SPECIAL SPECIFICATION

4679

Ballasted Track Construction

Description. This Item shall govern for the construction of ballasted track on constructed trackbed. Ballasted track construction includes, but is not limited to, removing existing ties and rail, placing ballast, distributing and lining ties, installing rail, and other incidentals as specified herein.

1. Materials.

A. General.

1. Use new material conforming to this specification unless otherwise designated in the plans or as approved by the Engineer. New material shall be free from defects, rust, or damage and conform to the requirements of AREMA standards unless otherwise stated in the plans, these specifications, or as required by the Engineer. Provide new material in an unblemished condition, free from defects, rust, or damage.

2. Where second hand material is permitted by the plans or approved by the Engineer, the second hand material shall be in good condition and conform to AREMA Standards unless otherwise indicated in the plans or required by the Engineer.

3. Second hand material shall be straight and true, in good condition, and free from excess rust, pits, or wear. Test second hand rail for head wear, corrosion, base wear, sweeps, kinks, cracking, delamination, or any other defect including internal metal defects. Ensure the material meets the appropriate specifications indicated below.

B. Rail.

1. Use 115 lb Standard Strength Continuous Welded Rail conforming to the requirements of American Railway Engineering and Maintenance of Way Association (AREMA) Chapter 4 “Rail”.

2. The Contractor will furnish the necessary joint bars, anchors, spikes, bolts, nuts, securements, and any other materials necessary for the rail installation. In the event any existing rail should break during tie removal, installation, surfacing, or any other portion of the project; the Engineer will determine whether the rail should be replaced or spliced by welding or the installation of joint bars. The Contractor will furnish the necessary joint bars, anchors, spikes, bolts, nuts, securements, welding, and any other materials necessary for the rail installation of the same rail section size as the break.
C. Track Crossties.

1. Timber track crossties required by the plans shall conform to the current UPRR Standard Drawings or AREMA Specifications, Chapter 30, Ties” as approved by the Engineer. The track crossties shall be new Oak, Douglas Fir, or Mixed Hardwood Wood ties, 7 inches x 9 inches x 8 feet-6 inches minimum AREMA-7 inch Grade or as shown in the plans.

2. Timber crossties shall be treated according to the American Wood Preservers Association Standards, based on 50 percent creosote and 50 percent coal tar solution with a minimum preservative retention of 8 pounds per cubic foot of Wood. Treatment shall conform to AREMA Manual Chapter 3, Parts 6, 7, 8, and 9 for applicable timber species. Treat field cuts or drilled holes with a compatible preservative before installing, spiking, or bolting. No boultonizing of ties will be permitted.

3. Timber crossties shall be seasoned, dimensioned and prebored prior to treatment and treated in accordance with AWPA Standard C6 “Crossties and Switch Ties - Preservative Treatment by Pressure Processes”, or ASTM D 1760 “Standard Specification for Pressure Treatment of Timber Products”. All ties shall be fitted with anti-splitting devices, regardless of their tendency to split.

4. Timber crossties shall be inspected and certified by an approved commercial testing laboratory stating that the ties to be used meet the specifications in accordance with AWPA Standard M2 “Standard for Inspection of Treated Wood Products”. Results of test and inspections shall be furnished to the Engineer. Ties may be rejected for excessive checking, warp, twist, or other defects as determined by the Engineer.

D. Tie Plates for Timber Ties.

Where timber ties are required by the plans, hot worked, high carbon, double shoulder, flat bottom tie plates shall conform to the AREMA specifications, Chapter 5, “Track”, and Union Pacific Standard Drawing 0442D, “Double Shoulder Tie Plate for 6” Base Rail 1:40 Cant”, with punched A-6 square spike holes. Where necessary on curves, use Curve Block Assemblies in accordance with Union Pacific Railroad Standard Drawing 262000, “Curve Block Assembly”.

E. Track Spikes and Coach Screws.

Where required by the plans, supply new high carbon steel track spikes conforming to the requirements of Union Pacific Standard Drawing 130005, “Cut Spike for Wood Ties” and coach screws conforming to the requirements of Union Pacific Standard Drawing 130800, “Rectangular Head Timber Coach Screw”. Track spikes and coach screws must meet the requirements of AREMA Chapter 5 “Track”. Deliver track spikes to the Job Site in Engineer-approved containers (kegs). Install in accordance with Federal Railroad Administration (FRA) Standards.
F. Joint Bars and Track Bolts.

