A. Purpose

This Manual Part recommends application criteria for track circuit bonding such as switch fouling, rail joints and frogs in circuits where rails do not carry propulsion return current. See AREMA® Manual for Railway Engineering, Chapter 4 - Rail, Section 3.7 Application of Rail Bonds.

B. Considerations

The following shall be considered:

1. Type of bond and bonding method for rail joints.
2. Type of bond and bonding method for switch point heel joints.
3. Type of bond and bonding method for steel deck bridges.
4. Type of bond and bonding method for frogs.
5. Type of corrosion-resistant material for bonds, where required.
6. Type of material of frog.
7. Type of connection and location of connection to rail.
8. Number of bonds per rail joint.

C. General
1. Rail joints and switch point heel joints shall be bonded with bonds as specified by purchaser.

2. Bond wires shall not be applied to the base of any rail.

3. Rail joints in road crossings or platforms where planking or paving is maintained, or where bonding is inaccessible, should be double-bonded.

4. Cross connections at crossovers and turnouts for shunt fouling protection shall consist of at least two discrete stranded conductors having a resulting dc resistance not exceeding 0.006 ohm. Each conductor shall not be smaller than No. 8 AWG (10 mm²) wire and shall be of sufficient conductivity that the track relay or equivalent electronic device will be in the de-energized position or detect an occupancy when the circuit is shunted. Cross connections shall be so installed as to reduce the possibility of both conductors being broken by dragging equipment.

5. Switch frogs shall be bonded so that the continuity of the track circuit will be broken when they are removed.
6. Frogs should be bonded in accordance with Figure 8120-1.

**Figure 8120-1: Recommended Bonding Diagrams for Typical Frogs**

- **A** = Welded Bond.
- **B** = Bond in Web of Rail Should be Placed as Close to Body of Frog as Practicable.
- **C** = Bond in Web of Rail.
Note:

The above diagrams show only one method of bonding frogs.
7. Bonds may be insulated when specified by purchaser.

8. Steel-deck-locations ridges with guardrails shall be bonded and insulated to eliminate the possible loss of broken rail detection in accordance with Figure 8120-2.
Figure 8120-2: Recommended Bonding Diagram for a Typical Steel Deck Bridge
D. **Drilling**

Drilling shall conform to Manual Part 8.6.25 Recommended Instructions for Drilling 3/8 Inch Rail Bond or Track Connector Holes.

E. **Bonding**

1. Web of rail, plug-type
   a. Drilled holes shall be 0.375 in (−0.000 +0.010 in) (9.5 mm −0.00 +0.25 mm). Hole should be drilled from the same side of rail as the plug is to be driven.
   b. Bonding should be done the same day holes are drilled.
   c. Plugs should be driven with a hammer approximately 3 lb (1.36 kg) in weight and when in place shall be tight to provide best possible contact throughout web of rail.

2. Head of rail, welded type
b. Bond terminals should be located as low as possible on rail heads, leaving only sufficient space for removal of angle bars.

c. Bonds for rail joints shall be applied within 5 in (127 mm) from end of rail (for single or double bonding).

Apply bond wires to the field side of the head within the limits of joint bars (or within the confines of binder rails, braces and castings in special track work such as frogs, crossing diamonds, etc.).

d. Bonds for rail joints shall be applied so that opening of the rail ends of 1 in (25.4 mm) will cause failure of the bond.

e. Bonds shall be installed in accordance with the manufacturer’s instructions.

3. Web of rail, welded type

a. Bonds shall be applied to the web of rail at or near the neutral axis and shall conform to Manual Part 8.1.32 Recommended Design Criteria for Copper Based Exothermically Welded-Type Non-Propulsion Rail-Web Bonds and Track Circuit Connections.

b. Bonds shall be installed in accordance with the manufacturer’s instructions.

4. Head of rail, pin brazed type


b. Bond terminals should be located as low as possible on rail heads, leaving only sufficient space for removal of angle bars.
c. Bonds for rail joints shall be applied within 5 in (127 mm) from end of rail (for single or double bonding).

Apply bond wires to the field side of the head within the limits of joint bars (or within the confines of binder rails, braces and castings in special track work such as frogs, crossing diamonds, etc.).

d. Bonds for rail joints shall be applied so that opening of the rail ends of 1 in (25.4 mm) will cause failure of the bond.

e. Bonds shall be installed in accordance with the manufacturer’s instructions.

5. Web of rail, pin brazed type

a. Bonds shall be applied to the web of rail at or near the neutral axis and shall conform to Manual Part 8.1.32 Recommended Design Criteria for Copper Based Exothermically Welded-Type Non-Propulsion Rail-Web Bonds and Track Circuit Connections.

b. Bonds shall be installed in accordance with the manufacturer’s instructions.

F. Identification

1. Each package or box of bonds or terminals should be so marked or terminal should be of such an individual design so that the manufacturer of the bond can be readily identified.

2. Each box of weld material should be so marked so that the manufacturer can be readily identified and should be stamped with the weld material lot number.
3. The type and size of weld material should be clearly identified on the individual packages and on its shipping container or carton.