

SECTION 02480 – RELOCATED TRACKAGE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Work included: All excavating, filling, backfilling, placement and removal of materials associated with the relocation of 1,900LF of main line and 700LF of passing track for 2' gage Maine Narrow Gauge Railroad.
- B. CONTRACTOR shall salvage and reuse existing rail and other track materials, and replace up to 25% of existing ties. To the extent existing rail and materials are not useable, as determined by RESIDENT, rail and other track materials shall be furnished by the DEPARTMENT.
- C. Related Work Specified Elsewhere:
 - Earthwork – Section 02300
 - Erosion and Sedimentation Control – Section 02370
 - Underdrain - Section 02620
 - Storm Drainage - Section 02630

1.02 PROTECTION:

- A. Paved Surfaces: Do not operate equipment that will cause damage on paved surfaces. Any damage to existing roads or other paved surfaces caused by construction equipment shall be repaired at no additional cost to DEPARTMENT.
- B. Maintain Construction Areas with approved barricades, lights, and signs to protect life and property until trackage is completed to a condition acceptable to the RESIDENT.
- C. Protect structures, utilities, monitoring wells, property monuments, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by track relocation operations. The CONTRACTOR shall be responsible for actual cost of repair or replacement of any items damaged as a result of construction activities, including any professional services required for inspection of repairs and replacement.

1.03 QUALITY ASSURANCE:

- A. Safety Standards: CONTRACTOR shall construct/relocate trackage within the limits of this contract to meet or exceed Track Safety Standards for Class 3 track as prescribed in Maine Department of Transportation Proposed Track Safety Standards for Non-General Railroad Systems (hereinafter referred to as Track Safety Standards). The cost for reconstruction due to failure to meet these standards shall be the responsibility of the CONTRACTOR.

1.04 JOB CONDITIONS:

- A. Site Information: The CONTRACTOR may make his own borings, hand probes, explorations, and observations to determine soil, water levels, and other subsurface conditions at no additional cost to DEPARTMENT. Coordinate with DEPARTMENT prior to start of additional investigative work.

- B. Existing Utilities: Locate existing underground utilities in areas where work will be performed. If utilities are indicated to remain in place, provide adequate means of support and protection during track relocation. Coordinate with utility companies for actual locations and shut-off services. If utilities are encountered that are not shown or that are shown incorrectly on the Drawings, notify RESIDENT immediately. Repair damaged utilities to satisfaction of RESIDENT and utility. The cost for repair of damaged utilities shall be the responsibility of the CONTRACTOR.

1.05 REFERENCES:

- A. Track Safety Standards – State of Maine Department of Transportation.
- B. 29 CFR 1926/1910 - OSHA Safety and Health Standards for Construction Industry
- C. FHWA Manual of Uniform Traffic Control Devices

PART 2 - MATERIALS

2.01 MATERIALS:

- A. General: All materials utilized for this Project shall be salvaged from the existing trackage, furnished by the DEPARTMENT, or obtained from a source that has been licensed or permitted for such use by local and state authorities. The CONTRACTOR shall be required to submit evidence of such if so requested. The “track structure” includes: Sub-ballast, ballast, ties, rails, rail fastenings, turnouts, track crossings, and other associated materials.
- B. Use specific: Specifications for these materials are as follows:
1. Sub-ballast: Excavated on-site railroad cinders as approved by RESIDENT or Gravel conforming to 703.06(b) Type D specified in Maine Department of Transportation Standard Specification.
 2. Ballast: Crushed stone shall be used for ballast and shall conform to AREMA/AASHTO Specification grade size #4.
 3. Ties: Main line ties shall be 8’-6” long grade 6” (min) with the exception of crossing and switch timber, which shall be 7” grade. Side tracks ties shall be 5’-6’ long grade 6” (min). Side track ties under welded rail and in crossings shall be 6’-0’ long grade 7”. All new cross ties and timbers shall be creosote-treated, manufactured from mixed hardwood species, Railway Tie Association Class TA or TD, with anti-splitting devices applied to both ends. Creosoted crossties and switch timber must meet AREMA specifications on material, design and inspection, seasoned and treated in accordance with the latest revision of the American Wood Preservers Association (AWPA) Standards. The following variances in AREMA crosstie inspection will be acceptable: splits not more than 1/2” wide and 10” long (unless an anti-splitting device is applied to bring the split into compliance), holes up to 1” that do not affect the strength and spike-holding capacity at the rail bearing area. Minimum treatment will consist of 60% creosote and 40% coal tar solution injected into the ties for a net retention of 6 lbs. per cubic foot or refusal in accordance with the latest AWPA Specification. 75% of ties removed from existing track are to be reused. Spike holes in all relay ties used will be plugged with treated tie plugs.

