One concept of motorization for the SkyShed Roll Off

In this concept we’re installing an off-the-shelf, ½ h.p., Genie garage door opener, screw type drive, in 10 X 12’ “SkyShed One”, the 7 year old SkyShed Roll Off Prototype Shed.

This is the same concept we have installed for a NASA sponsored meteor project. Those Sheds have been in heavy operation for years with this system and have stood the test of time, though all types of weather.

This system can be adapted for Sheds from 8’ to 12’ in length. For larger Sheds the concept stays the same but a larger opener is needed.

Unlike the NASA Sheds where an extra crossbar support was added to anchor the opener track to, in this case we’re replacing the original vertical roll off supports and crossbar, so that we can anchor the track using just the one crossbar and not have to add another. This is a “cleaner looking” install.

This part of the concept is good for people who are building a Shed for the first time and can locate the crossbar where needed to anchor the track to it. It means you won’t have to add an extra crossbar after the fact to an existing Shed.

For existing Shed owners you can add an additional crossbar to anchor to, or move your existing crossbar and braces as we’re doing in this example.

Unlike your Shed, the prototype had a drop down plank to cover the opening on the outside of the wall where the roof rolls off. During the following steps we remove the existing drop down plank and replace it to make the prototype look and function more like your Shed, as shown in the SkyShed Plans.

We are not including a parts list as this is step by step concept. You may be using a different opener. The concept remains the same but some parts may change.

This is a first draft of the concept steps. If you have any feedback please let us know.
Here is an overview of the motor mounted on the roll off end of the Shed. The motor is mounted off center to allow us to add the steel angle braces and to avoid snow or rain that might ingress from the gable vent above and get onto the motor. Later we temporarily covered the gable from the inside for the winter months. We take the cover off in the summer for added ventilation.

To anchor the motor and to attach the track to the gable we add 4 off-the-shelf steel angle braces (each 3’). As marked they could be trimmed to fit between two centers so as to look “cleaner”. We weren’t worried about as clean a look here and left the braces 3’ long.

We also added braces in the corners to help reinforce the join between the gable and the roof runner, as this is the part that gets pulled on the most. We used galvanized #12 X 1.5” wood screws and washers throughout.
Overview of the outside parts. There are a number of things that can be seen here. The standard track is 9’ long. We added two optional extensions that are 14” long each, in order to roll the roof off the entire way. We feel that 2 extensions is about max for this track therefore the largest length roof it will work with is 12’.

You can see the steel angle braces used to connect the track to the gable.

We have added 5/8” tubing, which we have cut down the middle, to cover the top of the track and protect the screw inside from the outside elements. The tube fit great with no further material needed to hold it on.
Here is the opener we used. Since then they’ve updated the model slightly so you may not find this exact model in stock. It’s a screw type drive, heavy duty, ½ h.p. unit.
Here Pat from our metal shop is assembling the tack parts. Notice the extensions in their boxes. Assembly hardware parts are color coded to make assembly easier.
After assembling the track we began to mount the motor. Notice a few things in the photo. We use the steel angle bracket to reinforce the 2 X 4” which we mount the motor to.

You will want to attach the electrical connections before you mount the motor as it’s very difficult to get at them once the motor is in place. Plus you’ll want to unwrap the trip switch wires before mounting.

The on/off switch can be replaced with leads to a control box for remote automation.

We screwed in the angle brace and temporarily held the motor in place by hand so that we could mark the wall where a hole needs to be cut in it to allow the track to mount through. BTW I was horrible using my new roto saw, and made a mess of the hole in the wall. It still works but it’s not pretty.

The factory default for the “force” adjustments was set at minimum. We turned these up to maximum, for maximum opening and closing force once the motor was in action.
Here’s the first angle brace mounted (we added more screws later) and the hole to pass the track through. Disregard the locking catch which was used in the prototype but not thereafter. Later we unscrewed the pieces and took them off the Shed.
We temp mounted the motor a couple of times in order to trim the hole in the wall, and ended up making the hole larger to allow the end of the motor/track through. Later we made the hole even longer to accommodate the carriage locking lever (pictured later).
We have removed the original drop down plank that covered the wall/roof opening. Instead of a drop down plank, your Shed will have a plank that extends down form the gable. The very bottom of it may need to be cut out slightly, along with the hole in the wall, to enable the track to pass though, depending on how far down your plank extends.

Not pictured. We have also removed the original vertical roll off supports, and crossbar and braces, to be replaced with new ones. The original vertical supports were made from wet wood and twisted badly not long after installation. This was a good opportunity to replace them and the original crossbar after 7 years of service.

You can see the different colors in the photo from where I also used this opportunity to spend a few hours and re-stain the Shed in a new tone.
Pat lifts the track into position and feeds it through the hole to see how it lines up with the motor. We used step ladders and a couple of extra Jacks we had on hand to temp hold things in place while we worked on adding the new crossbar and rebuilding the vertical supports and braces.

At this point the question was, “where would the end of the track end up?”, as that would determine where the crossbar would go, as well as the braces and vertical supports...
As it turns out the track lined up perfectly so that we could install the crossbar right at the end of the 12' horizontal roll off runners.

Had it lined up short of the end of the horizontal supports, we would have mounted the crossbar inwards so that we could anchor the end of the track on the crossbar.

Had it ended up lower we would have mounted the crossbar to the vertical supports instead of to the horizontal supports, and placed the vertical supports accordingly.

