Warrant

Rhinelander Railroad Association
P.R.R.&S.
PELICAN RAPIDS ROUTE
RAILWAY
Rhinelander, WI

January 2011

Alan Duchrow, Secretary and Librarian of the Rhinelander Railroad Association contributed mightily to success of the annual Open House Christmas Party at the Museum Depot.

Here, having decorated, and now guarding perhaps the most beautiful of traditional Christmas Trees Alan, while appearing to pose, attempts not to pose.

The RRA Library holds many a rare volume and is perfect for those pursuing research to portray rail history in this northern part of the Midwest.

Alan will help you find the answer among the books, periodicals and combined knowledge of members who worked on prototypes or have modeled from a historical viewpoint.

The true meaning of Christmas is to remember and give thanks to one's creator. But, also we hope to instill that curiosity of a child, that warmth that only a cup of hot coca along with a kiss from mom or a train under the tree bring. Bob Lake and Justin Christopherson are crowding their way to the 'goodie table' hoping to find the now famous apple pie desert by Brendan Marquardt. Justin brought wife Sam and their one year old Mirra to spark a child's love for toys, trains and perhaps as Bob might observe, to 'Hob Nob with Bob'. Folks might think it was Brendan Marquardt's pie that made them "Chew-Chew".

Wire: thoughts about wires

by R.G. Blocks

Our model railroad wiring was planned. Is it perfect? Nope. It does the task of carrying power to trains, turnouts, several accessory items and lighting. It has worked flawlessly to date without undue voltage drops or spurious aberration.

This paper was not written to tell you how we wired our layout but reviews some of the considerations we gave the topic. Perhaps some folks take them for granted. It's a review.

We began with the premise that we would use copper wire not aluminum or a clad wire. Our reasoning was simple. It is available in a range of gauges as well as either solid or stranded and with a variety of insulations. Further, electrical hardware is typically designed for use with copper wire. Soldering copper is generally easy. I'm all for easy. Copper would be our choice.

Wire capacity, the ability for it to safely carry power, is measured in watts. Wire will overheat if loaded with too many watts. One consequence of overheating wire is that the insulation will melt. Without insulation, wire may overheat wire support, short against another object, spark in contact with an object, melt another object and start a fire. Fires are not good in model railroads.

We typically use American Wire Gauge (AWG) when expressing copper wire diameter and wire charts will normally show wire capacity expressed in amps at common alternating current voltages (VAC). Typically, home wire ratings will be shown in amps rather than watts. Thus, common household wiring circuits are expressed in the National Electrical Code (NEC) as:

15 Amp Max	circuits use	14 AWG minimum wire
20 Amp Max	circuits use	12 AWG minimum wire
30 Amp Max	circuits use	10 AWG minimum wire.

These Approved maximum amps for wire gauge shouldn't overheat under normal application when wiring a house for 120 VAC. It's all about getting rid of the heat generated in the wire.

We know that circuit breakers used in our homes have a bit of inherent error and lose a bit of their rating with time (and trips); thus, wire gauges shown above are minimums. We know for example that copper wire in air versus same in a confined trough can actually carry more than approved minimums:

AWG Gauge	Max Amps for Unconfined Wire	Max Amps for Confined Wire
24	3.5	2.1
22	7.0	5.0
20	11.0	7.5
18	16.0	10.0
16	22.0	13.0
14	32.0	17.0
12	41.0	23.0
10	55.0	33.0

You may note that the NEC ratings are very similar but a shade safer than the confined wire figures on the rightmost column above. Your safety was the NEC consideration.

Lets begin a railroad illustration by looking at the Power Equation: where

P = Power in Watts
E = Volts (lets begin with 120 vac)
I = Amps

And P = E x I

When we build a model railroad we feed our transformers with household voltage at 120 VAC. Thus, if we have a very large transformer that is rated at 400 watts (P = 400, E = 120) we need a circuit that will carry:

P = E x I or 400 = 120 x I and, rearranging: Amps = I = 400/120 = 3.33

Hence, on the transformer feed side we note a 15 Amp household circuit (and outlet) will handle as many as four such transformers but not five (4 x 3.33 amps = 13.3 Amps). Only the very largest layouts would have such a concern.

Would four transformers be safe? Perhaps as a short term, intermittent load would be my answer. I wouldn't impose near full load on an around the clock continuous basis. My preference is to limit any circuit to about 2/3rd of its rated capacity. I try to follow that in our railroad wiring as well. Safety first.

