Type B Accident Investigation Report of the July 25, 1997 Contract Brush Cutter Injury on the Ashe-Marion #2 500 kV Line

Final Report

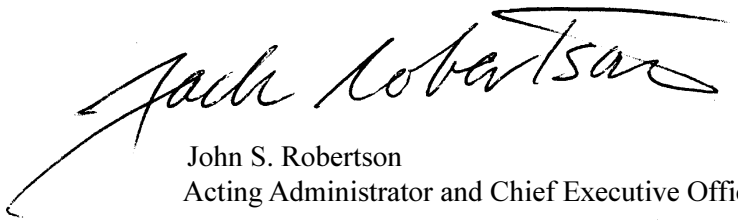
19 November 1997

DISCLAIMER:

On July 29, 1997, Randall W. Hardy, Administrator and Chief Executive Officer for Bonneville Power Administration established a Type B Accident Investigation Board to investigate the July 25, 1997, contractor tree falling - electrical arc injury which occurred on the Ashe-Marion No. 2 500kV Transmission Line right-of-way. The duly appointed Board's responsibilities have been completed with respect to this investigation. The analysis, identification of root and contributing causes, and judgment of needs reached during the investigation were performed in accordance with DOE Order 225.1, Accident Investigations.

As stated in BPA's Memorandum to Tara O'Toole, Assistant Secretary, Environment, Safety and Health, dated August 5, 1997, we have developed a proposed Construction and Service Contracting Implementation Plan. This plan was transmitted with a cover memo dated October 30, 1997. The proposed changes to BPA's contractual obligations related to contractor safety and contract language, and corrective measures identified in this accident and the April 25, 1997, and June 25, 1997, contractor accidents.

I hereby accept the findings of the Board and authorize the release of this report for general distribution.



John S. Robertson
Acting Administrator and Chief Executive Officer

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EXECUTIVE SUMMARY

INTRODUCTION

On July 25, 1997, at 1205 hours, a contract hand brush cutter was seriously injured when he felled a tree close to a Bonneville Power Administration energized transmission power line, located within a BPA transmission-line corridor.

On July 29, 1997, Randall W. Hardy, Administrator and Chief Executive Officer for the Bonneville Power Administration (BPA), appointed a Type B Accident Investigation Board (AIB) to investigate the accident in accordance with Department of Energy (DOE) Order 225.1, *Accident Investigation*, and BPA Manual Chapter 181, *Accident Investigation and Reporting.*

ACCIDENT DESCRIPTION

The accident occurred at 1205 hours on Friday, July 25, 1997, when a contract hand brush cutter, employed by Chaparral Reforestation, Inc., of Independence, Oregon, felled a tree close to the B-phase conductor on the Ashe-Marion #2 500-kV transmission line. The scene of the accident was on the right-of-way (ROW) containing the Ashe-Marion #2 and Buckley-Marion section of the Ashe-Marion #1 double-circuit 500-kV transmission line and the single-circuit John Day-Marion #1 500-kV transmission line. The accident site was approximately 227 feet east of structure 200/2 (second structure in the 200th mile) of the Ashe-Marion #2 line. This structure is 53 line miles east of BPA's Marion Substation, with the ROW under the jurisdiction of the Bureau of Land Management. The contract in place was for hand brush cutting and vegetation services on the right-of-way under the Ashe-Marion #2 and Buckley-Marion Section of the Ashe-Marion #1 and John-Day-Marion #1 500-kV transmission lines. Work began on January 20, 1997, and was to be completed on or before September 30, 1997.

At the time of the accident, the work assignment was vegetation control and brush cutting (including trees) both ahead-on-line (AHOL) and back-on-line (BOL) of structures 101/2 on the John Day-Marion #1 500-kV line and 200/2 on the double-circuit Ashe-Marion #2 and Buckley-Marion Section of the Ashe-Marion #1 500-kV lines. The transmission-line corridor for this work site is 292.5 feet wide.

On July 25th, at approximately 0700 hours, fourteen Chaparral employees and the Chaparral head foreman arrived at the work location and began work. A Cinebar Services contract inspector/monitor arrived at the work location at approximately 0720 hours. There was no "Tailgate" safety meeting conducted prior to the commencement of work that morning. The brush cutters began cutting vegetation, brush, and trees, about a half span AHOL from structures 200/2 and 101/2, until approximately 1100 hours. They took their normal lunch break until 1130 hours.

At approximately 1130 hours, the brush cutters split into several work groups. Two brush cutters went to remove brush and trees that remained, AHOL, west of structures 101/2 and 200/2. One group of seven brush cutters, including the head foreman, remained at the landing area, either adjacent to or under the structures. The remaining group of five brush cutters, including a lead foreman, reviewed the work area BOL and determined that there was adequate clearance between the trees to be cut and the conductors overhead. After this determination and discussion, they began cutting BOL and downhill from structures 101/2 and 200/2. One brush cutter was approximately 50 feet downhill, south of the accident site; one brush cutter was approximately 30 feet downhill, to the north side of the corridor; and one brush cutter was north of the accident site, parallel to the injured employee. The remaining brush cutters were spread out on the hillside.

At 1205 hours, the brush cutter/victim began to fall a 34.5-foot tree, base diameter of 7 1/2 inches, located adjacent to the Ashe-Marion #2 500-kV line. The brush cutter made a single cut into the base of the tree. As the tree started to fall, it broke away from the stump, leaving approximately a two-foot section of the stump attached to the butt of the tree. As the tree fell, the top portion came within arcing distance of the B-phase conductor on the Ashe-Marion #2 500-kV line. This arc produced a phase-to-ground fault that evolved into a phase-to-phase-to-ground fault condition. Based on reported 1200-ampere currents, the gradient voltage around the tree base is estimated to have been 30 to 40 kV to remote earth. That would have resulted in a step potential, bridged by the victim, of nearly 10 percent, or 3 to 4 kV. The two-foot section of the stump was still attached to the tree butt, as well as with the ground, which completed a ground-fault path. When the brush cutter saw the tree falling, he turned and started to step uphill, away from the falling tree. He stated that he froze, in a hunched-over position, due to a severe shock received from the fault. Both his hands remained on the chain saw, with no part of the saw touching the tree or tree stump. After the faulted line cleared, the brush cutter fell downhill and was found adjacent to the north side of the fallen tree.

The other brush cutters on the hillside reported that they heard an explosion, or loud noise, saw a flash, or bright light, and smoke coming from the area where the tree had fallen. They immediately ran to the victim and saw that his clothes were smoking and had been on fire. They noticed, also, that the fallen tree butt was on fire, as were some of the surrounding tree limbs and brush. They promptly called for a stretcher and fire extinguishers. They put out the fire, placed the victim on a stretcher and began to transport him up the steep slope to the landing area, adjacent to the structures, approximately 250 feet away. The victim complained that his back and feet were hot.

Upon hearing that the accident had occurred and that there were burn injuries, the head foreman immediately hollered and waved to the Cinebar Services contract inspector/monitor, who was within sight, in his vehicle. The inspector/monitor returned to the landing area; the head foreman called 911 on his cellular phone for medical assistance. The head foreman left the accident site to make sure that the road was passable, the access highway had been under construction. After the victim was placed in one of the work vehicles, the inspector/monitor led the way from the accident site to the paramedics in the ambulance, on the main highway, approximately 20 miles away.

The first medical response was provided by American Medical Response Northwest, from Sandy, Oregon. After initial evaluation, the paramedics removed the victim's clothing, notified LifeFlight, from Portland, Oregon and transported the victim to the Ripplebrook Forest Service Ranger Station. At Ripplebrook Ranger Station, the victim was transferred to LifeFlight and flown to Legacy Emanuel Hospital. After evaluation by Emanuel Hospital emergency room personnel, the victim was transferred to the hospital Burn Center.

ROOT & CONTRIBUTING CAUSES

The Board identified five Root Causes for this accident. These Root Causes, if eliminated, might have prevented the accident.

- Chaparral failed to ensure that only properly trained and experienced employees were allowed to fall trees adjacent to, or under, electrical power lines.

- The work-site foremen and workers failed to recognize electrical hazards in the area where the tree was to be fallen.

- The Cinebar Services inspector/monitor, the most knowledgeable person on site, was not required to, and did not, take part in the discussions or decisions pertaining to overhead electrical hazards or the cutting of the tree involved in the accident.

- Due to the angle of the conductor and the slope of the hillside relative to the tree, the setting was deceptive. The situation was not recognized by anyone as an electrical hazard.

- Neither the victim, the foremen, nor the Cinebar inspector correctly estimated the location of the conductor relative to the fall path of the tree.

In addition, the following Contributing Causes were identified:

- Brush was allowed to grow higher than desirable for maintenance by brush-cutting contractors.

- Chaparral management had no training records to show that workers and supervisors were properly trained to perform their assigned tasks in a safe manner.

- Chaparral failed to assure that safe work procedures were implemented.

- The Cinebar inspector was unable to confirm that the Chaparral foreman adequately communicated work assignments to all members of the crew, due to the English/Spanish language barrier.

- The tree-falling technique used was inappropriate for this particular tree considering the imminent overhead electrical hazard.

RESULTS OF THE INVESTIGATION

After an on-site investigation and review of all statements by Chaparral employees and the Cinebar Services inspector/monitor, the accident investigation revealed that worker knowledge of electrical hazards and tree falling was less than adequate. There were no training records of work experience with relevant brush control/tree-falling requirements. Their tree-falling experience was less than adequate, as evidenced by the inspection of the work site. Established Federal and State rules and regulations for tree cutting were not followed. Contract specification language needs to differentiate between tree falling and brush cutting. No on-site Chaparral employee held a current First Aid/CPR card. Contract language needs to clarify safety requirements such as training records, First Aid/CPR qualifications, and work-site communications.

ADDITIONAL INFORMATION

BPA will review the investigator's report from the Oregon Occupational Safety and Health Division (OR OSHA) to obtain additional information pertaining to potential rule violations, including any previous contractor citations and/or documentation of unsafe working practices or procedures, for brush cutting, vegetation control, and tree falling.

CONCLUSIONS

- The contractor must have experienced, qualified tree fallers, with knowledge of relevant brush control/tree-falling requirements, on site at all times.

- All contractor employees must have knowledge of electrical hazards associated with tree falling activities.

- All contractor employees at work locations must be certified in First Aid/CPR and capable of performing according to all Federal and State certification requirements.

- Adequate communications must be assured when two different languages are spoken.

- BPA contract language needs clarification and strengthening regarding safety responsibility, rules enforcement, and authority to stop work.

- Appropriate regulatory agencies, as well as the BPA Safety Office, need to be notified promptly about project commencement, locations and scope of work.

JUDGMENTS OF NEED SUMMARY

The conclusions determined by the AIB clearly show that contractors must employ verifiably qualified and experienced brush cutters and tree fallers. All critical aspects of a project must involve someone who can assure that speakers of different languages are truly communicating the same information. Potentially hazardous work-area situations must be thoroughly inspected and appraised for significant safety hazards before work activity is permitted. Someone certifiably capable of providing First Aid/CPR must be present on site at all times. Finally, once BPA contractual language is strengthened to reflect the Board's conclusions, prework meeting(s) must be held to thoroughly clarify these issues for service contractors.

