Nevada Test Site Oral History Project
University of Nevada, Las Vegas

Interview with Duane Lawrence

June 24, 2004
Las Vegas, Nevada

Interview Conducted By
Shannon Applegate

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Table of Contents

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Shannon Applegate*: OK, so just some brief background and then what led you up to working at the test site.*

Duane Lawrence: Right. When I came to Las Vegas I came here as the executive director of the American Red Cross. And at that time the United Way was attempting to make a change in their administration of nonprofit agencies in the Las Vegas area, and this was a pilot test that they were going to do. The national Red Cross asked me to fight the situation because they felt that this would be dangerous to the total Red Cross picture, if it was allowed to be done. So I organized with several of the other executive directors of agencies in Las Vegas, told them what was going to happen, and so we organized an executive directors meeting to argue with what the United Way was attempting to do. The pressure within the United Way hit us right square between the eyes because the executive director of the Boy Scouts, the executive director of YMCA, the executive director of another agency, I don't remember what it was, I think it was Focus, and myself as the executive director of the Red Cross were all terminated within a week of each other.

When that happened, then I was at a point of, where was I going to work? And my wife was tired of moving every couple of years, which I had with the Red Cross, and so I just started looking around for some employment and the CEO of REECo, Reynolds Electrical and Engineering Company, was on the board of directors of the United Way. He saw what was happening and he called me and asked me if I would be willing to go to work for REECo. So I started working out at the test site at that point in time.

And what year was that?

That would've been 1972, I think it was.

And why was what the United Way doing so dangerous to the Red Cross?

They wanted to control all of the equipment and ownership of the Red Cross. In other words, all of our typewriters, all of our cars, all of our various kinds of equipment that we used as office equipment there, that was to be owned by the United Way. They wanted all the secretarial staff to work for the United Way. They would pay the salary. The only *staff* people, professional staff people, would belong to the Red Cross agency. And that was the same thing they were going to do with the Boy Scouts, that was the same thing they were—so we would own *nothing*.

So was it just a power struggle or—?

It was a power struggle. But it was a money thing, is the way the United Way saw it. And so we fought the thing. Well, it never came through. They never developed it. And so on. But then I started working for REECo and the very first task that I was given was to establish a fundraising program for REECo.

So you didn't start off as an electrician.

No. I worked just a short time to get that fundraising organization going. And then after I finished that, then I started in the electronics section, in the radio communications section, because I had spent four years in the Navy as an aviation electronics technician and so I was experienced in working with electronic equipment and so on, radios and this sort of thing. And that's where I first started. And I did that for about two years. There was an opening in the quality control position, so I applied for that and I was transferred over to the quality control division and worked in quality control for I think it was three years.

And what would you do?

We tested diagnostic cables as it was being fabricated by the electrician. In other words, they would make the cables that would be used to work from the event site to the recording devices.

Those big long cables that were so expensive?

Right, they were long—right. And so that was my job as a quality control on those cables, to make sure that they met the specs that they have—

How would you test them?

We had a variety of equipment that we used: a high potter that we'd usually put between ten and twenty thousand volts on a line to make sure that it wouldn't short. We would look at it with what was called a TDR, and that's a time domain reflectometer, which would look at the full length of the cable and see if there was any ohm imbalances in the cable, if it's got a dent or—

[00:05:00] *Ohm?*

Ohm. A resistance reading. The process there was to make sure connectors were put on right, that the cable hadn't been damaged, and this sort of thing. So between the two tests we could guarantee that this was a good cable.

And that was pretty necessary because that's how they got all the data, right?

And so I did that. And then there was an opening in the training department, and so I applied for that position in the training department within REECo. And since I had taught high school for six years and I had a degree in education, I felt that that'd be a good place for me to go to, so I moved into the training department. And in the training department we did a whole variety of kinds of work. The concept and the attitude that the training department had was one of safety management training; it was work management training, to attitude program training. So we did a variety of courses. First of all I taught several setup courses. One of them is defensive driving, and there were a couple of others very similar to that.

Because the test site, didn't they have a lot of accidents?

Not really. But it was just a matter of making sure that we *didn't* have accidents, so every employee had to go through the defense driving course.

Oh really? That's interesting, because I had heard that they had called 95 the Widowmaker?

Well, that's part of it but that was not a part of the test site. That was getting *to* the test site.

Right. Was that part of the training though?

Yes, in a sense it was. But defensive driving is a good program for everybody, whether where they are is in the process. We did that. Then I started developing a variety of different courses. I taught a course on time management. I taught a course on quality control. I taught a couple other courses in different programs. One of the big programs I did was for the Teamsters: to understand hazardous material handling requirements so that they'd understand DOT rules and regulations; DOT being the Department of Transportation. Because even though they were on a government property and everything they transported was within the government property, they still had to comply with all DOT rules and regulations on transporting hazardous material at the test site. And a lot of people weren't *aware* of that to start with, and that was part of my responsibility: to teach all the Teamsters and staff people the responsibilities of compliance with DOT rules and regulations on transporting hazardous material. So that was a week program that all Teamsters had to go through that were involved in transporting or driving vehicles. And so I did that.

And then I had a couple other programs that I worked in. Another one that really became a real fun course, and one I really enjoyed, was called Underground Nuclear Weapons Testing Orientation Program, or we called UNWTOP. And that was a program that was designed for the security community. Security community would be those in CIA [Central Intelligence Agency],

State Department security, military intelligence communities, and so on. Part of the reason this course was asked for was that these people would come out to the test site and they would see these big drill rigs sitting out there in the desert, drilling a hole, and they'd say, Well, why don't you take it down in the day and then set it back up at night? Well, they had no concept of what was involved. They had no concept of the *processes* that were going on in preparation for a weapons test. And so the people in DOE [Department of Energy] said, We need to set up a training program for these intelligence people so they can have an idea of what we're doing here, so at the same time that they can see what we're doing, they can look at information coming from another country and determine what level they are in the progress of their development of nuclear weapons.

Now when did this start? When did the training program start?

I started that probably in 1980, thereabouts.

And you started it?

[00:10:00] I was one of the primary writers of the program. And so what we did, we had three people on our staff to put the thing together. We had one person from the security program with DOE; we had an officer from the Air Force base at Albuquerque where they did a program down there on weapons programs for the Air Force. And so the three of us basically worked together as a team in a sense. I gathered a lot of the preliminary information and then the rest of us kind of put the whole thing together. So I did research up at Livermore, I did research over in L.A. [Los Alamos] in the film libraries where they'd done early testing of weapons, I did research in Washington, D.C. at CIA headquarters—

What was your security clearance?

It was high.

Were you Q or were you higher? Is there higher than Q?

Well, there's special clearance ratings that I had besides Q.

OK. So that got you into where you needed to be.

Yes, it got me into where I needed to be. But I'd put these various pieces together. I took movies and I transferred and edited them into videotape programs so we could utilize them in the program. And so then we had the whole thing set up. We would usually have ten to fifteen people that would come for our class. Our class was usually a ten-day-long class. It would start at seven o'clock in the morning and usually end about five in the afternoon with a discussion session that would go on in the evening after it was over. And we would spend the first day looking at what DOE is doing in preparation of equipment for a weapons test: what kinds of things go in a tower, what these trailers are that sit out there at the site, how they're set up, and then some of the theory processes as to what the scientists were looking for when they detonated a nuclear weapon.

Oh really? So you had to know some physics and—

Right.

And you taught yourself all this stuff.

Right. So that was a whole part of that whole process that we went through. Then after we'd spent our first day here, then we'd go out to the test site and we stayed out at the test site for the rest of the time we were there. In the morning we would get up, have an early breakfast, go over and meet, and at that meeting I would bring out the historical videotapes that I had done of what we were going to look at that day. As an example, if we were going to go out and look at the vertical test program, which is the drilling the vertical shafts with the drill rigs and so on, I would bring out the early movies of the very *beginnings* of what we started doing with vertical testing:

the kind of drill rigs we used in the early days, whatever kind of historical things that they could look at in the process. Overhead pictures I would use and show them so that they could see from a vertical position of an overhead picture of what they were looking at. And we would go through that whole process. We would then come right up to what we were doing in current day performances: on preparations of cables, diagnostic equipment, and everything that was involved. Then after we finished that, which was usually about ten o'clock in the morning, we would get in vans and go out to the work location. And we would walk through a drilling operation. We would walk through a ground zero location. We would walk through a variety of site locations so that they could see what was happening in that whole process. And then after we'd done that walk-through, then we'd go back to the area where they would do the detonation point and they'd go in the rooms and they could see the process that was involved in the process of doing a nuclear weapons test and what it looks like. And we used videotapes there so they just could actually see what happens when they did a nuclear weapons test. And then we'd go back to **[00:15:00]** Mercury again and when we came back to Mercury, we would have the management people, usually they were REECo people and lab people that would come there and get involved in a question-and-answer session with these guys. In other words they could ask them questions of things that they didn't understand, but we couldn't *talk* about these things out in the field because of the security situations that we had. So we'd go back into a secure room and so the kinds of things that *they* needed to know dialogue-wise with what was happening is what they did. And so we'd do that. And then after we were through with all that and they were through with all their questions, then we would look at what we had as far as evidence from *nth*-country or unknown country on what *they* were doing in weapons testing.