Use joint bars, and track bolts conforming to the requirements of Union Pacific Standard Drawings 0904F, “Miscellaneous Joint Bars”, 0948B, “Compromise Joints”, and/or 0950H, “Track Bolt” and the requirements of AREMA Chapter 4, Part 2, Section 2.8, “Specifications for Quenched Carbon-Steel Joint Bars, Microalloyed Joint Bars, and Forged Compromise Joint Bars”. Compromise joint bars must be new and of the size, shape, and punch necessary to fit the rail sizes and sections being joined. Only factory designed and produced (forged or cast) compromise joint bars may be used to join rails of different sizes and/or sections.

G. Rail Anchors.

Use Grip type rail anchors conforming to the requirements of Union Pacific Standard Drawing 0457A, “Heavy Duty Rail Anchor”. Provide and Install in accordance with AREMA Chapter 5, Section 7 “Rail Anchors”.

H. Derails.

Supply left hand or right hand hinge derails as necessary of the appropriate size for the particular rail installation location shown in the plans.

I. Subballast.

1. Subballast shall consist of a foundation coarse for a typical railroad roadbed and shall be composed of crushed limestone or crushed concrete materials meeting Union Pacific Railroad Requirements and as approved by the Engineer. However, only 100% crushed material from oversized quarried rock or crushed concrete as the source will be accepted. Aggregate retained on a No. 10 sieve must consist of hard, durable particles or fragments of stone, gravel, sand or slag. Materials that break up when alternately frozen and thawed or wetted and dried are not permitted. Aggregate must not have a percentage of wear of more than 50 percent, by the Los Angeles abrasion test. A higher or lower percentage of wear may be specified by the Engineer, depending on the material available.

2. Subballast shall be in accordance with Item 247 “Flexible Base”, Type A, Grade 1 except as follows:

3. Gradations. Unless otherwise indicated on the plans, provide subballast consisting of gradations as set forth in Table 1.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>2”</th>
<th>1”</th>
<th>3/4”</th>
<th>No. 10</th>
<th>No. 40</th>
<th>No. 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Passing (optimum)</td>
<td>100</td>
<td>95</td>
<td>67</td>
<td>38</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>% Passing (permissible)</td>
<td>100</td>
<td>90-100</td>
<td>50-84</td>
<td>26-50</td>
<td>12-30</td>
<td>0-10</td>
</tr>
</tbody>
</table>
J. Ballast.

1. Supply crushed granite stone ballast in conformance to AREMA Chapter 1, Part 2. Ballast shall be hard, dense, and of angular particle structure providing sharp corners and cubical fragments, free of deleterious materials. Provide ballast material that has a high resistance to temperature changes, chemical attack, high electrical resistance, low absorption properties and free of cementing characteristics.

Submit Certificates of Compliance for all ballast materials furnished under this contract for review and approval by the Engineer prior to transporting ballast to the Job Site.

2. Property Requirements.

a. Physical Analysis.

   (1) **Method of Sampling.** Secure field samples in accordance with ASTM D-75. Reduce test samples from field samples in accordance with ASTM C 702.

   (2) **Sieve Analysis.** Perform sieve analysis in accordance with ASTM C 136. All sieve analyses require wet sieving.

   (3) **Material Finer than No. 200 Sieve.** Test material finer than a No. 200 Sieve in accordance with ASTM C 117. The proportion of material finer than a No. 200 Sieve must be 1.0% or less.

   (4) **Bulk Specific Gravity and Absorption.** Determine bulk specific gravity and percentage of absorption in accordance with ASTM C 127. Specific gravity shall conform to AREMA standards at 2.6 minimum.

   (5) **Percentage of Clay Lumps and Friable Particles.** Determine percentage of clay lumps and friable particles in accordance with ASTM C 142. The proportion of clay lumps and friable particles must be 0.5% or less.

   (6) **Resistance to Degradation.** Determine the resistance to degradation in accordance with ASTM C 131 or C 535 as follows: test materials having gradations containing particles retained on the 1” sieve by ASTM C 535, test materials having gradations of 100 percent passing the 1” sieve by ASTM C 131.

   (7) **Sodium Sulfate Soundness.** Sodium sulfate soundness tests shall be made in accordance with ASTM C 88.