TYPE B
ACCIDENT INVESTIGATION REPORT
OF THE JULY 25, 1997
CONTRACT BRUSH CUTTER INJURY
ON THE
ASHE - MARION #2 500-KILOVOLT (KV) LINE

This is a report by the Accident Investigation Board (AIB) formed to investigate the electrical shock injury sustained by an employee of Chaparral Reforestation, Inc., Independence, Oregon. Chaparral was performing brush cutting operations under a service contract with the Bonneville Power Administration (BPA).

1.0 INTRODUCTION

1.1 Background

On July 25, 1997, at 1205 hours, a contract brush cutter for Chaparral Reforestation, Inc., was seriously injured when he felled a tree close to a BPA energized transmission power line, located within a BPA transmission-line corridor.

On July 29, 1997, Randall W. Hardy, Administrator and Chief Executive Officer for the Bonneville Power Administration, appointed a Type B Accident Investigation Board to investigate the accident in accordance with DOE Order 225.1, *Accident Investigation*, and BPA Manual Chapter 181, *Accident Investigation and Reporting.*

1.2 Site Description

The accident site is located on the right-of-way (ROW) containing the double-circuit Ashe-Marion #2 and Buckley-Marion section of the Ashe-Marion #1 500-kilovolt (kV) line, and the single-circuit John Day-Marion #1 500-kV line. The accident occurred at the base of a 34.5-foot white fir tree, approximately 227 feet east of structure 200/2 (second structure in the 200th mile) of the Ashe-Marion #2, about 53 miles east of Marion Substation. The ROW at this location slopes approximately 80 percent downward, back-on-line (BOL), with a corridor width of 292.5 feet. The contract work in progress was part of an overall project that included significant brush cutting, vegetation control, and tree falling within the ROW containing the three power lines, and extending from Marion Substation, Stayton, Oregon, east to structure 101/2 (second structure in the 101st mile) on the John Day-Marion 500-kV line (See Fig. 1).

At the time of the accident, fifteen Chaparral employees were performing the following work at the accident site: Seven brush cutters were cutting brush and trees in the landing area, either adjacent to or under structures 200/2, on the Ashe-Marion #2 line, and 101/2, on the John Day-Marion #1 line; the head foreman was also working at the landing, adjacent to structure 101/2; two brush cutters were working ahead-on-line (AHOL), (See Exhibit 1), west of the landing area; and five additional brush cutters were spread out on the hillside, BOL, downhill from the two structures (See Exhibit 2). One brush cutter was approximately 50 feet downhill and north of the accident site; one brush cutter was approximately 30 feet downhill and to the south side of the corridor; and one brush cutter was south of the accident site and parallel to the injured employee. A Cinebar Services, Inc., contract inspector/monitor was on the BPA access road leading away from the landing area, AHOL, approximately 100 feet south, leaving the site in his vehicle, but within sight of the head foreman.

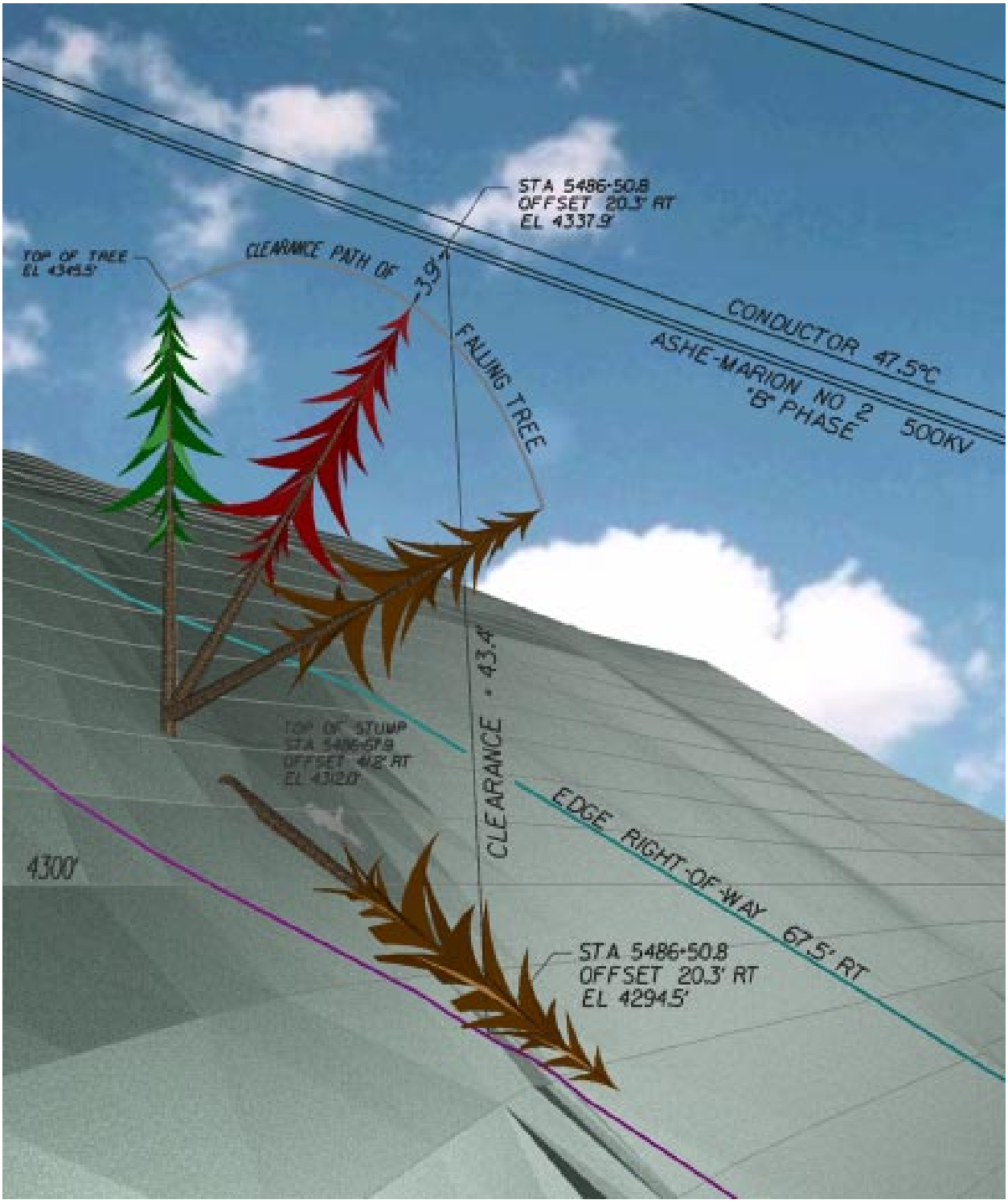


Figure 1 - Sketch of Accident Site

Exhibit 1 - Shows brush cutting at landing area, adjacent to two transmission line structures.

Exhibit 2 - Overview of work location and looking AHOL towards the two transmission line structures.

1.3 Scope, Conduct, and Methodology

The initial accident investigation commenced on July 25, 1997, with the investigation team headed by BPA Safety Office DOE-trained accident investigators. This investigation continued until July 29, 1997, when Randall W. Hardy, Administrator and Chief Executive Officer, Bonneville Power Administration, upon approval of the US Department of Energy, appointed a Type B Accident Investigation Board to investigate the accident in accordance with DOE Order 225.1, Accident Investigations, and BPA Manual Chapter 181, Accident Investigations and Reporting. The Board commenced its investigation on August 5, 1997, completed the investigation on September 4, 1997, and submitted its findings to the BPA Acting Administrator and Chief Executive Officer on November 19, 1997.

The scope of the Board's investigation was to review and analyze the circumstances to determine the accident's cause(s). The Board evaluated numerous types of issues associated with the accident, including environmental factors such as weather and terrain, regulatory requirements, tree-falling practices, language barriers and electrical conditions. The Board also considered the adequacy of both the contractor's safety management systems and work-control practices. Additionally, the Board reviewed and analyzed present BPA contractual language, examining the role of BPA's contractor personnel safety standards, as well as other utilities' contractual language, practices and standards for safety and health procedures. The Board also considered whether prevention measures failed or did not exist, and whether successful performance by Chaparral and Cinebar could have prevented, or mitigated, the severity of the accident.

One purpose of the investigation was to determine if there were any deficiencies in contractor safety management systems, contract employee training and qualifications, or in the interpretation of contractor-acceptable safety practices that might have caused the accident. Another was to examine BPA's role in contract compliance issues.

The Board focused its investigation using the following methodology:

- Gathering facts relevant to the accident through interviews, documentation and physical evidence reviews and site visitations.
- Reviewing BPA contractual practices and language.
- Reviewing contractual practices and language of several private, public, and governmental agencies or utilities.
- Analyzing facts and evidence providing supportive correlation and identification of the accident's causes.

Based on analysis of the data, judgments of need for corrective actions to prevent recurrence will be developed.

2.0 FACTS AND ANALYSIS

2.1 Background and Accident Description

The accident occurred at 1205 hours on Friday, July 25, 1997, when a contract brush cutter, employed by Chaparral Reforestation, Inc., Independence, Oregon, fell a tree close to the B-phase conductor on the Ashe-Marion #2 500-kV transmission line. The contract for hand brush cutting and vegetation services on the ROW, under the Ashe-Marion #2 and Buckley-Marion section of the Ashe-Marion #1 double-circuit 500-kV line and the single-circuit John Day-Marion #1 500-kV line, began January 20, 1997, and

was to be completed on or before September 30, 1997. The scene of the accident was BOL, approximately 227 feet east of structure 200/2 (second structure of the 200th mile) of the Ashe-Marion #2 500-kV transmission line. (See Exhibit 3)

Exhibit 3 - Overall view of the two structures, including AHOL and BOL work areas.

On the day of the accident, 14 Chaparral employees and the Chaparral head foreman arrived at the work location and began work at approximately 0700 hours. The Cinebar Services inspector/monitor, whose major role is inspection of accomplished work, as well as quality assurance, arrived at the work location at approximately 0720 hours. The brush cutters began cutting vegetation, brush, and trees about a half span, AHOL, from structures 200/2 and 101/2. According to statements there was no "Tailgate" safety meeting conducted prior to the commencement of work that morning. The crew worked until approximately 1100 hours and took their normal lunch break until 1130 hours. (See Exhibit 4)

Following lunch, the brush cutters split into several work groups. Two of the brush cutters went to

Exhibit 4 - Landing area where work vehicles were parked and where they had lunch.

remove brush and trees that remained, AHOL, west of structures 101/2 and 200/2. One group, including the head foreman and the inspector, remained at the landing area; the crew continued to cut brush adjacent to and under the two structures. The remaining group, including a lead foreman, examined the pending work site, BOL, and determined that there was adequate clearance between the trees to be cut and the conductor overhead. After this determination and discussion, they began cutting, BOL, downhill from structures 101/2 and 200/2. (See Exhibits 5 & 6)

Exhibit 5 - View BOL showing area to be worked.

Exhibit 6 - View AHOL showing area that had been previously worked.

Exhibit 7 - Area of work, BOL, from structures downhill and to accident site, by trees on left of picture.

Exhibit 8 - Two trees adjacent to accident site, showing fire indication on the tree and proximity of trees to the overhead power line.

