ENGINEERING SPECIFICATIONS
FOR
INDUSTRIAL TRACKS

CN – ENGINEERING
OFFICE of DESIGN & CONSTRUCTION

Effective: September 12, 2011
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Specifications for Industrial Tracks

1.0 Foreword

These specifications are provided only as a guideline for design purposes and should not be taken as authority to construct industry trackage without prior review and approval from CN Design and Construction. This document is addressed to firms, developers and local authorities who want to construct a rail siding to an existing facility, to a green field site, including rail access to industrial parks, and to rail-truck transload facilities. The document is an especially useful guide to the Consulting Engineers and to the Contractors retained by groups/firms requiring rail access.

The specifications represent the minimum standard of construction and design for Industrial lead and service tracks and in-plant tracks. Tracks exceeding 1/2 mile in length or that are planned for speeds in excess of 10 mph or that are to handle cars greater than 70 feet in length, hazardous materials, and unit trains are subject to more restrictive specifications. Deviations from these standards, as provided for within the specifications, must have approval from the office of the CN Senior Manager Design and Construction. All other changes requested must be approved by office of the CN Chief Regional Engineer.

Please note that the information contained within this document is the property of CN, and that this information cannot be used outside of its intended purpose. CN reserves the right to modify this document at any time.
Specifications for Industrial Tracks

2.0 Development of Industrial Projects

2.1 Process for Industrial Track Projects

The development of an Industrial Project requiring rail service by CN can be broken into five distinct steps. These steps identify the various stages of development and levels of contact with CN.

Step 1 - Initial Contact with CN Business Development/Real Estate

The initial contact for Industries requiring rail service is the CN Business Development/Real Estate Group. The Business Development/Real Estate Group can provide assistance with site location, preliminary rail layout, rail serviceability, and shipping rates. The Business Development/Real Estate Group will consult with the CN Engineering and Transportation Departments to ensure the project is the most effective combination of location, shipping rates and serviceability.

Step 2 - Development of Detailed Design

Once the conceptual work has been completed with the assistance of CN Business Development/Real Estate, the Industry is to obtain the services of an Engineering Consultant or Rail Contractor to develop a detailed design for their facility. The development at this stage will ensure the rail portion of the project integrates with the remainder of the project and will provide sufficient details to allow CN Design and Construction to evaluate the design for compliance to CN Engineering Track Standards.

Step 3 - Submission of Detailed Design to CN Design and Construction

The detailed design drawing prepared by the Industry’s consultant is to be submitted to CN Design and Construction for review. The proposed design will be evaluated against CN Engineering Track Standards, which are outlined in this document. The design will also be confirmed with CN Transportation to verify serviceability. Approval at this stage ensures the design meets requirements specific to CN. The drawings must be approved and signed and stamped by a Professional Engineer prior to submission.

Step 4 - Construction

CN forces will be involved in any work that is located on CN property. This usually involves installation of mainline turnouts, signals work, etc. It is the Industry's responsibility, along with its contractors, to ensure that construction of the project is in accordance with the project design specifications.

Step 5 - Completion

Once construction is complete and the rail facility is ready to enter into service, CN will conduct a final inspection to ensure the track is safe for rail operation. This is typically done by the local track supervisor, which can be arranged through CN Design and Construction. CN also requires a paper or electronic copy of the As-Constructed/Agreement drawing(s) for sidetrack agreement purposes and will retain a copy of the sidetrack agreement(s) for CN’s records.
2.2 Contacts

Primary Contact is:

**Local CN Business Development/Real Estate Manager**

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<thead>
<tr>
<th>Name</th>
<th>Phone Number</th>
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<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fax Number</td>
<td>Email Address</td>
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</tbody>
</table>

**Local CN Design and Construction Contact**

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone Number</th>
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<td></td>
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<td>Fax Number</td>
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3.0 Design Standards

When designing track to serve an Industrial Facility or Lead Track, the following elements must be considered:

- Direction of Inbound and Outbound traffic;
- Car Lengths and car floor heights (if applicable)
- Loading method and capacity;
- Frequency of service
- Commodity transported.

3.1 General

1. All new construction is to comply with all CN Engineering Track Standards and appropriate regulatory requirements including those outlined in Section 4.
2. Industrial spurs or lead tracks longer than ½ mile in length must provide for a run-around track. If a spur or lead track is less than a ½ mile but does not have all switch points facing the same direction, a run-around may also be required.
3. Maximum gradient on industrial spur track is to be no greater than 2% and should be limited to 1% on lead tracks. Grades on track at locations used for spotting rail cars should be 0%, but in no case should exceed 0.2%.
4. Track shall be designed for standard gauge of 56-1/2”.
5. Minimum track centers shall be as follows:
   a. Unless physically restricted, 25’ track centers should be used to provide safe working space for employees between Main and industrial spurs or lead tracks.
   b. Between industrial or yard tracks: 14 ft.
   c. Greater track centers may be required to accommodate loading of specific commodities. For example, a minimum of 25’ track centers is required at log/pole loading facilities.
6. The horizontal clearance envelope as well as the minimum distance between track centers shall be increased to account for curvature and super elevation as follows:
   a. 1” per degree of curvature of track for single track
   b. 2” per degree of curvature of track for parallel track
7. Clearance envelopes will comply with the Regulatory Requirements per Section 4.2.
8. Industrial track shall be constructed with maximum 20” tie spacing.
9. For new construction the minimum railway clearance requirements (in addition to or at least to meet regulatory requirements) will be:

   Vertical: 23’-0” Nearest Obstruction (clear headway above the top of the highest rail) except:
   27’-0” Overhead Wire Lines (clear headway above the top of the highest rail)

   Horizontal: 8’ 6” from the centerline of track to the nearest obstruction, unless otherwise provided in these specifications.

3.2 Design Process

All design work is to be reviewed by CN Design and Construction.

3.2.1 Drawings

1. Drawing submissions to CN may be in hard copy format or electronic in AutoCAD format and pdf. Six (6) copies of the design are required if they are submitted in hard copy.
Specifications for Industrial Tracks

2. The drawings shall be to scale (minimum scale of 1"=200' OR 1:2000) and a minimum of 11" x 17" in size. The submitted drawing shall comply with the standard format as indicated on pages 37, 38 and 39 and contain the following information:

- Mile and subdivision of the mainline connection
- Legal Land description of the proposed development
- Width of the CN Right of Way
- Plan, profile and typical cross-sections
- Proposed top of rail grades
- Rail Size
- Turnout type and locations
- Stationing will be in 100 foot increments
- Actual mainline stationing on point of switch (PS) locations
- Stationing for PS, clearance point, right-of-way line, and derail shall be shown, with PS = 1 + 00
- Derail type
- Curve data including PC/PT points, spirals (if any), and degree of curve
- Vertical curve data, including length of vertical curve
- Track center dimensions
- Drainage and culverts
- Wetlands delineation
- Easements
- Location of utilities
- Location and details of fencing and gates
- Proposed car spots, maximum car lengths and proposed maximum gross weight
- Track length
- Clearance envelopes superimposed on cross-section

3. A proposed schedule for completing the work shall also be included with any submission for a proposed development.

3.2.2 Approval of Material and Equipment

Both Industry and Contractor must certify that track related materials and equipment meet CN specifications.

