

KFCB CHANNEL 42, CONCORD, CALIFORNIA

Around 1982 I was approached by a couple of people regarding a proposed UHF television station to be built on Mt. Diablo in northern California. One person was the Rev. Ron Hood, who I knew when he was music director at Bethany Church in Alhambra, California where we were members. The other party was the Rev. Ronn Haus, pastor of a church in Redwood City, California, where Ron Hood was currently music director. Ron Hood knew something of my previous experience in engineering and constructing UHF television stations and had recommended to Pastor Haus that he consult with me regarding his plans. We met for a couple of hours in the restaurant atop the Sumitomo Bank, Los Angeles' tallest building. I made several recommendations, one of which would haunt me later. That was my suggestion that RCA was probably the best source for a transmitter and other major equipment as that company was known to provide the best financing.

I heard nothing from Pastor Haus for a couple of years, then suddenly found myself thoroughly involved in the project. Haus had formed a corporation named First Century Broadcasting and had obtained a Construction Permit from the FCC to build a station on UHF Channel 42 with studios in Concord, California and transmitter on the north peak of Mt. Diablo. He had negotiated a multi-million dollar contract with RCA to supply nearly all the studio and transmitter equipment. Since the contract included equipment from vendors other than RCA, a third party was needed to pass through these items in order to include them in the RCA financing. I agreed to handle these transactions through my Delaware corporation to facilitate the deal, making no charge for this other than reimbursement for out-of-pocket expenses. I agreed also to act as engineering consultant on the project although I was then employed full time as Chief Television/ Radio Engineer for the Long Beach Unified School District.

A major problem had arisen regarding the transmitter site. It was only the first of many. Mt. Diablo is located in Contra Costa County east of Oakland, California. There are two peaks; north and south, at altitudes of 3,557 and 3,849 feet above sea level, respectively. It is a very desirable communications site. Though there are many higher peaks in California, I have heard that one can see more square miles of the state from there than from any other mountain. South peak has been a state park for years, has a

paved road to the top and has operating communications facilities. North peak is a very different story. Access is by an unimproved dirt road and the last few hundred feet is steep and rough, requiring a four wheel drive vehicle. Knox Larue, a radio station owner and business communications provider in Stockton, California had for many years owned about fifty acres on top of North Peak where he had established several communications sites, each equipped with a small tower and equipment shelter, usually an old truck trailer. He leased these facilities to various companies that had installed repeaters for industrial two-way radios. At some point the State of California had taken over the mountaintop by eminent domain, but in the deal had given Knox what he called “permanent easements” for all his sites. He had agreed to lease one of these to First Century for their transmitter facility. Now Contra Costa County became involved, as the building permits would have to be issued by that entity.

Knox Larue’s sites had been rather meticulously documented when the state took over and each one specified the size, location and footprint of each building and tower that existed. The county would allow replacement of the building (an old trailer box) with a permanent structure, but only on the exact location and exactly the same size. The tower could only be replaced with another of the same height. Any variation would require legal proceedings that could well take years and this delay was not acceptable to First Century. The old trailer box currently on the site was 8ft. x 24ft. My introduction to Mt. Diablo was a trip on a foggy morning with Knox to view the intended site. It was nearly my last trip anywhere except to a cemetery. Even with his years of experience on that mountain he became disoriented in the fog and drove off the road, dropping the front of his truck over the side. Knox had to call one of his employees to come up the mountain and pull his truck back on the road.



Truck off the road



Proposed site

An immediate problem presented to me was the RCA TTU-60 transmitter, as it was designed for a much larger building. It consisted principally of three side-by-side cabinets, adding up to about a twelve foot width. The depth was nearly fifteen feet. The cabinets were backless, with a wire mesh “monkey cage” extending to the rear. The cage had been originally designed for mounting the major power supply components, but the advent and adoption of unitized power supplies in oil-filled weather-proof containers that could be situated outside the transmitter building had left the cage virtually empty. I was able to cut about eight feet off the back of the cage to make the rest of it fit in the eight feet that was available. The final installation left the front of the transmitter with it’s meters and controls just eleven inches behind the large sliding door in the side of the building, a real nightmare for maintenance engineers in the foul weather often encountered on the mountain.