For the next 30 minutes, the brush cutter/victim cut brush and trees for approximately 60 feet, from the skid road down the steep slope. (See Exhibit 7) He then began to cut a white fir, approximately 34.5 feet tall with a base of 7 1/2 inches, that was one of four trees adjacent to the Ashe-Marion #2 500-kV transmission line. (See Exhibit 8) The brush cutter made a single cut into the uphill side of the tree, at the base. As the tree started to fall downhill, it broke away from the stump, leaving about a two-foot section of the cambium layer of the tree still attached to the butt of the tree. The tree fell close to the B-phase conductor on the Ashe-Marion #2 500-kV line. (See Figure 2) B Phase is the lowest conductor at this point on the line. The top portion of the tree arced from B phase-to-ground,then evolved to C phase, creating a phase-to-phase-to-ground fault. The two-foot section of electrically-conductive tree cambium was still attached to the tree butt as well as to the stump. This created a ground fault path. After the tree started to fall, the employee tried to step uphill, away from the falling tree. He stated that he froze, in a hunched-over position, due to a severe electrical shock received from the fault created by the current conducted through his lower body; the current entered through his left foot and exited from his right foot. Both hands remained on the chain saw with the saw blade in the air. After the faulted line cleared, the employee fell downhill, adjacent to the butt of the fallen tree. (See Exhibits 9-14)

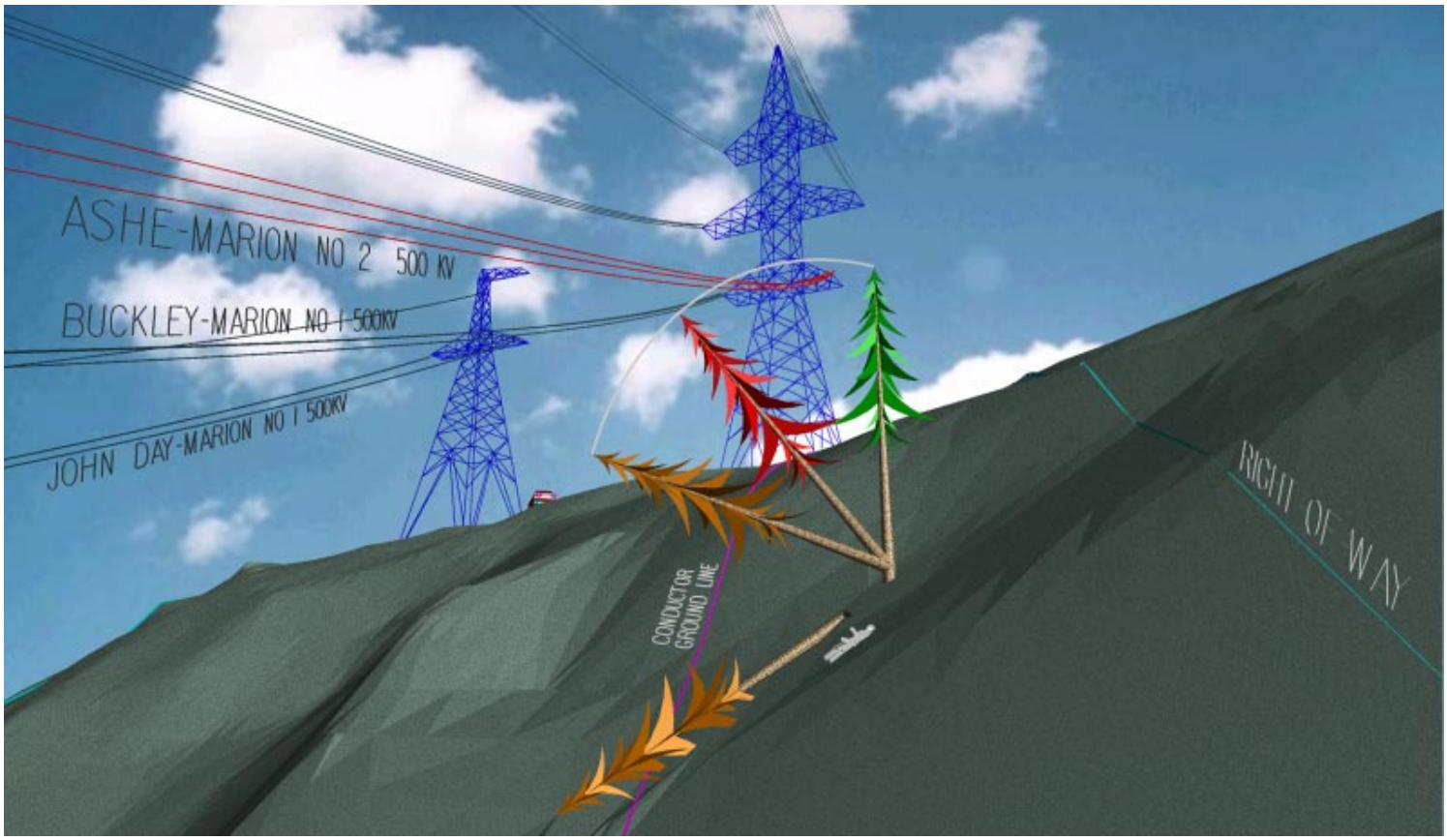


Figure 2 - Sketch of Accident Tree Fall Line

Exhibit 9 - Stump of fallen tree - victim would have been standing to the right of stump during falling process.

Exhibit 10 - Stump showing section that was torn off.

Exhibit 11 - Fallen tree with section of stump still attached.

Exhibit 12 - Final separation distance between stump and fallen tree. Arrow pointing towards victim.

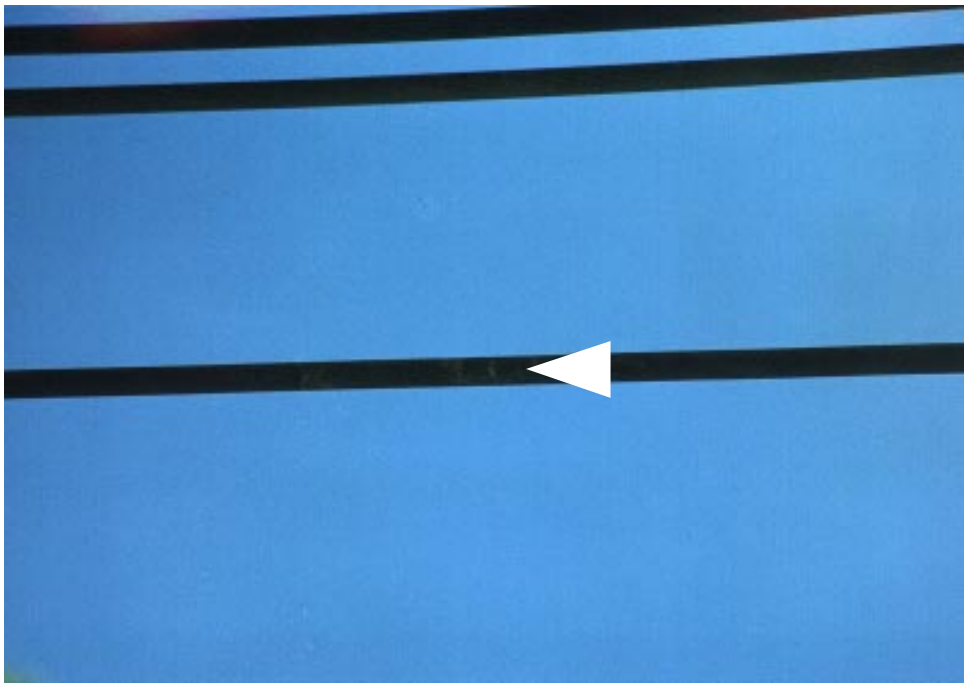


Exhibit 13 - Arc markings on B phase transmission line conductor.

Exhibit 14 - Point of arc contact with tree and conductor, approximately 4 feet from tip of tree.

Statements indicate that eight Chaparral employees heard an explosion, or loud noise, three of them saw a flash, or bright light, and five stated that they saw smoke coming from the area when the tree had fallen. The head foreman, hollering and waving, contacted the Cinebar inspector, who had been leaving the area in his vehicle, AHOL. The inspector returned to the landing area. When the head foreman had confirmed that an injury accident had occurred, he called 911 on his cellular phone for medical assistance, and provided accident details to the emergency communications dispatcher.

The first worker that reached the victim had been clearing brush on the landing above. Running down to the victim, he saw that the victim's clothing was burnt and smoking. The small tree to the south of the victim was also on fire, as was the fallen tree. The first responder immediately called for his coworkers to bring a fire extinguisher and a stretcher. Upon reaching the victim, fellow employees put out the fire, checked for bleeding, breathing, wounds, and shock and placed the victim onto a stretcher. They transported him up the steep slope to the landing area adjacent to structure 101/2. The victim complained that his back and feet were burning. His coworkers removed his shoes, but did not remove any additional clothing. At the landing, they covered the victim with a space blanket and loaded him into a manhaul (work vehicle) to be transported from the work area to meet the ambulance. The head foreman informed the workers and the contract inspector/monitor that he would go on ahead to assure that the main road was open; if not, he would have the road department and Forest Service make the road passable. (See Exhibits 15-20)

Exhibit 15 - Victim would have fallen downhill and to right of stump.

Exhibit 16 - Final location of victim, down hill from stump and adjacent to fallen tree.

Exhibit 17 - Fallen tree from butt to tip of tree, where employee is located is point of electrical arc contact.

Exhibit 18 - Indication of fire on fallen tree.

Exhibit 19 - Tree stump showing burn or heat indication.

Exhibit 20 - Direction from trees on the left, uphill travel for removal of victim on the stretcher.

Once the victim was loaded into the back of the manhaul, the Cinebar inspector/monitor led the way out from the accident site to the waiting ambulance. The group followed the BPA access road to Forest Service Road 7010 and then to State Highway 46, where they were met by the ambulance. After the paramedics evaluated the victim and removed his clothing, they notified LifeFlight, in Portland, Oregon, and transported the victim to Ripplebrook Forest Service Ranger Station. At Ripplebrook Ranger Station, the victim was transferred to LifeFlight and flown to Legacy Emanuel Hospital. After evaluation by Emanuel Hospital emergency room personnel, the victim was moved to the Burn Center at the hospital. (See Exhibits 21 & 22)

Exhibit 21 - Landing area where Head Foreman was located and road in which the Inspector was located.

Exhibit 22 - BOL and showing evacuation route on Forest Service Road 7010.

The Chaparral crew remained at the accident site to pick up work equipment and to ensure that the fire was extinguished. (See Exhibit 23)

Exhibit 23 - Tree fire on fallen tree and adjacent to location of victim.

2.1.1 Sequence of Events

The graphic summary, in Figure 3, shows the sequence of events from the awarding of the service contract through the accident scenario.