4. Switch Timber: For number required, size and length, see Timber Bill below:
Timber Bill for one #10 turnout for 2' gage track:
- | Pieces | Size | Length |
|--------|-------|--------|
| 26 | 7"x9" | 8'-6" |
| 2 | 7"x9" | 10'-0" |
5. Rails: As used in these Specifications, jointed rails are conventional rails, 33'-0" or 39'-0" long, bolted together, except: Shorter rails permitted in turnout areas. Rail shall be fit rail of Class II 85-lb. ASCE or 100-lb. ARA sections (AREMA Table - 4.2-6.6). Rails must have maximum top wear 1/4", gage wear 3/16", no engine burns or corrugations. Rail ends must be free of droop, bolt hole elongations and any other visible defect. Torch cut ends and bolt holes in the web, other than the drilled joint bar holes and small bond wire holes, are prohibited.
- 5a. Welded Rail: 100-lb ARA rail purchased for this must be inspected to assure that the base and web of this rail is free of corrosion, breaks, wear or damage which would reduce it to less than nominal size.
Welds must not be made closer than 8-1/2" from bolt hole. Rails shall be positioned and supported in such a manner to prevent misalignment or droop, shall be aligned to the top. Maximum offset on the gauge side shall be 1/16". Rail alignment shall be checked with a 36" steel straightedge. Welds shall be made by the thermite or portable flash butt rail process welding.
6. Rail Anchors: Rail anchors shall be new, reformed or fit one-piece, unit style anchors.
7. Track Fasteners: Spikes shall be new or fit quality, 5/8" x 6"
8. Switches: All switches must be constructed in accordance with Standard Plans included with these Specifications for 15'-0" split switch for 85-lb. rail, with slide plates and adjustable braces through #6 plates only.
9. Frogs: Frogs shall be No. 10 RBM style. Common, spring, and self-guarded frogs are prohibited. Frogs shall be of fit quality or reconditioned.
10. Frog Guard Rails: Guard rails shall be furnished in accordance with Standard Plans and Specifications or manufacturer's designs approved for use by the RESIDENT. "Hook flange" type guard rails of the braced design and one-piece manganese type guard rails of cast high manganese steel, marked manganese, MS or M, may be used without restriction in main tracks, including turnout side of main track switches.
11. Switch Operating Mechanisms: Type 17b or 17c switch stands and red/green reflectorized targets shall be furnished by DEPARTMENT. Switch stands shall be placed with spindle at 6'-6" from centerline of track. Spike holes for fastening the stand shall be pre-drilled with 7/16" drill bit 5-1/2" deep before driving spikes. Triple adjustable switch connecting rods shall be used.

PART 3 - EXECUTION

3.01 RAIL BASE/TIES:

- A. General: Ballast and sub-ballast cross sections should conform per cross section plan provided. Before installing rails and ties, ballast shall be compacted by vibratory roller to a grade elevation of 1" below bottom of tie.
- B. Ballast:
1. To the extent practicable, ballast should be unloaded in position for use with a minimum of redistribution and dressing.

2. Ballast must be distributed or immediately dressed so that ample clearance is provided for rolling equipment, switches are not fouled, and guard rails are unobstructed.

