

# FREE-MO N

PROTOTYPICAL N-SCALE MODULAR RAILROADING

DAVE FALKENBURG

JULY 7TH, 2011

# OVERVIEW

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

# RAISING THE BAR

(AND THE RAILHEAD, TOO.)



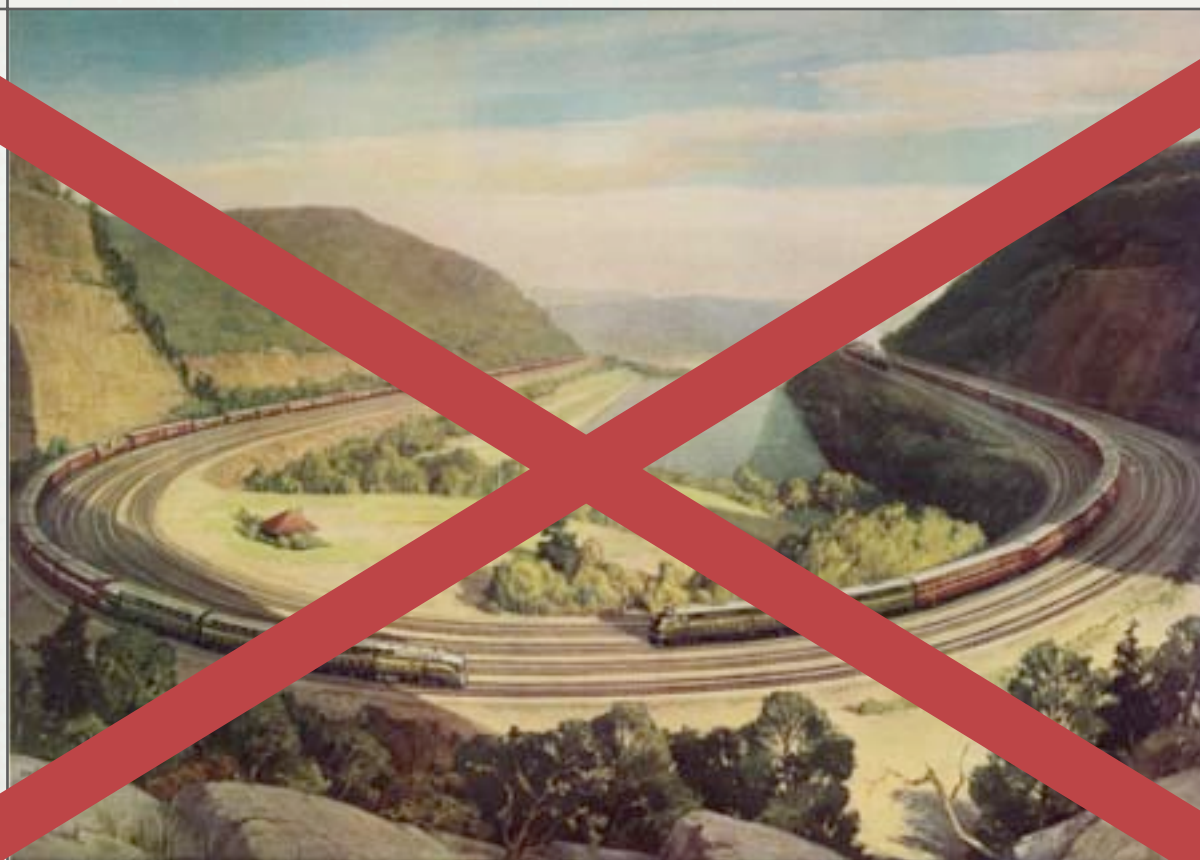
# FREE-MO OBJECTIVES

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- ☐ 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

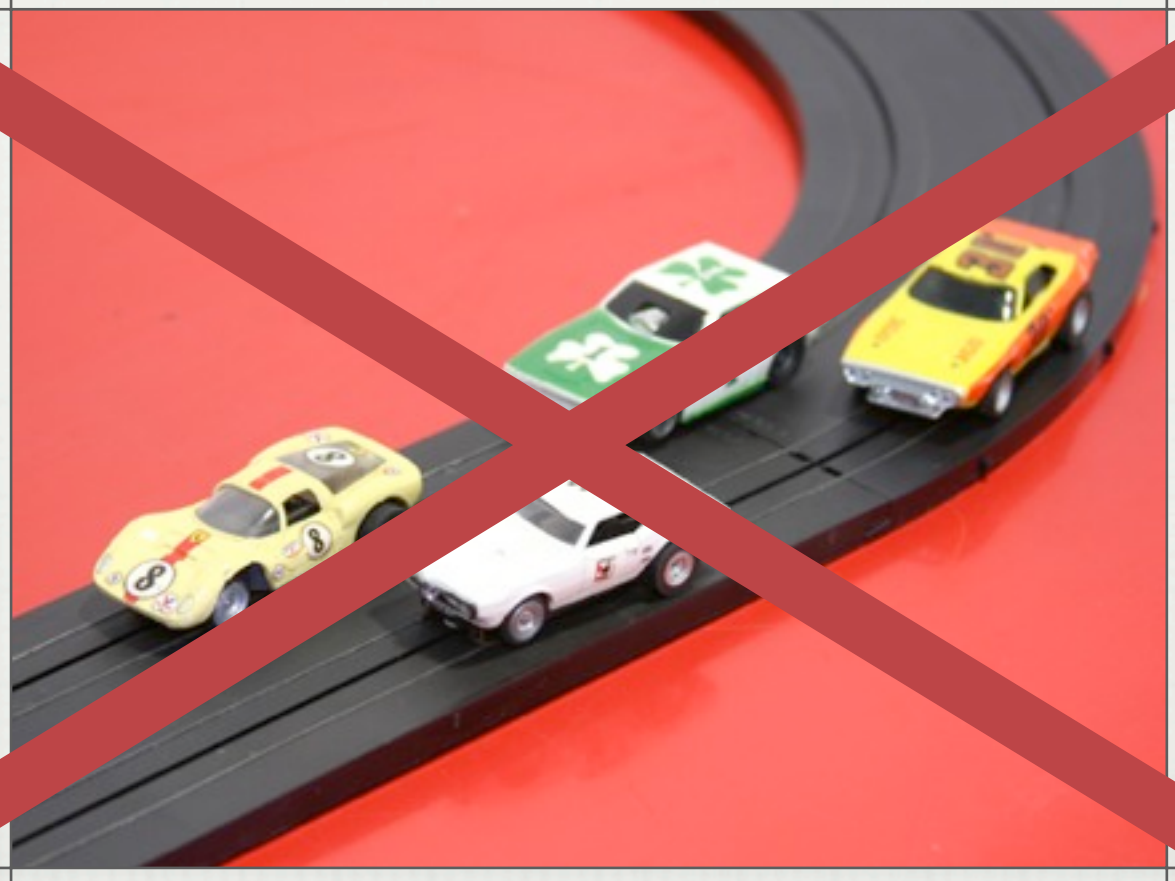
[HTTP://WWW.FREE-MO.ORG/](http://www.free-mo.org/)





1952 HORSESHOE CURVE Grif Teller

(NO OFFENSE INTENDED, PRR FANS!)