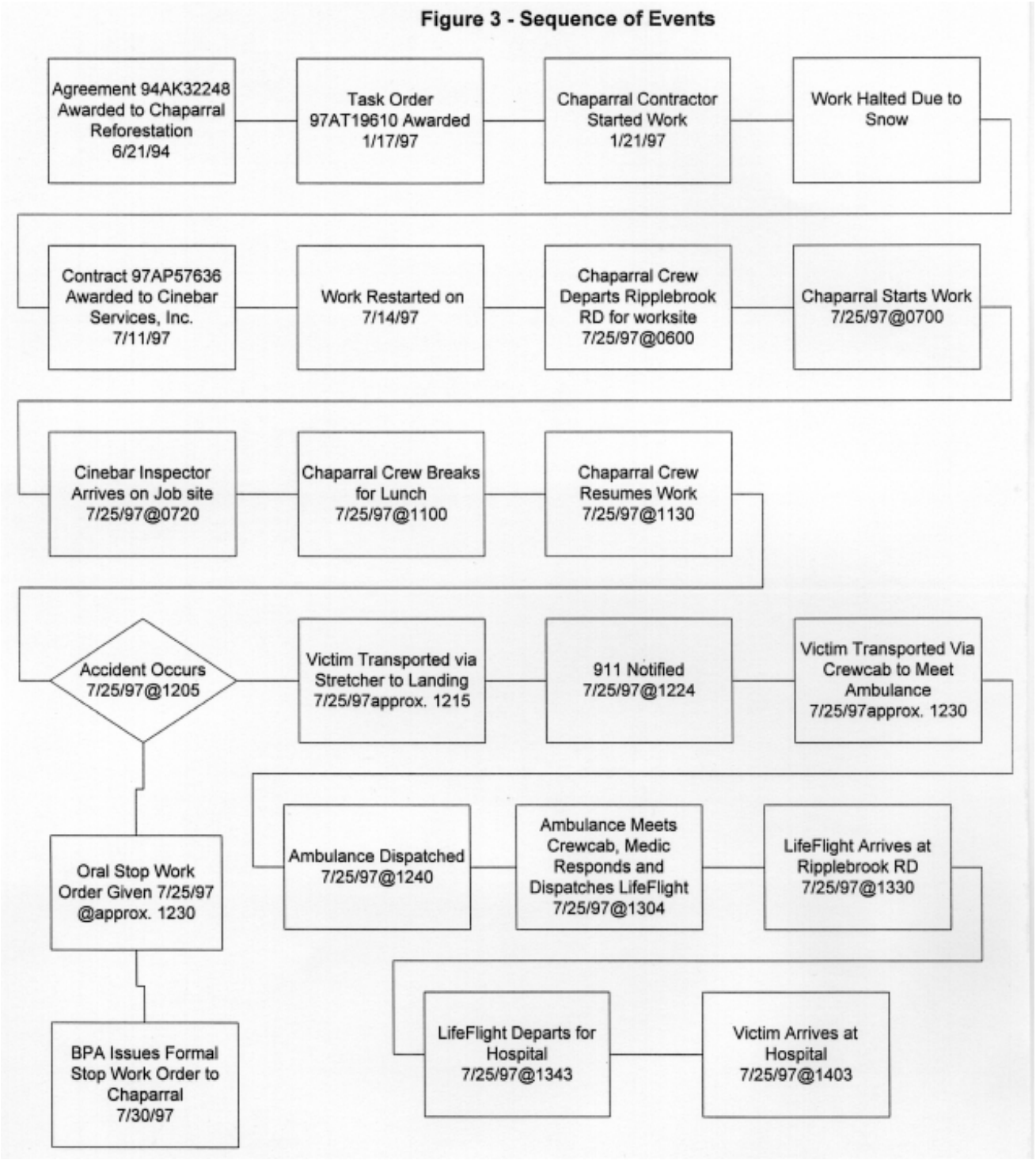


Figure 3 - Summary of Events

2.1.2 Emergency Response and Investigative Readiness

Upon realizing the extent of the injury, Chaparral's Foreman called 911 from the accident site at 1224 hours. Co-workers administered basic first aid procedures and transported the victim from the right-of-way, down Forest Service road 7010, until they met the American Medical Responder (AMR) ambulance. AMR was notified by Clackamas County 911 at 1224 hours. A Forest Service Quick Response Team was also notified of the incident, but did not respond. AMR met the Chaparral transport vehicle on Forest Service Road 7010 at 1304 hours. They administered first aid and transported the injured employee to the Forest Service helipad at Ripplebrook Ranger Station. LifeFlight arrived at the Ripplebrook helipad at 1330 hours and departed at 1343 hours for Legacy Emanuel Hospital in Portland, Oregon. LifeFlight arrived at Legacy Emanuel Hospital at 1403 hours. The victim was evaluated by emergency room personnel and transferred to Emanuel Burn Center for treatment. The victim received treatment for electrical and thermal burns and was released on August 18, 1997. According to the latest medical report, the prognosis for a total recovery is good.

2.1.3 Stand-Down Informational Meetings

BPA conducted safety "stand downs" for all brush cutting contracts, including Chaparral. Chaparral's meeting was held at BPA's Chemawa District Maintenance Headquarters in Salem, Oregon, on July 1, 1997. The victim's name is on the attendance sheet for the Chemawa meeting (See Chemawa Safety Meeting Minutes, Appendix E). The presentation was in English, translated by the head foreman into Spanish, the crew's language. BPA explained the dangers of working around high-voltage lines. The BPA Eugene Regional Safety Manager reviewed safe practices for working in, and around, power lines. He emphasized that a tree would not have to contact a line to be dangerous to persons working on the ground.

Crew members asked no questions during the presentation. Thus, though the issue was reviewed three times for emphasis, it is not known whether they fully understood that, even without direct contact, the line could be dangerous to workers on the ground.

Four crew members, as well as the head foreman, also attended a July 7th stand-down meeting at the BPA Regional Office in Olympia, Washington.

2.1.4 Chaparral Safety Practices and Procedures Regarding Chaparral's Safety Procedures

The following are ancillary facts based on statements taken from Chaparral employees:

- **Tailgate Meeting:** On the morning of the accident, the crew did not have a "tailgate of safety meeting." However, employees state that they regularly discuss what is going to be cut, including areas that need caution. The Cinebar inspector confirmed that Chaparral had regular tailgate meetings most mornings, but could not verify what was conveyed due to the language barrier.

- **Personal Protective Equipment:** The crew had personal protective equipment - chaps, hard hats, whistles, boots, ear plugs, gloves and eye wear.

- **First Aid Supplies and Training:** According to the head foreman, the vehicles were equipped with stretchers and first aid supplies. He also stated that a few of the crew members took a First Aid class quite some time ago. None are currently certified. The first cutter to respond to the victim had first aid training in the military.

- **Job Training:** All members of the crew had learned their work during on-the-job training. The head foreman has 26 years of experience in brush cutting and reforestation and he shows personnel how to cut big trees. The injured cutter has 5 to 6 years of experience, also in brush cutting and reforestation. The head foreman believed that the injured worker was competent or qualified to cut the tree involved in this accident.

- **Falling Practices:** Visual inspection showed that none of the trees cut in the vicinity of the accident have undercuts. In his statement, the head foreman said he told the cutters to never fall any tree perpendicular to the power line; it always should be parallel. Employees were instructed to notify the head foreman, before cutting any dangerous trees or brush, if they encountered any questionable situation not previously identified as dangerous. The head foreman would then discuss any potential problems with the inspector and could request a hold order or a clearance if he judged it was needed. (See Exhibits 24-26)

Exhibit 24 - Where victim was standing when he fell the tree - No escape route - Poor tree falling practice.

Exhibits 25 & 26 - Improper tree cutting/falling procedures.

2.1.5 Significant Tree-Falling Hazards

The following is a summary of standard, significant tree-falling procedures as outlined in applicable Federal and State regulations and falling/logging industry standards.
(OSHA, OR-OSHA, and falling expert D. Douglas Dent, Professional Tree Falling: A Procedural Approach, copyright 1974.)

- Before any cutting begins, the crew or faller needs to look the area over and identify any trees or brush that could be considered hazardous to the power line or any other potentially hazardous conditions.

- Once the faller decides where the tree should fall, he should walk around his intended lay to look for unseen objects or personnel in the fall area and assure himself that the tree cannot contact or enter the minimum approach distance of the conductor.

- If the faller determines the tree can enter the arcing distance of the conductor, he must use directional falling practices, which include, but are not limited to, the following: a face cut (horizontal cut and slope cut) and a back cut. If the tree can not be removed safely this way, additional safeguards must be employed. These could include a pulling line in the tree or removing the conductor from service.

- No work areas or personnel shall be closer than two tree lengths of the tree being felled.

2.1.6 Significant Electrical Analysis

The fault initiated as a B phase-to-ground through high impedance, then evolved to both a B and C phase to ground fault. The resistance to ground reduced with time, resulting in a 1200-ampere current flow to earth, for 63 milliseconds, until cleared from Marion, and an additional 700 amperes, for 88 milliseconds, until cleared from Ashe.

Based on the reported 1200-ampere currents, the gradient voltage around the tree base is estimated to have been in the order of 30 to 40 kV to remote earth. That would have resulted in a step potential, bridged by the victim, of nearly 10 percent, or some 3 to 4 kV.

Another way of estimating the step potential is through the puncture voltage of the boots. Based on previous boot tests, the puncture voltage would be in the order of 2000 volts for each boot. Examination of the boots show two puncture holes in the left boot and one in the right. The interior of the boots was inspected using a fiber optic probe. The right boot had one puncture near the ball of the foot while the left boot had two, one near the heel and the other near the ball. A video is on file showing the internal holes in the boots.

The step potential would result in the boots puncturing, followed by a current flow of at least 1 ampere through the legs and torso. The victim would have lost muscular control and the ability to move, as confirmed by the reports indicating that he was hunched over, and still be standing, but unable to move. There would have been considerable heat felt in the feet and torso as was also reported.

2.1.7 Applicable Federal and State Regulations

The following Federal and state regulations will apply.
Relevant sections of the Occupational Safety and Health Administration, applicable to BPA's contract with Chaparral Reforestation and Cinebar Services, are shown below:

OSHA Subpart "K" - Medical and First Aid

1910.151 Medical Services and First Aid

OSHA Subpart "R" - Special Industries

1910.266 Logging Operations

(d) General Requirements

(d)(1) Personal Protective Equipment

(d)(2) First Aid Kit

(d)(5) Environmental Conditions

(d)(6) Work Areas

(d)(7) Signaling and Signal Equipment

(e) Hand Held Portable Powered Tools

(e)(2) Chain Saws

(h) Tree Harvesting

(h)(1) General Requirements

(h)(2) Manual Felling

(i) Training

(k) Appendices

Appendix A. First Aid Kits (Mandatory)

Appendix B First Aid and CPR Training (Mandatory)

1910.269 Electric Power Generation, Transmission, and Distribution

(a)(2) Training

(c) Job Briefing

(c)(1) Number of Briefings

(c)(2) Extent of Briefing

(x) Definitions

See - Line Clearance - Tree Trimmer

1910.333 Selection and Use of Work Practices

(c) Working on or Near Exposed Energized Parts

(c)(1) Application

(c)(3) Overhead Lines

Oregon Occupational Safety and Health Division (OR-OSHA), Chapter 437 Division 6 Forest Activities - Effective January 1, 1992.

Relevant sections or subsections of OAR 437, Division 6 Forest Activities are as follows:

Subdivision A - General Requirements - Site Planning is referenced below.

437-006-0008

(1) Prior to the commencement of any logging activity at a new job site, the employer shall conduct a job site safety survey which shall consider:

(a) The topography of the land;

(b) Snags, residual trees and other work-site hazards;

(c) Conditions contained in the contract;

(2) The employer shall conduct a safety briefing with employees to communicate the findings of the survey.

Subdivision B - Safety and Health Program

437 - 006 0015

A safety and health program shall be developed and implemented by each employer. The program shall be in writing and at a minimum, the program shall include the following elements:

(3) Provision for employee involvement in the safety and health program which includes:

(a) Monthly safety meeting program for all employees. Meetings may be conducted individually, in separate crew meetings or in larger groups. Meeting minutes and attendance records shall be documented and made available to employees and Oregon OSHA upon request. Minutes and attendance records shall be maintained for three years from the date of issue.

(b) Provision for employee involvement in the safety and health program, through a system which encourages employees to report safety and health hazards and provides for prompt response and corrective action.