Current flow appears to take place largely on a wire's surface as frequency increases. The current trend toward digital signaling is akin to having a radio frequency AC wave on formerly placid DC. This suggests we improve our wire surface area where possible. Thus, while AWG is a measure of wire diameter, we can actually improve surface area by using stranded wire of the same gauge. More strands are better when it comes to surface area per overall wire diameter.

Stranded wire is also more flexible than solid wire. It doesn't readily break or neck down when flexed. Thus, it makes sense to use flexible, stranded copper wire.

Tightly bundled wires are to be avoided. One reason is cross-talk between wires. Wires may act like coupled antenna when bundled. The other reason is heat related. We want our wires to breathe, to dissipate heat easily. Thus, don't confine your wires tightly.

Long runs of wire introduce yet another concern. Every wire is a resister. Longer wires have greater resistance to current flow than short ones. Longer wires have greater voltage loss (we call it a voltage drop) in short wires of the same gauge.

The resistance of wire is well known and documented. Cold wire is rated at 20C or 68F. De-rated wire at 60 deg C (140 F) has higher resistance than the cold wire. We will use the de-rated values since they are more conservative (as follows):

AWG	Ohms per 100 feet
24	3.12
22	1.96
20	1.23
18	0.776
16	0.488
14	0.307
12	0.193

Lets say we have an engine that draws 1.0 amp at 6 volts and it has two strands of 12 AWG wire, each 50 feet in length feeding it (100 feet of wire):

E = I x R E = 1.0 amp x 0.193 ohms = 0.193 voltage drop.

If the circuit was wired with 24 AWG then E = 1.0 amp x 3.12 ohms = 3.12 voltage drop.

Thus, you can see that if we drive the circuit with say 6 volts we'd have very little voltage drop with 12 Gauge wire (6 volts – 0.193 volts = 5.807 volts). However, if we use 24 gauge wire instead of 12 Gauge; (6 volts – 3.12 volts = 2.88 volts). The train would run at perhaps less than half the speed intended (or maybe not at all) with the smaller 24 gauge wire.

The foregoing article is not meant to be a theoretical treatise on wire, or how to wire your layout. Rather, it is simply to provide illustrations on topics that should be contemplated before you begin your wiring.

Written by Roger G Blocks, P.E. December 28, 2010 as an outline for a first clinic at Three Lakes Model Railroad Club, Three Lakes, Wisconsin in preparation for a clinic at Rhinelander Railroad Association. I enjoy the fundamentals; holler if my views cause you anxious moments, sleepless nights or any personal distress. The intent is to improve knowledge. Another time we'll discuss voltage drops in tracks & feeds.

President's Message: *by Jim Brown*

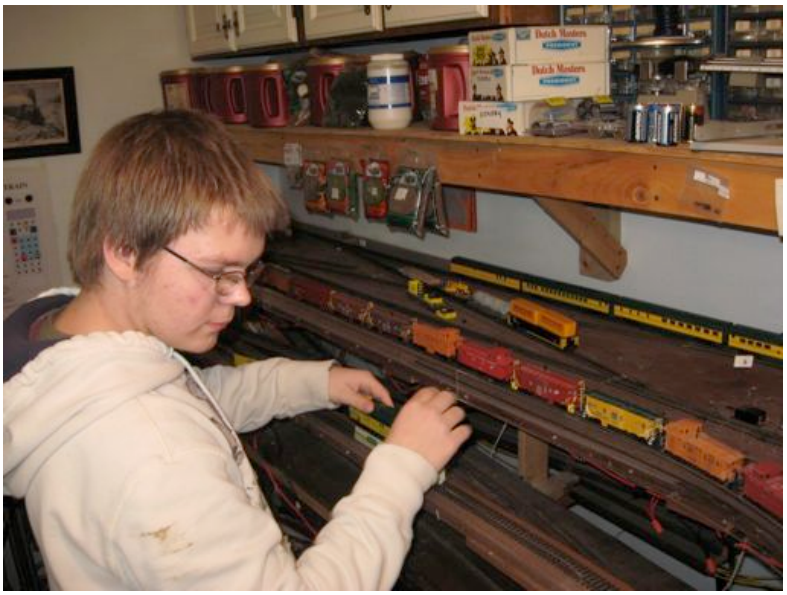
Greetings from the old man of " Dan Nort Woods".

First, I want to welcom everyone back for 2011. We are going to get rolling stock inventoried this year. Also, we're doing some work on the bylaws and will insure every member has a copy of them.

Then, I want to thank all members that were able to help out at our Christmas Open House. You helped make it a success.

