thank you.

CHAIRMAN MERRITT: Thank you. At this time, we also have a representative from Congressman Ron Paul's office, Dianna Kile.

Would you like to say a word? There's a microphone right here, Ms. Kile.

MS. KILE: Good evening. Congressman Paul regrets that he's not able to be here this evening. And I would like to read a letter to the community on his behalf.

Dear Friends in Texas City, I wish to extend my very sincere condolences to the family and friends of the 15 deceased workers, and 170 workers that were injured in the explosion of the Texas City BP plant on March 23, 2005.

The fabric of America is woven by the hands of

hard working people that risk life and limb in plants just like this one every day. I am not sure if we can truly appreciate the many amenities that are produced in chemical plants around the country.

Our day to day lives would surely not be the same if these plants were not able to operate. So in a great way, we owe our appreciation to those who gave their lives for the production of these commodities.

We know that tragedies like the one in Texas City will never be forgotten, but it is my hope that we can learn from this experience, and the lives lost will not be in vain. Sincerely, Congressman Ron Paul.

CHAIRMAN MERRITT: Thank you very much.

The Chemical Safety Board has called this meeting, and invited the public, in order to brief you, the public, on the latest information the CSB has in our continuing investigation of the tragic accident that occurred at the BP Texas City facility on March 23, 2005.

Our investigators will shortly present their preliminary findings. And these are preliminary findings. This investigation is still underway, and will continue for many more months.

After that, we will provide a period for public comment. We invite anyone who would like to speak to this

panel -- to this Board, to please feel free to do so. We ask that you please write down your name -- so that we can introduce you clearly and properly -- on the sign-up sheet, and please limit your comments to five minutes so that everyone can have their say.

We take all of these comments very seriously, and they will be included and considered as our investigation moves forward. A stenographer is here with us this evening and will be making an official record of these proceedings. A summary of these proceedings will be placed on our website at www.cbg.gov within the next couple of weeks.

Our investigation indicates 15 were killed and 170 other workers were injured, many of them very seriously. The Board members and the staff of the Chemical Safety Board express our sorrow to the victims, and our condolences to their friends and loved ones for those who lost their lives in this tragedy.

We all know we can't undo what has been done. But in conducting this investigation, we at the Chemical Safety Board hope to fulfill our mission of preventing similar accidents from happening in the future, not only here in Texas City, but throughout the oil refinery, and also the broader industry of this country.

The Chemical Safety Board is not an enforcement agency; we don't issue fines or penalties. Our mission is as an investigative body to investigate accidents. We make the findings known to the public and we issue formal safety recommendations in hopes of being able to prevent this kind of accident from happening again anywhere else, and then we follow up on those recommendations to make sure that they've been adopted.

In addition to the March 23 incident, we're continuing to look at subsequent accidents that occurred at the BP facility in Texas City on July 28 and August 10. These also impacted the community, although there were no casualties.

In the course of the investigation to date, we have received good cooperation from BP. The Chemical Safety Board wishes to express its thanks to them for this cooperation. Without it, this investigation would have been more difficult and taken much longer.

On August 27, the Chemical Safety Board took the unprecedented step of issuing our first urgent safety recommendation ever, issued even while the investigation is continuing. We asked BP to appoint an independent blue ribbon panel to examine the corporate and facility culture of all refinery operations in North America to identify

other reasons why this tragic event may have occurred.

BP has taken that recommendation to heart, announcing that just this past Monday, a diverse and distinguished panel headed up by former Secretary of State James Baker. I spoke with Secretary Baker on Sunday evening. He pledged to lead a thorough, no holds barred investigation of all the key corporate safety culture issues and oversight systems at BP. The Chemical Safety Board will be following the panel's work closely.

Just yesterday, we also issued two additional urgent safety recommendations to the petroleum industry through two industry trade groups, the American Petroleum Institute and the National Petro-Chemical and Refiners Association. We know that all 15 workers who died in this accident on March 23 were located in a temporary trailer, or in temporary trailers, placed too close to the hazardous process unit at this refinery.

We've urgently recommended that the API develop new industry guidance to ensure the safe placement of occupied trailers and similar temporary structures away from hazardous areas. In addition, we recommended that the industry alert all refining facilities of the need to immediately remove temporary structures from hazardous operating areas. These recommendations have the potential

of saving many other lives in the future.

Shortly, we will hear a report from the investigative team. At this time, I would like to introduce them. This team is heading up by Bill Hoyle, our investigative manager, and Don Holmstrom. Both of these gentlemen have a great deal of experience in refinery operations and safety management for the excellent -- and I want to thank you for the excellent work that you have already done.

At this time, I'd like to turn the floor over to Mr. Holmstrom and his team so they present this preliminary report to the community. Thank you.

MR. HOLMSTROM: Thank you, Madam Chair.

It is our privilege to be here and present our findings to the Board and to the community. I want to recognize the members of the CSB team investigating the BP incident. They are Cheryl McKenzie, Francisco Altamirano, Giby Joseph, Johnnie Banks and Mark Kaszniak. I would also like to thank BP and OSHA for their cooperation during our investigation.

This accident is the biggest and most complex investigation ever undertaken by the Chemical Safety Board. The investigation team to date spent four and a half months in the field.

We have conducted over 300 interviews; reviewed over 5,000 documents; thoroughly investigated the incident scene; measured blast damage; examined operating records during the start up, including pressures, levels, flows and temperatures. We are in the process of conducting dozens of tests on operating equipment and instrumentation.

In addition, we have supplemented the expertise of our own team with specialized experts on explosion modeling, emergency relief systems, process unit modeling, and instrument engineering.

On March 23, 2005, the BP Texas City refinery experienced severe explosions and fire. This was caused by the release of flammable hydrocarbons and resulted in 15 deaths, 170 injuries, many of them serious, and significant economic losses. Ladies and gentlemen, this accident was one of the most serious and deadly U.S. workplace accidents of the past two decades.

Our team will explain this incident in more detail, but in brief here is what happened. This incident occurred during the start up of a tower called a raffinate splitter that process large quantities of flammable hydrocarbons processed from crude oil. Starting up that unit without those kinds of hydrocarbons is one of the

most potentially dangerous events in an oil refinery.

During the start up, the tower and associated piping were over-filled and over-pressured. This resulted in inflammable hydrocarbons being vented from the tower to a piece of equipment called a blowdown drum with a tall connected stack that opened to the atmosphere. The blowdown drum and stack are shown here in the photo.

This blowdown drum filled completely with flammable liquid. A geyser erupted out of the top of the stack, a large flammable vapor cloud developed at ground level drifting toward and underneath unprotected trailers which housed contract workers.

The trailers had been placed too close to the blowdown drum. The vapor cloud exploded and killed 15 workers in and around those trailers. The work trailers were located here in the photo, and as you can see, they were completely destroyed.

I'd like to show you now a clip from the initial news coverage of this incident. This aerial footage was taken within hours of the initial explosion. The large cloud of smoke shown here was visible for miles away. As we get closer to the incident, you can see the size of the area affected in the refinery.

Flames can be seen billowing out of the top of

the blowdown stack. This was the location where the flammable material initially was released and ignited. You can see a truck burning, and here more vehicles engulfed in flames.

The tank that is shown was damaged due to the blast wave of the explosions. Benzene vapors were released from that tank and prevented inspection of the incident scene for more than a week. The camera zoomed showing emergency crews who were working to removed debris and locate the injured workers.

(Pause.)

MR. HOLMSTROM: Excuse me here. I'm now going to list the key safety issues in this presentation. Key safety issue number one: occupied trailers were placed in an unsafe location, too close to a process unit handling highly hazardous materials. All 15 fatalities occurred in the two trailers closest to the blowdown drum.

Key safety issue number two: the unit should not have been started up with existing malfunctions of the tower level indicator, level alarm, and control valve. Known problems were not repaired prior to start up.

Key safety number three: the raffinate splitter tower had a history of abnormal start ups. Running a high level in the raffinate tower during start

up, above the range of the indicator, for long periods of time and therefore not knowing how high the level really was, became the norm in prior start ups.

Key safety issue number four: the day of the incident, an unsafe blowdown drum vented highly flammable material to the atmosphere. The drum was never connected to a flare since its construction in the 1950s.

The first rule of oil refinery safety is to keep the flammable hazardous materials inside the piping and equipment. A properly designed flare system would safely contain the liquids and combust flammable vapors, preventing an unsafe release to atmosphere.

Key safety issue number five: between 1995 and March 23, 2005, there were four other serious releases of flammable material from the ISOM blowdown drum and stack. Even though these serious near misses revealed the hazard of the blowdown design, no effective investigations were conducted or changes made.

