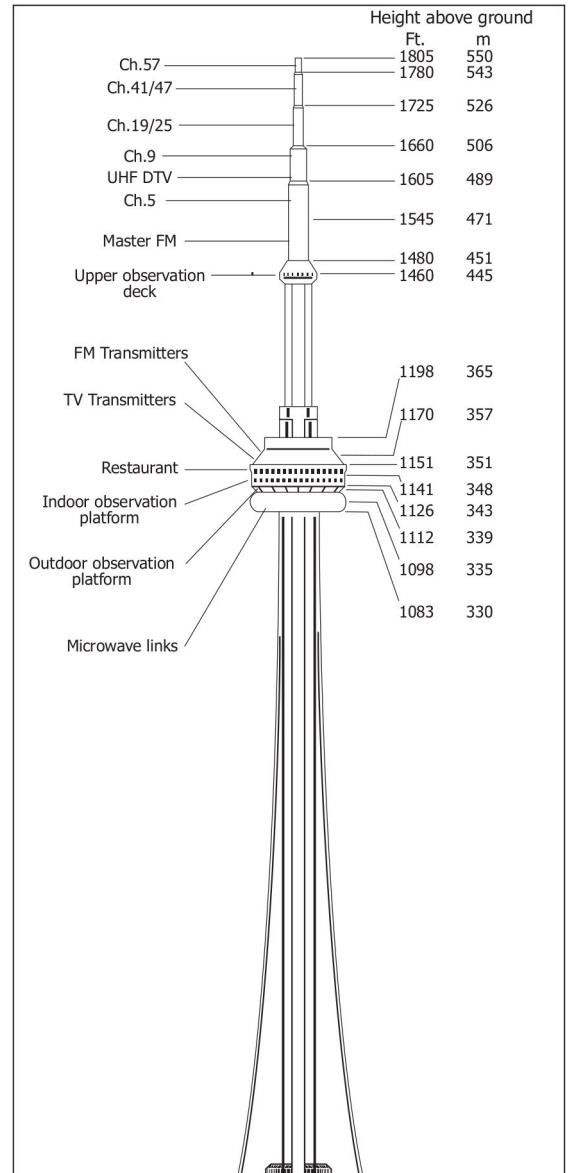


Alan Dick Broadcast and the CN Tower

When completed in 1975 the CN Tower was, at 1805ft. (550m) the world's tallest free standing structure, it rose from the Toronto waterfront to dominate an already impressive skyline. At its top is a broadcast antenna system designed, engineered, supplied and commissioned by Britain's EMI antenna group which in 1978 became part of Alan Dick Broadcast.

The group has long been associated with the challenges of television engineering and the challenge continues.

The realisation of any project on the scale of the CN Tower confronts engineers of many disciplines with a new and complex set of problems which have to be solved at every turn in the long road from planning to completion. The provision of the antenna system for the tower was no exception. Although the final objective was the radiation of improved television and radio signals to the city of Toronto and the surrounding area, many related problems had to be recognised and solved in the course towards achieving this ambition and ensuring its continuing reliability. Many of these problems were directly related to the physical size of the project. Viewed from the ground the antenna system appears as a deceptively tapering needle. The taper, in fact, is in steps from a base diameter of 26ft. (7.9m) at 1480ft. (451m) to a tip of 5ft. (1.5m) at 1805ft. (550m, the top of the tower. The core of the antenna array is a 300 ft. (91m), 220 ton steel column with a pentagonal cross section from its base for 90% of its length, changing to a square for the topmost antenna.