3.3 Curves

1. Maximum curvature on industrial track should be 9° unless approved by CN Sr. Manager Design and Construction. (or equivalent curve compensation per AREMA 3.7),

2. The chord definition of curvature is to be used. Degree of Curve is defined as the angle at the center of a circular arc subtended by a 100’ chord. Degree of Curve is related to radius as follows:

\[
\sin \left( \frac{Dc}{2} \right) = \frac{50}{R}
\]

Where Dc = Degree of Curve and R = Radius

3. If cars are to be coupled on a curve, the maximum curvature shall be 9°. This will help prevent couplers from bypassing and cars derailing. Where the curve is in excess of 9° there must be a minimum of 30 feet of tangent track between the last car and the point of curve (PC) in order to couple cars on the section of tangent track.

4. Gauge of track on all curves will be 56-1/2”.

5. The minimum tangent distance shall be at least 70 feet between reverse curves.
Specifications for Industrial Tracks

6. The rate of change for Vertical Curves should not be more than 1.2% per station in Sags and 1.5% per station in Summits for industrial tracks. The rate of change for Vertical Curves should not be more than 0.60% per station in Sags and 1.0% per station in Summits for lead tracks.

7. No portion of mainline turnouts is to be located in horizontal or vertical curves, spirals or within track with superelevation. Point of switch of any turnout or switch point derail not to be within twenty-five (25) feet of point of vertical curve. See Chart for minimum distances to bridges, curves, and road crossings. It is highly desired that no portion of the mainline turnout be installed closer than 100 feet to any bridge or public road crossing.

3.4 Road Bed and Ditching

1. Construction of an adequate roadbed and drainage system is the responsibility of the individual industry. The subgrade / sub-ballast / ballast structure must be designed by a Professional Engineer licensed in the state or province of the project to ensure structural capacity based upon the anticipated loading (i.e. 286,000 lb cars).

2. The drainage system shall be capable of handling the maximum expected flow of water and may not compromise the existing drainage system of the railway. Post-development flow rates to CN property must not be increased as a result of altered runoff characteristics.

3. Grading shall ensure there is adequate drainage away from the track structure.

4. Compact full width of subgrade and sub-ballast to density not less than 95% maximum dry density in accordance with Standard Proctor Density Compaction Test (ASTM D698).

5. Roadbed shall conform with Typical Cross-section as shown on page 20
   a. The top of the subgrade shall be shaped with a minimum 1:40 slope for drainage, typically each way from the centerline of the track.
   b. Embankments must have a slide slope of not less than 2H: 1V.
   c. Minimum depth of sub-ballast structure must be 12” and must extend at least 4 feet beyond the edge of ballast, unless otherwise approved by CN Design and Construction. Maintained top width shall be a minimum of 24 feet.
   d. Minimum depth of ballast structure must be 6” under industrial track and must provide a minimum 6” shoulder for jointed rail or 12” shoulder for continuous welded rail. Minimum ballast depth of mainline track class 2 or higher is 12”. Particular attention must be paid to turnout locations to ensure all minimum requirements are met.

6. The width of sub-ballast on the diverging side of turnouts shall be increased to create a walkway for train service employees. The sub-ballast width shall taper from the minimum of 12’-0” up to 20’ from the centerline of the tangent side of the turnout at the end of the stock rail ahead of the point of switch, until it reaches a point that is 12’-0” from the centerline of the diverging track. The 12’-0” minimum width should be maintained away from the point of switch until either 4’ past the location of a derail or 50’ past the clearance point if no derail is installed, and then should be tapered (if needed) to minimum width of 12’-0” from centerline of the track. Tennessee law requires that a walkway be provided, which requires a sub-ballast width a minimum of 12’-0” from track centerline to be provided on one side of any industry track for the entire length.

7. Ditch profile must be designed prior to the commencement of any excavation.

8. Drainage must be given particular attention at the following places: Switches, frogs, diamond crossings, grade crossings, and other places with limited vertical and side clearance.

9. Culverts shall be Corrugated Steel Pipes, Structural Plate Corrugated Steel Pipes, Seamless Steel Pipes or Reinforced Concrete Pipes to the latest CN and ASTM Specifications and must be sufficient to withstand 286,000 lb loading. These documents
Specifications for Industrial Tracks

3.5 Turnouts

1. Mainline turnouts must be new and comply with the current CN Engineering Standard Plans, copies of which are available from CN Design and Construction. The turnout must be of rail weight equivalent or greater than the mainline track and must be number 10 turnout or higher.

2. All turnouts within Industrial facilities may be new or second hand and must be a number 8 turnout or higher, or a number 10 turnout or higher if facility is to be serviced by six axle locomotives. Turnout rail weight must be 115RE or greater, unless approved by CN Design and Construction. Second hand turnouts must be of acceptable quality; rail may only be one spot rail, as defined in RM 1303-0. One spot rail is rail that is free of physical defects and has less than 20% of allowable head wear.

3. Industrial turnouts should be in accordance with CN Engineering Track Standard Plans. CN Sr. Manager Design and Construction may approve alternate turnout designs upon review.

4. All turnouts must have new hardwood switch ties.

5. All turnouts must be equipped with adjustable braces.

6. Second hand turnout material is not to be painted.

7. Switch stands will be of ergonomic design and can be new or second hand, and must be complete with connecting rods, targets, and reflective tips as required.

8. Frogs in other than Main Track turnouts will be either Self Guarded Solid Manganese (SGSM) or Rail Bound Manganese (RBM). Frogs in Main Track turnouts will be Rail Bound Manganese (RBM), Spring (SPR), or Flange Bearing (FB).

3.6 Derails

1. Derails must be installed:
   a. Where there is any possibility of equipment, which has been left standing on tracks other than main tracks or sidings, being moved by gravity so as to obstruct a main track or siding;
   b. On tracks on which an industry will move cars or equipment and
   c. On mining and other bulk loading facility tracks where cars are dropped by gravity toward the main or other track that is to be protected
   d. Any location where directed by CN Sr. Manager Design and Construction.

2. Hinge and sliding type derails may be used where the speed of the equipment to be derailed will not exceed 15 mph. A derail wheel crowder should also be installed where any of the following conditions apply:
   a. Derailing speed could exceed 9 mph; or
   b. The derail is installed on the inside of a curve.

3. Switch point derails must be used when speed of the equipment to be derailed could exceed 15 mph. Where switch point derails are used, adequate rail anchorage must be provided to prevent rail creep.

4. Where a private locomotive, track mobile or other car moving device is in use on industrial track, a switch point derail must be installed on the industrial track where it joins railway track. Exact locations will be coordinated with CN Design and Construction.

5. CN Regional Chief Engineer or designate will approve the derail selection for each installation.
6. The following table shall be used in selecting the appropriate derail:

Distance (Feet) in which a Free-Rolling Car will achieve the Following Speed:

<table>
<thead>
<tr>
<th>Gradient (%)</th>
<th>8 mph</th>
<th>9 mph</th>
<th>12 mph</th>
<th>15 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.30</td>
<td>1000</td>
<td>1280</td>
<td>2350</td>
<td>3800</td>
</tr>
<tr>
<td>0.50</td>
<td>485</td>
<td>615</td>
<td>1125</td>
<td>1805</td>
</tr>
<tr>
<td>0.75</td>
<td>310</td>
<td>395</td>
<td>700</td>
<td>1090</td>
</tr>
<tr>
<td>1.00</td>
<td>225</td>
<td>285</td>
<td>555</td>
<td>785</td>
</tr>
<tr>
<td>1.50</td>
<td>155</td>
<td>190</td>
<td>330</td>
<td>510</td>
</tr>
<tr>
<td>2.00</td>
<td>115</td>
<td>140</td>
<td>245</td>
<td>380</td>
</tr>
</tbody>
</table>

7. Derails must be installed so that equipment will derail away from the track being protected and shall be at least 20' beyond the 13' 6" clearance (fouling) point. Derails must be far enough behind any insulated joints to ensure that equipment derails before fouling the track circuit.