C. Ties:

1. The RESIDENT shall determine the size to be used in any specific situation requiring interpretation of these instructions.
2. Ties shall be spaced at 22 inches center to center, except as otherwise indicated for crossings and turnouts.
3. Ties should be placed in track with the kerf up, the wider heart wood face down and square to the line of the rail.
4. Ties should be brought to a uniform line 17-1/2 inches from the base of rail, with the kerf on the land side of track.
5. Ties shall be kept sufficiently spaced and square to the line of rail to permit proper tamping. When necessary, ties should be re-spaced as track is rehabilitated, by gangs equipped with suitable machinery.
6. Damage to ties
 - (a) When handling or spacing ties, care shall be taken not to damage them with picks or spiking hammers. Ties tongs, lining bars, other suitable tools or tie-spacing equipment shall be used.
 - (b) Only sufficient adzing to obtain a sound and true bearing for the tie plate shall be done.
 - (c) Standard tie plugs must be used to plug holes when spikes have been drawn.

D. Drainage:

1. Drainage is of prime importance for economical maintenance of track. Water mixing with materials of the roadbed tends to make the entire track structure unstable in varying degrees depending on the kind of material and the quantity and flow of water.
2. Water seeping or flowing toward the track should be conducted across the roadbed or be intercepted and diverted before it reaches the roadbed.
3. Water falling upon the roadbed should be quickly drained.
4. Adequate cross drains should be maintained, particularly where road crossings and sags interfere with longitudinal drainage.
5. Drainage structures under tracks shall meet requirements for American Railway Engineering & Maintenance Association (AREMA) E 80 track loads.

- E. Cross Section: Roadbeds, embankments and excavations shall be constructed in accordance with project plans. The approved ballast section is depicted in graphic supplement to these Specifications. Deviation from approved cross sections should not be made without authorization by the RESIDENT.

3.02 RAILS

- A. General: Welded rails may be field welded by a method approved by the RESIDENT and assembled in single strings to meet requirements through crossings.

1. Distribution:

- (a) Rails should be unloaded in position for laying to minimize further handling.
- (b) Rails should be placed parallel with the track and base down, avoiding excessive bending or damage.
- (c) In yards and at locations where employees must walk close to the track, rails should be placed as near to the ends of ties as possible to avoid obstructing the walkway area.

2. Laying Jointed Rail:

- (a) Jointed rails should be laid, one at a time, with space allowance for expansion being provided between rail ends in accordance with the following table:

33' RAILS	
<u>Rail temperature (°F)</u>	<u>Rail end space</u>
Below 6 Deg.	5/16"
35 to 47 Deg.	1/4"
47 to 60 Deg.	3/16"
61 to 73 Deg.	1/8"
74 to 85 Deg.	1/16"
Over 85 Deg.	None

- (b) To insure the space allowance required, rail ends should be brought squarely together against approved expansion shims of proper thickness and the rail joints bolted before spiking.
- (c) A standard rail thermometer shall be used in accordance with Track Safety Standards SEC. 113.9(a). A qualified Track Inspector/Maintainer shall see that the rail temperature is checked frequently and that proper rail expansion shims used.
- (d) Rails should be laid so that the joints of one line of rails shall be opposite the quarter point of rails in the other line with permissible variations through turnouts and at insulated joints
- (e) When laying rail, avoid placing bolted joints in or closer than 50' to the edge of road crossings, or closer than 12' within the limits of switch rails, guard rails, ends of open floor bridges, concrete deck track, trestles or viaducts, without approval of RESIDENT.

3. Bolted Rail Joints:

- (a) General

1. Bolted rail joints consist of either head free or head contact standard bars and head contact compromise joint bars held in position by track bolts.
2. Head free bars must have the inner surface of the head of the bar held tightly against the railhead fillet with the heel of the bar standing out the proper distance from the base fillet, where all of the draw-in for wear is concentrated.
3. Head contact bars must have the top surface of the bar held tightly against the fishing surface under the railhead but away from the railhead fillet area. Bars must be secured in a vertical position to avoid cocking.
4. Within the scope of this project, all joint bars furnished shall have a consistent bolt hole spacing for the end two holes in each rail.
Joint bars shall be 4-hole bars.

