



Figure B.1 This photo, from a government safety manual, demonstrates what happens when an aluminum fire ladder touches a high voltage power line, most of which are not insulated. ENG microwave masts have the same conductive characteristics as this ladder.

ENG Safety...A Long and Winding, but More Positive Road

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Editors note: Much earlier in the book we looked at satellite uplink safety from an RF exposure standpoint. In this section we will look at ENG microwave transmission dangers from an electrical safety standpoint.

On one hand, the broadcast industry has been racked by the deaths, injuries and property damage caused by ENG trucks. On the other, it has responded, perhaps better than other industries in the long time world-wide industrial revolution.

First, Some History

It was in the mid-80's when an ENG technician, who didn't have much in the way of education about the hazards involved in ENG, became the first person known to have been electrocuted raising his truck's mast into a power line. Once his mast was into the line, his reaction was that of an ideal employee in caring for the equipment he was placed in charge of by his station. Reportedly, the tech went back to the charged truck more than once to try and fix the situation, which got the better of him as he made the important, but fatal decision, leading him to become part of the electricity's path to ground. Few heard of the tragedy, and its lessons. This cost the industry a few more soldiers.

Another technician a few states away was another tragedy. This gentleman also raised the mast of his truck into energized lines. He also reacted in such a way that it cost him dearly. One of his first thoughts was that he would get in trouble for messing up his truck, and he reached into

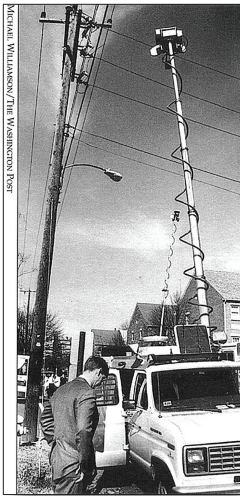


Figure B.2 This was the truck in which an early ENG tragedy occurred in which a technician died, the picture shot shortly after his electrocution. The picture illustrates the view one can have if standing a short distance from the van and looking at the overall "workplace" or "work environment." This hazardous workplace was created the moment the truck parked, as the van's clearance was certainly not anywhere near the mandated 10 foot clearance from overhead lines 0-50kV. The mast in the rear of the picture is from a van, which was parked across the street, well clear of the power lines. "Across the street from lines" is a great way of maintaining clearance.

the truck to move the mast lever into the lower position. As he touched the lever the voltage went through him and out his legs. The force violently knocked him to the ground. It was the last thing he did with the legs he was born with; as his burns were so severe he lost one leg above the knee, the other below. While hospitalized, he learned about the aforementioned accident, and read about another on the east coast.

Yet another accident crippled a female technician. She was somewhat new at the craft, and, like other field remote technicians, knew the mechanics of getting a live shot back to the station, but not much more, especially with regard to the hazards of her work. She set up in the parking lot of a major hospital and raised the mast of her live truck into a power line. She sustained severe burns on her hands when she plugged grounded cables into a panel, and was blown out of the truck, pieces missing from her hands according to one witness. Her news manager knew that field work was dangerous, and said that this sort of accident was waiting to happen in a post-accident interview published in the RTNDA Communicator about the increasing pressures and danger of live news coverage.

Undoubtedly, over the next decade, there were numerous close calls and events where masts were damaged, people injured, and trucks lost, in part or entirely, due to avoidable accidents. One particular ENG truck accident might be the considered the final straw, the beginning of the quest to prevent more.

Still, almost 10 years later, a contract services company technician, under contract and direction of a major news organization, was to transmit pictures of a high profile espionage arraignment. A transmission location in the courthouse's parking lot, discovered the previous day, could not be used, possibly because of security concerns. Under a lot of pressure from the desk to get the shot in, the technician parked across the street under power lines and raised his mast. Some at the scene felt he calculated that he would miss the wires, watching as the mast was going up. Pictures from the scene revealed that the truck was on a tilt caused by the crown in the road, a technique used in the construction of roads to facilitate water drainage. Without walking away from the truck and looking up, it would be hard to see that the mast was on a course to hit the overhead lines, even though the mast was on the street side of the truck, while the 19,900 volts-to-ground wire he hit was above the curb side.