Finally, key safety issue number six: in 1992, OSHA cited a similar blowdown drum and stack at the refinery as unsafe, but the citation was dropped and the drum was not connected to a flare. This early opportunity to connect hazardous blowdown drums to flare systems was not acted upon.

We'll have more to say about those key safety issues. Right now I would like to introduce Mr. Joseph who will describe the incident in more detail with crucial background information.

MR. JOSEPH: Thank you, Mr. Holmstrom. Today I'll provide some background information on --

VOICE: Speak into the microphone.

MR. JOSEPH: Can you hear me? Can you hear me?

I'll provide some background information on the Texas City refinery, and also give details on the equipment involved in the incident.

The BP Texas City refinery is the third largest in the United States. On January 1, 1999, Amoco Corporation merged with BP to form BP Amoco. The Texas City refinery can produce about 11 million gallons of gasoline a day.

Also, the refinery has 30 process units spread over a 1200 acre site. In addition to gasoline, the refinery produced jet fuels, diesel fuels, and chemical feed stocks. The Texas City refinery also employs about 1600 staff and hundreds of contractors.

This next slide is a graphical illustration that depicts the layout of the isomerization unit, or ISOM, and its surrounding areas. Isomerization unit is

the unit that had the incident.

Now this unit has a process that increases the octane number of light gasoline components, pentane and hexane. An example of octane number is the numbers you see at the gas pump, like 87, 91, 93. The unit is made up of four sections, and the raffinate section is the first section in the series.

The incident occurred during the start up of the splitter tower in the raffinate section. To deal with emergency conditions such as the splitter tower over-filling over-pressuring, the tower is connected by piping to the blowdown drum and stack across the unit. The drum is open to the refinery's process sewer system, and the stack is open to the air.

The trailers were very close to this open blowdown drum and stack. A total of nine trailers were located in the area to support maintenance turn around activities for the alter cracker unit, which was an adjacent unit to the ISOM.

Two of the trailers were only 121 feet away from the drum and stack. Now this is a close up -- these are a couple of close up picture of the splitter tower. It's 164 feet tall and normally operated at a pressure of about 20 pounds.

Gasoline feed is brought into the raffinate splitter from other units within the refinery. The splitter tower separates the feed into light and heavy gasoline components. When the tower is working properly, the heavy liquid material goes out the bottom and the light vapor material goes up to the top, and out through the top through a pipe, which I'll show in the next slide.

The incident occurred because something went wrong inside this tower. In a few minutes we'll show an animation that illustrates what went wrong, but before that let me give some more information on equipment that you'll see within the animation.

This is the mid section of this tower, and the piping that you see here is the -- it comes off the top of the tower. And when the tower's working properly, vapor travels up the tower like I said in the last slide, and comes off the top and flows through this pipe.

But on the day of the incident, liquid instead of vapor came out the top and flowed through this pipe. The animation will show how this happened.

Next, I want to point out these valves right here, which were used to mitigate pressure build up within the tower. Our next slide will be a close up of this area. This is what is called an eight inch chain valve at

the refinery. The valve is used to remove nitrogen from the tower. But, the valve is also routinely used to vent tower pressure during start ups.

The use of the eight inch chain valve to relieve pressure was not prescribed in the written unit's start up procedures. But practice had become -- this practice had become part of the operating norm over the years.

When pressure builds up within the tower, and the eight inch valve is opened, it sends material to the blowdown drum and stack. This valve was used on the day of the incident, and the animation will illustrate the role it played during the incident.

Three emergency relief valves also reduce high pressure build up within the tower. These valves open when pressure within the tower gets above 40 pounds, and also sends material to the blowdown drum and stack. These valves are not intended for routine operating pressure control, but rather for emergency situations.

This is a picture of the blowdown drum, and the 67 foot stack that sits on top of it. In total, the blowdown drum and stack are 114 fee tall. During the start up of the splitter tower on March 23, a series of events caused the tower to fill up and over-pressure.

The emergency relief valves opened and sent a large amount of flammable liquid material to this blowdown drum and stack. The blowdown drum could not handle such a large amount of liquid material, so flammable liquid erupted out of this stack in a geyser-like manner.

This is a close up of the bottom of the blowdown drum and stack, or actually the blowdown drum. The piping you see here -- the piping you see there leads to the process sewer. Liquid build-up in the drum would overflow into the process sewer system via this piping, and this valve, which was chain locked open.

During the incident, large volumes of liquid flammable material was released into the refinery's process sewer system. The material coming out of the stack and the process sewer formed flammable vapor clouds, which ignited. The resulting explosions destroyed the nearby trailers, killing 15 contract employees, and seriously injuring numerous others.

Now that ends my part of the presentation. Now Mr. Johnnie Banks will discuss the animation that illustrates what went wrong during the start up of the splitter tower on March 23.

MR. BANKS: Thank you, Mr. Joseph.

And good evening. For the next portion of our

presentation, I'll be presenting an animation of the events that led to the incident of March 23.

At about 2:00 a.m. on the night -- on the previous shift, as part of pre-start up activities, operating crews began filling the raffinate splitter tower with liquid hydrocarbon feed. Prior to filling, the tower had been purged with nitrogen to prevent oxygen from entering.

Now I'd like to take a moment to introduce key pieces of equipment that will be features throughout the animation, and they include the feed piping coming into a feed/heat exchanger, which is shown here; the piping from that exchanger, which is routed to a furnace, which is shown here; piping from that furnace going to the splitter tower, which is shown here; and the blowdown drum and stack.

Now as you can see in the animation, the feed was entering the splitter tower here. When feed flow was stopped, the level indicator showed as full, but within the range of the indicator. As you'll see here, the tower actually filled three feet above the range of the indicator. Operating a tower over the range of the level indicator is a serious safety issue.

Okay. Above that point, the operators are

essentially running blind. And as we saw in the animation with the red light on the alarm activated, it sounded when the tower over-filled, but a second hard wire redundant alarm failed to activate.

And what I'll do is -- we have the wrong one loaded there --

(Pause.)

MR. BANKS: Okay. Sorry about that. We'll walk through this first animation and get to the end of the slide. But as I was pointing out, the feed was coming into the tower here. And when the feed flow was stopped by the red light that activates there, the redundant --

(Pause.)

MR. BANKS: Okay. Our next scene -- we'll take a look at the tower circulation starting and more feed being added to an already over-filled tower. These events would occur at about 9:51 a.m. that morning.

At about 9:50 a.m. on the day of the incident, despite the fact that the tower was full, operators began filling and circulating feed, as we see here. The level indicator again showed the tower level as high, but within the range.

The actual level that the operators relied on showed a level within range. Their meter showed the flow

of the tower tankage at a rate of 4,300 barrels per day. The valve controlling this flow was actually closed. And when we run the animation through at the end of this, we'll point these things out, and I apologize for the mis-steps here.

Although required by the procedures at this time, no flow was established out of the tower to bring the tower level down to 50 percent, or six and a half feet in the tower.

Now on our next animation, the pressure builds in the tower, nitrogen and other gases are vented to the blowdown drum. At about 10:00 a.m., operators lit burners on the furnace to begin heating up the incoming feed, as we'll see in the animation.

This activity is captured by the lights underneath the furnace shown there. As the feed comes out of the furnace, the yellow arrows turn red, indicating that they are being heated prior to going to the furnace.

Now the level indication and recording devices showed a decrease, when actually, the level was rapidly rising toward the top of the tower, as we'll see here. By 12:40 p.m., the tower pressure had increased above the norm set point of 33 pounds per square inch due to compression of nitrogen from the rising level so liquid in

the tower. And as a result, the high pressure alarm was activated.

So the level indicator that the operators were relying upon showed a decrease in level from 9.8 feet to 8.6 feet, when actually, the level, as determined through analysis after the incident, the level had increased from 13 feet to 139 feet. And pressure in the tower had increased from zero to 33 pounds per square inch.

Now in our next scene, we'll take a look at pressure building in the tower and nitrogen and other gases being vented to the blowdown drum. With that pressure, as we see here, at about 12:40 p.m., an operator opened the chain valve to lower the pressure. This will be the chain valve that was opened, and that was pointed out by Mr. Joseph earlier.

In opening that valve, pressure was released to the blowdown drum through the stack, and two burners were turned off to lower the tower bottom's temperature. The chain valve was used because the valve prescribed to remove nitrogen during start up procedures was not operable.

As a result, the pressure -- high pressure in the line reset and the pressure dropped from 33 pounds to 22 pounds per square inch. As we see in the animation,

gas vapors, which were mostly nitrogen, were vented from the blowdown stack to the atmosphere.

Now in our next animation, we'll take a look at tower feed and temperatures increasing and the tower overflowing. These events would occur between 1:00 and 1:10 p.m.

