Engineering

Red Book of Track Requirements

April 1, 2024

CPKC

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RED BOOK OF TRACK REQUIREMENTS

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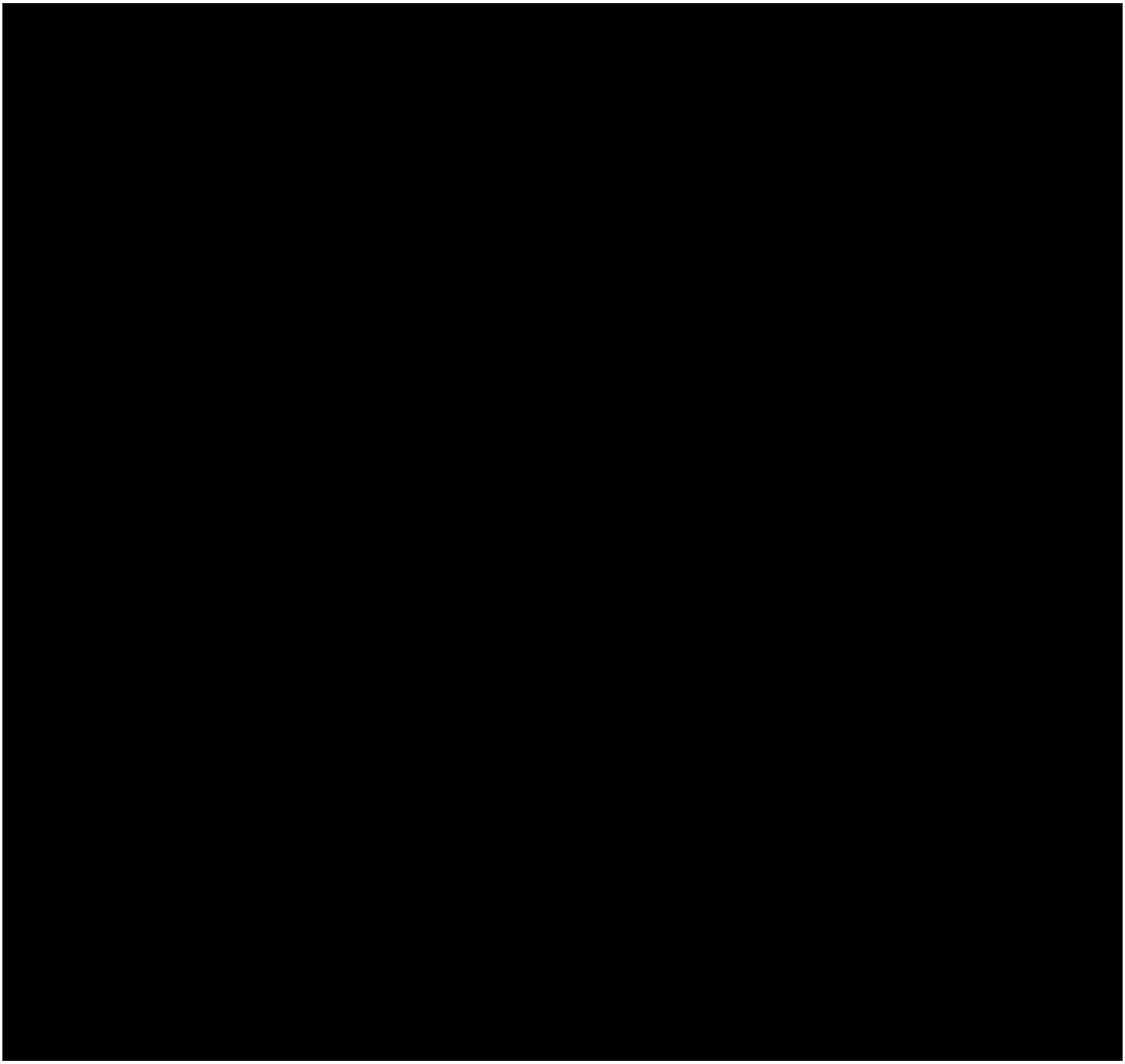

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RED BOOK OF TRACK REQUIREMENTS

SECTION 1 – REQUIREMENTS

1.1.0 Important

a. **Requirements** are standards, practices and procedures which MUST be followed to ensure safety and/or to comply with regulation, or action MUST be taken to protect the condition, as in *b. i.*, *ii.* and *iii.* below.