The first part of the accident, videotaped by other crews at the scene, and reported by witnesses, showed that the technician received an initial shock, then spun around and fell back into the opened doors of the technical compartment of the van, the charge from the wires and energized van traveling through his lower back, into his legs, then to ground. The EMT report summed up the physical damage to him by reporting a Pelvis broken, no pulse, no breathing, feet off.

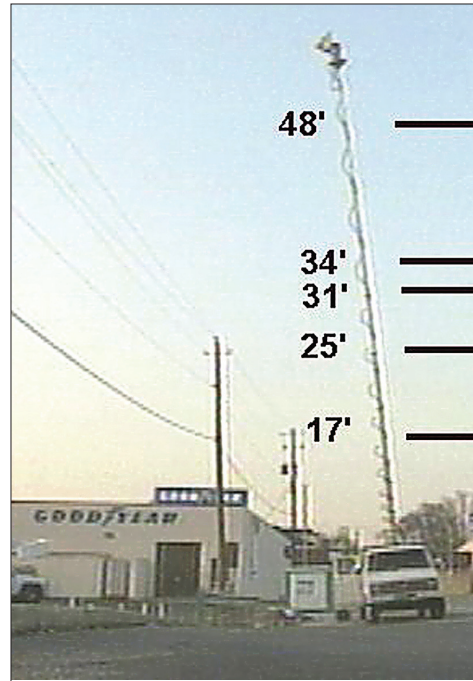
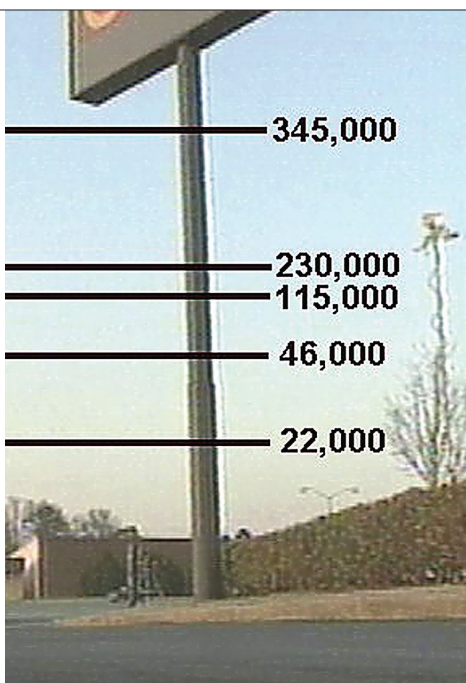


Figure B.3 This picture illustrates approximate mast heights and voltages on high voltages lines at those heights. Having the ability to reach these hazardous voltages with conductive material is a large, public service, responsibility.



Light at the End of the Tunnel?

After reading the story of this accident, this author, a Contributing Editor for Television Broadcast magazine, requested permission to write on ENG Safety with the idea of creating a number of articles that could lead to an industry forum for safety. Although there was some initial concern that the grisly topic upset readers and advertisers, as it turned out, articles about safety were probably one of the best things that happened to the manufacturers, as they were commonly the targets of product liability lawsuits because of safety issues. The words of experiences and procedural cautions derived from the articles could only help their clients increase their safety awareness.

Through research, it was found that a Multiple Station Owner (MSO) had a great safety program. Their manual and educational/training regimen was found to be superior to anything in the industry. Talks with their VP of Engineering, along with showing him the not yet completely published series, was enough for him to engage his Division President into discussions which led to him allowing for the manual to be given out to anybody who requested it, free of charge, for unrestricted use. The discovery of the manual and this offer created the need for the series to contain one more part. Even the vehicle manufacturers were positive about it. Safety has always been a major concern for the manufacturers, but their voice, up to this series, had been limited to their own publication and the few articles previously mentioned. Years went by as this new safety component was added to industry safety practices. Hundreds of broadcasters ordered the manual and its distribution continued until the MSO was sold to another broadcast group, who immediately ceased distribution of the industry-lauded manual.

This didn't stop many safety efforts, but it also didn't help. Another kink in the path to safety occurred when another very safety conscious individual, an Assistant Operations Manager at a large market station, wrote and web-published a great safety manual for his station and the industry. It was also lauded by industry managers and employees, but the corporation he worked for ordered it taken off the website in the summer of 1999.

