SPECIAL SPECIFICATION
4413
Ballasted Track Rehabilitation

1. **Description.** This Item shall govern for the rehabilitation of ballasted track on constructed trackbed. Ballasted track rehabilitation includes, but is not limited to, placing ballast; distributing, replacing, and lining ties; installing and field welding running rail; raising and lining track; installing vehicular grade crossings and other incidentals as specified herein. Track on ballasted deck bridges is also included.

2. **Materials.**

   **A. Rail.**
   
   Use Type RE 112, 119, 115, or 136 lb. Standard Strength Rail supplied by the Contractor or Type RE 136 lb. Standard Strength Rail held in inventory and supplied by TxDOT as directed by the Engineer and conforming to the requirements of American Railway Engineering and Maintenance of Way Association (AREMA) Chapter 4 “Rail” for replacing rail as necessary in plans and in highway-rail grade crossing improvements included in the plans. In the event any 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 and what size rail should be used or if broken rail should be spliced by installation of joint bars. The Contractor will furnish transportation of the replacement rail or the necessary joint bars and bolts of the same rail section size as the break.

   **B. Track Crossties.**
   
   Track crossties held in inventory are being supplied by Texas Pacifico Transportation, Ltd. (TXPF) and conform to the current American Railway Engineering & Maintenance of Way Association (AREMA) Specifications, Chapter 30, “Ties”. Inventory cross ties to be used are stored at designated locations along the rail line. Additional track crossties necessary to complete the project in accordance with the plans and directed by the Engineer shall conform to the current American Railway Engineering & Maintenance of Way Association (AREMA) Specifications, Chapter 30, “Ties” and shall be supplied by the Contractor. The track crossties shall be new Oak or Douglas Fir Wood ties, 7 in. x 9 in. x 8 ft. 6 in. minimum AREMA Grade -7 in.

   **C. Tie Plates.**
   
   Hot worked, high carbon, double shoulder, flat bottom tie plates shall be 7.5 in. x 11 in. or the largest size available for the rail size with 1:40 cant and conform to the
AREMA specifications, Chapter 5, “Track”, with punched A-8 square spike holes shall be used to replace any broken or missing tie plates.

D. Track Spikes.

Supply new high carbon steel track spikes conforming to the requirements of AREMA Chapter 5 “Track”. Deliver track spikes to the Job Site in Engineer approved containers (kegs). Install in accordance with instructions herein and Federal Railroad Administration (FRA) Standards.

E. Joint Bars, Compromise Joint Bars and Track Bolts.

Use joint bars, compromise joint bars and track bolts conforming to 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 or sections.

F. Rail Anchors.

Use Grip type rail anchors conforming to the requirements AREMA Chapter 5, Section 7 “Rail Anchors”.

G. Subballast.

Subballast shall consist of a foundation coarse for a typical highway-railroad grade crossing roadbed and shall be composed of uncrushed or crushed aggregates of either caliche, argillaceous limestone, conglomerate, gravel, crushed slag or other granular materials as approved by the Engineer. 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 %, by the Los Angeles abrasion test. A higher or lower percentage of wear may be specified by the Engineer, depending on the material available.

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>Percent Passing (optimum)</td>
<td>100</td>
<td>95</td>
<td>67</td>
<td>38</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Percent 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>

H. Ballast.

1. Supply crushed stone ballast that is hard, dense, 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 before transporting ballast to the job site.

2. Ballast Classifications.

Ballast shall be main line quality, AREMA Standard 4A Gradation. A variety of materials may be processed into the railroad ballast. The following general classifications and the accompanying definitions list the most common materials. Detailed examination of the individual materials will be made to determine the specific mineralogical composition. No crushed gravel is allowed.

a. Granite. Granite is a plutonic rock with an even texture and consisting primarily of feldspar and quartz.

b. Trap Rock. Trap rock is any dark-colored, fine-grained non-granitic hypabyssal or extrusive rock.

c. Quartzite. Quartzite is a granoblastic, metamorphic rock consisting mainly of quartz and formed by recrystallization or sandstone or chert by either regional or thermal metamorphism. Quartzite may also be very hard but unmetamorphosed sandstone consisting chiefly of quartz grains with secondary silica that the rock breaks across or through the grains rather than around them.

d. Carbonate Rocks. Carbonate rocks are sedimentary rocks consisting primarily of carbonate materials such as limestone and dolomite.

e. Slags. Slags are materials formed during the metal-making process by fusion fluxstones, coke and other metallic particles.