- (b) Application

1. Joint bars shall be applied with their full number of bolts, nuts and spring washers, in accordance with Standard Plans and Specifications.
2. New bolts, nuts and spring washers should be used when new or reformed joint bars are applied or renewed out-of-face.

- (b₁) Application of Head Free Joints

The following procedure should be followed in applying head free joint bars:

1. Set bars in position, insert all bolts and apply spring washers and nuts by hand.
2. Tighten the No. 3 and No. 4 nuts without fully tightening to avoid locking the bars in an improper position. Strike the bead on the heads of both inside and outside bars at both ends with a hammer to force the inside faces of bars tightly against railhead fillets. Do not strike the toe of the bar as this tends to force the head of the bar outward. Snug remainder of bolts, working from center of joint bars outward. During this final tightening, drive the toes of the bars inward by tapping with a spike maul or sledge. By following the above procedure, proper contact will be obtained between inner face of

- head of bar and the railhead fillet. Also, the heel of the bar will stand out the proper distance from the rail base fillet.
- (b₂) Application of Head Contact Joints: The following procedure should be followed in applying head contact joint bars:
1. Set bars in position on rail, insert all the bolts and apply spring washers and nuts by hand.
 2. See that bars are in a vertical (uncocked) position as one of the center bolts is tightened, by tapping toes of joint bars as bolt is tightened.
 3. Tighten all bolts, working from center of joint bars toward ends, tapping the toes of joint bars with a spike maul or sledge so that their vertical position is maintained.
4. Bolt Holes: Holes must be provided in accordance with Standard Plans and the following practice.
- (a) When holes are necessary, they must be drilled. All bolts must be of proper dimension, and installed in accordance with the applicable Standard Plan for the specific rail section, placing drill bit directly against the web of the rail, or by drilling through an approved template.
 - (b) When bolt holes are drilled, a uniform feeding pressure should be maintained and then reduced as the bit point breaks through the opposite side of the web. Forcing the drill may produce a ragged hole, with possibility of resultant bolt hole cracks. Lubrication should be used throughout this operation.
 - (c) When it is necessary to use cut rail at a compromise or insulated joint location, the mill or shop drilled end of the rail should be placed in the compromise or insulated joint. The bolt holes must be accurately drilled in accordance with the provisions of paragraph (a).
5. Cutting Rail:
- (a) The tools which may be used for cutting rails are power saws (Abrasive or Reciprocating) and track chisels.
 - (b) When using a track chisel, a sledge must be used. The use of a spiking hammer is prohibited.
 - (c) Gas or electric arc welders are prohibited on any portion of the rail except as listed below:
 1. Welding of engine burns in accordance with good engineering practices.
 2. Application of welded bonds.
 3. Top of rail within limits, of joint bars.
 - (d) Any rail accidentally damaged by torches must be promptly removed from track.
6. Tie Plates:
- (a) Tie plates shall be installed under running rails on all wood crossties and switch ties.
 - (b) Tie plates shall be single shoulder, for 5" width rail base with a minimum size of 7" x 10.5" punched with four holes for 5" base rail. No overlapping punching is permitted.
 - (c) Tie plates shall be installed so that the rail cants towards the centerline of track.
 - (d) Tie plates must be placed square to the base of the rail and no portion or part of the shoulder can be under the base of the rail.
 - (e) Tie plates should be centered over the tie so that the plate does not project over the edge of the tie.