   (8) **Unit Weight.** The weight per cubic foot shall be determined in accordance with ASTM C 29.
(9) **Percentage of Flat and/or Elongated Particles.** Percent of flat and/or elongated particles shall be determined in accordance with U.S. Army Corps of Engineers Test CRD-C-119. The proportion of flat and/or elongated particles must be 5% or less.

(10) **Plasticity Index.** The plastic limit, liquid limit and plasticity index shall be determined in accordance with ASTM D 423 and D 424. Each sample shall be tested in two ways; one test shall test the fines generated by the Los Angeles Machine, and the other test shall test the fines contained in the total sample. The portions of these samples generated by the Los Angeles Machine, and passing the #40 sieve shall be non-plastic (NP).

The portion of the total sample passing the #40 sieve shall have a liquid limit of not more than 25, and plasticity index of not more than 6.

b. **Chemical Analysis.**

(1) No specific chemical analysis is considered essential for the evaluation of granite, trap rocks, or quartzite type materials, provided the materials are defined by applicable method. For carbonate materials, dolomitic limestone is defined as having a magnesium carbonate content of 28 to 36 percent. Those carbonate materials indicating magnesium carbonate values above 36 percent shall be defined dolomite. Carbonate material indicating magnesium carbonate values below 28 percent shall be defined as limestone. Chemical analysis will be used in selecting or evaluating plant sites. Magnesium carbonate content of carbonate materials shall be tested and defined in accordance with ASTM C 25.

(2) The blending, stockpiling and other production handling operations shall be managed by the producer to minimize segregation of the finished product. Stockpiling operations shall minimize, as practical, breakage or excessive fall in stockpiling operations and movement of wheeled or tracked machines over stockpile material shall be limited. Processed ballast shall be washed and/or rescreened as necessary to remove fine particle contamination as defined by the specification.

(3) The manufacturer shall ensure the fitness of the cars for loading of prepared materials, arranging to clean cars of deleterious materials, plug leaks, close doors, and other like operations as necessary.

(4) TxDOT or its representative reserve the right to visit the producers facility during usual business hours unscheduled for the following purpose of examining the production facility and methods.

(5) Prior to installation, the supplier should provide the Engineer with certified results of ballast quality and gradation as conducted by a testing laboratory acceptable to the Engineer. The supplier shall receive approval from the Engineer for the testing laboratory prior to performing tests.
Table 2
Ballast Gradations

<table>
<thead>
<tr>
<th>Square Opening</th>
<th>2-1/2”</th>
<th>2”</th>
<th>1-1/2”</th>
<th>1”</th>
<th>¼”</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Passing (optimum)</td>
<td>100</td>
<td>95</td>
<td>60</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>% Passing (permissible.)</td>
<td>100</td>
<td>90-100</td>
<td>60-90</td>
<td>10 - 35</td>
<td>0 - 10</td>
</tr>
</tbody>
</table>

2. Equipment.

All on-track equipment used in connection with the project shall comply with Federal Railroad Administration regulations contained in 49 CFR 214 Subpart D, Roadway Maintenance Machine Safety.

3. Construction or Work Methods.

A. General Requirements.

1. Before starting work, the Contractor shall fully inform the Engineer of the construction methods he proposes to use, the adequacy of which shall be subject to the approval of the Engineer.

2. Concurrence on the part of the Engineer of any proposed construction methods or approval of equipment does not relieve the Contractor of the responsibility for the safety or correctness of the methods, the adequacy of his equipment or from carrying out the work in full accordance with the contract.

3. The following codes, regulations, reference standards, and specifications apply to work included in this section:

   a. AREMA, Manual for Railway Engineering, Chapter 1 “Roadway and Ballast”, Chapter 4 “Rail” and Chapter 5 “Track”.

   b. Applicable referenced ASTM Specifications

   c. Track Safety Standards of the Federal Railroad Administration (FRA).


   e. Standard drawings provided by the Engineer.

4. Any Items not covered specifically herein shall be in accordance with AREMA Standards and recommended practices subject to the approval of the Engineer. Construction must adhere to all UPRR Standard Plans, Project Plans, and FRA requirements.

5. The following review/approval milestones will be monitored during the project:

   a. **Grading.** Reviewed and approved prior to placement of track panels.
b. **Ballasted Trackwork.** Reviewed, approved and coordinate the track construction to assure compliance with TxDOT requirements.