# WHAT IS FREE-MO N?

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- ☐ 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

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

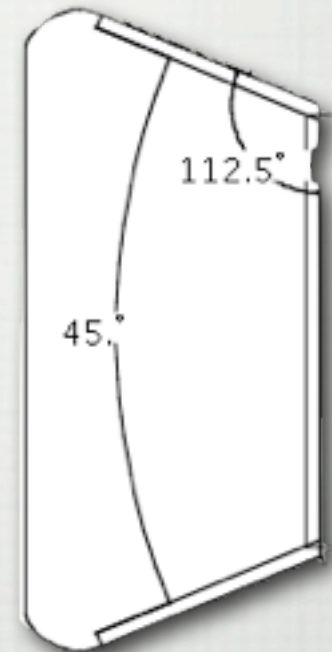
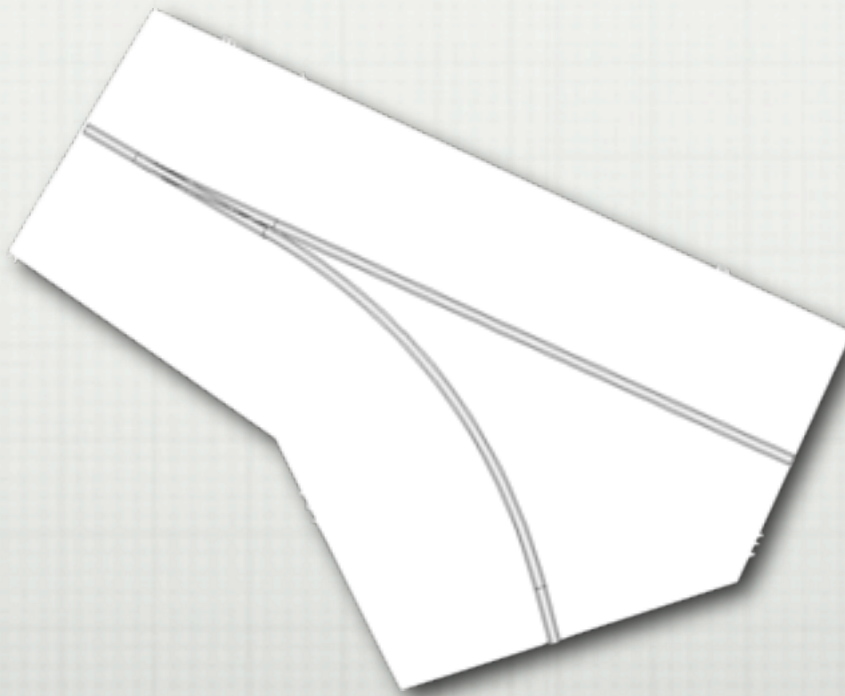
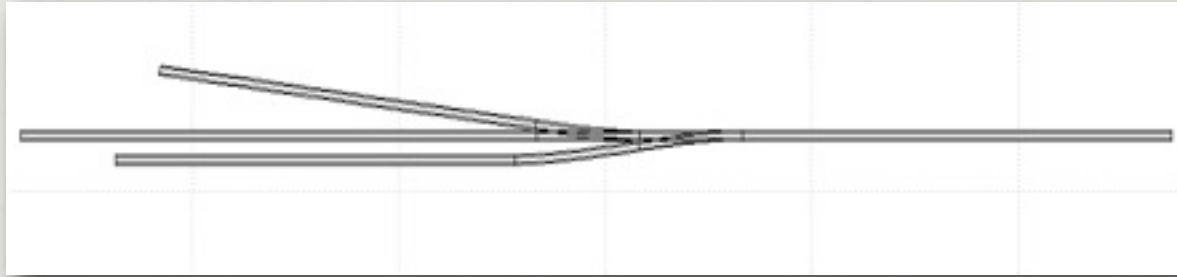
# DEFINITIONS

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- ☐ MODULE: A COMPONENT OF BENCHWORK 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

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# TRACK

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- ☐ 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_schwellenplatine/schwellenplatine.htm)