8. Hinge and sliding derails will be painted yellow, and any track equipped with a derail shall have the switch stand lever painted yellow. Proper signage shall also be erected at derail locations.

3.7 Cable Progressioners (Car Movers)

1. Must comply with clearance specifications.
2. Must have adequate lighting to ensure permanent mounted snatch blocks are visible at all times and that cables will not impede normal working activity.
3. Must be painted a conspicuous color.
4. Lockout controls must be installed on car progressioner panel to ensure no operation during switching or track maintenance.
5. Alarm system (i.e. bell, buzzer, etc.) should be integrated with start control so that a five second warning is given to personnel in the vicinity that car progressioner will be operating.
6. Standard warning sign should read “Caution: Car Puller Cables on Ground”.

3.8 Under Track Pits

1. Unloading Pits shall be designed and constructed in accordance with the provisions of the AREMA Manual, Specifications, Chapter 15, Part 8, Section 8.4 and must be stamped by a Structural Engineer Licensed in the state or province which the project is in.
2. Unsupported Running Rail
   a. No Joints in running rail shall be permitted over the pit.
   b. The top of the concrete pit walls shall be true and level to provide full bearing for the running rails.
3. Structural supporting Beams
   a. Running rails should be attached to the supporting beams at 2’ centers.
b. Welding of rails to beams is not permitted.
c. Beams should be provided with masonry plates.
d. Two anchor bolts for each masonry plate (bearing plate) should be provided.

4. The cover for the unloading pit will have to be installed flush with the top of the ties or constructed to provide minimum slopes of 4:1 from top of the ties to top of the opening and must not protrude above the rail. Both the cover and slope sections should be of metal and removable for ready inspection of rail and supports.

3.9 Material

3.9.1 Rail

1. Continuous Welded Rail (CWR) may be specified and will be laid and anchored under separate specifications per CN Engineering Track Standards.
2. For tracks handling dangerous commodities, all rail must be control cooled and approved by CN.
3. New rail, if used, shall be 115RE or greater.
4. Secondhand rail may be used in all locations except mainline switches, provided it meets the following standards:
   a. Rail lengths of 27 feet or greater are acceptable although rail less than 39 feet may not make up more than 25% of the total rail. Rails 78 foot or longer should be used through road crossing with joints no closer than 25’ from each end of the crossing surface.
   b. Rail section shall be 112RE or greater U.S and 100RA or greater Canada only.
   c. If rail of a smaller section is desired due to availability it may be used on approval from CN Sr. Manager Design and Construction.
   d. Quality must be at least 4 spot rail, meaning: Rails may have minor imperfections in line and/or surface, or minor physical defects that will not interfere with the safe use of the rail in yard tracks, industrial tracks and light density spurs.

5. Rail must be within the following limits of wear:

<table>
<thead>
<tr>
<th>Section</th>
<th>136RE</th>
<th>132RE</th>
<th>115RE</th>
<th>112RE</th>
<th>100RA (Canada Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Loss of Vertical Height</td>
<td>3/8&quot;</td>
<td>9/16&quot;</td>
<td>1/2&quot;</td>
<td>3/8&quot;</td>
<td>5/16&quot;</td>
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3.9.2 Joint Bars

1. All rail joints must be of proper design and dimension for the rail on which it is to be applied.
2. "Skirted" or "Toed" bars are not permitted.
3. Second hand joint bars in good condition may be used; except insulated or compromise joints
Specifications for Industrial Tracks

which must be new in all cases.

4. All joints shall be fully bolted with rail drilling that conforms to proper dimension and design for the rail section.

3.9.3 Sub-ballast

1. Sub-ballast gradation shall be sufficient to prevent penetration of the sub-ballast into the subgrade and shall conform to AREMA Manual Chapter 1, Section 2.11.2.5.

3.9.4 Ballast (Crushed Gravel)

1. Ballast shall conform to the following gradation, or be subject to the approval of CN Sr. Manager Design and Construction (type and size may be modified slightly to meet local conditions):

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>1-½&quot;</th>
<th>1&quot;</th>
<th>¾&quot;</th>
<th>½&quot;</th>
<th>¼&quot;</th>
<th>No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Passing by Weight</td>
<td>100</td>
<td>90 - 100</td>
<td>40 - 75</td>
<td>15 - 35</td>
<td>0 - 15</td>
<td>0 - 5</td>
</tr>
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</table>

2. Upon request of CN Design and Construction, customer must provide a sieve analysis of the ballast.
   a. Provide a sample for testing by a recognized materials testing consultant.
   b. Pay for material testing.

3. Ballast to have a minimum count of particles with one or more fractured faces of 70% on each sieve size.

4. The percent of wear due to abrasion shall be less than 30% for the ballast per ASTM C 131 “A” Grading.

3.9.5 Rail Anchors

1. Rail anchors are to be new or manufacturer certified refurbished rail anchors of appropriate size.

2. A minimum of 8 ties per 39 feet of track shall be fully box anchored (unless using Continuously Welded Rail or otherwise directed by CN)

3.9.6 Tie Plates

1. Recommended Tie Plate Usage found on “Turnout Return Curves and Spiking Pattern for Industrial Track” drawing, see page 33.

2. Tie plates for 5 ½” base rail to be a minimum of 12” in tangent up to a 2 degree curve, 14” greater than 2 degrees and tie cast Pandrol plated as per turnout spike pattern Page 33 greater than 6 degrees.

3. Tie plates for 6” base rail a minimum of 14” in tangent up to a 2 degree curve, 16” up to 6 degrees and tie cast Pandrol plated as per turnout spike pattern Page 33 greater than 6 degrees.

4. Tie Plates to be double shouldered with 1 in 40 cant.

5. Tie plates may be second hand provided they are not broken or damaged.

6. All ties are to be fully plated.
3.9.7 Ties

1. All ties are to be treated in accordance with the latest edition of AREMA Manual Chapter 30.
2. Timber Track Ties
   a. Track ties are to be a minimum of #2 hardwood ties. Ties should be new, however, second hand ties, of quality approved by the CN Sr. Manger Design and Construction, may be allowed if used in tangents.
   b. Track ties are to be a minimum 8’-6” in length and have minimum cross section dimensions of 6” x 8”. The corners may be beveled provided a minimum 7-1/2” flat surface exists on the top and bottom.
3. Where desired or if readily available the use of concrete ties is permitted with approval by CN Design and Construction.
4. Steel ties are not to be used in industrial tracks except upon approval from CN Design and Construction.
5. Switch Ties shall be new hardwood ties, minimum 7”x9” in size with length as required per the appropriate CN Engineering Track Standard plan.

