# Cohoe Radio Observatory, Alaska ~ Part 6, Observatory Building Update

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## 1. Introduction

This article series describes construction of a new radio observatory in Cohoe, Alaska, a small rural community about 120 km southwest of Anchorage. The current part, Part 6, describes the construction work undertaken from spring to mid-summer 2015. The previous five parts in this series are

- Part 1, Radio Frequency Interference Survey [Reeve1]
- Part 2, Guyed Tower Foundation Construction [Reeve2]
- Part 3, Guyed Tower Installation [Reeve3]
- Part 4, Callisto Antenna System [Reeve4]
- Part 5, Observatory Infrastructure and Building [Reeve5]

Note: References in brackets [ ] are provided in **section 10**.

As described in Part 5, the access road and other infrastructure were built and the observatory building was placed on its foundation in 2014. The work was suspended for the winter in the late fall and restarted in spring 2015. The summer work through 6 August consisted of construction of an exterior stairway and installation of interior electrical wiring and connections, interior plumbing and connections, interior drywall and interior wall paneling. The activities are described by images and captions in the following sections.

## 2. Internet Access

In early December 2014, I removed the Ku band transceiver on the HughesNet satellite dish. I originally planned to use this system for internet access but removed and returned it to vendor and cancelled the service. Signal quality was no different than on the day of installation, but the quality of service in terms of upload and download speeds had steadily decreased after installation in 2011. Coincidentally, a wireless vendor built cell site infrastructure that provides adequate 4G and LTE mobile service in the area. The monthly cost is only slightly higher but the service quality is much better. I extensively tested the upload and download speeds and plan to use it as fixed wireless internet access system.

## 3. Exterior Work

The required exterior work was minimal, mostly involving the installation of stairs at the front of the building and the coaxial cable entrance (the entrance is described later). I used pre-cut outdoor wood stair stringers purchased from a lumber supplier in the area, saving about 1/2 day labor. The stringers were spaced 16 in and I used 2 x 6 dimensional outdoor deck wood for the steps. The steps were screwed down with stainless steel fasteners and extend almost the full width of the porch.


Left: Before installation of outdoor stairs. Note the tower to the right of the building. Right: After stairs installation.




Four views of the building exterior. The tower or its supporting guys are clearly visible in all pictures.

## 4. Interior Work

The interior required finishing in all respects including construction of a partition, cable entrance, insulation and vapor barrier, drywall (also called sheetrock and plasterboard) and wood paneling. Work was slow but steady and accomplished during a few days each week over a twelve week period.

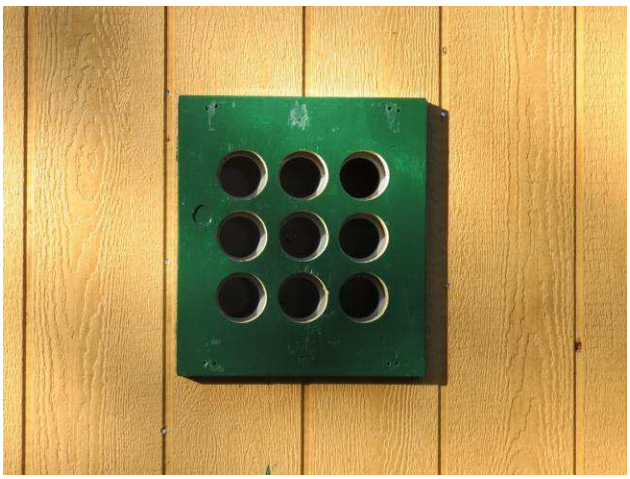

Left: A partition was installed between the main area and the bathroom. Next, the ceiling was insulated and sealed with a polyethylene vapor barrier (not shown). Right: The ceiling drywall was installed using a drywall lift (or jack) to hold the drywall against the ceiling while it was fastened with screws. This device easily saved at least a day of labor and helped improve the overall quality of the ceiling installation.


Left: The ceiling insulation, vapor barrier and drywall are completed. I installed a trap door, seen in upper-middle of picture, for access to the small attic area. Right: Next, the walls were insulated and covered with a vapor barrier (not shown). Note the electrical panel near the back (left in picture) and the cable entrance cabinet near the front.


Left: The drywall installation is complete except for taping on the ceiling seams. The walls are not taped because they are covered with paneling. Right: The ceiling has been taped and painted and cedar paneling installed on all walls. The bathroom door is not yet installed.

## 5. Coaxial Cable Entrance

The building is about 8 ft from the tower. Coaxial and rotor control cables will be routed along a transmission line bridge from the tower to the building, and the cables will enter through a protected cable entrance enclosure. The entrance has nine ports, which allow for plenty of growth over time (anyone who has brought coax and control cables into a building knows about the problem of undersized entrances). The interior enclosure is a commercial thermoplastic junction box and the exterior enclosure is a water-tight commercial steel junction box, both originally intended for electrical work.

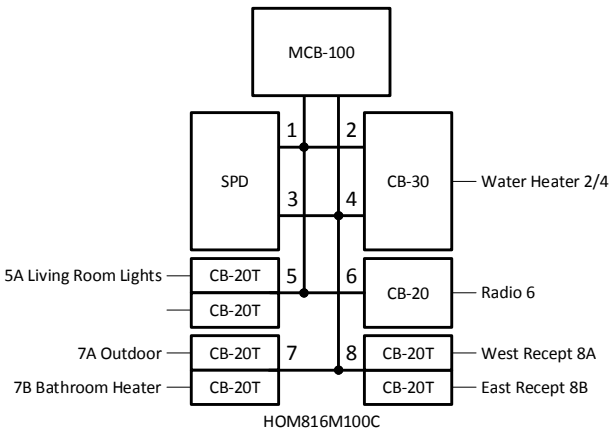



Left: The cable entrance enclosure installed indoors between two wall studs. Prior to mounting I made nine cutouts in the back and five in the bottom using a hole saw. Right: On the outside, a painted 1-1/8 in thick plywood enclosure back plate has nine holes that exactly match the indoor enclosure.