You'll notice that when the photo was taken we had already removed one of the original vertical supports and braces. Next we removed the other vertical support and moved the new pieces into place. We needed every step ladder and Jack available, as well as a few hands to hold everything in place while we worked.
Since we started in the late afternoon, we quickly ran out of daylight.

By the end of the day you can see we had replaced the vertical supports and crossbar, as well as anchored the track to the crossbar. In the background you can see that we added a new plank to the bottom of the gable, so that now it looks more like current Sheds.
The next day we started late in the day again, but got a chance to add the roll off support braces. In the background you’ll notice that we added the braces which connect the track to the gable. More on that next.

From this photo you can see why it’s easier and less work (plus cleaner looking) if you can add the motor and track when you’re building the supports for the first time.
Back inside we added 3’ steel angle braces to the lower 2 X 4” of the gable. Two braces so we could create lots of support and somewhere to attach the upper carriage bolts (more later). First we added the lower brace and then the upper. We used ¼” galvanized bolts to attach the two to each other, and screws and washers to attach them to the gable.

Notice we have more permanently mounted the motor, and added the on/off switch wire (running to the left from the motor). I only wish we had added the optical sensor wires, as the motor has to be taken off to add them, and I still haven’t had the time to add them yet. You can see the black AC wire running out from the right hand side of the motor.

It turns out that with this opener model, if you want to use the remote switch for the opener, you have to have the optical sensors installed for safety. Since I’m in the Shed when I use the opener I can see that the roof clears the scope and I hadn’t planned on adding the sensors.

Conversely you can mount the sensors on opposite walls, forming an optical line that the scope will intercept if it’s in the way of the roof opening. This will prevent the roof from colliding with the scope if it’s in the way while the roof is moving.

Now I plan on adding the sensors just to the left of the motor, facing each other, so I can use the remote switch. I’ll have to take the motor off the wall to attach the wires.
We cut the 4\textsuperscript{th}, 3’ angle brace into two 18” pieces, and used it to attach the track carriage to the gable.

The original track carriage hole was perfect for feeding a 5” X 3/8” carriage bolt (fitting name) through the hole, and added 4, 3/8” nuts and locking washers on each side of center to align the angle braces so that they were square to the gable, and there was no lateral movement to the braces.
To attach the angle braces to the gable we used 2, 4" lag screws (they look like large wood screws) which screwed into the gable’s lower 2 X 4" on the inside, and 2, 7" carriage bolts to attach the upper bracket.

We used the carriage bolts in the upper location because there is no 2 X 4” at that position inside to drive lag screws into.

In hindsight we could have used shorter carriage bolts because as you can see in some internal photos the carriage bolts are longer than needed. I didn’t know exactly how long they had to be when I was picking them up at Home Depot.

We kept everything square when we were adding the braces so that there would be minimum undue forces when the roof was moving. The braces can be painted with rust paint to prevent rusting. I plan to do that.
Here’s an inside view where you can see the carriage bolts, and not see the lag screws as they don’t penetrate the end of the 2 X 4”.

To locate where to drill the holes and drive the screws in from the outside, we measured inside and outside twice (to make sure) before drilling.
This photo shows another view of the track carriage and hole in the wall. I had to lengthen the hole in the wall to accommodate getting the carriage to close enough to close the roof fully.

I cut down the locking lever so that the hole didn’t have to be too large. I drilled a new hole in the remaining lever to tie a release cord to.
We haven’t looked at the far end of the track yet. You can see how we lined up the crossbar initially, then found we had to move the track up slightly after operating the roof a few times. We could tell there was stress on the carriage, so we unscrewed the end bracket and watched what the track did as the carriage moved. We found moving the bracket up a little removed the stress.

Luckily we still had enough crossbar to screw the top of the bracket into.

We had to grind off the lip at the end/top of the track in order to slide the bracket over it.

You can see the 5/8” tubing we used to cover the top of the track, and a piece of pipe insulating foam we used to cover the tubing and the open top of the trip switch. Both held up very well through their first year.
Here’s a look at the track, ready to roll. We finished by adding U shaped rubber that we cut out of a spare piece of black rubber matting we had, to cover up the excess of the hole in the wall, and make it look better, while keeping weather out. I also added rubber at the sides where my gable board doesn’t quite cover the holes in the wall. In the winter I stuff foam in there when the Shed is not in use to keep blowing snow out.

We installed pieces on the outside and inside of the wall using staples to hold them on. Not pictured.

Notice the carriage lever emergency release cord hanging from the carriage (bottom right). We use this to disengage the carriage when we want to move the roof by hand. Engaging the lever locks the roof to the track. If a storm is coming or we’re leaving the Shed for a while we engage the inner roof latches to add more locking security. The gable latches must be disengaged before we roll the roof off.

So how did it work? Great. Here’s a video on You Tube of the track rolling back and forth - http://www.youtube.com/watch?v=jGcqMfHOhjk
For security reasons we’re not allowed to show much of the NASA Sheds.

Here’s an outside photo of one. This is 10’ X 10’ Shed. After we installed the openers they decided they wanted to open the roof past fully open. Therefore we added extensions past the vertical supports, and had to anchor the track to an additional crossbar. This may be closer to what your Shed will look like after motorization if you don’t move the original crossbar.

They didn't like the original trip switches and added more robust switches found at electronics suppliers. With typical NASA protocol, we used two openers in case one failed. Neither has failed yet in heavy usage.

Different concepts of motorization may be discussed in the SkyShed Yahoo group, and other online forums devoted to observatory motorization and automation.

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