SP-120322a
(Replaces 120322)

Iowa Department of Transportation

SPECIAL PROVISIONS
FOR
RAILROAD MAINLINE TRACK

Pottawattamie County
IMN-080-1(366)4--0E-78

Effective Date
June 16, 2015

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

120322a.01 DESCRIPTION.
Railroad Mainline Track consists of ties, rails, fastenings, subballast, ballast, asphalt underlayment, and appurtenances delivered in conformity with the contract documents.

120322a.02 MATERIALS.

A. Rail.
New 136 RE (136 pounds/yard) rail shall be provided in 39 or 80 foot lengths. Rail shall conform to Chapter 4, Part 2 of American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. Rail shall be standard strength commercial grade; no industrial grade rail will be accepted.

B. Fastenings.

1. Tie Plates.
Shall be new double-shoulder tie plates per AREMA Plan No 13. Tie Plates shall conform to Chapter 5, Part 1 of AREMA.

2. Track Bolts and Nuts.
Shall be new, appropriately sized for the bolt holes in the rail section with length sufficient for a full nut and heavy-duty spring washers (new), including length sufficient to leave at least two threads exposed after the nut is tightened. Track Bolts and Nuts shall conform to Chapter 4, Part 3.5 of AREMA.

3. Spring Washers.
Spring washers shall be sized to ensure that the spring washer develops its full reactive force and does not jam into the joint bar hole. Spring washers shall be of the size to fit the bolt and nut used, shall be new, and shall conform to Chapter 4, Part 3.6 of AREMA.

4. **Track Spikes.**
   Shall be new cut spikes per Common Standard 130005.

5. **Rail Anchors.**
   Shall be new bar stock anchors for the appropriate rail base width per Common Standard 135010.

6. **Joint Bars.**
   Joint bars shall be new and of the size, shape, and punching pattern to fit the rail being joined per the IAIS Typical Specifications & Criteria for Construction of Industrial Tracks. Joint bars shall be of the "toeless" and "head free design" to match rail section. New joint bars shall conform to Chapter 4, Part 3.4 of AREMA.

7. **Compromise Joint Bars.**
   Compromise joint bars shall be new and of the size, shape, and punching pattern to fit the rail sizes and sections being joined per the IAIS Typical Specifications & Criteria for Construction of Industrial Tracks. Only factory designed and constructed compromise joint bars shall be used to join rails of different sizes. New joint bars shall conform to Chapter 4, Part 3.4 of AREMA.

C. Wood Ties.
Wood ties shall conform to Chapter 30, Part 3 of AREMA. All ties shall be new hardwood species. No industrial grade ties will be accepted.

1. Splits shall not be longer than 4 inch and not wider than 1/4 inch at either end. Splits longer than 4 inch but not longer than the width of the face in which the split appears, will be acceptable if specified anti-splitting devices are installed with the splits compressed. Any required adzing and drilling for spikes shall be performed prior to treatment.

2. Wood ties shall be sawed and shall be not less than 7 inch thick and 9 inch wide. The length shall be 10.0 feet at road crossings and 8.5 feet for all other track construction. Transition zones shall have tie lengths and quantities per the track drawings.

D. Railroad Crossings.
Concrete panels shall be per Common Standards 200100, 200101, 200102, 200900, 200901, and 200902. Concrete panels shall be supplied for 10 foot lengths at all crossings. Crossing panels shall be supplied with flangeway fillers attached.

E. Turnouts.
All turnout components shall be new of the size and type shown in the plans per the IAIS Typical Specifications & Criteria for Construction of Industrial Tracks. Turnout components shall be manufactured by a company regularly engaged in the manufacture of turnout components. All components need not be made by the same manufacturer but each turnout shall be the product of a single firm. Switch assemblies, stands, frogs, and guardrail assemblies shall conform to applicable requirements in AREMA.

F. Ballast.
Ballast shall be crushed granite or quartzite and conform to the mainline ballast material requirements in Chapter 2 Part 2 of AREMA. Ballast utilized for track constructed with 136 RE rail shall conform to AREMA Standard 4A gradation.

