**MEMORANDUM**

**DATE:** April 9, 2010

**TO:** Bob Smith, Provost & Sr. VP for Academic Affairs
Taylor Eighmy, VP for Research

**FROM:** Randy Nix

**SUBJECT:** Investigation Report, Chemistry 218 Explosion

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Throughout this report, the parenthetical notations reference attachments and locations or line numbers within the attachments. For purposes of clarity, the attachments are listed at the end of the report narrative.

## A: Description of the incident:

On January 7, 2010, and were working in room 218 in the Chemistry Building at Texas Tech University. They were synthesizing energetic materials and then subsequently running tests to characterize the materials. The quantities that were to be worked with were in the 50-100mg range, but more compound was made to speed up the research. The PI (Dr. Louisa Hope-Weeks) states that she had no prior knowledge that more than 100mg was being generated. and made approximately 10 grams of the energetic material and separated it into two different weight boats and stored them in the south fume hood. Both and had their own weight boat with the compound. was working on solubility studies with very small quantities in the north fume hood by taking small amounts from his weight boat in the south hood (Location H-1, photos 400 & 429) and transporting it to the north hood (Location H-2, photo 398).
was working with the contents of one weight boat (Location B-1, photo 324) and was preparing the sample to run characterization tests. noticed that the compound had clumps and decided to grind the clumps out with a mortar and pestle while the compound was dissolved in Hexane, doing the work on the northwest side of the south bench (Location B-1). After grinding the compound, states that he removed his safety goggles at his lab bench on the north

end of the lab (Location B-3) and returned to the compound in the mortar and pestle on the south lab bench (Location B-1). At this time, was also going to the southwest end of the lab directly to the north of the bench with the energetic material in the mortar and pestle (Location B-2). While was directly behind decided to slightly stir the slurry in the mortar and it detonated. was knocked back and lost three digits on his left hand, severely lacerated his right hand, perforated his left eye, scratched his right eye and had superficial cuts to the parts of his body that were exposed. No safety equipment was worn by at the time of the incident. was not physically injured by the explosion.

**B: Time Line:**

On January 7, 2010, at approximately 4:00 p.m., Environmental Health and Safety (EH&S) was notified that there had been an accident in Chemistry and our assistance was needed. At that time Jared Martin and Richard Whitehead responded to the Chemistry Building. When they arrived at the Chemistry Building, University Police were on scene and Dr. Dominick Casadonte, department chair, directed them to the second floor. Upon reaching lab 218, Justo Adame was seen rendering first aid to by having him sit in a chair under the safety shower at the south door of the lab in case the shower needed to be started. At that time, Yesenia Sanchez was keeping ice available for Justo to help keep calm. EH&S personnel assessed Justo's actions and determined that he was doing the best that could be done and if more people intervened it could agitate M . EH&S personnel asked if EMS was called and they were told by Chemistry staff they were in route. EH&S personnel then entered lab 218 through the north door at the other end of the lab so that the scene could be assessed to determine the type and kind of chemicals involved. Broken 4 liter bottles of solvent were on the bench top and there was liquid on the floor of the laboratory where the incident occurred. Significant damage could be seen on the bench top at the site of the explosion. Blood was pooled on the laboratory floor and pieces of flesh were observed on the ceiling, wall, bench top and various pieces of equipment and items. At that time EH&S personnel left the lab and Mr. Martin went to find on the first floor. was in the laboratory at the time of the explosion and EH&S personnel wanted to get information on the compound involved and to find out if there was anything else in the laboratory that should be of concern. told Mr. Martin that what M was working with had been spent during the explosion and that more of the compound was being stored in the fume hood closest to the bench where M was working and that it was in weight boats and was blue or purple in color. He also said that there was nothing else in the lab that we should be concerned about. EH&S personnel then went back to 218 and EMS had just arrived and were caring for . Once was gone, Dr. Brandon Weeks came to the laboratory and helped us identify the compound with which they were working. Dr. Weeks looked at the amount that was in the weight boats and said that they were supposed to work with only 50-100mg but there was obviously more than that present. EH&S asked Dr. Weeks if anything on the floor would react with bleach and he said they were

all solvents and that they wouldn't react with the bleach. EH&S asked this because they needed to get the chemical and blood off the floor. To make the cleanup of the laboratory easier, Adolfo Varela of EH&S arrived with more supplies to help clean up the floors. EH&S then proceeded to clean the floors with bleach where blood was present and used chemical absorbent pads where chemicals were present on the floor. After the blood was cleaned and chemical absorbed, the waste was placed in hazardous chemical bags. These bags were closed and left in the lab to be used in further cleanup. These actions concluded the events of January 7, 2010.

On January 8, 2010, Mr. Martin, Mr. Whitehead, and Mr. Varela of EH&S went back to Chemistry to assess more of the scene. In the morning, they went through the student office room 202, which is across the hall from 218. They were looking for a lab book, that was supposed to have, to see if they could get an idea of the work that he had been doing and to what scale the work was being done. One lab book was found that had s writing in it, but it was not up to date and not much information was in the lab book to indicate their exact actions. The last entry in the book just stated 10grams. During that time, several vials with powder compounds were found on three of the students desks, including 's. Those vials were taken to the middle fume hood in 218 for storage until they could be identified. That afternoon EH&S personnel went into the laboratory to assess more of the scene. They marked the areas where tissue was on the walls and where the pieces of mortar and pestle were found. and Dr. Hope-Weeks came to the lab to look at the damage and shut down any equipment that may need immediate shut down. The locks on the lab doors were changed at the request of EH&S with EH&S holding the keys. This concludes the events of January 8, 2010.

On January 9, 2010, Jared Martin received an email from Dr. Weeks informing him that there may be more energetic material in the laboratory that is not labeled or marked. This prompted the decision to shut the lab down and not let anyone enter the lab until these items could be identified and properly disposed. This concludes the events of January 9th 2010.

On January 11, 2010, a meeting was held in the president's office with EH&S, Chemistry and UPD to determine what needed to be done. During this meeting it was brought to the attention of the group that the Lubbock Bomb Squad had removed some materials from the s residence. The decision was made to have the Lubbock County Bomb Squad come into Chemistry and remove any suspect items that might be energetic. That evening the Bomb Squad, UPD, LPD, Lubbock Sheriff's Department, ATF, EH&S, Dr. Weeks and Dr. Hope-Weeks met in the lab to go through it with the Bomb Squad and identify what was necessary to remove. After the identification of various materials, the Bomb Squad removed the suspect items and transported them to be disposed of by detonation that same night. This concludes the events of January 11, 2010.

January 12 – 13, 2010, marking of tissue and mortar and pestle pieces continued. Students nd came to the laboratory to remove some of their samples, not

related to the project or involved in the incident; and some equipment needed to continue their research. These items were later logged. This concludes the events of January 12-13, 2010.

January 14, 2010, CSB requested the lab be shut down and locked until further notice.

January 19 – February 5, 2010, evidence for CSB was gathered. On January 19 and 20, 2010, t went into the lab escorted by EH&S to vent and then turn off a piece of equipment that could have failed and ruptured if not shut down.

February 5 – 11, 2010, Room 218 was cleaned under EH&S supervision.

February 11, 2010, Room 218 was released back to Dr. Hope-Weeks.

