MATERIAL SPECIFICATIONS:
1) STRUCTURAL STEEL SHALL CONFORM TO ASTM A-36 SPECIFICATIONS. WELDING TO BE PER AWS CODE.
2) ALL EXPOSED STEEL TO RECEIVE ONE COAT PRIMER.
3) END ANGLES FOR GAGE PANEL SHOULD HAVE 3" GAP MINIMUM TO IMPROVE SHUNT RESISTANCE. REINFORCING MATERIAL AND CLADDING TO BE CONSTRUCTED TO MEET SHUNTING REQUIREMENT. A NON-CONDUCTIVE SPACER TO BE ATTACHED TO GAGE FRAME.
4) CLADDING ON ENDS OF PANELS SHOULD EXTEND BEYOND CONCRETE 1/8" (+1/8", -0") TO IMPROVE MATCH WITH ADJACENT PANELS.
5) REINFORCING STEEL SHALL CONFORM TO CURRENT ASTM A615 SPECIFICATION. GRADE 60. IF ANY WELDING OF REINFORCING STEEL IS REQUIRED, MATERIAL SHALL CONFORM TO ASTM A765 SPECIFICATION. GRADE 60.
6) CONCRETE MATERIAL MIXING, PLACING AND CURING TO BE IN ACCORDANCE WITH PCI "MANUAL FOR QUALITY CONTROL: PRECAST AND Prestressed Concrete." MANUFACTURERS' MANUALS AND CEMENT MANUFACTURERS' SPECIFICATIONS. GRADE 60.
7) COPIES OF THE CONCRETE DESIGN MIX TO BE SUBMITTED TO RAILROADS FOR APPROVAL PRIOR TO THE START OF THE CASTING OPERATION.
8) TOP SURFACE SHALL BE NON-Crack DESIGN AND IS TO BE SEALED TO PREVENT ION MIGRATION DUE TO SALTING.
9) CURING TO FOLLOW THE RECOMMENDATIONS AND PROCEDURES OF PCI IN 4TH EDITION DIVISION 4.
10) 3/16" WEEP INSPECTION HOLES SHALL BE PLACED EVERY 2'-6" MIN. ALONG THE TOP OF THE STEEL FRAME ALONG A LINE 3/4" FROM OUTSIDE EDGE.
11) FLANGEWAY FILLER TO BE PERMANENTLY PREATTACHED AND HAVE THE FOLLOWING PROPERTIES:
   * A SAMPLE SECTION OF THE FLANGEWAY MATERIAL SHALL BE PHYSICALLY TESTED BY APPLYING A LATERAL FORCE OF 10 LB/IN AT 50 DEGREES CELSIUS. THE MAXIMUM LATERAL DISPLACEMENT OF THE TEST IS NOT TO EXCEED 1/16" (CROSSING TYPE, 10 ONLY). TEST RESULTS MUST BE SUBMITTED FOR RAILROAD APPROVAL.
   * MANUFACTURER TO DESIGN THE PREATTACHED FLANGEWAY FILLER TO ALLOW FOR REMOVAL OF PANELS FOR MAINTENANCE WITHOUT DAMAGING THE FLANGEWAY FILLER OR ANY OTHER COMPONENTS DESIGNED TO HOLD IT TOGETHER.
* SEE PAGE 2 FOR MATERIAL SPECIFICATIONS.

TOLERANCES:
1) OUT OF SQUARE 3/16" (MEASURED ALONG THE DIAGONAL)
2) LENGTH, WIDTH, AND THICKNESS: +/-1/8"
3) THE BOTTOM SURFACE, WHICH WILL BE IN CONTACT WITH THE TIES, SHALL NOT UNDULATE IN ANY DIRECTION MORE THAN 3/32". SEE SPECIAL TESTING NOTE 3 BELOW.
4) REINFORCEMENT PLACEMENT SHALL BE +/-3/4" HORIZONTAL, +/-1/8" VERTICAL.