G. Subballast.

1. Subballast shall be crushed gravel or crushed stone with a minimum 75% of the material having two fractured faces. Subballast must meet the quality requirements of ASTM Designation: D 1241 and be approved by the Engineer.

a. Crushed Gravel shall be the product resulting from crushing by mechanical means, and shall consist entirely of particles obtained by crushing gravel, all of which before crushing will be retained on a screen with openings equal to or larger than the maximum nominal size of the resulting crushed material. If approved by the Engineer, final product gradations may be obtained by screening or blending various sizes of crushed gravel material.

b. Crushed Stone shall be the angular fragments resulting from crushing by mechanical means the following types of rocks quarried from undisturbed, consolidated deposits: granite and similar phanerocrystalline igneous rocks; limestone; dolomite; sandstone; massive metamorphic quartzite, or similar rocks.

c. Quality and Material Characteristics:

1) Coarse Aggregate Portion (Fraction retained on a No. 10 sieve):

Na2So4 Soundness (5 cycles)	
AASHTO T 104, Max. % Loss	25%
Los Angeles Abrasion	
AASHTO T96, Max. %Loss	50%

2) Fine Aggregate Portion (Fraction passing a No. 40 sieve)

Plasticity Index, Max.	
AASHTO T90	10%
Liquid Limit, Max.	
AASHTO T89	35%

2. Subballast shall be uniformly graded and shall meet the following gradation requirements:

Sieve Size	Percent Passing
2"	100
1"	90-100
3/8”	50-84
No. 10	26-50
No. 40	12-30
No. 200	0-6

3. ~~If acceptable to the Engineer, the subballast may conform to the gradation specified for aggregate base by Iowa DOT, which most nearly matches the gradation of the Subballast, as specified.~~

H. HMA Underlayment.

1. Asphalt.
Unless otherwise shown on the plans, the asphalt shall be AC-10 or AC-20 viscosity graded asphalt cement and shall meet the applicable requirements of ASTM Designation: D 3515.

2. Aggregate.
The aggregates shall meet the applicable sections of ASTM Designation: D 3515 with a gradation as follows.

Sieve Size	Percent Passing
1-1/2 in.	100
1 in.	90-100
1/2 in.	70-90
No. 4	40-65
No. 8	28-48
No. 50	7-20
No. 200	3-8

3. Asphalt Mixture.

a. The Marshall mix properties for the asphalt mixture shall be as follows.

Property	Range
Compaction (blows)	50
Stability, N (min.)	3375
Flow, mm	3.8-6.4
Percent Air Voids	1-3
Percent Voids Filled	80-90

b. The asphalt content shall be in the range of 4% to 10%.

c. The asphalt production facility shall be capable of producing a mix meeting the specified mix properties and have sufficient capacity to produce the anticipated volume of asphalt mix.

d. Recycled Asphalt Pavement (RAP) will NOT be allowed in the Asphalt Subballast. Any mix design that includes RAP will NOT be approved. If any Hot Mix Asphalt has to be removed for any reason, it shall become the property of the Contractor and removed. Disposal shall be the responsibility of the Contractor.

120322a.03 CONSTRUCTION.

A. General.

Track construction not covered specifically herein shall be in accordance with AREMA recommendations and recommended practices. All work shall be supervised by experienced personnel skilled in railroad track construction. Track construction not covered by this specification shall be per AREMA Chapter 5, Parts 4, 5, and 8.

B. Wood Ties.

Ties will be unloaded and handled in such a manner as to not damage ties using approved handling equipment such as tie tongs. Standard center-to-center spacing of ties shall be 21 inch. Tie spacing within the limits of the crossing panels shall be per crossing panel manufacturer recommendations. Ties shall be laid perpendicular to the center line of the track with the grain up (heartwood side down) for wood ties. The best ties shall be used at the rail joints. The ends of ties on one side of the track shall be parallel to the rail and the center of the tie shall be on the approximate center line of the track. The top surface of ties shall provide full bearing for the tie plates. Adzing of wood ties shall be restricted to that necessary to provide a sound true bearing for the tie plate. Adzing in excess of 0.2 inch will not be permitted. Where adzing is necessary, the cut surface of the wood tie shall be completely saturated with creosote or other approved preservatives.

C. Tie Plates.

Track shall be fully plated with double-shouldered tie plates set in position with cant surface sloping toward the center of the track. Tie plates shall be free of dirt and other foreign material when installed. Tie plates shall be placed so that the rails will have full bearing on the plate, and the plate will have full bearing on the tie. Tie plates shall be set at right angles to the rail with the outside shoulder against the base of the rail, and centered on the tie. Tie plates shall be applied at the time the rail is laid to avoid unnecessary spiking.

D. Rail.

The base of the rail and the surface of the tie and tie plate shall be free of dirt and other foreign materials prior to laying rail. Rail shall be laid without bumping or striking, to standard gauge (4 feet 8 1/2 inches between points 5/8 inch below the top of the rail). A track gauge manufactured for the purpose of measuring gauge shall be used rather than a tape measure and gauge shall be checked every third tie.