1973, just a hole in the ground

Structural mechanics determined the size of this core and set the antenna engineers the first of their many problems. The horizontal radiation patterns of the antennas are basically omnidirectional although, in some cases, the radiated power is reduced over a

small arc to provide protection for adjacent service areas. An initial feasibility study was undertaken to determine the best solution to produce these patterns from antennas mounted on such large cross sections. This study was an integrated approach of precision scale model measurements and R.F. theory, from which the detailed design for the complete array emerged. Vertical radiation patterns provided an equal challenge. The sheer height of the tower and its position relative to its service area demanded patterns filled to very large depression angles. Reliability of

service has been greatly assisted by designing arrays that may be used in separate halves rather than resorting to the expensive and space-consuming practice of providing separate stand-by antennas.

Alan Dick and the CN Tower

An extremely important feature of the antenna design and indeed of the overall tower design is the G.R.P. (Glass Reinforced Plastic) radome. This massive cylindrical enclosure which weighs well over 50 tons provides the antenna with complete weather protection and greatly reduces the enormous forces that would result from the wind acting on its irregular surfaces more than a third of a mile above Lake Ontario. The radome was fabricated by the British company Hunting Industrial Plastics.

The R. F. power from the radio and television transmitters is fed to the individual antennas by semi-flexible coaxial feeders up to 6 1/8 inches in diameter. Over 10 tons of this cable were supplied to EMI by the West German company Kabel und Metallwerke, of Hanover. At each antenna the power is distributed and monitored to achieve the precisely tailored radiation patterns through more than 2 1/2 miles of highly sophisticated transmission line complexes.

Compensated half-wave dipoles were developed by the antenna group for the actual radiating elements of the VHF antennas. The UHF arrays were based on the already highly-successful multi-channel Emislot panel. The circularly polarised crossed dipoles for the Master FM array were developed for broadband, very high power operation by the Alford Manufacturing Company, of Boston, U.S.A., and manufactured under licence in the UK.

The final challenge came with installation and, here again, new techniques and equipment had to be developed. The installation was carried out under EMI supervision by their appointed Canadian sub-contractor, Skyhook Construction Ltd., with some additional specialist installers being hired from Alan Dick Broadcast. The Tower, including the steel antenna support column reached its final height of 1805ft. (550m) in April 1975. The next stage was weatherproofing the whole antenna aperture by installing the radome. Four hundred and fifty individual G.R.P. panels went to make up the complete radome, each was lifted outside the main concrete tower to the 1480 ft. (451m) level. Here they were landed on a specially-constructed head frame and gantry and then placed into position from a swing stage platform which was also specially designed and constructed for this project.



Ch.5 antenna testing at works including simulated radome supports



The antenna support spine is lifted into place on the CN Tower

Alan Dick and the CN Tower



The radomes are seriously large.

Ranging from 26ft. (8m) diameter down to 5ft. (1.5m) diameter.

Note the bus parked in the background.

This whole platform was suspended on five wire ropes which enabled it to be gradually raised as each ring of G.R.P. was completed. As the radome changed diameter at various levels, the platform was designed to be adjusted accordingly. After completion of the radome, the antennas themselves were installed using a similar method of lifting to the 1480 ft. level and then up inside the radome to their various apertures. The final electrical commissioning was carried out by EMI (now Alan Dick Broadcast) antenna engineers, to provide Toronto with a truly impressive broadcasting service.



Antenna pattern testing inside a 26ft. (8m) diameter radome



The CN Tower is completed

Almost thirty years later the CN Tower facility is still giving excellent service and has required very little maintenance other than the routine attention required by any antenna system. Relatively few changes have been made to the original installation and all those that have been carried out by Alan Dick Broadcast. The channel 41/47 UHF antenna was added to the original system in 1979 and the Ch. 79 antenna was reengineered for Ch. 57 in 1983. The most recent change took place very recently in 2003 when the Ch. 9 antenna array was reduced from seven bays to six in

order to make room for a new multi-channel UHF antenna for digital transmissions. This new antenna has just two bays of panels but with each bay containing eighteen panels mounted on a 9ft. 6ins. (2.9m) diameter structure to provide an omnidirectional service. The antenna is extremely broad band, carrying channels from 40 to 66.