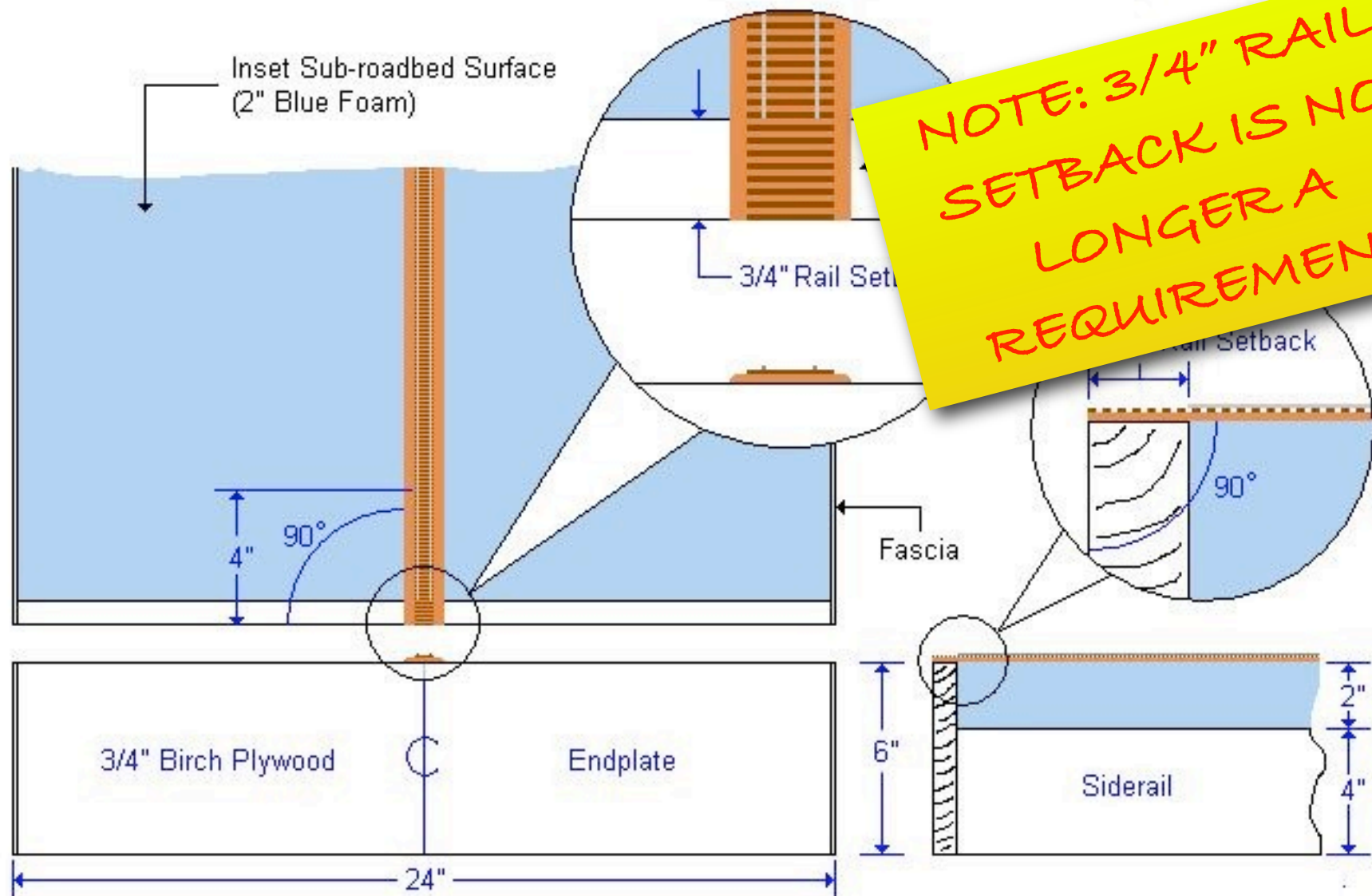


# BENCHWORK: ENDPLATE

- ☐ 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





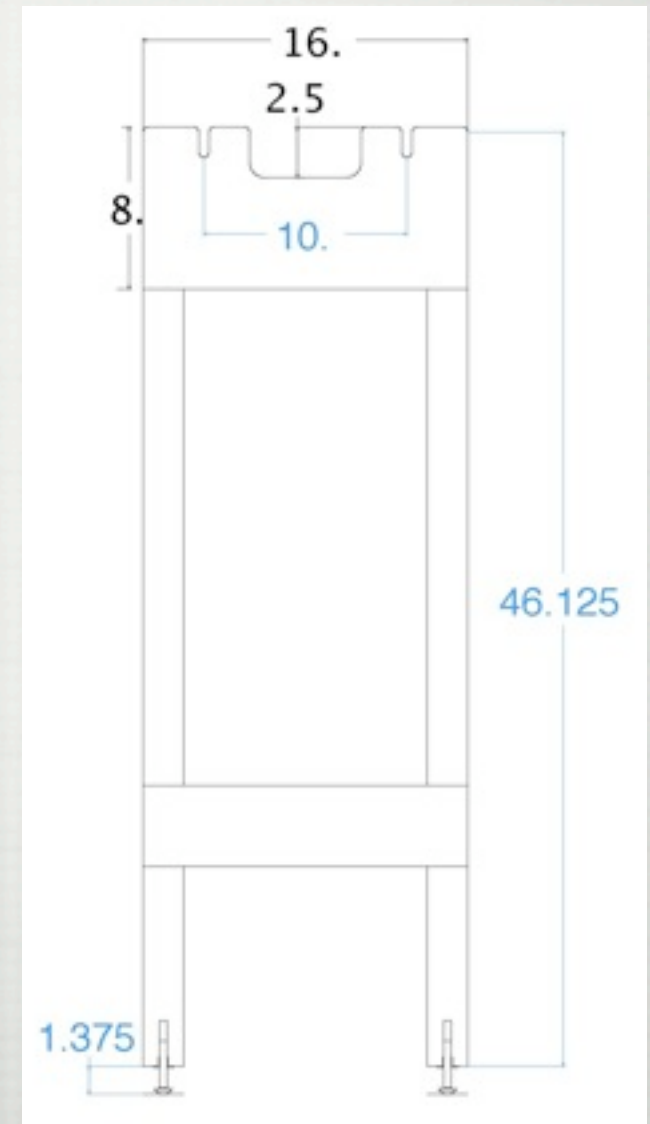


**NOTE: 3/4" RAIL  
SETBACK IS NO  
LONGER A  
REQUIREMENT**

	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

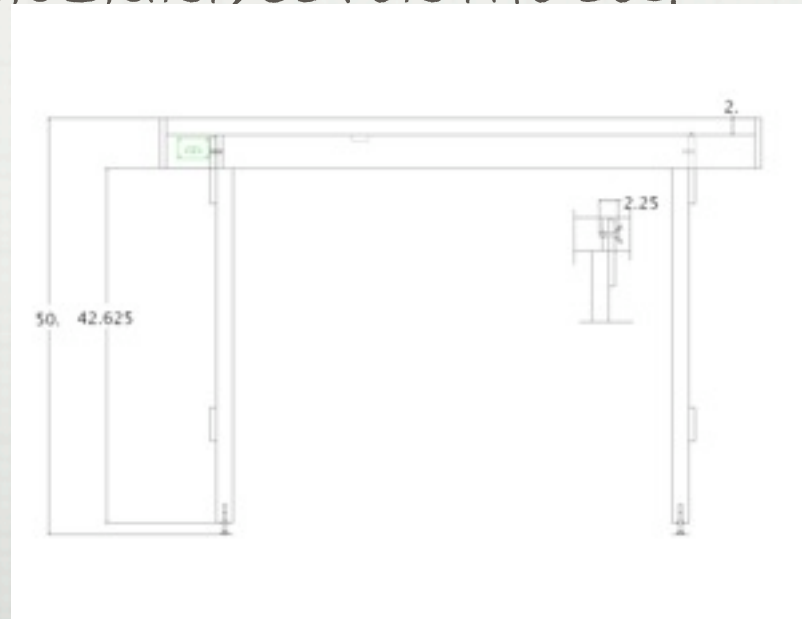




# BENCHWORK: MISC.

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- ☐ 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

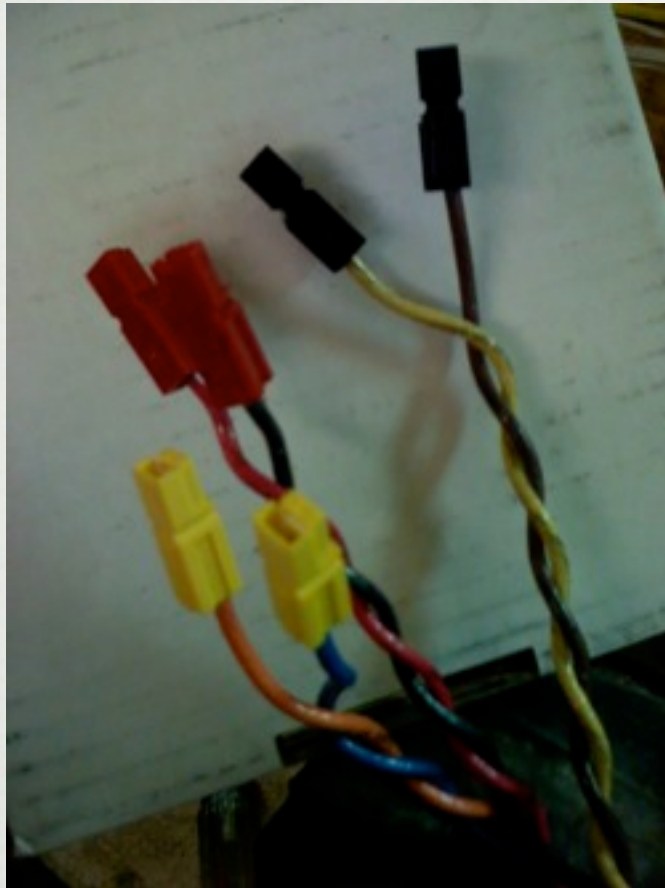
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- ☐ TRACK IS ALWAYS DCC
- ☐ BUS: 12 GAUGE (OR HEAVIER) THAT SPANS MODULE
- ☐ WIRES TERMINATE NEAR CENTER OF ENDPLATE(S), LONG ENOUGH TO CONNECT WITH ADJOINING MODULE(S)
- ☐ BUS HAS **RED** 30 AMP ANDERSON POWERPOLE CONNECTORS STACKED VERTICALLY (HOOD 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