b. This book contains the **Requirements** for managing track owned and operated by Canadian Pacific Railway. Conditions on track must equal or exceed the minimum requirements laid out in this document, which is in compliance with the *Transport Canada Track Safety Rules* (Canada) and the *FRA Track Safety Standards Part 213* (USA). Where conditions on track do not comply with these requirements immediate action must be taken to:

   i. Bring the track into compliance;

   ii. Halt operation over the track; or

   iii. Operate under the authority of a qualified track supervisor for up to 30 days at 10 mph.

c. All employees responsible for the maintenance and/or inspection of track owned and maintained by CPR must be trained and pass a qualifying test in these requirements.

d. All employees responsible for the inspection, installation, adjustment or maintenance of CWR track must be trained and pass a qualifying test on CWR procedures.

e. Safety is the most important aspect of any job. As a result, understanding and following safety rules and safe work practices is a condition of employment. When in doubt, employees must take the safe course of action.

SECTION 2 – DEFINITIONS

2.1.0 Definitions

a. **Balanced Elevation** is the curve elevation that for trains traveling at the maximum authorized speed results in equal vertical dynamic loadings on the high and low rail.

b. **Balanced or Equilibrium Speed** is the train speed that results in equal vertical dynamic loadings on the high and low rails of a curve.

c. **Bolted Rail** includes welded rail, in lengths up to and including 90 feet, which are joined together with joint bars.

d. **Classified Yard** is a term used in Canada for yards that have been categorized into one of four categories based on frequency of track use, volume of traffic and risk associated with the movement of trains and equipment as designated by Transport Canada Track Safety Rules. In Canada, all yards must be designated as classified or unclassified. In the US, all yards are unclassified. The Canadian Yard Track Classifications are shown in *Appendix 16*.

e. **Continuous Welded Rail (CWR)** is rail in lengths of 400 feet and longer. Rail installed as CWR remains CWR, regardless of whether a joint or plug is installed into the rail at a later time.

f. **EOTA** refers to Every Other Tie Box-Anchored.

g. **ETA** refers to Every Tie Box-Anchored.

h. **Gauge Face Wear** is loss in rail width measured on the gauge side of the rail 5/8 inch from the top of the worn rail. For rail that is not transposed, the gauge face wear equals the lateral rail wear.

i. **Heat of the Day** is the time of the day that the rail temperature is expected to be at its highest, usually between 1200 and 1800 hours.

j. **Inactive Track** is a term used in Canada to mean track used less than once per month and secured in a manner that will prevent use by train or movements.

k. **Lateral Wear** is the loss in rail head width measured as the difference between a new rail profile and the worn rail profile across the rail head 5/8 inch below the top of the worn rail.

l. **Line C Wear** represents the maximum limit to which rail can be worn prior to removal from track. See *Appendix 6 – Rail Wear Limits & Rail Management Decision Zones* for Line C wear limits on weights of rail used on Canadian Pacific Railway.

m. **Local Engineering Manager** refers to the local Director Track or Director Bridges, or his designate.

n. **Permanent Repair of Track Buckle** is corrective action to repair a track buckle that prevents recurrence and allows the passing of trains at authorized timetable speed.

o. **Preferred Rail Laying Temperature (PRLT)** is the designated rail laying temperature established to balance the risk of track buckles at high temperature and pull-aparts at low temperatures. Refer to *Appendix 1 – Preferred Rail Laying Temperatures by Subdivision*.

p. **Program Surfacing** is out of face surfacing or surfacing of whole curves.

q. **Rail Neutral Temperature** is the temperature at which a rail is neither in tension nor compression.

r. **Rail Wear** is the loss in rail head due to abrasive interaction between steel wheels and steel rail over time. Loss in rail head is determined using the combination of vertical and lateral wear measurements.

s. **Restricted Crossing** is any crossing that has a barrier (gate) to control or restrict access to the crossing, or that serves fewer than 3 residences.

   i. Generally, a restricted crossing occurs where a road or passage crosses a railway track at grade for the private use of a particular person, persons or parties (and no one else).

   ii. A restricted crossing is NOT for public use.

t. **Special Trackwork** includes diamonds, sliding joints, moveable point frogs, lift rail assemblies and other transition devices on moveable span bridges.

u. **Temporary Repair of Track Buckle** is corrective action taken to repair a track buckle that allows the passing of trains at a maximum of 10 mph.

v. **Track Buckle** is a lateral or vertical misalignment of track.

