

FREE-MO N

PROTOTYPICAL N-SCALE MODULAR RAILROADING

DAVE FALKENBURG

JULY 7TH, 2011

OVERVIEW

- THE STANDARD
- MODULE CONSTRUCTION SHOW & TELL
- QUESTIONS & ANSWERS

RAISING THE BAR

(AND THE RAILHEAD, TOO.)

FREE-MO OBJECTIVES

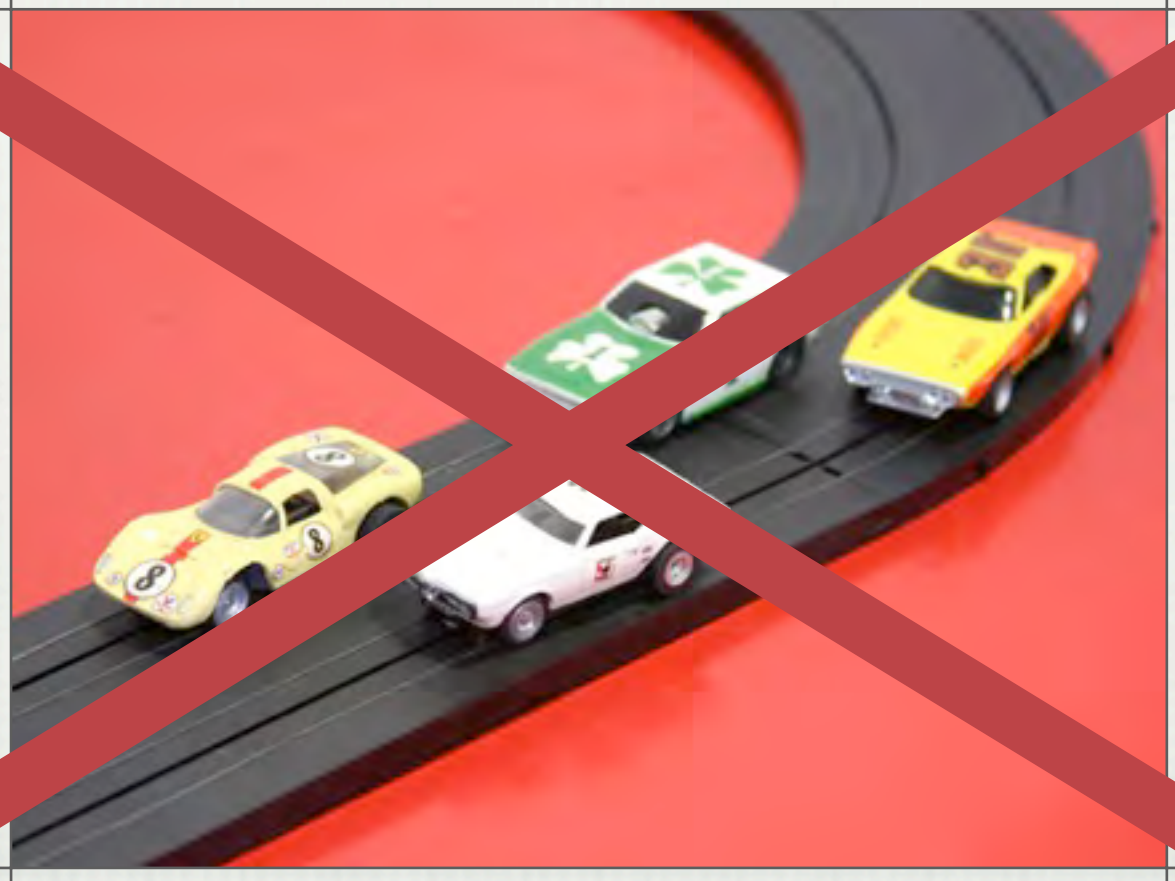
- PROMOTE AND REQUIRE HI-FIDELITY PROTOTYPICAL SCALE MODEL RAILROADING
- ENSURE RELIABLE TRACK AND ELECTRICAL OPERATION
- ENCOURAGE VISUAL CONTINUITY BETWEEN MODULES
- ENCOURAGE A LOOSE ASSOCIATION AMONG INDIVIDUALS FREE FROM CLUB MEMBERSHIPS, DUES AND TITLES
- KEEP THE STANDARD SPECIFICATIONS TO A MINIMUM WITHOUT COMPROMISING THE PREVIOUS OBJECTIVES

[HTTP://WWW.FREE-MO.ORG/](http://www.free-mo.org/)



1952 HORSESHOE CURVE Grif Teller

(NO OFFENSE INTENDED, PRR FANS!)



WHAT IS FREE-MO N?

- FREE-MO STANDARD APPLIED TO N-SCALE
- SPECIFICATION FOR BENCH WORK, TRACK WORK, AND DIGITAL CONTROL THAT ATTEMPTS TO RAISE-THE-BAR FOR SCALE MODULAR RAILROADING
- PROMOTES, AND EVEN FORCES, PROTOTYPICAL APPEARANCE AND OPERATIONS BY USING A SINGLE MAIN LINE TRAVERSING THE CENTER OF THE MODULE
- PROTOTYPICAL POINT-TO-POINT OR LOOP-TO-LOOP CONFIGURATIONS AND OPERATION

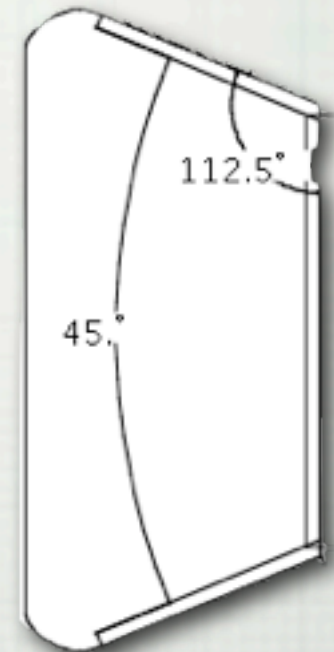
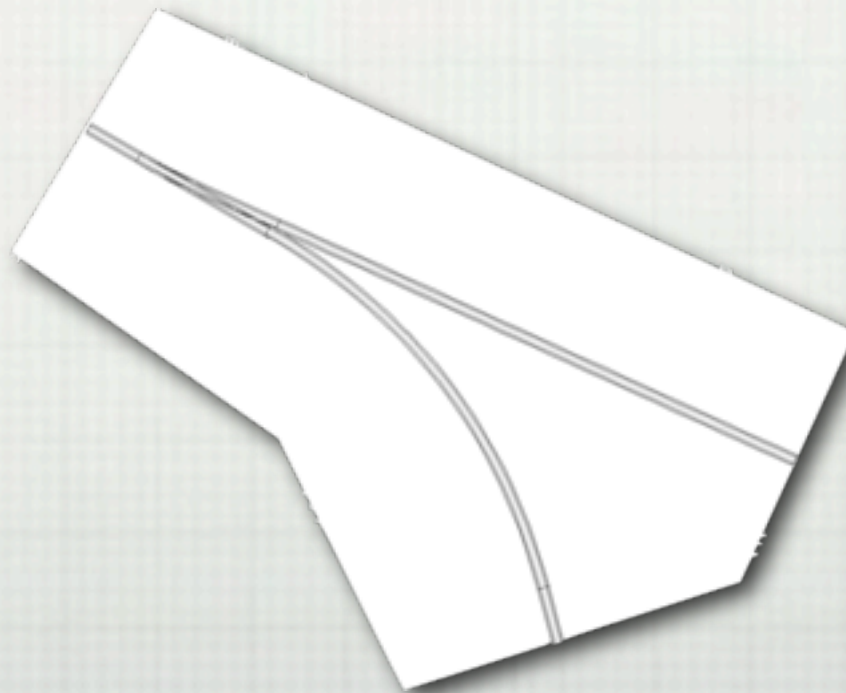
THE STANDARD

