

## **SECTION 20500**

### **SPECIAL TRACKWORK**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Section includes specifications for Contractor-furnished and Owner-furnished special trackwork.

##### **1.02 REFERENCE STANDARDS**

- A. Caltrain Standard Drawings
- B. American Railway Engineering and Maintenance of Way Association (AREMA):
  - 1. Manual for Railway Engineering (Manual)
  - 2. Portfolio of Trackwork Plans (Portfolio)

##### **1.03 DEFINITIONS**

- A. Special Trackwork: A generic term referring to turnouts, crossovers, track crossings, derails, and similar track items.

##### **1.04 SYSTEM DESCRIPTION**

- A. Special trackwork shall be configured, fabricated, and installed in accordance with the Contract Documents and AREMA Manual and Portfolio, where applicable.
- B. Special trackwork shall be coordinated with signal work. Include coordination of specific signal equipment or components required for special trackwork construction. Refer to Division 18, Signals.

##### **1.05 SUBMITTALS**

- A. Submit shop drawings prepared using the latest release of AutoCAD at least 30 days before fabrication is scheduled to begin, unless otherwise specified. Submit files in a CD in both Pdf and AutoCAD format. Submit hard copies of shop drawings as specified in Section 01300, Submittals and Deliverables.
- B. Submit material data for Contractor-furnished new material.
- C. Submit special trackwork packaging method.
- D. Qualifications: Submit data documenting each manufacturer's past performance and projects within the last ten (10) years furnishing special trackwork material to Class 1 Freight, Passenger or Commuter Railroad.

- E. Staging Plans: Submit plans include assembly locations, transport methods, and equipment used for prefabricating special trackwork outside of the working track.

**1.06 DELIVERABLES**

- A. Manufacturer of special trackwork (for either Owner-furnished or Contractor-furnished) shall provide to the Engineer the following:
  - 1. 2 copies of conformed design in latest AutoCAD
  - 2. 2 copies of as-builts in latest AutoCAD
- B. Installation of special trackwork:
  - 1. Submit Manufacturer's certificates of compliance for special trackwork.
  - 2. Certification of Installation: Submit affidavit by the manufacturer's field representative certifying that the installation of the special trackwork meets Manufacturer and Contract requirements.
  - 3. Submit an as-built report with tabulation of the vertical and horizontal positions of the final track alignment.
  - 4. Submit final shop drawings revised to show any variations from the tolerances, dimensions, lengths, or angles shown on the approved shop drawings.

**1.07 QUALITY ASSURANCE**

- A. Qualifications: Manufacturer of special track shall have successfully furnished special trackwork to Class 1 Freight, Passenger or Commuter Railroad. This does not include transit or light rail special trackwork.
- B. All special trackwork, assemble turnouts, crossovers, and derails shall be inspected in the manufacturer's fabrication shop.
  - 1. Coordinate the details and scheduling of the inspection with the Engineer at least six (6) weeks before the shop assembly inspection. Provide the Engineer with a safe access to the lay down area and assist with the inspection activities as required.
  - 2. Note on the final shop drawings any variations from the tolerances, dimensions, lengths, or angles shown on the approved shop drawings.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Limit the amount of "bundles" for each unit to the absolute minimum possible and indicate in the packaging plan how the materials will be stacked and marked to allow for easy identification of all the components that are part of the same unit.

- B. Pack as complete units in secured bundles all turnouts, crossovers, and derails.
- C. Mark units, bundles, and boxes clearly with the following information: identification of item contained, Manufacturer's name, shipping date, unit designation (right or left), number of pieces, destination, and gross weight.
- D. Handle special trackwork materials in a manner that will prevent breaking, bending, or other damage during packaging, loading, transporting, and unloading. Do not drop or throw materials from cars, but lift or skid to the ground or other surface. Do not sharply strike special trackwork.
- E. Transport and handle insulated joints in a manner that will protect them from damage.