Any joints shall be assembled prior to fastening rail to ties using joint bars with full number of track bolts and spring washer for each bolt. Loose mill scale and rust shall be removed from rail contact surfaces and joint bars prior to installation.

Continuous welded rail (CWR) will need to be destressed as soon as possible after laying per BNSF “Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR in Industry Tracks.” All welds shall be installed by an individual qualified by the manufacturer of the weld kit and have documentation to support such qualification. All welds must conform at a minimum to the latest addition of the AREMA Manual.

Rails shall be cut square and clean by means of a rail saw. Holes for complete bolting of cut rails shall be drilled and under no circumstances shall new holes be drilled between two holes already drilled. Cutting rails or drilling holes in cut rails by means of acetylene or electric torch will not be permitted.

E. Fastenings.

1. Joints.

Joints shall be installed at connection to existing jointed rail. Bolted joints will not be permitted within 20 feet of the crossing panels. Rails of less than 15 feet in length shall not be used except for temporary closures.

Allowance for expansion shall be provided at rail joints by using rail-expansion shims of softwood not over 1 inch width. Shims shall be of the thickness shown in TABLE I. The temperature of the rail shall be determined by use of a thermometer placed on the rail base on the side away from the sun. Typical rail gap gauges are as shown.

TABLE I. SHIM THICKNESS

Rail Temperature (ºF)	Shim Thickness per 39 foot rail length (inch)
Below 25	1/4
25 to 50	3/16
51 to 75	1/8
76 to 100	1/16
Over 100	None

Rails shall be laid to ensure good alignment and the rail ends shall be brought squarely together against the expansion shims and shall be bolted before spiking.

Joint bars shall be clean. Rail joints shall be installed so that bars are not cocked between the base and head of the rail. Bars shall be properly seated in the rail and the full number of correct-size bolts, nuts, and spring washers installed. Bolts shall be placed with nuts alternately on inside and outside of rail. A corrosion resistant lubricant shall be applied to the bolt threads prior to application of nuts. Bolts shall be tightened to an initial bolt tension of between 20,000 and 30,000 pounds, beginning at the center of the joint and working both ways to the ends of the joint.

2. Continuously Welded Rail.
Continuously Welded Rail shall be installed per the current BNSF Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR in Industry Tracks.

3. Track Spikes.
Rail shall be spiked promptly after being laid. The right-hand rail going away from the switch points or the outside rail on curves shall first be spiked in position in its proper relation to the lined end of ties. The opposite rail shall then be spiked to true gauge (4 feet 8 1/2 inches). Track shall be laid to standard gauge on tangents and curves of less than 6 degrees; track shall be laid to a gauge of 4 feet 8 3/4 inches on curves 6 degrees or greater. In no case shall gauge less than 4 feet 8 1/2 inches be allowed. Rail shall not be struck with maul or heavy tool when spiking, gaging, or lining.

Track shall be spiked in accordance with the IAIS Typical Specifications & Criteria for Construction of Industrial Tracks. Spikes shall be started vertically and square and be driven straight with full bearing against the base of the rail. Straightening with maul of spikes started crooked shall not be permitted. Spikes started crooked shall be pulled, the holes plugged, and spikes re-driven. Spikes shall not be driven against the ends of joint bars. 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 the base with a minimum of pressure.

If spikes are withdrawn from wood ties, the holes shall be swabbed with creosote and plugged with creosoted tie plugs of proper size to fit the hole. If spikes are withdrawn and spikes are to be reinserted in existing spike holes, the holes shall be swabbed with creosote and plugged with creosoted tie plugs prior to re-driving the spike. Tie plugs shall not be installed in prebored holes unless spikes have been driven and withdrawn.

4. Rail Anchors.
Rail anchors shall be utilized for track constructed without elastic fasteners. Rail anchors shall be applied out-of-face along each rail, directly across from each other on the same tie. Box anchor every other tie in standard track construction and every tie in turnouts and at road crossings. Rail anchors shall grip the base of the rail firmly and shall have full bearing against the face of the tie. Rail anchors shall not be moved by driving them along the rail. Rail shall be anchored immediately after spiking and before rail has experienced a large temperature change.

F. Ballast.
The track, after being aligned, shall be brought to grade and surface in lifts not exceeding 4 inches. After each list, the ballast shall be tamped. When using jacks, they shall be placed close enough together to prevent undue bending of the rail or stress of rail and joint. Both rails shall be raised at one time and as uniformly as possible, except where superelevation is required. Superelevation shall be obtained by raising the outside rail of the curve; the inside rail shall be maintained at grade.

