Building the Perfect Beast

A turntable for the three-rail portion of the Minnesota Central Railroad.

Overview:
The Minnesota Central Railroad is the club layout of Roundhouse Inc. (the St James Model Railroad Club) in St James, Minnesota. The club has a (dimensions are 30 by 60 feet) building located adjacent to the Depot Museum in St James. The club operates large O-gage (three-rail) in conjunction with a HO Scale layout.

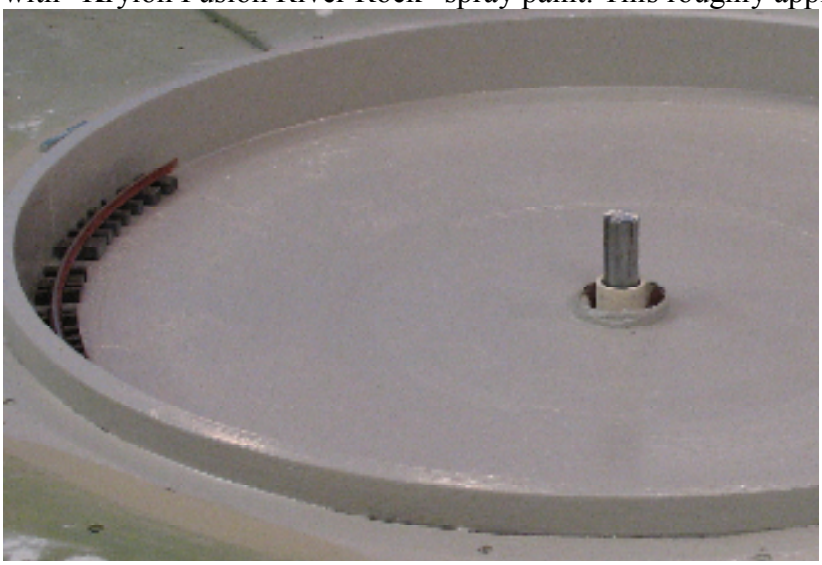
With the purchase and construction of a couple of Atlas O scale roundhouse kits, it was decided to install a turntable in front of the completed six-stall roundhouse. The 'Atlas O Motorized Turntable' is not representative of the most common type of railroad turntable. To complete the look and feel of a midwestern railroad, there was no other choice but to have the Minnesota Central Engineering Dept. design and build its own turntable. The Minnesota Central railroad rosters two Great Northern S2 4-8-8-4 steam locomotives that power its crack passenger trains around the pike. It was found that a minimum of 25 inches was required to safely turn that locomotive. A piece of ¼ inch thick "C channel" of 25 inches length was acquired and a keyed boss was welded into the bottom of it. The Atlas roundhouse is set up to have a 24 inch turntable installed in front of it, so approximately a ½ inch of the roundhouse base was removed. This brought the roundhouse closer to the pit but ½ inch was a small price to pay for having the tracks line up properly.

A 25 inch diameter circle was scribed and cut in the plywood in front of the roundhouse. The plywood cutout piece was installed at a scale 10 (is this correct?) foot level below the surface of the pit wall. The pit wall was constructed is made of strips of ¼ inch thick "Masonite", three strips thick. These strips were laminated, in place, to each other using screws and "Liquid Nails" brand adhesive. A hole was drilled in the center of the plywood floor and a keyed shaft was installed through a ¾ inch bearing.
A raised ½ inch plywood circular pedestal was cut and installed around the edge of the pit to serve as a base for the circular pit rail. After the pit was poured, one rail from Atlas O Scale three-rail flex-track rail was bent to conform to the diameter of the pit and Atlas flex-track ties were trimmed to serve as the pit rail ties. The "C Channel" was installed on the shaft and adjustments were made at this time so the rotating turntable would not bind on the sides of the

pit. The bridge and deck of the turntable were built and installed in the pit allowing the roads' crack passenger engines to be serviced and turned with a minimum of delay. This allows the trains to run on time leaving the Minnesota Central's, as yet untarnished, reputation intact.