w. **Underbalanced Elevation** is the elevation of the outer rail relative to the inner rail on a curve that is less than balanced elevation.

x. **Unrestricted Crossing** is any crossing to which all of the following apply:

   i. It does not have barriers (gates) to control highway traffic flow.

   ii. It serves 3 or more residences.

   iii. It serves any commercial enterprise or business to which the public has regular access.

y. **Vertical Wear** is the loss in rail head height measured as the difference between a new rail profile and the worn rail profile at a point on the top of the rail in line with the middle of the web.

z. **Welded Rail** is rail in lengths more than 90 feet long but less than 400 feet long. Welded Rail must be laid in the same manner as Continuous Welded Rail.

SECTION 14 – TRACK INSPECTION

14.1.0 General

14.1.1 Background Information

a. The method chosen for and the frequency of track inspections must ensure that the track is safe for operation at currently authorized speeds. All unsafe conditions found during inspection that cannot be corrected immediately must be properly protected.

b. As a minimum, all tracks must be inspected in accordance with the schedules listed in the current Transport Canada Track Safety Rules in Canada or the FRA Track Safety Standards in the US. These schedules are shown in *Figure 14-1, Figure 14-2,* and *Figure 14-3* below.

c. Each inspection must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with federal regulations. However, mechanical, electrical and other track inspection devices may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 miles per hour when passing over track crossings, public crossings, turnouts or special trackwork.

   When riding over the track in a vehicle, the inspector(s) may inspect up to two tracks at one time provided that:

   i. each main track is actually traversed by the vehicle or inspected on foot on alternate inspections at least once every two weeks, and each siding or crossover is actually traversed by the vehicle or inspected on foot at least once every month.

   ii. One inspector cannot inspect more than two tracks at one time and cannot inspect any track centered more than 30 feet from the track on which the inspector is riding.

   iii. track inspection records must indicate all track(s) included in the inspection and indicate which tracks(s) was traversed by the vehicle or inspected on foot.

   iv. The inspectors' view of the track(s) is unobstructed by tunnels, bridges, differences in ground level, or any other circumstances or conditions that would interfere with a clear view of all the tracks they are inspecting.

d. When track is occupied by equipment the inspection will be made by a walking inspection on each side of the track.

[redacted]

g. The Roadmaster responsible for the territory has the responsibility and authority to order additional inspections if they are required for safe railway operations.

h. Additional track inspections are required under the following conditions:

i. strong winds, which may cause trees or other obstacles to fall on the track.

ii. heavy rain, snow or repeated freeze-thaw cycles, which may cause high water, washouts, rock falls or mud slides.

iii. extreme hot or cold temperatures, which may cause buckled track or rail pull-aparts.

iv. long dry periods combined with track maintenance activities, or during any train operations that may cause fires.

v. after an earthquake.

vi. any other occurrence which may have damaged the track structure.

[redacted]

j. The inspections must be carried out by employees who are qualified under the Transport Canada Track Safety Rules or the FRA - Track Safety Standards and must be under the direction of the Roadmaster.

14.2.0 Frequency Of Track Inspections

a. The minimum requirements for regulatory track inspections are shown in the *Figure 14-1, Figure 14-2,* and *Figure 14-3.* These minimum requirements do not eliminate the Roadmaster's responsibility to carry out or arrange for additional inspections when conditions call for additional inspections.

b. In Canada, visual track inspections must be made according to the following schedules:

VISUAL TRACK INSPECTION FREQUENCY – CANADA

[redacted]

Figure 14-1

i.

i. In the U.S., track inspections must be made according to the following schedules:

TRACK INSPECTION FREQUENCY – U.S.		
Class of Track	**Type of Track**	**Required Frequency**
Excepted Track and 1, 2, 3	Main Track and Sidings	Weekly with at least 3 calendar days between inspections, or before use if the track is used less than once per week. OR Twice weekly with at least 1 calendar day between inspections if the track carried passenger trains or more than 10 million gross tons of traffic during the previous calendar year.
Excepted Track and 1, 2, 3	Other than Main Track and Sidings	Monthly with at least 20 calendar days between inspections.
4, 5	Main Tracks & Sidings	Twice weekly with at least 1 calendar day between inspections.
6	Main Tracks	Twice weekly with at least 2 calendar days between inspections.