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

# ELECTRICAL: ACCESSORY BUS

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- ☐ 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

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- ☐ 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

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- ☐ 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”

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- ☐ 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

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- ☐ 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

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





# ALVISO, CA

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



# TRACK PLAN

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6' X 18" MODULE





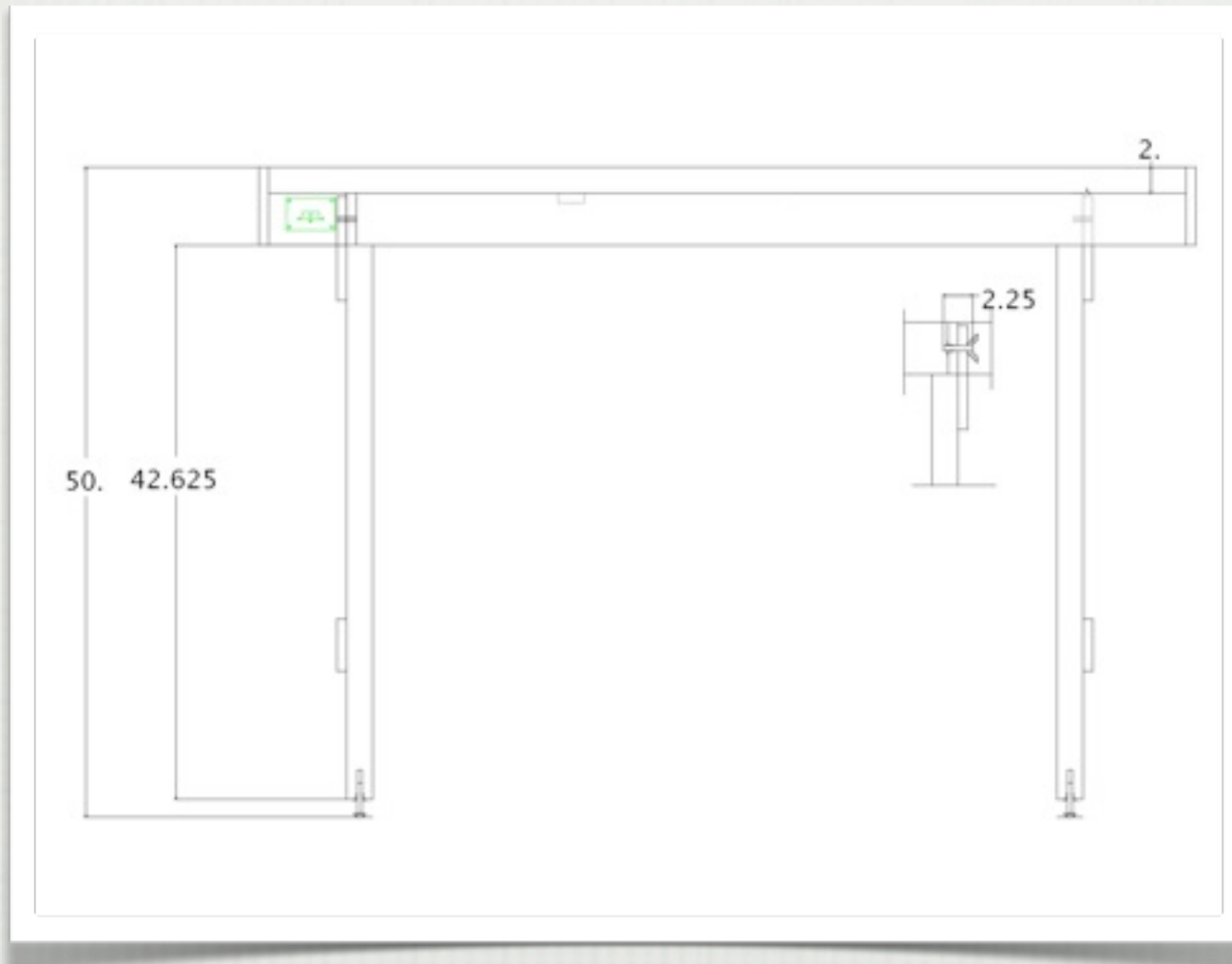
# CONSTRUCTION

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- ☐ 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

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- ☐ 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

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- 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/)