(4) Training and follow-up training. Training and follow-up training shall be conducted which provide for job safety instruction and training for all employees. Prior to commencing any new work assignment, each employee shall be instructed, or shall previously have been trained in the safe operation of any machinery, tools, equipment, process or practice which the employee will use or apply.

Subdivision C - Work Conditions, Personal Protective Equipment, First Aid

Medical Services and First Aid

437-006-0050

(1) The employer shall provide for the immediate and emergency care of ill or injured employees.

(6) When employers are subject to both federal and state occupational health regulations, the more comprehensive first aid list shall apply.(9) A qualified first aid person shall be available to any place of employment which is not in proximity to an emergency care service to render first aid as well as to ensure that the emergency medical plan is carried out, unless a physician approves a first aid and medical plan which does not include the requirements for a first aid person.

(A) Each work site not within 30 minutes travel time to a physician or ambulance with emergency medical technicians, shall have at least one (1) serviceable and operable two-way

radio, phone or radio/phone combination available to reach ambulance service. Citizens' band radios are permitted as a secondary means of communication.

(i) Crew buses used by isolated employees, such as cutters, shall carry a communication unit as described above. The crew bus shall be parked as close and centrally located as possible to the employees using the vehicle.

(ii) Each operating site or crew located in a communication "dead" area shall have a mobile communication unit or plans made in advance to relay emergency calls through another site operating in the vicinity.

(B) Availability of transportation to a point where an ambulance can be met or to the nearest suitable medical facility. Vehicles provided for this purpose shall be available at all times, shall have right-of-way over all vehicles or equipment under the control of the employer, and shall be equipped so that due consideration can be given to the proper care and comfort of the injured employee.

(C) Qualified medical personnel at destination.

(16) All employees shall be knowledgeable concerning the first aid and emergency medical plans.

Subdivision I - Timber Cutting

General Requirements

437-006-0350

(1) Cutters shall be located so they will not endanger themselves or other employees from falling or rolling trees or snags, sidewinders, leaners, logs or other hazards.

(2) Other employees shall not approach a faller within reach of the trees being felled unless a signal has been given and acknowledged by the faller that it is safe to approach.

(3) The power chain saw engine shall be stopped or the engine shall be idling when warnings are given or answers are being received.

(5) Trees shall not be felled or bucked within a unit of standing timber prior to any cutting operation if such falling or bucking creates a hazardous condition for the original or subsequent cutters or operations.

(6) Only experienced and qualified fallers shall be assigned to work as danger tree fallers.

(7) Inexperienced employees shall not fall trees or buck logs unless working under the close supervision of an experienced cutter.

(8) Cutters shall check for overhead hazards while falling, bucking or limbing.

(9) If the cutter has determined a tree cannot be safely felled, work shall not proceed until the cutter has conferred with a supervisor or an experienced cutter, such as the head faller, and the safest possible work method or procedure has been determined. The supervisor shall assure that the predetermined work method or procedure is used.

(11) Trees shall not be felled directly uphill when the possibility of the tree sliding back past the stump exists. Trees felled uphill shall be quartered to the slope, to a degree that prevents workers from being exposed to the possibility of sliding or rolling trees or logs.

Falling

437-006-0355

(1) The minimum distance between cutters, or any other personnel, shall be twice the height of the trees being felled.

(12) An escape route shall be determined and arranged before the tree is felled so that the cutter can get at least twenty-five (25) feet away from and to the side of the base of the tree when necessary. The escape route shall be kept clear of brush, tools, and other material that would impede a quick escape. Fallers shall look up the front and back of each tree immediately before beginning the face cut and check for hazardous limbs and tops.

(13) Cutters shall be in the clear as the tree falls.

(14) Trees shall be felled into the open whenever practical.

(15) Precautions shall be taken to prevent falling trees into power lines. If a tree makes contact with a power line, the power company shall be notified immediately and all employees shall remain clear of the area until power company personnel advise that conditions are safe.

(17) Undercuts are required on all trees or snags over eight (8) inches Diameter Breast High (DBH) and shall be large enough to safely guide the trees and eliminate the possibility of splitting. In trees of sound wood and no perceptible lean, the undercut shall be no less than one-fourth (1/4) the diameter of the tree and the face opening shall be no less than one-fifth (1/5) the diameter of the tree.

(20) Undercuts and back cuts shall be made at a sufficient height above the highest ground level to enable the cutter to safely make the cut, control the tree and have freedom of movement for a quick escape to be in the clear from a falling tree.

The above standards address mandatory work planning, safety, first aid, timber-falling and logging requirements that govern the contractor's work. The sections cited specifically address the required methods and procedures that were not adhered to by Chaparral or Cinebar employees.

2.2 TYPICAL CONTRACT PRACTICES

Typical oversight practices of various utilities and agencies involved in brush clearing, tree falling or tree thinning are similar to those of BPA (See Appendix C): Providing minimal oversight of the Contractor's safety program or practices; placing the responsibility and training solely on the Contractor; and leaving the Contractor responsible for meeting all Federal, state, and local laws and requirements. The Contractor is responsible for developing adequate training, recognizing work hazards and hiring qualified employees.

BPA's oversight is comparable to that of other Northwest utilities and the US Forest Service. Washington Water Power exacts greater contractor certification requirements than BPA and other NW utilities.

2.3 BPA'S SERVICE CONTRACTOR PERSONNEL SAFETY

2.3.1 BPA's Historical Service Contract Policy

Historically, BPA has placed responsibility for personnel safety and environmental protection on service contractors. Generally, safety and environmental protection under this policy were good. BPA Contracting Officer's Technical Representatives (COTRs) and BPA field inspectors monitored contractor results for compliance with service contract requirements. COTRs and field inspectors were expected to halt seriously unsafe contractor operations, if observed. The contractor's judgment generally prevailed in matters where no serious, immediate hazard was present. Historically, BPA has not emphasized safety as a criterion in service contractor selection.

2.3.2 BPA's Current Service Contract Policy

BPA's current policy, contained in BPA's purchasing instructions and contracting operational procedures, is to place the responsibility for ensuring the safety of contractor personnel, property, and the environment on the contractor providing the services. Contractor compliance with OSHA rules and state safety regulations is required by the contract terms and conditions.

In the past decade, BPA has awarded multi-year, master agreements and contracts for brush cutting rather than award work each season, as was past practice. Master agreements help strengthen BPA's relationship with contractors and enhance the understanding of the work. Recently, due to reduced staff and increased workload, BPA has started using contractors for field inspection. Inspection contracts have been awarded based upon the experience and qualifications of contractor personnel.

2.4 CONTRACTUAL ISSUES

2.4.1 Chaparral Contractual/Management Requirements

BPA contracted with Chaparral Reforestation, Inc., for brush cutting services. As stated in Chaparral Contract 94AK32248, Clause 15-4, "SAFETY, HEALTH, AND PROPERTY PROTECTION - SERVICES," the Contractor's safety responsibilities are as follows:

1. The Contractor shall protect the safety and health of its employees while working on a BPA site. The Contractor shall prevent damage to property, materials, supplies and equipment. In fulfilling these requirements, the Contractor shall comply with applicable laws, regulations, and any BPA safety and

2. The Contractor shall be responsible for damages caused by the Contractor's failure to comply with this clause, including failures of subcontractors. The Contractor shall hold BPA harmless from any suits, actions and claims for injuries to or death of persons or damage to property arising from any action or omission of the Contractor, its subcontractors, in any way related to the work under this contract

3. The Contractor shall immediately correct any noncompliance upon discovery, or upon notification by the Contracting Officer or a designated representative. The Contracting Officer or a designated representative may issue a stop work order if the Contractor fails to promptly correct their noncompliance. No time extension, claims of damages, or excess costs resulting from the stop work order or corrective action will be allowed.

4. Additional Safety and Health Requirements: The Contractor shall provide qualified safety watchers for the protection of workers and BPA facilities for the phases of the work performed in energized facilities, or where such watchers are required by law or regulation.

Contract clause (24-15M), "PERMITS AND RESPONSIBILITIES," requires additional responsibilities:

"The Contractor shall, without additional expense to BPA, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, state, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others."

In addition, the Statement of Work (SOW) for Contract 94AK32248, "Selective Control of Vegetation on Transmission Line Rights-of-Way," requires the following safety practices:

A.5 SAFETY WATCHES AND HOLD ORDERS

A. In areas of possible electrical hazard, the Contractor may need a safety watch. If a safety watch is necessary, the Contractor shall provide personnel for that duty in accordance with the Terms and Conditions clause titled Safety, Health, and Property Protection.

B. The power lines shall remain energized (HOT) during performance of work. The Contractor shall request a HOLD ORDER when needed.

The Contractor shall request a HOLD ORDER from the BPA inspector 24 hours in advance. A HOLD ORDER is defined as follows:

A special operating order is used to put control of re-energizing a facility under the direction of a dispatcher and to protect personnel working on, or near, energized lines or equipment.

When a HOLD ORDER is in effect, only one falling or cutting crew, per location, shall perform the work."

2.4.2 Cinebar Contractual/Management Requirements

BPA contracted with Cinebar Services, Inc., for inspection services. As stated in Cinebar Contract 97AP57636, Clause 15-4, "Safety, Health, and Property Protection", (Oct. 93)(BPI 15.2), the Contractor's safety responsibilities are as follows:

1. The Contractor shall protect the safety and health of its employees while working on a BPA site. In fulfilling these requirements, the Contractor shall comply with applicable laws, regulations, and any BPA safety and health requirements stated elsewhere in the contract. The Contractor shall immediately report to the Contracting Officer's Technical Representative (COTR) any on site injuries or property damage.
2. The Contractor shall immediately correct any noncompliance upon discovery, or upon notification by the Contracting Officer or a designated representative. The Contracting Officer or a designated representative may issue a stop work order if the Contractor fails to promptly correct their noncompliance.

In addition, the Statement of Work requires the contractor to be familiar with BPA standards for this type of work including all applicable OSHA and state requirements; to notify the vegetation control contractor of any apparent working conditions or practices hazardous to health or safety as determined under the applicable BPA and Federal OSHA requirements; and, if there is imminent danger to life or property, to request a work stoppage until the situation is corrected. Also, the contractor must recognize and document workmanship and methods that might endanger life, property or government facilities.

2.4.3 BPA Service Contract Issues

BPA's contractual oversight regarding the enforcement of contract safety requirements, as described in Section 2.4.1, has been adequate within present operating policies and contractual language. BPA instructed the contractors fully in their requirements and methods, to ensure required safety compliance and qualified employees. BPA's service contract safety language, in general, is consistent with other Federal agencies and electrical utilities. Contract terms and conditions place the responsibility and liability for safety solely with the Contractor(s).

2.5 CAUSAL FACTORS

The Root Causes of the accident (the fundamental causes that, if eliminated or modified, could prevent a recurrence of this, or similar, accidents) were as follows:

- Chaparral failed to ensure that only properly trained and experienced employees were allowed to fall trees adjacent to, or under, electrical power lines.

- The work-site foremen and workers failed to recognize electrical hazards in the area where the tree was to be fallen.

- The Cinebar Services inspector/monitor, the most knowledgeable person on site, was not required to, and did not, take part in the discussions or decisions pertaining to overhead electrical hazards or the cutting of the tree involved in the accident.

- Due to the angle of the conductor and the slope of the hillside relative to the tree, the setting was deceptive. The situation was not recognized by anyone as an electrical hazard.

- Neither the victim, the foremen, nor the Cinebar inspector correctly estimated the location of the conductor relative to the fall path of the tree.