3. 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.

   (4) Bulk Specific Gravity and Absorption. Determine bulk specific gravity and percentage of absorption in accordance with ASTM C 127. Minimum specific gravity shall be 2.4 and conform to AREMA standards.

   (5) Percentage of Clay Lumps and Friable Particles. Determine percentage of clay lumps and friable particles in accordance with ASTM C 142.
(6) **Resistance to Degradation.** Determine the resistance to degradation in accordance with ASTM C 131 or C 535 as follows: test materials with gradations containing particles retained on the 1” sieve by ASTM C 535, test materials with gradations of 100 % passing the 1” sieve by ASTM C 131. Allowable wear based on the Los Angeles Abrasion Test shall be no more than 35 percent per ASTM C-535.

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

(8) **Unit Weight.** The weight per cubic ft. shall be determined in accordance with ASTM C 29.

(9) **Percentage of Flat or Elongated Particles.** Percent of flat or elongated particles shall be determined in accordance with U.S. Army Corps of Engineers Test CRD-C-119.

(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 no. 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 with a magnesium carbonate content of 28 to 36 %. Those carbonate materials indicating magnesium carbonate values above 36 % shall be defined dolomite. Carbonate material indicating magnesium carbonate values below 28 % 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. Slags shall be evaluated for use in accordance with DMS-11000.

(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 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) 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 before performing tests.

c. **Gradations.** Gradation analysis shall be determined in accordance with AREMA Standards 2.4.4 “Gradations” with laboratory sieves having square openings conforming to ASTM specification E 11. Gradation Numbers 24, 25, 3, 4A, and 4 are acceptable in accordance with AREMA standards for main line ballast materials.

3. **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.

4. **Construction or Work Methods.**

   A. **General Requirements.**

   1. 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).

      d. Standard Drawings supplied by the Engineer.

      e. Special Specifications contained herein.

   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 TxDOT Standard Plans and FRA requirements.
5. The following review/approval milestones will be monitored during the project:
   
a. **Grading.** Reviewed and approved before placement of subballast.
   
b. **Ballasted Trackwork.** Review, approve and coordinate the track rehabilitation and construction to assure compliance with TxDOT requirements.

6. All workers employed in the project or supervising the project shall have been certified according to Federal Railroad Administration regulations contained in 49 CFR 214, Subpart C, Roadway Worker Protection.

7. When the Contractor desires to occupy any space above the top of rail within the horizontal distance of 10 ft. of 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 Texas Pacifico Transportation (TXPF) with at least 24 hr. advance notice. The authority will be requested and granted according to TXPF operating rules, and the Contractor will fully comply with all instructions issued by TXPF in regards to occupancy of the track. If, in the judgment of TXPF, flagmen are required, they will be furnished at TXPF’s expense.

8. The Contractor shall require his employees, agents, or subcontractors to comply with any and all instructions or warnings of TXPF’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. TxDOT’s acceptance of trackage and its appurtenances which have been built shall be based on the Engineer’s written statement that construction and construction materials have met TxDOT standards.

11. Unless otherwise specified in the plans or as directed by the Engineer, all removed materials shall become the property of the contractor. All removed materials and debris must be removed from TxDOT property and disposed of in a manner approved by the Engineer.

**B. Trackwork.**

1. Defective ties that will be replaced shall be marked by the Engineer or his designee before the commencement of work. The contractor will remove marked ties and replace them with new ties, laid with the heartwood face down. Sequentially installed ties shall be placed on 19.5 in. centers in main tracks. Individually replaced ties shall be centered in the gap and not skewed. All ties shall be laid at right angles to the rail with the ends lined uniformly.

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. 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.

3. Tie plates that are removed from marked ties shall be reapplied to the replacement tie, unless broken. 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. All broken tie plates will be replaced and held for the Engineer’s inspection.

4. All rail shall be gauged when laid and when replacement ties are spiked. The standard gauge is 4 ft. 8½ in. between points 5/8 in. 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 in. in variance from the master gauge, those gauges shall immediately be removed from the job.