Figure 14-3

j. Note: Inspection Intervals in the U.S. are defined as follows:

i. Weekly, with at least 3 calendar days between inspections means that if the inspection on the first week is made on Friday, then next week's inspection cannot be made before Tuesday. If the second week's inspection is made on Wednesday, the third week's inspection could then be made on Monday, assuming Monday is the start of the third week.

ii. Three times weekly with at least 1 calendar day between inspections means that if the first inspection of the week is on Monday, the second must be on Wednesday or later. If the second inspection is on Wednesday, the third inspection must be on Friday or later.

iii. As required, with a maximum of 3 calendar days between inspections and operation means that if a train is to be operated on Friday, the track must be inspected no earlier than Monday of that week.

14.3.0 Methods Of Inspection

a. Track inspection methods include walking, or riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track in accordance with *Figure 14-3*. If a hirail vehicle is used for visual inspection, the speed of the vehicle must not be more than 5 mph when passing over track crossings, highway crossings or switches.

b. Track may also be inspected by train, riding a forward facing second unit when possible. Inspection by train will provide a view of the track and right-of-way and will give an indication of ride quality, but is not included in the count of required inspections by Transport Canada or the FRA. The Roadmaster should inspect the main track on his or her territory once every month from the engine of one of the faster trains.

14.4.0 Key Inspection Items

a. When inspecting track, pay particular attention to:

i. the adequacy of the ballast section at sags, culverts, ballasted deck bridges, bridge abutments and locations where vehicles may have been driven along the right of way or where foot paths may cross tracks.

ii. loose, bent, frozen, broken and missing track bolts.

iii. signs of rail moving through anchors. Look for anchors in one direction not bearing against the ties. The base of the rail may be scored.

iv. signs of track moving with the traffic current. Look for anchored ties moving towards non-anchored ties.

v. short flat spots in the curve alignment or line kinks in the tangent track. By digging out one tie end at a time, determine whether the ties are hanging.

vi. signs that the base of the rail is not seated uniformly on the tie plates. Improperly stressed rail tends to tilt on the tie plates.

vii. high cut spikes and broken screw spikes.

14.5.0 Track Inspection – Items, Methods, Actions

INSPECTION METHOD				
Item	Walking Observe For:	Track Inspection Vehicles Observe For:	Train Observe For:	Remedial Action

Figure 14-4

INSPECTION METHOD				
Item	**Walking Observe For:**	**Track Inspection Vehicles Observe For:**	**Train Observe For:**	**Remedial Action**
[redacted]				
Beaver Dams and Culverts	Watercourse or culvert blocked. Note Track forces are responsible for the inspection of culverts 36 inches or less.	Watercourse or culvert blocked. Note Track forces are responsible for the inspection of culverts 36 inches or less.	Watercourse or culvert blocked. Note Track forces are responsible for the inspection of culverts 36 inches or less	Any change or blockage of a watercourse, or sudden change in depth of water, must be reported to the Roadmaster immediately.

Figure 14-4 cont'd

INSPECTION METHOD				
Item	**Walking Observe For:**	**Track Inspection Vehicles Observe For:**	**Train Observe For:**	**Remedial Action**
[redacted]				
Drainage	Ditches or culverts blocked, hanging ties.	Ditches or culverts blocked	High water.	If drainage ditches or culverts are found blocked, immediately contact Rail Traffic Controller to arrange for safe operation of movements and advise the Roadmaster. Check water levels, and if higher than normal for a particular location, make closer inspections to determine the reason.
[redacted]				

Figure 14-4 cont'd

14.6.0 Record Of Track Inspections

a. Each track inspection must be recorded and signed on the day the inspection is made. Records must include the following:

i. the track inspected, including the from and to mileages of main track and siding inspected.

ii. the date of the inspection.

iii. the method of inspection and whether the track was observed or traversed.

iv. the type of inspection, for example, regulatory, special, joint bar inspection.

v. the location and nature of any rail or track defects found, including any differences from the requirements of *Canadian Railway Track Safety Rules*. In the USA, any differences from the requirements of *FRA Track Safety Standards* must be reported.

vi. the remedial action taken and the date of the action.

b. All inspection records will be stored in the *Digital Track Notebook (DTN)* system. Any inspection records that cannot be entered into DTN will be kept by the local Roadmaster.

c. Track inspections must be recorded in the *Digital Track Notebook (DTN)* system or on the following prescribed forms.