In addition, the following Contributing Causes were identified:

- Brush was allowed to grow higher than desirable for maintenance by brush-cutting contractors.

- Chaparral management had no training records to show that workers and supervisors were properly trained to perform their assigned tasks in a safe manner.

- Chaparral failed to assure that safe work procedures were implemented.

- The Cinebar inspector was unable to confirm that the Chaparral foreman adequately communicated work assignments to all members of the crew, due to the English/Spanish language barrier.

- The tree-falling technique used was inappropriate for this particular tree considering the imminent overhead electrical hazard.

3.0 CONCLUSIONS AND JUDGMENTS OF NEED

Conclusions are a synopsis of those known facts and analytical results that the Board considers especially significant. Judgments of needs are managerial controls and safety measures believed necessary to prevent or mitigate the probability or severity of a recurrence. They flow from the conclusions and causal

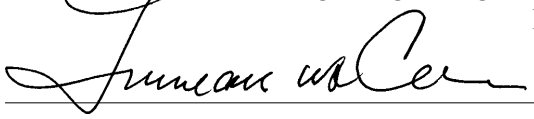
Conclusions	Judgments of Need
Chaparral Reforestation	
• Contractor personnel lacked sufficient knowledge or training on the relevant electrical hazards associated with brush cutting and tree falling around high-voltage power lines.	• Contractor must provide adequate training in tree falling and electrical hazards.
• Contractor did not have records, or any other means, of verifying tree-falling qualifications for workers. • Contractors lacked current/up-to-date CPR/First Aid certification cards or training.	• Contractor must maintain training records. • Contractor needs to comply with OSHA regulations, safe work practices and first aid certifications.
• Contractor failed to carefully inspect the work area for potential hazards. • Site foreman and crew failed to recognize whether trees could be felled with sufficient clearance from electrical hazards.	• Contractor needs to thoroughly preview the work when there are hazardous situations.
• Contractor failed to consult with inspector or others more experienced before proceeding with a potentially dangerous operation.	• Contractor must encourage workers to consult with others about potentially dangerous operations.
• Contractor used inappropriate techniques while falling trees near high-voltage power lines.	• Contractor must use proper work techniques in hazardous situations.
Cinebar Services	
• Inspector was unable to confirm that the Chaparral foreman adequately communicated work assignments to all members of the crew, due to the English/Spanish language barrier.	• Contractor must provide adequate language/communication resources.
• Site inspector failed to recognize whether trees could be felled with sufficient clearance from electrical hazards. Though there was a cursory inspection of the falling area, the setting was deceptive and the inspection proved inadequate.	• Contractor personnel must look for, and be more aware of, potential safety hazards.

BPA	
• BPA's evaluation of contractor qualifications needs to be different.	• BPA needs to review contractor safety program as part of the award process. BPA needs to award contracts only to firms with satisfactory safety programs. BPA will more thoroughly evaluate contractor qualifications.
• Contract did not adequately represent the scope of work. • Contract language does not differentiate between brush and trees. Construction and tree/brush-cutting safety contractual language needs consistency.	• BPA needs to provide clear expectations in contract language and ensure that the contractor discusses the necessary duties with their personnel. BPA needs to clarify the role between inspector and those being inspected. BPA needs to better assess work requirements, write contracts accordingly and use contracts consistently throughout the agency. • Differing aspects of contractual safety language between construction and tree/brush cutting need to be identified and applied to future contractual arrangements.
• Contract language did not specify which safety rules to follow. It referenced, generally, but did not actually contain, OSHA rules. • Timely project information is not routinely provided to appropriate regulatory agencies as well as the BPA Safety Office.	• BPA needs to include BPI clause 15-2 (See Appendix D) in vegetation-control contracts and ensure that the contractor understands the provisions. • Appropriate regulatory agencies, as well as the BPA Safety Office, need to be notified promptly about project commencement, locations, and scope of work.

The specific implementation schedule of these needs are outlined in more detail in the letter dated October 30, 1997 from Jack Robertson, Acting Administrator and Chief Executive Officer for Bonneville Power Administration to Tara O'Toole, Assistant Secretary, Environment, Safety, and Health.

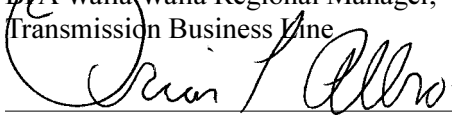
factors and are directed at guiding managers in the development of follow-up actions.

BOARD SIGNATURES



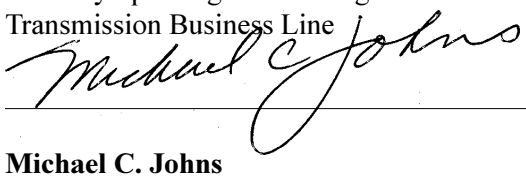
Date: November 19, 1997

Truman W. Conn
Accident Investigation Board Chairperson
BPA Walla Walla Regional Manager,
Transmission Business Line



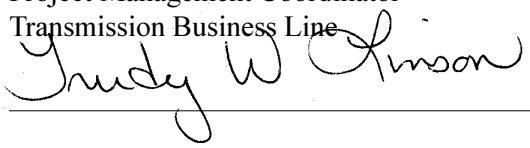
Date: November 19, 1997

Orion L. Albro
Accident Investigation Board Member
BPA Olympia Regional Manager
Transmission Business Line



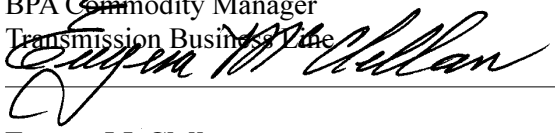
Date: November 19, 1997

Michael C. Johns
Accident Investigation Board Member
Project Management Coordinator
Transmission Business Line



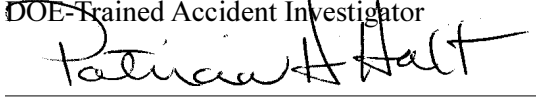
Date: November 19, 1997

Trudy W. Linson
Accident Investigation Board Member
BPA Commodity Manager
Transmission Business Line



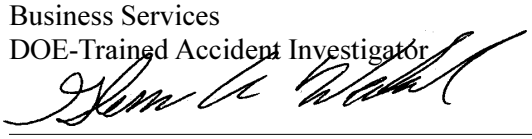
Date: November 19, 1997

Eugene McClellan
Accident Investigation Board Member
BPA Safety & Occupational Health Manager, Business Services
Lead Accident Investigator
DOE-Trained Accident Investigator



Date: November 19, 1997

Patricia H. Holt
Accident Investigation Board Member
BPA Safety & Occupational Health Specialist,
Business Services
DOE-Trained Accident Investigator



Date: November 19, 1997

Glenn Weikel
Accident Investigation Board Member
BPA Lineman, Ross District, Olympia Region
Transmission Business Line

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BOARD MEMBERS, ADVISORS, AND STAFF

Chairperson	Truman W. Conn, BPA, TFP/Walla Walla
Member	Orion L. Albro, BPA, TFO/Olympia
Member	Michael C Johns, BPA, TN/4
Member	Trudy Linson, BPA, TSP/MODW
Member	Eugene McClellan, BPA, CC/Z992
Member	Patricia H. Holt, BPA, CC/Z992
Member	Glenn Weikel, BPA, TFOP/LMT
Technical Advisor	Barry J. Clark, WAPA, Sierra Nevada Region
Technical Advisor	Jared G. Goddard, BPA, CC/Eugene
Technical Advisor	D.A. Gillies, Consultant
Legal Advisor	Robert L. Jones, BPA, LL-7
Legal Advisor	Jacilyn Margeson, BPA, LL-7
Technical Writer	Stuart Sandler, Contractor

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APPENDIX A
APPOINTMENT MEMO FOR TYPE B ACCIDENT INVESTIGATION

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DOE F 1325.8 e Electronic Form Approved by CGIR - 01/20/95
(8-89)

United States Government **Department of Energy**

Bonneville Power Administration

memorandum

DATE: July 29, 1997

REPLY TO ATTN OF: CC-Z992

SUBJECT: Accident Investigation Board, Contractor Injury of July 25, 1997

TO: James H. Curtis, Senior VP For Business Services - C

This memorandum is to confirm the appointment of the individuals listed below to the Bonneville Power Administration's Type B Accident Investigation Board. The purpose of the Board is to investigate the contractor accident that occurred on July 25, 1997.

Truman Conn	BPA Walla Walla Regional Manager, Transmission Business Line, Board Chairperson
Orion Albro	BPA Olympia Regional Manager, Transmission Business Line, Board Member
Alan Courts	BPA Manager, Technical Services, Transmission Business Line, Board Member
Eugene McClellan	BPA Occupational Safety and Health Manager, Business Services, Lead Accident Investigator and DOE Trained Accident Investigator, Board Member
Patricia Holt	BPA Occupational Safety and Health Specialist, Business Services, DOE Trained Accident Investigator, Board Member
Trudy Linson	BPA Commodity Manager, Support Services, Transmission Business Line, Board Member
Glenn Weikel	BPA Lineman, Ross District, Olympia Region, Transmission Business Line, Board Member

The following individuals will provide technical support to the Accident Investigation Board:

Robert Jones	BPA Attorney, Office of General Counsel
Jared Goddard	BPA Occupational Safety and Health Manager, Business Services

The accident shall be thoroughly investigated and a report prepared in a manner consistent with DOE Order 225.1 and BPA Manual Chapter 181. During the investigation, the team shall review the accident site, equipment, work procedures, management systems, and other elements that are possible factors in the accident. Working with the Oregon State Occupational Safety and Health Division (OR-OSHA) investigation team is important to assure a complete, thorough, and competent assembly of facts. Do not hesitate to seek the technical assistance of any others that may help in your analysis of the findings. Bonneville's final report shall include the facts, analysis of facts, probable cause (conclusions), and judgment of needs.

The report shall be forwarded by memorandum which states the Board's recommendations to me within 30 calendar days. The Board will keep this Office advised of the continuing investigative process.

Randall W. Hardy
Administrator and Chief Executive Officer

cc:
Adm. Chron. File - A
S. Hickey - A-7
J. Curtis - C-2
G. McClellan - CC-Z992
P. Holt-CC-Z992
J. Goddard - CC-Alvey
R. Jones - LL-7
H. Spigal - T-DOB1-N
F. Johnson - TF-DOB1
O. Albro - TFO-Olympia
W. Banker - TFOP/LMT
G. Weikel - TFOP/LMT
T. Conn - TFP/Walla Walla
A. Courts - TN-4
M. Nelson - TS-PSB-2
T. Linson-TSP-MODW
Official File - CC (PE-53-12)

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APPENDIX B
DEFINITIONS, ACRONYMS & INITIALISMS

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APPENDIX B - DEFINITIONS, ACRONYMS & INITIALISMS

ahead-on-line (AHOL): The direction of increasing tower numbers or miles on a power line. Normally numbered from source to load.

back cut (felling cut): The cut in a falling operation of a tree, made on the opposite side from the undercut. The final cut in a falling operation.

back-on-line (BOL): The direction of decreasing tower numbers or miles on a power line.

brush: A thicket of shrubs or bushes. Cut or broken branches.

butt: The bottom of that fallen part of a tree.

cambium: The layer of a tree, beneath the bark, that is electrically conductive.

clearance: Assurance given to a worker by a System dispatcher or Substation operator that (1) specified power system equipment or transmission line is isolated from the power system, and (2) it will not be ordered energized from the power system until that worker reports the crew is in the clear, the equipment or line is ready for service and the Clearance is released.