- B. Gage:
1. Standards for Gage: The standard gage for track, measured between the running rails at right angles to the alignment of the track, 5/8 inch below the top of rail, is:
 - (a) Tangents: 1. 2 feet – 0 inches.
 - (b) Curves: 1. 2 feet – 0 inches up to 13 degrees, inclusive.
2. 2 feet - 1/2 inch over 13 degrees.
 - (c) Gage must remain in compliance with and must be corrected prior to reaching the limits of Track Safety Standards, Part 13.53, for Class 3 track. Track will be gaged to the standards in (a) and (b) above, where rail is renewed or out-of-face gaging is performed.
 - (d) Changes in prescribed gages should be made in uniform increments of not more than 1/4 inch per 31 feet of track.
 - (e) Gage shall be changed by suitable adjustment of the rail opposite the line rail.
 2. Maintenance of Gage: Gage shall be measured with a standard track gage or other authorized device. Gage is measured perpendicular to the rail at a point 5/8 inch below top of rail.
- C. Alignment: Alignment consists of series of straight lengths of track, referred to as tangents, connected by simple, compound or reverse curves.
1. Outer rails of curves and field side rails on tangents should be selected as the line rails.
 2. When general alignment is to be corrected, such as the removal of long swings on tangents and the restoration of curves to circular curvature, laying out of spirals, etc., the throws should be determined from field measurements.
 - (a) A transit or rail-mounted telescope should be used to determine the corrections required on tangents.
 - (b) The string line method should be used to determine the alignment of curves and to calculate the required corrections throws.
 3. For detail corrections of irregular line, the required throws may be determined by using a line wire and indicator device, plotting a graph on curves, with automatic lining equipment or with stakes set by transit by surveyors.
 4. Alignment must be maintained within the limits prescribed in Track Safety Standards, Part 13.55.
- D. String Lining Curves:
1. String lining of curves is based on the following principles:
 - (a) The mid-ordinates of a curve are indicative of its degree of curvature.
 - (b) The mid-ordinates of a circular curve are equal for chords of uniform length.
 - (c) For practical purposes, the mid-ordinate varies directly with the degree of curvature.
 - (d) Where track is thrown in or out at any single station on the curve, the mid-ordinate of the curve at the station is affected by the amount of the throw and the mid-ordinates at the adjacent stations are automatically affected by one-half (1/2) of the amount, but in the opposite direction.
 2. String lining of curves is a method for determining the most advantageous alignment that can be obtained with reasonable amounts of throw.
 3. Any of the established mathematical methods, such as the “Bartlett Method” or “Bracket Method,” may be used to calculate the throws of curves. All calculations should be checked to ascertain that the calculated throws will actually produce the required changes in mid-ordinates.
 4. Track shall be stationed for string lining on the gage side of the outer (high side) rail of the curve, with stationing marked on the web or base of the rail.
 - (a) Stationing shall begin at a point on tangent sufficiently far ahead to permit the measurement of any reverse curvature or “dog-leg,” and continue throughout the curve to

- a point sufficiently far on the tangent to permit measurement of any reverse curvature on the leaving end.
- (b) 31-foot stations (62-foot chords) should be used for most curves found in main tracks, in which case a mid-ordinate of one (1) inch will indicate one (1) degree of curvature. It may be desirable to use 44-foot stations for curves under 30 minutes, or to use 22-foot stations for sharp curves.
 - (c) The practical relationship between station and chord-length, mid-ordinate and degree of curvature for various stationing is shown in the following table:

Degree of Curvature	Station Length	Chord Length	Mid-Ordinate
1 deg. 00'	15'6"	31'	1/4"
1 deg. 00'	22'	44'	1/2"
1 deg. 00'	31'	62'	1"
1 deg. 00'	44'	88'	2"