3.9.8 Hardware

1. All hardware (bolts, nuts, spring washers, etc.) shall be new.
2. Track bolts shall be of appropriate size, complete with nuts and conform to latest edition of AREMA Manual, Chapter 4.
3. Spring washers shall be of appropriate size and conform to the latest edition of the AREMA Manual, Chapter 4.

3.9.9 Track and Screw Spikes

Track spikes shall be new 6" x 5/8” square.
Screw spikes shall be new 6” x 7/8” diameter with rectangular head

3.9.10 Bumping Posts/Earthen Bumpers

1. Bumping posts shall be Hayes Type WG or HD (or equivalent) for the designated rail section.
2. Install bumping posts/earthen bumpers 10 feet from the end of track, with 10 ties in front of and all ties behind it fully anchored.
3. Due to the potential damage to rail car undercarriages, wheel stops are not acceptable for new track construction, except upon approval by CN Design and Construction.
4. A typical earthen bumper is shown on page 21.

3.9.11 Derails

1. Install derails in accordance with the appropriate standard plans, as follows:
   a. Hayes EB (Hinged Type Derail)
   b. Hayes HB (Sliding Type Derail)
   c. Switch Point Derail - See Page 31
2. The correct size of derail to be used on various rail sections is as follows:
   a. Size 6: 100# (Canada only), 112 lb & 115 lb (worn)
   b. Size 7: 115 lb (new) and larger
3. A plywood or steel shim of the correct thickness with holes punched or drilled for all fasteners may be necessary under the derail to ensure the block lies flat on the top of the rail.

3.9.12 Bonding and Track Grounding

1. At any location where flammable commodities may be loaded or off-loaded, bonding wires and track grounding are to be provided per CN Engineering Track Standards.
4.0 Regulatory Requirements

Regulatory requirements pertaining to the design and construction of railway tracks are established at the national, state, and local level. They pertain to a variety of issues such as the handling of Hazardous Materials, Pipe and Wire Crossings, Regulatory Clearances, minimum construction and maintenance requirements, and road crossings. Prior to commencing development of a project, the CN Business Development/Real Estate department should be contacted to acquire current and local information pertaining to regulatory requirements and submissions.

4.1 Pipe and Wire Crossings

Pipe and Wire crossings must be submitted for approval to CN. Detailed instructions and requirements for pipe and wire crossings are available through the CN Design and Construction contact. U.S. information is also available on the CN website:

www.cn.ca and view “quick links public issues”

The general process is as follows:

1. Submissions to CN for permission to cross the railway with any type of pipe or wire must conform to the relevant General Order or Standard. The application must be submitted to the appropriate CN contact for approval. The steps for obtaining approval for an application are as follows:

   a. Application - submit for review three (3) copies of an acceptable plan to CN with the Application Fee.
   b. Agreement - once the plans are approved an agreement will be sent outlining the agreement, costs, special conditions, and Industry’s responsibilities.
   c. Installation - installation of pipes or wires may begin once the terms and condition letter is received by CN and three (3) working days notice is given to arrange flagging protection and signals locating as required.
   d. Additional information regarding the requirements for an Application for a Pipe or Wire crossing may be obtained from CN Design and Construction.

4.2 Operating and Structural Clearances

4.2.1 Restricted Clearance Proposals

1. Requests for permanent restricted clearances require approval from the appropriate governing Regulatory agency. Any proposal for permanent restricted clearances shall be reviewed by CN Design and Construction in order to:

   a. Ensure that there is business justification for the proposed restriction and that it cannot be economically or conveniently eliminated.
   b. Ensure that the proposal is reviewed in the engineering context of structure adequacy and safety.
   c. Ensure that CN Transportation is satisfied that locomotives, railcars, and employees can safely operate past the proposed restriction.

2. Requests for approval of restricted clearances shall be submitted to CN Design and Construction and shall include the following information:

   a. Location of the facility and restricted clearance, including mile post and subdivision;
Specifications for Industrial Tracks

b. Location of standard restricted clearance signs;
c. Reason(s) for restricted clearance;
d. Method of operations over the track concerned (locomotive, car progressor or gravity);
e. Need for locomotives to pass the point of restricted clearance;
f. Operations to be conducted over the track concerned;
g. Confirmation that the restricted clearance is unavoidable;
h. Nature of the restricted clearance (permanent or temporary);
i. Six (6) copies of drawing showing the relative position of the track and the obstruction, with cross sections at each point of restricted clearance. That drawing will indicate the following:
   i. Vertical clearance from the top of rail;
   ii. Horizontal clearance from the centerline of track;
   iii. Location of the "Restricted Clearance" sign.

4.3 Safety and Right of Entry

Authorized personnel working within the CN right of way must adhere to “Safety Guidelines for Contractors and Non-CN Personnel” and must be in the possession of a "Right of Entry Permit" issued by an Officer of the Railway that is only valid for the time period outlined in the document. To obtain a copy of the permit, contact CN Design and Construction. Insurance required by the “Right of Entry Permit” must be approved prior to working on CN property.

4.4 Certification and Training

 Contractors working on or near CN property must present proof that all personnel have completed the required training. All contractor personnel must also complete safety and security training per CN Police and Risk Management requirements (including Erailsafe.com).

CN Training requirements are:

- U.S. FRA On-Track Worker Safety
- E-Railsafe
- Canada Contractor Safety Orientation
- Canadian Rail Operating Rules (CROR)

Flagging will be required for all work performed by contractors within 25 feet of CN operating tracks, or where CN representative deems it necessary.

5.0 Track Construction

5.1 Site Grading

Construction of an adequate subgrade, which conforms to all submitted drawings, will be the responsibility of the individual industry. The Industry shall retain the services of a Professional Engineer to design the subgrade. The subgrade shall be designed and constructed to ensure there is adequate drainage away from the track structure.

5.1.1 Site Clearing and Grubbing

1. The contractor is responsible for the identification and protection of overhead and underground utilities at the site, including the portion of CN right-of-way affected by the
Specifications for Industrial Tracks

2. The Contractor shall clear all vegetation and brush (except for trees and shrubs which are to be preserved, as indicated on the drawings), rocks, expansive soils, and other similar objectionable materials from the project site, including the portion of CN right-of-way affected by the construction. The contractor is responsible for the safe and appropriate disposal of materials removed.

5.1.2 Embankment Construction

Embankments shall be constructed and compacted to the lines and grades set forth in the submitted drawings. If the quantity of materials required for construction of embankments is in excess of the quantity of material removed from excavations. Additional material may be obtained by widening cuts in the grading area, with the approval of CN Design and Construction; cuts shall be widened in such a manner as to:

a. Be stable
b. Provide adequate drainage for the cut slope and roadbed
c. Provide adequate protection against erosion
d. Adequately permitted by governing authorities.

5.1.3 Moisture and Density Control

Unless otherwise shown on the Drawings, embankments and those portions of cut sections designated, shall be constructed with moisture and density control. The moisture content of the soil at the time of compaction shall be at the optimum moisture content plus or minus four (4) percentage points of the optimum moisture content as determined by ASTM specification D 698.

5.1.4 Erosion Control

A seed and fertilizer mixture, in compliance with local, state/province and federal specifications, shall be applied so as to provide adequate erosion control and slope protection. Creeping grasses shall not be used. Additional erosion control methods, such as the use of Jute fabric or geo-textiles, or silt fence shall be applied to ensure the long-term integrity of slopes and embankments, as required.