**C: Chemical Hygiene Plan and Laboratory Compliance (refer to CHP for more detailed explanation of requirements)**

3.1.1 List of OSHA Regulated Substances – There was no list provided to EH&S. There was an inventory for the laboratory from 2007 on a computer in the laboratory. (D1, L36-39; D4, L50; D6, L21-23; D7, L289-313)

3.3 Lab coats, gloves and eye protection will be worn when working in chemical laboratories. – The individual stated that he was not wearing eye protection. (D4, L38-39; D5, L15-18; D7; L123-124, L139, L148-150)

4.1 General responsibility for safety – Training was not done prior to incident. (D1, L32-34; D4, L37-41; D6, L29-31; D7, 231-236)

4.4 Departmental chemical hygiene coordinator – EH&S did not have one on file. (Direct observation)

4.5.1 Ensure containers are labeled with required information – Many unlabeled containers were in the lab. (D1, L5-7; D7, L296-298, Direct observation)

4.5.2 Perform a hazard determination – No determinations present. (D7, L215-229)

4.5.3 Ensure workers know and follow CHP – Workers were unaware of the CHP. (D7, 238-244)

4.5.4 Prepare written procedures for the use of carcinogens: There were no written procedures. (Direct observation)

4.5.6 Provide regular, formal chemical hygiene and housekeeping inspections - There are none documented. (Direct observation)

4.5.8 Ensure facilities and training for use of any material being ordered are adequate – Staff said they have not gone through proper safety training prior to incident and there are no records of any training. (D1, L32-34; D4, L37-41; D7, 231-236; Direct observation)

6.3 Departmental CHP – There is not one present. (Direct observation)

6.3.1 SOP's – None were written prior to the incident. (D3, L27-30; D4, L33-37; D5, L10-13; D6, L17-19; D7, L220-211) –

6.3.2 Criteria to determine and implement control measures for reducing employee exposure - None present. (Direct observation)

6.3.3 Requirements for functionality of fume hoods and safety equipment – None were written specifically for the chemistry department but the university CHP states it.

6.3.4 Provisions for employee information and training – None present. (D7, L231-236)

6.3.5 Departmental approval for procedures – None present. (Direct observation)

6.3.6 Provisions for medical consultations and medical examinations – None present. (Direct observation)

6.3.7 Assignment of DCHC – Not appointed. (Direct observation)

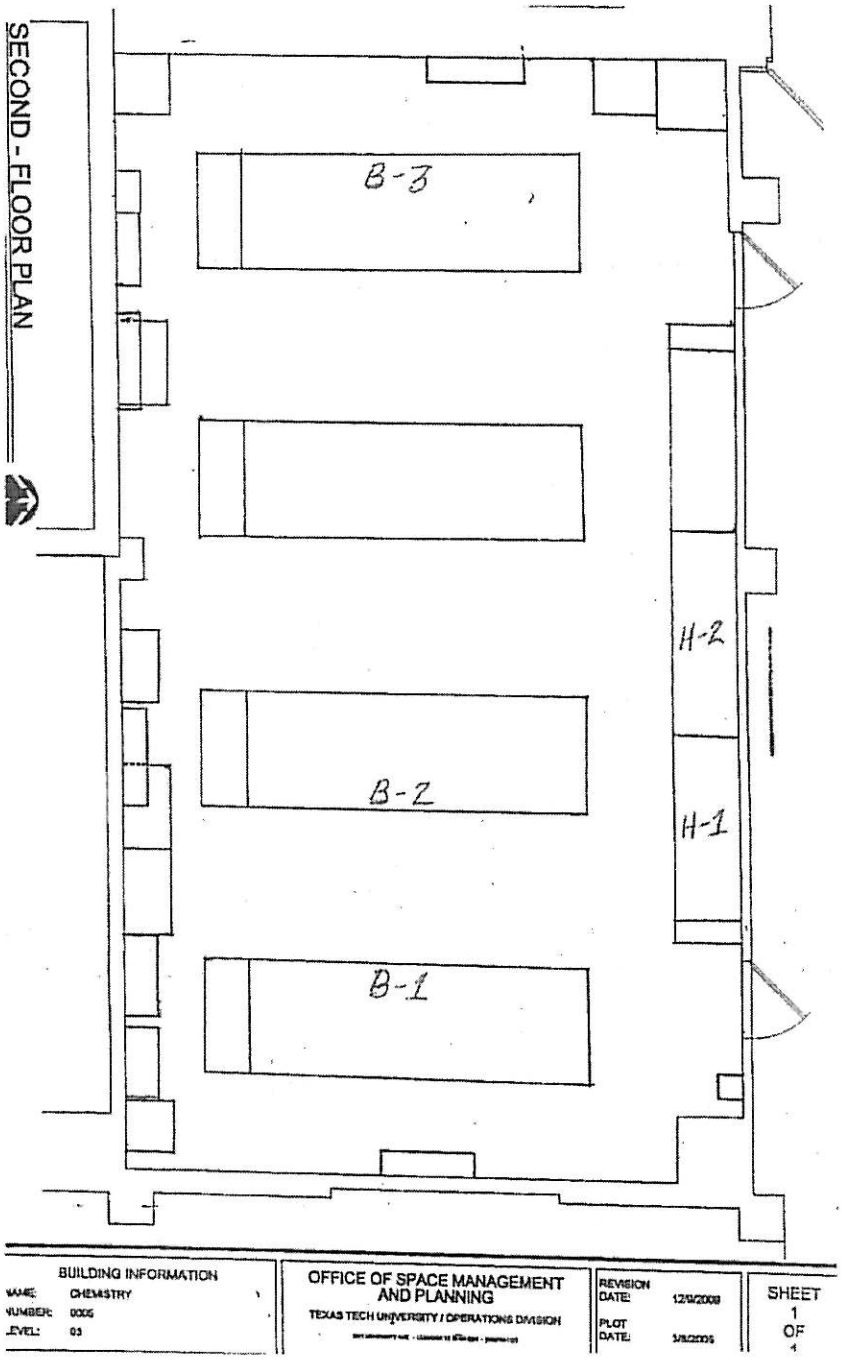
6.3.8.1 Establishment of a designated area – None present. (Direct observation)

8 Employee Training – Laboratory staff stated they have had some training at one time or the other. The training was not complete and there are no records of such training. (D1, L32-34; D4, L37-41; D6, L29-31; D7, 231-236)

10.4 MSDS's – They were not complete and not in any usable order. (Direct observation)

Attachments: Lab diagram, Chemistry 218
Photos (4)
Interviews (6)

cc: Dominick Casadonte
Alice Young
Ronald Phillips
John Zak
Javad Hashemi
Todd Anderson