[HTTP://FREE-MON.WESLEYTEINER.COM/](http://free-mon.wesleysteiner.com/)

DEFINITIONS

- MODULE: A COMPONENT OF BENCHMARK MEANT TO BE OPERATED AS A SINGLE UNIT
- A MODULE CAN BE COMPOSED OF ONE OR MORE SECTIONS
- ENDPLATE: STANDARDIZED SURFACE OF A MODULE AT ANY PLACE WHERE IT CAN BE CONNECTED TO ANOTHER MODULE

EXAMPLES



TRACK

- MAIN LINE CODE-55 NICKEL-SILVER FLEX OR HAND LAID WITH PROTOTYPICAL TIE DIMENSIONS AND TIE SPACING
- ATLAS OR MICROENGINEERING CODE 55 FLEX WORKS FINE
- MINIMUM RADIUS FOR THE MAIN IS 22 INCHES WITH AT LEAST 6 INCHES OF STRAIGHT TRACK BETWEEN REVERSE CURVES
- MAIN LINE TURNOUTS MUST BE #6 OR LARGER. FROGS MUST BE POWERED WITHOUT RELYING ON POINTS & STOCK RAILS

JOINTS

- US STANDARD UPDATED TO REPLACE "FITTER RAILS" WITH FLUSH RAIL JOINTS.
- EUROPEAN FREEMO HAS USED THIS STYLE WITH GREAT SUCCESS

[HTTP://WWW.AMERICA-N.DE/
TIPPS_SCHWELLENPLATINE/
SCHWELLENPLATINE.HTM](http://www.america-n.de/tipps_schwellenplatte/schwellenplatte.htm)

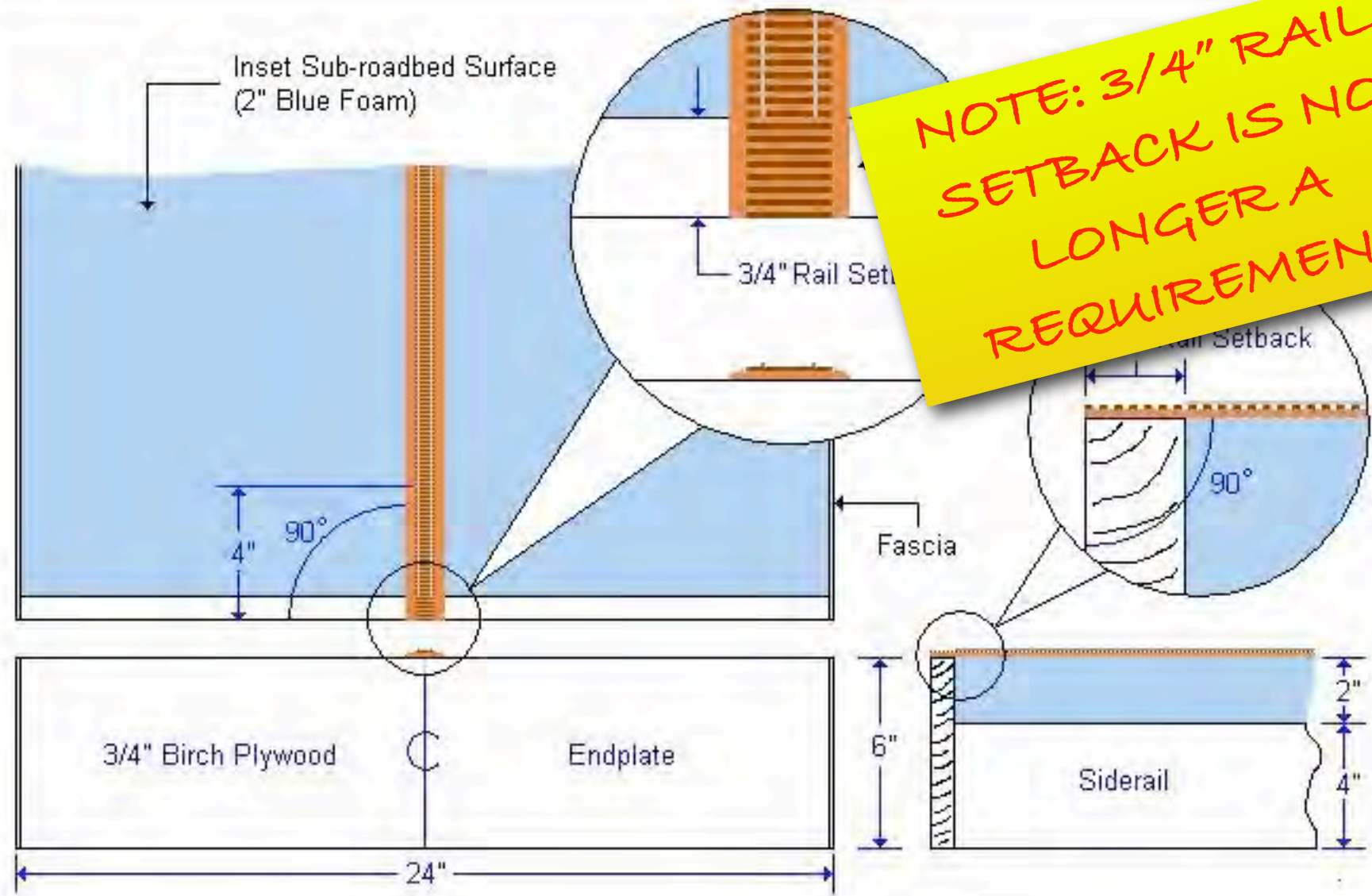


BENCHWORK: ENDPLATE

- ENDPLATES SHALL BE CONSTRUCTED OF 3/4 INCH BIRCH PLYWOOD OR AN EQUIVALENT MATERIAL TO RESIST WARPING
- 6 INCHES HIGH AND A MINIMUM 12 INCHES WIDE
 - A 24 INCH WIDTH IS RECOMMENDED FOR EASE OF TRANSPORTATION AND CONTINUITY
- AVOID USING DIMENSIONAL LUMBER SINCE IT HAS A TENDENCY TO WARP
- MODULE TO MODULE END PLATES SHALL BE SECURED WITH C-CLAMPS