Pouring the Pit:

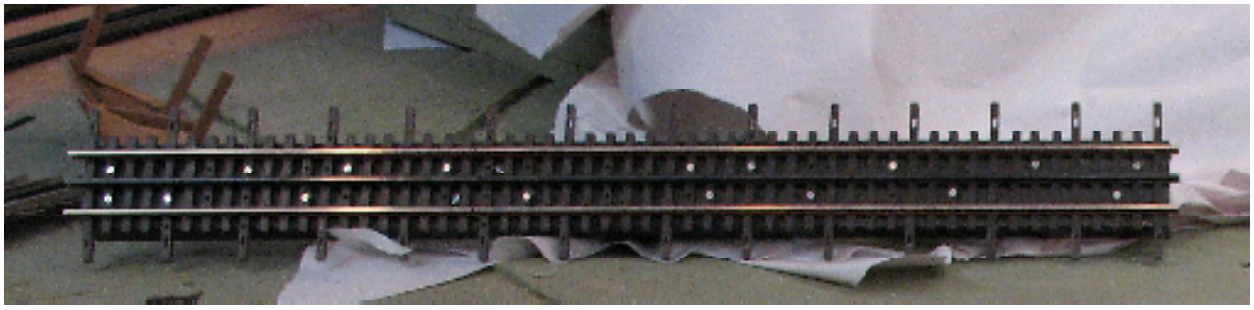
A form with the desired pit profile was clamped to the turntable channel and all possible seep holes and the bearing were sealed with masking tape. A soupy "Ultracal 30" mixture was poured in to the pit and the channel was rotated steadily till the "concrete" mix was dry. The surface of the form was cleared constantly with a putty knife to remove the excess "Ultracal 30". The poured pit was left to dry overnight and when it hardened; it was lightly sanded to remove gross irregularities. Some marking of the pit surface was desired so it would appear that the surface was "worked" after the cement was poured. The pit walls and the pit itself were then painted with "Krylon Fusion River Rock" spray paint. This roughly approximates the color of concrete.



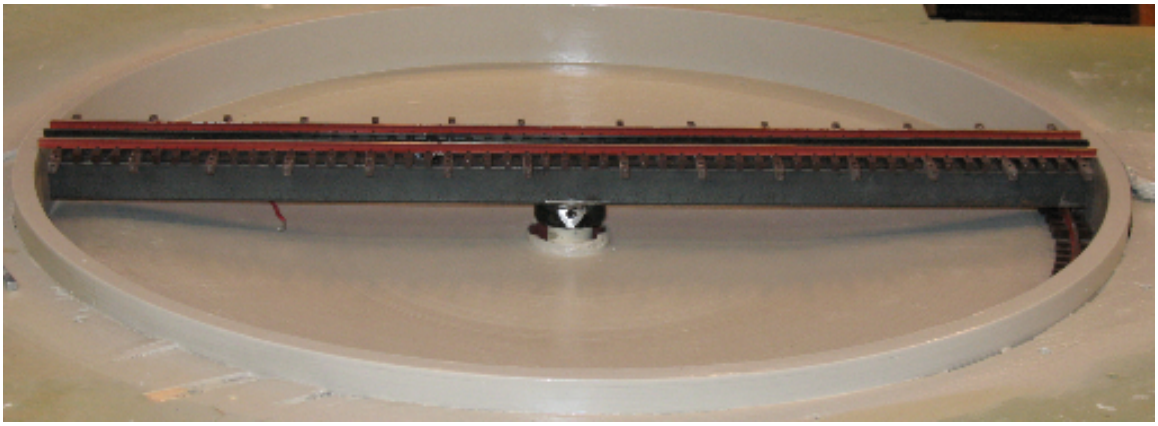
The resulting color and semi-flat texture didn't match the Roundhouse foundation so the entire pit was re-sprayed with "Floquil" Concrete. This paint has a rough texture and is really flat. This results in a look and feel that is closer to real concrete. Floquil Concrete has been discontinued but is still available at retailers.