5. 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 ft.-lbs. 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.

6. All track spikes are to be the proper size. 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.

7. All rail shall be spiked to 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.

8. 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 rail field side of the tie plate shall be spiked through the tie plates with one rail-holding spike on curved track.

9. Rail shall not be struck with maul or heavy tool when spiking, gauging or lining.
10. Immediately after completion of track surfacing, spikes 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.

11. Tie plugs, where required, shall fill holes 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.

12. Rail anchors shall be re-applied in box pattern to all replacement ties where the removed ties were equipped with rail anchors. Rail anchors shall be installed after the ballast operation and the track is raised, lined and ties re-spaced. 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.

13. Care shall be taken to avoid overdriving or damaging anchors. Anchors shall not be driven along the rail. Anchors shall be installed on the same sides 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.

14. Rail saws shall be used when necessary to cut rail. The use of a torch or track chisel shall 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 use 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.

15. All rail replaced in highway-rail grade crossings as included in the plans shall be welded as directed by the Engineer. Rails to be welded are to be cleaned and free of grease, oil, dirt, loose scale, and moisture to a minimum of 6” back from the rail ends. Rail ends are to show no steel defects, dents or porosity before welding. Rail ends are to be aligned and properly gapped to produce a weld which conforms to the alignment tolerances as directed by the Engineer. Vertical alignment shall provide for a flat running surface. Horizontal alignment shall be in such a manner that any difference in the width of rail heads occurs on the field side. All rails for electric-flash butt welds shall have the scale removed down to the bright metal in those end zones, top and bottom of the rails where the welding current-carrying electrodes contact on the head and base of the rail. All electric-flash butt welds shall be forged to point of refusal to further plastic deformation and have a minimum of ½”, with 5/8” as standard. If flashing on electric-flash butt welds is interrupted because of malfunction or other reason, with less than ½” of flashing distance remaining before upsetting, rails shall be reclamped in the machine and flashing initiated again. Rails for preheated rails shall be cleaned 2” on each side of the weld to remove scale and rust using a power actuated grinder, with abrasive wheel. Rail ends shall be preheated prior to welding to at least the temperature
designed by the welding manufacturer and for a sufficient time to ensure fusion of the weld metal to the rail ends without cracking of the rail or weld. All heavy grinding shall be performed on the hot metal, immediately following welding, by an approved rail grinder to prevent metallurgical damage. Finish grinding shall be carried out in a cooled down condition. Use a straightedge frequently while grinding to make sure that a good straight surface is produced.

16. The contractor shall record the number of crossties replaced between each whole-number milepost and provide a report of that information to the Engineer or his designee daily. When crossties are replaced between multiple mileposts the contractor shall record the number of crossties replaced between each individual whole-number milepost and provide a report of that information to the Engineer or his designee daily.

C. Joint Bars.

1. Joint bars that are removed shall be reapplied to the rail, unless broken. 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. All cracked or broken joint bars shall be replaced and held for the Engineer’s inspection.

2. 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.

3. 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.

4. 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.

D. Compromised Joints.

1. At permanent connections of different rail sections, compromise joints shall be used, and where practicable they shall not be located in crossings, main track curves, on open deck bridges, or in turnouts.
2. Compromise joints are required at all locations between the ends of rail of different weights or cross-section. The Contractor shall install all compromise joints as directed. Installation of compromise joints shall be considered incidental to track laying and no separate payment made therefore. Compromise joints shall not be placed within the limits of turnouts.

E. 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 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 before unloading ballast for the final raise, the track shall be lined as close as practical to the stakes and all ties straightened and respaced 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.

5. Ballast shall be spread and the track raised in a series of minimal or skim lifts to the approved elevation. No single lift shall be higher than 2 in. In raising track, if jacks or mechanical tampers are used they shall be so regulated as to avoid the binding or straining of joints. Sufficient sets of track jacks, if used, shall be simultaneously used and properly spaced to avoid sharp breaks or bends in the rail when the track is raised. Both rails shall be raised simultaneously and to proper cross level by utilizing standard track level boards with each set of track raising jacks (minimum three insertions).