Left: Another view of the indoors cable entrance enclosure after drywall installation. Each through-wall hole has a plastic bushing with rounded edges. I also installed rubber grommets on the bottom where the cables exit the enclosure. Right: The outdoor enclosure is painted steel with matching cutouts and bushings at the back and cable entrance holes with rubber grommets at the bottom. All cutouts were made in a series of steps. First, a pilot hole was cut using an ordinary 1/8 in diameter drill, followed by a 5/16 in step drill to enlarge the holes for the draw bolt in a 3/4 in hole punch. The 3/4 in punch was used to enlarge the holes for the draw bolt of a 1-3/4 in punch. The final step was the 1-3/4 in punch itself. A 3/16 x 1 x 12 in copper ground bar is mounted and bonded to the enclosure and to the site grounding electrode system. Cutouts in the ground bar (barely visible in the picture) accommodate lightning protection assemblies and were made with a step drill. Plugs made from marine plywood and painted with a clear exterior finish seal the unused holes against insects, and duct seal will be used in partially occupied holes.

## 6. Electrical Work

The electrical system is quite simple, consisting of a main distribution panel (load center) and branch circuits for indoor and outdoor receptacles, indoor and outdoor light fixtures, water heater and bathroom heater and fan. One duplex receptacle is on a circuit dedicated to the radio equipment. For all but the radio circuit, I used "tandem" circuit breakers in the main panel. These allow two individual circuits in each pole or position. All wiring is 12 AWG except the water heater, which is 10 AWG, and all switches and receptacles are rated 20 A at 120 Vac.




Left: Electrical load center layout showing the 100 A main circuit breaker (MCB) at top and branch circuit breakers below. The SPD is a surge protection device. Right: Load center, installed and ready for use. Circuits had not yet been labeled when the picture was taken.

## 7. Plumbing Work

Indoor plumbing in many rural areas is a luxury. The bathroom consists of a shower, toilet and vanity, all of which require hot and cold water supply lines and a drain, waste, vent (DWV) system. Hot water will be supplied by a 30 gal electric water heater to be installed after the flooring is finished. The main water supply line comes from an existing 68 ft deep well through 1 in diameter high-density polyethylene (HDPE) continuous pipr. All building water lines are cross-linked polyethylene piping (PEX), 3/4 in for the main cold water supply and 1/2 in for hot and cold water distribution.

Left: The water supply line (black pipe) connects at left to a tee with a hose bib and ball valves before entering a filter (middle of image). I installed an air connection (right) to allow the water lines to be purged during winter. The building water supply line (white pipe) enters the building from underneath. I made provisions for a water softener, which may be installed later. Right: Drain pipes are located underneath the building and eventually will be skirted in.

## 8. Ancillary Structures

The site is used for purposes other than radio astronomy. To take advantage of the salmon runs during summer, we built a smokehouse and an outdoor cutting table for processing the red salmon (also called sockeye salmon) caught from the nearby beaches.


Left: The smokehouse is about 4 x 4 x 8 ft with a door in front and hinged vents on each side. It was later painted with a protective coat of clear outdoor wood sealant. After cutting the red salmon into filets to remove the skeletons and then cutting the filets into strips, the strips were soaked in brine and smoked with wood chips on electric burners (the new fashion way). Right: The salmon strips are hung on removable 2 x 2 in wood racks while being smoked. The strips shown here have been smoked for about 12 h.


Left and right: After smoking, the salmon strips were cut into short sections, placed in jars (with or without other items like a slice of jalapeño for additional flavoring) and cooked in a pressure cooker. The jars hermetically seal themselves when pressure cooked and can be stored almost indefinitely (well, for a long time anyway).

## 9. Next Steps

The next steps consists of interior finish to protect the cedar paneling, laminate flooring, final installation of the bathroom appliances, light fixtures, water heater and finally the observatory radio equipment.

## 10. References:

[Reeve1] Reeve, W., Radio Frequency Interference Survey at Cohoe Radio Observatory, Alaska, *Radio Astronomy*, Society of Amateur Radio Astronomers, September-October 2013

[Reeve2] Reeve, W., Cohoe Radio Observatory, Alaska ~ Part 2, Guyed Tower Foundation Construction, *Radio Astronomy*, Society of Amateur Radio Astronomers, November-December 2013
[Reeve3] Reeve, W., Cohoe Radio Observatory, Alaska ~ Part 3, Guyed Tower Installation, *Radio Astronomy*, Society of Amateur Radio Astronomers, January-February 2014
[Reeve4] Reeve, W., Cohoe Radio Observatory, Alaska ~ Part 4, Callisto Antenna System, *Radio Astronomy*, Society of Amateur Radio Astronomers, May-June 2014
[Reeve5] Reeve, W., Cohoe Radio Observatory, Alaska ~ Part 5, Observatory Infrastructure and Building, *Radio Astronomy*, Society of Amateur Radio Astronomers, September-October 2014

## 11. Units of Measure Conversion

Many unit converters can be found online: http://www.digitaldutch.com/unitconverter/volume.htm, but for convenience conversions of the non-metric units used in this article are shown below.

| Convert from | To | Multiply by |
|---|---|---|
| inches (in) | millimeter (mm) | 25.4 |
| gallon (gal) | liter | 3.8 |
| feet (ft) | meter (m) | 0.305 |
| mile (mi) | kilometer (km) | 1.6 |

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