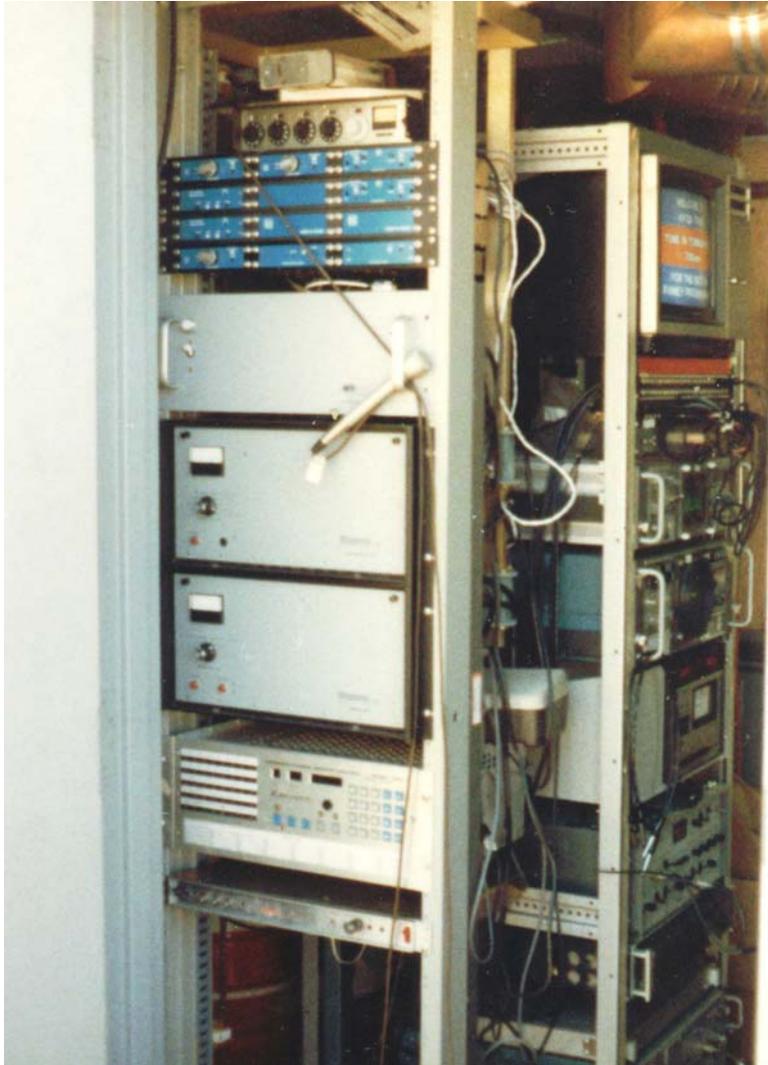
Another large piece of equipment that required space in the building was the heat exchanger. The klystron power tubes used in the RCA transmitter are cooled by water that is boiled into steam, then condensed back to water in a heat exchanger; this in contrast to other types of klystrons that are water or air cooled. The heat exchanger for a water cooled transmitter can be located outdoors because anti-freeze can be used in the system in extreme weather. Anti-freeze cannot be used in a steam system because it would be immediately boiled out, therefore the heat exchanger must be indoors, taking up more of the limited floor area.

Then there was the filterplexer. This is a large heavy piece of equipment used to combine the RF outputs of the separate aural (sound) and visual (picture) transmitters into a single 6-1/8" diameter copper co-axial transmission line going up the tower to feed the antenna. The 6-1/8" filterplexer output also had to be first routed to a multiport patch panel to facilitate emergency reconfiguration and allow connection to a dummy load. The only space left available was over the transmitter. It was fortunate that the county specifications for the site had not included a dimension for the height of the building as was the case for all the other sites. We were able to increase the height of the building to fourteen feet, giving room for the filterplexer and associated coaxial lines. It looked a little strange at eight feet wide and fourteen high.



We actually mounted the heat exchanger and set the transmitter on the floor slab and built the building around it.

Perhaps the greatest challenge was figuring out how to locate the many large transmission lines so they could be installed and still allow the necessary access to tuning adjustments, etc. The engineer hired to make the installation was incapable of doing the job and I wound up making the installation myself, although I had provided complete detail drawings. There was barely enough room left in the building for a couple of racks containing microwave, monitoring and remote control equipment.