- 5. Mid-ordinates should be measured to the gage side of the string in sixteenths (16ths) of an inch.
 - (a) String line holders or offset blocks should be used to position the string a distance of one (1) inch away from the gage line of the rail, so as to permit measurement of any reverse curvature.
 - (b) Mid-ordinate measurements should be taken with the string line pulled taut, not affected by the wind, and with the string line holders and the scale held horizontal and perpendicular to the gage.
 - (c) If a conventional rule is used to measure the mid-ordinate, the actual scale reading should be recorded and a correction made to compensate for the one (1) inch offset of the string line from the rail when calculations are made, to avoid field errors. Direct compensated readings of mid-ordinates may be recorded by the use of a scale.
 - 6. Track center distances should be measured and recorded at least every station in two-track territory, and more frequently where close track centers are encountered. The distance from centerline of track to any obstruction which might interfere with the lining of the curve, should be measured and recorded so that limiting throws for these tight spots may be determined.
 - 7. The location of both ends of each elevation runoff should be noted so that the relationship between spirals and runoffs can be maintained.
- E. Curvature, Elevation, and Speed: Table for 24" gage track shall be as provided in Track Safety Standards, Section 13.63, for Class of Track 1, 2 and 3. Also see Track Safety Standards, Sections 13.57, 13.59 and 13.63. Superelevation shall not exceed that for 15 mph operation.
- F. Clearances and Track Centers: Waiver granted under Article .01, Scope, of MDOT Clearance Order, Chapter 501, for 2-foot gage track. The following modifications have been authorized for 2-foot gage track:
- 1. .03 overhead clearances
 - (a) Minimum overhead clearance – 19'-0" ATR
 - 2. .04 side clearances on all tracks
 - (a) 6'-6" from centerline to obstructions except 5'-6" to switch stands and targets
 - (b) Curve allowance shall be 1/2" per degree of curve, additional clearance required on curvature
 - 3. Track Centers: In maintaining alignment, the existing track centers including equivalent centers on curves, must not be reduced below the minimum established for the territory.
 - 4. For new construction or reconstruction, the following track centers should be used for tangents, and be increased for curves as set out below, unless otherwise instructed by the RESIDENT:

Track Centers-

Designation of Tracks

on tangents

- (a) Adjacent tracks, including additional main tracks 13'-0"
- 5. On curves, to provide clearance between cars and locomotives equivalent to that obtained on adjacent tangents, tangent track center distances in paragraph (c) should be increased, as follows:
 - (a) Where the amount of elevation is the same on adjacent tracks or the elevation of the inner track is greater than that of the outer track, increase the tangent track center distance 1 inch for each degree of curvature.
 - (b) Where the elevation of the outer track is greater than that of the inner track, the tangent track centers distance should be increased 1 inch for each degree of curvature, plus 3-1/2 inches for each 1 inch of difference of elevation of the two tracks considered.
- 6. Side clearance measurement of obstructions between parallel tracks shall not be less than 6'-6" from centerline of both tracks.
- 7. Clearance points at divergent tracks shall be marked on both sides of both rails of both tracks with a 4-inch wide white stripe painted on the rails. In addition, close clearance signs may be erected outside the track area, at least 6'-6" from centerline.

G. Grades:

- 1. No grades shall be introduced exceeding a rate of 2 percent unless authority has been obtained from the RESIDENT.
- 2. Where changes in grade occur, gradient lines should be connected by vertical curves, observing the following provisions:
 - (a) The length of a vertical curve is determined by the difference in grades to be connected and the rate of change adopted.
 - (b) Only rate of change shall be not more than 0.10 foot per station of 100 feet in sags, and not more than 2.0 foot per station of 100 feet.
- 3. On curves, the low rail will be kept on established grade.

H. Track Surface:

- 1. Track surface is the relationship of opposite rails to each other in profile and cross-level. Track profile is the running surface along the top of the grade rail. Cross-level is the difference in elevation of the tops of heads of opposite rails measured at right angles to the track alignment. The ideal surface is a uniform profile consisting of straight gradients connected by vertical curves, with zero cross-level on tangents and predetermined cross-level on curves.
- 2. When constructing, reconstructing or changing the alignment of tracks, trackage must meet the requirements for Class 3 track established in Track Safety Standards (See Sections 13.55 - Alignment; 13.57 - Curves, Elevation and Speed Limitations, 13.59 – Elevation of Curved Track; Runoff, and 13.63 – Track Surface).
- 3. Special attention must be given to the surface and line of track at the ends and approaches of crossings and platforms.
- 4. In very hot weather, special attention must be given to creeping rail, frozen joints, skeletonized track and, at the foot of heavy grades or in sags, to avoid displacement of tracks of "sun-kinks." Joint condition must be checked before installing ties or surfacing, and frozen joints loosened to allow the rail to move.
- 5. When track is given a general raise, both rails should be raised simultaneously. When track jacks are used, they should be placed opposite each other, and must not be placed between the rails except when absolutely necessary and then only under proper protection.
- 6. Before raising track in hot weather, there must be assurance that the track will not warp or buckle. Bolts should be loosened and subsequently retightened where necessary.

