

I received my amateur radio license in the late 1960s while attending high school in Edmonton. After nearly fifty years of absence, I rejoined the active amateur radio community. Much has changed since those early years of my amateur radio activities. The days of a 20-meter Tri-Ex Skyneedle in my parents' backyard and climbing Delhi towers to repair Yagi-Uda antennas have long since passed.

An effective antenna system continues to be a principal requirement for successful amateur radio communication. The installation, maintenance, and repair of antenna systems are important factors to consider—especially given the weather conditions in western Canada and my own advancement in age and ability to conduct such operations at height.

Construction began on HF and amateur satellite antenna-tower systems that could easily be lowered to ground level, allowing maintenance, repair, and modification to be conducted safely and efficiently.

VE6HQ A Tale of Two Towers

HF Antenna System

The HF antenna system was based upon a multi-band end fed vertical. The Cushcraft R8 was selected, providing operations on amateur bands 40 m through 6m. RF radiation pattern modelling using the EZNEC software, with an antenna elevation of 5 metres (16 feet) chosen.



A hinge-plate assembly was fabricated such that it could be inserted between the tower base to tower sections.

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HF Antenna System



The antenna assembly can be easily raised and lowered using a hand winch assembly (not shown). This tilting tower design eliminates the need for any ladder or scaffolding during antenna maintenance.

Earth grounding of each tower leg, adequate concrete foundation, guying of vertical (manufacturer recommended procedure) and coax lightning protection - all completed as part of this project.

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Satellite Antenna System

Amateur radio satellite communications provides an exciting technical opportunity for ham radio enthusiasts. Successful operations are routinely conducted with minimal equipment such as a HT VHF/UHF transceiver and a handheld Yagi-Uda antenna manually pointed at the orbiting satellite.

I designed and fabricated a cost-effective satellite tower assembly using an available Wade TV tower sections. The tower sections were reinforced to add required strength to the cantilever tower design.



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Satellite Antenna System

Engineering structural analysis was conducted during the design of the cantilever tower as mechanical strength of the “light-duty” 18-gauge metal tower sections used both as a column and truss must be considered. Analysis showed that it would be prudent to add structural reinforcement at key stress areas within the design. Galvanized, 19 mm Schedule 40, steel pipe was inserted in tower leg assemblies forming a tight-fitting, rigid strength members.



The photographs show the installation of these galvanized pipe sections during the construction.

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Satellite Antenna System

The tower hinge assembly is an important area of the design and serves as the pivot point for tower rotation.. This section was reinforced to accommodate bending moments experienced during raising / lowering of tower.



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Satellite Antenna System

Tower foundation design and construction is an important part of any antenna installation. Foundation size, cement specifications, reinforcement bar (rebar) and air entrained in cement removal during placement must be considered. The foundation should be designed to consider any possible changes / additions to antenna loading and / or possible addition of tower section.



Prior to site excavation, all utilities must be surveyed and marked by qualified personnel.

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Satellite Antenna System

Proper cement curing time must be allocated to ensure a structural integrity of the foundation prior to additional tower assembly. Earth grounding of all tower leg sections must be installed using acceptable hardware and wire gauge.



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Hand operated winch and cable minimum safety factor of 3 was used in the selection of all lifting equipment. Proper installation of wire-rope clamps and clevises should always be emphasized.



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Satellite Antenna System

The cantilever tower design has proven both simple and functional. The antenna – tower system may be safely raised and lowered safely by a single operator. This system is currently in use for amateur radio satellite communications and thus far has proven to be reliable during operations. Additional testing and evaluation will be conducted during the upcoming months of operations.



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About the Author

Don has pursued a lifelong interest in science and engineering beginning as a youth in western Canada. He received his first amateur radio license at the age of 15 while attending high school in Edmonton, Alberta, Canada.

Don continued this interest and graduated from the University of Alberta receiving a Bachelor Science in Electrical Engineering. During the last 41 years he has worked in the Energy Exploration industry in Canada, the United States, Europe, South America, the Middle East and the Far East.

His technical area of interest lead to publications of nuclear magnetic resonance applied to reservoir characterization. He was granted numerous US patents for developments of wireline pressure core technology. Don Westacott strongly considers training and technology transfer as an important part of his role within the E&P industry. Don accepted a role as guest lecturer at the Colorado School of Mines providing instruction to a new generation of petroleum engineering students. Don was honored to be the Distinguish Speaker at the Harvard University Energy Panel Arab Conference. During 2020, Don received the prestigious Hart Energy Innovators Award.

I was first amateur radio license was in 1967 as VE6ANW, a year later achieved the advanced certification as VE6RI. I initially pursued 20-meter DX working using the Drake R4B / T4XB / L4B equipment and a 3 element Yagi/Uda antenna at 70 feet. Soon after, I became interested in weak signal UHF propagation. Constructing of a "home brew" 70 cm radio system complete with 4CX250 linear amplifier based upon a novel resonant coaxial cavity design was completed. Three hundred (300) kilometer daily communications using over the horizon tropospheric scatter was achieved between his Edmonton QTH and VE6JX located in Calgary, Alberta.

After more than 50 years have passed, I have rejoined the amateur radio ranks and currently active on 20 meters and VHF / UHF bands. I was granted the KI5KGX call as an extra class USA amateur operator. Subsequently, we moved to Canada and I reinstated by Canadian amateur radio certificate and requested my current call VE6HQ.

Don and his wife Marilyn enjoy the success of their sons Matthew and Andrew.

During 2021, I presented a webinar on Time and Frequency, which may be found at :

[VOD Player \(qsotodayhamexpo.com\)](https://www.qsotodayhamexpo.com/VOD-Player)