Yes. And you would analyze—

And so they could see that corresponding as to what we're doing today current, what we had done earlier, and what then *nth*-country is doing. So that they could do an analysis as to the progress or process which they were involved in and what were the footprints that a nuclear weapons test program has *versus* just a mining hole or digging a wet hole. What are the things that are different? What are those footprints? How do you identify them? What kinds of things do you look for that make it a different situation from a normal situation?

Right. And you couldn't talk about this with your family, with anybody, right?

Well, you could talk about it like we're talking about it now because what I'm talking about is not classified. But what actually *happened,* I can't tell you what happened in reference to *nth*-country test. Those I can't talk to you about.

Did you ever get nervous over some of the stuff you were looking at?

No.

No? Knowing that some of these countries are this advanced in nuclear—?

No.

Why didn't you? It didn't alarm you or—?

No. We saw what they were doing and you know that certain countries are involved and it's just a matter of where they were progress-wise as to where we were and you know what was going on in that whole system.

But that was a one-day situation. And then the next day we'd go take a look at horizontal testing, going in the mines and what do you do in a horizontal test program, and why is that different from a mine test or a vertical drop test, and what are the various kinds of things that are involved? And we'd go through the same process with them as we did with the others. Then we'd have the experts come in and they could talk about it and we would look at what different

countries are doing, the Americans too, that kind of a situation, and so on. So that was a part of what we looked at.

And then did you all stay at Mercury?

Yes, we stayed at Mercury for the whole time we were there. And then the whole day you'd be involved with these people in discussion and talking. Of course, we had dialogues in the vans all the time with them, and the vans were always swept so there were no mikes or anything in them, to make sure that we were clean on everything. And that was the process that we could go through, and it took us ten days to do the full test site operation and the process of what we were doing at that time.

So would you talk about all *aspects of the test site?*

Right.

OK. So they knew everything that was going on. It was like an overview.

Right. Complete overview. And then the last day I gave them a final exam.

Oh really?

Yes. I'd break them all up into teams of usually three or four, depending upon how many people in the class, but three or four to five people in the team and I'd give each team a stack of photographs. They were all aerial photographs. And they were supposed to take this stack of photographs, identify what they were, and place them in the chronological order of a weapons test so that they could say: OK, this is where they first started breaking ground. This is where they started bringing in the drill rig. This is where they drilled the hole. This is where they brought the cables in. This is where the—all the way up to the event. So that they had to be able to put all these pictures in an order of sequence from what they had learned during the week, and so on.

Did most pass?

Yes, they did. You know they had some real problems with some of them because I'd throw ringers in the process with it. But that's part of what we did in that whole thing.

Now did you have materials for them to take home? Were they allowed to take notes?

[00:20:00] I wrote a bibliography, a dictionary of weapons testing, and every single word that was in the bibliography came out of non-classified documents. I mean there were dictionaries, science books, you know. Nothing in it was classified. And I put it all in a single book and the DOE classified it. And that really created a lot of headaches because you know we'd sent out a bunch of books already before they decided that they were going to classify it. And so I had to get them back and—

You had to get all the books back?

Had to get all the books back and have them all stamped again and then treat them as a classified document after that.

So what's the difference between a classified document and a non-classified document?

OK, the reason they classified it is because nobody had ever put all of these words together in a weapons program. I mean when you talk about a nuclear explosion and what are the step processes of a nuclear explosion, there's nothing *wrong* with that in a sense. But when I started talking about all of the things that led *up* to that nuclear explosion, then I built a pattern of words, and so therefore they felt that pattern then leads a direction. And they don't want people to basically have that easy access to that pattern.

You connected the dots and they don't want that.

Yes. Right.

Now you could still send these documents out, right, but there's a different procedure.

Right, but I had to treat it as a classified document if you sent it out.

What's the procedure for that?

Well, those are rules and regulations that DOE security has set up for transmitting classified documents.

So you would have to give it to them and then they would handle it.

Yes. But they all had to sign for it when they got it and they had to verify that they would treat it as a classified document and so on.

And it's going to people with security clearance anyway.

Right, and yes, they're all cleared. It's just a matter of doing that. One of the big problems that I had is when I went and did programs at different locations, like Washington, D.C., I'd do a one-day program in Washington, D.C. at CIA, or I'd do another program at an Air Force base, and so on, on a one-day or a two-day class session. And I had all these documents with me that are all classified. And when I would fly with them, I had them padlocked to my wrist, and when I got to an air base or where I was going, I had to take them and lock them in a secure vault before I could go to bed that night. If I couldn't get a secure vault that night, then I'd go to sleep with a padlock on my wrist.

Really! Did you get looks when you were in the airport?

Oh, you always did, you know, but—

That's interesting. Did you actually sleep with it on your wrist?

One night I did because the secure person wasn't there to pick me up like he was supposed to be, so I—

So you had to shower with it?

Had to shower with it and so on. But that's part of the secure clearance thing. But that was a fun program. I enjoyed it and met a lot of really nice people and so on.

Now who were the majority of people that took that class? You said CIA.

State Department intelligence. Military intelligence, which would be all branches of the military.

Now would you keep them—would you have a CIA group and then an Air Force group or were they all mixed?

No, they were all mixed together. And so they had a lot of dialogue with each other in the process. When they first came in, some were banging heads a little bit, but for the most part they really became involved with each other in the discussion and the ideas and concepts, which was a good part of what they were doing. Because now they could go back to Washington, D.C. and they could call somebody that they knew personally eyeball to eyeball and ask them a question.

Yes, so it was actually a good way for all of the branches to communicate with each other.

Yes. Right. So that's a part of what happened.

So that started in the 1980s?

About that, I think, that was in—

And then it stopped—?

I did it for four years and then I started another part of my training programs. That program, I only did two sessions of it a year, so you know they'd bring a group in and so I—so during the rest of the time during the year I was doing a variety of other programs. I went to **[00:25:00]** Montreal, Canada to learn about hydraulics maintenance so I could come back and start teaching people on how to repair hydraulics equipment out at the test site. And then they asked me to go out and set up a training program for electricians in Area 12 on how to terminate coaxial cables out there. They were having a high rate of coaxial cable failures as far as when the QA [quality

assurance] tested them, too many of them were breaking down. And so they wanted me to come in and set up a training program to teach the electricians how to do terminate cables.

Now when you say "terminate cables" do you mean—?

Put a fitting on the end. Put a connector on the end.

OK. And that was the reason why they weren't working?

Right, there were processes and so I went out to Area 12 and started teaching the electricians how to test or terminate all the cables. And usually it was a week course that the electricians are involved in. I'd go through all the connectors, how to prepare the connector, how to put the connector on properly on the cable, and then we would test it to make sure that it was right. And if they had a problem with it, then we'd look as to what they did wrong, as to why it was a problem, and so on. So that was the whole thing that I did for all the electricians.

Now if the cable wasn't terminated properly, would the cable then be lost? Could you still recover part of the cable or—?

The cable's there. I mean—

OK, so it was fine. It wasn't like it was ruined. Because I—

Yes. You just have to re-terminate it.

It just would take time.

But—yes, right, it'd just take time and—

Because I know that cable was expensive.

Right. Different cables, it varied. Some of it ran as high as ten dollars a foot. And a lot of the cables that we were running were anywhere from eight hundred to a thousand foot long, so that gives you an idea as to what one cable could cost. And different kinds of cables varied in what they could do as far as the speed of the signal down the cable. The real expensive cables, like the

ones that were ten dollars a foot, were three-quarter-inch diameter coaxial cables that could transmit a signal at 94 percent the speed of light with less than a half-ohm of resistance.

Now what does that mean, "less than a half-ohm"?

OK, a light bulb has a certain ohm in it. If you look at the back of a frying pan or something, like your frying pan will tell you what the resistance of the ohm reading is on it; or it'll give you watts reading, with watts is the amount of current that flows through it. So volts and currents gives you the watts, and that resistance is what you have. The less *ohms* that you have, the better your signal is going down it, because if you can have it less than a half-ohm of resistance on a thousand-foot cable, then your signal goes down that cable at almost the speed of light because there's nothing slowing it down. And so you want things as fast as you can possibly get it from the test event activity to our recording devices. And you look at different positions of explosion when you look at it on a scope, so you can see the first part of the explosion, the second part of the explosion, the third part of the explosion, the fourth part of the explosion, and then a drop-off, which is the fall-off after the explosion has taken place. And so each cable is made up *length*-wise and *position*-wise so that that particular scope at the end can look at zero-one-plus-one nanosecond, zero-two-plus-two nanoseconds, zero-three-plus-three nanoseconds, and so on a time frame of what happens within an explosion.

So then it's like you're taking slices of time and you're getting a real finite slice of—

Right. And that's how you learn the efficiency of what you're doing.

And what are these cables hooked up to? Because when the explosion happens, doesn't everything just disintegrate and—?

It depends upon what they were doing, where they were, and some of them, of course the beginnings are destroyed. Other parts are not. So it's what *kinds* of readings that they were doing

[00:30:00] with it, whether you were working at something in a vertical test site or whether you were working on something in a horizontal program.

And then so whenever they would do a test, there were always different things that they were looking at.

Yes.

So they could duplicate a vertical test many times but they were looking at different things every time they do the test.

Yes. So that was the *process* that went on in doing that.

Did you work a lot with scientists from the labs?