5.2 Sub-ballast

1. Sub-ballast material may be placed once the finished subgrade is inspected. It shall be placed, using methods that do not lead to segregation or degradation of material.

2. Place material to full width of section in uniform layers not exceeding 12" thickness and compact to specified density.

3. Compact full width to density not less than 95% maximum dry density in accordance with Standard Proctor Density Compaction Test (ASTM D698).

4. Control
   a. Representative samples should be taken for laboratory tests to approve its quality and nature prior and/or during its use.
   b. Finished sub-ballast surface to be within ½" of design elevations but not uniformly high or low.

5.3 Use and Handling of Track Material

5.3.1 Timber Track Ties
Specifications for Industrial Tracks

1. Line the end of the track ties true on one side of the entire length of the track. All ties are to be installed at right angles to the rail.
2. Treated ties must not be handled with any tool having sharp points that will penetrate beyond the depth of the treatment, or cause damage to the ties.
3. When ties are re-spiked, the spike holes must be plugged.

5.3.2 Rail

1. Use rail saws and rail drills only for cutting and drilling rail respectively. Rail having cuts or holes made with an oxy-acetylene torch or an electric arc must not be used. When sawing rail for re-use, saw cut must be made at least 4” from any torch mark on the rail.
2. Rail must be handled carefully at all times. It should be unloaded by use of a crane, skids or threader and must not be dropped. Rail must not be struck with a steel hammer or similar tool.
3. Expansion space between rail ends, when laying bolted rail or track panels, must be provided. Fiber, hardwood or metal shims may be used to obtain the proper expansion space by bringing rail ends squarely together against the expansion shims. Expansion shims must not be removed until the rail is properly spiked, the bolts tightened and rail anchors applied. Expansion space should conform to the following:

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<td>5/16</td>
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<td>Above 85</td>
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4. Where the length of rail being laid is in excess of 78’, rails 39’ or less in length shall be laid on each side of non-bonded insulated joints, turnouts and railway crossings at grade.
5. Lay second hand rail in the same position it occupied before removal from the previous track so that the gauge side remains the gauge side.
6. All installations shall be designed using the same rail section throughout, if possible. Use compromise rails, compromise welds or compromise joints to join rails of different sections.

7. Rail joints on opposite rails shall be staggered by at least 12 feet. Rail joints must not be placed in road crossings if possible.
8. If Continuous Welded Rail (CWR) is used, ensure that it is destressed before placing the track into service and that Neutral Temperature of 105 degrees F has been achieved, unless the track is north of Duluth, MN. or in Canada, where the neutral temperature is 100 degrees F.
9. Anchor rails immediately after installation or proper destressing.
10. Place joint bars and tighten bolts before spiking the rail.
11. Tighten bolts in the rail joints in the following sequence:
   a. The two bolts at the center of the bar,
   b. The second bolt from the end of each rail,
Specifications for Industrial Tracks

c. The third bolt from the end of each rail.

12. Tighten bolts to the following torque:

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<tr>
<th>Size of Bolt</th>
<th>Torque (ft-lb)</th>
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<tr>
<td>1&quot;</td>
<td>490</td>
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<tr>
<td>7/8&quot;</td>
<td>375</td>
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</table>

13. Gauge of track after laying must be uniform and within 1/8" of design.
14. Where new rail adjoins second hand rail the maximum mismatch shall not exceed 1/8". Where required, mismatch shall be reduced through welding, grinding or replacement of the rail.

5.3.3 Turnouts

1. Minimum 13" Tie Plates are to be used in all turnout construction.
2. Tamp turnout ties firmly throughout the entire length.
3. The turnout stock rail must be bent horizontally, as shown on the standard plan. Only standard carbon and 3HB rail, in 115 lb section or smaller, may be field bent with an approved bender. For safety reasons, under no circumstances are head hardened rails or rails greater than 115 lb to be bent in the field.
4. Ensure the switch point fits snugly against the stock rail for the entire length of the planed portion.
5. Bolt switches, frogs and guard rails fully. Provide proper washers and cotter pins for bolts as required. Lock tight nuts are recommended.
6. Switch stands must be securely bolted or lagged to the head block ties.
7. All switches must be equipped with the appropriate reflectorized target assembly (in some locations a double bladed target tip is required). Target assemblies will be properly adjusted to display green when the switch is lined for the normal route and yellow (siding/industrial) or red (main line) when lined for the diverging route.
8. Switch targets will bear 3" black numbers on the yellow target representing the track number.
9. Install switch rod bolts and connecting rod bolts, except the bolt under the switch stand, with the nut on the upper side to permit ready inspection of the cotter pin.
10. Install the connecting rod bolt under the switch stand with the head on the upper side.
11. Install cotter pins on all connecting and switch rod bolts.
12. Position the handle to be on the frog side of switch stand when the switch is lined in the normal position.
13. Ergonomically designed switch stands are to be used on all turnouts.
14. Lubricate switch stands, switch plates, connecting rod bolts and spring frogs properly after assembly.
15. Maintain the distance between the gauge side of a frog and the bearing side of the guard rail at 4' 6-5/8".
16. Fully anchor the length of the turnout as per CN Engineering Track Standards Section 3.1, to the maximum extent possible.
17. Once installed, line new turnouts for through movement and clamp or spike the switch point. Switch points shall remain clamped or spiked until inspected by a CN Track Supervisor or his designate.

5.3.4 Other Track Materials

2. Spiking on Industrial Spurs is to be done per “Turnout Return Curves & Spike
Specifications for Industrial Tracks

Patterns for Industrial Tracks*.  
3. Spiking on Industrial Leads is to be done per “Turnout Return Curves & Spike Patterns for Industrial Tracks”.
4. Spiking in Turnouts must fill all spike holes in the plate, up to a maximum of 6 spikes per plate.
5. Pandrol Plates and clips required on every other tie in curves 6 and greater.
6. Pandrol Plates will require four (4) screw spikes installed per plate.
7. Screw spikes shall be 6” x 7/8” diameter with rectangular head.

5.4 Lifting, Lining, and Surfacing

5.4.1 Distribute Ballast

1. The Contractor is cautioned that damage caused by his equipment to track and turnouts during the distribution of ballast will be repaired by the Contractor at his expense.
2. Lifts in excess of 6" are prohibited.
3. Care must be taken to protect signal appliances during track surfacing operations.

5.4.2 Lifting

1. Raise all tracks and turnouts with the ballast to provide a minimum depth of 6" from the bottom of the tie to top of sub-ballast or to a depth directed by the Engineer.
2. Use tamping machines or other mechanical tamping equipment to tamp the ballast.
3. Tamp both sides of ties from a point 16" inside each rail to the end of the ties.
   a. Tamp inside and outside of the rail simultaneously.
   b. Do not tamp at the center of the ties between the inside limits stated above.
4. Tamp turnout ties firmly for 16 inches on either side of the mainline and turnout rails.
   a. Tamp by hand the areas under the frog, guard rails, and heel castings, using bars or mechanical hand tampers
   b. Hand tamping to be permitted only where power or mechanical tamping is not possible.

5.4.3 Lining

Line all track and turnouts to conform to the approved drawings.

5.4.4 Dressing

Dress the ballast to conform to the ballast sections as shown on attached standard drawing "Typical Cross Section Detail".