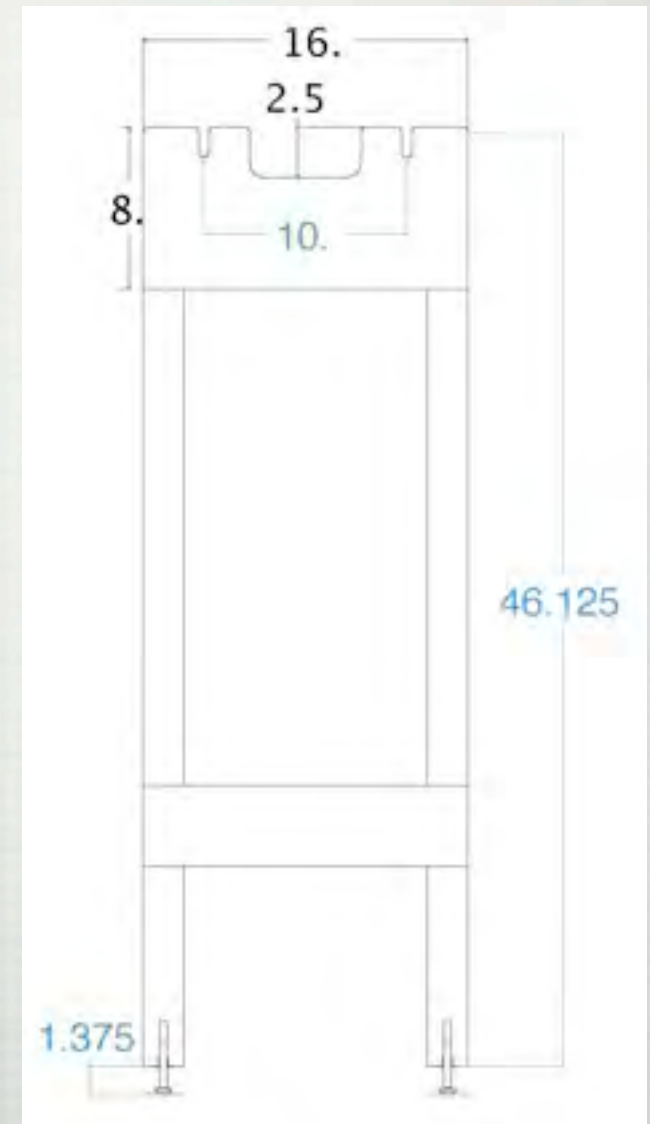
**NOTE: 3/4" RAIL
SETBACK IS NO
LONGER A
REQUIREMENT**



	Free-mo N Endplate Construction	Font: Arial 8 / 10
Revision: 7-30-03	Scale: 1 pixel = 1/16"	Copyright © 2002-2003 by Wesley Steiner

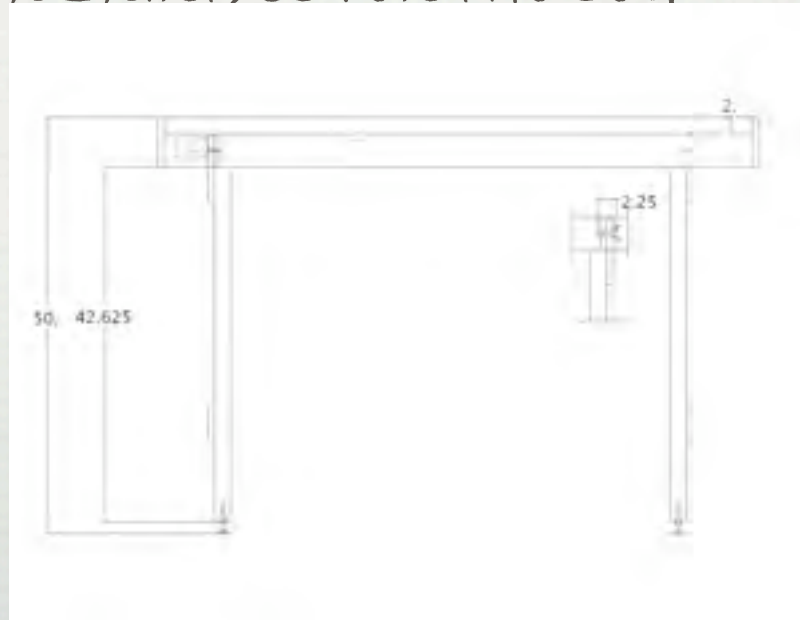
BENCHWORK: LEGS

- MODULE MUST BE FREE-STANDING
- MUST BE VERTICALLY ADJUSTABLE PLUS AND MINUS 1 INCH TO COMPENSATE FOR UNEVEN FLOORS
- RUBBER TIP (OR EQUIVALENT) FOR FLOOR PROTECTION
- NOMINAL AND MINIMUM HEIGHT OF RAILHEAD FROM THE FLOOR SHALL BE 50 INCHES



BENCHWORK: MISC.

- SURFACE SHALL BE STURDY ENOUGH TO PREVENT SAGGING OVER THE LENGTH OF THE MODULE.
- FASCIA: BOTH SIDES, CONTOURED TO MATCH SCENERY
- SKIRTING: BLACK SKIRT, COVER THE LEG*



ELECTRICAL: TRACK BUS

- TRACK IS ALWAYS DCC
- BUS: 12 GAUGE (OR HEAVIER) THAT SPANS MODULE
- WIRES TERMINATE NEAR CENTER OF ENDPLATE(S), LONG ENOUGH TO CONNECT WITH ADJOINING MODULE(S)
- BUS HAS **RED** 30 AMP ANDERSON POWERPOLE CONNECTORS STACKED VERTICALLY (HOOD UP, TONGUE DOWN)
- THE TOP POWERPOLE SHALL CONNECT TO THE LEFT RAIL, AS YOU FACE THE ENDPLATE, THE BOTTOM POWERPOLE SHALL CONNECT TO THE RIGHT RAIL
- FEEDERS: 24 GAUGE OR HEAVIER

POWERPOLE CONNECTORS



[HTTP://WWW.ANDERSONPOWER.COM/PRODUCTS/
STANDARD-POWERPOLE.HTML](http://www.andersonpower.com/products/standard-powerpole.html)

ELECTRICAL: ACCESSORY BUS

- DCC SIGNAL (SEPARATE BOOSTER FROM TRACK) OR 16V AC
- 12 GAUGE OR HEAVIER SPANNING THE LENGTH OF THE MODULE BETWEEN THE ENDPLATES.
- WIRES TERMINATE NEAR THE CENTER OF THE ENDPLATE(S), EXTENDING LONG ENOUGH TO ATTACH TO THE ADJOINING MODULE
- BLACK 30 AMP ANDERSON POWERPOLE STACKED HORIZONTALLY (TONGUE-TO-TONGUE, HOOD-TO-HOOD).

ELECTRICAL: CONTROL BUS

- LOCONET CONTROL BUS*

* NCE UTP IS
COMPATIBLE
WITH LOCONET

- 6-CONDUCTOR WIRING (RJ12)

- 26 AWG, STRAIGHT-THRU CABLES

- CONNECTION ON EACH SIDE TO ALLOW MODULE REVERSAL

- MULTIPLE JACKS FOR MULTIPLE OPERATORS IF NEEDED

- DECENT DESCRIPTION OF WIRING HERE:

- [HTTP://WWW.RAILWAYBOB.COM/MODULES/WIRINGRJ12S/
RJ12S00INDEX.HTML](http://www.railwaybob.com/modules/wiringrj12s/rj12s00index.html)

SCENERY

- LANDSCAPING AT MODULE ENDS MUST BE DESIGNED TO FLOW SMOOTHLY INTO ADJACENT MODULES
- FINE LIGHT GRAY BALLAST; SOME FORM OF SCENERY HIDING BENCH WORK
- AVOID FEATURES SUCH AS ROADS, LAKES, AND SO FORTH FROM RUNNING AGAINST THE MODULE ENDS
- WITHIN 6 INCHES OF ENDPLATES USE A FLAT PROFILE ROUGHLY 1/4 INCH BELOW TOP OF MAIN LINE RAIL
- USE A GENERIC GRASSY/SANDY TERRAIN
- AVOID STRUCTURES & DETAILS THAT OBSTRUCT YOUR FOREARMS JOINING MODULES OR BE DAMAGED!