7. Adequate ballast for dressing to the required ballast cross-section should be distributed in advance of raising.
8. Track, which has been worked and is being returned to service, will be inspected by the RESIDENT before releasing. The first train over the new work shall be restricted to a maximum speed of 5 m.p.h.

I. Turnouts and Curvature:

1. No. 10 turnouts with 15-foot switch points shall be used throughout.
2. No curves shall be constructed or realigned resulting in a curvature greater than 13 degree (R = 441.68').

J. Rail Anchors: Rail anchors must be applied to control longitudinal rail movement in both directions at the rate of six (6) anchors per 33-foot rail. Rail anchors shall be applied as follows:

1. Rail anchors shall be applied at both ends and on the same side of the tie. They should be spaced throughout the rail length as evenly as practicable.
2. When laying rail, the necessary anchors shall be applied before trains are permitted to pass over track unless protected by slow order.
3. Rail anchors must have full bearing against the tie or tie plate when applied.
4. Drive-on type rail anchors shall be applied, from the field side of the track, to all rails including the stock rail, with exception of the rail adjacent to the switch point area.
5. Ties under welded rail shall be box anchored throughout.

K. Track Fasteners: Spike pattern shall be constant throughout this project, with the spike on the field side of the rail, on the end of track side of the plate where possible. The number and application of track fasteners is as follows:

1. Requirements of Track Safety Standards Sec. 14.127 apply.
2. When cut steel track spikes are used in track constructed with wood crossties, each rail, unless otherwise ordered by the RESIDENT, shall be fastened to every tie by the following number of spikes:

Track	Rail holding spikes	Plate holding spikes
Tangents and curves – all tracks		
Under 3 degrees	2	0
Curve 3 degrees or over	2	1

3. All spikes shall be driven with the head pointed towards the rail, except spikes against sides of all joints, especially bonded and polyurethane-coated steel insulated joints, shall be driven with the head pointing away from the rail and not be in solid contact with the joint bars.
4. Spikes must be started vertically and square, and driven straight. The shank of rail holding spikes must have full bearing against the base of the rail. Care must be given not to overdrive spikes. Pre-drilling of ties with 7/16" bit is recommended.
5. Care must be taken not to strike the rail, its fastenings or signal appliances when driving spikes.
6. All old spike holes shall be plugged prior to re-spiking.

L. Switches: All switches must be constructed in accordance with Standard Plans included with these Specifications for 15'-0" split switch for 85-lb. rail, with slide plates and adjustable braces through #6 plates only. It may be necessary to trim the inward ends of some plates to avoid conflict and punch new spike holes with torch. Also it is permissible to torch cut and re-weld No. 1 and No. 2 rods and gage plate to accommodate 2-foot gage track. Construction details are as follows:

1. Switch rails should be kept in good line and surface and in good order with all bolts tight and cotter pins in place.
2. They should fit the stock rails closely and accurately, with a full bearing against the head. If a wear pattern indicates bearing only along the top edge of point, corrections should be made by grinding in accordance with standard instruction.
3. Running of switch rails and stock rails should be prevented by adequately anchoring the adjoining rails.
4. Vertical switch rod bolts must be placed with threaded ends up, and nuts locked by cotter pins.
5. Switch plates and movable parts should be kept clean and lubricated. A permanent type of coating may be applied.
6. Switch rails shall be rejected when worn or chipped.
7. Switch rails shall be rejected when raised portion of switch rail is worn down to the level of the top of the stock rail. . See Track Safety Standards SEC. 14.133 and SEC. 14.135.
8. Each stock rail must be securely seated in switch plates, but care must be used to avoid canting the rail by overtightening the rail braces.
9. Each switch point must fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate on a tie must not adversely affect the fit of the switch point to the stock rail.
10. Each switch must be so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.
11. The heel of each switch rail must be secure and the bolts in each heel must be kept tight.
12. Each switch stand and connecting rod must be securely fastened and operable without excessive lost motion.
13. Each throw lever must be operable without excessive lost motion.
14. Each switch position indicator must be clearly visible at all times.
15. Switch points must be of fit, relay or reconditioned quality.

M. Frogs:

1. Frogs shall be fastened to ties with twin hook plates per Standard Plan.
2. All fins and lips of flowed metal should be ground from frogs and the gage and guard edges of castings rounded.
3. All bolts must be installed and tight.

N. Frog Guard Rails:

1. The length of the "Hook Flange" type guard rails for No.10 Frog shall be 9 feet.
2. The gage and distance shall be in accordance with Track Safety Standards, SEC. 14.143.

O. Switch Operating Mechanisms:

1. Switch slide plates and switch stand mechanisms must be lubricated with lubricant approved for this service and adjusted so that switches throw with minimal effort.
2. Switch throw mechanisms must be adjusted for tight fit to both stock rails.
3. Manually operated switch stands shall be placed so that the operating rod is in tension when the switch is set in normal position in main track, and at the siding end of crossovers between main track and siding.
4. Switch stands shall be located so that the minimum distance from gage to center of spindle is 7'-0".
5. At all track switches, throw levers of switch stands shall be secured by locking with a standard switch padlock provided. Padlock is to be fastened by chain to the switch stand. RESIDENT will furnish padlocks upon request of the Contractor.

- P. Rail Crossings:
1. Signage: Signage for rail-highway and trail grade crossings shall be in accordance with FHWA Manual of Uniform Traffic Control Devices (MUTCD) for advance warning signs, crossbucks and pavement marking.
 2. Protection: Public grade crossings shall be protected, according to degrees of hazard, state statutes, municipal ordinances and Public Service Commission regulations, by device, sign or pavement marking.
 3. When damaged during construction, all signs and other forms of protection at grade crossings shall be immediately repaired or replaced.
 4. During construction, crossings should be kept clean and attention given to the following:
 - Drainage, sloping the surface if necessary, and constructing underground drains.
 - Surface water flowing along highway toward the railroad should be diverted before it reaches the tracks.
 5. For construction details of crossings, see Detail Sheet C409.
 6. Work on highway crossings, roads and trails shall be done with the least inconvenience possible to travelers. Care must be taken to protect the work, in compliance with safety requirements and the law. Where it is necessary to construct temporary footwalks or driveways, they must be kept in a safe condition.
- Q. Track Removal:
1. Contractor shall dismantle and remove from site all materials from track discontinued as a result of this track construction.
 2. Contractor shall transport materials and unload same to designated storage areas within the City of Portland as directed by the RESIDENT:
 - (a) Rail: To off-site storage area.
 - (b) Ties:
 - Good relay ties – to off-site storage area.
 - Scrap ties – to be disposed of by Contractor in appropriate legal manner at Contractor's expense. Receipts for such scrap tie disposal must be furnished to the RESIDENT.
 - (c) Other Track Material: Spikes, tie plates, joint bars, bolts, switch stands, etc. to be unloaded by Contractor at designated storage area on Maine Narrow Gauge Railroad museum site.
- R. Wire Lines: Communication and signal lines crossing tracks shall conform to National Electrical Code IEEE Standard C2-2002 for standard gage track.
- S. Cut-over: See Special Provisions for MNGRR operations during construction.

*** END OF SECTION ***