FINISH:
1) ALL RECESSES AND MINOR CONCRETE SPALLS ARE TO BE FILLED AND FINISHED TO THE PANEL DIMENSIONS USING THE PROPER BONDING AGENT AND REPAIR MATERIAL SURFACE OF THE REPAIRED AREA IS TO MATCH THE COLOR AND TEXTURE OF THE SURROUNDING AREAS.
2) THE DrIVING SURFACE IS TO HAVE A LIGHT BROOM FINISH OR AS APPROVED BY RAILROADS. THE ADDITION OF WATER TO THE CONCRETE SURFACE FINISH DURING CASTING IS NOT PERMITTED.

SPECIAL TESTING:
1) TWICE ANNUALLY, VENDORS SHALL SUBMIT (VIA AN INDEPENDENT TESTING LABORATORY TO THE RAILROADS) THE FOLLOWING TEST ON THE APPROVED MIXED DESIGN
   - ASTM C696 FREEZE/THAW
   - ASTM C227 MORTAR BAR METHOD
   - ASTM C1260 AT TOTAL ALKALI BURDEN = 0.06%
2) GAGE PANELS SHALL BE DESIGNED WITH SHUNT RESISTANT FEATURES IN ORDER TO PROVIDE A MINIMUM ELECTRICAL RESISTANCE IN ACCORDANCE WITH THE STANDARD ELECTRICAL TEST (DWG 500930).
3) A REPRESENTATIVE SAMPLE OF PANELS SHALL BE CHECKED PERIODICALLY FOR BOTTOM FLATNESS BY USING A STRAIGHT EDGE CALIBRATED TO WITHIN +/-1/32" AND A TAPER GAGE AS FOLLOWS: 8 POSITIONS OF FLATBAR (---) CHECK FLATNESS AT EACH POSITION USING TAPER GAGE:

[Diagram of flatness check]

GENERAL:
1) THE MANUFACTURER SHALL BE ISO 9000 OR AAR M-1003 CERTIFIED. ALL TESTING PERSONNEL SHALL BE A MINIMUM OF AGI LEVEL 1 CERTIFIED.
2) THE FABRICATOR SHALL BE RESPONSIBLE FOR LOADING AND PROPERLY SECURING ALL PRECAST CONCRETE MEMBERS FOR SHIPMENT.
3) THE MANUFACTURER SHALL WARRANTY PRODUCT FOR A MINIMUM OF TEN YEARS AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP.
4) MANUFACTURER TO PERMANENTLY MARK EACH PANEL WITH A CONCRETE IMPRINT FOR SIZE OF RAIL, WEIGHT OF PANEL, MANUFACTURER'S I.D., MONTH/DAY/YEAR OF MANUFACTURE, AND CROSSING TYPE. END OF EACH PANEL TO BE STENCIL PAINTED WITH SIZE OF RAIL, WEIGHT OF PANEL AND CROSSING TYPE.

UNION PACIFIC RAILROAD
ENGINEERING STANDARDS

GENERAL SPECIFICATIONS FOR ROAD CROSSINGS WITH CONCRETE PANELS

APPROVED: R. Stough, VP ENGINEERING
ADOPTED: OCT. 24, 2013
REVISED: MAY 9, 2019
FILE NO.: 0308A

STD DWG 0308A
PAGE 1 OF 2

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# Non-Conductive Filler Compound Material Specifications

An ALD EPDM based compound is to be used in the UPRR attached concrete panel fillers. It is to have superior weathering, aging and heat resistance characteristics and is to be made using only non-conductive ingredients and pigmented so it is a non-marking black color.