“FREEDOM OF ASSEMBLY”

- FREE-MO MODULES SHOULD BE ABLE TO BE OPERATED IN ANY (RIGHT-SIDE UP) CONFIGURATION
- EITHER SIDE CAN BE THE FRONT!
- BACKDROPS & FLATS DON'T REALLY WORK WELL
- CONTROL JACKS ON EACH SIDE OF MODULE
- TURNOUT CONTROL FROM EITHER SIDE IS BEST, IF POSSIBLE

EQUIPMENT

- ROLLING STOCK WHEELS, TRUCKS AND WEIGHT SHALL MEET OR EXCEED NMRA STANDARDS & RECOMMENDED PRACTICES
- LOCOS MUST BE DCC-EQUIPPED
- NO PIZZA CUTTERS!
- FOX VALLEY MODELS AND BLMA NOW MAKE SOME SLICK N-SCALE WHEELSETS THAT DROP INTO MICROTRAINS TRUCKS

A FIRST MODULE

LAYOUT DESIGN MOMENT

- PICK A PROTOTYPE
- HOW MUCH SPACE?
- GIVENS & DRUTHERS
- YADA YADA YADA
- TRACK PLAN



ALVISO, CA

- NEARBY WITH A NEAT BRIDGE AND CHARACTER
- SINGLE TRACK LOCALE



TRACK PLAN



6' X 18" MODULE

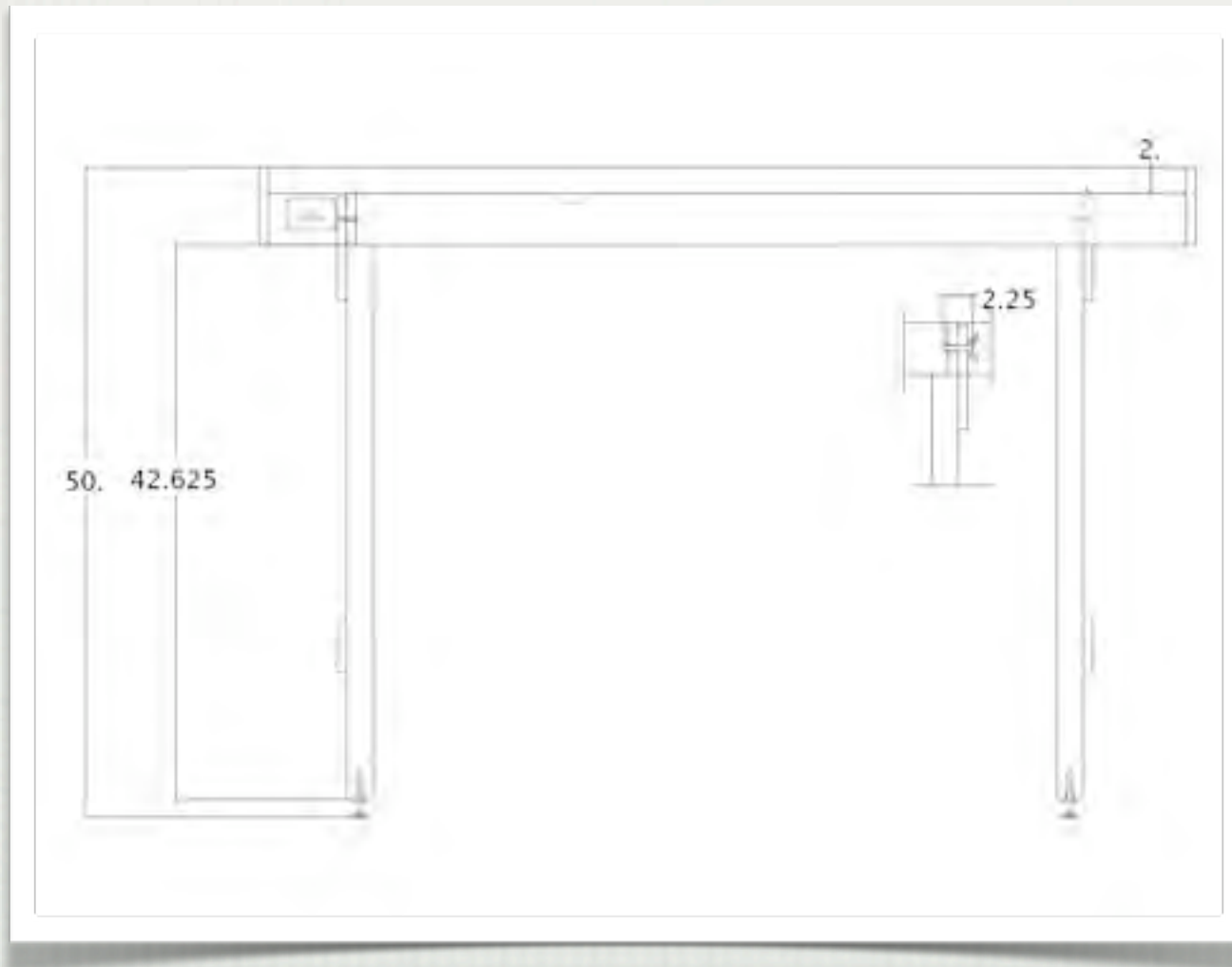


CONSTRUCTION

- BIRCH PLYWOOD ENDPLATES
- ALSO USED PLYWOOD FOR SIDE RAILS
- RIGID FOAM INSULATION FOR SCENERY BASE
- VINYL SPACKLE + PAINT + GROUND COVER



DAY 0 (ZERO): CAD



CAD OR DRAWING
KNOW YOUR LUMBER'S TRUE DIMENSIONS!

DAY 1: MODULE FRAMES

- BLUE FOAM (ROAD TRIP)
 - PACIFIC SUPPLY IN OAKLAND, CA & SAN JOSE
- BIRCH PLYWOOD
 - NOT CHEAP
 - SOUTHERN LUMBER
 - AURA HARDWOODS