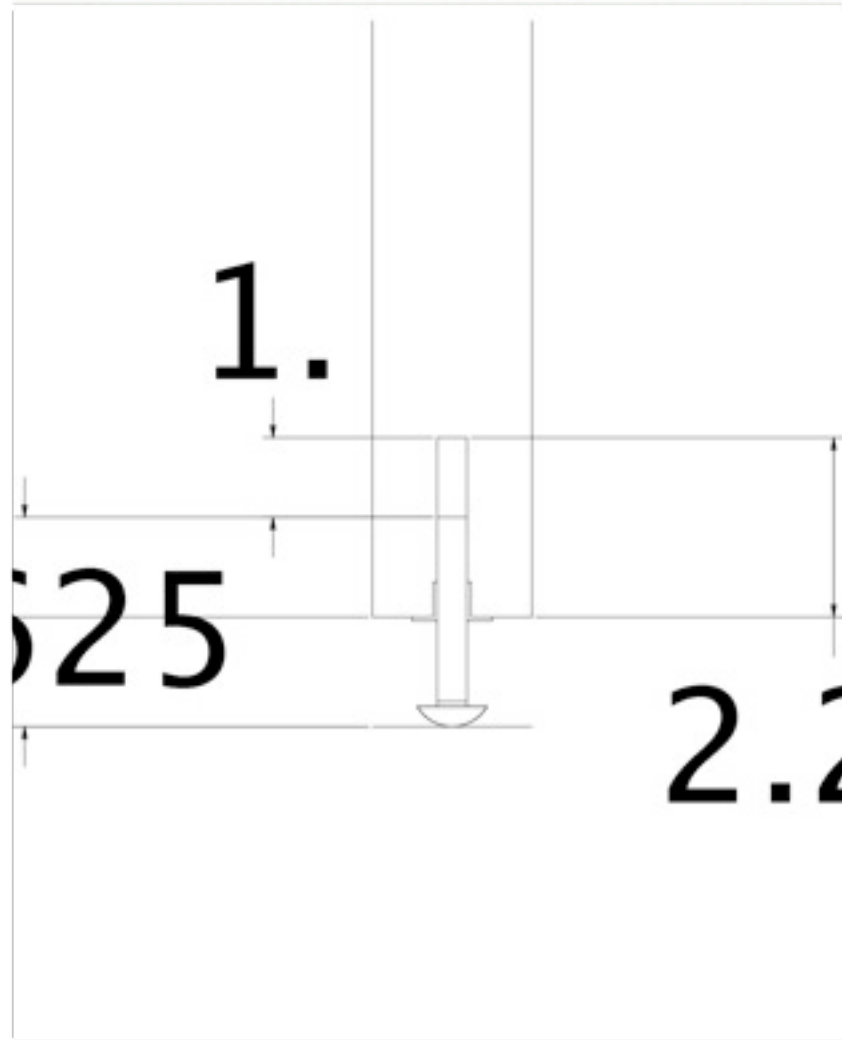


2X2 LEGS WITH PLYWOOD BRACING





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

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SILICON VALLEY ENGINEERING



# WIRING

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

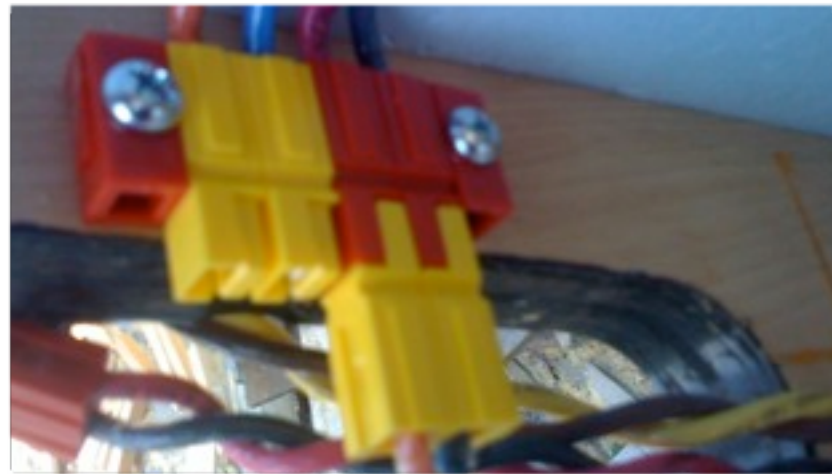
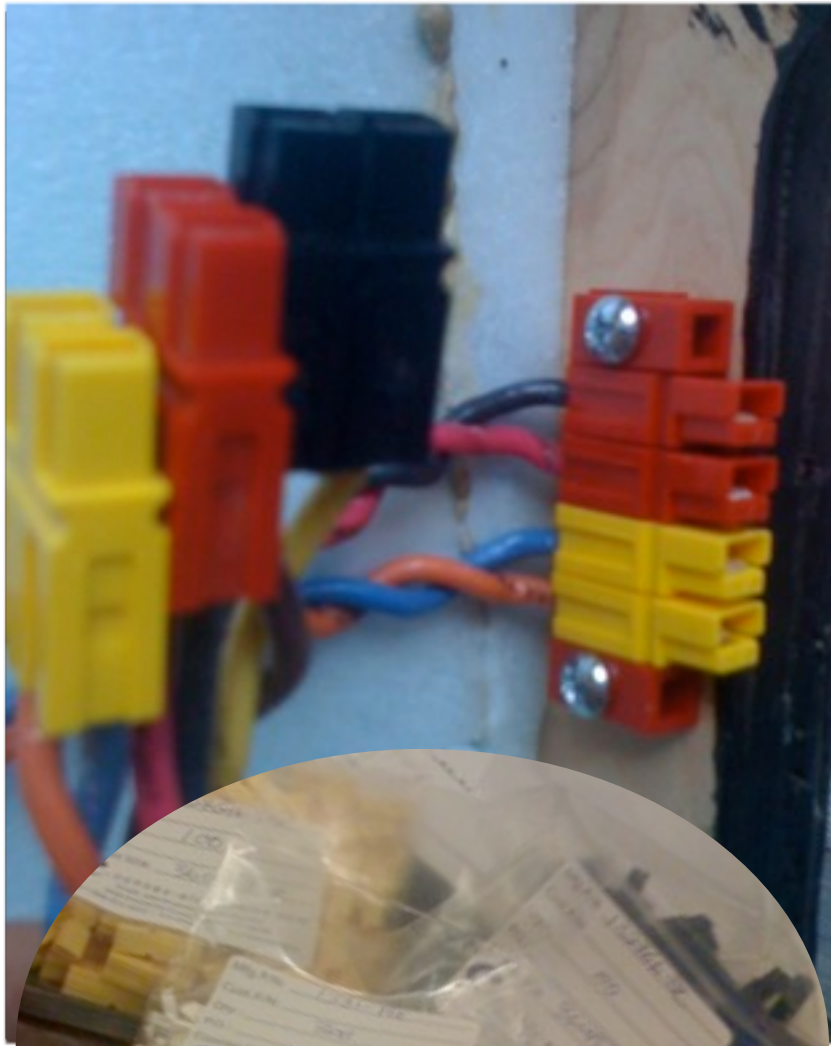


SILICON VALLEY ENGINEERING



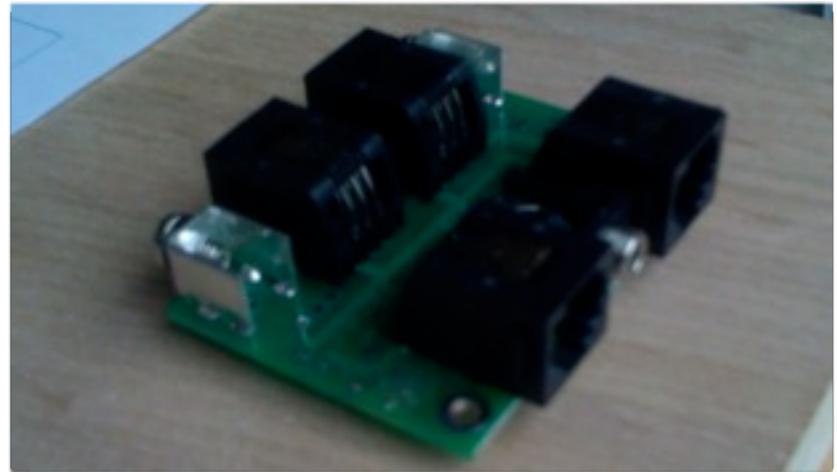
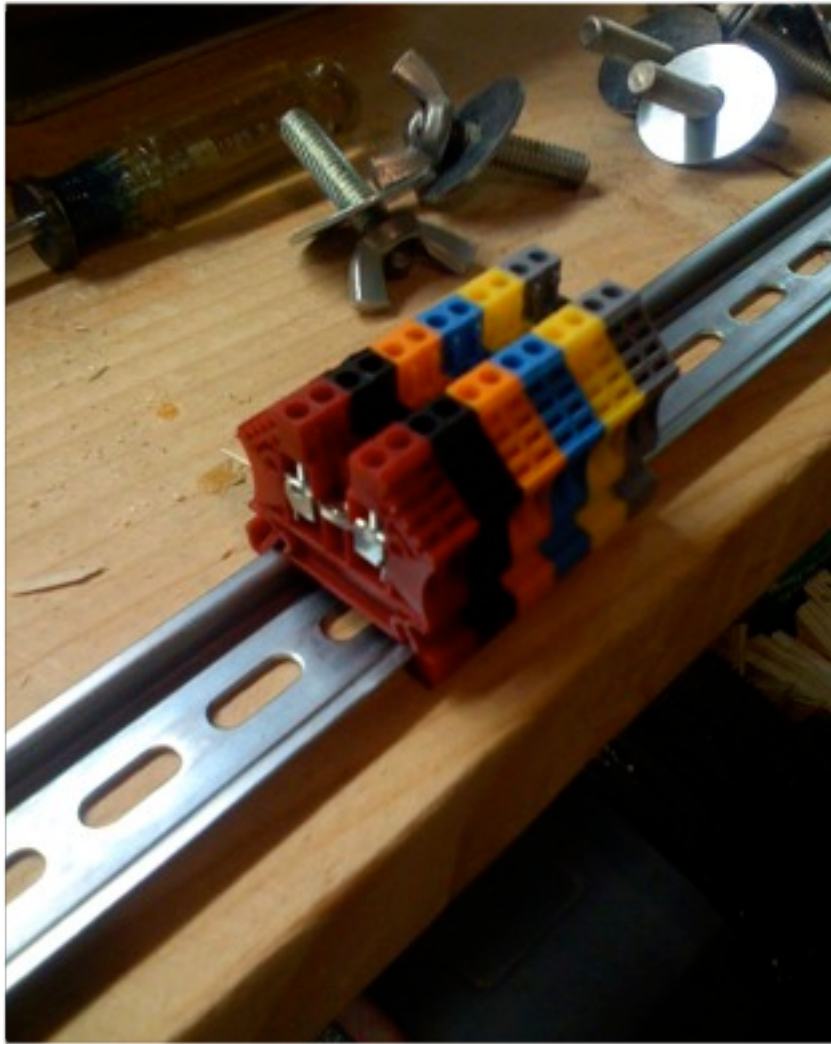
SILICON VALLEY ENGINEERING  
BUS WIRING (NOTE: WE ADDED AN EXTRA PAIR)