At about 1:00 p.m., the splitter level control valve shown here was open to allow the flow of storage. Hot feed flow out of the splitter tower to the storage tank rose sharply to 28,000 barrels per day, and can be captured in the yellow arrows turning orange going into the furnace and coming out red, being warmed even more, prior to going to the splitter tower.

Opening up the level control valve to storage led to a sudden rapid increase in feed temperature coming into the tower. As we can see here, with the feed arrows changing from yellow to orange, the feed temperature starts to rise.

The temperature of the feed rapidly increases by 156 degrees in this first 10 minute period. This hot feed entering the tower is now above the boiling point by 1:05 p.m. As a result, some of the liquid vaporizes. When liquid changes to vapor, the liquid volume expands significantly.

And we can see here in the animation, this vaporization causes the liquid level to increase as it expands in volume. At 1:10 p.m., the tower is full and starts to overflow into the overhead piping.

So at 1:10, the level indicator that the operators were relying upon showed a level of 8.6 feet, while the actual level, as determined after the fact, had increased -- had gone from 158 feet to an overflow status. And the time is 1:10.

Okay, in our next scene, tower pressure increases rapidly and relief valves open up to the blowdown drum and liquid hydrocarbons are released to the atmosphere. At this point, the liquid level is building in the overhead piping, as we see here.

The weight of the rise in liquid in the 150 overhead piping adds a significant addition of that additional pressure to the area where the emergency relief valves are located.

The pressure rises from 21 to 63 pounds per square inch in just two minutes. The pressure relief valves open at approximately 1:14 p.m. when the pressure reaches 40, 41 and 42 pounds as we see here, and the still expanding liquid volume is vented to the blowdown drum.

Now as the liquid level rises in the blowdown

drum, and here in the animation it overflows into the process sewer piping that's shown here. The blowdown drum completely fills, as we see here, and at this point, numerous witnesses report seeing a geyser-like eruption of liquid as high as 20 feet above the blowdown stack. The geyser lasted approximately 45 seconds to one minute, and the liquid falls to the ground, creating a large vapor cloud.

What I'd like to do now is to play this animation in its entirety with a minimal amount of commentary, and allow you to see how the chain of events unfolded into the incident.

(Pause.)

MR. BANKS: The raffinate splitter tower overfills.

(Pause.)

MR. BANKS: The level of alarm indication activates, but a second hard wire redundant alarm fails to activate.

(Pause.)

MR. BANKS: Tower circulation starts, more feed is added to an already over-filled tower. The circulation loop shown here. The tower feed is heated, the level rises to the top of the tower.

(Pause.)

MR. BANKS: The burners are added, the feed is heated.

(Pause.)

MR. BANKS: Nitrogen in the tower is compressed by the rising liquid level. The pressure builds in the tower, nitrogen and other gases are vented to the blowdown drum. This depicts the venting of the blowdown drum tower. The chain valve is opened, and pressure is vented to the blowdown drum.

(Pause.)

MR. BANKS: Mostly nitrogen gas is vented from the stack. The tower feed temperature increases and the tower overflows.

(Pause.)

MR. BANKS: The feed coming in is warmed prior to going to the heater where it's heated even more, going to the splitter tower. The rising liquid level. The tower pressure increases rapidly, and the relief valve opens to the blowdown drum. Liquid hydrocarbons are released to the atmosphere.

(Pause.)

MR. BANKS: The pressure builds, the relief valve's opened.

(Pause.)

MR. BANKS: The process sewer piping overflows, the liquid level rises, and the geyser-like eruption from the splitter tower -- I mean, from the blowdown stack.

This concludes my portion of the presentation. I will now turn the proceedings over to Mr. Kaszniak who will walk you through several blast scenarios.

MR. KASZNIAK: Thank you, Mr. Banks.

Four conditions are necessary to create a vapor cloud explosion. First, the flammable material must be released to the atmosphere; second, a flammable vapor cloud must form and expand to a sufficient size; third, the vapor cloud must be ignited by a suitable ignition source; and fourth, as the vapor cloud burns, it must encounter congested and/or confined areas in order to accelerate the speed of the flame.

If wind acceleration does not occur, then no blast pressure will result, and only a large flash fire will occur.

The animation that you just saw described a sequence of events which showed how flammable hydrocarbons were released from the blowdown stack during the March 23 start up of the raffinate splitter tower.

Now I will discuss how the other three

conditions came to be present on March 23, then I will discuss the consequences produced by these vapor cloud explosions, focusing in on damage created to the occupied trailers.

The darkened area inside the dotted line in this aerial photograph taken a day after the explosion shows the burned area which indicates the extent of the flammable vapor cloud that was created. As a point of reference, the blowdown drum and stack are shown in the white rectangle.

As you can see, this area includes the bulk of the ISOM unit itself, portions of the roadways on the left and right sides of the unit, a portion of the pipe rack and trailer area below the unit, and a vehicle parking area near a warehouse, also below the unit.

The expansion of the flammable vapors into this area occurred in two distinct phases. The first phase occurred before the vapor cloud was ignited.

During the one to two minute period, natural forces, in this case primarily gravity, evaporation and the wind, moved the flammable vapors from the blowdown stack to the ground where a cloud formed and then spread away from the drum in all directions.

The second phase occurred after the ignition of

the cloud. As the cloud burned, the flame front that was created pushed unburned vapors ahead of it, much like a piston would.

The computer simulation that I'm about to run, which was developed by a consultant for CSB, shows one way that the vapor cloud could have expanded before it was ignited. Please note that this is a preliminary simulation that will be refined as the investigation continues.

This simulation is based on a validated computer model. The results produced by this model have been compared against information obtained from large scale tests and historical data of actual vapor cloud explosions.

You are looking at a three dimensional scale representation of the ISOM unit and the area immediately surrounding it. The raffinate splitter tower is in the lower right hand corner. The blowdown stack is in the upper center of the photo. And the trailer area is on the left side.

Please note that this simulation only shows the flammable vapors expanding at ground level, not coming out of the stack. And the wind speed is five miles per hour, blowing toward the southeast, as it was on March 23.

(Pause.)

MR. KASZNIAK: This is how far the model predicts the vapor cloud expanded one minute after the release began from the stack. The various colors represent different concentrations inside the vapor cloud. As you may know, flammable vapors can only explode in a limited concentration range. In the ISOM unit, that range was between 0.8 and 7 percent by volume in air.

The red areas of the cloud show vapor concentrations above 7 percent. These vapors are too rich to burn. The yellow and green areas of the cloud are vapors between 4 and 7 percent, and the blue areas of the cloud are vapors between 0.8 and 4 percent. These vapors are in the proper area, and they can burn and explode. Those areas that remain black are below 0.8 percent. Any vapors in those areas are too lean to burn, and are not represented in this simulation.

To date, CSB has identified four potential ignition points that could have ignited the flammable vapor cloud. Other potential ignition points are still being evaluated by CSB. This photo shows the location of those points relative to the ISOM unit as a whole, and the blowdown drum and stack in particular, which is indicated by the white rectangle.

The first potential ignition point is a diesel truck that was parked near a contractor trailer located inside the ISOM unit. The ignition key inside this truck was found in the on position after the explosion.

The second potential ignition point is a furnace located -- also located in the ISOM unit. This furnace was operating at the time of the explosion.

The third potential ignition point is a switch gear building located in a corner of the ISOM unit. Flammable vapors cold have entered this building and been ignited by an electrical spark.

The fourth and closest potential ignition point is a diesel pickup truck that was parked alongside the roadway about 25 feet from the blowdown drum and stack. This photo shows a close up of that pickup truck.

Several eyewitnesses reported seeing or hearing the engine of this truck, which was idling at the time of the explosion, over web when the vapor cloud reached it. Two eyewitnesses saw this truck explode, followed shortly thereafter by the first vapor cloud explosion. One of these eyewitnesses observed sparks leaving the truck and igniting the vapor cloud.

This second computer simulation shows one way that the blast pressure wave could have moved after the

vapor cloud was ignited. Again, this is a preliminary simulation. The ignition point chosen for this simulation was the diesel pickup truck parked closest to the blowdown drum, and the vapor cloud was ignited one minute after the flammable hydrocarbons were released from the -- released to the atmosphere.

In this simulation, the combustion products produced by the flame front are used to show the movement of the blast pressure wave. This time, the changes in color that you will see, from blue to green to red, indicate more combustion products are being produced. And thus the blast pressure wave is accelerating as it moves through those areas of the ISOM unit.

So there's the location of the ignition point where the diesel truck was, and now I'll run the simulation.

(Pause.)

MR. KASZNIAK: You can see the cloud expanding here, the red indicating that the flame is accelerating in those particular directions. First it's localized, and then it forms in the congested area and expands greatly.