ENDPLATES & "STABLE" LUMBER FROM PLYWOOD



BRACING THE CORNERS
GLUE IS YOUR FRIEND

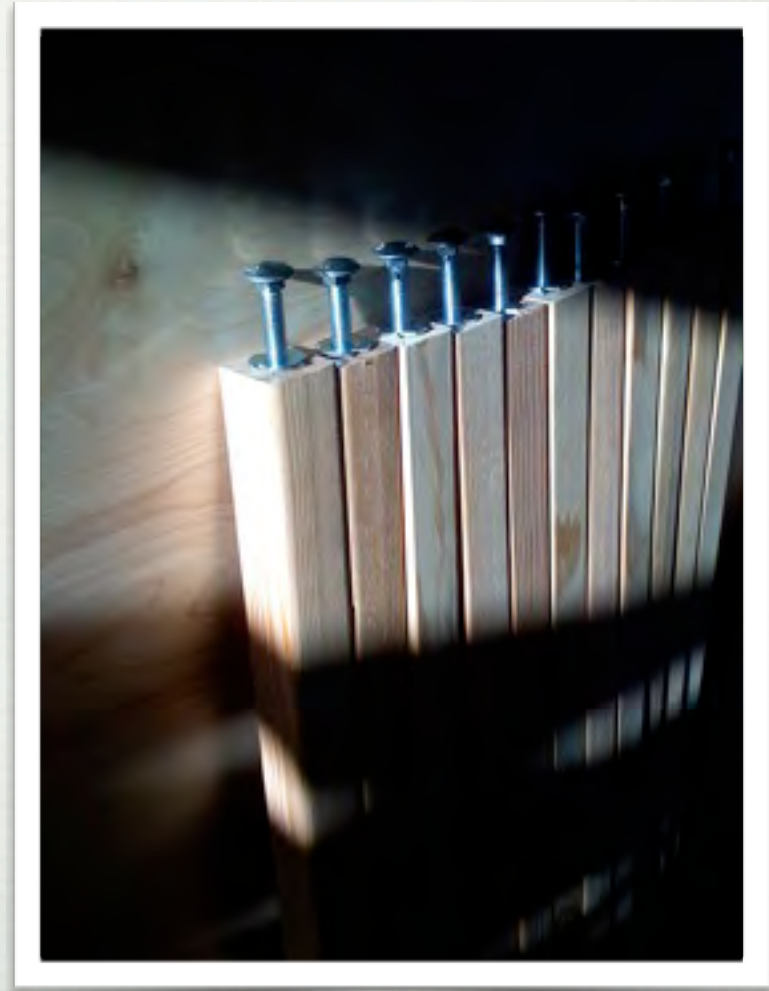


END OF 1ST DAY: MODULE FRAMES SCREWED & GLUED

SECOND SESSION: LEGS

- GOAL OF SECOND SESSION WAS TO BUILD LEGS FOR MODULE FRAMES
- DESIGN BASED UPON WORK DEVELOPED BY GERMAN N-SCALE MODULAR GROUP

[HTTP://WWW.AMERICA-N.DE/](http://www.america-n.de/)

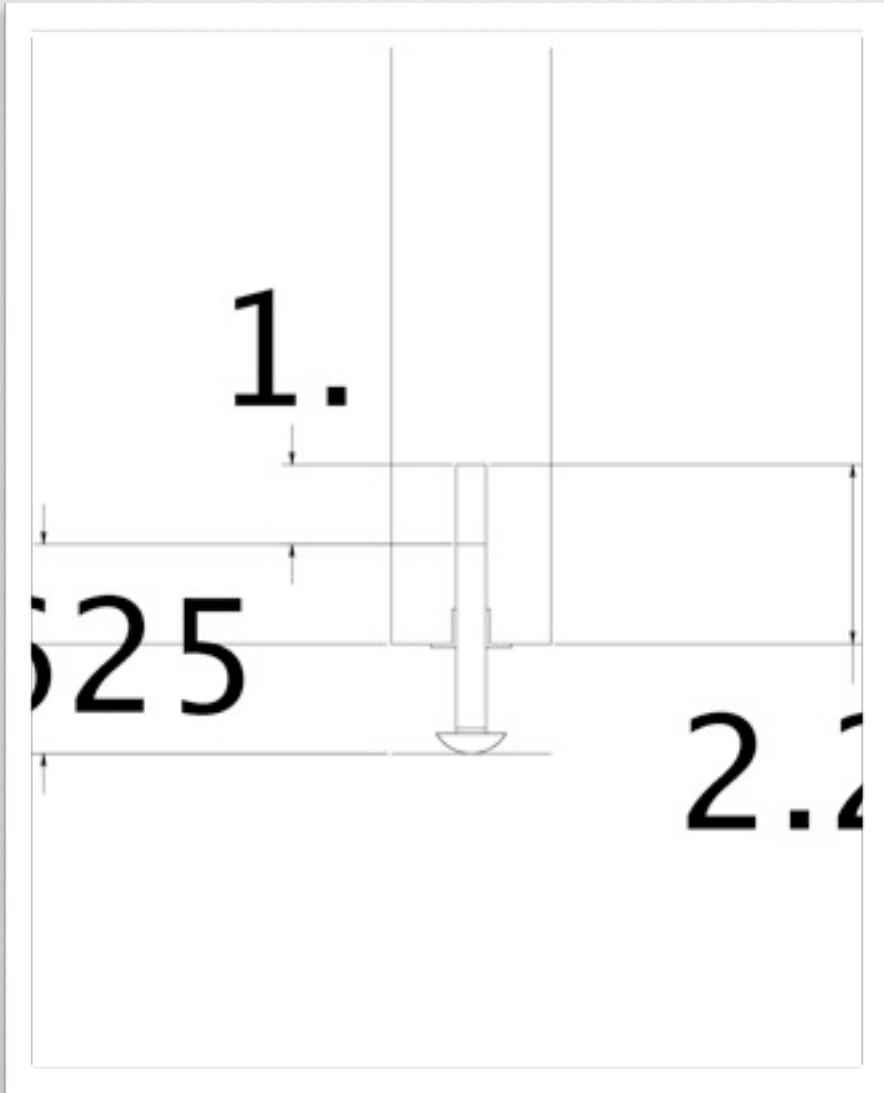




2X2 LEGS WITH PLYWOOD BRACING



SILICON VALLEY ENGINEERING
REMEMBER: YOU NEED A PLACE FOR THE WIRES TO GO!