6. All welding shall be performed by UPRR.

   All workers employed in the project or supervising the project shall have been certified according to Federal Railroad Administration (FRA) regulations contained in 49 CFR 213, “Track Safety Standards”; 49 CFR 214, “Railroad Workplace Safety”; 49 CFR 217, “Railroad Operating Rules”; 49 CFR 218, “Railroad Operating Practices”; 49 CFR 237, “Bridge Safety Standards”; and all other FRA regulations, rules, and orders as applicable. All workers employed in the project must comply with the workplace safety requirements of the UPRR.

7. When the Contractor desires to occupy any space above the top of rail within the horizontal distance of 10 ft. either side of the centerline of any track, measured at right angles to the track centerline, it will be necessary that he obtain authority from the Railroad with at least 24 hr. advance notice. The authority will be requested and granted according to the Railroad operating rules, and the Contractor will fully comply with all instructions issued by the Railroad in regards to occupancy of the track. If, in the judgment of the Railroad, flagmen are required, they will be furnished by the Railroad as provided in accordance with the Railroad Force Account agreement.

8. The Contractor shall require his employees, agents, or subcontractors to comply with any and all instructions or warnings of the Railroad’s flagmen as to clearance for the passage of trains.

9. All scaffolding, materials, and equipment used in the Contractor’s operations shall, at all times, be maintained at a clearance from the tracks as approved by the Engineer, except when working within the limits of authority granted to occupy the tracks.

10. Unless otherwise specified by the plans or directed by the Engineer, all removed materials shall become the property of the Contractor.

   All removed materials and debris must be removed from the railroad right of way and TxDOT property, and disposed of in a manner approved by the Engineer.

11. The replacement of railroad ties, ballast distribution, surfacing work, and associated mechanical operations will be performed using standard on-track equipment. All work must be performed using on-track equipment whenever possible.

12. Designated materials storage areas and mobilization areas must have SW3P plans implemented as shown in the plans before off-track equipment operates in those areas.
B. **Subgrade.**

   Railroad subgrade shall be constructed in a firm and unyielding manner and compacted to a minimum density of 95% modified proctor, regardless of the depth, except that all fill within 100 feet of bridge ends and 20 feet of outer edges of culverts shall be compacted to 100%. Moisture content of fill material shall be adjusted to within -3% and +3% of optimum moisture content prior to compaction. Subgrade stabilization shall be in accordance with TxDOT’s Standard Specification Item 260, “Lime Treatment (Road-Mixed)”, to the lines, grades, and thickness as shown on the plans. If geotechnical report suggests other stabilization methods, the alternative method will be considered.

C. **Trackwork.**

   1. All timber ties required by the plans shall be spaced uniformly at 19.5 inches center-to-center of ties (24 crossties per 39 feet of rail), and laid with heart side down, except when ties are not true, the bow side shall be laid upward.

   2. Ties shall be placed and maintained square to the line of rail on straight track and radially on curves. The right-hand end of ties (direction determined by facing away from initial point of the line) shall be lined parallel with the rail.

   3. Tie hooks, tongs or tie crane shall be used in handling ties, to avoid damage to the ties. New treated ties must not be adzed without authority from the Engineer. If adzing is authorized, an approved preservative shall be applied to the adzed surface.

   4. Tie plates must set squarely on the tie and shall be of the dimensions to fit the base of rail used. All tracks shall be fully tie plated and spiked in accordance with proper criteria. Tie plates shall be centered and have full bearing on ties. Rail shall be properly seated in the tie plates and not riding on the shoulder of the tie plate. Tie plates and rail shall be cleaned before being laid. Tie plates must be placed with slope of plate towards center of track.

   5. All rail shall be gauged when laid and when replacement ties are spiked. The standard gauge is 4 feet 8-1/2 inches between points 5/8 inch below the top of rail on the two inside edges of the rail. All gauges used by the Contractor will be checked by the Engineer. If found to be more than 1/16 inch in variance from the master gauge, those gauges shall immediately be removed from the job.

   6. Track bolts, with nuts, which have wrench turn fittings, shall be used where required. Spring washers shall be the correct size to fit the bolt. All bolts will be tightened with an approved bolt machine or torque wrench to a torque of 650 foot-pounds. Bolting shall be started with the center bolts working toward the ends and all nuts shall be turned up tight with bolt heads staggered inside and outside of the rail alternately.