SILICON VALLEY ENGINEERING  
GET ANDERSON, GET CONNECTED





SILICON VALLEY ENGINEERING  
NCE UTP SOCKETS & DIN-MOUNTED HARDWARE



# PANEL JACKS & FASCIA

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SILICON VALLEY ENGINEERING



MAKING A SCENE





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WORK IN PROGRESS AS OF 11/2008

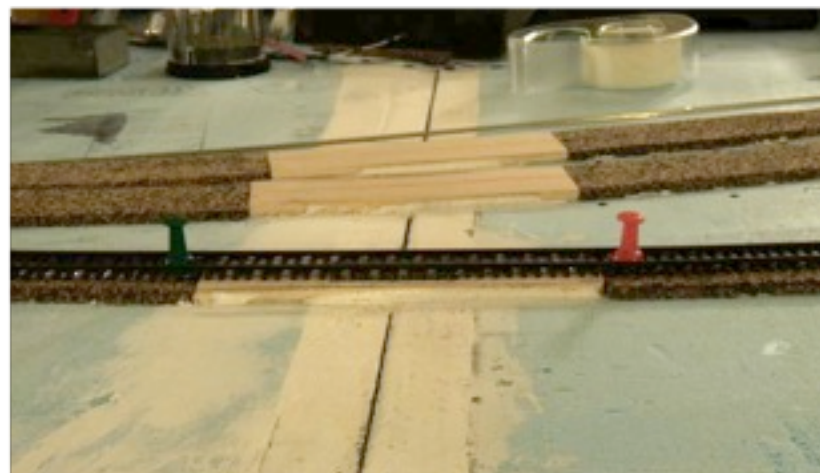
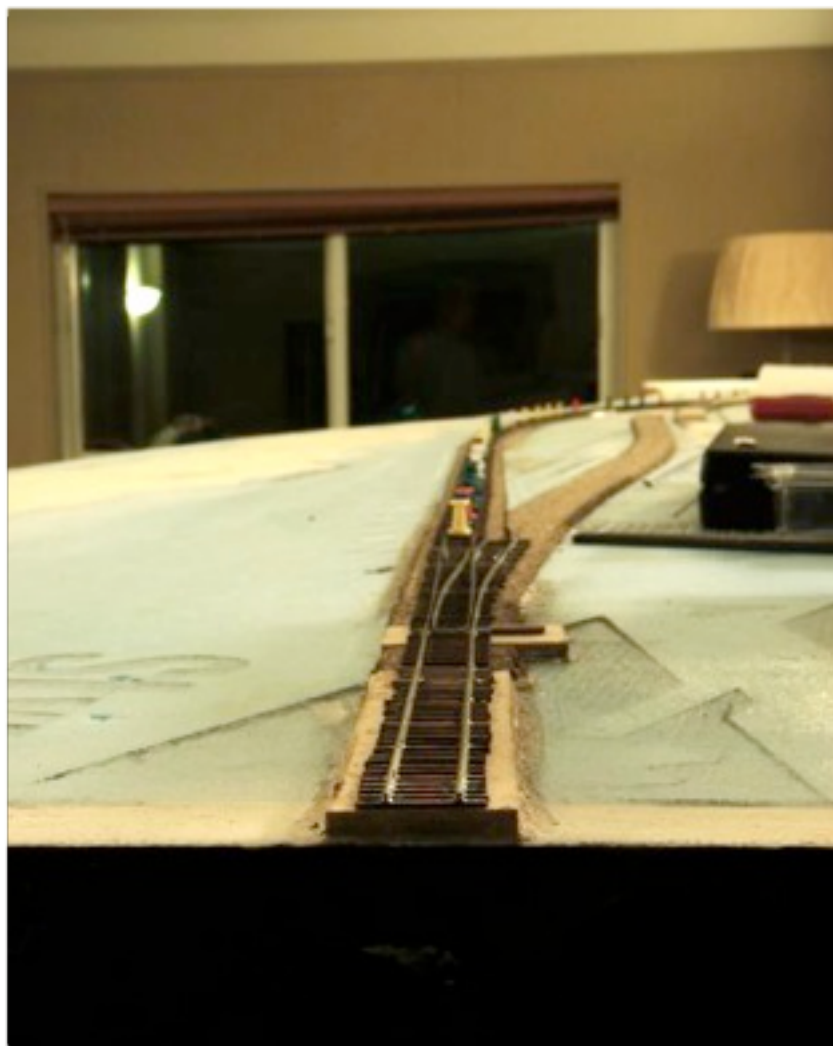


NO NEED TO THINK INSIDE THE BOX (OR RECTANGLE)