## **PART 2 - PRODUCTS**

### **2.01 CONTRACTOR-FURNISHED TURNOUTS, CROSSOVERS, AND DERAILS**

- A. Fabricate turnouts, crossovers, and double point split switch derails, including frogs and guardrails, from new materials. Fabricate special trackwork entirely insulated with the proper number of gage plates ahead and behind the extended switchpoints and stockrails and with all other components necessary.
- B. Design for turnouts, crossovers, and derails shall conform to Caltrain Standard Drawings. All rail shall be 136 RE rail section.
- C. Special trackwork shall be manufactured from head hardened (HH) rail.
- D. Spring frogs shall conform to Caltrain Standard Drawings or Engineer approved equal. Castings shall be 3-shot explosion-hardened. Rail shall be deep head hardened rail. Furnish frogs without plates for turnouts and crossovers on concrete ties. Bolts shall be 1-3/8 inch Grade 8 square head with 1/4 inch hardened flat washers and hexagon security locknuts. Lubricate frog bolts and torque to 2,500 foot pounds.
- E. Railbound Manganese (RBM) frogs with elastic fastening system shall conform to Caltrain Standard Drawings or Engineer approved equal. Manganese castings shall be 3-shot explosion-hardened in accordance with AREMA Specifications. Heel of the frog shall incorporate a 30-degree cut. Furnish frog plates with one inch round holes except as otherwise indicated on the Caltrain Standard Drawings. Bolts shall be 1-3/8 inch Grade 8 square head with 1/4 inch hardened flat washers and hexagon security locknuts. Lubricate frog bolts and torque to 2,500 foot pounds.
- F. Turnouts and crossovers shall be fully insulated and welded from the ends of the stock rails through the switchpoints, insulated joints, closure rails and frog area, including all trim rail and beyond the long switch ties where it shall be welded into the existing track or newly constructed track. This includes the welding of the insulated frog gage plates to the guardrail plates.
- G. Switchpoints, stockrails, frogs, and trim rail shall have the two (2) outside bolt holes drilled to facilitate temporary connections during constructing panelized

turnouts and crossovers. Refer to Part 3 of this Section for welding of temporary connections after installation.

- H. All switchpoints are extended; the turnout switchpoint shall have a replaceable manganese tip, samson undercut, furnished with rollers and have the two outside bolt holes drilled in accordance with Caltrain Standard Drawings.
- J. Switch pack with Hollow Steel Ties (HST) shall be used for new #10, #14, and #20 turnouts on mainline tracks. Switch pack shall include, but not limited to, rails, ties, hollow steel ties, blue rods, and all related components to complete the entire switch pack assembly.
- K. All stock rails are extended, samson undercut and have the two (2) outside bolt holes drilled in accordance with Caltrain Standard Drawings.
- L. Boltless adjustable guardrails shall have one inch riser furnished with U69 Guard Bar, complete with four (4) shims per guard-rail plate and fastened with Pandrol "E" clips. Determine the length of guardrail and quantity of guardrail plates in accordance with the switch layout. Furnish guardrail plates with one (1) inch round holes and a 1:40 cant.
- M. Provide insulated vertical switch rods with AAR bracket for GRS 5F switch machine for the No. 1 and No. 6 positions, where applicable. Furnish all other vertical switch rod locations without AAR brackets.
- N. Insulated Joints:
  - 1. Conform to the requirements in Section 20120, Track Appurtenances and Other Track Material.
  - 2. Incorporate insulated joints into closure rails in order to eliminate additional welds in turnouts and short pieces of rail.
  - 3. Furnish insulated joints in lengths of 19 feet 6 inches minimum, and install them with a minimum stagger of 4 feet 8 inches and a maximum stagger of 10 feet 0 inches.
  - 4. Paint manufacturer's lift locations or center point on the rail head.
  - 5. Provide sufficient clearance on insulated joints for the insulated bar rail and Pandrol E2063B clip to properly fit together.
  - 6. Elastically fastened using Pandrol Fastclip, modified "E" clip, or Engineer approved equal.
- O. Ties:
  - 1. Nominal tie spacing: 19-1/2 inches (wood) and 24 inches (concrete).
  - 2. Refer to Section 20130, Timber Crossties and Switch Ties, for timber ties for special trackwork.