Somewhat. The scientists would all get into that as we go through this process of building cables. So then I had them all trained to do something. And then I came back to the training department and I wrote a letter suggesting that what they do is they establish a program where the electricians will prefab the cables outside of the tunnels instead of working underground in the tunnels, where they'd have better light, better work benches, and proper tools, and a better way of controlling the manufacture of those particular cables. And I gave that to my boss. My boss took it upstairs to the head boss—.

Who was your boss?

[Lavonne Lewis]. Anyway, she took it upstairs. He read the letter, called me immediately up to his office and says, `Duane, I would like you to go out to Area 12 and talk to the managers out there about what your suggestion would do.` And so I did, and they said, `When do you want to start working as an electrical superintendent out here and managing these electricians?` And I said I hadn't thought about it. And so that's where I ended up becoming an electrical superintendent out at the forward area for eleven years.

Now why were they doing it in the shafts, do you know?

Well, basically historically that's what they did. They knew a cable went from this position to this position [demonstrating on table] and then they would have to terminate it on both ends. Well, there wasn't any reason why it couldn't have been made someplace else, finished, quality-controlled, and brought in; they knew how far apart these two places were, so let's prefab it outside where we're doing cable at a better rate of production. So what *happened* in the process of my doing that, I was given my own warehouse building to work with; I was given a group of electricians that were specifically trained, and I worked on them to make sure that they kept up the work. I would rotate people in and out so I kept retraining people in the process of doing that. But we went from a failure rate of about 10 or 12 percent to a failure rate of less than 1 percent.

That's really impressive.

So that's part of what took place in the process of doing that. We also changed the rate and speed of what they were doing. Normally prior to this they would spend maybe two-and-a-half, three hours to put one kind of connector in on a cable underground. And when they were working in the warehouse condition *outside*, I expected them to put a connector like that on every fifteen minutes.

That's dramatic.

So not only did we increase the *value* of the work that they were doing but we increased the *rate* at which they were working at. And so that was part of that whole *process* that we did.

Now were the conditions in the warehouse, did they have to stay real cold for the cable?

No. No.

No? So there weren't any environmental—

We had swamp coolers working in there to cool the place off and we had—it was a comfortable place to work and for the most part the wiremen liked it. It was, you know, comfortable, they had

a comfortable place to sit and eat lunch at, they weren't down in the dirt and mud underground in the mines and the tunnels, and so on. And we'd get all the cables ready and then ship them out. After we did that, then we usually went back up into the tunnels and did certain cables that they couldn't give us exact fitting locations on, and so then my team of people would go in and work underground to do that process. And so that was that whole process of what we were doing.

[00:35:00] *And then how did you relate with the scientists?*

Well, when we were doing cables, they would come and say, `OK, how long would you take to finish doing these cables for me?` Or, `Can you make these cables for me?` Or, `How can we improve this particular type of a connector?` Or, `What kind of tools do we do?` And we worked on developing some new tools, developing some new concepts of preparing cables and connectors, and so on. So we were doing a combination of not only putting connectors on but we were developing or improving the quality of the connectors and cables that we were working with in the process. So I quite frequently got involved in discussions with them too. We changed several cables in the process of what we were doing before into a simpler cable, an easier cable to put a connector on, and this sort of thing.

What was your overall impression of the scientists? Did you enjoy working with them?

I enjoyed working there. It was a good place to work. People were good. The attitude was good. And we had very, very few problems in the sense of what we were doing. There's always a few people that are hardnosed troublemakers and so on, but I mean you get that anyplace, anywhere. But for the most part we were—and it didn't make any difference what craft you were with. Everybody really got along. There was always some animosities between different craft groups and so on. But being the kind of person I am, I was involved with a whole bunch of different people. I mean I'd be working on something electrical and I'd go over to the pipe fitters and talk

to them about, `Well hey, can we do this with this thing?` And they'd say, `Oh sure, we can take care of that.` Or whatever. I said, `Yes, I picked up an old junk refrigerator that wasn't working. Can somebody come over and look at it and see if they can get it going?` You know, those *kinds* of things that we did to help each other out. Or they'd come over and ask the electricians to come wire something up for them. And so we would do things through the non-professional, written request to get tasks done to make it comfortable for people.

You helped each other out.

Help each other out.

Now did you work with scientists from both Livermore and Los Alamos?

Yes.

What was your—?

I had Livermore and Sandia and Los Alamos, all three of them.

Oh, all three. Were they different? Like could you—?

Yes.

Oh, how so?

Sandia and Los Alamos were fairly similar in attitude. Not as quite specifically stringent on doing things. They allowed for some fluctuations in the process. The *dialogue* was a lot better between them and us, and in the process. Livermore was more *exacting*, more difficult to comply with their tasks. They were much more *specific* in what they said that they wanted, and not always making it possible to comply with those tasks. And so there were some kinds of—I mean we were all friends in the process. It's just that they made it a little bit more difficult sometimes to do things for them than what we had.

Now how did they make it difficult? Just in the way they communicated it with you or with what they were asking?

Somewhat within what they were asking, within the time frame that they wanted it by. And so it made it a little bit hard to try and get the work done within the—from what they were saying that they had.

Now was your impression that they were like that because they didn't understand your *job, or was it because they had backed themselves into a corner and they needed—?*

I think they backed themselves into a corner. I shouldn't say that, but I think that's part of what happened, yes.

But it was just different cultures within the different labs.

Yes.

See, that's just fascinating how—that's the research that I'm doing currently and it's interesting how they're so different.

But it's because they're all basically funded by the same money and—

And doing the same kind of stuff.

—doing the same thing, but there was a constant competition between them and so on.

Oh yes. And could you feel that when you were—?

You could feel that.

Would each of the labs try and find out what the other lab was doing with you guys?

No, that's not what it was. It was a competition in a different type of event, in a sense, as to what they were doing. So it was—the attitude of the REECo staff people that were assigned specifically for—if you went to the different lab sections where they were working on the **[00:40:00]** vertical tests, not so much on the horizontal tests because we all worked together

underground in one central location. But on the vertical tests you had one area which was Area 3 which was predominantly Los Alamos. In Area 2 it was predominantly Livermore. And the twain shall never meet. And the REECo staff people that worked between the two had an animosity between each one. The cooperation that I talked about that we had, where the electricians will go help the plumbers and so on and so forth, which we did up in the tunnels, didn't necessarily happen between the REECo Los Alamos and the REECo Livermore people. It was a—

Really! So the culture bled through from the—

Yes, right.

That's interesting.

And so it was kind of an interesting sort of process.

So the rivalry really—you could see it and—

Yes. And there was a rivalry that existed.

Now did they ever duplicate the same tests?

I don't know.

Oh, you didn't know if you were duplicating that.

No.

Now that's really interesting.

But—that whole process. But the whole time that I'm involved in doing all this and whatever, I was still very much involved in the community in Las Vegas.

Oh, you were? What were you doing in the community?

Well, I was president of the Academically Talented Parents Association for eight years. I served on the board of directors for the academically talented program for fifteen years. I was a member

of the State of Nevada Special Education Research Group which operated out of the state Department of Education. Then I served on the State Board of Education for six years as a member of the state board. And so in my process of being out there and working with them, the company still allowed me to become involved in community activity. And generally speaking, they were very supportive of people working within the community in a variety of tasks. So it was a good company to work for. It really was.

Now did you retire as the electrical superintendent?

Yes.

What year did you retire?

Nineteen ninety-three.

So that's what, twenty-one years with the same company?

Yes.

That's impressive. So going back to some of the fundraising, when you first got hired and you did that, what would you do fundraising for?

That was for United Way. That was the kind of fundraising I did. In other words, I'd go out and ask—and we would set up a program whereby employees could make donations to United Way, Red Cross, Boy Scouts.

But you were a REECo employee when you did that.

I was a REECo employee when we did that. And we changed the system.

Oh, you did? How'd you change it?

Well, before people would give to United Way. Then the United Way would distribute the money out to the various agencies. Well, what we did then is we allowed people to make specific donations to specific charities. So they could give 1 percent to the United Way, 20 percent to

Red Cross, 20 percent to Salvation Army, and 50 percent to another charity that they wanted to give it to that was on our list of thirty-some charities that they could make donations to. And then REECo paid directly to those charities without it going through the United Way coffers.

Right. And was that due to your prior experience—?

Yes. Because, see, what happened is whenever you put money in the United Way program, they took out 15 percent right off the top for themselves.

And most people wouldn't know that.

They don't know that. So if you gave a dollar to Red Cross, Red Cross only got eight-five cents because the United Way took off their cut right off the top.

Yes. Now how did you go from being a school teacher to working for the Red Cross? Is that what happened?

Yes.

OK. Because you did a lot of great things as a history teacher, and that was in Montana, right?

Right, that was in Montana. And when I first started teaching I started out with a salary of fifty-**[00:45:00]** five hundred dollars the first year for a full year's salary. At the end of six years of teaching, I was getting seventy-two hundred dollars a year. And if it wasn't for hunting and fishing, I wouldn't have had much meat to eat in Montana. So I decided to look for another job. And that's when I went to work with Red Cross.

And what did you start off with them? What were you doing?

Twelve thousand.

Well no, your position.

Oh. It was called the Red Cross field—I'm trying to think—it was the field worker, is what we were called. We worked with military personnel. And first year, I was at Fort Lewis, Washington

working with military personnel, going through the training program. And then I spent a year-and-a-half in Korea, with military personnel in Korea.

What year was that?