When the paint was dry the sides of the pit rail were painted a rusty brown color and pit rail and ties were installed.

Turntable Construction:



The piece of "C channel" was drilled and tapped and to accept 2-56 screws to hold the ties from in place. Every fourth tie was lengthened by splicing two regular ties. This served as a support for the wood plank walkways that were installed at a later stage. Every third or fourth ties was screwed into the plywood below it and the cast on spikes in the ties held the rail in place.

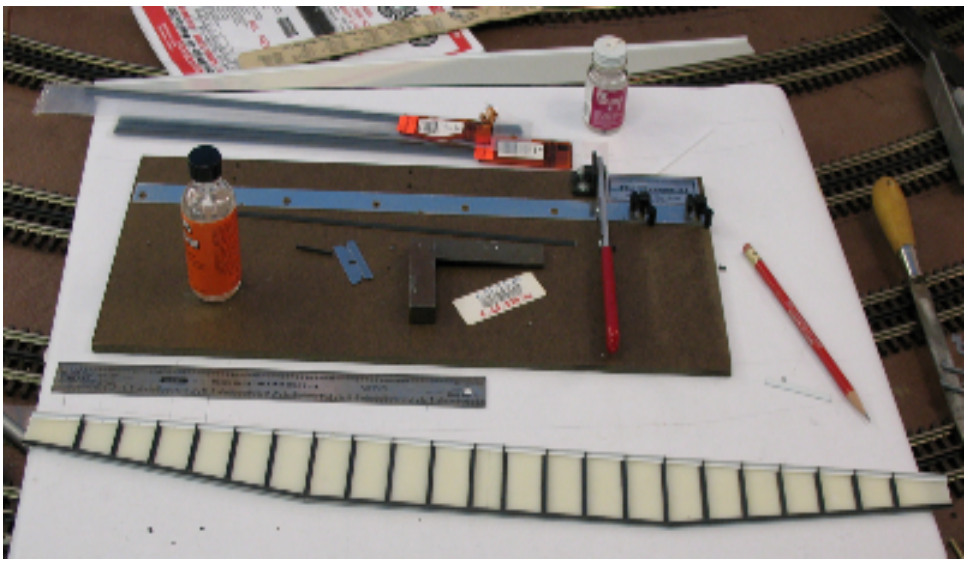


With the partially finished deck in position, the key installed and the setscrew in place, the deck was rotated to check for binding and to make sure it was level. All such adjustments must be done at this time. Once the deck approaches a more finished stage, it will be much more difficult to make these adjustments.

Using the HO scale Walthers HO 90foot turntable kit as a guide, dimensions were scaled up two times and the sides of the girders were cut out of styrene.

The edges and sides were filed square and Plastruct and Evergreen Styrene angle iron shapes were glued to the edges. There is a slight difference in the dimension of the two manufactures' angle pieces but it isn't significant.

A NWSL chopper helped keep the cuts square and true. Plastruct and Testors glues were used extensively. Note that the two center angle-iron pieces are closer together. This is a load bearing area and would require additional support.