5.4.5 Surfacing

Bring track to a uniform gradient with corresponding cross-level to suit the alignment.

5.4.6 Tolerances

1. Gauge: The difference between gauge measurements taken 19'-6" apart may not be more than 1/4".
2. Alignment: The maximum out-of-alignment measured from mid-ordinate of a 62' chord may not be more than 1/8".
3. Surface: The deviation from uniform profile on either rail at the mid-ordinate of a 62' chord may not be more than 3/16".
4. Cross-level: The deviation in height from one rail to the other may not exceed 3/16".
5.5 Road Crossings

1. All new crossings shall conform to all applicable regulations.
2. All crossings shall be located clear of turnouts, switches and other track appliances.
3. Rail joints shall be kept clear of crossings and where practicable should not be located closer than 25' to the edge of the crossing.
4. Insulated rail joints at crossings shall be installed per CN Engineering Track Standards.
5. Drainage of the track at all crossings must be properly maintained at all times.
6. Crossing surface to be as follows:
   a. Only fully planked timber, concrete or solid rubber planking will be accepted. Gravel and Asphalt crossing surfaces are not permitted.
   b. Planks to be full depth of the crossing to match the height of rail. Planks shall not protrude above the top of the rail.
   c. Shim planks with shims covering the full contact area between the tie and the plank.
7. Provide a flangeway space of not more than 3" or less than 2" deep, and not less that 2 ½" or more than 3" wide.
8. Fasten timber planks with ½" x 12" crossing spikes or lag screws, with one fastening in every other tie and at each end. Countersink planks for recessing of the washer and the lag bolt head.
9. Trim the ends of the planks parallel to the road centerline. Bevel edges to prevent dragging equipment from catching on planks
10. Where the width of crossing necessitates, replace jointed rail with welded rail.
11. Crossing sightlines are to comply with all regulatory requirements.

6.0 Post Construction

6.1 Post Construction Requirements and Submissions

1. Once construction is complete, the local CN Track Supervisor must inspect the track before the facility is placed into service. The inspection can be arranged directly with the Track Supervisor or by contacting CN Design and Construction.
2. CN also requires that an agreement/as–constructed drawing be submitted to complete their records and to form the basis for an agreement for service. The preparation of this drawing is the responsibility of Industries’ Engineering Consultant or Rail Contractor. The drawing may be submitted in the same manner as the design drawing, but must include the following additional information:
   a. Track that is owned by the Industry is to be colored Green.
   b. Track that is owned by CN is to be colored Red.
   c. Complete formal name of Industry to be registered on the Agreement.
3. The electronic file (AutoCAD format) or six (6) copies of the Agreement/As-Constructed drawing are to be submitted to the Business Development/Real Estate Manager as soon as possible after construction, prior to track being put into service.

7.0 Sample Documents
<table>
<thead>
<tr>
<th>Specification</th>
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<tbody>
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<td>1. Typical Cross Section Detail</td>
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<td>2. Earthen Bumper Detail</td>
<td>21</td>
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<td>3. Typical Horizontal and Vertical Clearances</td>
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<td>10. Culvert Installation Detail</td>
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<tr>
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IF SIDE SLOPE CONTINUES ABOVE TOP OF SUB-BALLAST, AN INTERCEPTOR DITCH MAY BE REQUIRED ON TOP OF SLOPE

TYPICAL CROSS SECTION
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<td>Structures in Buildings</td>
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<td>Building Material and Supply Storage (Long Term)</td>
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NOTE: FOR CANADIAN MESS TRANSIT CANADA CLEARANCES TABLE.

E2: Height of Car Covering
## PLATFORMS

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**DIAGRAM DIMENSIONS**

- **E=** EXEMPT
- **OFH=** CAR FLOOR HEIGHT

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## SIGNALS

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<th>MAIN</th>
<th>SECONDARY</th>
<th>LOW, BETWEEN OR ADJACENT TO TRACKS</th>
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**NOTE:** FOR CANADIAN LINES, TRANSPORT CANADA CLEARANCES GOVERN.
## Design Criterion

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<tr>
<th>Track Classification</th>
<th>Industry Lead Track</th>
<th>Industry Service Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Criterion</td>
<td>RR</td>
<td>Industry</td>
</tr>
<tr>
<td>Degree of Curve</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Radius of Curve</td>
<td>7 deg 30 min</td>
<td>8 deg</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00%</td>
<td>1.50%</td>
</tr>
<tr>
<td>Vertical Curve Factor</td>
<td>0.05% per 100 ft</td>
<td>1.50% per 100 ft</td>
</tr>
<tr>
<td>Tangent Between Curves</td>
<td>100'</td>
<td>70'</td>
</tr>
<tr>
<td>Track Centers</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Distance from T/O To Curve</td>
<td>100'</td>
<td>70'</td>
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### HAZMAT/Leads > 1/2 mi

<table>
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<th>Track Classification</th>
<th>Industry Lead Track</th>
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</tr>
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<tr>
<td>Design Criterion</td>
<td>RR</td>
<td>Industry</td>
</tr>
<tr>
<td>Operating Speed</td>
<td>25 MPH / 15 MPH</td>
<td>25 MPH</td>
</tr>
<tr>
<td>Turnout No/Wgt/Type</td>
<td>#12 New / #10 New</td>
<td>#10 New</td>
</tr>
<tr>
<td>Type of Frog</td>
<td>Mainline</td>
<td>Mainline / #10 New</td>
</tr>
<tr>
<td>Rail Weight/Section</td>
<td>115# RE New</td>
<td>110# RE SH</td>
</tr>
<tr>
<td>Cross Tie - size</td>
<td>7&quot; x 9&quot; hardwood</td>
<td>7&quot; x 9&quot; Grade HW</td>
</tr>
<tr>
<td>Cross Tie - spacing</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Ballast depth</td>
<td>12&quot;</td>
<td>6&quot;</td>
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### General Service

<table>
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<tr>
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<td>Design Criterion</td>
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<td>Industry</td>
</tr>
<tr>
<td>Operating Speed</td>
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<td>15 MPH</td>
</tr>
<tr>
<td>Turnout No/Wgt/Type</td>
<td>#10 New</td>
<td>#10 New</td>
</tr>
<tr>
<td>Type of Frog</td>
<td>Other</td>
<td>Rail Bound Manganese (RBM)</td>
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<tr>
<td>Rail Weight/Section</td>
<td>115# RE New</td>
<td>110# RE SH</td>
</tr>
<tr>
<td>Cross Tie - size</td>
<td>7&quot; x 9&quot; Grade HW</td>
<td>7&quot; x 9&quot; Ind Grade HW</td>
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<tr>
<td>Cross Tie - spacing</td>
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<td>m</td>
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<tr>
<td>Ballast depth</td>
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<td>6&quot;</td>
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### HAZMAT

<table>
<thead>
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<td>Design Criterion</td>
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</tr>
<tr>
<td>Operating Speed</td>
<td>25 MPH</td>
<td>25 MPH</td>
</tr>
<tr>
<td>Turnout No/Wgt/Type</td>
<td>#12 New</td>
<td>#12 New</td>
</tr>
<tr>
<td>Type of Frog</td>
<td>Mainline / #10 New</td>
<td>#10 New</td>
</tr>
<tr>
<td>Rail Weight/Section</td>
<td>115# RE New</td>
<td>110# RE SH</td>
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<td>Cross Tie - size</td>
<td>7&quot; x 9&quot; Grade HW</td>
<td>7&quot; x 9&quot; Ind Grade HW</td>
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<tr>
<td>Cross Tie - spacing</td>
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<td>m</td>
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<tr>
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### Unit Train