That would've been in 1968—no, 1969, I think it was. And during those times you do counseling with military. You provide them messages in reference to family situations at home, whether it be an illness program or a death in the family or something like that. Provide them with financial assistance to help them. And so on. So you're providing a whole variety of social work, in a sense, assistance to military. And then I came back from Korea to Fort Carson, Colorado, and I was there for about twelve months—or not even twelve, about ten months. Then they had an opening as what was called a Red Cross field representative, and so I asked for that job and I was promoted to that. And I was the only paid staff person in the whole state of Wyoming. And I traveled the whole state from one corner to the other and back again and around, working with Red Cross chapters. And in that you do everything from training volunteers to publicity to fundraising to accounting to personnel management problems. You know, a couple people get mad at each other as volunteers and you have to go up and talk to them and try and convince them to shake hands and keep on working. Things like that. But I mean that's what I did, and I did that for two years as a Red Cross field representative. Well, then there was the executive director job here in Las Vegas opened up, and so I applied for that and I got that job and I came down here. And that job didn't last very long.

Oh yes, that's with the major power struggle.

Right.

Did you enjoy working with the Red Cross while you were doing that?

Yes, I did. I've enjoyed every job I've worked at.

How'd you like being in Korea?

I enjoyed it.

Did you really?

Yes.

Was your family there?

No.

Oh, so you were gone for a year-and-a-half?

Right.

How often would you visit?

I didn't. So I was there for a year-and-a-half and I didn't see them for a year-and-a-half.

So you were like in the military.

Yes, it's just like a military position.

And it's government, right, so—?

Right. Well, your Red Cross people are paid by Red Cross, not by government. But you live on a military base and you have all of the rights and privileges as a military officer. But I had friends over there, I had Korean friends over there, and—

Did you speak the language?

No.

Were you able to get around even though—?

Oh yes, I got around a lot. I shot a lot of pictures. I got myself a real good camera and I did a lot of photography.

That's interesting. OK, so then you said the CEO of REECo was on the United Way board, right?

Right.

Who was the CEO at the time?

Oh boy, I've been trying to think of it and I can't—[Ron Kiehn or Harold Cunningham].

But it was in the early 1970s.

Yes.

We can look that up. So then how did you guys get to know each other? Was it just through this whole thing going on?

Yes, and he knew what was happening and so called me up and talked to me.

Oh, that's nice. So you were able to network and to stay here and—.

Yes, right.

Now would you drive out to the test site every morning?

I rode a bus every day. I would catch my bus at usually about six o'clock in the morning or a quarter to six and then ride out, get off the bus usually about a quarter to eight, and go to work. Get on the bus at 4:15 and we would leave the site at 4:30 and I'd get off the bus usually about 6:15, 6:30 at night. So it was a twelve-and-a-half-hour day really. I read a lot. I got a lot of books **[00:50:00]** read. I slept a lot. I mean in the early morning during the wintertime, I'd get on and throw a coat over the top of me and pile my head into a pillow and go to sleep and sleep until I had to get off. But then during the summertime I read most of the time.

Yes. And was there a place to eat? I mean I've been out to the test site. Was there only that cafeteria to eat at?

You had a cafeteria in Mercury, which is the cafeteria you've probably been to.

Right.

There was a lunch cafeteria in CP, which is control point, and they had a fast food preparation cafeteria. They would pre-cook the food usually in Mercury and then they'd bring it out for main course stuff, but then you'd also get hamburgers and stuff like that cooked there. Breakfast is cooked there on location, so on CP. Then in Area 3 they had a lunchroom set up where you get your food out of machines. And then Area 12 had a full cafeteria where they did full preparation of all their food and everything out in Area 12.

Now where did you spend most of your time?

The first couple years when I was with—as radio electronics people, I was in Mercury. Then in quality control I was in Area 2, and you brought your own lunch for Area 2. Then in the training department I worked in Las Vegas, downtown. And then back and forth out to the test site, depending upon what projects I was working on.

What part of downtown?

Right behind what is now Bingo Palace or the—it's a vacant lot for a parking lot right now, but that was where our building was. And then when I was electrical superintendent out there, I was out in Area 12.

And then how far is Area 12 from Mercury?

About sixty miles.

So you would have to come in about seventy-five miles and then go sixty—

Well, the bus would go right to Area 12.

So that's where you're saying you'd get picked up at a quarter to six and get there around eight.

Yes.

That's a long commute.

Hundred and ten miles from my house to where I worked. And then I'd get off the bus and get in the pickup and I'd drive to wherever I was working, whether I was in the tunnels or whether I was down in my warehouse that I worked at.

Did that ever wear on you, the commute?

In a sense it did, yes. If it hadn't have been for the fact that I like to read, I probably would've had a problem, but I got a lot of books read.

And you liked your job, right?

Yes.

That's interesting. Now when you were with QA, did anything, you know, like have you ever experienced where you had tested a cable and then it didn't work or—?

Oh yes.

Oh really?

Yes.

So what was that like if that happened?

You just log it in your code book and then call the electricians to come out to repair it whatever, whether you tell them what connector is bad; or whether there's a dent in the middle of the cable and you got to replace the cable; or whether there's an open wire in a multi-conductor cable and you got to figure out where that open wire is—why it's there, whether it's a wrong connector or a broken cable or—so you tell them what's wrong with it and then the electricians have to fix it.

Now would the scientists get upset, you know, would you ever feel—?

Depends upon where they were in the position of when a cable went bad. We've had cables all tested, everything working fine, and they would take the cables and put it down hole in the event, and it gets down to the bottom, and for some reason or other it quits working. If they didn't have

any spare cables doing to that same position, because usually they had a variety of spare cables that they could work with, then they were in a crisis state and we would have to somehow fix that cable or get another cable into the location or whatever.

And that would be—

That was crisis time.

Pressure. Now say that it goes off, the test, and then the cable doesn't work, would they have to redo that whole test again?

Probably.

Did that ever happen?

Depends upon what part of the cable went bad. Example of what *could* happen, let's say that they were putting the event down the hole and the chain snapped on the support rig and the **[00:55:00]** whole load dropped and broke all the cables. So then they got an event down there. What do they do with it?

Now you're saying "an event."

A nuclear weapon.

OK. Yes, see, some people call it a "device."

Yes, a device.

Would you all call it an "event"?

Well, the "event" is the whole process, but let's say the device is down there. And so what do they do with it? Do we have to dig back down into it, put more cables in? Can you do that? Those are some of the things that were decisions that had to be made. Because they had a couple things like that that happened.

Really. And so you guys would have to think on your feet.

Yes. And so they would decide, Well, what can we do? Because here's a weapon that's ready to go and we haven't got any way of firing it now. So we leave it there? Can't do that. And so do we drill down to it and try and put some more cables onto it so we can fire it? That might set the thing off while we're in the process of doing it, so we don't want to do that. You know, those are kinds of questions that are being asked. And what they did with the two devices that did end up in the bottom of a hole where they couldn't fire them, they drilled holes right next to them so they were about twenty-five, thirty feet away from the one that didn't go, and then they would set that one off to basically destroy the one that didn't go off. Now the thing that *happened* was that you didn't get a double bomb. It would *destroy* it.

So it wouldn't go off.

But it wouldn't go off as a nuclear weapon.

Oh, that's interesting. And then you'd get all the data from the second one.

You get the data from the one that you put—the second one that you put in. But what they found out was that the second weapon wouldn't go unless it was properly triggered to go. It would be destroyed as a weapon, as a device, but it wouldn't—

That's interesting. Now would the radioactive material be such that two bombs went off or one?

Well, one bomb with a high level of components in it. I mean you have all that radioactive material there that didn't go off as a nuclear weapon but you have that impregnated into the pit area where the device went.

That's really interesting.

So that gives you some ideas.

Yes. So you really did a variety of things on the—oh, OK, I know what I was going to ask you. How was your relationship with your boss and your supervisors?

Fine.

Was it like an open door type of thing?

Yes.

Because that's the one thing that in talking with people is that it seems like everybody enjoyed who they worked with and there was all this camaraderie and even at the [REECo retirees monthly] breakfast people really liked each other.

Yes. **[00:58:11]** Lavonne Lewis is who I was trying to think of earlier.

Oh, that was your supervisor?

But I got along very fine with all my supervisors. I had a couple that I had some differences of opinion about.

And then the other thing I was going to ask was I had done some reading about REECo and labor issues. Was there anything like that that you saw while you worked there?

There were some attitudes of the way certain management people felt towards labor and communicating with them. It's the usual: boss sets rules, regulations, management, and then labor complies. And you don't give them a lot of benefits, so to speak, in the process, and so on. I had a different opinion. I was kind of a lone star in that respect that—

How so?

Well, do I want to say it? Basically I guess you can say that when I knew that we had to get a certain number of cables finished by Monday morning so that they could be placed in location in the event, and the tunnel management people said, `Well, Duane, you're going to have to work overtime this weekend, but you don't tell your staff, your employees until Thursday night or` **[01:00:00]** `Friday morning that they're going to work overtime on Saturday and Sunday.` I objected to that.

What was the logic in not telling them?

Well, that was their logic in reference to treating union people. You don't give them a lot of information. And I really objected to that. My feeling is that these guys are here to work, to do a job, and they will work as hard as they can if you treat them properly. Their attitude was that if it looks like they're going to work overtime, that they will slow down and not get the work done so they'll *definitely* work overtime.

They'll milk the clock.

