

FOX RIVER TROLLEY MUSEUM SPECIFICATION: BONDING

Existing Conditions. The existing Trolley Museum mainline track is 70.40 ASCE rail and functions as the return for the traction power system. The mainline rail is bonded, on the field side head of the rail, with single bonds to provide for continuity. Both rails are bonded with occasional crossbonds, on either the field or gage side of the base of the rail, at approximately 1,000' intervals. The Spur track is not bonded.

References.

- a. Cadweld Welded Electrical Connections, Installer's and Inspector's Guide
- b. Signal Bond Training With Cadweld

Bonding. Bonding shall be performed with the manufacturer's instructions, current revision, for the specified products. It shall be the responsibility of the Contractor(s) to maintain a current copy of the manufacturer's instructions on site and familiarize themselves with the project requirements contained therein.

General Notes

All welds are subject to the approval of the Museum Engineer or his/her appointed representative. Alternative products and methods are subject to approval by the Museum Engineer.

Caution must be exercised to prevent contact between ignition sources or hot welding material and ties or other combustible materials. Contractor must have a fire suppression plan and resources in place prior to performing the work. Contractor must not leave the work site until any smoldering materials are extinguished.

Material. The Contractor shall furnish materials for all work in this section, except as specifically noted herein. All material shall be made available for inspection by the Museum before construction and shall be satisfactory to the Museum Engineer. Material is incidental to the work and shall not be paid for separately.

- a. **Bonds.** Rail head bonds shall be Cadweld PBC1-2J-9, provided by Erico Products, Inc, or approved equal. Crossbonds shall be 4 aught (0000) insulated copper cable of sufficient length to permit burying in the ballast a minimum of 6" below top of tie. Terminals approved by the Museum Engineer shall be provided for both ends of the crossbond.
- b. **Welders.** Welder and ancillary parts, including but not limited to Weld Material, Molds, Bond Clips, Mold Suspension Assembly, Clamp Assembly, and Extension Bar, are to be of the size and type specified by the manufacturer for the approved bond. Where no welder is specified by the manufacturer for the bond, Contractor shall submit proposed welder to the Museum for approval. For the PBC1-2J-9 bonds, the welder components supplied by Erico Products , Inc. are as follows:
 - Welder – PBC-T8-2J-9
 - Weld Material – PB 65
 - Molds – PBC-T8-2J-M
 - Bond Clips – PBB-194-A
 - Mold Suspension Assembly – PBC-2J-F

FOX RIVER TROLLEY MUSEUM SPECIFICATION: BONDING

Clamp Assembly – PBB-197-A

Extension Bar – PBS10212

For the crossbonds, welder components shall be supplied by Erico Products, Inc. as approved by the Museum Engineer. It is the Contractor's responsibility to confirm if above Erico part numbers are current for the application prior to purchase and installation.

Construction. Bonds shall be applied in accordance with the manufacturer's instructions for the selected application.

- a. **Existing Bonds.** Existing bonds, still attached to 1 rail, and existing crossbonds may be reconnected subject to the following conditions:
 - Free end of the bond shall be cut from the rail using a cutting wheel designed for such purposes.
 - Bond is of sufficient length to meet other installation requirements.
 - Fixed end of the bond is not damaged by the cutting, rail removal and replacement, or other work and is in good condition as inspected and approved for rewelding by the Museum Engineer.
 - Bond is not damaged by the cutting, rail removal and replacement, or other work and is in good condition as inspected and approved for rewelding by the Museum Engineer.
- b. **Previously Bonded Rail.** Rail intended for reuse shall have bonds cut from the rail using a cutting wheel designed for such purposes. Area of prior bond shall be ground flush with the adjacent areas of the rail, using a grinding wheel designed for such purposes.
- c. **Surface Preparation.** Area to be bonded shall be free of rust, scale, grease, and other foreign materials. Areas shall be ground smooth using a grinding wheel designed for such purposes. Surface preparation to be inspected and approved by the Museum's Chief Engineer or his/her appointed representative prior to bond welding.
- d. **Preheating.** Prior to bonding the rail the rail temperature should be taken, within 6" of the weld location, with two reliable rail thermometers. If the thermometers differ by more than 5°F, a additional thermometers should be used to find two thermometers with matching temperatures within 5°F, recording both temperatures. When the rail temperature of the lowest used thermometer is below 40°F, the rail shall be preheated to a minimum of 40°F. The actual temperature of both thermometers at the time of welding shall be recorded, with the lowest being a minimum of 40°F.
- e. **Crossbonds.** Crossbonds shall be welded on the base of the rail between ties. Prior to welding, crossbonds shall have insulation removed and designated Terminals applied to each end of the crossbond. Welding frame must be manually held against the base of rail during welding. Crossbonds shall be buried in the ballast between ties a minimum of 6" below top of tie. Crossbond shall be bent such that cable is at minimum depth of bury no less than 4" beyond base of rail.
- f. **Layout.** Prior any rail removal the contractor shall locate and document the location of crossbonds within the limits of the rail removal, furnishing the Museum Engineer a

FOX RIVER TROLLEY MUSEUM SPECIFICATION: BONDING

copy. Contractor may, upon approval of the Museum Engineer re-space the crossbonds outside the limits of the temporary rail to minimize removal and replacement of crossbonds.

- g. **Inspection.** Museum shall be notified of completed bonds for inspection by the Museum Engineer in accordance with the Cadweld Welded Electrical Connections, Installer's and Inspector's Guide. Welds shall not project above the top of rail. Only welds meeting the "Good" or "Acceptable" standard shall be accepted. All other welds will require removal and replacement in accordance with the bonding specifications.

General Clean-up. All rubbish and debris resulting from the Work of this section shall be collected, removed from the site and disposed of legally.

Emergency Repairs. In the event of a failure, of a bond installed by the Contractor during museum operation hours, Museum may make repairs necessary to insure safe and timely operations at the Contractor's expense. Notification to the Contractor and Engineer shall be made as soon as practicable. Repair costs incurred by the Museum shall be paid for by the Contractor directly to the Museum within 30 days of receipt of each invoice.

Review and Inspection. The cost of the review of submittals and inspections by the Museum shall be paid for by the Contractor directly to the Museum within 30 days of receipt of each invoice.

Method of Measurement and Basis of Payment. The work shall be performed at the Contractor's sole cost and expense or upon concurrence by the Museum performed by the Contractor at no cost to the Museum. Work performed by the Museum for benefit of the Contractor shall be billed to the Contractor at actual cost and paid for by the Contractor directly to the Museum within 30 days of receipt of each invoice.