3. Refer to Section 20140, Concrete Crossties and Rail Fastener Assemblies, for concrete ties for special trackwork
- P. Furnish all other track material (OTM) required for construction of turnouts, crossovers, and derails.
- Q. Furnish signal bonding equipment as part of the complete special trackwork items.

## **2.02 SWITCH STANDS**

- A. Hand throw switch stands shall be Racor 36-EH switch stand or approved equal. Furnish a 14-inch red target with reflective material such as Scotchlite or equal on both sides.
- B. Hand throw switch stand for crossovers shall be Racor 36-E switch stand, or Engineer approved equal, furnished with a 40 1/2 inch straight handle providing maximum clearance between tracks. Furnish an 8-inch red target with reflective material such as Scotchlite or equal on both sides.
- C. Hand throw switch stand for double point split switch derail shall be Racor 36-EH switch stand, or Engineer approved equal, in accordance with Caltrain Standard Drawings. Furnish a 14-inch round "D" target with yellow reflective material such as Scotchlite or equal on both sides.
- D. Derail sign and posts will be Owner-furnished. Refer to Section 01600, Materials, for related requirements.

## **2.03 POWER SWITCH MACHINES**

- A. See Division 18, Signals, for type and installation requirements.

**2.04 LUBRICANTS**

A. Provide the following types of lubricant or Engineer approved equal:

	<b>Switch Components</b>	<b>Type of Lubricant</b>	<b>Brand/Manufacturer</b>
1	Spring Frogs Wing Rail & Base Plates	Graphite	Slip Plate No. 1 – Superior Graphite Co
2	Switchpoint & Slide Plates	Soy Oil Base	Ultra Green Sprayable – Trac Lubricants & Coatings, LLC
3	Switch Rods & Hand Throw Switch Stands	Grease	
4	M23 Power Switch Machine	Soy Oil Base	Ultra Green Sprayable – Trac Lubricants & Coatings, LLC
5	5F Power Switch Machine	Soy Oil Base	Ultra Green Sprayable – Trac Lubricants & Coatings, LLC
6	A-5 Pneumatic Power Switch	Soy Oil Base	Ultra Green Sprayable – Trac Lubricants & Coatings, LLC
7	M23 Power Switch Machine – Gear Box	Petroleum Lubricating Grease	Lubriplate No. 5555 – Fiske Brothers Refining Co

**PART 3 - EXECUTION**

**3.01 INSPECTION**

A. Prior to commencement of special trackwork installation, perform inspection of the following items:

1. Inspect the 8-inch HMAC track underlay and verify its line, grade, cross section, and compaction as specified in Section 02720, Asphalt Paving.
2. In locations where HMAC underlayment is not required, inspect the track subgrade and verify its line, grade, cross section, and compaction as specified in Section 20400, Track Construction.
3. Verify track alignment as to line, grade, and cross section:
  - a. Track center distance at crossover locations shall be in conformance with track center distance designed for the crossover. Maximum deviation shall not exceed 1/2 inch of the design distance or alignment.
  - b. Track shall be on tangent at locations of the straight side of the special trackwork.

**3.02 TURNOUT, CROSSOVER, AND DOUBLE POINT SPLIT SWITCH DERAIL CONSTRUCTION AND INSTALLATION**

A. Fully weld turnouts, crossovers and double point split switch derails at joint locations, including both the toe and heel of the frog. Bolt and properly bond

temporary joint locations. Drill only two (2) outside holes on each side at all temporary joint locations. Weld out all temporary joints within 14 days of installation.