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</tr>
</thead>
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<td>Design Criterion</td>
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</tr>
<tr>
<td>Operating Speed</td>
<td>15 MPH</td>
<td>15 MPH</td>
</tr>
<tr>
<td>Turnout No/Wgt/Type</td>
<td>#10 New</td>
<td>#10 New</td>
</tr>
<tr>
<td>Type of Frog</td>
<td>Other</td>
<td>Rail Bound Manganese (RBM)</td>
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<tr>
<td>Rail Weight/Section</td>
<td>115# RE New</td>
<td>110# RE SH</td>
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<tr>
<td>Cross Tie - size</td>
<td>7&quot; x 9&quot; Grade HW</td>
<td>7&quot; x 9&quot; Ind Grade HW</td>
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<tr>
<td>Cross Tie - spacing</td>
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### Material Specifications

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<td>Industry</td>
</tr>
<tr>
<td>Material Specifications</td>
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</table>

### Industry Lead Track

1. Mainline turnout weight to match main line section (not less than #10-115# New)
2. Tie spacing in xing areas are to match crossing surface specifications.
"L" = LENGTH OF CURVE IN 100' STATIONS

SAG CURVE

SUMMIT CURVE

G1

G2

G1

G2

L" = LENGTH OF CURVE IN 100' STATIONS

\[ \frac{v}{L} = \frac{G2 - G1}{L} \]

<table>
<thead>
<tr>
<th>TRACK</th>
<th>MAXIMUM V/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAG</td>
<td>SUMMIT</td>
</tr>
<tr>
<td>YARD TRACKS</td>
<td>0.40</td>
</tr>
<tr>
<td>INDUSTRIAL LOADS</td>
<td>0.60</td>
</tr>
<tr>
<td>INDUSTRY TRACK</td>
<td>1.20</td>
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</table>

G1 AND G2 DESCRIBE GRADIENT IN PERCENT.
L = LENGTH OF CURVE IN 100' STATIONS.
V = ALGEBRAIC DIFFERENCE IN GRADIENT IN PERCENT (G2 - G1)
V/L = AVERAGE CHANGE IN GRADIENT PER 100' STATION.

TO DETERMINE LENGTH (L), DIVIDE V BY THE DESIRED V/L ROUNDED UP. THE RESULT IS THE NEAREST 100' STATION.

EXAMPLES:
GIVEN G1 = 1.05 AND G2 = 0.71 \( V = (-7) - (-1.05) \) = 1.75%
GIVEN V/L = .10 \( L = \frac{-1.76}{.10} = 176' \) STATION,
VERTICAL CURVE LENGTH = 1800' (ROUNDED UP).

NOTES:
VERTICAL CURVES SHALL NOT FALL WITHIN THE LIMITS OF HORIZONTAL CURVES OR TURNOUTS UNLESS AUTHORIZED BY THE CHIEF ENGINEER.
GENERAL:

1. FENCE SHALL BE PROVIDED AS INDICATED ON THE CROSS SECTION ON BOTH SIDES OF THE VXVACUT. THE FENCE SHALL EXTEND COMPLETELY ACROSS THE STRUCTURE OR CN RIGHT-OF-WAY, WHICHEVER IS SHORTER.

2. SPLASH BOARDS SHALL BE PROVIDED ON BOTH SIDES OF THE VXVACUT IN LOCATIONS WHERE SWITCHING OR OTHER FREQUENT RAILROAD ACTIVITIES ARE PERFORMED. THE SPLASH BOARD SHALL EXTEND COMPLETELY ACROSS THE STRUCTURE OR CN RIGHT-OF-WAY, WHICHEVER IS SHORTER.

3. LIGHTS ARE TO BE INSTALLED ON THE UNDERSIDE OF THE VXVACUT WHERE SHADOWS CAST BY THE STRUCTURE WOULD INTERFERENCE WITH THE RAILROAD OPERATIONS.

4. SLOPE PAVING SHALL BE PROVIDED WHERE END SLOPES ARE STeeper THAN 2 HORIZONTAL TO 1 VERTICAL.

5. FALSEWORK, NETTING OR OTHER SUITABLE PROTECTION SHALL BE PROVIDED TO PREVENT DEBRIS FROM FALLING ON THE TRACK DURING DEMOLITION AND CONSTRUCTION OPERATIONS.

6. APPLICANT SHALL BE RESPONSIBLE FOR IDENTIFICATION, LOCATION AND PROTECTION OF EXISTING UTILITIES.

7. CONTACT CN'S PUBLIC WORKS ENGINEER FOR THE DESIGNATED PROJECT IN THE STATE IN WHICH IT IS LOCATED AT LEAST 1 WEEK PRIOR TO COMMENCEMENT OF WORK TO LOCATE ANY UNDERGROUND SIGNAL INFRASTRUCTURE.

8. 2 WEEKS PRIOR TO PROJECT START, CONTACT PUBLIC WORKS ENGINEER WHO WILL ARRANGE FOR FLAG PROTECTION TO BE PUT IN PLACE.

9. APPLICANT MUST CONTACT JOINT UTILITY LOCATION SERVICE TO DETERMINE LOCATION OF FIER OPTICS.

10. CERTAIN LOCATIONS MAY REQUIRE ADDITIONAL CLEARANCES OR FEATURES BEYOND THOSE SHOWN IN THIS DRAWING BASED ON LOCAL CONDITIONS.

11. EXCEPTIONS TO THESE STANDARDS MUST BE APPROVED BY CN.

NOTES:

1. CLEARANCES:

   MINIMUM VERTICAL CLEARANCE SHALL BE 23' ABOVE THE PLANE OF TOP-OF-RAIL. ADDITIONAL CLEARANCE MAY BE REQUIRED IF SAG OF VERTICAL CURVE MUST BE ADJUSTED OR IF FUTURE TRACK RISE FOR FLOOD CONSIDERATIONS OR MAINTENANCE IS PROBABLE.

   MINIMUM HORIZONTAL CLEARANCES, MEASURED AT 12' VERTICAL ABOVE THE PLANE OF TOP-OF-RAIL, SHALL BE AS SHOWN.

   MINIMUM CONSTRUCTION CLEARANCES SHALL BE 23' VERTICAL ABOVE THE PLANE OF TOP-OF-RAIL AND 12' HORIZONTAL AT 12' VERTICAL ABOVE THE CENTERLINE OF TRACK. DEPENDING ON TYPE OF STRUCTURE, CLEARANCES MAY BE INCREASED.

   HORIZONTAL CLEARANCES ARE TO BE INCREASED 1 1/2" PER DEGREE OF CURVE WHERE THE STRUCTURE IS LOCATED ADJACENT TO OR WITHIN 80' OF THE CURVE LIMITS.

2. FUTURE TRACKS:

   SPACE TO BE PROVIDED FOR ONE OR MORE FUTURE TRACKS AS REQUIRED FOR LONG RANGE PLANNING OR OTHER OPERATING REQUIREMENTS, WHERE PREVISION IS MADE FOR MORE THAN TWO TRACKS, SPACE TO BE PROVIDED FOR ACCESS ROADS ON BOTH SIDES OF TRACK.