(Pause.)

MR. KASZNIAK: And then it shrinks back to a smaller size after it has been expanded.

Now I will show you four areas where the CSB has determined that explosions occurred inside the flammable vapor cloud. As I previously explained, these are congested or confined areas where the flame front accelerated to produce a blast pressure wave.

Each explosion area is characterized by a circular pattern of locally intense structural damage that was pushed or deformed away from the center in all directions. Three explosion areas were found in the main part of the ISOM unit. Two were located in reactor areas and one in a compressor area, shown by these three rectangles on the photo.

All of these areas were highly congested with process equipment, structural support -- and structural supports and thus high blast pressure waves were generated. As these blast pressure waves propagated outward, they damaged a lot of steel process equipment, structural supports and piping.

The fourth explosion area was located between the pipe run and the trailer area, as shown by this rectangle. Flammable vapors settled in the lower area of the pipe run where they were also partially confined by the walls of the nearby trailers, and some had dispersed underneath the trailers as the time of the explosion.

Although the magnitude of the blast pressure wave here was only about a third of those generated in the main part of the ISOM unit, this explosion occurred very close to where the occupied trailers were located.

The aerial photo on the left taken several months prior to March 23 shows where the double wide trailer was located in relation to the warehouse. The rectangle shows where the fluor trailer would later be located.

The aerial photo on the right shows the same area after the explosions. Note that the trailers have been totally destroyed and the warehouse has sustained major structural damage.

This aerial photo is a close up of just the trailer area. All 15 contractor fatalities occurred in this area, and several BP employees were severely injured.

The fluor trailer, which is indicated in this rectangle, was totally destroyed by the explosion. As you can see, only its metal frame is left, and it has been deformed and was moved by the explosion from its original location.

The double wide trailer was also destroyed by the explosion. As you can see, both metal frames were significantly bent in the middle. Again, both the trailer

the ISOM unit. As you can see, the roof has partially collapsed and its windows have also been broken.

Although the blast pressure wave dissipated the farther it traveled from the explosion area, it was still capable of breaking windows in a number of homes and small businesses located north of the refinery, up to a distance of one mile. As a point of reference, the amount of over-pressure it takes to break windows in a typical building ranges from about .1 to .3 pounds per square inch.

That concludes my portion of this presentation. Now I will turn it back to Don Holmstrom, the lead investigator, who will come back to discuss the preliminary findings.

MR. HOLMSTROM: Madam Chair, now that we have described what happened on March 23, I will present some important facts that relate to the causes of the hydrocarbon release, the subsequent fire and explosion, and the reasons for the injuries and the fatalities.

Since the investigation is not complete, we call these preliminary findings. The first preliminary finding is associated with the placement of occupied trailers too close to hazardous process areas.

All of the fatalities, and many of the serious injuries, occurred in or around the nine contractor

trailers that were sited near process areas as close as 121 feet from the ISOM blowdown drum.

This unit contained large quantities of flammable hydrocarbons, and add a history of releases, fires, and other safety incidents over the previous two decades.

Trailers have been periodically located in and around process areas handling highly hazardous materials for reasons of convenience, such as ready access to work areas. BP had located trailers needed for contract workers in the same location near the isomerization unit for a number of years. Trailers such as these did not need to be located as close as they were to process areas in order for workers to perform their job duties.

Under BP's citing policy, trailers used for short periods of time, such as turn around trailers, were considered as posing little or no danger to occupants. This approach conforms with the safety guidance published in Recommended Practice 752, by the American Petroleum Institute, or API.

The American Petroleum Institute is the primary safety standard setting trade association for the oil industry. API 752 states that each company may define its own risk in occupancy criteria. There are no defined

minimum protections. API 752 provides no safe minimum distances from process areas for the location of trailers used in refineries and other chemical facilities.

Over 40 trailers were damaged in this incident. Workers in adjacent units were injured in trailers 480 feet from the ISOM blowdown drum. A number of trailers, some as far as 600 feet from the blowdown drum, were heavily damaged.

Trailers can be easily relocated to less hazardous areas. Subsequent to the March 23 incident, BP announced that it would move trailers at least 500 feet from hazard process areas. A number of contractor offices were moved to an offsite location.

Finally, trailers are not generally designed to protect occupants from fire and explosion hazards. In contrast, occupied buildings such as control rooms, operator shelters located within a process unit are typically permanent and constructed to be blast and fire resistant.

For these reasons, as Chairman Merritt has discussed, the CSB issued an urgent recommendation to the American Petroleum Institute to remove trailers away from hazardous areas in process plants.

Next we'll talk about unit start up and

mechanical integrity issues. The raffinate splitter tower was started up despite malfunctioning key process instrumentation and equipment on the day of the incident, including the tower level indicator and sight glass, tower hard wire level alarm, blowdown drum high level alarm, and the tower three pound pressure valve.

As we saw in the start up animation earlier, the level alarm associated with the level indicator sounded during the initial filling of the raffinate splitter tower.

However, both the tower level indicator and a separate hard wired high level alarm were malfunctioning during the events that led to the incident. The hard wired high level alarm and the level indicator were documented by work orders as malfunctioning, but were not repaired prior to start up.

The sight glass on the raffinate splitter tower, which gives a visual check of tower liquid level and can help verify the accuracy of the level indicator, which as we found, was inaccurate on the day of the incident, was reported prior to the start up to be dirty and non-functional.

In addition, the high level alarm for the blowdown drum did not sound prior to the incident at the

time liquid was flowing into the process sewer system, this alarm switch, which was subject to severe fouling and required a weekly maintenance procedure to try to keep it functioning.

Prior to start up, operators informed management that the tower three pound pressure valve was not operating. Still, the valve was not repaired prior to start up. This led operators to use alternative methods to remove nitrogen and reduce tower pressure, such as using, as we saw in the animation, the eight inch chain valve, which as we saw, opens to the blowdown drum and stack. Post-incident testing confirmed that the three pound valve was not working properly.

Madam Chair, with important instrumentation and equipment malfunctioning, the ISOM unit should not have been started up until repairs were made. The proper working order of key process instrumentation was not checked as required by the start up procedure.

This was an additional opportunity to verify that the instrumentation was working properly. However, operations personnel did not know of problems with the tower level indicator and high level alarm because checks to determine operability of these instruments was not

performed.

Verification of instrument operability is required in the procedures and a critical step in the start up process. Unit operations management turned away instrument technicians and signed off on the checks as if they had been completed.

We will now discuss unit start ups. Operations personnel did not open the tower level control valve at the time specified in the start up procedure. The operator did not balance the hydrocarbon flows in and out of the tower.

As we have shown in our animation of the start up process, the tower filled up because liquid was being added for nearly three hours without being removed to the storage tanks. An outside operator stated he requested the board operator to open the valve that would remove the tower liquid to storage.

However, controlling personnel stated that instructions were given to keep the level control valve closed. The CSB is further investigating this issue.

The tower level was actually rising rapidly for three hours. During the hours of 10:00 a.m. to 1:00 p.m., we now calculate that the liquid level was rising rapidly towards the top of the tower at 158 feet, of 164 foot

tower.

However, the indicator that operators were observing showed the level to be dropping in the bottom 10 feet of the tower during this same time period. The tower level indicator only indicates the bottom 10 feet and nothing above the 10 foot level.

A false level indication showing the tower level declining was a factor in the delay in removing liquid from the tower. Operators relied on this level indication, and they took no action as they observed the level drifting back towards the normal operating range.

Start up procedures did not address the importance of maintaining a balance of liquid flow in and out of the tower. The tower was not equipped with additional instrumentation indicating tower level. Additional instrumentation, such as a tower bottom pressure indicator, could have provided the operators with additional data concerning tower level.

We're now going to talk about a history of abnormal unit start ups. In 16 start ups of the raffinate splitter tower from April 2000 to March 23, 2005, eight of these start ups of the raffinate splitter experienced at least two time the normal pressure, greater than 40 pounds per square inch versus 20 pounds, the normal operating

pressure. In 13 out of the 16 start ups, the pressure exceeded 30 pounds, the alarm set point for high tower pressure.

In February 2003, the set points of the emergency relief valves that we've seen earlier in the animation on the tower were lowered from 70 to 40 pounds due to corrosion in the tower. Two of the start ups since 2003 involved pressure excursions over 40 pounds where emergency relief valves likely opened.

Thirteen of the start ups of the raffinate splitter had liquid levels above the range of the level indicator, that is, greater than 10 feet, some lasting as long as four hours.

Also, in two thirds of the start ups, liquid feed circulation to the raffinate splitter was started when the tower was already above the range of the level indicator. As we have discussed, filling above the level indicator makes it difficult to know how much liquid is within the tower, thus making it much easier to over-fill.