Chemistry 218

Photo 400

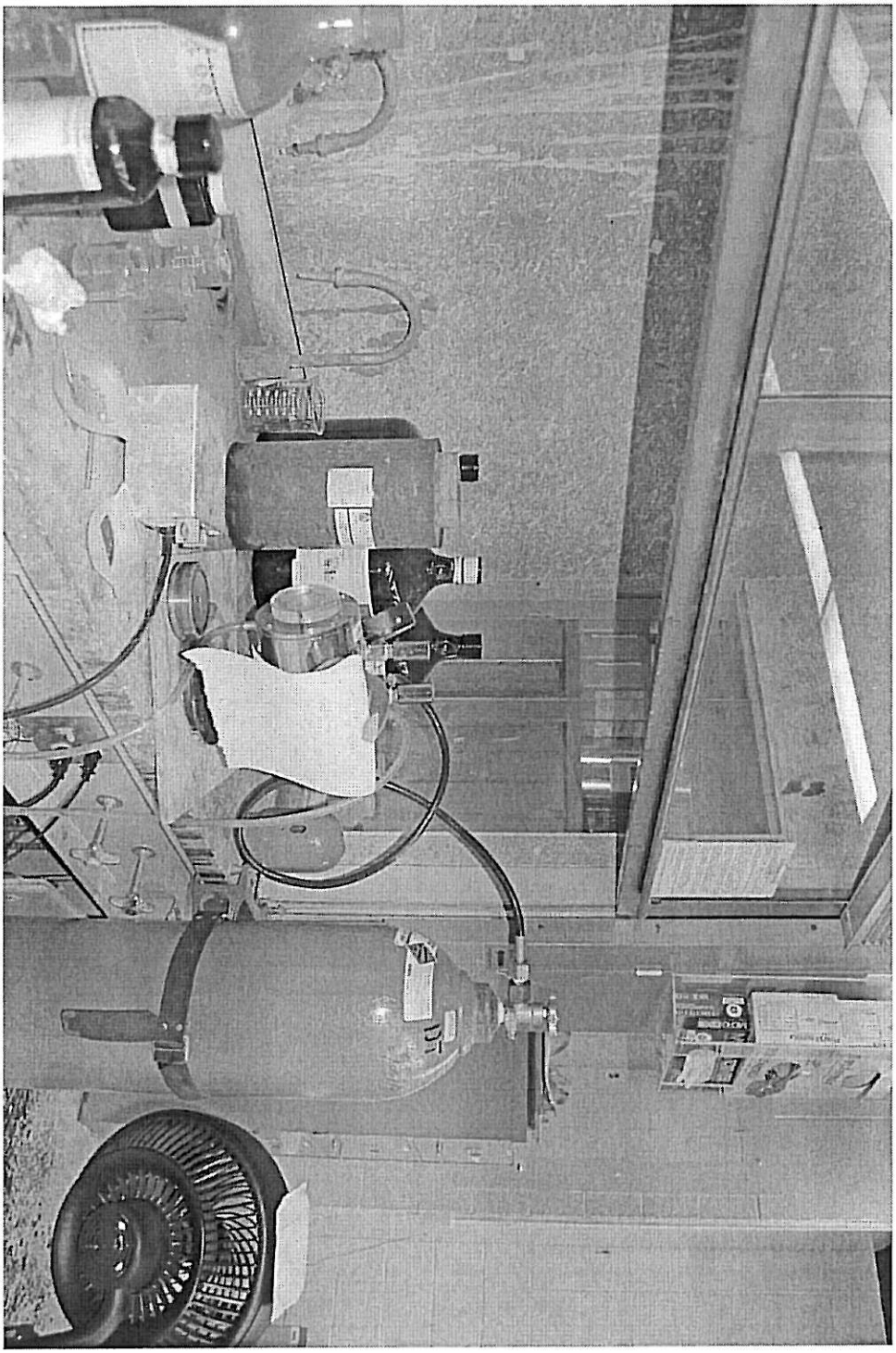


Photo 429

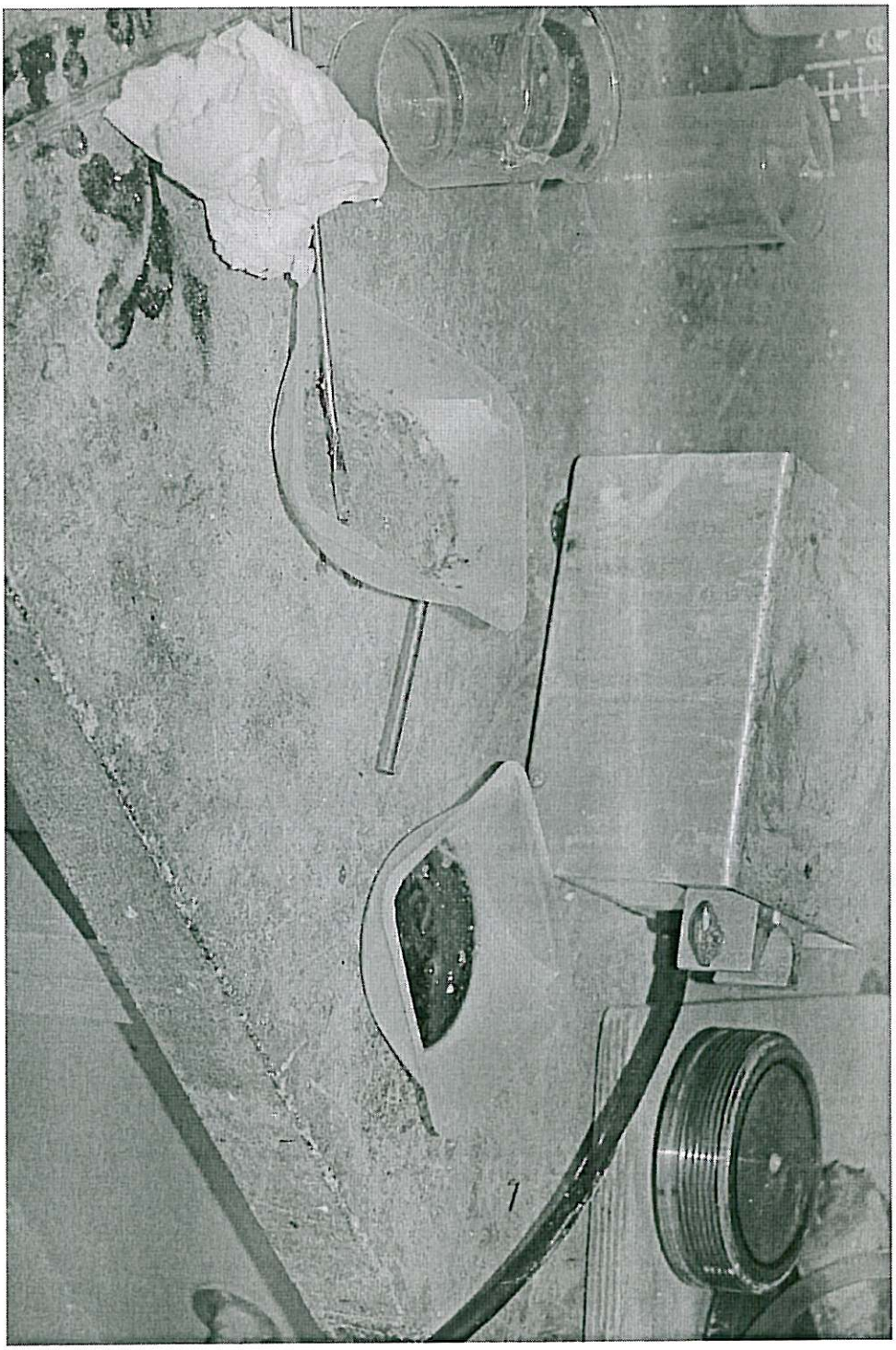


Photo 398

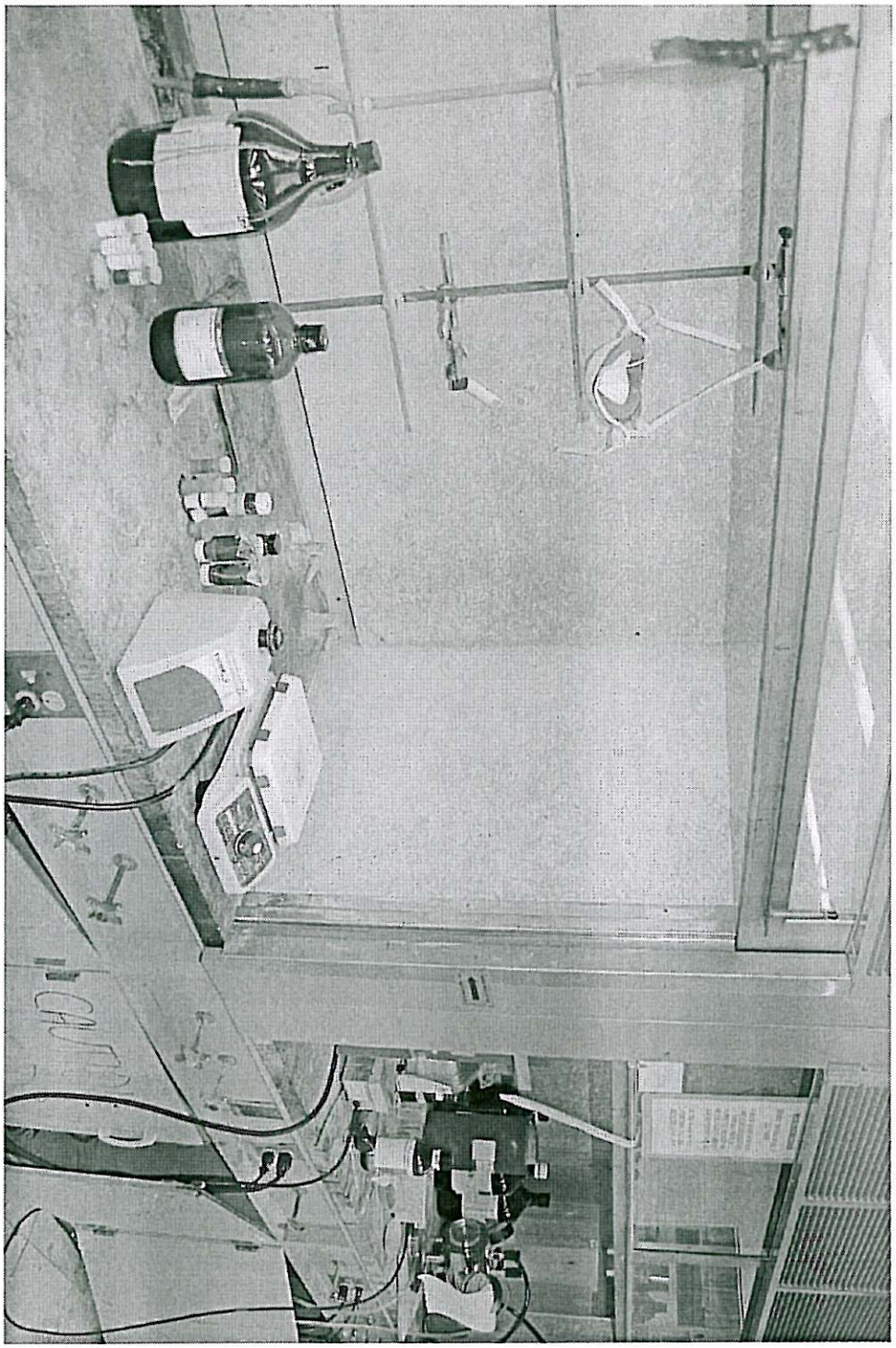
