SMRHS TRACK CONSTRUCTION STANDARDS

Version Control: Initial version December 7, 2009 by Greg Hauser and Dave Megeath.

Purpose: To establish track construction standards, ensure that approved track construction personnel apply consistent construction techniques outlined in this manual.

Construction Manager (David Megeath) and or Track Inspector (Gregory Hauser) will administer a final inspection to track work before it is glued in place.

All turnouts will receive a final inspection for quality and proper function by Track Inspector (Gregory Hauser) before installation.

Construction Procedure

1. Roadbed preparation and application to bench work.
2. Application of flex track to roadbed road surface.
3. Track transverse leveling, straight and curves.
4. Laying turnouts.
5. Track repair.
6. Track ballasting.
7. Personnel training.

1. **Roadbed Preparation and Application to Bench Work**.
    a. The use of a bubble level is mandatory when verifying that the bench work is level. A long bubble level will be used, ranging from 12" to three to four foot long. Laser levels can be use for long spans of bench work running the length of the floor area.
    b. Verify that all bench work joints are level and even where they meet. All screws to be counter sunk below surface of bench work.
    c. Use a long level and lay it across the surface to find depressions or dips in bench work. When they are found, add bracing from bottom side and screw in place pieces of wood that will support and eliminate the dip.
    d. Layout/geometry – transfer design to sub-roadbed marking center-line with chalk line and curve templates. Use spiral transition curve geometry between curve and tangent (straight) track. Maintain minimum 12" straight track separating reverse-curves (S-curves).
    e. To lay roadbed, first cut and fit roadbed material to area in question. Apply to surface of bench work carpenters glue, and spread evenly using a notched trowel for large areas. For narrow areas, use a small scraper or trowel. Note glue is preferred over caulking compound for ease of re-work.

f. Position and fit roadbed in place, then use cable-staple gun ($^{9}/_{16}$" staples) and staple a 12" pattern for large areas or 1" to 4" for narrow sections of roadbed. When glue has dried (typically 24 hours), remove staples using a pair of pliers.
g. All roadbed must be sealed using a latex paint, using a brush making sure roadbed is completely covered. When necessary, apply a second coat, but sand the area first to remove any fuzz or rough areas.

2. **Application of Flex Track to Roadbed Surface**.
    a. **Objective**: upon completion track work will be level when checked across the run of the rails, sighting down the rails will not reveal any kinks, and when checked for vertical changes in elevation no abrupt dips or humps will be found.
    b. **Tools** used include rotary tool (Dremel) with cutoff wheel, high-speed rotary tool (like the Dewalt drywall cutter with a 'saber saw' bit), soldering iron, wire strippers, bubble level, straight edge, curve templates (fit between rails), and a mirror used to sight along the run of the rails. This is a process where you will place track against either a straight edge reference or use a curve template, pin, then visually check alignment and adjust – repeat until its right.
    c. Lay track on roadbed surface and determine its location. For straight sections of track, use a long straight edge ranging from four feet to six feet. Pin straight edge in place on roadbed surface after visually checking alignment (use the mirror as well as direct sighting). Place pins on opposite side of ruler where track is to be laid.
    d. Rest rail head of flex track against straight edge, not the plastic ties. Visually check alignment.
    e. Track power drops – after checking for under-layout interference mark drops by using a black marker put a mark on roadbed and top of rail surface. Remove track and drill thru using a ¼" drill or the high-speed rotary tool.
    f. Off set rail joints by cutting back one rail about 5.5 inches (roughly a 39' scale rail section) using a cutting wheel and Dremel tool. Pull the rail out of the flex track before making the cut. Locate joint on center of one tie. Remove burr from bottom of rail using miniature flat file.
    g. You will 'knit' together adjoining pieces of flex track – this involves inserting a rail joiner mid-span on the first piece of flex track and then sliding the rail from the next piece of flex track into place. Using the Walthers code 83 rail joiners, we clip the flat ends off prior to applying to the track. Using a soldering iron you can place/melt the rail joiner into the plastic tie webbing. This has the advantage of allowing the joiner to assume the correct depth in the webbing preventing humps at the joints. It helps to dress the end of the rail that you will slide – chamfer the bottom and sides of the rail. For curved segments, solder rail joiners while the track is 'relaxing' in the straight alignment, then lay it on the roadbed (prevents kinks at joints).

h. In (e.) above you marked both on the rails and the roadbed for power drops. Note the color coding, the DCC will be delivered to the track on a pair of wires, one black, one white; polarity is important, so be sure to verify color coding. To solder electrical drops, take same piece of flex track and flip it on back side. Locate marks you made earlier and solder 16 gauge wires, black and white to bottom of rail head. Make sure they're tinned and have an "L" shape for soldering in place. Use a heat sink to prevent destruction of the plastic ties.
i. Reinstall flex track in place with rail head against ruler and check wire drops for binding or bowing when track is resting on road bed.