INSPECTION REPORTS	
Inspection	**Prescribed Form**
Regular main track inspections	• Track Inspection Form for Regulatory Defects • Track Inspection Form for Non-Regulatory Conditions
Monthly inspections of other tracks and turnouts on other than main tracks	• Monthly Yard & Other Track Inspection Form
Monthly main track turnout inspections	• Monthly Inspection of Turnouts Form
Detailed main track turnout inspections	• Detailed Turnout Inspection Form
Monthly rail diamond crossing inspection	• Track Crossing Inspection Report
Annual derail inspection	• Annual Derail Inspection Form
Joint bar inspection in jointed track, including joint bar problems found during regular track inspections	• Joint Bar Inspection Form (joint track)
Joint bar inspection in CWR, including joint bar problems found during regular track inspections	• Joint Bar Inspection Form (CWR track)

Figure 14-5

14.12.0 Culverts and Drainage

a. Culverts with a diameter of 36 inches or less must be inspected either by foot or from hi-rail vehicle at a frequency of 1 time per year, with no more than 540 days between inspections.

b. When special inspections of drainage hazards are required, the following must be used to evaluate conditions:

   i. Culvert obstruction – Record the percentage blocked culvert by describing if it is ¼, ½, ¾ or completely blocked as shown in Figure 14-7.

   ii. Ditch obstruction - Record the percentage obstructed width of ditch by describing if it is ¼, ½, ¾ or completely blocked as shown in Figure 14-8.

   iii. Height of embankment – Record the height of embankment over which the potential observed blocked culvert if it is a low, medium or high fill as shown in Figure 14-9.

   Hazardous condition created by water seepage under tracks can occur when unusually high differential water level is observed on high side of the embankment. Always look for potential blocked culverts or ditches that may impede drainage flow followed with careful observation in the area of concern of potential sinkholes or voids through ballast or side slope, tension cracks along embankment shoulder, leaning trees on side slope, seepage coming out of slope, bulging and any sign of small sand fan at the toe of embankment. Record the height of water surface above the upstream end of culvert invert (A), the height measuring from the base of rail to the upstream water surface (B) and the differential water height between upstream and downstream water surface (C) along with the probability of water overtopping rail as shown Figure 14-10.