   7. All track spikes for timber ties are to be the proper size. Tie plates shall be adjusted as necessary so that the spikes can be driven into the spike holes. Care shall be taken to make sure that the base of rail is not riding on the shoulder of the tie plate.
when spikes are driven. Spikes shall be started, driven vertically, and square when driven into the spike holes of the tie plate. Crooked or bent spikes shall be removed and replaced. Straightening with maul of spikes started crooked will not be permitted. When spikes are pulled, the hole shall be plugged with a standard treated tie plug. In driving the spikes, the last few blows of the hammers shall be such that the spike head will not be bent or broken, and the hammer shall not be permitted to strike directly upon the rail.

8. Timber ties shall be spiked through the tie plates with three rail-holding spikes in each tie plate on curved track. The rail gauge side of the tie plate shall be spiked through the tie plates with two rail-holding spikes on curved track. The field side of the tie plate shall be spiked through the tie plates with on rail-holding spike on curved track.

9. Rail shall be spiked to timber ties with not less than four spikes per tie, one spike in contact with gauge side and one in contact with field side of each rail. Spikes shall be staggered so that the outside spikes shall be on the same side of the tie and the inside spikes on the opposite side. Ties shall be spiked through the tie plates with two rail holding spikes in each tie plate on tangent track; the rail gauge side and rail field side spikes in each tie plate being driven diagonally across from each other.

10. Rail shall not be struck with maul or heavy tool when spiking, gauging or lining.

11. Immediately after completion of track surfacing, spikes on timber ties shall be settled in place with the underside of the head of the spike contacting the top of base of rail with a minimum of pressure.

12. Tie plugs, where required, shall fill holes on timber ties from which spikes are drawn. The plugs shall conform to the current AREMA Specifications for Tie Plugs, and are to be treated with a Creosote oil solution.

13. Grip type rail anchors shall be applied in the approved manner for the particular type of anchor furnished and as directed by the Engineer. Rail anchors shall be installed after the ballast operation and the track is raised, lined and ties re-spaced or as directed by the Engineer. On ballast deck bridges and within 100 feet of a ballast deck bridge, all ties shall be fully box-anchored. All ties shall be fully boxed anchored within 200 feet of an open deck bridge.

14. Under no circumstances shall rail anchors be installed on ties under or immediately adjacent to rail joints, nor shall anchors be installed on one side of the tie under one rail and on the opposite side of the tie under the other rail.

15. Care shall be taken to avoid overdriving or damaging anchors. Anchors shall not be driven along the rail. Sufficient rail anchors shall be applied and maintained to effectively control longitudinal rail movement. Anchors shall be installed on the same side(s) of the tie on both rails. Anchors must not be applied to one rail only, but must be applied to both rails in a uniform pattern. For CWR, anchors must not be applied on the opposite rail directly across from the joints or straps.
16. Rail anchors which are dislodged or removed during work, including surfacing, are to be replaced in box pattern. To avoid tie skewing, the anchors must be applied against the same tie on opposite rails. Rail anchors when applied must have full bearing against a sound tie.

17. Track shall be box anchored every other tie. Box anchoring is defined as installing opposing anchors to bear against each side of the tie on each rail for a total of four anchors per cross tie.

18. When laying rail in tangent track, the right-hand rail (direction determined by facing away from initial point of line), shall be laid first and lined to the staked track alignment. After each right-hand rail is lined and spiked, the left-hand rail shall be laid to accurate gauge and spiked to gauge every third tie with gauge spikes fully driven (except through joint areas) and before the track gauges are removed.

The left hand rail shall be laid into the track, and rail joint bolts installed (if used) before spiking to gauge, and before gauge spikes are driven. The left-hand rail shall be held in place snugly against the track gauges with lining bars.

19. When laying up to existing track tie-in locations, a combination of rails less than standard length may be used to avoid cutting, if practicable. Rail saws shall be used when necessary to cut rail. The use of a torch or track chisel will not be permitted. All necessary new bolt holes shall be marked, using an approved rail drilling template and the drilling operation shall be carefully performed. Both cutting and drilling shall utilize proper lubrication. Cut rails shall be drilled and fully bolted. There shall be no extra holes in the rail. The burred edges on bolt holes drilled in the field shall be carefully removed by grinding. When necessary to cut secondhand rail, the cut end shall be beveled. When necessary to cut new standard carbon rail, the cut end shall be end hardened and beveled in accordance with Railroad Specifications.