However, most of the previous start ups established liquid flow out of the tower much sooner, between three minutes and 45 minutes after flow was introduced, rather than the three hours it took in this incident.

Moreover, preliminary analysis indicates that none of the previous start ups experienced a high level into the upper section of the tower, as occurred in the March 23 incident.

BP did not investigate these previous raffinate splitter tower start ups with high pressures and high levels as required by BP policy. The occurrence of high pressures and high liquid levels during the tower start ups had become part of the operating norm.

It is important to investigate these incidents that we call near misses, even those without serious consequences, because catastrophic incidents can follow if problems go uncorrected. Investigation of these incidents could have resulted in improvements to tower design, instrumentation, procedures and controls.

Next we're going to talk about management oversight and accountability. BP management did not assure that an experienced supervisor was in the unit during start up to provide oversight. PB policy requires experienced supervisory personnel to be assigned to process units start up to assist in making important decisions.

At 10:00 a.m., the supervisor in charge left the unit for a family emergency. But no substitute with

ISOM operating experience was assigned. The departing supervisor had many years of operating experience in the unit.

The relief supervisor was not involved in the start up and had no ISOM operating experience. He could not provide the necessary level of guidance during the critical start up period. No other experienced supervisors were assigned to this start up.

We're going to talk about process design. The blowdown drum and stack were outdated and unsafe because they released flammable hydrocarbons to the atmosphere, rather than to a safe location such a flare system.

The ISOM's unit blowdown drum and stack released hydrocarbons to atmosphere, which created a fire and explosion hazard. The blowdown drum had a 67 foot tall stack open to the air. This open system design is outdated and unsafe.

In fact, BP policies recommended phasing out such blowdown systems when major modifications were made. Modern emergency systems, relief systems, send hydrocarbons to a flare system that includes an adequately sized knock out drum to capture liquids and a flare which safely combusts the flammable vapors.

Amoco safety standards, last revised in 1994,

state that when blowdown drums -- that blowdown drums should be connected to a flare when major modifications are made. In 1997, Amoco replaced the blowdown drum and stack with identical equipment rather than connecting the drum to a safer location such as a flare system.

This replacement was due to corrosion, and was a major modification under Amoco's procedures. Amoco was the owner of the refinery in 1997. Consequently, at that time, the blowdown drum and stack should have been converted to a flare system.

After the merger in 1999, BP adopted the Amoco safety standard for blowdown drums at the refinery. In 2002, BP evaluated connecting the ISOM blowdown system to a flare as part of an environmental initiative, but did not pursue this option.

Since the March 23, 2005 incident, BP has stated they plan to discontinue the use of blowdown drums open to the atmosphere at the facility.

At the time of the incident, the raffinate splitter tower did not have an effective pressure control system to reduce high pressure and remove hydrocarbons to a closed system. This led, in part, to the dependence on a blowdown drum and stack to reduce high pressures build up within the tower.

The tower should have had an additional layer of protection such as a pressure control valve to a closed system to remove hydrocarbons and reduce build up excess pressures, thus lessening the dependence on the blowdown drum and stack relieving the atmosphere. The use of a closed system could have prevented, or reduced the severity of the incident.

In 1992, OSHA cited and fined Amoco on the hazardous design of a similar blowdown drum and stack at the Texas City refinery. The blowdown referred to was located in another unit, but was of similar design to the ISOM blowdown.

In the original citation and notification of penalty, OSHA suggested that the appropriate abatement method was to reconfigure the blowdown to a closed system with a flare. In a settlement agreement, OSHA withdrew the citation and fine and the refinery continued to use blowdown drums without flares. This early opportunity to remove hazardous blowdown drums was not acted upon.

Since 1995, at least four releases from the blowdown drum sent hydrocarbons to the stack and sewer, generating flammable vapor clouds at ground level. During these releases, vapors escaped from the sewer and formed ground level flammable clouds.

The drain valve off the bottom of the blowdown drum was chained open at the time of the incident and had been in this position for a number of years to allow for liquid hydrocarbons to flow into the sewers -- process sewers.

Since the hydrocarbon vapors coming out of the stack were heavier than air, material released descended towards the ground and also formed flammable clouds. Luckily, these previous releases did not find a source of ignition. We found that the four previous blowdown incidents were not properly investigated, nor were needed corrective actions implemented.

Finally, in terms of preliminary findings, we're going to talk about vehicle policy. We found that vehicles played an important role in the incident. PB's traffic policy allowed vehicles unrestricted access near process units. BP's vehicle policy does not establish safe distances from process unit boundaries for vehicles.

Approximately 55 vehicles were located in the vicinity of the blowdown drum and stack at the time of the incident. Two running vehicles may have provided sources of ignition for the incident. One was within 25 feet of the blowdown drum. Earlier we saw the photo of this diesel pickup truck north of the blowdown drum.

That concludes our preliminary findings. Finally, our future investigative activities. The CSB investigative team will complete our remaining interviews and testing of instrumentation and equipment in the next weeks.

We will also analyze root causes and use various tools to do that, and we will develop additional -- and analyze and do research and develop additional -- propose safety recommendations. We plan to issue the final report and present it to the Board for a vote a public meeting in Texas City in fall of 2006.

Madam Chair, that concludes our presentation. We are now ready for Board questions.

CHAIRMAN MERRITT: Thank you.

At this time, I'd like to open the floor to any of the Board members who might have questions for the panel.

MR. VISSCHER: Thank you, Madam Chair.

CHAIRMAN MERRITT: Mr. Visscher.

MR. VISSCHER: Thank you, Madam Chair.

First of all, I want to thank Don and the team. That was a very comprehensive presentation. And thank you for all that.

One question. Near the end of the presentation

you mentioned that the four releases that had occurred since 1995 from the blowdown drum of hydrocarbon -- from vapors had come through the sewer.

Had any of the -- had any previous releases of vapor come through the top of the stack? Do we have record of any previous releases through the top of the stack, or had all the previous releases come through the sewer?

MR. HOLMSTROM: Three of the previous releases came out the top of the stack and were in the form of vapor, not liquid as we saw in this incident on March 23. The vapor was released from the top of the stack, and because it's heavier than air, drifted down towards ground level.

In one of those incidents, a witness has reported to us that an explosion meter was pegged out when measuring the hydrocarbon concentrations at the ground level. One of the incidents involved large quantities of hydrocarbons going into the sewer system and creating a vapor cloud out near some of the underground equipment boxes related to the sewer system.

MR. VISSCHER: Was it a similar situation where it had come through the open valve out of the blowdown and into the --

MR. HOLMSTROM: That's correct.

MR. VISSCHER: -- cool air and went up -- okay.

MR. HOLMSTROM: That's correct.

MR. VISSCHER: So three of them were out the top of the stack, however.

MR. HOLMSTROM: Three of them were out the top of the stack.

MR. VISSCHER: Okay. Thanks. I guess, you know, listening to this, you've described a situation which there were clearly issues, kind of design issues, equipment issues, management issues, and operator issues. And I wanted to just ask a couple of questions on the last of those.

Was the amount of -- were the number of operators involved here, was it principally one operator following this start up, or were there additional operators involved? Is this basically a one person start up process?

MR. HOLMSTROM: There were operators in the control room, and there was an operator on the control board, and there were operators outside in the process unit. In this particular incident, there were several operators who were outside, two of whom had outside experience, one who had not worked outside for a number of

years and been primarily a board operator. There was one control operator, that was typical practice for the start up of this particular unit, the raffinate splitter.

As part of our ongoing investigation, we're looking at a number of issues related to what are called human factors, the interface between the operator and the machinery, and what was going on at the control board and alarms that were going off and distractions and things of that nature. That is part of our continuing investigation into this incident.

MR. VISSCHER: Okay. Did he have responsibilities other than the start up? Was he monitoring other things besides the start up?

MR. HOLMSTROM: Yes. Yes. There were other process units operating that he was responsible for, as well as another section of the ISOM unit that was in circulation at the time.

MR. VISSCHER: I guess one of the things that strikes me in this is, even with the equipment failures, the fact that liquid was going in for three hours as you described, and nothing was going to storage. It seems it would have occurred that it must be building up somewhere to the operator.

You kind of touched on that in terms of what

may have been going on there. Do you have anything more on that, or is that one of the areas that you're still looking at?

MR. HOLMSTROM: As I indicated, we're investigating the version of events from several witnesses who were present, and trying to determine the exact sequence of events with both the operators in the control room, as well as the operators outside.

We're also looking at issues related to the training and procedures concerning this. We mentioned some of those in our findings concerning the importance of containing in procedures, balancing flows in and out of the towers, as well as we're examining the training that was given on the operators on those issues.