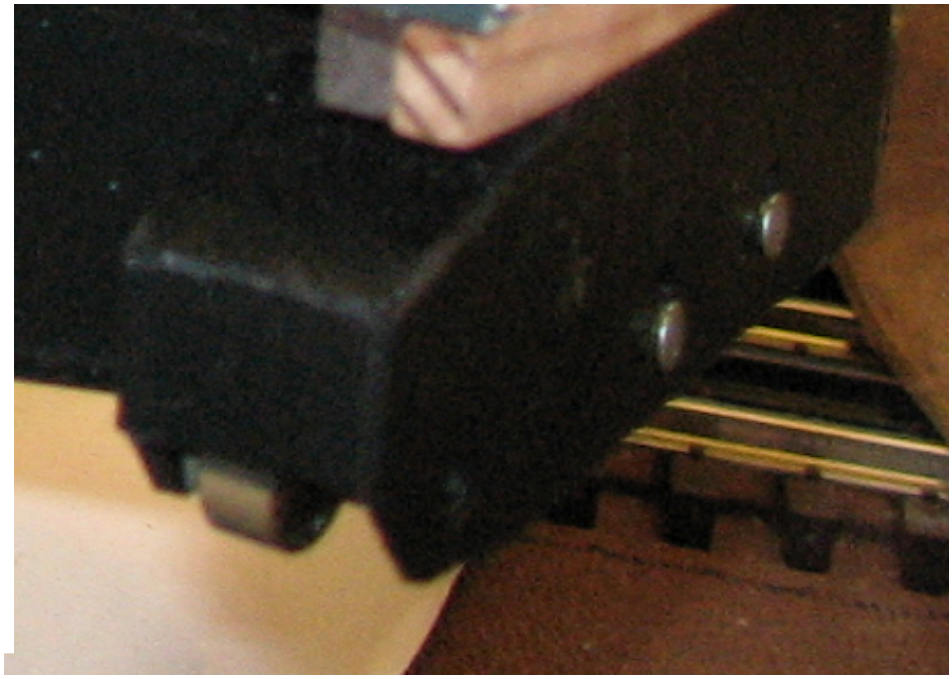


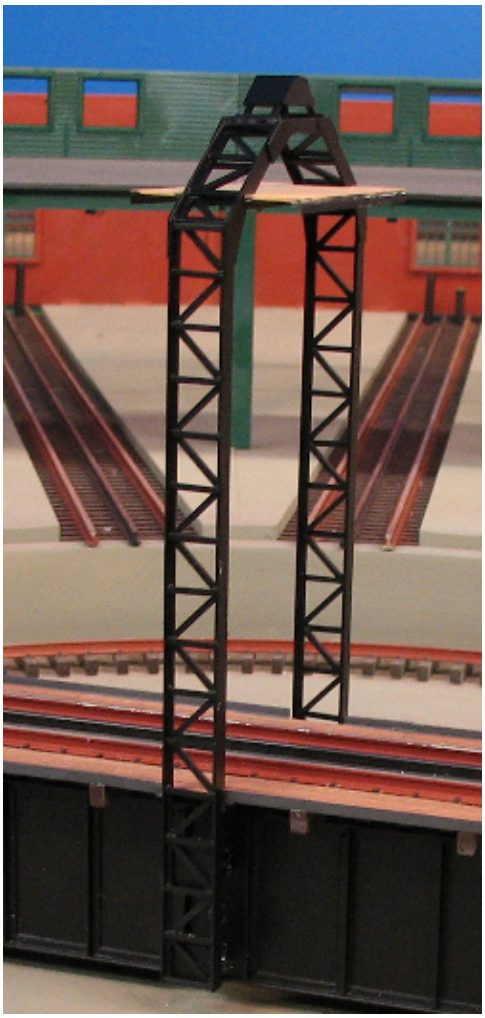
Each angle piece was cut to the proper length and was notched. There were four notches required for each piece. Each piece was notched to clear the width and thickness of the angle piece. A razor blade came in handy here. A jig or spacer was used to assure uniform spacing between each vertical angle iron. A right angle square was used to assure proper vertical alignment. After test fitting each piece, it was glued in place.

Keep in mind that the vertical part of the angle iron faces the end of the girder. To ensure this, work was started from the middle and proceeded towards the outside. Rivets can be applied in this area at this time. However since the turntable is over 2 ½ feet from the edge of the layout, they would be practically invisible so it was decided to forego them.
Once the sides were completed and painted, they were glued to the metal "C-channel" with "JB Weld Quick" which sets up quickly. At this time the sides were clamped to the center piece and any excess epoxy seeping out of the joints were cleaned up.

At this time a shaped wood beam was attached under the ends of the rail. This piece was shaped to follow the curvature of the pit. Rail was installed to support the control shack and platform. Angle-iron pieces were installed flush with the tie edges so the railing could be glued to them. The wood plank decking was installed so it cleared the tie plates.