3. PIERS:

   PIER PROTECTION (CRASH WALLS) SHALL BE PROVIDED IN ACCORDANCE WITH AMERI CHAIPAER 8, PART 215 FOR PIERS WITHIN 25 FEET OF THE CENTERLINE OF TRACK.

   TOP OF FOOTING SHALL BE A MINIMUM OF 6' BELOW BASE OF RAIL AND A MINIMUM OF 1 F 1 FOOT BELOW FLOOR LINE OF TRACK.

   TEMPORARY OR PERMANENT SHORING SHALL BE DESIGNED AND SEALED BY A LICENSED ENGINEER OF THE STATE IN WHICH THE STRUCTURE IS BEING BUILT AND SUBMITTED TO CN'S STRUCTURES GROUP FOR REVIEW (SEE SPECIFICATION DRAWING)

4. DRAINAGE:

   DRAINAGE FROM THE OVERPASS SHALL BE DRAINED AWAY FROM CN TRACKS AND NOT DISCHARGED ONTO THE TRACKS OR ROADS.

   A STANDARD FLAT-BOTTOM DITCH SHALL BE PROVIDED ON EACH SIDE OF TRACKS AS NECESSARY.

   CULVERTS MAY BE INSTALLED ON THE OPPOSITE SIDES OF COLUMN FROM TRACK IN LIEU OF STANDARD RAILROAD DITCHES WHEN APPROVED BY TECHNICAL SERVICE ENGINEER. MAINTENANCE OF CULVERTS IS TO BE AT APPLICANT'S EXPENSE.
ANCHOR PATTERN NEAR FIXED OBJECTS.

ANCHOR PATTERN OF TRACK.

NOTE: On jointed rail, without a completed length of continuous welded rail, the first six joints should be fully box anchored. All joints, but jointed tie and thereafter every other tie must be box anchored.
PLAN OF RIGHT HAND TURNOUT

<table>
<thead>
<tr>
<th></th>
<th>#8</th>
<th>#10</th>
<th>#12</th>
<th>#15</th>
<th>#20</th>
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</thead>
<tbody>
<tr>
<td>END TO P.S.</td>
<td>3'- 5 5/8&quot;</td>
<td>3'- 5 5/8&quot;</td>
<td>3'- 5 5/8&quot;</td>
<td>3'- 5 5/8&quot;</td>
<td>3'- 5 5/8&quot;</td>
</tr>
<tr>
<td>POINT LENGTH</td>
<td>16'- 6&quot;</td>
<td>31'- 6&quot;</td>
<td>36'- 7&quot;</td>
<td>45'- 9&quot;</td>
<td>58'- 10&quot;</td>
</tr>
<tr>
<td>S</td>
<td>1' 42' 01&quot;</td>
<td>1' 42' 01&quot;</td>
<td>1' 16' 31&quot;</td>
<td>1' 02' 00&quot;</td>
<td>1' 04' 30&quot;</td>
</tr>
<tr>
<td>H.S. (HEEL SEPARATION)</td>
<td>5 5/8&quot;</td>
<td>6 1/4&quot;</td>
<td>6 1/4&quot;</td>
<td>6 1/4&quot;</td>
<td>8 1/4&quot;</td>
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<tr>
<td>P.S. TO P.F.I.</td>
<td>29'- 10 3/4&quot;</td>
<td>34'- 0 1/2&quot;</td>
<td>41'- 1&quot;</td>
<td>41'- 1 1/8&quot;</td>
<td>61'- 1 3/64&quot;</td>
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<tr>
<td>LEAD</td>
<td>67'- 10 3/4&quot;</td>
<td>81'- 6&quot;</td>
<td>98'- 1&quot;</td>
<td>112'- 4 1/6&quot;</td>
<td>156'- 0 1/2&quot;</td>
</tr>
<tr>
<td>LENGTH</td>
<td>91'- 0 3/8&quot;</td>
<td>110'- 8 7/8&quot;</td>
<td>137'- 3 3/4&quot;</td>
<td>175'- 1 1/2&quot;</td>
<td>220'- 0&quot;</td>
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<tr>
<td>F (FROG)</td>
<td>5' 27' 09&quot;</td>
<td>4' 01' 28&quot;</td>
<td>3' 29' 48&quot;</td>
<td>2' 47' 06&quot;</td>
<td>1' 47' 21&quot;</td>
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<tr>
<td>TOE LENGTH (FROG)</td>
<td>5'- 0&quot;</td>
<td>12'- 0&quot;</td>
<td>14'- 3&quot;</td>
<td>13'- 8&quot;</td>
<td>16'- 1 1/2&quot;</td>
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<tr>
<td>HEEL LENGTH (FROG)</td>
<td>8'- 0&quot;</td>
<td>14'- 0&quot;</td>
<td>17'- 3&quot;</td>
<td>18'- 3&quot;</td>
<td>24'- 10 1/2&quot;</td>
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<tr>
<td>F (FROG)</td>
<td>7' 09' 10&quot;</td>
<td>5' 43' 29&quot;</td>
<td>4' 46' 19&quot;</td>
<td>3' 49' 06&quot;</td>
<td>2' 51' 51&quot;</td>
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<tr>
<td>LIMITS OF TURNOUT</td>
<td>94'- 6&quot;</td>
<td>114'- 2 1/2&quot;</td>
<td>140'- 9 3/8&quot;</td>
<td>178'- 7 1/8&quot;</td>
<td>223'- 5 5/8&quot;</td>
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</tbody>
</table>
WALKWAY STANDARD NO. 3
INDUSTRIAL TRACK ROADBED ONLY

WALKWAY STANDARD NO. 4
INDUSTRIAL TRACK ROADBED

WALKWAY STANDARD NO. 1 AND 2
INDUSTRIAL TRACK ROADBED

WALKWAY STANDARD NO. 5
INDUSTRIAL ROADBED FOR TWO OR MORE TRACKS

TYP. SWITCH STAND SECTION

NOTE:
WALKWAYS ARE TO CONSTRUCTION ONLY FOR INDUSTRIAL TRACKS AND ARE NOT TO BE USED ALONG HIGH RAIL TRACK SSwitches. USE ONLY NO. 5 FOR BALLAST.
CONSTRUCTION DRAWINGS
TITLE SPECIFIC TO PROJECT

NNN STNAME STREET
XXCITYXX, XXSTATE/PROV.XX XZIP/POSTALCODEXX
DD MMM YYYY

INDEX

STANDARD REFERENCE DRAWINGS
The reference drawings listed on this plan shall be considered a part thereof.

Benchmark
BM #1
Top of Railroad Track at ________.
Painted ________.
Elevation = XXX.XX' (NAVD XX)

BM #2

FLOOD ZONE INFORMATION
This is to certify that this property (the subject property or portion of surveyed) is not within the limits of a designated flood hazard area. This property falls within an "other areas", Zone X being defined as, "areas determined to be outside 500-year flood plain" per FEMA FIRM Map Number ___________________ Dated MMM XX, YYYY based upon our interpretation of the flood hazard boundary limits in relation to the property lines. No flood study was performed for this survey.

ISSUED FOR

SUBDIVISION: XxSUBDIVISION NAMEXX
MILE POST: XxNUMBER.OXX
RR STATION: XxNEAREST STATIONXX

FOR REVIEW