Additionally, we've looked at the role that the level indicator played that was giving a incorrect reading, and the operators were, to some degree, relying on that. We also stated that the procedures called for placing the level control valve in auto instead of 50 percent at the beginning -- at 10:00 a.m., at the beginning of the process, before heat was applied and the heaters were started. And that was not done.

The flow out showed an indication. We believed it to be a false indication of some flow out. We believe

there was no flow out of the tower. The level control valve was in the closed position, the output was zero.

MR. VISSCHER: Thank you.

CHAIRMAN MERRITT: Thank you, Mr. Visscher.

MR. BRESLAND: Just following up on --

CHAIRMAN MERRITT: Mr. Bresland.

MR. BRESLAND: Just following up on that question. You say that there was a zero indication on the valve which would indicate that the valve was closed?

MR. HOLMSTROM: That's correct.

MR. BRESLAND: So somebody looking at that would know that there wasn't any flow leaving the bottom of the column?

MR. HOLMSTROM: One looking at a zero output valve should be concerned that there's no flow going out. As I indicated, there was a flow shown, but we believe that flow to be incorrect.

MR. BRESLAND: A question about the supervisor who left at 10:00 a.m. for personal reasons. What level of expertise did he have and -- I'm asking you to speculate here, but if he had stayed, would there have been a greater level of expertise in the start up operation on that day?

MR. HOLMSTROM: We list that as one of the

preliminary findings because we think that is a significant event. The supervisor who left had many years of ISOM operating experience, had actually worked as an operator, knew the ISOM very well.

BP policy required that there be experienced supervisors, or technical experts with expertise who could provide assistance and do troubleshooting during start ups. And that policy, as we understand it, was developed specifically in response to some previous start ups historically within Amoco, prior to BP, the owner of the refinery, where there were serious incidents that occurred during start up.

And what we mentioned earlier is that start up is a very critical time during refinery operations and presents many potential hazards.

MR. BRESLAND: A question -- let me see if I can find this in your presentation -- the issue in 1992 regarding the OSHA citations. And as I understand it, and correct me if I'm wrong, OSHA, as part of that initial settlement with OSHA there was an agreement to do something with the blowdown drum, and then that agreement was changed.

Can you expound on that, and correct me if I'm --

MR. HOLMSTROM: Well, OSHA issued a citation that said that the blowdown drum was unsafe because it did not remove the hazardous material to a safe place, it was open to the -- it wasn't a closed system. And as part of their recommendations for mitigation they -- one of the recommendations was connecting the blowdown drum to a closed system such as a flare system. That citation and fine was later dropped by OSHA.

MR. BRESLAND: And have we had any discussions with OSHA about that?

MR. HOLMSTROM: For approximately the last eight weeks we've been in contact with OSHA to try to arrange interviews with inspectors who were involved in that particular investigation and incident, and we have been unsuccessful to arrange those interviews thus far.

MR. BRESLAND: And are your efforts going to continue in this area?

MR. HOLMSTROM: Yes, our efforts will continue in this regard.

MR. BRESLAND: Okay. This incident involved fatalities in trailers where people working in trailers, temporary trailers. Is this a one of kind incident, or has something like this ever happened in the industry before?

MR. HOLMSTROM: There have been previous incidents in trailers and refineries. In 1995 there was another serious incident that occurred at the Penzoil oil refinery in Rouseville, Pennsylvania. That incident involved the bursting of two flammable liquid storage tanks. Five were killed, including two contractors who were located in trailers that were sited near the tanks.

The EPA, in 1998, released an investigation report and concluded that those fatalities may have been prevented if the trailers had been moved away to a safer location.

MR. BRESLAND: Do we know of any other incidents involving trailers?

MR. HOLMSTROM: We are investigating other trailer incidents that have occurred across the country. We know of some others where there have been damages. We are obviously looking at all the trailer incidents that we can find that related to the trailers being placed too close to hazardous process areas.

MR. BRESLAND: Okay. Thank you.

CHAIRMAN MERRITT: I'm not an engineer, so maybe you can help me here. I'm a little bit confused about how a flare system would help in a situation where a liquid geyser has erupted.

Can you explain when you talk about a flare system, exactly what to you mean and how would it handle a liquid situation such as we have in this particular incident?

MR. HOLMSTROM: Well, we're talking about a flare system, and a system would include both a -- what is commonly referred to as a knock out drum, there are other terminology for such a vessel, but a vessel that would collectively -- properly sized and properly designed to collect a worse case scenario of liquid that could be sent in emergency relief scenarios and safely contain that liquid.

The vapors would then be sent to a flare, which is lit and would safely combust the vapors and prevent a release to the atmosphere of flammable liquids or gas.

CHAIRMAN MERRITT: Okay. Thank you.

I'm a little disturbed about this chain valve, this valve that was chained open at the bottom of blowdown drum. Was this something that occurred just this day, or was it something that had been there a week, or what is your findings with regard to this valve open to the sewer?

MR. HOLMSTROM: We understand that the chain valve had been -- that valve had been chained open to the sewer for a number of years. The reason given was that

they -- BP wanted liquid to leave that blowdown drum and not build up a liquid level to the same point in the drum that the emergency relief piping is entering, thus restricting the flow of that -- of those vented gases into the drum.

However, as we stated earlier, we found that in a previous incident, the liquid went into the sewer and formed a vapor cloud at ground level. We also know, in this incident, that the liquid going into the sewer was created -- helped add to the vapor cloud and eventual explosion damage and fire in this incident. It was vented out of the sewer system.

CHAIRMAN MERRITT: And understanding about process safety management, when process hazard analyses are done, you're supposed to take into consideration potential events.

In your investigation, have you identified the process hazard analysis, and did they take into consideration these potential events, or past events that had occurred at this facility?

MR. HOLMSTROM: A number of the events were not included in the -- either the initial or revalidation of the process hazard analysis. I believe there was one that was mentioned, and I'm going to hand over, for a minute,

to my colleague, Mark Kaszniak, to further address that issue.

MR. KASZNIAK: That's correct, Don. So far we've only uncovered one potential past incident that was addressed in the process hazard analysis to date. We're doing further investigation on those analyses, and still trying to understand them by interviewing some of the people who were involved in those analysis at the refinery to try to get additional information on just what was discussed during those PHA meetings.

MR. HOLMSTROM: Thank you, Mark.

CHAIRMAN MERRITT: Thank you very much, panel. I really appreciate the work that you've done and this is a very complicated subject, and I think you've done a marvelous job of putting it in terms that I certainly could understand, and I hope others could understand as well, as to what you have learned to this point.

MR. HOLMSTROM: Thank you.

CHAIRMAN MERRITT: Thank you very much.

At this time, I would like to open the floor for public comment. I'll call your name -- and I apologize if I don't get the pronunciation right -- if you would, for our stenographer, please state your name when you come to the microphone. This is an open mike right up

here in the front. And everyone is welcome.

If others who have not registered yet for public comment would like to, then please go to the desk outside and give them your name so that I have it and I can call on you.

The first person registered is Chris Kightlinger.

MR. KIGHTLINGER: I'd like to just thank the panel for trying to help with this terrible thing that has killed so many people.

My name is Chris Kightlinger. I am upset with the Amoco Texas City refinery. It just -- even the contract workers trying to work hard; let them live in peace.

As someone brought to my attention, you should treat others with dignity. I was escorted to the gate with my pen. Where good people cannot be allowed to work, these accidents will continue.

I'm unhappy with oil businesses, because they're willing to pay more of their wages to a contractor just so they can be exempt from a lawsuit and keep us from a fair wage.

I always hear how BP is good. I remember two years ago they disputed paying taxes. This raises

homeowners' [indiscernible] to work. This refinery never cared about hiring locally. This expense of [indiscernible] causes youth to just stay with their drugs.

What can be done about crime in Texas City, other than make me move out? Amoco employees want police protection, too. I'm asking Amoco to pay for bulletproof windows on the police vehicles. It came to my attention -- Detective Joe Stanton -- I noticed on his plaque his vest saved his life, and he brought this to my attention.

That's about it. Thank you very much.

CHAIRMAN MERRITT: Thank you very much.

Mr. John Wagner.

DR. WAGNER: My name is Dr. Wagner. In past experience, I worked for Exxon and helped develop walk-through safety protocols as a vice chairman and chairman of their safety technology in Floren Park. More recently I taught fire protection engineering for close to 25 years.

It's indeed a pleasure for me to see one of my master's candidates, Mr. Giby Joseph, doing a fine job for the Chemical Safety Board, and the Chemical Safety Board presentation's top notch.