3. **Track Transverse Leveling, straight and curved sections**.
   a. With flex track against ruler, sight down rail and see if track is bowing away from ruler. If so, move track against ruler to straighten it out.
   b. Check curves with the between-the-rails templates. Template should slide freely – if it binds you have a kink which you should be able to see (hint - use the mirror). Transition from curve to tangent straight track should be a 'spiral easement', meaning the curve gradually transitions from wide radius at the point of tangency to the final curve radius.
   c. Pin in place using push pins about an inch apart. In between pins, lay a small bubble level on rail heads and check for level. Use styrene or paper shim stock to bring track level. Thickness will vary from .005" up to .025" thick material. You may need to use only paper folded in half in some cases.
   d. Level track entire length of ruler. Next, slide ruler half the length of a section of flex track, and pin the other side of track, directly opposite of other pins.
   e. For curved sections of track, the procedure is the same for soldering drops. Offset rail joints are done the same but the joint must be soldered before you lay track in place. Lay the track and pin one side of track first.
   f. Check for flat spots in the curve -- sections of track that don't follow the contour of the curve. Level track using bubble level and pin opposite to existing pins one inch apart.
   g. With track pinned in place, use a syringe with the curved nozzle to apply diluted white glue between the RR ties. Use a small amount, don't flood the area. Remove pins only when glue has dried (typically 24 hours). Use 60% white glue 40% water. Again, white glue is preferred as it allows for

4. **Laying Turnouts**.
    a. Before turnout can be installed, the bottom side must be shimmed using .020" x .100" shim stock. Cut to length shim stock and A.C.C. in place on copper printed circuit ties only (**do not shim the throw bar!)**. Only three pieces need be applied on the width section of the frog area of turnout, parallel to the stock rails and one centered along the run of the frog.
    b. Locate spot where switch will be installed. Rail joiners will be used on both ends of switch. When joining to the flex track, use the procedure discussed earlier with a soldering iron to insert the rail joiners into the flex track.
    c. Use straight edge to line up switch with flex track and use a fine-point marker and mark location for throw bar and power drops (1" back from the frog center toward diverging rails). Use the high speed rotary tool and cut a ¾ "long throw bar slot thru road bed surface, drill holes for drops.
    d. Solder power drops observing correct polarity for the stock rails, use a red jacketed wire for the frog. Drops are prepared in the same way as for straight sections of flex track. The location is about 1" back of frog point. Once soldered, check for cold solder joints.
    e. Trial fit switch in place making sure there is no binding where drops go thru road bed. Make adjustments to drops as necessary.
    f. Install switch in place using ruler, rail joiners at both ends of switch. Check for transverse level using bubble level. Shim switch if not level using shim stock.
    g. Pin in place and glue using 60/40 white glue and large syringe. Deposit glue between ties using small amounts. **Be careful not to glue switch points and throw bar in place.** When glue has dried, check for smooth operation. Remove pins only when glue as dried (typically 24 hours).

5. **Track Repair**.
    a. Track repair will performed by personnel who have been trained by Construction Manager and or Track inspector.
    b. When the temperature is above 100 F, the track is likely to buckle in some areas. Switches may buckle as well but can be repaired in place if the damage is not too severe. When this happens when happens to a switch, see instructor for demonstration.
    c. For straight sections of track, spray with water and wait until glue is soft (takes about 45 minutes or more to release) and move track to its correct position. Use straight edge and pin in place apply a little more glue if necessary.
    d. Throw bar repair: Switch should always be repaired in the normal position. Place a piece of foil or paper between stock rail and switch point if this side has failed. Use pins to hold in place rails and hold throw bar straight. Solder switch point and leave a good amount of shoulder at the joint.
    e. Use the frog finishing tool on the switch point to obtain correct flange depth clearance.

f. Repair opposite side the same way, but no foil or paper need be used. You must maintain the correct gap of .060" to .065". Use the NMRA gauge for this. Position the gauge over the diverging rout rail and place on inside of switch point boss. See instructor for demonstration.

6. **Track Ballasting.**
    a. Track ballasting is performed after there is agreement that the track has been test-run for a sufficient amount of time and declared 'good to go'.
    b. All painting and/or weathering of the rails and ties should be done in advance.
    c. Typical ballast method:
        i. Mask off the edges to define the ballast borders
        ii. Lightly oil throw bar and top of ties where point rails slide
        iii. Paint the shoulders of the road bed with white glue, dry-distribute ballast between rails and along the shoulders. Do not foul the throw bar slot, this must be kept open.
        iv. Using matte medium or diluted white glue (w/denatured alcohol mixed in) spray or eye-dropper the solution to saturate the ballast.
        v. Allow at least 24 hours to dry before running (while damp will false detection)
        vi. Clean up flange ways and check switch movements.

7. Personnel Training.
    a. Construction Manager and or Track Inspector will brief individuals on current construction and track standards before any construction efforts take place by individuals in training.
    b. The individuals in training, who want to participate in track construction, regardless of individual Model Railroading background shall:
        i. Accept current and proven SMRHS construction methods.
        ii. Demonstrate they can learn and repeat the construction process as it has been taught.
        iii. Demonstrate they have the proper dexterity, skills and willingness to comply with construction methods.
        iv. Recognize SMRHS Track Construction Standards as a "Club Standard", not as an "individual" standard.
    c. Individuals who demonstrate an inability to comply with any of the above may not continue with track construction.
    d. Under no circumstances will any club member who has not been trained as defined by this manual, perform any track repairs or switch repairs.
    e. In extreme cases where there are noncompliance issues, the matter will be referred to the Board of Directors for resolution and or disciplinary action.