YOU CAN NEVER HAVE TOO MANY CLAMPS



TRACK ON STEVE'S MODULES





LOOP DE LOOP

# TIPS & TRICKS



# WEIGHT REDUCTION

# MAKING MODULES LIGHTER

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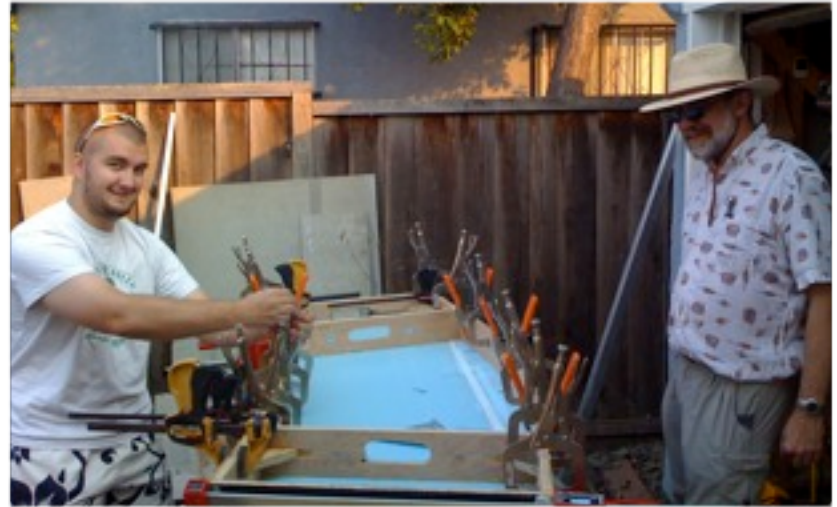
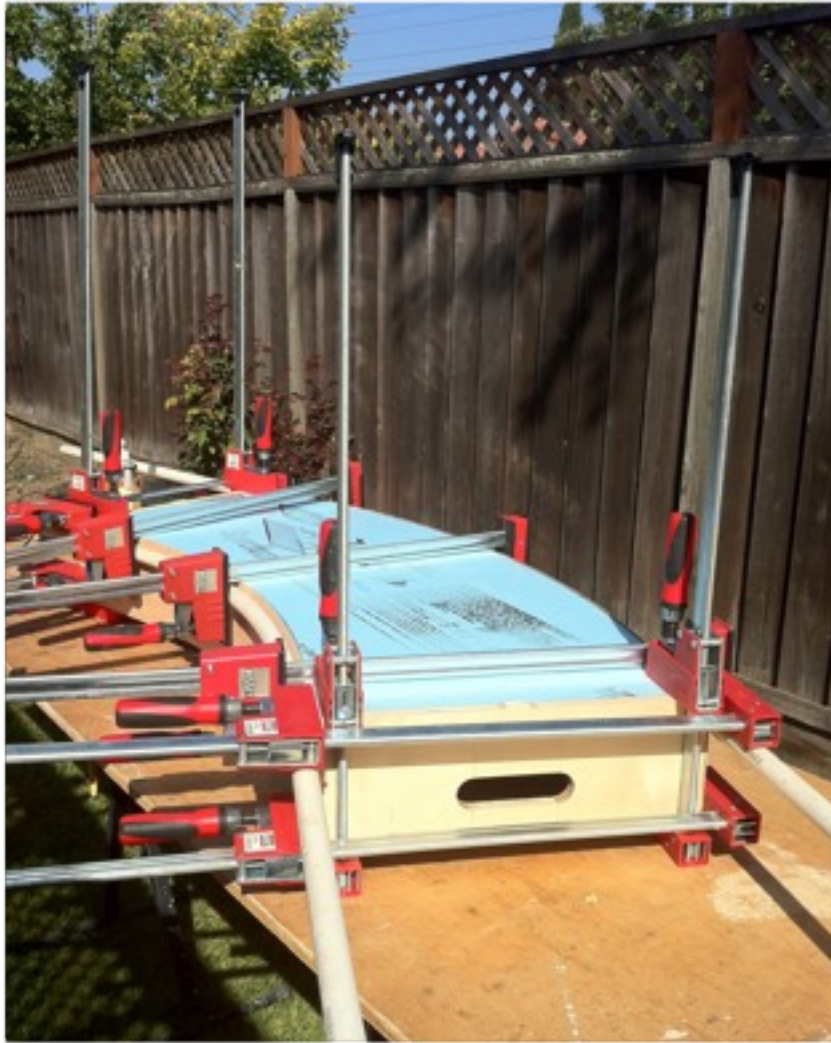
- ☐ PLYWOOD IS HEAVY
- ☐ PLYWOOD SIDERAILS END UP MAKING UP THE MAJORITY OF THE WEIGHT OF THE MODULE
- ☐ REPLACE WITH LAMINATED DOOR SKIN (THINNER PLYWOOD)
- ☐ GORILLA GLUE IS AWESOME STUFF FOR ATTACHING FOAM DIRECTLY TO WOOD
- ☐ WEAR GLOVES—GORILLA GLUE IS MESSY STUFF!