Contracting Officer (CO): The person responsible for ensuring performance of all actions required for effective contracting, compliance with terms of the contract, and safeguarding the interests of BPA in its contractual relationships.

Contracting Officer's Technical Representative (COTR): The person responsible for monitoring whether BPA has received, in a timely manner, the goods and services that conform to technical requirements set forth in the contract.

corridor: A strip of land forming a passageway for utility facilities.

danger brush: Any plant growing in the transmission line right-of-way that could contact any conductors if it falls, or presents an immediate hazard of potential encroachment within the safe distance to the conductor from bending, growing, swinging, or falling toward the conductors.

danger tree: Any tree growing adjacent to a transmission line right-of-way that could contact any of the conductors if it falls, or presents an immediate hazard of potential encroachment within the safe distance to the conductor from bending, growing, swinging, or falling toward the conductors.

double circuit: A structure containing two high voltage transmission lines.

escape route: A predetermined path of exit used by fallers when falling or bucking. The essential components of an escape route are the selection of the desired direction and distance, prior to falling or bucking, and a well-cleared path.

face cut: A section of wood sawed and removed from a tree's base. Its removal allows the tree to fall and assists in directing where it will fall. The face is comprised of two separate cuts that have constant

relationships: the horizontal cut must be at least 1/3 the diameter of the tree; the sloping cut must be angled enough to allow a wide opening, and the two cuts must not cross each other.

fall (fell): To cut down trees.

faller (feller): An employee who falls trees. Specialist who falls and bucks trees in a safe manner while utilizing as much of the tree as possible.

hazardous falling area: The area within a circle centered on a tree being fallen and having a radius not less than twice the height of that tree.

hold order: A special operating order used to put control of re-energizing a facility under the direction of a dispatcher and to protect personnel working on, or near, energized lines or equipment.

inspector: Authorized representative of the COTR who is responsible for on-site inspection and review of work performed under the contract.

OR-OSHA: Oregon Occupational Safety and Health Division.

OSHA: Occupational Safety and Health Administration (Federal).

qualified person: A person who, by possession of a recognized degree, certificate, professional standing, or by extensive knowledge, training, and experience has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, work, or project.

right-of-way (ROW): An easement for a certain purpose over the land of another, such as the strip of land used for a road, electric transmission line, ditch, pipeline, etc.

single circuit: A structure containing one high-voltage transmission line.

step potential: The difference in voltage between the feet of a person standing on electrically energized earth.

transmission: In power-system usage, the bulk transport of electricity from large generation centers over significant distances to interchanges with large industries and distribution networks of utilities.

tree: A tall, woody plant having comparatively great height and a single trunk.

undercut: A notch cut in a tree to guide the direction of the tree's fall and to prevent splitting or kickback.

APPENDIX C
TYPICAL CONTRACT PRACTICES

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APPENDIX C - TYPICAL CONTRACT PRACTICES

The following summary table contains several public, governmental and private agencies or utilities that were compared to determine typical industry oversight processes on contractors performing similar work.

Table 1		
Utility	**Oversight**	**Contractor Responsibility**
Public/Government		
Bonneville Power Administration (BPA)	Oversight to recommend compliance through inspector or COTR. Contractor cannot take hold orders or clearances.	Contractor is responsible for assuring safe work practices and compliance with applicable OSHA and state regulations.
Western Area Power Administration (WAPA)	Some oversight to recommend compliance and correction through Inspector and Safety Manager. Contractor cannot take hold orders or clearances.	Contractor is responsible for safety and assurance of knowledgeable or competent workmen.
US Forest Service (USFS)	Some oversight to recommend compliance and correction through Contracting Officer or designated individual.	Contractor is responsible for safety and compliance with OSHA and state requirements.
British Columbia Hydropower (BC Hydro)	Oversight not provided on a continuous basis. Prejob conference is held where safety hazards and regulations are reviewed. Sight checks are made and safety check-off sheets are used. Hold orders are issued to contractors, but clearances and grounding are accomplished by BC Hydro employees.	Contractors must provide employees with a level of training and certification required by their Workers Compensation Board (OSHA).
Private		
Washington Water Power (WWP)	Oversight is provided by foresters who have been safety trained. Ungrounded clearances are utilized and issued to the contractor. If minium safe working distances are in question, a qualified WWP employee will	Contractors must meet OSHA and WISHA requirements; contractor employees must demonstrate an experienced level of safety and arbors knowledge. WWP utilizes two training programs - - one produced by the National Arbor

	ascertain the clearance and the ground.	Association and another by ACRT, on electrical hazards. A similar program is utilized by Pennsylvania Electric.
Puget Sound Energy (PSE)	Little or no oversight. PSE holds preliminary and quarterly meetings where safety rules, regulations, and hazards are reviewed. They use contract inspectors to perform right-of-way inspections. Contractors take clearances and hold orders. Grounding is accomplished by PSE personnel.	Contractors are required to submit an annual work plan that includes safety training and certification goals. Contractor personnel are required to be line-clearance certified by the Union. The contract makes clear separation in safety responsibilities and stipulates the contractor must meet OSHA/WISHA standards.
Idaho Power (IP)	Idaho Power provides no direct supervision. If hold orders or clearances are required, they are held by IP personnel. They do daily checks for contract compliance.	Bonding and insurance are required. Contractor is responsible for training of personnel. They are required to follow OSHA standards. Contractors hold their own "tailgate" meetings and are required to review hazards, regulations, and practices.
Oklahoma Gas & Electric (OG&E)	OG&E does not provide direct oversight or supervision. They do not police contractor conformance to OSHA or any other safety regulations. Inspection is performed by an OG&E employee and is limited to contract compliance. However, any observations of infractions to safety rules are reported to the contractor.	Contactors are totally responsible for any and all safety requirements.

Additional information is provided in the following Federal Acquisition Regulations (FAR) requirements. Other Federal agencies have adopted FAR clauses for use within their own agencies or have developed additional clauses (e.g., NASA). BPA uses the Bonneville Purchasing Instructions (BPI), Clause 15-2, "Safety and Health" Clause 15-4, "Safety, Health, and Property Protection - Services" and Clause 24-15, "Permits and Responsibilities" as its procedures and guidelines.

Federal Acquisition Regulations (FAR):

The Federal Acquisition Regulation has guidelines only for construction contracts. The FAR prescribes that the Contracting Officer shall insert the clause 52.236-13, "Accident Prevention," in solicitations and contracts when a fixed-price construction contract or a fixed price dismantling, demolition, or removal of improvements contract is contemplated and the contract amount is expected to exceed the small-purchase limitation.

ACCIDENT PREVENTION - NOV. 1991

(a) The Contractor shall provide and maintain work environments and procedures which will (1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities; (2) avoid interruptions of Government operations and delays in project completion dates; and (3) control costs in the performance of this contract.
(b) For these purposes, in contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall—

(1) Provide appropriate safety barricades, signs, and signal lights;
(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and
(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purpose taken.

(c) If this contract is for construction, dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of US Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.
(d) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent damage to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.
(e) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

(ALTERNATE 1 - Nov. 1991)

If the contract will involve (a) work of a long duration or hazardous nature, or (b) performance on a Government facility that on the advice of technical representatives involves hazardous materials or operations that might endanger the safety of the public and/or Government personnel or property, add the following paragraph (f) to the basic clause:
(f) Before commencing the work, the Contractor shall—

(1) Submit a written proposed plan for implementing this clause. The plan shall include an analysis of the significant hazards to life, limb, and property inherent in contract work performance and a plan for controlling these hazards; and
(2) Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

NASA SAFETY CLAUSE (FAR-BASED):

(Safety and Health - March 1997)
(a) The Contractor shall take all reasonable safety and health measures in performing under this contract. The Contractor shall comply with all Federal, State, and Local laws applicable to safety and health in effect on the date of this contract and with the safety and health standards, specifications, reporting requirements, and provisions set forth in the contract Schedule.
(b) The Contractor shall take or cause to be taken any other safety and health measures the Contract-

ing Officer may reasonably direct. To the extent that the Contractor may be entitled to an equitable adjustment for those measures under the terms and conditions of this contract, the equitable adjustment shall be determined pursuant to the procedures of the changes clause of this contract; provided that no adjustment shall be made under this safety and health clause for any change for which an equitable adjustment is expressly provided under any other provision of the contract.

(c) The Contractor shall immediately notify and promptly report to the Contracting Officer or a designee any accident, incident, or exposure resulting in fatality, lost-time occupational injury, occupational disease, contamination of property beyond any stated acceptable limits set forth in the contract Schedule, or property loss of $25,000 or more arising out of work performed under this contract. The Contractor is not required to include in any report an expression of opinion as to the fault or negligence of any employee. Service contractors (excluding construction contracts) shall provide quarterly reports specifying lost-time frequency rate, number of lost time injuries, exposure, and accident/incident dollar loses as specified in the contract Schedule. The Contractor shall investigate all work-related incidents or accidents to the extent necessary to determine their causes and furnish the Contracting Officer a report, in such form as the Contracting Officer may require, of the investigative findings and proposed or completed corrective actions.

(d)

(1) The Contracting Officer may notify the Contractor in writing of any noncompliance with this clause and specify corrective actions to be taken. The Contractor shall promptly take and report any necessary corrective action.

(2) If the Contractor fails or refuses to institute prompt corrective action in accordance with subparagraph (d)(1) of this clause, the Contracting Officer may invoke the stop-work order clause in this contract or any other remedy available to the Government in the event of such failure or refusal.

(e) The Contractor (or subcontractor or supplier) shall insert the substance of this clause, including this paragraph (e) and any applicable Schedule provisions with appropriate changes of designations of the parties, in subcontracts of every tier that (1) amount to $1,000,000 or more (unless the Contracting Officer makes a written determination that this is not required), (2) require construction, repair, or alteration in excess of $25,000, or (3) regardless of dollar amount, involve the use of hazardous materials or operations.

(f) Authorized Government representatives of the Contracting Officer shall have access to and the right to examine the sites or areas where work under this contract is being performed in order to determine the adequacy of the Contractor's safety and health measures under this clause.

(g) As a part of the Contractor's safety plan (and health plan, where applicable) and to the extent required by the Schedule, the Contractor shall furnish a list of all hazardous operations to be performed, including operations indicated in paragraphs (a) and (b) of this clause, and a list of other major or key operations required or planned in the performance of the contract, even though not deemed hazardous by the Contractor. NASA and the Contractor shall jointly decide which operations are to be considered hazardous, with NASA as the final authority. Before hazardous operations commence, the Contractor shall submit for NASA concurrence either or both of the following, as required by the contract Schedule or by the Contracting Officer:

(1) Written hazardous operating procedures for all hazardous operations.

(2) Qualification Standards for personnel involved in hazardous operations.

APPENDIX D
BPI Clause 15-2 SAFETY AND HEALTH (Mar 95) (BPI 15.2)

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APPENDIX D - BPI Clause 15-2 SAFETY AND HEALTH (Mar 95) (BPI 15.2)

(a) The Contractor shall assure that no person employed on this contract works in surroundings or under conditions that are unsanitary, hazardous, or dangerous to their health or safety. In fulfilling these requirements, the Contractor shall comply with:

(1) Department of Labor Safety and Health Standards for Construction under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.).

(2) Occupational Safety and Health Act of 1970, (Public Law 91-598) and applicable rules and regulations as may have been delegated to the States.

(3) Supplemental BPA safety and health requirements stated below or elsewhere in the contract.