I'm a little confused, based on my experience, in knowing that a typical large refinery, say, in the 350,000 or 400,000 barrels a day of processing, has some 350 to 500 combustible gas sensors. And I'm wondering how many sensors did BP have in their -- that you found from the inspection?

CHAIRMAN MERRITT: Well, we will -- if you would make your statement, and we will --

DR. WAGNER: Okay.

CHAIRMAN MERRITT: -- continue --

DR. WAGNER: All right.

CHAIRMAN MERRITT: -- we don't -- we'll take that into consideration.

DR. WAGNER: Okay. Typically, combustible gas sensors are employed as early warning, and with such a massive release, it perplexed me that nothing I could read anywhere had any relevance on combustible gas sensors.

The second point is, I noticed there was a failure in the liquid level controller. The principles of safety engineering that I taught, those key points, critical points need redundant sensing. And I'm wondering whether there was redundant sensing.

That's all I have to say. Thank you.

CHAIRMAN MERRITT: Thank you very much.

DR. WAGNER: You're welcome.

CHAIRMAN MERRITT: Mr. Fillip, Harry Fillip.

MR. FILLIP: I've been a homeowner in Texas City at 301 12th Street, southeast of American Oil. A lot of time their flare -- they say about flares, they can prevent accidents.

Well, they sure do make a lot of noise and they -- I call the police and say they disturbing the peace by having those flares rumbling and all that noise. And I can't understand why BP wants to be -- help the homeowner, why they're not even listed in the phone book. Can you answer that? I'd like to know why they're not even in the phone book.

And so I know Able Garza; he's my relative, and he lives across the street, and my fence is -- cyclone fence is all rusted from the chemical pollution. A lot of times pollution is so bad, I have to turn the air conditioner off because of the smell that comes from one of the refineries. Maybe it's BP, maybe it's Marathon, maybe it's Texas City refinery. They make -- they're either making the gas and stuff like that.

I thank you very much.

CHAIRMAN MERRITT: Thank you, sir.

Mr. Mike Wright.

MR. WRIGHT: Thank you, Chairman Merritt. My name is Mike Wright. I'm a member of the Steelworkers Union, I'm the head of the Union's health, safety, and environment department.

We are, of course, the Union that represents BP workers in this refinery, and most of their other American operations. And, of course, we represent the majority of unionized oil and chemical workers across the country. And I'd like to give a brief statement on behalf of the Union.

First, we'd like to thank the Chemical Safety Board for this meeting, and for all of your excellent work on the March 23 accident, and may other industrial tragedies.

In particular, we'd like to thank you for the August 15 recommendation to BP for an independent panel investigating the company's safety management system in all it U.S. refineries. And, for more recently, the October 25 recommendation to the petrochemical industry in general on the safe siting of trailers on the plants' site.

We hope that recommendation is followed rapidly with one on the atmospheric venting of uncombusted flammable liquids and gases. We eagerly await that kind

of recommendation, because I think that's obviously of relevance for the whole industry.

And, of course, we'd like to thank you for this meeting, and for the interim report.

As the CSB's investigation, as well as the Union's investigation proceed, we're learning more and more about what went on on March 23. And more importantly, what went wrong in the years leading to it.

We've only had a few hours to review the statement released by the CSB this morning, but it's entirely consistent with what we are finding in our own investigation as the Union.

We've also read the company's press release. BP claims that the CSB's findings are inconsistent with their own. Since they've provide no detail, we'll have to wait and see.

But the company's release contains at least one falsehood. BP says they have "cooperated fully with all the bodies who have requested information." To date, they have refused to turn over a single document to the Union, in contrast to their public statements, and, in fact, in violation of the Union's rights under federal labor law.

We've offered to protect their trade secrets and the privacy of individuals, but to no

avail. And currently the issue is in the hands of our lawyers, and we are likely to go to litigation.

Although the investigations continue, there's little doubt about many of the factors that led to the March 23 tragedy. Safety procedures were confusing and conflicting procedures sometimes applied to the same operation. Some procedures existed only on paper; many were dangerously out of date, having never been upgraded as the process changed.

Sonny Sanders, the U.S.W. International Representative who services this area, and a former BP worker, is going to talk more about procedures in a minute.

In addition, training was sporadic; instrumentation was inadequate and poorly maintained; maintenance was poor; prior accidents and near misses were never investigated, or the investigations were just seen as an inconvenient formality to be done as quickly as possible.

The company failed to learn, even from past OSHA citations. The investigations continue, but one conclusion is inescapable, this was a failure of the entire safety management system in Texas City.

Again, on behalf of the Union, I'd like to

address a couple of comments to BP, and my colleagues from the Union tell me that there isn't much BP management here, but I assume that they'll hear about this eventually.

First, the CSB's work to date makes it clear that March 23 was, indeed, a failure of te entire safety system in Texas City, and the corporation. It was not the fault of a few individuals. We hope that BP will take this opportunity to reinstate the six workers, three Union, three management, who were wrongly blamed for the accident and then fired.

Now some may think that six dismissals are insignificant, even trivial, compared with 15 deaths and 170 injuries. And stated that way, I would certainly agree. But it's not a question of jobs, it's a question of fairness and justice. And fairness is never insignificant and justice is never trivial.

In fact, the only real failing of those six who were fired is that they were unlucky enough to be on duty when BP's broken safety management system, its acceptance of unsafe procedures, often without regard to the written rules, its past decision not to replace blowdown drums and vent stacks with safer systems, its flawed decisions on trailer siting, when all those factors came together in a

perfect storm of cause and effect to produce the March 23 tragedy.

If those six individuals deserved to be fired, then so do several thousand other people in the corporation, beginning at the very top in London.

There's another even more important reason for reinstatement, so long as the company con conveniently blame a few individuals for the accident, it will fail to truly understand the real root causes and will fail to fix the system that created them.

Finally, again addressed to BP, in the effort to truly improved safety throughout the corporation, the Union offers its full cooperation to BP. We have indeed been critical of you in the past, and tonight. But we are not your enemy, and you're not ours. Unsafe conditions, faulty engineering, inadequate procedures are our mutual enemies, the Union and the company.

We represent workers in scores of industries and thousands of work places. We have a lot of experience in safety. We'd like to combine our experience with yours, with BP's knowledge and expertise in a cooperative, mutually respectful way at all levels in the corporation.

And we'd like to do that immediately. The independent panel will tell us a lot, but it won't report

for a year. Unless BP proposes to shut down its facilities in the meantime, we'd better get to work now. Our members, BP's employees, their families, the communities around BP's plants, deserve our best efforts.

My thanks again to the Board for this opportunity to speak and for all your fine work in Texas City and elsewhere. Thank you.

CHAIRMAN MERRITT: Thank you.

Mr. Sonny Sanders.

MR. SANDERS: Madam Chairman, my name is Sonny Sanders. I'm a resident of Texas City; I'm a former refinery worker and a union representative for the United Steelworkers. I'd like to echo my colleague's endorsement of the findings of the Chemical Accident Safety Board. I didn't know he was so eloquent, or I'd have asked to speak before him.

I'm rather encouraged that the title of your report is a preliminary report, that you haven't taken the same out as your sister agency, rush to settlement with a fine -- while maybe is significant to me, is nothing more than a parking citation to this corporation.

There are a couple of things I would like to talk about. On page two of the press release today, Mr. Holmstrom started -- mentioned in the fourth paragraph

about start up procedures. This is an area that the Union feels the Chemical Safety Board should really delve into.

In this particular case, on the day of the accident, there were at least two start procedures being used by operations personnel. These two procedures, while similar, did not deal with the actions that needed to be done on that date to prevent this accident, or this tragedy.

There's several other things too, that there seems to be a general attitude that while start up procedures are required by the OSHA 1910 standard, in this refinery, they're treated in some cases as guidelines. There was a deviation from start up procedures on another unit shortly after this accident.

And while it was questioned -- while the operators on that unit questioned the deviation, the management informed them the these start up procedures were merely guidelines. So there seems to be an attitude about something required by the statute not being adhered to and being treated as guidelines, as a step by step guideline, or step by step requirements on how you bring up a process unit.

So we would like for the Chemical Accident Safety Board to expand the questioning about procedures in

that plant, start up procedures and how they're utilized.

The final comment that I'd like to talk about is about staffing. Now there were some questions by one of the panel members about staffing in that refinery. The board operator who was working that day was looking at three different processes in addition to bringing up the fourth. Staffing is an issue and we feel that it should be addressed.

Thank you.

CHAIRMAN MERRITT: Thank you very much.

Yotarsha Baker.

MS. BARKER: I'm Yotasha Barker. I'm a construction engineer. I put in the first phase of that project that they did at BP, we did in Oklahoma at the General Motors plant.