We have a new copy machine that does everything imaginable. With help from Brendan it is up and running.

I would like some input from members on what they think of the newsletter and if they have anything to offer. Turn in your ideas to either myself, Jim Brown President (email : cj.virginlake@frontier.net), or Roger Blocks our Editor (715-546-2807 or rgblocks@me.com), or Brendan Marquardt, Assistant Editor (715-490-2094 or brendan.marquardt@gmail.com).



Brendan, shown on the left is quite knowledgeable when it comes to technology. He enjoys DCC control, anything computer related and cooking. Here he's 'cooking up' something in C&NW livery.

Members should be reminded that dues for 2011 are due on or before February 28, 2011. Norman Braegar, Treasurer (phone 715 369-0354) is happy to make change. The newsletter is basically for dues paying members.

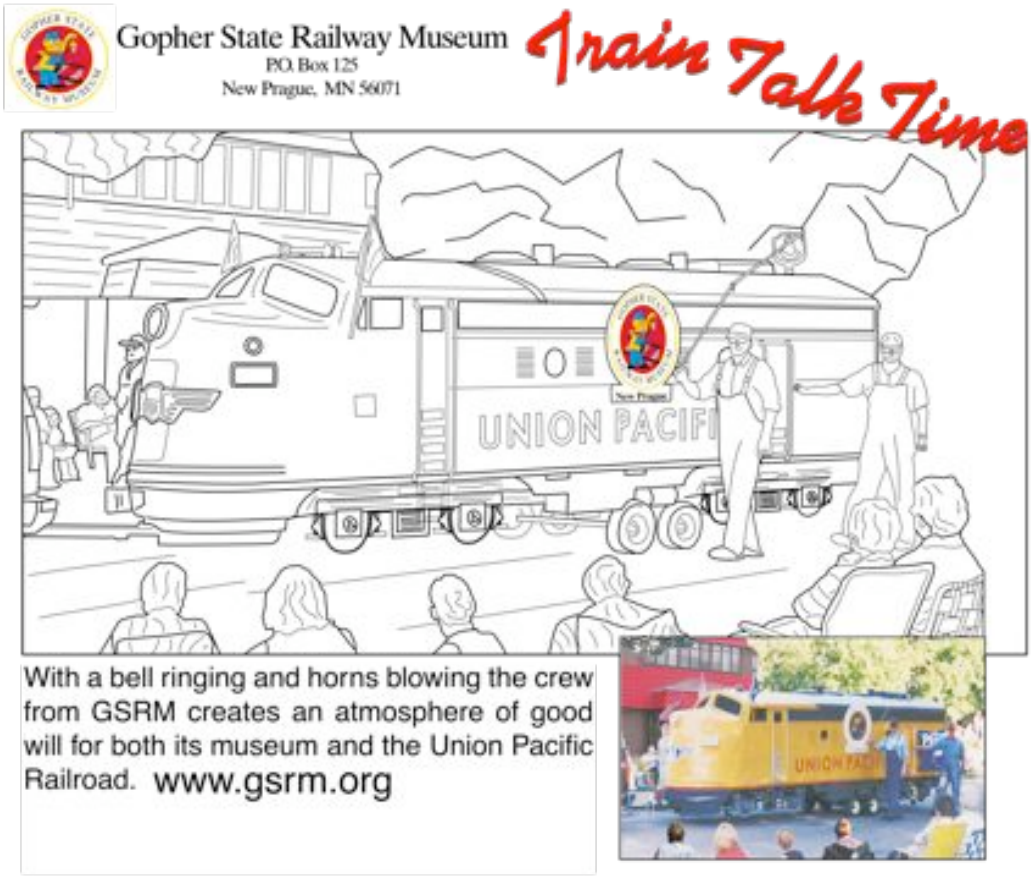
The next business meeting will be on Wednesday, January 5th and the second meeting of 2011 will be on February 2nd at 7PM in the depot. Hope to see you there !

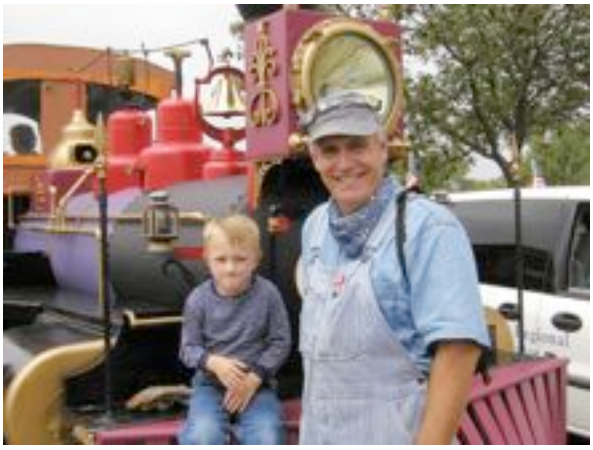
Take care.
Jim Brown, President, RRA.