20. The Contractor is responsible for rail delivery to the site. If the Contractor plans to deliver by rail, delivery shall be coordinated with UPRR and TxDOT. The Contractor shall unload the CWR trains as directed by the Engineer. The Contractor shall provide for the handling and laying of welded rail strings in such a manner as to avoid damage to the roadbed, sub-ballast and rail strings. Care must be taken to avoid twisting or damaging the welded rail strings. The speed of unloading welded rail strings shall not exceed 4 MPH. Guide rollers shall be placed in pairs about every 39 feet for the entire length of each string at the unloading end of the rail train. This will carry the welded strings from the cars in a gradual manner, not deforming the rail.

21. When unloading CWR, joint straps shall be removed, rail ends by-passed when necessary and wooden blocks or shims shall be placed between rail ends to accommodate thermal expansion of rail. CWR must not be unloaded where it would obstruct a grade crossing and must either be cut or buried through it.

22. The desired laying temperature of the rail is 115 degrees Fahrenheit. The Contractor shall record the temperature of each rail laid. Rail temperature measurements shall be taken on the base of rail on the side away from the sun.
23. When it is not possible to lay rail at the desired laying temperature, the Contractor shall make the necessary adjustment at a later date. The exact procedure used to adjust the rail temperature must be approved by the Engineer.

24. The Contractor should apply all rail anchors immediately behind the laying of rail. Ballast must be unloaded and all cribs filled as soon as rail anchors have been applied. The track should be surfaced and tamped as soon as possible after the laying of the rail.

25. De-stressing rail must conform with UPRR’s Engineering Track Maintenance Field Manual, Sections 4.4, 4.4.1, 4.4.2, 4.4.3, and 4.4.4. The Contractor shall supply all field weld kit, molds, bentonite, sand, paste, etc for UPRR crews to use for cutovers. Welds will be Boute one-shot.

26. All rail joints shall be welded unless shown otherwise in the plans or as directed by the Engineer.

27. Rail not in CWR locations shall be staggered according to the UPRR Maintenance of Way Rules or at the direction of the Engineer, except when balancing the joints for switch leads, road crossings, bridge ends and signal circuits, as well as in secondary tracks where use of prefabricated track panels is authorized. To reduce the resonant reaction, rail joints shall be staggered at 12 feet from the nearest joint on the opposite rail. To avoid unnecessary rail cutting in providing staggered joints, a two-foot tolerance will be permitted in either direction. When laying rail, joints must not be located in road crossings, bridge decks, or on ends of bridges.

28. At the time rail is being laid, joint bars shall be applied as shown in the plans, placing one bolt at each end of rail in the joint bar. Before the bolts are tightened, and after the track has been surfaced and lined, the joint bars shall be removed and the joint bars as well as the rail ends within the limits of the joint bar area shall be thoroughly cleaned with a wire brush to remove all rust, dirt and mill scale. The contact surface of the joint bars shall then be lubricated using a liberal amount of lubricant as approved by the Engineer. After application of lubricant, the joint bars are to be reapplied; taking care to see that no dirt, gravel or other foreign material is permitted to get into the lubricated area.

29. Rail expansion shims must be used to establish the proper opening between rails. Expansion shims must not be used at the ends of strings when laying CWR. At joints, the opening between rail ends must be as shown in the following table:

**For 39 ft Rail:**

<table>
<thead>
<tr>
<th>Rail Temperature</th>
<th>Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 25°F</td>
<td>½”</td>
</tr>
<tr>
<td>51°F to 75°F</td>
<td>1/8”</td>
</tr>
<tr>
<td>Above 75°F</td>
<td>1/8” every other joint</td>
</tr>
</tbody>
</table>
For 78 ft Rail:

<table>
<thead>
<tr>
<th>Rail Temperature</th>
<th>Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 25° F</td>
<td>½”</td>
</tr>
<tr>
<td>25° F to 50° F</td>
<td>3/8”</td>
</tr>
<tr>
<td>51° F to 75° F</td>
<td>1/4”</td>
</tr>
<tr>
<td>75° F to 100° F</td>
<td>1/8”</td>
</tr>
<tr>
<td>Above 100° F</td>
<td>1/8” every other joint</td>
</tr>
</tbody>
</table>

30. Rail thermometers of the approved type must be used to determine the rail temperature.

31. The application of lubricants and general maintenance of rail joints in jointed-rail territory are necessary to ensure that the rail is working properly to accommodate rail expansion and contraction resulting from temperature variations, and prevent the occurrence of track buckles or sun kinks and pull-aparts. Joint bars and rail ends must be cleaned and lubricated with an approved joint lubricant when installing joint bars. Joints must be installed with the full number of bolts and the nuts tightened to the proper tension.