The housing for the pit-rail wheels was constructed at this time. The ends, which contain the wheels, are angled in, so the wheels can follow the pit rails. The entire assembly was screwed into a plastic block epoxied to the inside of the channel. In the center the assembly is a graphite motor brush, which is what actually contacts the pit rail. This brush is the means for electrical pickup and is soldered to the center rail.



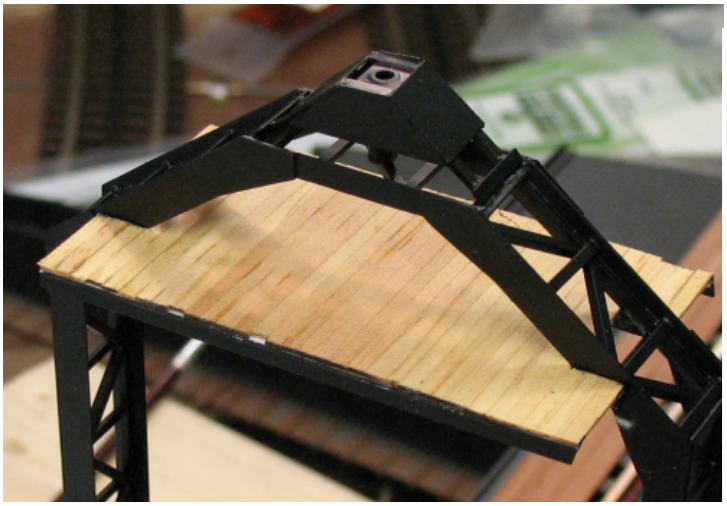


The bridge was constructed at this time. It is made with Plastruct shapes that were cut to size. The horizontal braces were fitted to the outside of the Plastruct shape to provide ladder rungs and to give it the typical "Z" profile of these structures. A box was constructed on the top to provide a pivot point for the electrical box that would normally feed the motor with power. All joints were gusseted for additional support and strength. A maintenance platform was constructed and fitted. The platform was constructed of wood planking fastened to angle iron braces. Plates were glued to the inside of the Plastruct shape and pieces of Plastruct 'I beam' were fastened to them. These 'I beams' will appear to run the width of the turntable. These were attached to the girders with epoxy.

To calculate the height of the bridge before it angles in towards the center, various pieces of equipment were run over the turntable. The Engineering Dept. wanted it to be noted that even the Big Hook would have to be turned at this location.

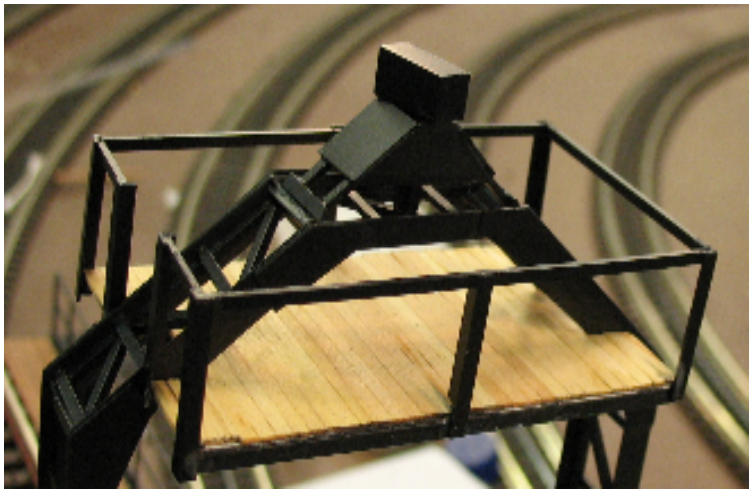
Since OSHA wasn't around yet to mandate these safety appliances, a safety cage around the vertical structure was not considered. The Minnesota Central, which is a well-run railroad, only hires sensible people who will not let go when climbing any ladder type of structure.