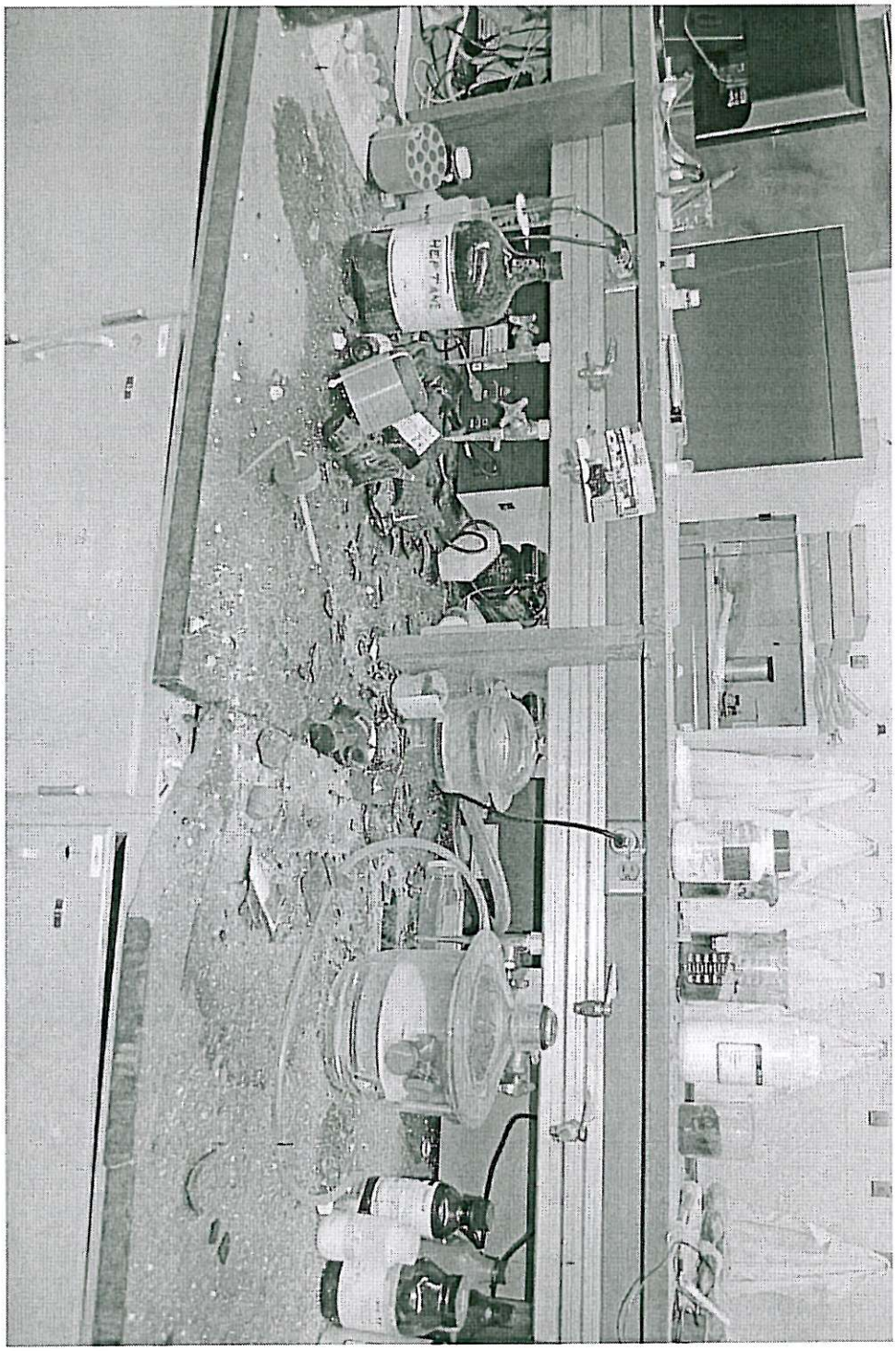


Photo 324



# D-1

Interview with (CS) January 12th 2010

Q: What is the lab like in area?