6. Tamping is to be done by machines approved by the Engineer, in a manner that will produce uniform compaction. Tamping must not disturb subgrade or subballast. Thorough tamping under the rail set is required, and joint ties shall be tamped especially firm.

7. Tamping will not be permitted at the middle of a tie. Both ends of a tie shall be tamped simultaneously and tamping inside and outside the rail shall be done at the same time. All ties that are pulled loose in the track raising operation shall be placed in their proper position and properly tie-plated and fully spiked before tamping.

8. During each track raise, the track is to be tamped in such a manner that it will be uniform. During the raising and tamping operations, enough spot boards, track
level boards or other approved surfacing devices shall be constantly used to insure the correct surface and cross level in the track after tamping work is completed.

9. After ballasting is completed and the track is in correct gauge, surfaced and lined according to the Engineer’s directions, the ballast shall be trimmed neatly to the Engineer’s satisfaction, and any surplus material shall be spread evenly along the slopes of the ballast section. Dressing of the ballast by placing earth higher than the ballast toe and thus preventing proper drainage will not be permitted.

10. Bring the initial layer of compacted ballast to an elevation that will establish the track surface no higher than 2 in. below final base of rail grade as directed.

11. Ballast shall be inserted under ties in minimum or skim lifts. Cribs shall be filled with ballast to the top of tie.

12. Do not perform track surfacing unless the cribs are filled with ballast.

13. Special care must be taken when surfacing during hot weather to avoid track buckles.

14. Perform track surfacing by an approved method which prevents undue bending of the rail or straining of the joints.

15. Both rails shall be raised at one time and as uniformly as possible.

16. Ties that have been pulled loose shall be replaced to proper position and shall be fully tamped to proper elevation.

17. Ballast shall be kept clean and free of segregation during handling and placing operations.

18. Ballast shall be thoroughly regulated and level for the full length of each tie, end to end, and shall conform to the existing toe and slope past tie ends unless otherwise directed by the engineer. Centers are to be filled and regulated.

19. Tamping tools shall be inserted simultaneously on opposite sides of the same tie to prevent the tie from cocking, to insure that the ballast under the tie is completely compacted and that the rail is firmly seated on the tie plate.

20. When using power tampers in tandem, the machines should be of the same type and have identical tamping heads to produce uniform compaction.

21. Track shall be constructed to the alignment and grade prescribed by the plans. Deviation from established gauge and cross level shall not exceed ¾ in. per 62 ft. cord; deviation from profile grade and horizontal alignment shall not exceed ¾ in. All work shall be acceptable to the Engineer.

22. Tangent track shall be cross level.

23. No humps or sags will be accepted nor will irregularities in alignment, either on tangent or curved track that exceed previously defined deviations. Top of track ballast shall be dressed parallel with top of ties for the full length of each tie, end to
end, and shall conform to the existing toe and slope past tie ends unless otherwise directed by the engineer. Not less than 3 insertions of tamping tools shall be made.

24. Before final acceptance, all track shall be surfaced and accurately lined to remove all irregularities of cross level, surface or line caused by settlement or compaction of ballast following traffic loading. Any ties not giving full support to rails shall be retamped. Bolts shall be retightened, if necessary, to bring to full tension and spikes set down to full rail contact.

F. Vehicular Grade Crossing.

1. When crossties are replaced within vehicular grade crossings, finished crossings shall be constructed to the lines and grades indicated on the plans or as directed by the Engineer. Grade crossing surfaces shall be replaced in-kind or as directed by the Engineer.

2. Verify that the track has been installed in accordance with the specifications and approved for alignment and profile by the Engineer.

3. Temporary crossing surfaces shall be constructed where necessary as directed by the Engineer.

4. Verify that cross-ties are of correct length, position and spacing. Correct any deficiencies before proceeding with grade crossing installation.

5. When required by the plans, install filter fabric and perforated pipe extending to the indicated limits shown in accordance with the manufacturer's instructions. Filter fabric shall meet the requirements of Departmental Material Specification DMS-6200 “Filter Fabric”.

6. Protect filter fabrics from puncture throughout construction.

7. All welds within the crossing surface shall be ground flush on all sides of the rail except on the bottom of the base. The track must be properly lined, tamped, compacted, spiked, broomed and anchored before any crossing material is installed.