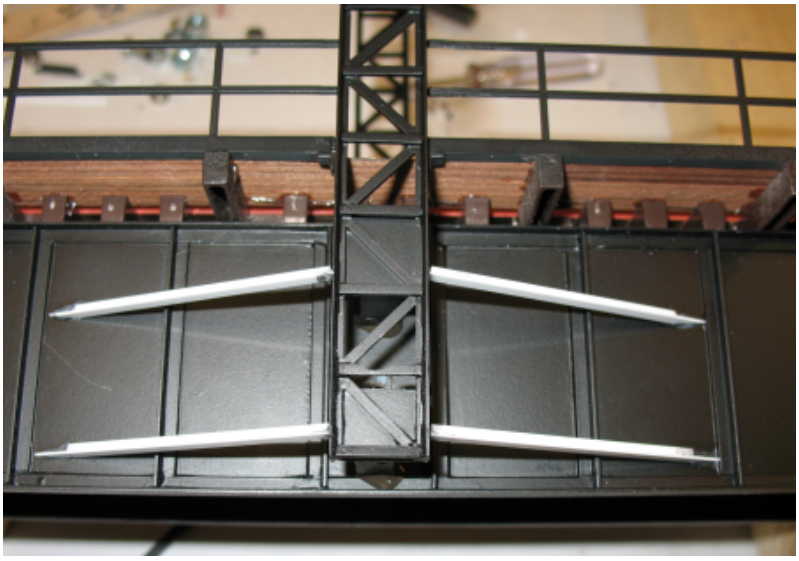
The control platform was epoxied to its support rails and the control shack was mounted on it.
Since the Minnesota Central values its employee's safety, at great expense, a sheet of diamond tread plate steel was acquired and fabricated to serve as the control platform.



The placement of the maintenance platform can be seen here along with the location where the electrical control box will pivot. The upper gussets can be seen in more detail also. The middle angle irons under the platform are glued to the angled part of the bridge above the lower gussets. May different kinds of safety railing can be used here, from pipe to rope threaded between stanchions.

The head of the Engineering has a fear of heights and he insisted that safety railing be installed on the maintenance platform. The railing supports are angle iron. The middle railing supports were notched to clear the wood plank platform. The electrical control box was installed on its pivot at this time.



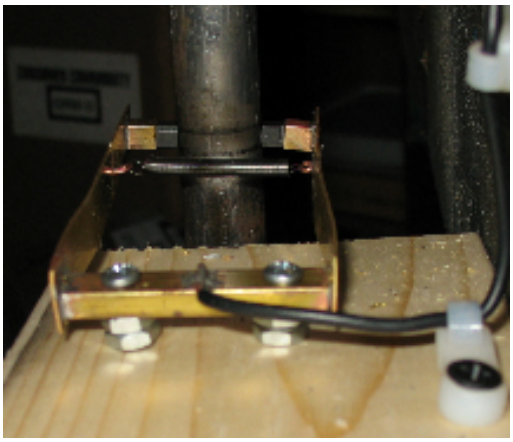


Angle Iron braces were installed to further support the bridge assembly. Painting these supports completed the turntable assembly. Now the completed deck can be installed in the pit and locomotive servicing can proceed 'full steam ahead' at the Minnesota Central's engine service facility.

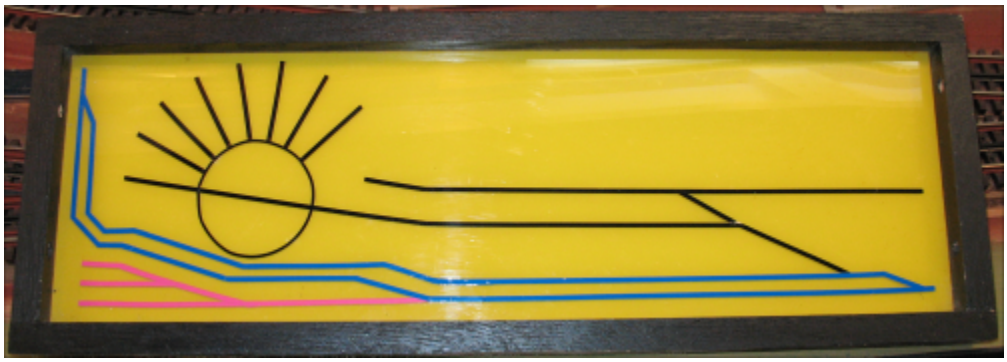
The Drive Mechanism:
A turning mechanism for the turntable was required that would stop rotating the turntable if there was any binding against the pit wall, due to foreign objects or protruding locomotive parts. However, the motion required had to be smooth without any hesitation or jerkiness. For this reason any rigid coupling like gears or a chain drive was discounted.