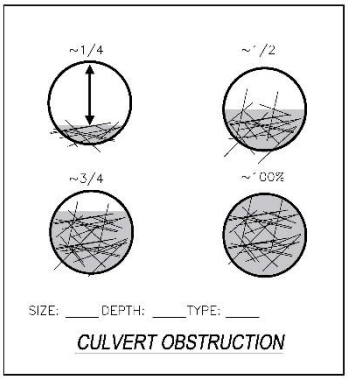

Figure 14-7

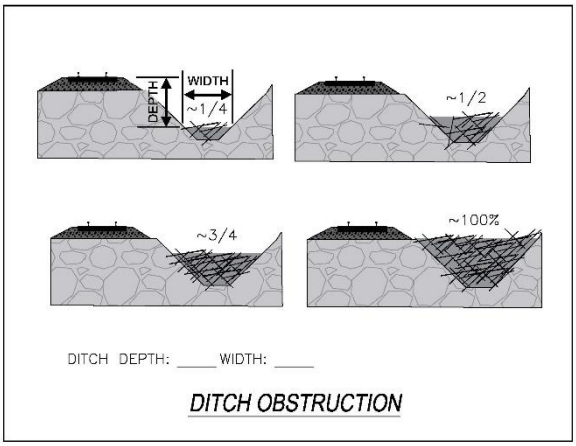

Figure 14-8

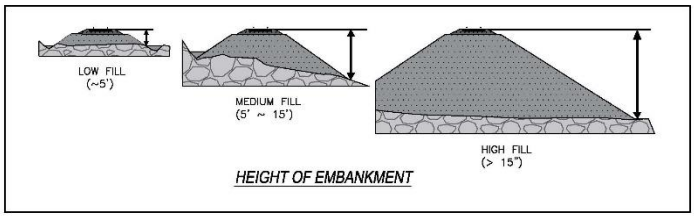

Figure 14-9

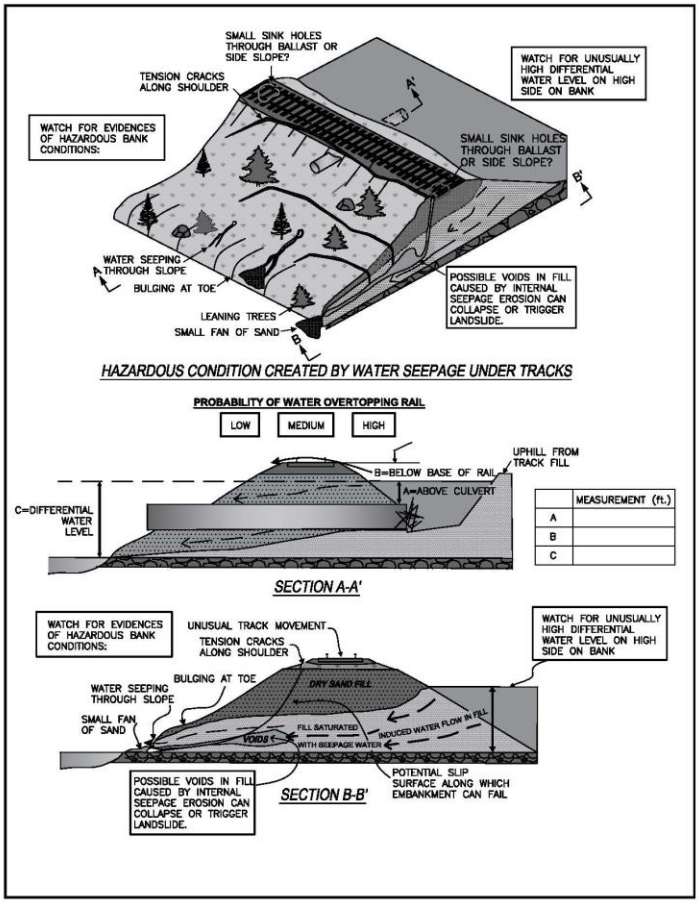

Figure 14-10

c. Culvert inspections are to be recorded in DTN and the purpose of the inspection is to ensure the following:

   i. hydraulic flow can be observed without obstruction upstream and downstream of the inlet and outlet,

   ii. site conditions have not changed in a manner that impacts drainage through assessment of land use and ditch conditions, and

   iii. the structural integrity of the culvert is sufficient to support ballast and embankment material and no voids are observed in the ballast or embankment.

   In cases where defects are observed to any of the above conditions, a detailed inspection by a Bridge Supervisor must be conducted for a detailed evaluation of the culvert and determination of any remedial action required (if any).

d. Beaver dams located upstream from the track, in streams that flow under or near the track, represent a potential hazard. The Roadmaster must arrange regular inspections of beaver dams on their territory and take the necessary protective action if conditions are hazardous. On certain territories, an aerial inspection of dams may also be required in the spring and fall of each year to support ground inspections.

e. An up-to-date list of beaver dams will be maintained on each Roadmaster's territory. The list should show:

i. the subdivision mileage

ii. the side of the track on which the dams are located

iii. the number of dams

iv. whether the dams are upstream or downstream

v. the distance of each dam from the track

vi. remarks regarding the condition of the dams

vii. water fluctuation

viii. the date of the inspection.

14.13.0 High Water and Spring Run-Off Inspections

With the onset of Spring flooding conditions, snowmelt run-off, ice movements and precipitation, the following steps need to be taken to prevent bridge and culvert washouts.

a. Basic Track Maintenance, S&C and Track Program as well as Structures personnel need be on the outlook for water related problems as a component of their regular duties. Locations of concern must be reported to the local Roadmaster or Structures Supervisor for action.

b. All employees must report:

i. Inlet Conditions:

- Watercourses with lower or higher than normal spring flow discharges. If creek discharges are less than usual or if debris and mud are evident in the flow, an upstream watercourse blockage may exist.
- Flow constraints, such as debris build-up at the culvert inlet should be removed to restore normal flow through the culvert.
- Water ponding at the inlet to a culvert.
- Water levels higher on one side of the track than the other side.

c. Track Inspectors must inspect bridges for track alignment and level during Spring runoff.

d. Typical problems experienced by bridges in spring conditions of snowmelt and ice movements are:

i. Scour conditions at substructures (piers and abutments). Eddying or dirty water around the substructure base may be a sign of scouring.

ii. Failure of supports (particularly for trestle type bridges) due to ice loads or debris.

iii. Loss of substructure support causing subsidence or sway of bridges.

iv. Settlement, sliding or rotation of substructures (piers and abutments).

v. Inadequate bank protection during Spring run-off conditions.

vi. Failure or poor condition of ice protection measures such as noses on piers or upstream protection structures.