Every tie in the track shall receive two or more full insertions of the tamping heads. Ballast shall be power-tamped under both sides of ties from each end to 15 inches inside each rail. The center shall be filled with ballast, but tamping will not be permitted in the center of the tie between the above stated limits. Both ends of the ties shall be tamped simultaneously and tamping inside and outside of the rail shall be done at the same time. Tamping tools shall not be used with more than 35% wear and shall be worked opposite each other on the same tie. All ties shall be tamped to provide solid bearing against the base of the rail after the track or turnout is raised to grade at final surfacing. All down ties shall be brought up to the base of rail and shall be machine tamped. The resultant track surface and alignment shall be uniform and smooth. Tamping of track in snow or frozen ballast conditions will not be permitted.

For road crossings, tamping of ballast materials shall be performed by setting the tamping force and insertion depth to the minimum necessary to adequately tamp the track. The tamper operator shall monitor the depth of tamping and limit the depth to prevent detrimental effects of the tamper feet on the HMA underlayment.

The ballast between the ties shall be thoroughly compacted with a vibratory compactor, or other approved means, after each raise. The ballast shall be tamped for the entire length of the crossties for the crossing. The track shall receive final alignment and surfacing prior to placement of the crossing surface. The ballast in the cribs and on the shoulders shall be compacted using a vibratory plate compactor or other approved means.

G. Railroad Crossings.
Concrete crossing panels shall be installed per manufacturer recommendations.

H. Turnouts.
Turnouts shall be fabricated and installed to IAIS standards.

I. Removal of Railroad Track.
The former track zone shall be shaped to drain and allow a wheeled vehicle to drive the grade at 20 mph. All materials including the rails, ties, tie plates, ballast, fasteners, and other associated track materials shall become the property of the contractor and shall be removed from the project and properly and legally disposed of off the property.

J. Subballast.

1. Submit the following items to the Engineer:
   a. The source of the subballast to be used on the project.
   b. Material Test results of the subballast proposed for use on the project. Test results must outline the material gradation and percentage of material with two fractured faces.

2. Subballast shall be placed only when weather conditions do not detrimentally affect the quality of the finished subballast. Hauling and placing of subballast will not be permitted when doing so will rut or deform the finished subgrade.

3. Subballast shall be placed in uniform lifts of not more than 6 inches loose for the full width of the cross section. Each lift of subballast shall be compacted to a density of not less than 95% of the maximum dry density determined by ASTM Test Designation: D 1557 (Modified Proctor).

4. The subballast shall be trimmed to the lines and grades shown on the plans and shall be maintained in a condition or manner acceptable to the Engineer until the final acceptance and completion of all work under this Contract. Any irregularities that develop in the subballast section during construction operations and prior to laying track, shall be filled and compacted

to a smooth and even surface true to the subgrade elevations without any additional cost to the Contracting Authority.

K. HMA Underlayment.

1. General.
Asphalt shall not be applied to the soil when the air temperature in the shade is less than 40ºF and rising unless otherwise permitted by the engineer. Work shall be suspended during rain or when the mix is wet. Submit design mix to Engineer 14 days prior to placement of HMA.

2. Preparation of Subgrade.
Prior to beginning any asphalt stabilization, the subgrade shall be compacted and shaped in conformance with the lines, grades, and cross sections shown on the plans or established by the Engineer. The subgrade shall be free of ruts, depressions, or loose material.

3. Equipment.
Equipment necessary for the proper construction of the work shall be on the project site and in good working condition before construction operations will be permitted to begin. The Contractor shall at all times provide sufficient equipment to enable continuous execution of the work. The Engineer shall have the right to reject equipment which is not capable of producing the required results, or which cannot be properly calibrated or controlled.

4. Placement and Compaction.

a. The asphalt mix shall be hauled by truck from the mix plant. The temperature of the mix when leaving the plant shall not be less than 290ºF and the trucks shall be covered to minimize temperature loss. The mix shall be placed using either a standard highway asphalt paver or backdumped from trucks and spread with a dozer blade. Procedures for spreading and compacting the mix shall minimize temperature loss. The temperature of the mix shall not be allowed to fall below 200ºF prior to obtaining the required compaction.

b. The asphalt mix shall be placed in lifts not exceeding 4 inches in compacted thickness. The layer shall be compacted using pneumatic roller or steel drum vibratory compactors meeting the requirements for compacting equipment specified in Section 2107 of the Standard Specifications. The layer shall be compacted to a minimum of 95% of the theoretical maximum density determined in accordance with ASTM Designation: D 2041.