They'll milk the clock. Well, my men that worked for me didn't do that. They didn't *want* to work overtime. And I would tell them, you have to have a hundred and fifty cables done for this event by Friday afternoon. If we don't have them done, then we're going to work overtime. That's your alternatives. And I would tell them that on Monday morning. And nine times out of ten, my men never came to work on overtime. Because they didn't *want* to work overtime. And this'd drive the management people in the tunnels crazy. Well, did they know they were going to work overtime? And I said, Yes, I told them there was going to be overtime if they didn't get this job done. And that's why I was somewhat of an irritant.

The thorn in their side.

Right. Well, several other things are involved in that process. Remember I told you where they would spend an hour, an hour-and-a-half, or two hours to put a connector on a cable.

Right.

And my people did it in fifteen minutes.

And so the tunnel managers were the ones in charge of the people that were taking an hour, an hour-and-a-half.

Yes.

So they probably weren't too, too happy about the new efficiency.

Right. And there was that. And the sort of thing—I had a real go-around at one time with my electricians.

I told them, I says, I'm expecting you to put a connector on every fifteen minutes on an overall average. I know you can't *always* do it because of a variety of reasons, but on an overall average that's the time frame that I allow in order to get this task done. I can put that same connector on in seven minutes.

Oh, you can't put that connector on.

I says, Yes, I can.

So they went out and got a connector and cable and brought it in and put it on the work bench and says, OK, Mr. Lawrence, you put the connector on.

And my whole crew stood there with a stopwatch and I had the connector on in six-and-a-half minutes. They never said another word. But the point was that they knew I knew my job. They knew what I was expecting was not unrealistic. They knew that I allowed them to bend accordingly. We cooked regularly in our warehouse for lunch. We would do barbeques regularly. We would all chip together and bring—you know, I mean, so we worked as a team. I was a part of the team. Even though I was the boss, I was still a part of the team.

And how many men did you have working for you?

Anywhere from fifteen to thirty.

Oh, that's a nice group.

So that was the process that I operated from. And some of the management people up in the tunnels got upset with me and the process that I did, but I always completed my task on time, with good efficient products, and that was—

So you didn't have any problems with the unions or—?

No, I didn't.

Well, that's interesting. But REECo as a whole though had some issues, right?

They had some issues with them, yes.

Were you exposed to that at all?

Oh yes. It wasn't a difficult problem but it was the usual management/labor relationship problems that—

Crop up?

Yes.

Now did you have any anxiety about job security? Because I read that REECo would only get the government contract for a year. So was it every year it was being renewed or was it kind of like—?

It was in a sense. You would really watch it because REECo had three levels of management that they had to deal with. They had to deal with the Livermore contract, they had to deal with the LASL contract, they had to deal with the Department of Defense contract, and—

What was the middle one? LASL?

LASL. Los Alamos. And Department of Defense contract. And so they had all these—and then DOE itself which was the overall mother of the whole project to **[01:05:00]** oversee it. Well, it depended upon how budgets were set up for a group of events. And there's times when it wasn't really us that were going to get laid off as such, but the craft people were laid off. They would reduce the craft people usually by quite a bit.

And the "craft people" you're talking about the union guys.

The unions. Right. And so the management people usually stayed but the craft people—and so you'd have to go through and sort through your staff people, saying, OK, we're going to have to reduce by thirty electricians. We want ten of them to come from your

crew. Which ones do you want to drop? So you'd have to drop ten people out of your crew.

How would you normally drop people? I mean how would you determine who you dropped?

By workmanship and quality of work, dedication to task.

So it wasn't based on seniority or anything like that?

Seniority was a part of it, but we did a quality evaluation of all of our employees twice a year and you would go through and you would evaluate them on a whole gamut of things in reference to what they did and how they did it and the quality of their work, and it was all time-recorded. I had one employee of mine that he didn't like to work on Fridays, but if he worked Friday he wouldn't work on Monday. I mean I could always depend upon him. He was always going to be gone either a Friday or a Monday. And I told him, I said, This has got to stop. I said—

Yes. Would he call in sick or—?

Well, he just wouldn't show up for work, OK? And I says, I depend upon you to be here to do a task. You're part of this team and if you're not here, then that means I shortfall on getting this task done on time, and that's going to stop. And he said, OK. And the next week he'd be gone on Friday. And so I talked to some people and I said, What do I do? And he says, Well, you go ahead and write him up and give him a couple days off without pay. And so I did that. Next week he was gone off Monday. So they said, OK, continue the process. So the next time I gave him a week off without pay. And then he was screaming and hollering because I was picking on him. He said, other people would leave on certain days and I says, I know, but they would come in and make a request in advance as to when they wanted to be off. And I could do some planning accordingly in reference to getting various jobs done. But with you I have no concept as to whether you're going to be here on

Monday or Friday. That doesn't work. And so I ended up terminating him. But that was the worst example I had.

Otherwise you had a real tight—

Yes.

So how often did you have to go through the laying-off process?

Oh, probably every two, three years almost.

Was it very difficult? Did the guys know?

No, they knew it. They knew in advance what was going to happen. I mean they read the newspapers. They hear the news. They talk with people. They have a pretty good concept of what's going on.

So it was usually with the political climate to determine that?

Yes, but what happens with what the weapons is going to be. I mean we were in the midst at that time of the Cold War era with Reagan and what he was going to do in events. He was in the Star Wars [Strategic Defense Initiative] program and what we were doing was Star Wars events, and how much money Congress gave to Star Wars events as to whether we were going to do projects or not do projects.

Yes. So was your group political? Would they talk about politics and vote according to—?

Not necessarily. They voted the usual way that most unions vote.

That makes sense. Well, that's really interesting. Well, so did you move a lot within REECo within divisions and things like that? Because it sounds like you did different tasks so—

Yes, each one of those major changes was a major transfer to different bosses, work locations, divisions, and this sort of thing.

Was REECo pretty much the same within their divisions, or did you really feel a difference when you moved within the company?

[01:10:00] There was some different attitudes in reference to management. There wasn't any *problem* areas. It was just some difference of management attitude. The operations division, which is the one that actually did the work in the fields for the events, that was a labor-boss relationship attitude. In the training department, that was an executive-management attitude. The electronics department was kind of a combination of the two in reference to how they handled it.

Did you get hats and stuff for working on different tests? Because I had seen with I think it was Mr. Owen, he would get a plaque or a like a certificate and a hat for working on different tests. Did you—?

Those are just awards that were given to people.

So did your group not really get that?

No.

Did REECo have Christmas parties and company picnics and—?

Yes.

How were the Christmas parties? Were they pretty nice?

Well, they were fun. I mean it was the usual corporate Christmas party sort of thing and whatever.

Where would they have it?

One of the hotels.

So they wouldn't do it out at the test site.

No. And then they would have usually a picnic in the spring, downtown, for all the families and everybody to all come to, I mean that sort of thing, for the spring picnic. Quite frequently we did

barbeques out at the site. I mean I told you our group did it. Well, every once in a while we'd have a big barbeque of some sort that would—

Now did you have a serious barbeque with brisket and ribs, or was it hamburgers and hot dogs?

Well, it could be both but I mean it's—so.

Well, that's neat. Well, is there—?

Can't think of much of anything else that I did. Has anybody talked to you about the closure that goes into effect in a tunnel, as far as sealing the tunnels off and what happens?

No. Oh no.

Nobody's ever said anything to you about that?

No. What's that like?

Most of the tunnels, where the whole thing takes place has a metal tube in it that generally speaking will be eighteen to twenty foot in diameter on the large end that will go down like a funnel to about twelve inches at the ground zero end. And this whole area then is vacuumed. They pump all of the air out of it so that they get it to a level of a high altitude test. So like this explosion would go off at a high altitude area.

So they manufacture the environment to—

They manufacture a high altitude event. And that's part of what we were doing in the Star Wars testing is to do a high altitude event test. Then you have in the tunnel which goes out like a funnel, and then you have another, what is called the bypass drift, which runs parallel to the tunnel drift all the way down to ground zero. That's where all the work goes. And then you got cut-acrosses at different spots to get into the tunnel, and then you have portals to go in the tunnel to set your equipment up, and places for your cables to go, and so on. When they finish with all the work, then the bypass drift is completely filled with concrete. Now there will be a tunnel the

size of this room that runs that full length now. They fill all this with concrete and they have a pipe about yea-round that they pump all of the concrete from way outside in to fill this. Now you've seen these concrete pumps in town probably that have these big things that pump, you know.

Yes.

Well, they're doing a short-term pump. I mean they're not involved. We would pump out there for maybe three or four days straight, twenty-four hours a day, and we would pump through a pipe about this big for a mile-and-a-half to two miles. So you have to make sure your temperatures are right in your concrete. It has to be cold enough that it won't set. So while we're making concrete outside you mix it with ice.

You'd mix it with ice?

[01:15:00] Yes.

Because you'd be doing this in the summertime.

Yes. We had huge, great big trucks of ice and we would dump ice into the concrete as it's being mixed, so you'd keep it cold so it wouldn't start setting up so it could go through the pipe all the way to where we're doing the backfill. But those are parts of the process of *sealing* ground zero. And you usually come back about, oh maybe five hundred to six hundred feet of backfill with concrete, like that, so everything is sealed. All the cables that come out of that hole area have to be gas-sealed cables. In other words, so high- pressure gas won't run in the cables, so they're sealed so nothing can escape from ground zero when the event goes off. Then you have the one-square-foot hole and then right behind that is where the device sits. Then you come back from that about maybe two hundred feet. Then you have what is called the TAPS [Tunnel and pipe

seal] doors. These are two big aluminum doors that are about that thick and they're about eight foot high, one on each side. And do you know what a nanosecond is?