SMALL STRONG ENDPLATE FRAMES + FOAM + DOORSKIN = GOODNESS





YOU CAN NEVER HAVE TOO MANY CLAMPS





MORE CLAMPS HERE



**KEEP  
CALM**

**AND**

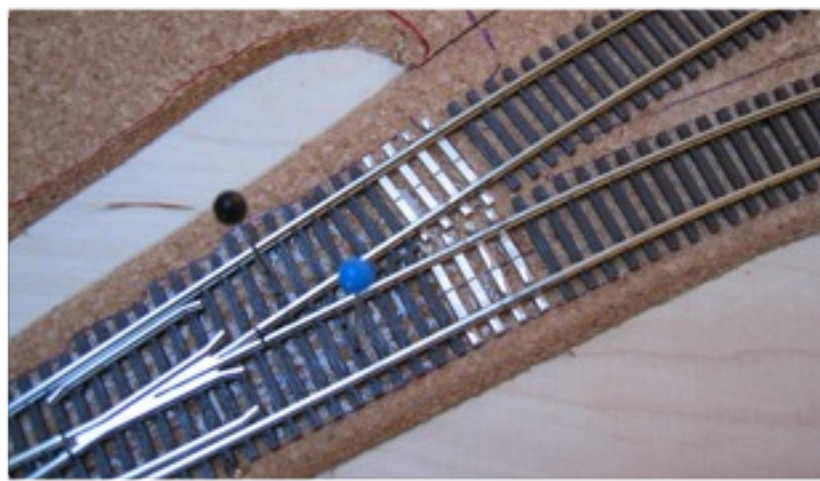
**BUY MORE  
CLAMPS**



# PCB TIES

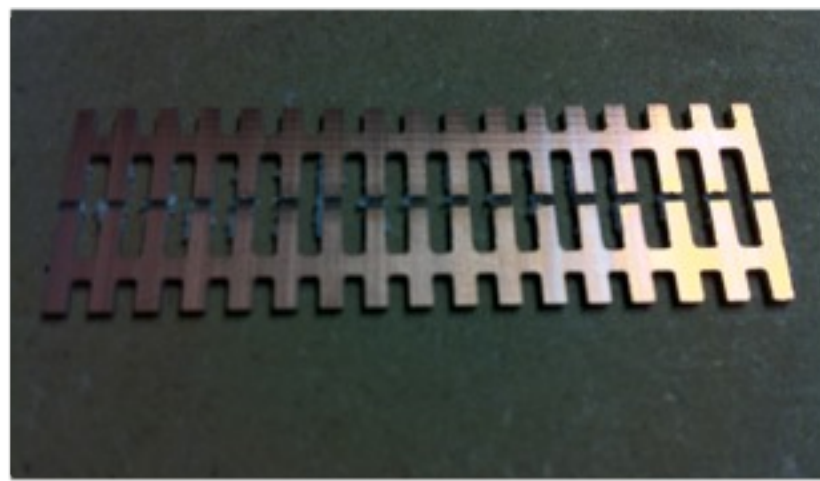
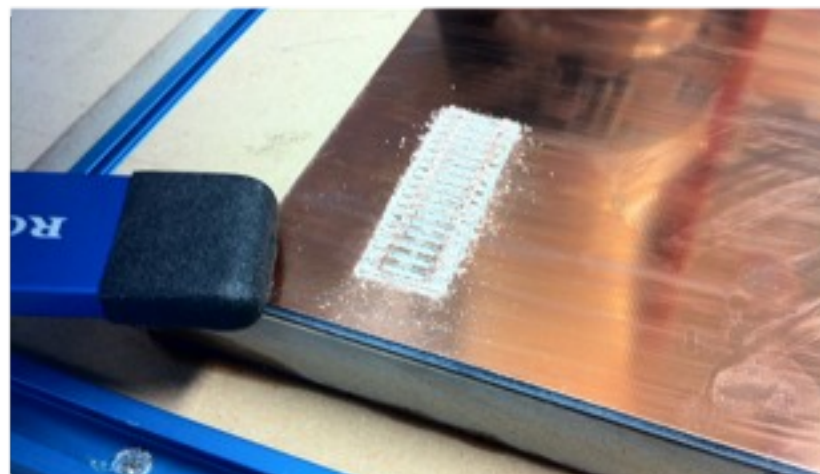
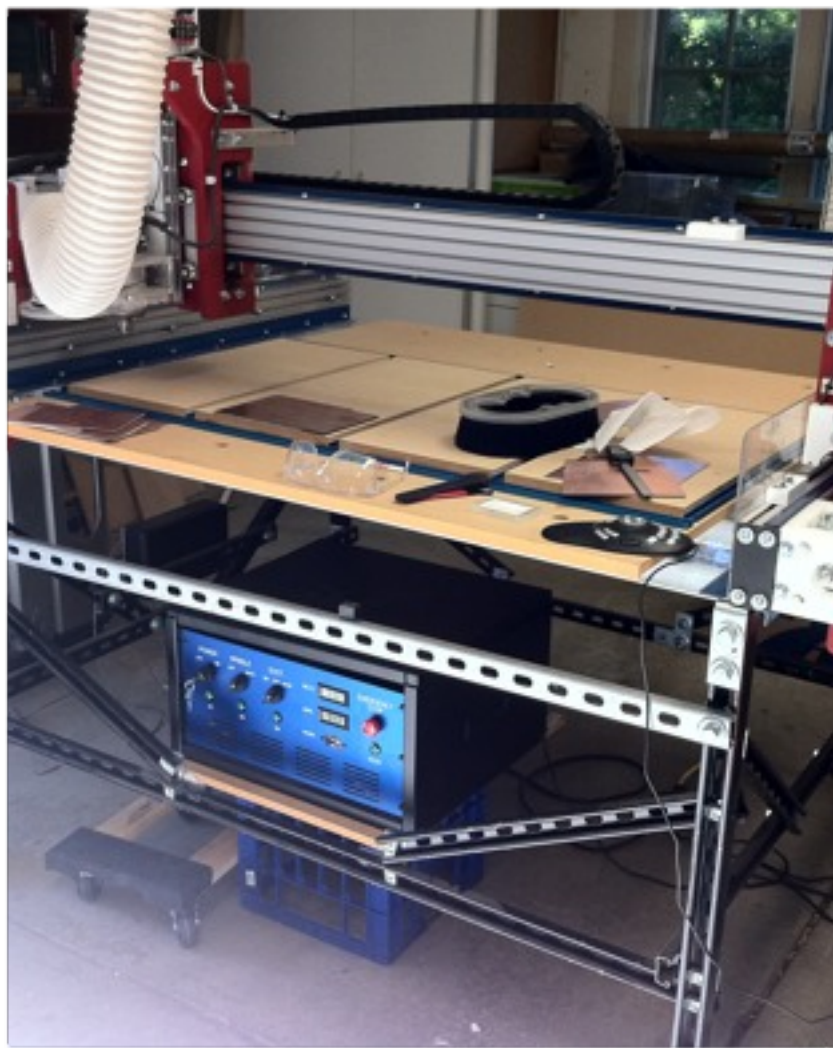
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- ☐ WORKED WITH AMERICA-N.DE FOLKS TO OBTAIN PCB TIE STRIPS WHICH MATCH TRACK THICKNESS AND SPACING
- ☐ NORMAL PCB TIES FROM THE USUAL SOURCES ALSO WORK
- ☐ REINFORCED ROADBED (WOOD) AT ENDS
- ☐ EPOXY THE TIES IN PLACE— THEY WON'T GO ANYWHERE!
- ☐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



PCB TIES



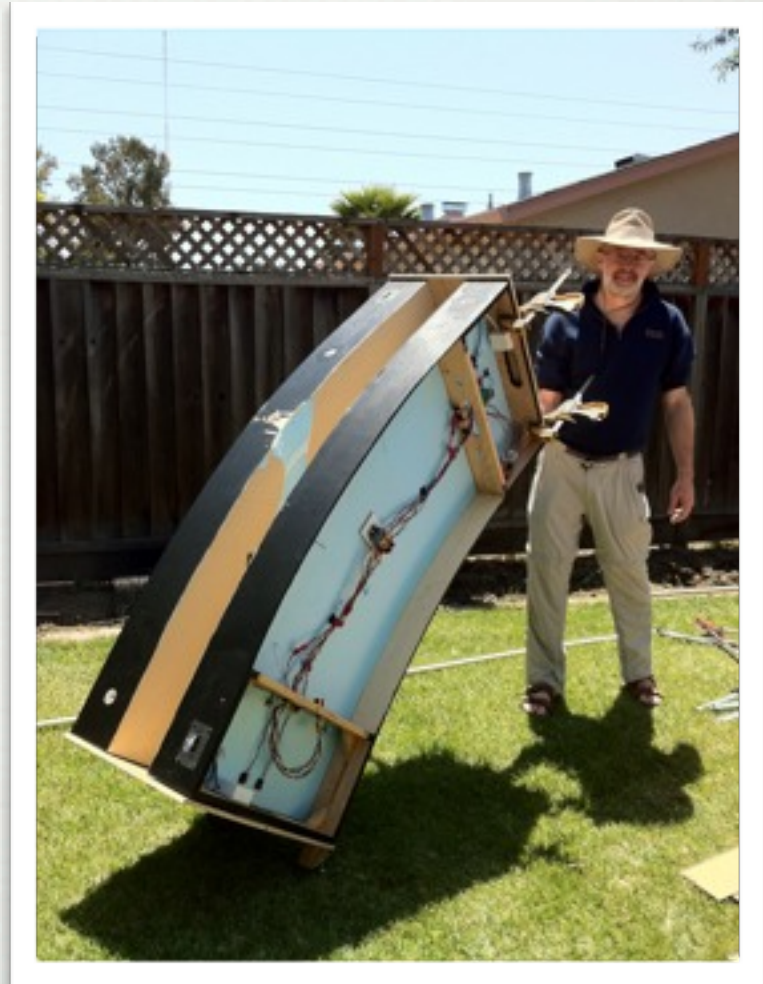


COOL TOYS MAKE NEAT THINGS

# TWO IS BETTER THAN ONE

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







## MIRROR MIRROR

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

# THE STORAGE PROBLEM

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- ☐ 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...

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... UNLESS YOUR BACKYARD IS FULL OF MODULES



“MINI-MO”

# MINI

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- ☐ 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

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- ☐ 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

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



# OBSERVATIONS (CONT.)

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- ☐ HARD TO STORE LOTS OF MODULES!
- ☐ HARD TO CONVINCE 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?

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- ☐ 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

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- ☐ [HTTP://GROUPS.YAHOO.COM/GROUP/FREE-MON/](http://groups.yahoo.com/group/free-mon/)
- ☐ [HTTP://FREE-MON.WESLEYTEINER.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

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- ☐ **HTTP://WWW.ANDERSONPOWER.COM/PRODUCTS/STANDARD-POWERPOLE.HTML**
- ☐ **HTTP://WWW.POWERWERX.COM/**



# CAB JACKS

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- ☐ 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)

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- ☐ 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