A: It was disorganized and his fume hood is the one on the far left. No items were labeled.

Q: What is your working relationship with

A: Works in the same lab as but had very little contact with and knew little about his work. There had been conflicts over work space, cleanliness of the lab and use of chemicals.

Q: Did you know of the quantities of compounds was working with?

A: Didn't know he was making higher quantities. A student by the name of who works for Mark Vaughn had told her about the work and he did after he had heard about the incident and she said he would be a good person to talk to.

Q: Who else did work with?

A: was the present person he was working with on the project. worked some with prior to him going to Chemical Engineering. S / from Mechanical Engineering did some work helping 1 do some burn tests. Also he went to Brandon Weeks' lab in Chemical Engineering to perform drop hammer tests.

Comment by CS: There was waste that was unaccounted for. 5 – 400ml beakers ¾ full that were of orange and yellow colors. Noticed them in October and told to label them by email for waste pickup. They are now gone and has no record of where they went.

Q: What kind of training have you been given?

A: Said she had not been given any training

Q: What type of inventory system is there in the lab?

A: They have an inventory on the computer in an excel spreadsheet that was done in 2007 and was unsure if it had been updated since then.

Comments: was not present in the laboratory at the time of the incident and was unaware of all the work that was doing. Her work was on other projects unrelated to 's. Her and appear to not have a very good working relationship.

# D-3

Interview with January 13th 2010

Q: Did you ever work in Hope-Weeks laboratory?

A: I use to work in Hope-Weeks laboratory.

Q: How much time did you spend working with ?

A: I helped him run open burn tests. I would say a total of 6 hours was spent working with over several visits.

Q: What kind of samples did you think you were working with?

A: I believe it was just nitrate samples.

Q: What kind of containers did bring to the lab with compounds in them?

A: They were in glass vials. He was told that a metal container would be better for the transport but he continued to bring them in a glass vial.

Q: How were the vials transported, what were they transported in?

A: They were brought over in a backpack or in a coat pocket.

Q: Do you have any protocols for the work that was being performed?

A: Our protocols are old theses that have procedures on how to conduct the burn test. They are located on flash drives.

Q: Who performed the burn tests?

A: I performed the tests.

Q: What quantities are needed for the test?

A: 10mg up to 30-60mg might need to be used.

Q: How much was brought over?

A: Several grams of compounds were brought over at a time.

Q: Do you know the quantities that was suppose to have?

A: No.

Q: Was all the material brought over spent during the tests?

A: No, what was left he would take back with him to the laboratory.

Q: Did you ever give them advice on how to work with their compounds?

A: That they should work with less than a gram while it is wet.

Q: Did they ever mention about working with large quantities?

A: Did say they had made 10g and that it had sparked on them. I suggested having to wet product.

Comments: After interview I was shown data on computer, and file names looked to reference both nitrate and perchlorate compounds.

# D-4

Interview with : Conducted January 14, 2010 by Jared Martin

Questions Asked and Answers:
Describe what you were doing?
What was doing?
How much should you be working with?
What type of written procedures were used, or were there any?
What type of training did you have and did it and how did they give it?
What did you do with the waste?
Where you aware of product being taken home?
Have you ever taken product home?
Have you ever taken product from the laboratory?
How was it transported?
Is there and inventory?
Is there an inventory or log for energetic material?
What kind if interaction with Dr. Hope-Weeks was there?

They and had made a new compound by adding extra Hydrazine and the color was a purple. was performing solubility tests on the energetic material that was involved in the incident in the fume hood farthest from the incident. He noticed that the compound was slightly soluble in water. He had heard say he was going to grind the compound while it was still wet and was intending to add Hexane to the compound as a precaution. The reason they wanted to sample ground was because it had lumps and was not a fine enough power to conduct the experiments they wanted to do such as the burn test and drop hammer. To perform all the tests that they wanted they made 10g, but were aware that they should have made only 100mg or less. He did not see how much of the compound removed and put in the mortar and pestol and did not see if he added Hexane. After looking at the pictures of the compound in the weigh boats he said must have taken all that was in one of the weigh boats which was around 5g. was returning to the bench behind when the compound detonated and he was standing behind and facing west. When asked if procedures were used he said that they went off published papers as a guide for the production of the compounds they made, but there were no written procedures for how they were to conduct generation of compounds. assumed that Dr. Hope-Weeks had given procedures but was unaware of any if there were any. The type of training he received was given by had told him that he should were a lab coat, goggles and gloves, but himself did not wear any of these items himself. No EH&S training was taken either. He also stated that was the one who gave him the training on how to make the compounds. never questioned about the quantities of compound they were making. As far as the waste said all the compound was spent during the testing and no waste was made. When asked about the waste containers left under the fume hood he had no account. (It was later learned the waste containers were accounted for) was asked if he knew of taking any of the compound from the laboratory and taking it home and he said that he was unaware

that was taking place. When asked about taking compounds from the laboratory he said was taken to Chemical Engineering for the drop hammer tests and to Mechanical Engineering for burn tests. He said the compounds were transported in a bag that was made of leather. When asked about an inventory or log he said there was none. When finally asked about the contact with Dr. Hope-Weeks he said Dr. Hope-Weeks would ask how things were going and about the compounds, but did not ask about the quantities made.

# D-5

Talk with Louisa Hope-Weeks January 15th 2010

On January 15th 2010 I went to Louisa Hope-Weeks' office to discuss what was found during my interviews and to talk about things that could be done differently to help with meeting the requirements of the Chemical Hygiene Plan. I informed her that there were students that were aware of the quantities of compound that was being generated in the laboratory by and that they never reported this to her or Brandon Weeks. She said that she knew that they were making compound and assumed that they were making the quantities they were initially told to make (50-100mg). She never checked on the amounts and said that there were no written documents indicating the amount that was suppose to make. I informed her that the scale-up of the compounds started around middle of June of 2009 and she said that if she would have known she would have stopped him from making the compounds in those quantities. I asked about 's use of PPE. She said that every now and then she would come in the lab and have to remind him to put on his goggles, but he would comply and other times she came into the lab and he would be wearing his PPE. We then discussed how to best document training how work is to be conducted in the laboratory. She said that she was going to have each student write up what they were doing in each experiment and she would review them and discuss them with each student. She then said she was going to forward these protocols to me for review and if anything else needed to be added or mentioned. After my review she was going to print each of the protocols have the students sign them and she was going to sign them as well. All these protocols were going to be kept in the lab inside of a notebook that could be reviewed by all that entered the lab. She also stated that she was going to a lab contract with all students that they will abide by the rules or they will be dismissed from the laboratory. She seemed to understand what was lacking in the lab and was wanting to make changes that were necessary to comply with safety regulations of the University.