c. The top surface of the compacted layer shall be finished to a true surface with no depressions which will hold water or prevent proper drainage. The finished top of subgrade shall conform to the grades shown on the plans with a tolerance of plus or minus 1/2 inch, except that for full depth designs, where the ties are placed directly on top of the HMA layer, the tolerance of the finished surface shall be plus or minus 1/4 inch.

d. Laboratory test reports shall be submitted to the Engineer. The testing shall be performed by an independent laboratory under contract with the successful bidder. Detailed requirements of the quality control program follow:

1) Verification of Marshall Properties.

a) A minimum of one test will be pulled daily to determine the Marshall properties of the mix.

b) Additional testing may be required for additional information to effectively control production and to ensure a quality product is being provided.

c) Marshall properties shall conform to Part 2.3A of the Standard Construction Specifications.

2) Ignition Oven and Gradation Testing.

a) One test shall be pulled per 500 tons of asphalt mixture produced.

b) The Engineer shall provide the testing laboratory representative with tonnages at which to pull the required tests.

c) The asphalt cement content of the mix shall be between 4.5% and 10% as determined by the asphalt ignition oven.

d) The gradation obtained from the ignition oven sample shall conform to Article 120322.02, H, 2.

3) Theoretical Maximum Specific Gravity (Gmm) Testing.

A theoretical maximum specific gravity will be determined with each ignition oven sample and logged and a 4-point moving average established for calculation of in-place density as measured by a nuclear density meter.

4) In-place Compaction Testing.

a) In- place density testing will be measured with a nuclear density meter calibrated on the project for each lift of asphalt placed. Compaction shall conform to Article 120322.03, K, 4, b which states that the minimum density shall be 95% of the Gmm value.

b) Percent density will be calculated using the average of all Gmm tests conducted the day the pavement was placed. If less than three Gmm tests were conducted for a day of production, the 4-point moving average (last four tests prior to the end of the day) value shall be used in the density calculation.

c) Location and frequency of density tests shall be as shown in the table below:

Daily Production (Tons)	Number of Sub-lots	Number of Density Tests	Number of Verification of Density Tests
0-599	3	6	3
600-999	4	8	4
1000 or more	5	10	5

5) Non-Conforming Material.

a) Any material fount to be out of specification will be addressed immediately

b) The Engineer shall be notified of the situation and be provided with a proposed solution in order to address the out of specification material.

6) Profile Grade and Cross Slope.

a) In order to maintain profile grade, a 30 foot ski or string line is to be used.

b) The profile grade shall not exceed 1/4 + inch variance in 50 feet.

c) The cross slope shall not exceed 1/4 + inch variance in 12 feet.

d) If there is a problem with profile grade or cross slope the Contractor will be required to stop work and make the appropriate adjustments.

120322a.04 METHOD OF MEASUREMENT.

A. Rail.

Track linear feet installed measured along the centerline of track for each rail weight and tie type.

B. Railroad Ballast.

Per ton for each ballast gradation, satisfactorily placed.

C. Railroad Subballast.

Per ton, satisfactorily placed. No allowance for shrinkage or compaction will be allowed.

D. Railroad Crossing.

Per track linear feet of installed crossing measured along the centerline of track for each rail weight and tie type.

E. Turnout.

Per each installed turnout for each size, rail weight, and tie type.

F. Removal of Railroad Track.
Per track linear feet removed measured along the centerline of track.

G. HMA Underlayment.
Per square yard, satisfactorily placed.

120322a.05 BASIS OF PAYMENT.

A. Rail.
Payment is full compensation for furnishing and installing rail, ties, fasteners, joint bars, welding, and incidental items and accessories.

B. Railroad Ballast.
Payment is full compensation for furnishing, installing and tamping of ballast.

C. Railroad Subballast.
Payment is full compensation for furnishing and installing subballast. Payment is full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, crushing, loading, hauling, placing, compacting, wetting, drying, trimming, and all other items required to complete the work in accordance with the plans and specifications.

D. Railroad Crossing.
Payment is full compensation for furnishing and installing concrete railroad crossing panels.

E. Turnout.
Payment is full compensation for assembly and installation of turnout, including rail, ties, fasteners, joint bars, welding, and all accessories and equipment.

F. Removal of Railroad Track.
Payment is full compensation for removal and disposal of all track components.

G. HMA Underlayment.
Payment is full compensation for furnishing and installing HMA underlayment. Payment shall be full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, loading, hauling, placing, compacting, and incidentals necessary to complete the work in accordance with these specifications.