Yes.

Can you imagine something that weighs a ton moving in two nanoseconds?

No. Did you actually see that?

Yes. So what happens is that you have a combination of extremely high air pressure tank systems along with a miniature explosion-type thing that's behind there so the [snapping sound] doors cross like that in two nanoseconds. OK, that's the first closure seal.

Well, let me pause because we're running out of CD and this is really interesting.

OK, so we were talking about the second—

Right. These doors come closed and then they seal so that your—I think I might've placed this wrong. Maybe the MAC [modified auxiliary closure] door's first. Yes, the MAC door's first and then the TAPS [tunnel and pipe seal] doors.

Now what are the "MAC doors"?

The MAC door is a great big huge door that is up at the top and it folds—goes closed like this [demonstrating]. So it's a slower door—

Like a garage door?

Well no, it's—

But it comes down like that?

Yes. Let me say this is the door [demonstrating] and it goes down like that and it seals the gate all the way around. And that's a much slower door. It's basically almost a gravity fall door in the process. The purpose of the MAC door is to stop large element flows from the nuclear explosion

from coming down the tunnel. It seals, but it—well, yes, I'm right, the MAC door's in front of the TAPS doors. But that's what happens.

And is that made out of steel?

That's steel. That's all steel. Then the TAPS doors, which is the real fast doors, is about another fifty feet to a hundred feet beyond where the MAC doors are. Now the TAPS doors is to stop radioactive material from coming down the tunnel, and that's why it's so fast. Those are set to go off, usually they close the tunnel within four to five nanoseconds *after* the explosion.

And is that due to getting the data?

So they've got all of the electronic *data* from the nuclear explosion down the tunnel, and then the doors close to prevent any *more* from coming down the tunnel to seal it, and that's a part of what *happens*. So most of the data that they want is within the first four or five nanoseconds of a nuclear blast. And so you have the MAC doors preventing *hard* material from coming down the door, TAPS doors from preventing any more electronic material coming down the doors, and that goes down and is read in all of the locations at the end of the tunnel wherever they have their event, the things that they're testing is in that.

Right, because you can't have that cable, that data coming through if you have everything shut off.

Right.

So has an explosion ever happened where a door had malfunctioned?

Not that I'm aware of.

Because that would be high priority to make sure that those doors worked.

We had some problems in Mighty Fortress [Oak]? Yes, Mighty Fortress [Oak]. We had an event, but that was a different *type* of event that happened there. But what happens is that you've sealed off the tunnels, and then these tunnels are reused again.

Oh, they are?

Yes. We go in and we clean them and the MAC is reused again, the TAPS is reused again. And so we go through and clean, take all the radioactive material and everything off of them, so we can go back and we can use them on another event. Because those things are expensive.

Yes. So you can reuse the doors even?

You can reuse the doors and this sort of thing. So anyway, that's what's happened. So your tunnel is vacuumized because there's been a high altitude type event test, above atmosphere, so the pressure that's inside is designed—air will go *in* instead of *out* if there's a crack or something like that in itt—so the whole thing is sealed to keep everything inside at that event test location.

Now how long does it take to prepare a tunnel?

Generally speaking, from the time they first start mining a hole until they do a test in it is about a year-and-a-half to two years.

And then once it's used, how long does it take to clean it up, to get it to be used again?

Well, they go back in usually in about six months afterwards.

To clean it?

Yes, but they wear decon [decontamination] clothes and all this sort of stuff to start cleaning it and then they take the equipment out and it goes to a decon lab where it's completely cleaned.

[00:05:00] *How do they clean a tunnel? Like how do you—?*

Well, you don't clean the tunnel. I mean you wash the tunnel and then you cut the tunnel into pieces again and then that's cleaned and then moved and then so on.

So do they separate out the—?

Yes. You weld the pieces of pipe that they use to make the tunnels, and you have to have very, very *skilled* welders to do this. You just don't take any ordinary welder that might come on. He's got to know exactly what he's doing and it's got to be done just exactly right. It's not a haphazard sort of thing.

Now is it skilled in the sense that they have to be so precise because it has to be strong or—?

It has to be strong, there can't be any holes in it, and all welds are X-rayed to make sure that there are no cracks or leaks or holes in it.

Oh, they're X-rayed?

Yes. And you have a pipe that's twenty foot around in diameter with a weld all the way around the whole pipe, and then the next piece of pipe is brought up to it, set there, and it's welded in place, and so on. So you got welds all the way around from ground zero all the way out, each piece of pipe, generally speaking, oh, about fifteen to twenty foot long.

Yes. So safety was a high priority.

Safety is very much a high priority.

And how much experience did you have with the safety people with your job? Was it—you know, being an electrician?

Well, you do regular safety checks on everything, but you have to comply with certain rules and regulations as to where you can go, when you can go, what times are clear and what times are not. When they're welding in certain spots, you can't be involved in that process. When they're pressurizing the tunnel or depressurizing the tunnel, you can't go in the area where they're doing that because of the safety factors that are involved. I mean those are all safety concerns in the process. But they will go through, seal off the tunnel, pressurize it, put it under full pressure, and

it has to stay that way for forty-eight hours; then if it stays then they say, OK, then we can vacuumize the tunnel now. So that's part of the *testing* processes we go through.

Now was it a difficult learning curve to figure out all of these safety procedures or was it—?

No, not really, if you were at all involved in an attitude of safety. For people who are haphazard and don't care at it, there might be some problems with that, but I don't think there's a real problem.

But could you accidentally just wander into an area that you shouldn't be in and you didn't know or—?

No. It was pretty well a hard way to do it. I mean the secure system's set up so that you just didn't wander into a spot you didn't belong to.

So they had measures in place to where that wouldn't happen.

Yes.

Were you ever a part of a test that vented?

No.

No? Because aren't those signs on the test site, the rad safe, isn't that for venting purposes, to track that if it happens?

It's to identify where they are. Baneberry was one. Mighty Oak was the one I was thinking of that we had to—we had in Baneberry. That was before I started working out at the test site when that happened. We had a couple other ones where we had some gas leaks come up out of a vertical test when I was out there that were not real crisis problem tests. Mighty Oak was a horizontal test and they had some unusual ground motion when they did Mighty Oak. And I don't know exactly what they came up with as to what happened. I have my idea as to what happened and I don't know whether my idea is right or wrong but—

What was your idea?

That you have a ground reflection, and it's kind of hard to explain it without drawing it, which means nothing on the disc [recording]. But when a nuclear weapon goes off and it's above ground—and usually they'll set an above ground nuclear test—you have a shock wave that goes out. Then you have a shock wave that also comes down, in that whole process, that joins the ground, and then it forms an echo. That's called the BY, and it looks like a letter Y of shock formations. You can see the density of air in the process of doing this. This point where it's the leg of the Y coming down is twice the amount of shock wave of the other two shock waves because it's an echo combination of the other two shock waves that were moving. My feeling that what happened at Mighty Oak is that we had too much rain and water that got down into the ground zero area of where we had this formed, so that the ground *density* was much *stronger* as far as providing the shock wave instead of bouncing *out*, it formed the BY in the process of going through the ground.

Yes, that makes sense.

And that's what created the extended shock that we had that tore up the tunnel; it ripped out the insides of the tunnel area. We didn't have any radioactive exposure coming *out* of the tunnel because our sealing system was such that it was closed and it stayed within the tunnel. But it destroyed almost all of the equipment, events, and everything else inside the tunnel. Stuff that was up on top of the mesa, where they had cables going up to the top, trailers were tipped over up there because of the ground movement, and normally that stuff all just sits. I mean there's no problem to it. But we had a much more extended shock wave from that event than the event should have. The device wasn't any bigger than anything else they'd ever done. So we had a lot more happening. I think what happened is because of the amount of *water* that came in there, it

created a change in that shock wave movement, causing the BY movement through the rock, and that's what caused it. Now that was my feeling and I don't know whether it's right or wrong. I'm not a geologist and I'm not a scientist. But my reading and studying I did on the underground nuclear weapons testing program, I looked at all these kinds of things in the process of what happened, and so that was what I thought happened.

So after a test would go off, would it feel like an earthquake or—?

Yes.

Just an average earthquake or would you feel aftershocks?

Depends. There's certain things as to what was involved as to whether you would have a—

Depending upon the test?

Depending upon the test, where it was located. Generally speaking, we weren't at work during the time the event was going off. They'd keep us all home during that day when they would do a test, unless you were on a return location where you were one of the people who went back in right away after the test was done.

How soon would they let people go back in?

Usually within a few hours.

Oh really? So were they ever concerned about aftershocks or—?

No. Because you didn't have aftershocks. Now in the vertical test things, that was a different **[00:05:00]** story because the event would go off, you'd have high pressure in there, then after that pressure had dissipated, then you'd have settling, and that's when you'd get the craters that you see. That is not a crater, because a crater is a blowout. These are depressions, because it's the ground settling into the vacuum area that was created after the device was exploded. Well, sometimes these things'll go within a matter of ten, fifteen minutes. They have been gone two,

three days before they've settled. And so you can't get people anywhere *close* to that thing until it *does* settle. And that can scare you if you happen to be in a work location that's not very far away for it. Well, you're sitting there working on a piece of equipment and [makes an explosive sound]. And so on. But that's one of the things that you have to kind of watch for. But those are some of the kinds of things and so on. We'd watch the crows flying. Crows are funny.