- B. Dimensions, details and configuration of the turnout, crossover or double point split switch derail shall be as shown on the Caltrain Standard Drawings and the Contract Drawings. Shop drawings of Owner-furnished materials will be provided to the Contractor when they become available.
- C. In no case shall a spike or screw spike be within 14 inches of the end of a switch tie.
- D. Shift connecting tracks to their new alignments as shown on the Contract Drawings and connect all tracks to the replacement turnout.
- E. Tracks shall be within 1/2-inch of the designed alignment prior to placing ballast.
- F. Switchpoints/stockrails, rail joints, frogs, and other parts of the turnout, crossover or double point split switch derail shall fit together properly and be of the proper match. Allow two (2) inches of clearance between moving parts of the switch and the top of the ballast.
- G. Place ballast as required in the turnout, crossover, or double point split switch derail and raise to proper grade in a minimum of two (2) lifts. The initial lift shall not exceed four (4) inches. The final lift shall not exceed two (2) inches and all tracks shall be brought into final alignment at that time. In addition, stabilize with a dynamic track stabilizer. Surfacing (tamping), ballast dressing requirements, alignment tolerances, and de-stressing shall be in accordance with Section 20400, Track Construction.
  - 1. Use care not to surface through frog utilizing the tampers switch hooks only. Wing rail or frog base plates can be bent or torn and rendered inoperable. Use helper jacks on opposite guard rail and frog itself to lift track and achieve proper surface.
  - 2. Use care when surfacing through switch point section so that rail remains properly seated in slide plates be careful not to allow tamping tools to strike or damage turnout component.
- H. After the turnout, crossover, and double point split switch derail and associated track has been completely surfaced, lined, stabilized, and dressed with ballast, place walkway aggregate around the turnout and associated track to the dimensions governed by CPUC General Order 118 and as shown on the Contract Drawings and specified in Section 20110, Ballast and Walkway Aggregate, and Section 20400, Track Construction.
- I. Install switch stands and adjust the switch operating mechanisms so that the switch operates smoothly and without requiring excessive forces. Force at end of handle must be verified with a torque wrench designed for testing switch stand resistance. The measured force at end of handle shall not exceed 30 pounds for the lift-up handle position, 50 pounds for the middle handle position, or 75 pounds for the push-down position. Hand throw switch stands shall have

a proper target. Lubricate switch plates and connection points in the switch rod with the lubricants specified herein.

- J. Install switch to hold the switch point tightly against the stock rail when stand is in normal position. Adjust switch rods to hold the opposite point tightly against the rail when stand is in reverse position. Secure switch stands with spikes and fasteners to the headblock. Square headblocks with the track prior to tamping.
- K. Install and adjust as required all required rods and plates, including switch point rods, switch point rollers, switch stand rods, basket rods, gauge plates, and U5 box and connections.
- L. Install signal bonding as required in accordance with Section 18400, Rail Bonding. Coordinate special trackwork installation with signal work.
- M. After installation of special trackwork, perform necessary tests to ensure the operating signal system has been restored. Complete all signal testing in accordance with Section 18600, Signal Systems Testing, prior to placing the turnout in service. Obtain approval of signal test results from the Engineer prior to opening the track to service.
- N. Refer to Section 01011, Work Planning, for track back in service requirements. Complete the Return to Service Report in Section 20400, Track Construction, prior to restoring track to service.

### **3.03 PANELIZED TURNOUT, CROSSOVER AND DOUBLE POINT SPLIT SWITCH DERAIL CONSTRUCTION**

- A. As an option, construct panelized turnout, crossover, and double point split switch derail as a unit or in multiple panels for installation into the track.
- B. Provide all equipment, tools and materials necessary to safely move the panelized turnout, crossover or double point split switch derail as a unit or in multiple panels, providing sufficient bearing to avoid excessive stress to the turnout, crossover or double point split switch derail during handling. Repair any damage caused to turnout, crossover, or double point split switch derail during handling and installation to a condition in accordance with this Section and Section 20400, Track Construction.
- C. Panelized turnout construction tolerances shall conform to the track criteria and tolerances in Section 20400, Track Construction.

### **3.04 DERAIL SIGNS**

- A. Install derail sign and post in conformance with Caltrain Standard Drawings.

### **3.05 FIELD QUALITY CONTROL**

- A. After completion of special trackwork installation, perform inspection of the track alignment as to line, grade, and cross section.



1. Correct track alignment and profile with errors exceeding construction tolerances specified in this Section.
2. Prepare an as-built report with tabulation of the vertical and horizontal positions of the final track alignment.
3. Final acceptance will not be granted until work, punch list and as-built data of final alignment are submitted and verified.

**END OF SECTION**