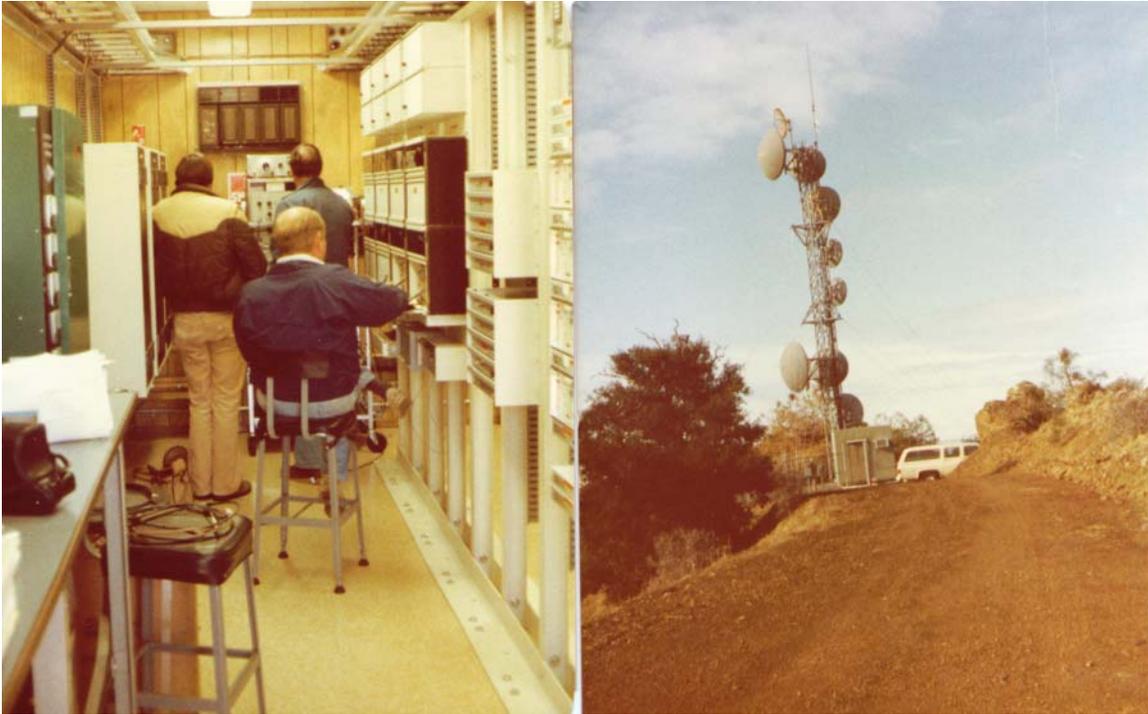


I was astonished at the high amount of the bid that First Century had received for construction of the tower. Knox Larue had a lightweight ninety-foot tower on the site that was to be replaced by a much heavier tower capable of supporting the three ton RCA pylon transmitting antenna. We were again helped by a lack of specificity in the county description of the site.

A tower height of ninety feet was called for, but we were able to substitute a much heavier ninety foot tower and then put the fifty foot antenna on top of it. The antenna was considered an attachment on the tower. A civil engineer who had worked on the design of the transmitter building was proposing a major and very expensive installation of the ground work for the tower guying system. Mt. Diablo is the only place in California with a Grade 5 wind-loading requirement, and structures must be designed to withstand 95 MPH winds. I contacted Richard Bell, owner of Atlas Tower Company in Oklahoma. Richard had previously built a couple of towers for me and he came out to look at the site. He recommended the use of rock anchors, as the top of the mountain is pretty much a solid block of granite under a thin layer of soil. This proved to be much less costly. Richard had a California licensed civil engineer certify the plans so Contra Costa County was satisfied.

Now enters Chevron (then Standard Oil Company of California). Chevron had (probably still has) a major business operation in Concord, California. I seem to remember that they handled their credit card billing from there. At any event, they had a major terrestrial microwave hub on the north peak about two thousand feet from the Channel 42 site, with microwave paths going several directions. When they learned that a 2.5 megawatt ERP television signal was to be radiated over their facility they were understandably concerned. When their fears were communicated to the powers that be at First Century Broadcasting I was dispatched to Chevron headquarters at 225 Bush Street in San Francisco to attempt to smooth the ruffled feathers.

I met several times with their engineers and a vice-president to assure them that there would be no problem, as the Chevron site was many feet lower than the TV antenna which would transmit a very narrow beam way above their site. Chevron was mollified but not totally convinced. They placed an engineer with a spectrum analyzer at the receiving point of each microwave path on the day we first fired up the transmitter. Their vice-president was even up on the mountain with us. As I had predicted (with considerable trepidation) there was no increase in the baseline noise level on any of their hops. I was told that Chevron spent \$100,000.00 on the tests.