There's a lot of things that I think that have brought Texas City down, and we should all be aware of it, that staffing, as he said, is a problem. We've always been a Union city here. The Union's always taken over. We worked for a long time without a lot of work.

This contractor that BP hired has yet to come forward to say anything. Nobody has ever said anything about the major contractor. And they subcontracted all the work out, so that left the Union out of the loop

period.

And I would like to say the same point of I live in that community. BP has yet to do anything in the community. And they went from a pneumatic system -- well, they went to a pneumatic system with just that one contractor who subbed all the work out.

And I feel like that BP really should, and they owe it to our community, to work with our Union here. Because the Union people -- Amoco used to be a Union company, and the Union has always built their own, and they've always taken care of their own plant, they train their workers.

When we were in Oklahoma, we trained the workers. And that's part of it. You train them. Here's an opportunity for the Union here in Texas City to be trained for the pneumatic system that they put in. So the Chemical Board here -- and the Board here, I'd like for you all to just mention that to them, you know.

We need an opportunity here for our people to work and it'd be part of our community and build our community. When that plant went down, that was two days before the project manager ever arrived, because nobody lives within 20 miles of that plant.

So we need to taka look at that, because

that's a big standpoint of having safety. You need to have somebody within that neighborhood that can come out immediately to take charge, and there was none. And I live two blocks from the plant.

CHAIRMAN MERRITT: Thank you.

Mr. David Wilson.

MR. WILSON: Yes, I'm David Wilson. I'm a contractor out there, and I was there the day of the explosion. As a matter of fact, the trailer -- they showed it -- 260 feet away, that was my office.

My concerns -- first of all, I'm glad you're addressing all the concerns of what can be done after the fact. But my concerns are more before the fact and what we can do in preventative measures to make sure this -- things like this don't happen again.

They hold the contractors liable for everything that we do. We have to go to safety meetings every day, we have to be put through safety standards that operations and BP employees, or employees of any other plant, never have to follow the same safety guidelines that we do. They should; it should be across the board. Safety is for everybody.

One of my concerns also is that there should be more of a universal safety standard throughout the

industry. I know that a lot of us contractors -- we do travel from refineries to refineries -- we go through different alarm systems at each plant. It gets confusing. We've got different emergency numbers that we have to contact, that gets confusing.

The color code system on the piping that BP Amoco -- your nitrogen is in an orange system. At other refineries it's on a green system. Well, the green system at BP is safety shower water. So you can understand that the concerns that we have of having a color coding system being universal throughout the industry could prevent a lot of problems too.

I do appreciate the steps that are being taken towards the investigation. I do notice that out at the plant presently things are changing as far as safety goes. I do think that one thing that I still don't see changing is the employees of BP, or of the such they don't have to follow the same safety standards we do.

If I was caught without my harness on one of the scaffolds, they would escort me to the gate. And they can get around on the scaffolds, they don't -- they can take their eye wear off, they can -- they get away with a lot more than we do, and I think to set an example they should lead by example.

Thank you.

CHAIRMAN MERRITT: Thank you.

Now, I can't read the last name on here, but the first name is Gretchen. Is there a Gretchen who wanted to speak? Oh, I'm sorry. Would you spell your last name, please?

MS. BRUNER: My name is Gretchen Bruner, B-R-U-N-E-R. My father was killed at BP on March 23, and he was innocent. So needless to say, we have a lot of questions and concerns.

I'm going to comment on Mr. Bresland's comment also earlier about the '92 citation from OSHA. If OSHA citations, which are obviously made for prevention, if they're going to be settled and withdrew, you know, what's the purpose and would BP change their negligent ways in the future when this happens again?

And to go along with that, in the future, when BP is negligent again, because you don't have a year -- you don't have years of history like this and change, the fines will be dropped again.

They do not have to comply with OSHA recommendations because they are recommendations. Contractors like my father, who are killed or injured there, do not go on the record, and they don't have to pay

a fine that exceeds more than two hours of work. So it seems that they are not punished. Why would they change, like I said?

So basically, you know, we just have the questions that why will BP change in the future when it's been like this for so long? Thank you.

CHAIRMAN MERRITT: Thank you.

Mr. Art Kelly.

MR. KELLY: I come here as an outsider, because I live in LaPorte. But plant safety is a matter of deep concern to me. I'm a retired chemical engineer, and I'm an active member of LaPorte CAC, the Citizens Advisory Committee. I think it's the largest one in the country.

Each month, about somewhere between about 30 plants report to citizens, and these regular citizens, members of the school system, members of the local -- the officials of the City of LaPorte, and these gentlemen, under the pressure, the peer pressure of the citizens and under the peer pressure of their -- dealing with their colleagues, do a very earnest job.

One of the things that's expected of them, any accident or any fine is reported monthly to the citizens of LaPorte. And I think this pressure has a substantial effect on the plant managers.

I'd like to be very clear so there's no misunderstanding, I am not coming here trying to represent the LaPorte CAC. I just come here as an individual who is a member of that CAC. I think the chemical and the refining industries have done good work in this country, and I'm proud to be a chemical engineer.

But I am ashamed to see a company that has been cited, I believe, for 190 egregious violations of appropriate practices by OSHA, and that, to me, is unfortunate. It would be interesting to see a comparison of the OSHA reports and the Board's report at some point in time. Thank you.

CHAIRMAN MERRITT: Thank you.

Mr. Jack Ploss.

MR. PLOSS: My name is Jack Ploss. I'm a citizen here in Texas City. I'm 69 years old, and I worked for 50 years in and around the refineries. And these gentlemen, to me, appear to have done a great job in going through this and finding how it happened.

And it's a beautiful presentation, and I think that -- there's one thing I would like to ask, and maybe part of the equation that should be put into this is, in the 50 years that I've been in the industry, I've noticed that, to me, there's the employees, whether it was the

operator who was on the board, or the guy that left to go home in the family emergency, or his boss, or the plant manager, there's just not that level of conscientiousness that used to be 40 years ago.

And is there any way to measure that to see how that attributed to the accident? And is there any way to improve that? I'm an old man, I'm retired. But I don't want to see anybody die. And I do think -- and maybe it's just an old fogie -- but I do think that the men nowadays, and, you know, it's a small percentage, but there is a level of, you know, 4:00 and payday and I'm not going to do it unless I have to, or I'll sit down, that'll alarm will go off after a while, or I'll reset it.

And working in the industry, I've seen that deteriorate over the years. And I just think that there should be some investigation as to how that affected this whole situation. Thank you.

CHAIRMAN MERRITT: Thank you.

If there are no other public comments at this --

VOICE: Madam Chair?

CHAIRMAN MERRITT: Yes, sir?

VOICE: May I speak, please?

CHAIRMAN MERRITT: Yes, sir.

VOICE: Thank you.

CHAIRMAN MERRITT: State your name, please.

VOICE: My name is Joe Bilancich. I'm the chairman of the Union at BP refinery. I have not spoke in public out of due respect to the families of the tragic accident that happened on the 23rd of March; however, I feel compelled to answer the gentleman here who was a contractor and spoke of training.

I'm glad you received training; however, there is not a higher trained workforce than a BP proprietary employee. Our operations, maintenance, the training we go through is expensive, it is constant, and it is the best there is in the industry.

I don't want to take a lot of time. I just wanted to address it. Thank you.

CHAIRMAN MERRITT: Thank you.

I'd like to thank all of you who have come this evening to share your thoughts, and to the families of those who represent the victims and the fatalities of this tragic accident. The comments have all been transcribed, and the CSB will take these comments into account as our investigation continues.

As I said at the beginning of this meeting, this investigation is the most extensive that this CSB has

ever undertaken. A lot of work has already been done by our investigative team, and with the cooperation of BP, there's a lot of work yet to be done.

We anticipate our final report will be ready by the summer of next year. Now you notice that the slide said the fall. This is the Chairman speaking.

We look forward to seeing the results of the safety culture investigation, because I think that's -- we believe that is an extremely critical part of the equation of what happened at this facility on the 23rd of August -- 23rd of March.

We anticipate that the American Petroleum Institute and the National Petro-Chemical and Refiners Association will work positively to meet our recommendation to the industry on the placement of occupied temporary structures away from hazardous process unites.

I'd like to also remind you that we have an active website that you may go to to obtain ongoing information as it's released from the agency on this and other investigations. And that website, again, is www.csb.gov. The transcription of this meeting will be posted on that website when it's ready in a few weeks.

We pledge to this community that the Chemical

Safety Board will continue to work independently to fulfill our mission to identify the cause of this tragic incident and to help prevent its reoccurrence, not just here, but elsewhere in this country where such hazards might exist.

I thank you all this evening for attending. And with that, this meeting is adjourned.

(Whereupon, at 8:15 p.m., the hearing was concluded.)