(b) If there are conflicts between any of the requirements referenced in this contract, the more stringent requirement will prevail.

(c) If the Contractor fails or refuses to promptly comply with any safety or health requirement, the Construction Site Representative (CSR) may notify the Contractor of any noncompliance and the Contractor shall take immediate corrective action. Such notice, whether oral or written, when served on the Contractor or any of its employees at the site of the work, shall be deemed sufficient. If the Contractor fails or refuses to promptly correct the condition, the CSR may stop all or any portion of the work. When satisfactory corrective action has been taken, the Contractor shall request permission to resume work from the CSR. No time extension or additional costs, resulting from the directive to stop work shall be allowed. Failure of the CSR to provide notice of noncompliance or to stop work shall not relieve the Contractor of its responsibility for the safe performance of the work.

(d) The Contractor shall furnish hard hats and other required safety equipment, except that which has been specified to be furnished by BPA. Hard hats meeting the requirements of OSHA shall be worn by all persons on all construction projects unless a more serious hazardous condition is created by such use. Yellow hard hats shall not be worn in BPA substations. (A yellow hat signifies a qualified BPA electrical worker.)

(e) Energized Facilities.

(1) Whenever a worker enters energized substation yards or communication equipment sites, or whenever work is otherwise in proximity to BPA's normally-energized transmission facilities, the Contractor shall provide for the safety of the workers and shall at all times take necessary precautions to protect BPA's facilities from accidental contact that could cause an outage or damage the facility.

(2) The Contractor shall, as directed by the CSR or Station Operator, erect, maintain, and remove such safety fences as are required to prevent accidental contact between BPA's normally energized facilities and the Contractor's equipment or workers. BPA will normally furnish the safety fences required in its energized substation yards or communication equipment sites. The safety fences shall not be removed without consent of the CSR or Station Operator. Safety fences furnished by BPA remain the property of BPA. If 'Safety Fence' is not specified separately in the Schedule of Prices as a specially priced item, its cost shall be considered included in the contract price(s) for the other item(s) listed in the Schedule. If separately priced, the estimated units (linear meters) of safety fence and the price for same are set forth in the Schedule of Prices. The "Variation in Quantity" clause, whether or not included herein, is inappli-

cable to this safety fence requirement. The Contractor will be compensated at the same unit price for the actual lineal meters of safety fence installed.

(3) The Contractor shall take precautions such as the following when fueling gasoline vehicles or power tools on a transmission line right-of-way or within a substation or BPA communication site:

(A) The fueling device should be grounded and bonded to the object being fueled before any vapors are permitted to escape;

(B) No ungrounded object or person should be allowed within the zone of escaping vapors;

(C) Metal containers should be used;

(D) Plastic or any other non-conducting container should not be used.

(4) Dangerous induced voltages may be present because of energized adjacent facilities. The Contractor shall take adequate safety measures to protect its employees and others from induced voltages as well as direct contact. The Contractor shall provide qualified safety watchers for the protection of workers and BPA facilities for the phases of the work where required by these specifications, law or regulation, or where it considered them to be necessary. Safety watchers shall be positioned close enough to all workers and equipment required to be watched so that work can be immediately stopped and safety instructions readily given. Hence, more than one safety watcher may be required. A safety watcher shall have no other duties than to warn workers of any impairment of safe clearance or other possible electrical hazards. Safety watchers are required under any of the following conditions:

(A) For all work being performed in a substation yard, except when the work area is separated from energized parts by a guard or barrier approved by the Substation Operator.

(B) Whenever inadvertent movement could cause equipment or material to contact energized parts.

(C) Whenever equipment or its load can come within 5 meters of energized parts, regardless of approved guards or barriers.

(D) Whenever inadvertent movement by a worker could result in violating the minimum working distance shown in Table 1.

(E) When operating or moving equipment in a substation yard, except when the equipment is separated from energized parts by a guard or barrier approved by the Substation Operator.

(F) For painting of transmission line towers when painters or their rigging exceeds the level of the lowest energized conductor, or come within 15 feet of such conductor.

(G) Whenever the contractor otherwise determines a safety watcher is necessary.

(5) All safety watchers shall be competent electrical workers, having satisfactory experience with energized high voltage facilities of the type located in proximity to the employees they are assigned to watch. The Contractor shall submit the prospective safety watcher's resume to the Contracting Office. This resume shall clearly demonstrate the ability of the individual to be a qualified safety watcher. Additionally, safety watchers shall pass a test administered by BPA and participate in an interview prior to per-

performing any safety watcher duties.

(6) The test will be a written examination covering the safety regulations set forth in the BPA Accident Prevention Manual. The interview will be administered by a BPA Substation Operator or designated BPA electrical worker to ensure the safety watcher is experienced with the type of high voltage facilities where they are to be a watcher. The interview may be given at the Construction Services Building in Vancouver, Washington, or the work site, at the discretion of BPA. Tests will be administered in Vancouver, Washington at the Construction Services Building on the BPA Ross Complex. Arrangements for taking the test shall be made with the Contract Construction Safety Manager. The contractor shall give BPA at least a 7-day notice prior to taking the examination. In the event an employee fails the test, one re-test can be given. A second failure will make the individual ineligible for future tests for a period of one year. The names of individual(s) passing the examination will be placed on a list. The names will remain on the list for a year, at which time the individual(s) will take another test, or have their name removed from the list. Upon request, the Contracting Officer will provide the list of names to the contractor. Testing will not be required for individuals listed. BPA does not guarantee the availability of any persons listed. All requests for safety watcher testing shall be forwarded to:

Bonneville Power Administration
Construction Management
Contract Construction Safety Manager - TKC
P.O. Box 491
Vancouver, Washington 98666

(7) If “Safety Watcher” is not specified separately in the Schedule of Prices, the costs therefore shall be considered included in the contract price specified for the contract item(s) listed. If separately priced as a separate unit-priced item, the estimated hours of safety watcher and the price for same are set forth in the Schedule of Prices. The “Variation in Estimated Quantity “ clause, whether or not included herein, is inapplicable to this safety watcher requirement. The Contractor will be compensated at the specified rate for the actual hours of safety watcher hours performed.

(f) The Contractor shall maintain an accurate record of, and shall report to the CSR in the manner prescribed by the latter, all cases of death, occupational diseases, and injury arising from, or incident to, performance of work under this contract. The record and report shall include a description of the preventative measures to be taken to avoid recurrence, any restitution or settlement made or the status thereof.

(g) The Contractor shall have 30 days to take the remedial action required. If the Contractor fails to make full restitution or settlement within 30 days, BPA may:

(1) Make, or cause to be made, the required remedial action or cash settlement to the person or persons who have been injured, and

(2) Charge to the Contractor’s account an equitable amount, not to exceed $2,500.00, for any injury claim. More than one such payment, and charge, can be assessed if more than injury has occurred.

(h) The Contractor bears sole responsibility for ensuring that all personnel engaged in work related to the contract possess the necessary knowledge and skills to perform their work safely and to otherwise function in compliance with the foregoing criteria. (See also the Material and Workmanship clause)

(i) The Contractor shall hold BPA harmless from any and all suits, actions, and claims for injuries to or death of persons arising from any act or omission of the Contractor, its subcontractors, or any employee of the Contractor or subcontractors, in any way related to the work or operations under this contract.

(j) The Contractor shall indemnify and hold harmless the property owners or parties lawfully in possession against all claims or liabilities asserted by third parties, including all governmental agencies, resulting directly or indirectly from the Contractor's wrongful or negligent acts or omissions.

(k) Nothing stated herein shall be construed to be a limitation on the Contractor's liability. The rights and remedies of BPA provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

TABLE 1

Nominal Voltage Between Phases	Minimum Working Distance in Centimeters (Inches)
600V to 15kV AC	60.96 (24)
15.1kV to 35kV AC	71.12 (28)
35.1kV to 46kV AC	76.20 (30)
46.1kV to 72.5kV AC	91.44 (36)
72.6kV to 121kV AC	101.60 (40)
138kV to 145kV AC	106.68 (42)
161kV to 169kV AC	111.76 (44)
230kV to 242 AC	152.40 (60)
345kV to 362kV AC	213.36 (84)*
500kV to 552kV AC	335. 28 (132)*
700kV to 765kV AC	457.20 (180)*
400kV DC +	266.70 (105)
500kV DC +	350.52 (138)
Insulated Overhead Groundwire	60.96 (24)

* Note: For 345 - 362kV; 500 - 522kV; and 700 - 765kV, the minimum working distance and the minimum clear hot stick distance may be reduced, provided that such distances are not less than the shortest distance between the energized part and a grounded surface.

(End of Clause)

Alternate I (Oct 93)

(l) Before commencing work, the Contractor shall:

(1) Perform a hazards analysis of the work specified by this contract. Site and adjacent conditions shall be considered. All significant hazards shall be identified. Some of the hazards foreseen are identified as:

(A)_____,
(B)_____, etc.(CO to list)

(2) Submit a safety plan for dealing with each specific hazard identified, whether identified by BPA or the Contractor.

(3) Meet with representatives of the Contracting Officer (CO) during the preconstruction conference to discuss and to develop a mutual understanding relative to the content and implementation of the plan.

(4) The CO, or her or his representatives, may require other hazards to be added to the plan. If planned hazard avoidance measures are deemed insufficient, the CO, or a designated representative, may require revision. Work involving identified hazards shall not commence until adequate plans have been submitted and reviewed. BPA's review of the Contractor's plans shall in no way relieve the Contractor of the latter's liability for safe performance.
(End of Alternate I)

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APPENDIX E
CHEMAWA SAFETY MEETING MINUTES / ATTENDANCE

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Attendees at mtg. — 0800

6/97 Chaparral — Briefing on Contractor Fatality of June 25, 1997

1) Jared [illegible] — BPA
2) [illegible] — BPA
3) Paul [illegible] Reynolds — BPA
4) [illegible] — Chaparral
5) [illegible] "
6) [illegible] "
7) [illegible] "
8) [illegible] "
9) [illegible] "
10) [illegible] "
11) [illegible] "
12) [illegible] "
13) [illegible] "
14) [illegible] "
15) [illegible] "
16) [illegible] "
17) [illegible] "
18) [illegible] "
19) [illegible] "
20) [illegible] "
21) [illegible] "
22) [illegible] B.P.A.
23)
24) Reviewed our BPA Safety Meeting with [illegible]
25) [illegible] Chaparral [illegible] safety [illegible]
26) [illegible] in order to prevent [illegible] accidents
27) from [illegible] [illegible] to [illegible] any
28) [illegible] accidents [illegible]
29) [illegible] on the [illegible] of [illegible]
30) [illegible] that [illegible] not [illegible] to actually [illegible]
31) [illegible] to get hurt. ([illegible]) No
questions or comments. Meeting adjourned [illegible]

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APPENDIX E
OLYMPIA SAFETY MEETING ATTENDANCE

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✓ JORGE OCHOA – 1 VICTIM
✓ JAVIER TORENTO – 2 FOREMAN LEAD
✓ DANIEL CAUDILLO – 3
NICOLAS GUERRERO – 4
VALENTE ZUNIGA – 5
ANTONIO FLORES – 6
AGUSTIN GUTIERREZ – 7
MIGUEL ZUNIGA – 8
✓ ALBERTO OCHOA – 9
✓ FRANCISCO TORENTO – 10
JOSE GARIBAY – 11
DANIEL GUERRERO – 12
JUAN LA TOURETTE – 13