Why?

We'd sit at lunchtime and the crows would be there and they would sit on the cable lines above where we would work and they would challenge each other and they'd sit out there and they'd fold up their wings and they'd dive off just like a bomber, *vroom!* Spread their wings out and sail up in the air and they'd go way up and sail around, come back, and sit down on the power line again, and then another one would do it. They had a ball. It was fun to sit and watch.

So you had crows out there. Were there other animals?

Yes, we had a fox that would wander on every once in a while, and we had a whole flock of ptarmigans came in our warehouse—oh, not ptarmigans, but grouse—came in our warehouse one day. We almost caught one so we were going to cook it, but we didn't.

Well, you're a hunter.

But we had snakes there regularly, rattlesnakes. We'd have to watch for rattlesnakes regularly, to make sure we didn't have the snakes.

Were there scorpions out there?

Yes. We had tarantulas. We used to catch tarantulas and hold them in your hand and let them walk up your arm. They're nice, fuzzy little things.

Really! So you had a lot of critters out there.

And we had coyotes and we had cougars. I saw several cougars out there in the process of being out there. We had wild horses.

Yes, did you see the burros? Were there any burros?

Didn't see any burros out there, but we had wild horses out there.

Did you guys get a mascot? Would you feed any of these animals and—?

No, we didn't, and of course you weren't supposed to either because that created a variety of difficulties.

Oh right, for when a test would go off, you'd want to make sure.

But, you know, you get a coyote that regularly comes to your back door at eleven o'clock for lunch and that becomes a habit. Then let's say that you're gone for a week. The coyote comes at eleven o'clock for lunch and there's nobody giving him lunch. Then he gets upset.

He's going to have an attitude.

Yes, he's got an attitude problem. But that's a part of the problem of feeding animals like that, because if you've been doing it and then you leave, who's going to continue to feed them? Because now they've established a pattern. And so that's why they don't want you to feed any animals.

Did you have any exposure to protesters at all during your days working at the test site?

Somewhat.

Oh really? What was that like?

Well, they blocked the buses a couple times for us when we were coming out to the test site and this sort of thing, and so we'd have to sit and wait until they got out of the way so we could continue on to work.

So they'd block you going in?

Yes, they would create road blocks. On the turn where you come out to the gate, they would create a block. We had one guy that locked himself with a chain to the underneath frame of the bus, so they couldn't drive the bus because he was in there; if they drove it, it'd just wrap him up. And so we were there for probably about forty-five minutes until they finally got him out from under the bus and cut the chain off. And that happened one time. One of the *interesting* **[00:10:00]** events for the protesters, I was at the site. I came home and Jean's cousin, my wife's cousin, was visiting and she had arrived during the day, and she was telling me about what she did all day. And I said, `Well, that's where I was.` And she's a protester that had come from back East and she was all fired up about this whole thing about nuclear weapons being tested and whatever and so on. And I says, `Well, what do you think I do all day?`

She knew you worked there.

No, she didn't. She didn't know I worked there, and that was rather interesting.

That's interesting. So were you guys amicable with each other?

Oh yes, we continued on our—I mean we were—she didn't get violent about the whole thing. It was rather interesting.

Oh, how funny. So how many times did you experience protesters? Were there time period like years where it was heavier than normal?

Usually around Good Friday, was usually a time for protests.

Oh really? Do you know why that was?

It's a part of when they did their annual thing out here and so on. They'd camp out there in the mountains around the gate at the entrance to the—and you have all these people and they have big get-togethers in the middle of the night and whatever. We had several things that happened that were kind of weird out there in the process of—pipe fitters were an unusual union.

Oh yes?

They're somewhat on the wild side. And protesters were raising their banners and flags and so on. Well anyway, the bus came in and there was a moon in every window as we went past them. It was all pipe fitters.

That is funny. They were the wild boys. Oh, that's funny.

But, fact is, that's some of the weird kind of things that happened.

But for the most part, protesters didn't get on to the site.

No, they didn't get on the site.

And how many would be there?

Anywhere from five to a hundred or so.

Now would they corral them into those—because I saw the gates.

Yes.

So they'd hold them there?

Yes, and then they'd haul them off to Beatty or to Tonopah where they'd put them in jail and let them pay their fine and send them on their way.

Now did they all look the same? Was it like a certain type or were they—?

Yes, like you. Young radicals.

Do you think I'm a young radical?

But they're just normally, generally-speaking, young people. One of the protesters that was out there was a guy by the name of Kerry.

Was John Kerry really out there?

Yes. Not too many people know that.

I didn't know that. Was he a senator then or was he in politics?

No, he wasn't a senator then. That was before he became a senator.

Was he speaking or something? Is that how you knew he was out there or—?

He spoke out there, yes.

That's really interesting. So I take it you're not voting for him.

Oh yes.

Oh, you are?

So as far as your politics and your view of nuclear energy and nuclear testing, weapons testing, are they the same as they were when you went in, started working? Have they changed at all or—?

I'd say that it hasn't changed a bit in reference to what my feelings were before, as it what it is afterwards. The essential systems that were involved in nuclear weapons testing is an important part of our whole government's direction and attitude, and it was right. There was nothing wrong with that. There was some politics that were involved that were wrong. There was some education of people outside of the test side was wrong. What happened with the expansion of drifts of radioactive material up into Utah and so on, people really weren't told enough information in the process of what took place. I mean these are the things that were wrong. Not that we *did* it is wrong. It's how people were educated as to what was wrong, is what I felt.

How so, the education part?

Well, if you're going to have—a test goes off and there's a high possibility of a nuclear fallout **[00:15:00]** coming over this area, you can't stand out and watch this cloud fly over the top of you. They should've been told to get underground or inside a building and not be looking at it. If you have livestock that is in a area where this is going to go through, move the livestock and we

will pay for the movement of that livestock out of this area so that they're not contaminated. Because we lost a lot of sheep up in Utah in the process and so on. Why those sheep died, nobody will say.

Yes. Right. Well, I talked to a lady that works for the AEC [Atomic Energy Commission] and she said that the official take on that was that they ate something.

Yes, that's what I'm saying. Like you said, nobody will say. The point is that we did not properly *educate* these people that are in the possibility of being contaminated, and we should have. Some of the events that were first done when the soldiers were out there and they did the above ground tests with these soldiers, these people weren't given the proper education to prepare themselves for what it would be like in a nuclear weapons test. That's the problem that I had. Not that they *did* the test. It's that the people who were involved weren't given the proper education to the dangers of what they were doing.

But by the time you worked for the test site, do you think that that was rectified? Do you think the public—?

Not completely.

So you think the public still *was kind of in the dark as to—*

That's right.

Did you encounter that with your wife's cousin? Did she know enough about nuclear testing to have an educated protest or—?

No, She had no clue.

She just knew it was nukes and it was—

Yes, right. "Anything that's nuke is bad" that was a part of it. My feeling in reference to what's happening at Yucca Mountain is that Yucca Mountain shouldn't be here, because there's places

in Texas that are a better place to put it than here. But because the politicians in Washington didn't *want* it in Texas, that's why it's here. But I'm not *afraid* of Yucca Mountain being used as a nuclear storage area. What I'm *afraid* of is the transportation of nuclear weapons or nuclear stuff from a power plant *to* here.

Yes, that makes sense.

That's where my real dangers are. And I feel that way because of when I taught the Department of Transportation on hazardous material handling. The rules and regulations that are written for handling and transporting hazardous material are not complied with, because they can make *money* by not complying with it. If companies that are involved in transporting radioactive material are going to have the same kind of attitude that: `If I can build a unit that ships this stuff out here cheaper than this other guy over here, then I'll make more profit, and so I'll just hope that my truck isn't involved in an accident on the way out here.` I mean that's what I say is what scares me, and I cite the example of what happened in Laramie, Wyoming. A truck came into Laramie, pulled up to the truck stop, driver got out and started doing the walk around and around his truck, and he heard a *pow-pow-pow* going on inside his truck, and he just took off running, and this other driver says, `Where are you going?` And he says, `I'm getting out of here before that truck goes.` And the other guy knew what he was hauling.

What was he hauling?

It's a component factor of chemicals that if you get it wet it'll explode. Well, they just came through a blizzard between Laramie and Rawlins—I don't know if you've ever been in a blizzard in Wyoming—but it's real, real fine snow and it just feeds through any crack that you've got. Well anyway, it fed into this truck. Well, the second driver grabbed the truck, got in the truck, drove immediately out into the country just about two, three miles out of Laramie;

drove right through the barbed wire fence out in the field, and ran back to the ditch and got back just at the time his truck went off. Well, it blew parts of the truck about two miles away, put a hole in the ground about twenty foot deep. Now this truck was sitting in a truck stop. Right across the street from that truck stop was a grade school.

That could've been tragic.

[00:20:00] That's right. Now, here's somebody that did not put the stuff in plastic sealed bag because that's what the requirement is, that this stuff be packaged in waterproof containers. The contractor packaged it in regular paper cement-type bags instead of plastic sealed bags.

Because it was cheaper?

Because it was cheaper. And I can say to you other very similar sort of things to that in reference to noncompliance of Department of Transportation rules and regulations. Well what's going to happen with the transporting of nuclear waste? Is it going to be in *full* compliance of rules and regulations or is businesses going to get into it and say, `Well, this is a good way for us to make money and we will cut the systems that are required for us to do, and so on.` That's my worry. That's my concern.

