

The Next 100,000 Ties Should we use Concrete Ties ?

We are thinking about buying the next 100,000 ties. Enough ties to build 6.3 miles of track.

Either we are going to get rid of the IRS and we will want to build more track, or we will be living under the terms of the Friends of Train Mountain lease and we will have to build more track. The lease requires another 5 miles of track by Dec 31, 2018 and requires Friends to replace another 0.9 miles of track south of S. Chiloquin Road.

Should we use Recycled Plastic Ties or shift to Concrete Ties ? If we are going to switch to Concrete Ties, we probably need to do a proof of concept this summer.

Ties are the most expensive part of the track... 45% of the cost of a track panel.

Here are the 2008 cost figures that Friends is using for budget purposes. They are about right, but little problems can drive them up surprisingly quickly.

Cost of 10' Track Panel Steel on Plastic Ties.

	Per	Panel
Steel Rail per foot	\$1.10	\$ 22.00
Rail Shipping	\$0.02	\$ 0.36
Screws	\$0.01	\$ 1.41
Tie Plates	\$0.06	\$ 3.48
Joiners	\$0.09	\$.18
Plastic Ties	\$1.68	\$ 50.40
Labor to assemble track		\$ 19.93
Gen & Admin at 15%		<u>\$ 14.66</u>
	Total	\$112.42

Then there are costs to prepare the grade and lay the track.

Today everything is going to cost more.... especially steel and plastic. With the higher costs of plastic, Ties are probably over half the cost of a track panel.

In 2007 Pete Pedigo from Southern Indiana Live Steamers suggested that we use concrete ties. He sent us some ties and we laid them on a heavily traveled piece of track behind Central Station. They have worked great. No problems.



To learn about Pete's concrete ties, visit <http://www.newrr.com/ConcreteTies/>

Train Mountain's Switches are all built on ties 3" high so our Concrete Ties must be 3" high.... not 2" high like Pete uses. This means custom molds will need to be made.

The Concrete Ties need to be 3" wide.... not 2" wide. We need enough concrete around the plastic screw anchors to prevent cracking. That means 3" wide ties.



Pete only uses 2 screw anchors per tie. At Train Mountain we run more trains and heavier trains so we would need 4 screw anchors and they would need to be in a channel sized to hold the tie plate in position.

3" wide ties means only 2 Concrete Ties per foot of track instead of 3 Plastic Ties 2" wide per foot of track.

Material Costs of 3x3x16" Concrete Ties

Raw Materials	Qty	\$ per	Units	Total	Comment
Sand	0.001028807	\$40	cu yd	\$0.04	
Concrete	0.027777778	\$6	cy ft	\$0.17	\$4 per 2/3 cu ft bag
Form release	0.001	\$20.00	gal	\$0.02	
Aggregate	0.001028807	\$40	cu yd	\$0.04	
Rebar	1	\$0.12	each	\$0.12	#3 rebar
Screw Anchors	10	\$0.01	each	\$0.10	
Forms	0.05	\$3.00	each	\$0.15	20 pours per form
Plywood	0.000390625	\$30.00	each	\$0.01	40 pours, 64 forms
Burlap	0.000166667	\$120	100 ft	\$0.02	20 pours per
Watering hose	0.000714286	\$20.00		\$0.01	20 pours per
Total				\$0.68	

So for a 10' Track Panel.... Concrete Ties are \$13.60 plus the labor to make them. Plastic Ties are \$50.40.

Cost makes Concrete Ties worth considering.

Pete uses a 2"Hx3"Wx15"L Rubbermaid shelf organizer as a mold. For 3"Hx3"Wx16"L Ties, we would have to custom make molds.... probably plastic boxes that we could re-use several times. They would have sloped sides... slightly bigger at the bottom... so getting the ties out would be easy. The fact the tie is smaller at the top than at the bottom should also help the ballast hold everything in place.

The signaling system uses the track with Pete's Concrete Ties. There has been no issue about the concrete ties conducting electricity between the rails. Maybe adding a channel for the tie plates could change this. We need to test.

Pete uses Real Trains Splice Bars bolted to each side of a rail joint. TM uses Rail Joiners. Rail Joiners need a screw through the Rail and Rail Joiner to hold the Rail Joiner in place.... to keep the Rail Joiner from sliding off as the rail expands & contracts or moves. There are 3 solutions to this problem :

- 1) Add a screw anchor to the concrete ties to take the Rail Joiner screw, or
- 2) Put a screw through the side of the rail to hold the Rail Joiner in place, or
- 3) Use a plastic tie at rail joints. This is what we did on the test section.

We all know that sun decays plastic. We have not seen sun damage yet, but concrete should last longer than plastic.

There is a rumor that concrete ties are noisier. This appears to be untrue. You can run over our test section and see what you think.

Weight is an issue. Assuming rail weighs 20 pounds per 10' panel

Plastic 3"x2"x16" ties weigh 2.7 pounds	101 lbs a 10' panel
Pete's 2"x3"x15" concrete ties weigh 6 pounds	140 lbs a 10' panel
3"x3"x16" concrete ties would weigh 9.6 pounds	212 lbs a 10' panel
3"x3"x12" concrete ties would weigh 7.2 pounds	164 lbs a 10' panel

One solution to the weight problem is to make the ties shorter than 16". The ties have to be at least 11" long to have enough cement around the screw anchors for them to not crack out.... 12" long would be better. Plastic plasterboard mud pans are available at 4"Wx3"Hx12"L.... They could be used as test molds. Google "Task Force 243939 drywall pan" to see the one at Lowes.