32. When laying new or second hand jointed rail, or constructing new track using jointed rail, the contact surface of the rail ends and joint bars shall be lubricated using a liberal amount of approved lubricant.

33. To maintain free rail movement in existing joint rail territory, joint area must be thoroughly lubricated along all marring surfaces and into the interior of the bars, using a Hudson sprayer or equivalent. Frozen joint conditions shall be corrected by loosening the bolts and breaking the bars free from the rail to permit proper oiling and ensure free rail movement within the joint.

34. Where joint bars are required, the joint bars must be installed with the full number of bolts and the nuts tightened to the proper tension. Joint bars shall be either 4-hole, 24 in. or 6-hole, 36 in. joint bars fully bolted with lock washers; elliptically punched for oval necked bolts. Bolts shall be inserted into the joint bars from alternating sides of the rail, seated in the elliptical bolt holes, so that bolt heads are located next to the nut of the bolt in the adjoining bolt hole. Rail joints shall be applied so that bars are not cocked between base and head of rail. Bars are to be properly seated in rail.

35. In the event any existing joint bars should crack or break during tie replacements, ballasting, surfacing, or any other portion of the project; the contractor will replace the defective joint bars with bars of the same size. Replacement of such broken or cracked bars will be subsidiary to the other trackwork and no separate payment will be made.

36. Mismatched Rail. Where the running surface of rails at joints are mismatched by more than one eighth (1/8) inch, the Contractor shall build up, grind and profile the rail per Union Pacific Railroad Company Instructions Governing the Inspection,
Welding and Heat Treating of Track Components. A rail of more section shall not be ground down to match the lesser, but the lesser built up.

D. **Ballasting and Surfacing.**

1. Furnishing, delivery and unloading of ballast to project site is the Contractor’s responsibility. Care must be taken to insure that track and walkways are safe for movement.

2. Haul and place ballast material in such a way that damage to adjacent areas is avoided.

3. Ballast shall be uniformly distributed and the track raised, lined, surfaced, and tamped, with the finished surface of the ballast dressed in accordance with the approved drawings or the Engineer’s instructions.

4. The track shall be laid and connected before ballast is spread and raised. It will not be permissible to operate over long stretches of track before it has been raised and surfaced unless approved by the Engineer. Immediately prior to unloading ballast for the final raise, the track shall be lined as close as practical to the stakes and all ties straightened and re-spaced as necessary. Ballast shall then be spread evenly and leveled to the required section, taking care to assure that subgrade material is not intermixed with the ballast.

E. **Removing Ballasted Track**

1. As construction progresses for each interior bent, coordinate with UPRR for the removal of existing track. Track sections will be cut by UPRR. Remove cut track panels, complete with ties and ballast as necessary to complete demolition of existing bents and construction of proposed bents.

2. Install new track panels and ballast after proposed bent construction is complete. UPRR will weld new rail to existing rail.

F. **Salvaging.** Unless otherwise specified, all removed materials shall become the property of the contractor.

4. **Measurement.**

A. Ballasted Track Construction Timber Ties will be measured by the centerline track foot.

B. Ballasted Track Removal will be measured by the centerline track foot.

C. Subballast will be measured by the cubic yard, complete in place.

5. **Payment.**

A. Payment for ballasted track construction concrete or timber ties will be made at the unit price bid for "Ballasted Track Construction Concrete Ties (Track)" or “Ballasted Track Construction Timber Ties (Track)” and “Ballasted Track Construction (Track Removal)".
This price shall be full compensation for furnishing, transportation, storage, and installation of all materials including rail, crossties, ballast, securement, derailers; anchors; furnishing and placing ballast; for the removal and transportation of all materials used in Ballasted Track Construction (timber ties) and Ballasted Track Removal, and for all other materials, tools, equipment and incidentals necessary to complete the work.

B. Payment for subballast will be at the unit price bid for “Subballast”. This price shall be full compensation for furnishing, hauling, placing, sprinkling, rolling the subballast and for all other materials, tools, equipment and incidentals necessary to complete the work.