# D-6

Interview with January 15, 2010

Q: Did you work in Hope-Weeks' lab?

A: Yes.

Q: When did you work in the lab?

A: May 2008 to December 2009.

Q: What type of work did you do with in the lab?

A: Synthesized and tested energetic material.

Q: Where there any written procedures that you went by?

A: No.

Q: Do you know of any data files that were kept as to the amount of compounds made?

A: No.

Q: What kind of training did you have?

A: A Post doc (Raj) verbally told me how to operate the equipment.

Q: How about safety training?

A: Did not have any.

Q: Was there anything followed, such as papers or articles?

A: Reference articles were followed.

Q: What amount of energetic material was supposed to be worked with?

A: 10-50mg was stated.

Q: Who was your supervisor?

A: Brandon Weeks.

Q: There was a question about waste left in the hood; do you know anything about that? It was in the hood in October of last year.

A: That was mine. Some of it was my samples with gold and the other was acid waste that was sent for normal waste pick up.

Q: What about energetic waste?

A: It was separated out, but don't know how it was disposed of.

Q: Do you know of an inventory of the amounts of compound made each time?

A: No.

Q: Do you know when the scale up of material started?

A: It started in middle of June of 2009. First started with 1-3 grams and the largest that I know about was 5grams.

Q: How many times did this happen that you know about?

A: Four.

Q: Did you mention any concerns?

A: I told that I didn't think it was appropriate and he said things were just fine.

Q: What kind of contact did you have with Brandon and Louisa?

A: Brandon was in contact 3-4 times a week by email, phone or office visit. Never told quantities used, just told what was made and tests run. Louisa, there was very limited contact.

Q: Where were samples placed in lab?

A: Samples were placed on top of oven with varying quantities in mg range up to a gram in total.

Q: Did you ever transport energetic compounds on campus?

A: Yes.

Q: Where did you go and what were the quantities?

A: Chemical Engineering to do the drop hammer test in 10-20mg. We also transported compounds to Brandon Weeks' lab in Chemical Engineering in multiple vials of <50mg each for a total quantity of 10g. Brandon had knowledge that this was going on.

Q: What was the compound transported in?

A: Glass capped vials.

Q: Did you know was taking compounds home?

A: No.

Q: Have you ever taken any compound home?

A: No.

Q: While working with compounds did you or anyone ever grind the compounds in a mortar and pestle?

A: No.

# D-7

Interview with

Randy Nix (RN): This interview is part of the accident investigation of the events that occurred in the Texas Tech University Chemistry Building, Room 218, on January 7, 2010, at approximately 1600 hours. Present are , doctoral candidate and researcher in the Texas Tech University Chemistry and Biochemistry department; , his spouse; Jared Martin, Texas Tech University Laboratory Safety Specialist; and Randy Nix, Director of Environmental Health and Safety at Texas Tech University. And before we really get started, we wanted to find out if you all had any questions of us.

: This isn't punitive in any way?

RN: No, no.

Just wanted to make sure.

RN: No, we're not enforcement at all, we have no authority for enforcement or punitive actions or anything else, we're a staff agency and our job is strictly to try to gather the facts, and try to give recommendations and guidance about whatever happened to try and ensure it doesn't happen again. That's our role.

: Ok.

RN: What we would like to do first is to ask you to give an overview of your research; you know both the goals and the methods that were being used.

: Ok, my research with Dr. Hope-Weeks entailed working with energetic compounds; I tried to make new energetic compounds that have never been made before. And also to make compounds that have been made before, but were not fully characterized in the literature. So sometimes we would find a compound that had been made maybe in the 50's or 60's, but no one had really investigated all the properties, so our goal was to synthesis new compounds.

RN: Ok.

: That had energetic properties.

RN: Alright, and then could you kind of give us an outline of the typical workflow of your research activities.

: Well, we, we were making uhm we attempted to make lots of different compounds. Some required more synthetic skill than others. Sometimes we had to do several steps and heat things uhm, so I'm not sure exactly what you're looking for?

RN: Well.

: This, this particular reaction just involved simple precipitation, it wasn't very involved.

RN: Ok, well I wasn't so much looking for how you synthesized the compounds as I was once you had the compounds, what did you do with it?

: Ok, sure. Once we had a compound we were interested in, we had several things we needed to investigate. One of the properties that we would look at is its impact sensitivity. So we would take it over to the engineering building, and use the drop hammer it's called. And it's a big weight you can change the amount of weight, you can change the height and you'd figure out how sensitive this compound is to a load beam being dropped on it.

RN: Ok, now, and you, you were taking it to Chemical Engineering to do this?

: Right, so we did it in Chemical Engineering. This particular test. Another thing we would do is we would take some of the compound and we would run what's called a DSC, differential scanning calorimetry, and we'd have that instrument right in our lab in 218 and that tells us information about heat released when the compound detonates or whatever you what to say. We would also take it over to Mechanical Engineering and run what is called flame speed propagation. And what's involved in that is you'd take some of the compound and spread it out in the line. Similar to what you see in the movies with the drug people, but you spread it out in a line and you light it inside a pressure vessel, there's an ignition switch electronic, and you film it with a high speed camera, and knowing the frames per second you're using you can calculate how quickly it burns through this compound.

RN: Ok.

: So there were a number of little tests that we did, but basically that was the gist of them.

Jared Martin (JM): Ok.

: That's what we did once we made the compound. Also we tried to re-crystallize the compound, and use and get its x-ray crystal structure. On the x-ray defractometer.

RN: Ok.

: But that's about it.

JM: Ok.

RN: Ok, well next we'd like for you to give us a narrative description of the events of the day of January 7th including any preparatory work you did to get ready to the, for the activities on the 7th

: Ok, so that day we were interested in making cobalt perchlorate hydrazinate and the steps that were involved in that are very simple. I had a partner I was working with by the name of I'm not very sure of how to say it.

RN: Alright.

: is easy enough though. And so he did, so really that day I didn't have very much work I was doing, I was working across the hall on the computer writing up a paper and I would just come over just every now and then to the lab to do a step and then it would have to sit in a beaker for a while or whatever. So the first step involves dissolving cobalt nitrate in water, and did that step. And once you have the cobalt nitrate dissolved in water we added aqueous sodium hydroxide, not the pellets, but after it was dissolved.