SILICON VALLEY ENGINEERING
NUTS AND BOLTS OF FREE MO



SILICON VALLEY ENGINEERING
TEST FITTING THE LEGS

FRAMED, LEGGED, & FOAMED



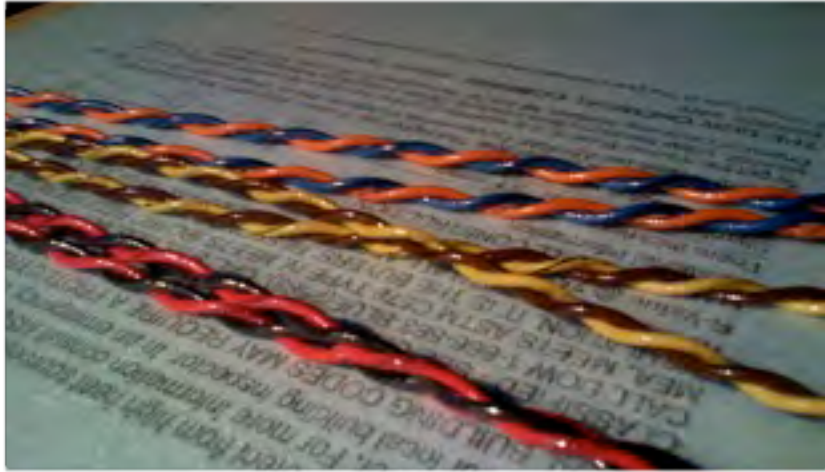
SILICON VALLEY ENGINEERING

WIRING

- 12 AWG FEEDERS
(STRANDED)
- ANDERSON 30 AMP
POWERPOLE
CONNECTORS
- TWIST THE BUS



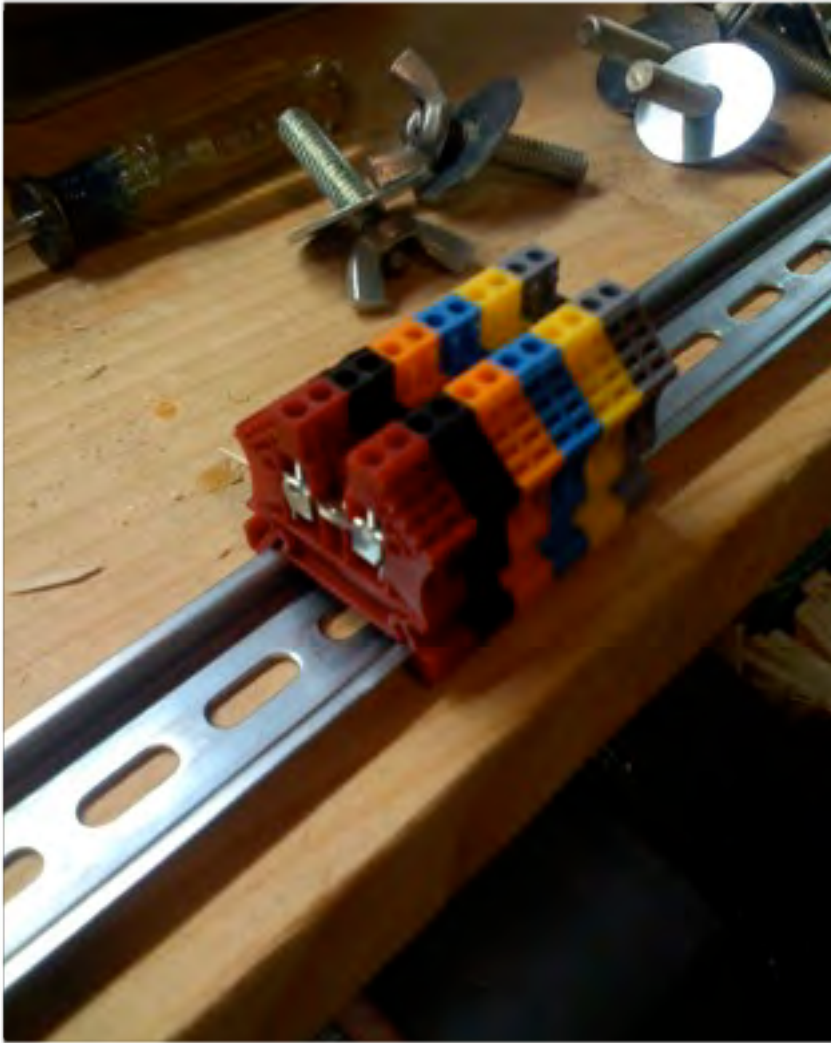
SILICON VALLEY ENGINEERING



SILICON VALLEY ENGINEERING
BUS WIRING (NOTE: WE ADDED AN EXTRA PAIR)



SILICON VALLEY ENGINEERING
GET ANDERSON, GET CONNECTED



SILICON VALLEY ENGINEERING
NCE UTP SOCKETS & DIN-MOUNTED HARDWARE

PANEL JACKS & FASCIA



SILICON VALLEY ENGINEERING



MAKING A SCENE



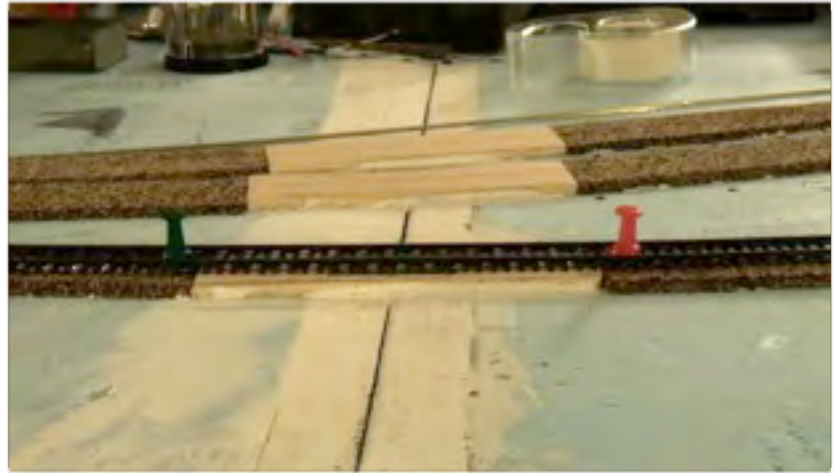
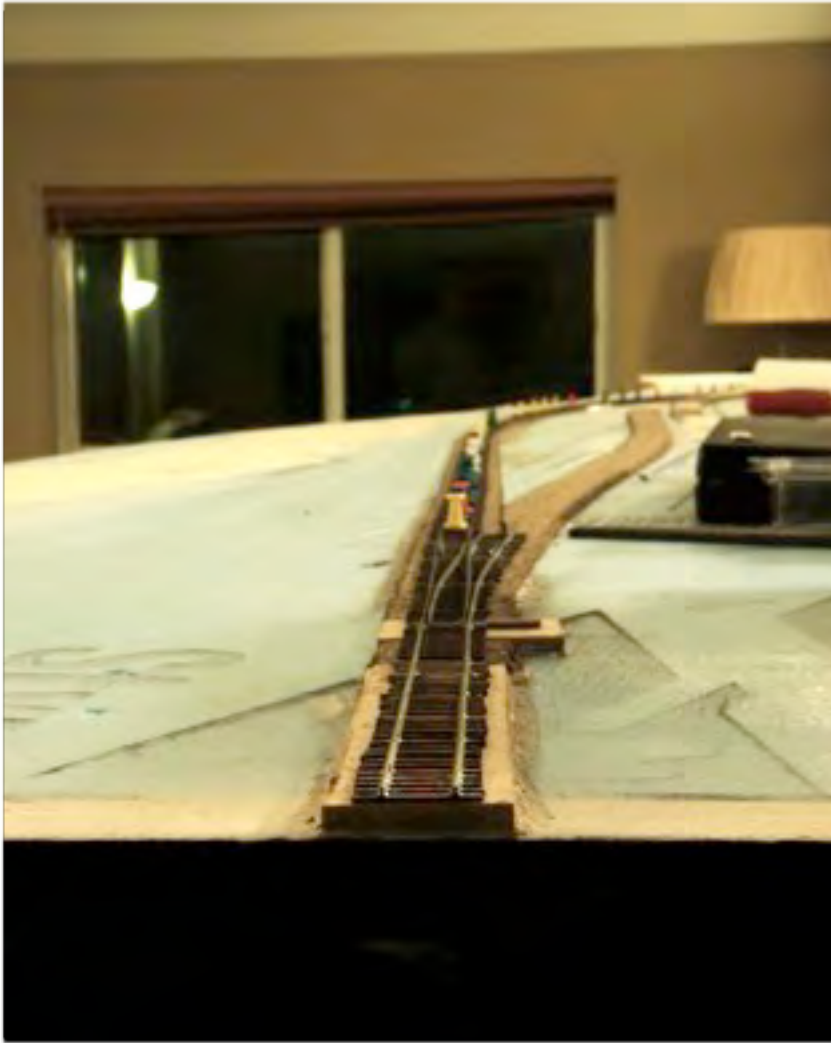
WORK IN PROGRESS AS OF 11/2008



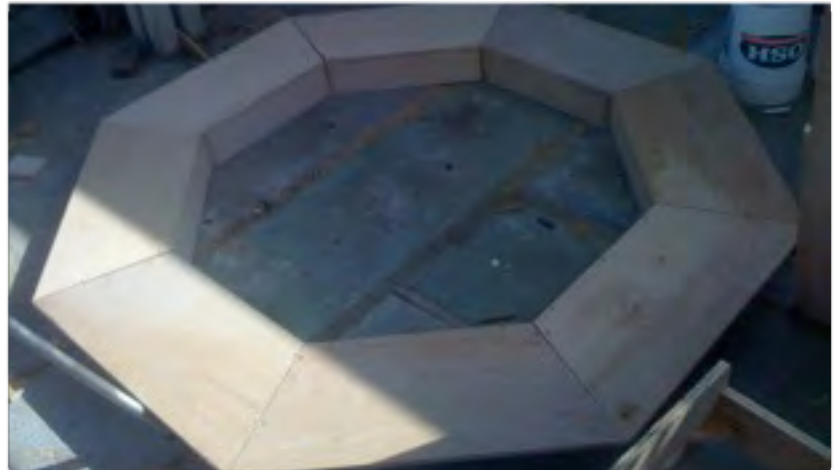
NO NEED TO THINK INSIDE THE BOX (OR RECTANGLE)



