The Roll-Off Roof Design vs. Dome Style Observatories

By Tim R Crawford

As we all quickly learn the best telescope set up is the one that get's used and the one that will get used the most is the one permanently located close to home or capable of being remotely operated at the operators discretion.

Once a decision is made to commit to a permanent observatory the first major decision will be whether or not to construct a roll off roof design or a dome style.

My first observatory, built North of Anchorage, AK, was a self designed and constructed roll-off roof style while my second and current observatory, located in Arch Cape, OR, was put together from a commercial "kit" and placed on a self constructed deck.

Based upon my own personal experiences and conversations with others I have come to the conclusion that neither style is to be preferred in it-self but that based upon the observers geographical location and preferences there is a one best design to meet that individual persons situation. In other words, there are pros and cons for each style.

I will discuss some of these pros and cons as well as offering a few hints on the construction of each style.

The first issue you will need to address is whether or not your local zoning or home owners association will permit the installation of either design on your property; the answer can very well determine your choice without consideration of any of the other issues.

Assuming you have the option of constructing either design the first major consideration is whether or not you live in an area with significant dewing throughout the year. If you live in an area where dewing occurs with some frequency throughout the year then the roll-off roof design, when open, essentially exposes your equipment, accessories and papers to the same dewing that you note on the grass, cars and other exterior surfaces. My roll-off in Alaska, because of the low air moisture air content most of the year, only had this problem for about three weeks in the fall and some of those nights it was like it was raining inside because of how damp everything became; but it was a short period and not that hard to live with.

My Dome on the NW Coast of Oregon is exposed to frequent dewing, however, with the exception of some non-objectionable dewing on the inside of the dome some nights, the interior remains dry and is therefore a wiser choice, IMO, for dewing environments.

One of the more significant advantages of the roll-off roof design is that it allows you to have full sky views and enables a much greater connectivity to the sky than do the domes. However, if you have neighbors with yard lights this can be a major disadvantage which is ameliorated with the dome design; in addition to aiding shielding of neighbor's yard lights, unless directly in front of the slit, the dome design, somewhat partially dependent upon the shutter design, can be a great aid in shielding out direct moon light.

While on the subject of yard lights and even porch and window lights I have had great success with inviting neighbors over to view eye candy whereupon I take the opportunity to point out, if necessary, that their outside porch, window or yard lights are troublesome and they universally have always worked with me on a solution. JUST ASK! I had a most unusual problem with my roll off roof observatory in Alaska in that I was on the high ground of one side of the lake and on the other low side (~1/2 mile away) a neighbor had mounted a large yard light on a tall pole such that the light was directly in my eyes when looking west; once I explained the problem to him and showed him a catalog of yard light shields he allowed me to order one and install it… problem solved. JUST ASK!

The roll-off roof design has the obvious advantage of a more rapid cooling of the interior than do the domes. While on the subject of cooling, regardless of the design you choose, I would highly recommend that the floor be wood raised decking so that cooling is more readily enabled; cement holds heat and releases it slowly. Regardless of the design chosen or floor choice you want to insure that your pier is isolated from the floor otherwise vibrations will be a considerable nuisance as you move around.

Normally, the dome design offers better wind protection than does the roll-off roof design, however, the wall height of the roll off will have considerable influence on how much or little your scope will be affected by the wind. If you will check the roll-off photo above you will note that my scope projected above the wall height and was affected in stronger winds. While it is rare for winds to be troublesome with my dome, they can be if directly flowing through the slit and then more so for the CCD cables than the scope itself. While some manufactured domes give you the option of controlling the wall height, many do not and that is one of the potential advantages of the roll off design in that, if you self construct, you can control your wall height.

When it comes to construction there is much less work involved in the erection of a manufactured dome than there is in either assembly of a manufactured roll-off kit or a self constructed one.

I think that generally speaking the self constructed roll-off design will prove to be the least expensive option; although there is the alternative of purchasing a low cost dome and then building your own walls and support structure for the dome. This last option should be cost competitive with the roll off design. I have not taken into consideration, regarding costs, where the manufactured roll-off kit design would fall.

To summarize the advantages of domes: Protection from dewing; Shielding of neighbor's lights; shielding of direct moon light; better wind protection and simple construction, if manufactured.

To summarize the advantages of the roll-off roof design: Rapid cooling; full view of the sky with its greater "connectivity" to the sky; control of wall height and normally less expensive.

As I have no experience, yet, with automation, from what I read and know of the two designs the dome design would appear to lend itself more readily to automation; however, there are several firms/individuals who would appear to have solved the automation challenges of the roll-off design.

An excellent online source of Amateur Astronomical Observatories designs; note that the vendors are an incomplete listing: http://obs.nineplanets.org/obs/obslist.html

If you want some reference books I highly recommend the following which can be obtained at Amazon using the AAVSO link: www.aavso.org/aavso/support/amazon.shtml

1) Setting-Up a Small Observatory: From Concept to Construction, D Arditti & P Moore
2) More Small Astronomical Observatories, Patrick Moore
3) Building a Roll-Off Roof Observatory: A Complete Guide For Design and Construction, John Hicks.

Pier height is one of the first issues to be resolved once you have chosen a design. Pier heights are always going to be a compromise in that depending upon the pier height chosen you are either going to be bending over when nearing the zenith or climbing a ladder when progressing towards the horizon; it's hard to find a comprise that best suits all positions of the sky. While I can provide you with the height of the pier that I chose for my 12" SCT you would be advised to experiment with your own scope on a tripod or a friends to see what height seems best to suit you.

With both of my observatories the same pier was used which measures ~43" above the floor of the observatory with an overall length of 63 inches. With this J bolt mounted pier ~ 1200 pounds of cement were poured into the ground.

While not an issue with a roll off roof design it is important to understand that the when you mount an SCT in a dome that the pier is not going to be the center of rotation for the polar mounted telescope. The center of rotation will actually be your Declination axis.

Therefore you want to offset your pier to the South so that the Dec axis actually is located in the center of your observatory. That center point is going to depend upon your pier diameter, your latitude and the size of your instrument. The only foolproof way that I know of to insure you measure the center correctly is to install your pier, mount your telescope, polar align it, and then drop a plumb bob down from the center of your Dec axis to find the center; then construct your floor after the center of the dome has been determined in this manner.

With a roll-off roof design it is advised to have structure parallel with the North South line with your roof rolling off to the North in as much as you will seldom be viewing in that direction so the raised roof represents a lesser obstruction than if a different orientation were chosen. In my case I used V grove wheels with an inverted angle iron track for the roof to roll on; three wheels on each side with the wall height at 72 inches and the overall size of 10' x 12'. The roof was built rather stoutly in anticipation of a heavy snow load.

The photo to the right shows one of the corners and how I used a turnbuckle to secure the roof when not in use. The dark piece in front of the wheel was a simple rubber boot that I used at each corner over the track slit to keep out blowing dust.

The siding for the roof overlaps the lower section and I had to make a small door on the south end of the roof to clear the scope when opening while allowing a "seal" when closed.

I hope that some of this has been informative for you and if you have further questions (remember, there is no such thing as a dumb one) please feel free to contact me at : StarBoyCTX@yahoo.com.

Ad Astra