JM: Ok

: To precipitate a cobalt hydroxide precipitate with the aim of getting rid of all the nitrate ions that were present in the solution. So that precipitates and you filter it out and the next step after that is to gather all that precipitate that's left on the filter paper and dissolve it in perchloric acid, so you'd take this solvent and add perchloric acid it was, let see if I remember. It was fairly dilute if I remember, but anyway it's uhm add it kind of drop wise until all the hydroxides precipitate you know you know that this neutralized. Now this all took over, took place over a period of a couple of hours. Like I said the filtering took awhile, took awhile to run all that solution through the filter paper, and it kind of sat there for awhile. And, so I was just coming back every now and then to check on it. At this point I was wearing my goggles. During this whole, this whole time every time I was working with these energetics I wore them. The next step after it's dissolved again is to add hydrazine, again that's aqueous solution. You add it drop wise, and you get the precipitate will form immediately. And you kind of add that hydrazine, drop wise until you're not seeing any more precipitate forming. And then you filter it again. Now at this point you have the target compound that we've made, but it's very wet, it's got a lot of water in it. So you filter it again, and after you filtered it and it's stuck on the filter paper, you could rinse it with some hexanes uh just drop on top. And then at this time I'd, moved part of the compound to one vessel and part to a mortar and pestle. Now all the work that we had done these, this compound previously we had already made this compound several times, previously. All the work that we had done on this compound it said, that it was safe to handle when wet. And so we didn't mind it being wet, we just didn't want it to being wet with water. So I, in the mortar and pestle there were some chunks that, that needed to be ground down a little bit. The larger pieces don't behave the same as the powder. And all the work we had done previously was on the powder, so to be consistent; I wanted to make sure we were working only with the powder. So I

poured, still wearing my goggles, I poured the hexanes into the mortar and pestle, and very gently, very, very gently was pressing just on these things just kinda stirring it really. Because the hexanes was breaking apart the chunks just being in the liquid.

RN: uhm.

JM: Ok.

: And at this point when I felt that it was sufficient. I set the mortar and pestle down on the counter, and went over to my bench took my goggles off. And then as I was walking back, my bench is located on one end of the lab, where I was working is on the other. So I walked over here to the far end of the lab set my goggles down. As I was walking back towards this end of the lab I had the mind that I should just go look at it one more time. And I walked over to it, it still had hexanes on it, and I just grabbed the mortar and pestle and just kind of went like that ( made of motion of stirring with his left hand). Just you know again I know it is impact sensitive so I wasn't pressing hard at all. And that is when it exploded in my face or in my hands or whatever you want to say. And I, I remember falling to the floor, and being helped up into a chair. And that's pretty much the last that I remember.

Jared: Ok.

RN: Ok.

: Is that sufficient?

(M : You cold hon?

: Uhm, kinda. I don't know if it's cold or scared or shivering or what. (laugh)

: Ok.

: But I'm shivering a little bit.

RN: Yeah, I'm sure it's not a pleasant experience to recall.

JM: If you need to take a break just, just let us know.

: No, no, no it's fine, I just want to get it over with.

JM: Ok.

RN: Ok. Who was in the lab at the time and, and what were they doing? Do you know?

: was in the lab, but at the same time I was, again he was kinda in and out too. But I believe he was in the lab during this part. And he had this other part of the

compound, that he took. Remember we had separated this compound into, you know two portions, they weren't necessarily equals kinda separated them by just looking at it.

RN: uh-huh

: And what he was doing was he was searching for solvents that this compound was soluble in. So when you make this compound just with the precipitation it's not crystalline. And it's unsuitable for x-ray diffraction. And what we wanted to do was do x-ray diffraction, so we needed to dissolve this stuff again and let the crystal form by itself, kinda very slowly. And so he had separated this compound into smaller you know portions and was trying to dissolve it. And he was the only one present in the lab at the time.

RN: Ok.

JM: Ok.

RN: Were there written procedures on what you were doing?

No, there's no procedures for this.

RN: Ok.

: uh just kinda something that we. You know we knew the reactivity with the hydroxide, we knew it precipitated; we knew we could do the ion exchange with the acid, and we knew the hydrazine would precipitate. I mean this is just something that we kinda came up with, I mean.

JM: Ok.

RN: Ok. Had there ever been a communication of the hazards of any of the things that you were working with to you by anybody?

: We knew that it was dangerous. I mean we knew that again I knew it was impact sensitive. The only thing that I didn't know, and I, you know, I found it out, but you know all that we had done said that this stuff was not dangerous when it was wet. And it was very wet when it exploded. That's the only thing about this compound that we found out the hard way. But..

: You had reviewed literature on solid compounds before you ever started, right?

: Yeah. We are not the only ones to make this compound. Well somebody made the nitrate compound. We wanted to make the perchlorate. But the literature also tells you that it's, you know, explosive that it's handle with care. All these kinds of things and we thought that we were doing that.

RN: OK, and as part of working in this laboratory had you ever had any type of safety training from anyone?

: No formal training. Just kinda you learn as you go thru the courses, the freshman chemistry and the instruction by your TA and your undergrad education uh safety procedures. But no specific training after arriving at the graduate school

RN: Ok. And are you familiar with the University Chemical Hygiene Plan?

: Well I'm familiar with uh how to handle the waste and uhm

RN: Ok

: I mean, I guess that's uh a no, I guess. But uh....

RN: Ok.

JM: Yeah

RN: What I understand that Dr. Hope-Weeks was your advisor.

: She was. She is.

RN: Ok. And what kind of contact did you have with her?

: We had a weekly team meeting that was usually held either Mondays or Fridays, and then I probably saw her maybe every other day. I'd go down to her office and ask her a question or two. Those communications were usually you know ten minutes or whatever, just whatever I needed. And the team meetings usually lasted an hour or so.

RN: Ok. And when you had these meetings, what was discussed?

: Each member of the group was there. And we would each give a report of the work that we'd done the previous week. We would give her; show her any results that we had. And she would give ideas for future experiments. Or possible things to, you know that we could expand the research.

RN: Ok. And the other people in this group, now, was the work that they were doing related to what you were doing.

: I was the only one working on this project.

RN: Ok. And do you know if anything was ever put into writing as a result of these meetings?

: She would take notes uh I think to keep us on track or to keep track of, uh, little fibs people were telling, uh, I don't know. But sometimes people like to make themselves sound like they were doing more work than what they have so she would keep track of what we were telling so we couldn't tell her the same thing two weeks in a row. But there was never any report or anything that was given to us.

RN: There were no minutes.

: No, no. Just, and she would take notes also of things we needed from her. Sometimes we would ask her to look at a paper or to read something we had written up for a journal. And she would you know make a note to herself, so I don't know exactly she was writing down, but it just seemed to me that she was taking little notes.

RN: OK. Is there an inventory of the compounds that you created?

: Not the ones that we created. But there's an inventory of the chemicals we have in the laboratory.

RN: Right.

: But when we made compounds we just labeled them with the letter code or something that we could identify later. And many of them had like, really brilliant colors. So we were easily able to identify them by sight.

RN: OK. Was there any kind of usage log or anything for the things that you made? Or anything that indicated what the final disposition was of whatever compounds were created.

: I'm not sure that I understand the question?

RN: Was there, was there anything that indicated, o-k, you made X amount of this substance and then what subsequently happened to it? You know whether it was used up in testing, or?

: No, not, not really like that. What we would do is when we made the compound we would of course keep track of the results of the experiments. But we never kept track of I used 50 milligrams in the DSC. I burned up 25 in the flame test propagation. We, we didn't keep track of it like that.

RN: OK. Did you generate any waste as a result of this creation?

: We sure did.

RN: And what happened to that waste?

: Uhm put it in waste jars. The waste uh was, the waste, for instance, the first part when you add the sodium hydroxide so the waste is a base. And there's a little bit of metal in there so you just put a, a note on the waste jar that it's a base and that it has some Cobalt Nitrate in it and so everything, all, all the waste that we generated, was properly put into waste jars as we were shown to do.