The compound meets line callout ASTM D2000 38A714, A14, B13, C12, F17, Z1, Z2, Z3, Z4, Z5, Z6, Z7

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>UNIT</th>
<th>REQUIRED LIMIT</th>
<th>TEST METHOD</th>
<th>TESTING FREQUENCY</th>
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<tbody>
<tr>
<td>Tensile Strength</td>
<td>PSI</td>
<td>1400 MIN</td>
<td>ASTM D412</td>
<td>X</td>
</tr>
<tr>
<td>Elongation</td>
<td>%</td>
<td>400 MIN</td>
<td>ASTM D412</td>
<td>X</td>
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<tr>
<td>Hardness</td>
<td>Shore &quot;A&quot; (Z3) Duro Points</td>
<td>75 +/- 5</td>
<td>ASTM D2240</td>
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<tr>
<td>Heat Resistance</td>
<td>% change</td>
<td>-25 MAX</td>
<td>ASTM D573 70 HRS @ 212°F</td>
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<tr>
<td>Tensile Strength</td>
<td>% change</td>
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<td>ASTM D395 B</td>
<td>22 HRS @ 158°F</td>
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<tr>
<td>Elongation</td>
<td>% change</td>
<td>-25 MAX</td>
<td>ASTM D411 Method B</td>
<td>70 HRS @ 50 ppm @ 104°F</td>
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<tr>
<td>Hardness</td>
<td>Points change</td>
<td>+10 MAX</td>
<td>ASTM D257 (Dry)</td>
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<tr>
<td>Compression Set</td>
<td>% (Z3)</td>
<td>25 MAX</td>
<td>ASTM D257 (Conditioned in an 18% NaCl Solution for 180 HRS @ 25°C)</td>
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<tr>
<td>Ozone Resistance</td>
<td>N/A</td>
<td>Pass NO Cracks</td>
<td>ASTM D1117 Method B 70 HRS @ 50 ppm @ 104°F</td>
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<tr>
<td>Fluid Resistance</td>
<td>% change (Z4)</td>
<td>+/- 5 MAX</td>
<td>ASTM D471 (Water) 70 HRS @ 212°F</td>
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<tr>
<td>Low Temperature Brittleness</td>
<td>N/A</td>
<td>Pass NO Cracks</td>
<td>ASTM D2137 Conditioned 3 MIN @ -40°F IN METHANOL</td>
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<tr>
<td>Volume Resistivity</td>
<td>OHM-CM (Z5)</td>
<td>1.0 x 10^3 MIN</td>
<td>ASTM D257</td>
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</tr>
<tr>
<td>Volume Resistivity</td>
<td>OHM-CM (Z5)</td>
<td>1.0 x 10^3 MIN</td>
<td>ASTM D257 (Conditioned in an 18% NaCl Solution for 180 HRS @ 25°C)</td>
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<tr>
<td>Volume Resistivity - Compression</td>
<td>OHM-CM (Z5)</td>
<td>1.0 x 10^3</td>
<td>Vol Resistivity ASTM D257 While Under Compression Per ASTM D575 (See Note 10)</td>
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<tr>
<td>Meggar Test</td>
<td>OHM (Z6)</td>
<td>2G OHM</td>
<td>UPRR Test (See Note 11)</td>
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<tr>
<td>Tear Strength</td>
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<td>ASTM D624 Die &quot;C&quot;</td>
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<td>Rheometer</td>
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<tr>
<td>Specific Gravity</td>
<td>SG</td>
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<td>ASTM D2097</td>
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</tbody>
</table>

Notes:
1. Test results from a representative sample along with recommended tolerances are to be submitted to UPRR for review and approval.
2. A sample of the proposed material is to be submitted to UPRR for review and approval.
3. Material specifications apply to both gage side and field side flange material.
4. Any changes in material composition of the approved sample will require prior approval from UPRR.
5. Manufacturer shall be ISO 9001-2000 or AAR M-1003 certified.
6. All personnel conducting material testing shall be AAALC certified for conducting mechanical testing. Any alternative lab accreditation will require prior approval.
7. Manufacturer shall maintain records for 10 years and records are to be open to review by authorized UPRR representatives.
8. Manufacturer to warranty materials for 10 yrs.
9. Each batch shall be marked with a unique identifier that will permit tracking of the material. Each sample shall be marked indicating it is "UPRR Approved".
10. Refer to: Volume Resistivity - Compression Tests for Annual Material Certification 12-01-05
11. Refer to: Insulation Resistance Testing of Concrete Crossing Panel Flange Filler - Both Center and Field Panels 12-09-05

# General Specifications for Road Crossings with Concrete Panels