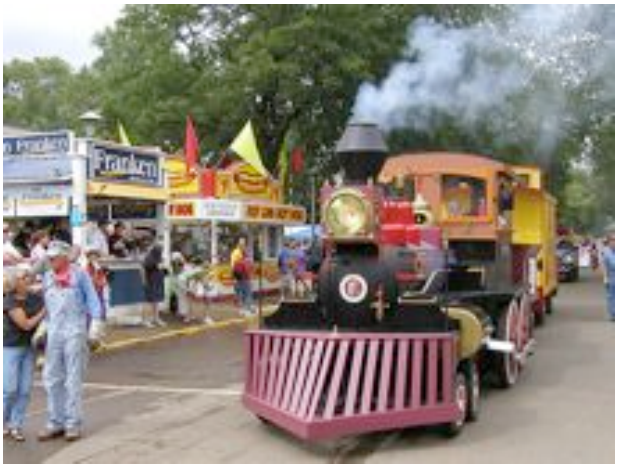
Knowing your Fellow Railroaders

by R.G. Blocks

Bet you didn't know that fellow member Mike Lehne was for a period of six years President of Gopher State Railway Museum (PO Box 125, New Prague, MN 56071). Mike is enthusiastic about rail and parades. His creativity and energy are apparent in his steam train parade float, some 60 feet long, holds 30 full sized folks and he'd move it here to Rhinelander; but, it needs a good sized barn for storage. If you like parades, want to be in one for the 4th of July, then support Mike and help him find a home for this and a ½ sized F7.







Programs and Stuff of Interest:

January 5th, Rhinelander Depot at the Museum… 7 PM Program on Wire by Roger G Blocks, P.E. President, ChemAl, Inc. a Registered Engineering Company, Racine, WI. rgblocks@me.com

January 15-16, 2011- Sat & Sunday 14th Annual Model Railroad Show & Sale- Stevens Point, WI Ramada Hotel- Corner of Business 51 & North Point Drive
Info at www.trainweb.org/cwmr Or Contact Tim at btvictor@charter.net

January 29, 2011- Great Tri-State Rail Sale- LaCrosse Center- 2nd & Pearl Streets
LaCrosse, WI Info at: www.4000foundation.com

February 20, 2011-WISE Division Meet-Country Springs Hotel-Waukesha, WI
www.wisedivision.org
February 19-20, 2011- Mad City Model RR Show- Alliant Energy Center- Madison, WI
www.nmra-scwd.org

March 5-6, 2011- Traintime 2011 Model Train Show- MSOE-1025 N. Broadway
Milwaukee, WI Free Admission

March 5-6, 2011- High Wheeler Train Show- Harper College- Palatine, IL
www.highwheelertrainshow.com Or www.foxvalleydivision.org

March 13, 2011- Metro Model Railroad Club Show- Circle B Recreation Center
Hwy 60 Cedarburg, WI- www.metrorrclub.org

April 9-10, 2011- 10th Annual Model Train Show- Menomonie Middle School
Menomonie, WI Info Call: (715) 505-4044

April 15-17, 2011- NMRA Midwest Region Annual Convention- Madison, WI
Info at: www.nmra-scwd.org/Badgerland

Note from your Editor:

A Happy New Year. We'll do our best to keep you informed regarding various railroad affairs here and elsewhere, clue you in regarding our membership, their projects, group projects, and the goals and aspirations of RRA. Color Photos in this issue were taken by either myself or with the blessings of Mike Lehne who is looking for some active support and has big ideas.

The purpose of this newsletter is to inform and educate. I've alluded to several constituencies in RRA. You might fall into one or more of them. The concept of education and fellowship are common to organizations such as ours. To that end, I've prepared a talk that in NMRA (National Model Railroad Assn) terms is called a clinic. It is on the subject of wire. This newsletter is the handout for what will be a power point lecture on Januray 5th. You're invited. Bring a friend. Interrupt when you've a question. The idea is to learn together.

We'd like to have one educational program each month. How do you feel about that? Speak to the program chair: your V.P. Bob Lake 715-420-0146 or rekkonball@charter.net . Thanks.

R.G. Blocks 12/30/2010 rgblocks@me.com or 715-546-2807