YOU CAN NEVER HAVE TOO MANY CLAMPS



TRACK ON STEVE'S MODULES



LOOP DE LOOP

TIPS & TRICKS

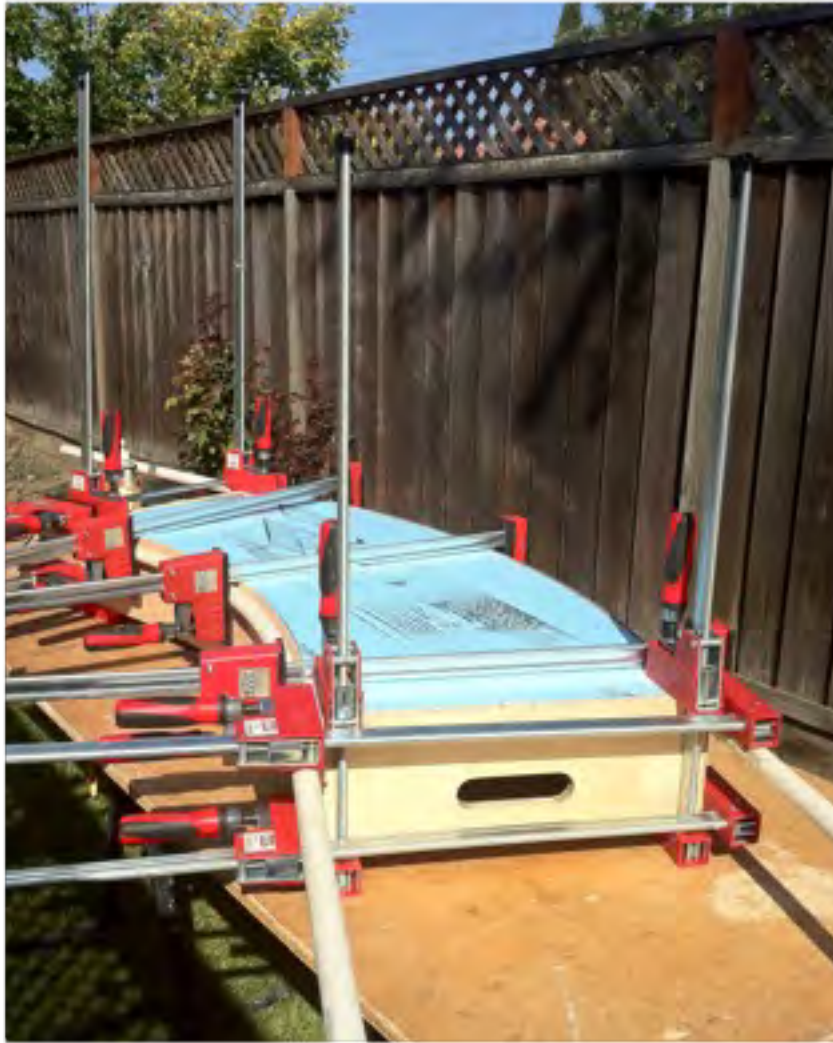
WEIGHT REDUCTION

MAKING MODULES LIGHTER

- PLYWOOD IS HEAVY
- PLYWOOD SIDERAILS END UP MAKING UP THE MAJORITY OF THE WEIGHT OF THE MODULE
- REPLACE WITH LAMINATED DOOR SKIN (THINNER PLYWOOD)
- GORILLA GLUE IS AWESOME STUFF FOR ATTACHING FOAM DIRECTLY TO WOOD
- WEAR GLOVES—GORILLA GLUE IS MESSY STUFF!



SMALL STRONG ENDPLATE FRAMES + FOAM + DOORSKIN = GOODNESS



YOU CAN NEVER HAVE TOO MANY CLAMPS



MORE CLAMPS HERE



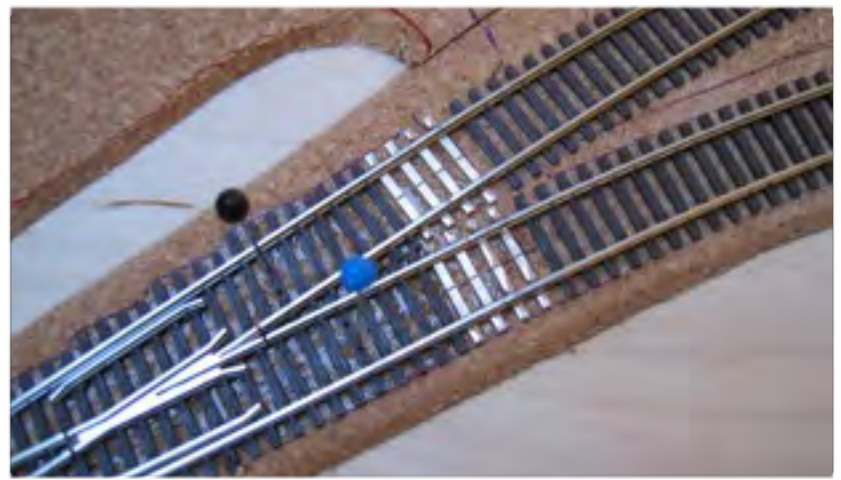
**KEEP
CALM**

AND

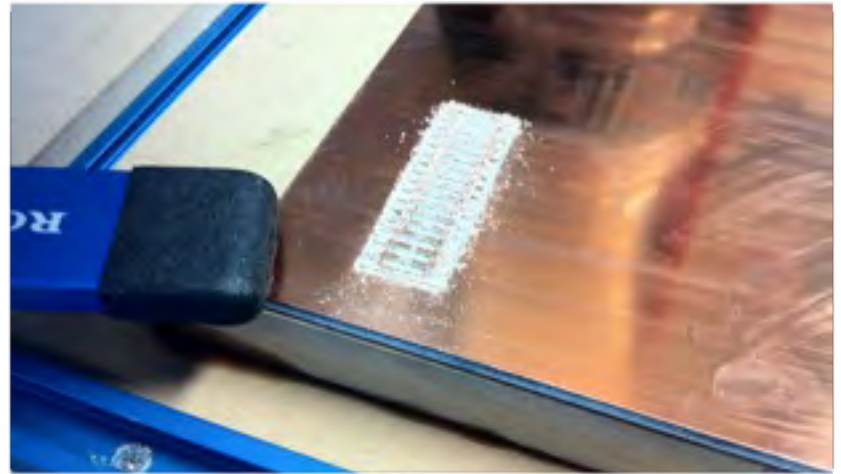
**BUY MORE
CLAMPS**

PCB TIES

- WORKED WITH AMERICA-N.DE FOLKS TO OBTAIN PCB TIE STRIPS WHICH MATCH TRACK THICKNESS AND SPACING
- NORMAL PCB TIES FROM THE USUAL SOURCES ALSO WORK
- REINFORCED ROADBED (WOOD) AT ENDS
- EPOXY THE TIES IN PLACE— THEY WON'T GO ANYWHERE!
- RECENTLY HAVE BEEN PLAYING WITH "CNC-CUT" PCB MATERIAL.