Right, because you're increasing the human factor. Now where is this nuclear waste going to be coming from?

It'll be coming from every nuclear power plant in the United States.

So Texas would be a more central—

Texas could be more central. But you have a component factor of what are called salt domes in Texas that would be a much better place for this nuclear waste to be stored in than in the volcanic tuff that they're going to use out there. The salt domes don't have a water flow problem in them. You have a water flow problem in volcanic tuff. I mean there's some problems that are there but I think they can work around these problems. But I'm worried about getting the stuff

from Minnesota to here, from Texas to here, from Sacramento to here, from [unclear name] in California to here. Every place there's a nuclear power plant has spent fuel and they've got to transport it to here.

Where are the salt domes in Texas?

South and west of Dallas. But the power structures of Texan political power just kept it completely out of Texas, and that would've been a much better place to build it than right here.

Right, and then with Bush in office there's no way.

But that's part of it. But I don't have any objections to it *being* here, other than I'm worried about it *getting* here.

So you don't have any safety issues once it is here.

No. I worked in Area 15 where they put in nuclear waste storage dumpsters to do the testing on what it would be like to store it in a granite rock, which is one of the only few areas in the state of Nevada has granite. And they put a mine in there and they stored nuclear spent fuel in domes in there to determine what the heat transmission is, problems within granite *versus* volcanic tuff. I've been in a couple other areas where they've put in spent fuel, as far as tests, and know what they're doing in the process. I know what kinds of things that they're trying to come up as a waterproof solving situation so that even though over a thousand years this stuff won't dissolve. The other advantages that you have with what they're doing at Yucca Mountain is that we're putting the spent fuel in, in such a way that it can be retrieved. So even though we're looking at spent fuel not being a safe product for a thousand years, in thirty years they might have developed a way of taking that spent fuel out and getting rid of it as a hazardous material. And we can *do* that out at Yucca Mountain the way they're doing it. So to me that's a positive approach as to what they're doing.

What do you think is the most glaring aspect of the test site and nuclear issues that you think that the public is uneducated about? Does that make sense? What is the public's most glaring misconception of the test site and nuclear energy and nuclear weapons?

They have no concept of what "nuclear" is. They think "nuclear," they think "bomb." They have **[00:25:00]** no idea that there's levels of radioactive components that are good and are bad. Every time you get an X-ray, you're getting radioactive components. Every time you're using your microwave, you're having radioactive components. Every coal-powered power plant in the United States drops uranium fallout out of the coal that was burned in that coal power plant and it falls within a distance of fifteen to twenty-five miles around every coal power plant in the United States. Nobody knows that. *But* you put "nuclear" and it immediately becomes a crisis. Sacramento Public Utility District built a huge, beautiful nuclear power plant that could produce enough electricity to provide all the power that San Francisco needed, and all the power Sacramento needed, and a good part of the northern Bay Area, for electricity. But the citizens of Sacramento got all bent out of shape because it was a nuclear power plant, and before that plant even started producing at full level—they were only producing at about 30, 40 percent level—they closed the plant down. So now they have a great big huge nuclear power plant that they can't do anything with. And there's no reason for that. Because people are afraid of the word "nuclear."

So you think it's a hysteria now that—

Yes.

In the 1950s everybody was real *happy with it and now* my *generation, you say "nuclear" and it's just bad.*

Yes, right. I've held a piece of plutonium in my hand. I had a ball about this big, I held it in my hand. I've worked with uranium and so on. For example, we took sheets of plutonium that looked just like X-rays and they were stored all in a gallon coffee can in the safe. We took those sheets of plutonium out, we put them over on a table, and then we put a one-inch-thick piece of Plexiglas down on top of it, and then we put another plutonium and then another one-inch until we had stack up, and we got up to about nine or ten sheets like this. Then our instructor told us to take and start another stack next to it. So we did. And so we got that and he says, `OK, now we'll go back to the control station`. So we went back about three-quarters of a mile to the control station, and at the control station we brought this stack up and started to slide it over the top of this stack [demonstrating procedure] and we went to a critical mass. And then he hits a button and everything flies apart so we don't go into a full critical mass. Now here's fifteen, twenty sheets of plutonium wrapped together, sitting in a gallon can in the safe, but as soon as we start stacking them with Plexiglas in between each one, we start having the rays that come out of plutonium bouncing back into each other. Where before they were just going out into space, now they're coming back into each other, and when we start to get more of them on top of it, then we have a critical mass function. So people don't understand what that is. And they talk about what are the dangers in reference to these sorts of things? I mean how can you hold a piece of plutonium in your hand like that? My hand got warm.

Did it really?

Yes, I could feel the warmth coming off of this piece of plutonium. But there was no danger to me from it because the rays that were coming off would not penetrate my skin. It would not penetrate a piece of paper. Would not penetrate my cloth in my clothes. But if I put a piece of plutonium inside my *mouth*, then I'm in a critical state situation.

See, but people don't know that. Now did you have to wear a radiation badge all the time?

Yes, all the time.

Did you ever have a scare with that, with—?

I never had a high reading.

You never had a high reading?

No.

And see, I think that that's the other thing that people are afraid of, is when you say "nuclear" it's radioactive material and it's the waste and how do you clean up an environment and—

At CP below—have you ever been out to the test site?

Yes. I took a tour.

Do you remember where CP was? That's the control point at the top of the flats before you look out at Yucca Lake?

[00:30:00] *Yes.*

Down the road to the right and down the bottom there was a cleanup station. And equipment and everything is brought into the cleanup station and is cleaned and scrubbed. And it can be covered with radioactive material but it's cleaned and scrubbed. And all the water and everything that's taken out of there that's scrubbed is held as a radioactive component factor and it's handled as waste. But the equipment is now clean and no longer a radioactive contaminated object. And that's a part of what they do.

But then that water still is radioactive, right?

Right.

And how long does it take before it's safe again?

Depends on what radioactive components they had in it. Some could last for a week. Some could last for six months. Some could last for five, six years. Or some could last for a hundred years.

And it just depended upon the—

The half-life time frames of each one of the component factors.

Yes. I think that the majority of people, when you say "radioactive" it's just this vision of glowing and [the movie] Silkwood.

Yes. When I worked out at the test site, you turned the lights out, you'd just see me glow. But that's part of what people—they don't really know. I used to get into discussions with my wife about it. We don't talk about it anymore because she has her opinions and I just let her have her opinions and that's the extent of it.

Is she against nuclear testing?

Yes.

That must've made it interesting.

But it wasn't a problem. She wasn't against nuclear *testing* but she was against what she considered dangers of where I was working.

Yes, that would cause concern.

And she doesn't understand that where I was working were basically as safe as any factory that I wanted to work in. I mean nuclear was a part of what we were *aiming* at, but we weren't really faced that much with nuclear. When I was doing the UNWTOP program, I was involved in a variety, all over the test site. We would take people out to Frenchman Flats and we would walk through the areas of Frenchman Flats which has some long-term contaminated material in the ground out there. And so you come back and shake your feet off and make sure that they're clean and get in the vehicle and go on. But I mean the point is that these guys would get out and they

could see this stuff. Well, we weren't contaminated. We could pick up contaminated material, but it wasn't a problem that we had to worry about. You'd go up above Area 12 in where they had one of the first crater explosions and that created some contamination on the sides of the mountains. Well, we wouldn't walk in that area. We'd *drive* past it but we wouldn't get out and walk in it because that was of a completely different type of radioactive component parts. And time frames were different too.

So you were all very aware of the test site and what each part of it had and then the relationship of radioactive material on it.

Right.

But your wife still, she saw the test site as glowing and—

Yes, right.

And you're working there.

Yes. And my three children, I have three daughters, and one's a doctor and the other two are teachers, and they're education of listening to us talk varies. I have one daughter that has absolutely no objection to anything that I've done and feels completely safe about it. My younger daughter, No way! That's stuff's bad. Keep it out of here attitude. And so on. But that's the process.

Well, that's interesting. But you guys talked about it.

Oh yes.

But there were aspects of your job though that you couldn't talk to with your wife.

Yes.

How was that? Was that—?

No problem.

No problem? But you had other people on the site that you could talk to about what you were working on and—

Yes.

Because that's something that we're looking at too, is families. And the whole idea of secrecy and how fascinating that is if that's part of your job, because that's not a normal aspect of people's work.

Right. I could talk to her about cables that I had all kinds of trouble with today, the doggone thing had a leak in it and we couldn't find out where the problem was, and this sort of thing, **[00:35:00]** I could tell her about that, but I couldn't tell her that that cable went to a specific location that was—what it was involved in the process of doing.

Right. And did she care or—?

No.

No? That was just part of your job.

That's part of my job.

Did you ever think about that these were weapons that you were testing and the use of atomic weapons, and did you have a position on that or—?

That is a part of our whole defense structure of the United States and I have no objection to it.

And you saw it as, it's necessary and—

Yes. I spent four years in the Navy. I spent two years in Korea. I worked with the military for a total of three-and-a-half years. And so, I don't have a problem with that whole process.

And were you able to communicate that with your wife's cousin?

You could not communicate with her. There was no communication.

There was no meeting of minds. Well, is there anything else that you'd like to add?

I can’t think of—I don’t think so.

Well, thank you very much.