G. Turnouts.

1. The switch stands in the project area shall be fastened securely to headblocks and shall be square with the track. The targets shall be lined parallel with the rails of the major track when the switch is lined for the major track.

2. All switch ties shall be fully tie plated. Stock rails for turnouts shall be bent accurately and shall not be sprung into place.

3. All frogs, with the exception of self-guarded frogs, shall be protected by guardrails installed in accordance with the standard plans before any train is allowed to pass over them. Turnouts shall also include switchman walkways.

4. Turnouts shall have all special switch plates, frog and guard rail plates fully spiked.

5. Measurement.
A. Inventory Tie Removal and Replacement will be measured jointly by each individual tie removed and replaced as one unit.

B. Tie Removal and Replacement will be measured jointly by each individual tie removed and replaced as one unit.

C. Ballast Delivery and Regulating will be measured by the ton, complete in place.

D. Ballasted Track Surfacing and Alignment will be measured jointly by the mile.

E. Vehicular Grade Crossing will be measured by the foot for installation and removal, including all ties, rail, spikes, joints, bolts, securement, filter fabrics, drains, etc.

F. Replacement Rail installed will be measured by the foot for installation and removal.

G. Inventory Replacement Rail installed will be measured by the foot for installation and removal.

6. Payment.

The work performed and material furnished by this Item and measured as provided under "Measurement", will be paid for as follows:

A. Payment for inventory tie replacement will be made at the unit price bid for "Inventory Tie Removal and Replacement". This price shall be full compensation for transportation; storage; removal of defective ties, installation of all track work materials including replacement ties, securement, anchors, joint bars, all track work on bridges, track work at vehicular grade crossings; and for the removal of all materials used in Ballasted Track Construction and for all other materials, tools, equipment and incidentals necessary to complete the work.

B. Payment for contractor supplied tie replacement will be made at the unit price bid for "Tie Removal and Replacement". This price shall be full compensation for transportation; storage; removal of defective ties, installation of all track work materials including replacement ties, securement, anchors, joint bars, all track work on bridges, track work at vehicular grade crossings; and for the removal of all materials used in Ballasted Track Construction and for all other materials, tools, equipment and incidentals necessary to complete the work.

C. Payment for Ballast Delivery and Regulating will be made at the unit price bid for "Ballast Delivery and Regulating". This price shall be full compensation for transportation; storage; installation of materials including placing ballast; for regulating ballast to final grade and cross section; for the removal of all materials used in Ballast Delivery and for all other materials, tools, equipment and incidentals necessary to complete the work.

D. Payment for “Ballasted Track Surfacing and Alignment” will be made at the unit price bid for "Ballasted Track Surfacing and Alignment". This price shall be full compensation for transportation; storage; tamping and raising track to final grade and alignment, and for the removal of all materials used in Ballasted Track Surfacing and
Alignment and for all other materials, tools, equipment and incidentals necessary to complete the work.

E. Payment for vehicular Grade crossing will be made at the unit price bid for "Vehicular Grade Crossing" and “Vehicular Grade Crossing (Removal)”. This price shall be full compensation for all crossing materials, filter fabric, underdrains, fasteners; for the removal of the crossing materials, filter fabric, underdrains, fasteners; for all ties, rail, plates, spikes, joints, bolts; and for all other materials, tools, equipment, labor and incidentals necessary to complete the work.

F. 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. Payment for “Rail Replacement” will be made at the unit price bid for “Rail Replacement. This price shall be full compensation for transportation; storage; all fasteners, plates, spikes, joints, bolts, welds; and for all other materials, tools equipment, labor and incidentals necessary to complete the work.

G. Payment for contractor supplied “Rail Replacement” will be made at the unit price bid for “Rail Replacement. This price shall be full compensation for transportation; storage; all fasteners, plates, spikes, joints, bolts, welds; and for all other materials, tools equipment, labor and incidentals necessary to complete the work.

H. Payment for “Inventory Rail Replacement” will be made at the unit price bid for “Rail Replacement. This price shall be full compensation for transportation; storage; all fasteners, plates, spikes, joints, bolts, welds; and for all other materials, tools equipment, labor and incidentals necessary to complete the work.