Coincidence, Irony, or Destiny?

There were more accidents within the decade, as the hundreds distributed didn't cover all the stations using ENG vans, nor were employees in all stations with manuals required to read them before undertaking their responsibilities with live trucks. One station lost a technician and a truck after his heel was blown off while on his first ENG assignment. Another saw two employees disabled in an accident, one losing a leg, the other burned severely. Two other techs, one from a radio station, were killed in separate accidents. Numerous other accidents had occurred, with per-

sonal and property damage losses in the millions of dollars. But no period of time was as bad as one single month in 2000, when three accidents changed the lives of six people, three stations, and hopefully thousands more in the industry.

In the first, a 3 person on-site crew placed their mast into 230,000 volt circuit lines, bringing 115,000 volts to ground. ("Circuit voltages" are line-to-line measurements, and typically those voltages are halved when one wire is grounded.) None of the employees reportedly had ever seen the industry's safety manuals. It was a night time live shot, and the truck technician was reportedly distracted by other station issues and didn't see the plainly visible wires nor the huge towers supporting them. The reporter was sitting in the truck, and the cameraperson, 70 feet away, was moving his camera. It was connected to the truck through a cable reel. When the rising mast hit the power line, the tech was blown down, and the cameraperson sent staggering after the camera literally exploded next to his head. The power company circuit breaker opened the circuit. The reporter was stunned. She sat within the huge explosion, and was next to the driver's side air bag, which exploded as well. She panicked, and ran out of the truck. About five seconds after she ran out, the power company's circuit breaker, set to automatically reset after 15 seconds, did so, causing another explosion. Luckily nobody on the crew, or anyone around the truck, was killed. The accident was videotaped, a picture of the reporter running from the exploding truck a terrifying legacy of the event. Both the tech and reporter were ok, but the cameraperson has not returned to work as of the writing of this paper. This was the second accident in this market within 7 years, and many EMT's and rescue people who reported to this accident were at the previous one.

The second accident was with a two-person crew, who was setting up for a staged noon live shot to show off a police run child safety-seat roadblock. Police officers were at the site as the truck was setting up. The crew had vaguely heard about the previously mentioned incident that month, but had not seen "footage" from the videotaped accident. Neither crew member had ever received documented safety training, either. The crew determined that parking on the same side of the road as the power lines was ok, and parked on a 5-degree ramp right next to an auto body

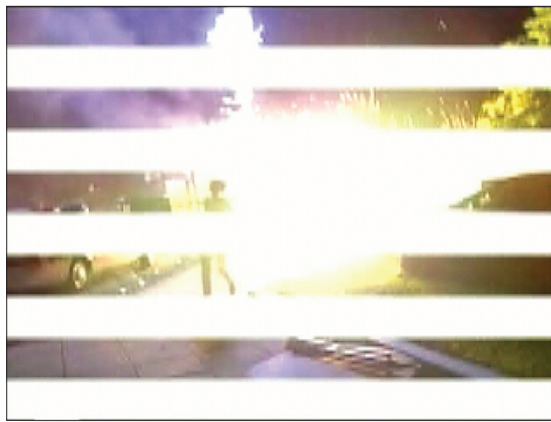


Figure B.4 In one of the most stunning video frames from any recorded accident, a terrified reporter runs from her electrified news van, seconds after jumping out a short time after the mast had been placed into contact with a 115,000 volt power line. The power line was de-energized right after the initial contact by its circuit breaker, perhaps saving her life. It automatically reset 15 seconds later resulting in a second explosion, pictured here.

shop, a massive utility wire array overhead. The way the truck was parked, the doors to the van could barely be opened without hitting the wall of the shop. The tilt of the ramp would have the effect of causing the mast top to move closer to the lines as it was rising, proximity to the building limiting escape routes. When the mast finally hit the energized wires, the tech touched the rear door handle trying to get into the truck to stop the mast, and was propelled from the truck, and knocked down. The reporter, still inside, was given very questionable advice by bystanders outside to get out of the truck, and proceeded to do so. She exited with her left hand on the passenger door inside armrest and hit the ground with her right foot, completing a 19,900 volt circuit to ground. The reporter lost much of her left arm and right leg and toes and fingers from her remaining limb. This accident was also videotaped.