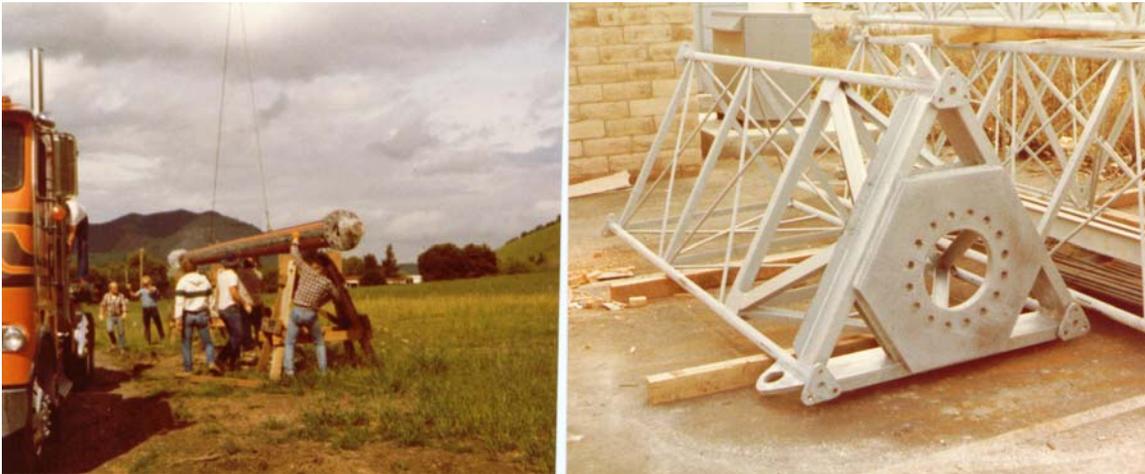


Chevron microwave hub on North Peak, Mt. Diablo.

Another issue with Chevron was that they had built and still owned the power line up the mountain, though Pacific Gas and Electric supplied the power. It was a single-phase high voltage line and a third wire would have to be added to supply the three-phase power required by the television transmitter. It took months of negotiations with Chevron and P.G. & E. to resolve this problem and the delay necessitated the operation of Channel 42 on diesel power for many weeks after first sign-on. The 225KW Caterpillar generator had to be hauled up the mountain with a large Caterpillar tractor, and was placed in a used shipping container similarly transported.

Then there was the antenna installation. An RCA Pylon UHF antenna is made from a piece of heavy steel pipe with radiating slots cut in it and an inner copper coaxial feed harness. It is about fifty feet long (depending on channel) and weighs about three tons. It is mounted free-standing on top of the tower, secured by bolts through a flange welded to the lower end. The co-axial feed sticks a few inches below the mounting flange, a definite design flaw because it is very vulnerable to damage when put through the hole in the tower top during installation. It was recognized that under existing conditions the most practical way to set the antenna was by helicopter but because of a previous unhappy experience with that means of antenna installation I was apprehensive.

A chopper was contracted for by the station chief engineer and I was present when it arrived at the parking lot at the foot of Mt. Diablo where the antenna had been unloaded from the trailer on which it was shipped from the RCA antenna facility in Meadowlands, PA. Unfortunately, the chopper they sent was not capable of lifting the antenna to the altitude of the mountaintop and the lift had to be postponed



I was unable to be present when the next attempt was made, but the coaxial feed was damaged when it was set on the tower and the antenna had to be trucked back to Pennsylvania to be checked out and repaired. It made the round trip in a couple of weeks and was then successfully installed. The tower crew had to make three trips from Oklahoma.

After the antenna was set, the 6-1/8" rigid transmission line up the tower was installed by the tower crew. There was a problem with the elbow complex connecting the transmission line to the antenna and I had to make a special part and connect the complex. The transmission line from the building to the tower was still not in place nor was there any way to support it, so I designed a galvanized steel support bridge and hired a local steel fabrication company to build and install it. The station owners had been advertising a sign-on date just after the Memorial Day holiday and we were under considerable pressure to meet that commitment. Of course the bridge installation crew left early on Friday before the holiday with the job incomplete. We worked through the week-end so that the RCA field engineer could perform the final tweaks and proof-of-performance on the transmitter. Sign-on occurred as scheduled and thus ended my active participation in construction of the station.

A couple of years later I contracted with the station to build a low power UHF translator station in Fresno, California to relay the programming of the Concord station to that city in the central San Joaquin Valley, but that is a story for another chapter



RCA Field Engineer performing proof-of-performance and coax bridge installation.



Sign-on picture and finished installation.



Channel 42 transmitter building in 2001. A few additions made but to access the front of the transmitter you are still out in the cold.

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P.S. I neglected to mention the smelly, blanket-clad Indian that showed up at the television studio one day claiming that we were disturbing his ancestor's sacred sites on Mt. Diablo. That problem was solved by proving that the complainant belonged to another tribe.