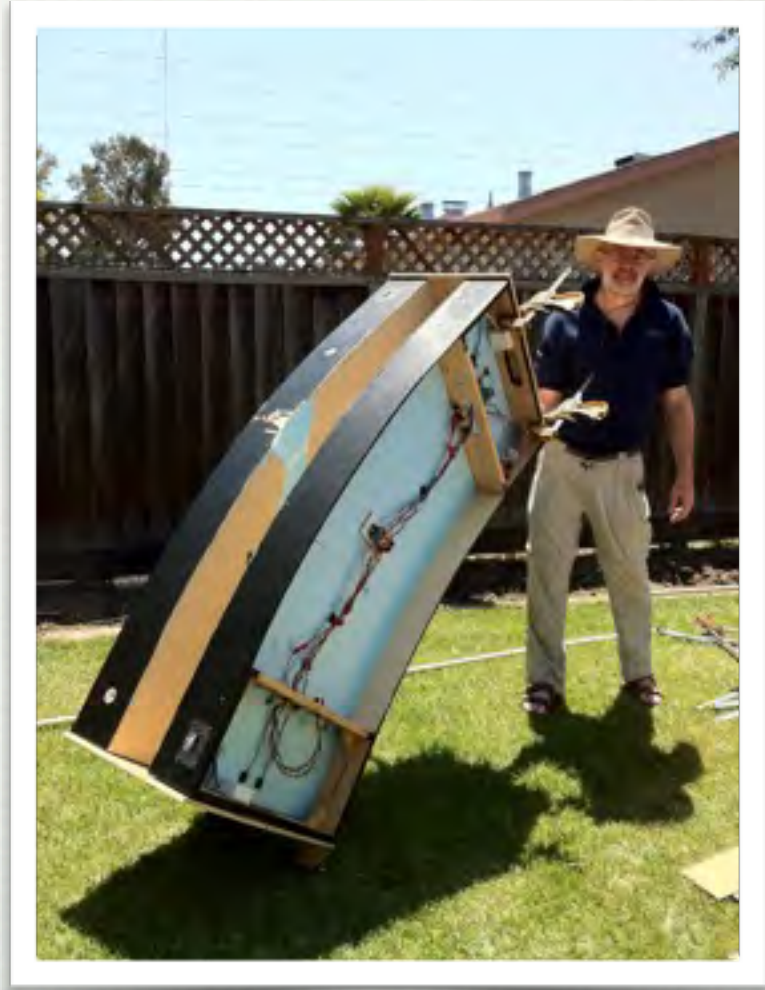
PCB TIES



COOL TOYS MAKE NEAT THINGS

TWO IS BETTER THAN ONE

- BUILD MODULES AS TWINS
- EASY TO MOVE 2X MODULES
- PROTECTS TRACK & SCENERY!





MIRROR MIRROR

A SMALL MIRROR IS REALLY USEFUL TO ENSURE THAT TRACK IS SQUARE TO MODULE ENDPLATE

THE STORAGE PROBLEM

- EASIER TO BUILD MODULES THAN TO STORE THEM!
- EASIER TO STORE MODULES THAN TRANSPORT THEM
- "INERTIA" CAN SET IN





BUILDING FRENZY ENSUES



IT NEVER RAINS IN CALIFORNIA...

... UNLESS YOUR BACKYARD IS FULL OF MODULES

“MINI-MO”

MINI

- FUN TO BUILD AND PRACTICE
- FIT IN YOUR SMALL CAR
- GOOD FOR ABS SIGNAL BLOCK BOUNDARIES
- "CROSSING" MODULES (INTERLOCKING RECOMMENDED)
- BE CAREFUL NOT TO MAKE THE TOO SMALL
 - NEED ROOM FOR CLAMPS
- TOO MANY MODULES CAN INTERRUPT FLOW

LEGACY ADAPTERS

- TWO "ADAPTER" MODULES HAVE BEEN BUILT TO ALLOW LEGACY MODULES TO BE ATTACHED.
- 12" LONG MINI-MO FEATURES:
 - SETBACK RAIL ON ONE END
 - PCB SOLDERED, FLUSH JOINT AT OTHER END



MINI-MO

“MARKETING”

MORE OBSERVATIONS

- EASY TO BUILD A MODULE
- EASY TO BUILD MORE THAN ONE
- NEED > 1 MODULE (USUALLY) FOR OPERATIONS

OBSERVATIONS (CONT.)

- HARD TO STORE LOTS OF MODULES!
- HARD TO CONVINC SIGNIFICANT OTHER THAT YOU NEED MORE THAN ONE AT HOME
- IF YOU ARE INTO PROTOTYPICAL MODELING AND OPS...
- WHY NOT GIVE FREE-MO N A TRY

"LIKE IT? WELL, I DON'T SEE WHY I OUGHTN'T
TO LIKE IT. DOES A BOY GET A CHANCE TO
WHITEWASH A FENCE EVERY DAY?"

— MARK TWAIN FROM TOM SAWYER

INTERESTED?

- FIRST GET TOGETHER AT
FREMONT PCR
CONVENTION 2009
- FIRST SETUP FOR THE
NMRA NATIONAL 2011





25TH ANNIVERSARY FREMO EUROPE

[HTTP://WWW.WESTPORTTERMINAL.DE/MEETINGS/ALSFELD.HTML](http://www.westportterminal.de/meetings/alsfeld.html)

WEB LINKS

- [HTTP://GROUPS.YAHOO.COM/GROUP/FREE-MON/](http://groups.yahoo.com/group/free-mon/)
- [HTTP://FREE-MON.WESLEYSSTEINER.COM/](http://free-mon.wesleysteiner.com/)
- [HTTP://GROUPS.GOOGLE.COM/GROUP/SILICON-VALLEY-FREEMON/](http://groups.google.com/group/silicon-valley-freemon/)
- [HTTP://WWW.NLANDPACIFIC.COM/](http://www.nlandpacific.com/)
- [HTTP://WWW.FREE-MO.ORG/](http://www.free-mo.org/) USA
- [HTTP://WWW.FREEMO.ORG/](http://www.freemo.org/) EUROPE
- [HTTP://WWW.AMERICA-N.DE/](http://www.america-n.de/) GERMANY-BASED N-SCALE

GETTING POWERPOLES

- [HTTP://WWW.ANDERSONPOWER.COM/PRODUCTS/STANDARD-POWERPOLE.HTML](http://www.andersonpower.com/products/standard-powerpole.html)
- [HTTP://WWW.POWERWERX.COM/](http://www.powerwerx.com/)

CAB JACKS

- WE USE NCE "UTP" CAB JACKS ARE COMPATIBLE WITH DIGITRAX CONTROL AND NCE CONTROL
- [HTTP://WWW.NCEDCC.COM/UTP.PDF](http://www.ncedcc.com/utp.pdf)
- AVAILABLE LOCALLY AT MOST DEALERS AS WELL AS ONLINE

Q&A

TRACK (CONTINUED)

- MAIN LINE ROADBED MUST BE 1/8 INCH CORK OR EQUIVALENT
- NOMINAL AND MINIMUM HEIGHT OF RAILHEAD FROM THE FLOOR SHALL BE 50 INCHES
- MAXIMUM GRADE SHALL BE 2.0 PERCENT (1/4 INCH PER FOOT)
 - MAXIMUM HEIGHT OF THE RAILHEAD SHALL BE 62 INCHES FROM THE FLOOR FOR MODULES WITH GRADES
 - HIGH END MUST BE MULTIPLE OF 3/4" ABOVE THE LOW
- TIES AND BALLAST SHALL BE CONTINUED TO THE MODULE END FOR GOOD APPEARANCE AND MATCHING ADJACENT MODULE