The third accident was the second in this state within five years. The technician, who reportedly had been told about the previous accidents that month, parked a truck under clearly visible 230,000 volt circuit high tension lines, and between equally as visible tall wooden support structures for the lines. He received a shock, which could have measured as much as the potential 115,000 volts to ground. One report stated the technician claimed to have a divot in his head as a result of the accident, and suffered severe leg burns, disabling him. One picture showed the truck's rear section with 2 small distortions in the pavement where the tech's feet were.

Since that fateful month, there have been numerous accidents, mostly, thank goodness, involving property damage, not personal injury. One accident occurred as a crew was driving from a live shot location while editing. The generator and equipment rack was on, but unknown to them, the mast was rising. It eventually got caught in wires and the incident



Figure B.5 Clearance accidents occur much more often than any other type of ENG/SNG incidents. Although these mishaps can also cause a threat to life, they most often cause property damage, and damage to one's career. The ENG truck on the left had its mast down, but that was still not low enough to clear this 9'6" hotel canopy. ENG/SNG operators need to know their "on-the-road" clearance. The right photo shows a KU dish that got sheared off a SNG truck when that truck took off with the dish still up.

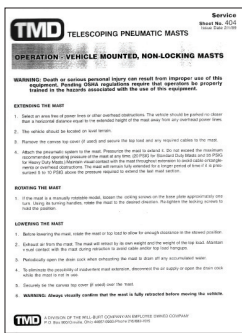


Figure B.6 Ohio's Will-Burt provides almost 100% of the masts used in ENG trucks. With each, they issue technical advisories regarding proper operating procedures and cautions. The bulletins above were issued in 1989, and warn that "Death or serious personal injury can result from improper use of this equipment," and "The operator should always visually confirm that the mast is fully retracted before moving the vehicle." Proper safety education for operators should include reference to, and observance of, such manufacturer issued warnings. Warning signs are proven accident deterrents. Not only do they warn operators about hazards, but they can also alert others in the area of hazards, which might cause them to alert an errant operator.

caused all sorts of damage to the truck and utility company property. Clearance accidents far outnumber raised mast incidents.

End of the Road or Good Rest Area?

But, for every accident, there are tens of close calls, and hundreds of incidents where some sort of intervention was needed to prevent damage.

In the vast majority of accidents, the operators were not educated or trained. Most had little knowledge, if any, of any safety regulations with regard to elevating structures, such as a mast on their ENG truck, despite the fact that the manufacturers of equipment on the trucks distributed literature explaining this with the new truck. Most states have regulations, or in the absence of State regulations, the Federal Regulations are in effect. Those along with some common sense are great guidelines.

- Stay at least 10 feet away from all overhead lines. (Law) If the lines look to be very big, get further away. A 20 foot distance from wires covers just about every voltage which one can encounter. Simply staying across the street from wires is a great guideline.
- Having a spotlight in a truck is a help at night when lines are not visible...In fact it's a must.
- Walk Around, Walk Away, Look Up!! This is a great safety discipline for safety. There has not been an accident in which the view from 50-100 feet away has not shown the apparent danger.
- Take extra and specific time to check mast when stowed after events. Walk around twice to double check that expensive mast top equipment is safe.
- Inspect safety devices and write up problems. Those devices are there to save your life.
- Make sure clearance and danger signs are very visible to all operators. Signage saves lives and property.
- Make sure all operators have read and reviewed operator's manuals and safety literature for the equipment they are to operate.

As of May, 2002, the State of California has proposed regulations in front of them to enact laws which will specifically cover ENG vehicles under their Title 8 electrical safety code. This will be the first set of laws in the nation to govern operations, partly because the broadcast industry has failed to do so. Whether laws exist or not, operators always need to look out for the protection of their stations, the general public, and themselves. It's been a long and winding road to get here, and we're so much better off than before, but only IF we use the knowledge from our history. For more information on ENG Safety, please consult the engsafety.com website. ■