The ¾ inch shaft that the turntable rotates on is installed using two ¾ inch sealed bearings. Attached with a surplus v-belt pulley to the bottom of a shaft is the platter off an obsolete LP turntable. A rubber band is installed around the circumference of the platter with rubber cement. This rubber band can be renewed periodically with a piece cut from an old inner tube.
The shaft of a spring loaded 15 Volt gear motor rotates against the rubber band to move the platter around. A piece of fuel hose installed on the motor shaft helps increase the friction between the motor and the platter.
This is a relatively forgiving mechanism that will cause the turntable to stop rotating at even the hint of a bind. This mechanism may seem overbuilt but some of the modern O-gage locomotives are very substantial and weigh anywhere from five to thirty pounds. The drive mechanism was able to handle the weight without any jerkiness or slipping. The drive mechanism stops immediately to prevent damage to locomotive or turntable in case there is any kind of binding.

Electrical Pickup:
As mentioned previously, the center rail is powered by a motor brush on each side of the turntable that rubs against the pit rail. The outer rails are supplied by power being fed through the main shaft. Two motor brushes rubbing against the shaft supply power to it. This could also be adapted to an HO Scale application if desired.



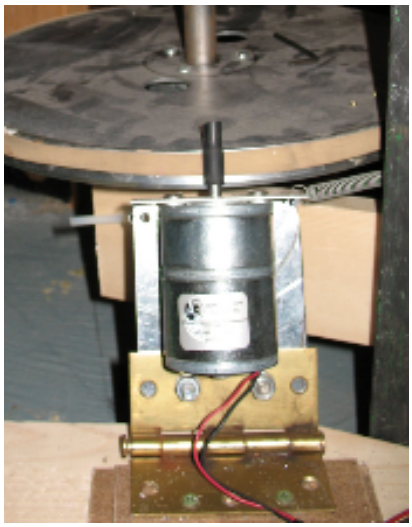
The Control Panel and Controller:



A locking Control Panel was constructed to allow local control of the engine service area. Switches were installed to turn the roundhouse tracks on and off. It also allows control of the tracks in the rest of the engine service facility including the diesel house.

The control panel is made of clear Lexan, which was painted on the reverse side. The frame was made of wood cut to length on a table saw. The tracks were represented with automotive pin-striping tapes in different colors and thicknesses. Beside the control panel is a plug for a small throttle with a momentary direction switch, which allows the turntable to be jogged in either direction. The throttle can be removed when the club has open houses.

The Motor Drive:

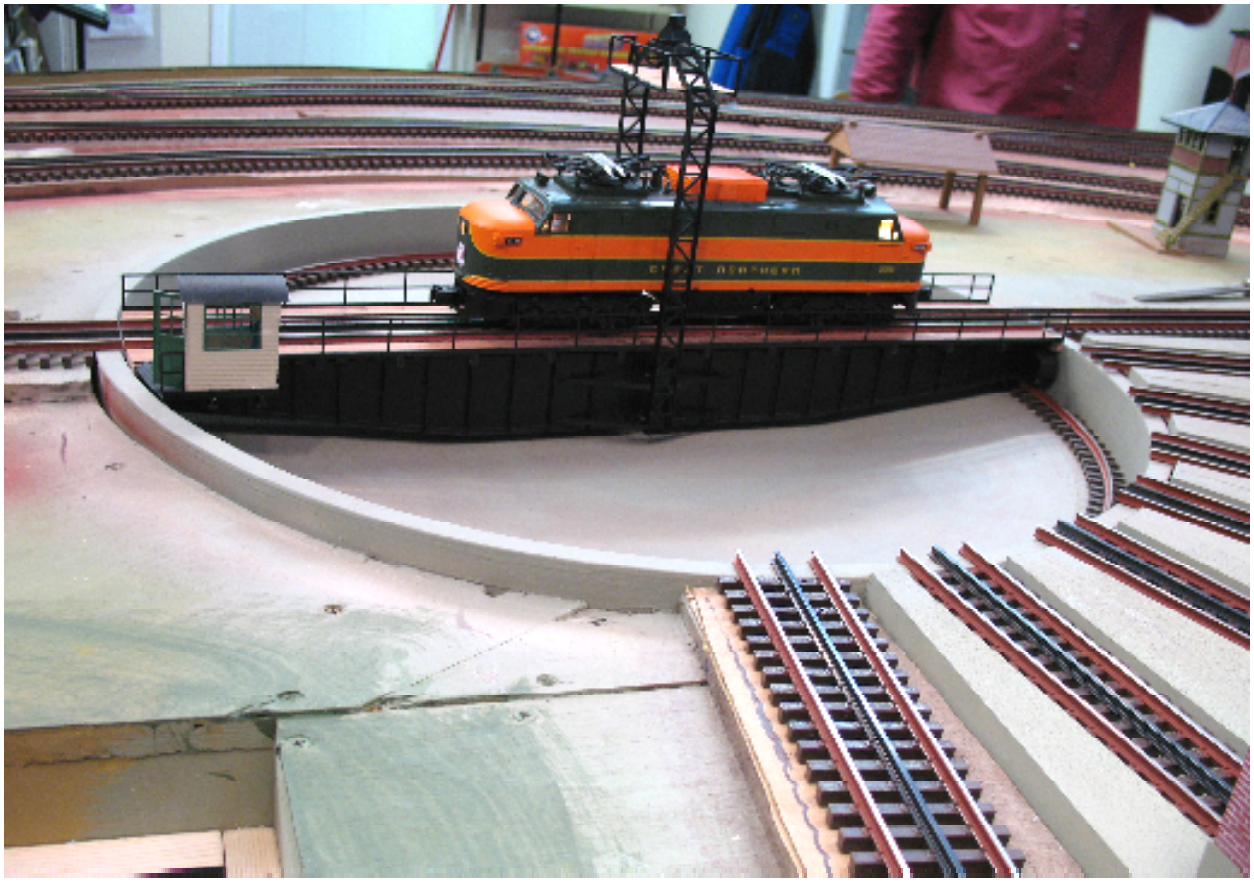


The motor drive is very simple. The motor is on a hinge. It has spring tension on it and the shaft is covered with a piece of fuel hose. This rubs against the rubber band on the outer edge of the turntable. The least pressure on the turntable will stop its movement.

Future Additions:

During the long Minnesota winters, the hours of daylight are relatively short and lights must be installed under the elevated maintenance platform to allow the hostlers to safely turn locomotives during the hours of darkness.

Many railroad turntables were turned with air-operated motors, so a recording of the Chicago and North Western railroad's Mankato, MN turntable will be installed on a sound chip. It will be activated as long as the turntable is rotating.



The “Beast” at work! Finally!

“The Beast”, as the Engineering Dept. came to call it, took an incredible amount of time and effort but the results, both aesthetically and operationally were tremendous.

The MC Engineering Dept for this project were:

Bill Nelson (President/ Grand “pooh”bah)
Charles Stoll (Layout Manager/Head of Engineering)
Dan Schaikoski (Styrene Chopper/Chief Rivet Counter)
Dave Scheurer (Heavy Equipment Operator/ Chief Smokestack Washer)
Deepak Das (Glue Slinger/Chief Cough-Syrup Tester)
Lyle Petrick (Sec.-Treasurer/ Chief Gopher)