RN: Ok. And then what happened to it?

: And when they were full we made a phone call to the EH&S and they came by and pick it up, about, about once a month.

RN: Ok.

JM: Ok

RN: Ok and..

: And after that I wouldn't know.

RN: I know, I wouldn't expect you to. And other than what you just described, what, what type of waste was generated?

: Liquid almost exclusively, pretty much, because uh the only solid we ever kept was our compound.

RN: Ok.

: Everything else was dissolved, you know dissolved again. So it was liquid waste.

RN: OK. And where in the lab did you conduct the experiments?

: The experiments that require heating of course, we knew that heating this compounds was something that we didn't want to do, so we'd heat them usually to very low temperatures. Say you know 45C or something like that. Just very gentle heating. All the experiments that required heating were done in the hood. The work that required the funnel, there's no fumes being generated at all, so that was done out in the open lab. Including the fatal, or not fatal, but disastrous mortar and pestle incident.

JM: When you worked with the perchloric acid, was that also, was that heated too as well? When you....

: No, no. This, this is all done at room temperature. We didn't want to heat the, uh, yeah, ok.

JM: OK, that's fine.

RN: Ok. Once you synthesized the compound, where was it stored?

: It was stored in small quantities in glass vials that were kept on our lab bench.

RN: OK. And who worked with you on this research?

:

RN: Right, he was the only one?

: He is a masters Organic Chemical student. And so what he, he could make things that I couldn't make and so he would make ligand and I would put it on the metal. So we had a good partnership going. And uhm, so we worked together and I under the supervision of Dr. Hope Weeks and there was no one else.

RN: Ok. And I want to make sure I understand something that was brought up when we were talking to people previously. Now as I understand it, you were about to complete your doctoral work.

: Yeah, I have enough work completed to write up my dissertation without this energetic project. About a year, about a year ago, Dr. Hope Weeks told me that she was not satisfied with the work that a previous student was doing. Really, that she wasn't making enough progress. And she wanted to put me on this project and we, we got a lot of really good results. So it seemed to be going well.

RN: OK. Well, what I was leading to really was, it had been inferred that you were going to be leaving the University before too much longer. And that perhaps was going take over this research.

: Right. So the idea was that he would know everything that I was doing. And he's a very smart guy; I was trying to convince him to enroll in the Ph.D. program. But anyway, I was planning on graduating in May and he would still have another year left even under his Masters program and he would kind of continue where I left off. And take it up from there.

RN: Alright. And were there other people prior to : that worked with you on this same project?

: Not on the same project. There were other students who worked making different compounds that never amounted to anything. So I don't feel this...

RN: Ok and typically, how much of the compound did you make?

: I would say, usually made about maybe 200 milligrams or 150 milligram something like that.

RN: Ok, and how much were you instructed to work with at a time and by whom?

: I would say about that same amount, by my advisor.

RN: Ok. And we understand that you started scaling up the amount at some point?

: Well, we made a little more that day. You know, I'm not sure, because I don't remember exactly. And as I said, : dissolved the Cobalt Nitrate in the water the first time, so I don't, I don't think I know how much was in there. But it's something I did think about when I looked at the mortar pestle that I was going to grind the stuff up. I did look and say o-k, that doesn't look like too much to me. I don't know how much was in there, we didn't weigh it out, like I said.

RN: Right, you just, had split it. in. . in two portions.

: Yeah we just split it out. At the time obviously, I didn't think it was too much, it didn't look like that much. I'm not sure how much it was.

RN: OK, do, do you recall whether the portion you were working with was more or less than the other portion, or about the same amount?

: I don't recall.

RN: OK, and what do you estimate was the quantity you were working with?

: I...you know, I,...it's tuff to say. I thought it was about a gram.. I didn't. You know so I thought it was maybe double or triple, kind of, what we'd been working with. But again, it's sitting under you know three inches of hexanes and you know....what we were worried about, what I was worried about was could we make this thing consistently so, we make one small batch and we use it up in one test. So then, we make it again and am I making the same thing, ya know? So what I'd want to do is make a, a little more so we could do these 3 or 4 tests that we need to do from the same exact thing. You know, we were really worried about consistency of the, of the compound.

RN: OK. Well, and you've already talked about where the compounds got transported in terms of Chemical Engineering and Mechanical Engineering and it's our understanding that there was some here at your house.

: Yeah, sometimes I, I would absent mindedly leave a vial in my pocket you know as I left the uh you know as I left the lab. And you know, usually it was returned the next day I would put it back in my pocket and take it back to the lab.

RN: Ok, and uh

: Sometimes you know p.. uh, sometimes we would go over to use the you know the drop hammer at the engineering bldg only to find that someone was already using it so at

that point it was just time to go home. And, and sometimes I forgot to go back by the lab and drop off the compound.

RN: OK. And when you were transporting these compounds, how, how were you doing that?

They were just in the small glass vials. And I either held them in my hand or had them in my pocket. I mean they were very small amounts that we needed to do each test, so.

RN: OK. And throughout your research at any time did anyone ever mention concerns about the quantities of materials that you were…

: Not once.

RN: …working with or how to handle them or anything of that nature.

: Well, we mainly discussed quantities. And you know I knew that, that having more obviously was more dangerous than having a little bit you know. You know, a little bit of compound wouldn't probably hurt me at all. A very, very small amount. I don't know what a hundred milligrams would… I don't know. It's tough to say. But I was -- I was certainly instructed by my advisor to keep the quantities low and I thought that they were low enough.

RN: Ok.

: Other than that, what was the other question? It was a two part question.

RN: Oh, did anybody ever speak with you about how to handle the compounds?

: How to handle…? Uh not really, I mean, just carefully. I mean uh… yeah.

RN: OK, that's all the questions that I have. Did you have anything?

JM: No, that went through everything here. Do you have any more questions yourself?

I don't have any questions, no.

JM: Ok.

RN: Ok.

: I hope I was, thorough or understandable or whatever I needed to be.

RN: Oh, I think so. As I said, what we'll do is go back and, and get this recording transcribed and then once we've done that, we'll contact you about coming back by for

you to review that and to make sure that what's been typed up agrees with what you recall having said. And at that point our investigation will be concluded.

. OK. Thanks again for coming by the house. I know. It's a little more hassle...

RN: Well, we appreciate your time and your cooperation and ...

Thanks also for waiting until uh. It's uh, a little easier to talk about now than it was two weeks ago.

RN: I understand. That's not a problem either. That's perfectly understandable.

JM: So, what is the prognosis on your hands so far?

: The right hand is pretty good. And the left hand is missing 3 fingers, but they say that's looking pretty good.

JM: How's your vision?

: It's fine. It's certainly not as good as it was before. But it's certainly good enough to do everyday things. So I don't need to spot eagles from, uh. . . you know.

RN: Are you right or left handed?

I was left handed. I'll have to be right handed now.

RN: Well, ok, that will certainly take some adjustment. Ok, well...

JM: If you have anything else. . . .

By my signature and initials I acknowledge that the preceding is an accurate transcription of the interview conducted on February 18, 2010.

_____ _____

Date