**Hollow Switch Ties**

*Prepared for*

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**Hollow Switch Ties**

Phenomena

Internal Rodding

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**Traditional Designs of Turnout Switches**

Place the Point Operating Mechanisms in the Ballast Crib Between the Ties.

- Mechanical simplicity
- Throw Rods, Spreader Rods, Assisted Throw Rods, Locking Rods, and Detector Rods have typically been placed in the space between the turnout switch ties. Problems and compromises result from the placement of the rodding in this location.

Examples of these problems are:

- Surface
  - The presence of the rod in the tie crib does not allow these areas to be completely filled with ballast.

- Tamping
  - Tamping or consolidation of ballast in the tie crib containing the rod is difficult without removal of the rod.

- Damage
  - The rod is exposed to mechanical damage.

- Rods Binding on Ties
  - Running of the Points and Stock Rails sometimes causes the rod to be forced against the tie, increasing throw forces or preventing the throwing of the switch.

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**Typical Problems**

- Lock Rod Binding on Tie
- Rod Relief Manually Chipped into Tie
- Unfilled Cribs
- Tamper Damage to Rod

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**Typical Class I Switch Rodding**

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**Hollow Tie Developments in Europe**
Hollow Switch Tie Family

- The Hollow Switch Tie will be formed from a mild steel alloy chosen specifically for its strength and formability. The most likely candidate alloy is ASTM A588 (CorTen).
- Hollow Ties will be formed by Press Braking plate stock, bending it away from a flat sheet. Welding, which could eventually lead to long term fatigue failure, will be avoided and not used in this assembly.
- All Hollow Ties will be of the same cross section and vary only in length and end details.
- A typical Hollow Switch Tie Set for a turnout will consist of:
  - A Head Block Tie for the Switch Throw Rod with Switch Machine mounting pad, optionally with a Bell Crank or Bearings for Helper Rods.
  - Some number of Hollow Switch Ties for the remainder of the Switch Spreader Rods, optionally with a Bearing or Bell Crank for Helper Rods.

Design Solutions

- Unique Switch Point Lugs allow switch point drilling and tie locations to be maintained permitting field retrofits.
- Switch Plates are insulated from the Hollow Tie and the track Fasteners are insulated from the tie plate and Hollow Tie.
- Hollow Ties are coated with a bonded Polyurea coating 1/8" to ¼" thick.
- The Hollow Tie Lug slots and utilize Manganese Bronze Pins allowing the Switch lug to slide in the Switch Rod Clip.
- A Rotary Assist or Helper Rod System is employed to allow variation in tie centers without affecting operation or adjustment. Linear slip joint permits change in tie centers.
- Design Constraints

- Switch Point drilling must not be changed or relocated.
- Switch Tie locations must not be changed.
- Switch Plates must be electrically isolated from the Hollow Tie.
- Hollow Tie must be coated to allow ballast to grip tie.
- The Hollow Tie must accommodate thermal expansion of the Switch Point utilizing ± 1" of travel relative to rods.
- Lost motion or helper rods must accommodate changes in tie centers without altering or changes of adjustment.
- Helper Rods must be fully insulated and electrically neutral.
- Lost motion devices should be moved outboard of the track when possible to avoid interference with heater ducts and enhance safety during adjustments.
- Hollow Tie Sets must be Switch Machine Transparent - Various Switch Machines interface with the Hollow Tie Set by exchanging a minimum number of parts.

Design Solutions (continued)

- Pultruded Composite Fiber Material was selected for rods. Insulating coefficients are 400 Volts per .001" and the longitudinal yield strength is 100,000 psi.
- Lost motion baskets are located between the Switch Machine and the near side track rail affording greater accessibility and enhanced safety.
- Various Switch Machines may be interchanged by changing mounting plates and rod end stubs. These components are supplied in “kits”.

GRS GrandMaster™ 4000 Switch Machine

Selected For First Application To Nortrak's Hollow Switch Ties

Hollow Switch Tie Assembly
Lock And Detector Rods

Pultrusion Process For Composite Rods

Typical Pultruded Applications