3"x3"x12" concrete ties would be about 5 cents cheaper than 3x3x16" ties.

Can anyone explain why we need 16" ties as opposed to 12" long ties ??

We have to decide if we could lay heavier track panels the way we do now.

There are 2 major issues :

- 1) COST INCLUDING LABOR TO MAKE TIES ??
- 2) DOES WEIGHT CHANGE THE WAY WE WOULD LAY TRACK ??

The costs of making Concrete Ties and Laying Track might erase any potential savings ??

So my questions to the TM Community are :

HOW COULD WE MAKE CONCRETE TIES ? Here are some things to consider about making ties.

1. The costs of shipping Concrete Ties would be high so they probably would have to be made at TM.
2. The costs of bringing a concrete truck from Klamath Falls are prohibitive unless we buy 10-12 cubic yards and then the costs of keeping the truck while we pour lots of small forms would be prohibitive. The concrete would need to be mixed at TM.
3. The Ties might need 3 days in the forms before removal.
4. Concrete is strongest after 7 days. Keeping it wet for 3+ days makes it a lot stronger. Strength helps retain the plastic screw anchors without micro-cracking.
5. Our 12' flatbed rail cars can only carry 600 pounds.
6. Moving the forms after pouring the concrete has to be limited or the associated vibration could cause some separation of the concrete and weaken the final product
7. We would need to make at least 24,000 ties a year.... 32,000 would be better.
8. It would be best if the ties could be made while the weather was too bad to move dirt or lay track.

HOW WOULD WE LAY TRACK ? Here are some things to consider about laying track.

- a. Our construction season is short. Our current track laying system allows us to reliably lay and ballast 400' of track a day. After many weeks of dirt moving we start laying track in mid August and lay to mid October... 8 weeks.... 40 work days. So in theory we can lay about 16,000' of track. Our best year was 12,000' of track. We need a system that will allow us to lay at least 12,000' of track a year (300' or 600 concrete ties per day).... better 16,000' a year (400' or 800 concrete ties per day).
- b. In the track shop we make 20 track panels a day.... 600 ties. 600 Concrete Ties means 300' of track a day.
- c. The tools we use to lay the track have to get out of the way of the 1-ton flatbed ballast spreading truck that we back in after every few hundred feet of tack laying. The tools can retreat to previously ballasted track or be thrown off to the side of the grade. They cannot be moved ahead of the track because the truck needs to go by.
- d. To switch from Plastic Ties to Concrete Ties, the speed of track laying has to be better with Concrete.
- e. To switch from Plastic Ties to Concrete Ties, the total cost of laid track needs to be cheaper with Concrete.

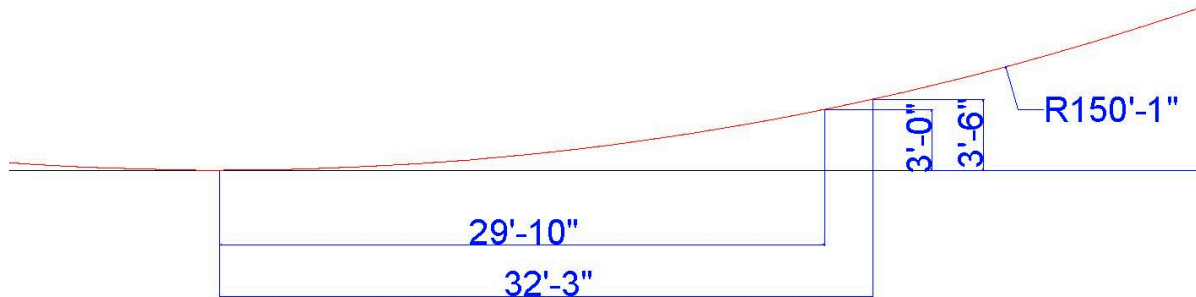
Here are some ideas on laying track :

Present System -- Can we handle panels that weigh more ?

Pete's System -- Pete lays the ties out on the ground, screws down 1 rail, gets the shape right, then screws down the second rail. All work on your knees.

The Crane System -- The idea here is to build the track panels like we do now, take it on trains... 3 panels per carload... and create a crane system to move the track into position.

The Ramp System -- If you turn over a plastic tie track panel and place it upside down on a block at the center of the 10' panel, then the ends of the track panel sag 1". That arc is a part of a circle of 150' radius. It turns out that after 30' the circle is 3' off the ground and after 32.3' it is 3.5' off the ground... comfortable working height.



One way to lay track is to construct a 35'-40' ramp on wheels. Trains would bring rail and ties to the end of rail. Track layers would bring individual ties from the train to the working height area where the ties would be screwed to the rail. There would need to be a rack to hold rails in position above/ahead of the ramp. Rail curve would be put in as you went.

The End of Track Build --Another idea is to build the track in the field on a table on wheels with a crane to move the track off the table and connect it to track already laid.

Other ideas are welcome.

Conclusion

Nobody is going to buy more ties till the IRS situation clarifies, but if we are going to change our construction strategy, then we need to do a trial of the new method soon... probably this summer.

We have to look at the alternatives and be sure that we are not overlooking a better technology.

You guys are smart and inventive.

Please help figure out if we can save time and money by moving to Concrete Ties.

All ideas are welcome.

We want to come to consensus by the end of the Triennial.