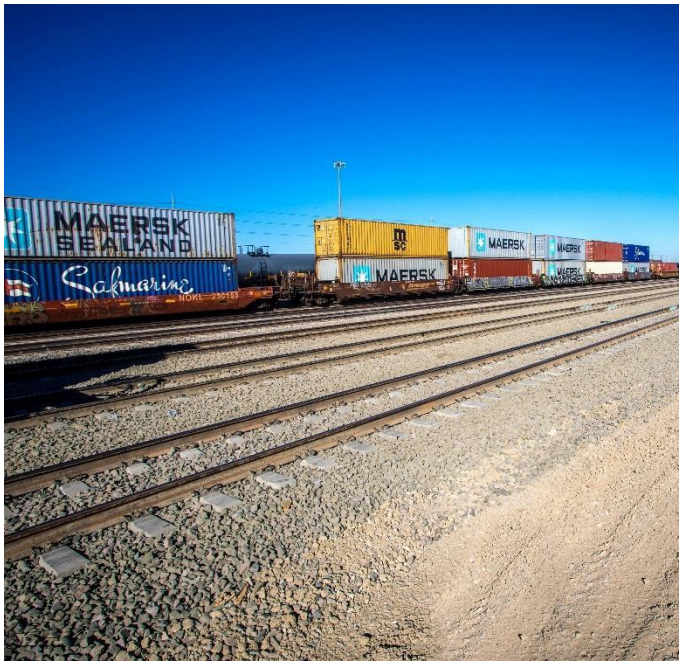

Logistics Park of North Dakota – Freight Rail Basis of Design

HDR

Minot, ND
November 17, 2022

PREPARED BY: NICHOLAS STADEM

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Basis of Design

Project Background

The North Dakota Department of Transportation (NDDOT) is partnering with the Minot Area Development Corporation (MADC) of Minot, North Dakota, and Ward County, North Dakota, to develop the Logistics Park of North Dakota (Project). The Project will develop the necessary rail infrastructure to provide a logistics park that offers intermodal, transload, bulk unit train shipping and additional infrastructure to support manifest shipper operations. The proposed project builds upon previous work on the 800+ acre industrial park located in northeast Minot. Figure 1 depicts the Study Area in relation to the surrounding transportation infrastructure and land use.

Currently, rail facilities within the state of North Dakota are performing limited intermodal/transloading operations, and this project is intended to expand upon and fulfill underdeveloped needs in multiple areas of rail logistics. The project will increase the economic activity for the surrounding communities and throughout North Dakota both with the initial construction of the project and with the creation of jobs for new and expanding industries that utilize the logistics park. Additional benefits of the project include reduced costs for transporting products and maintenance of highways due to the reduction of truck traffic.

Design Background

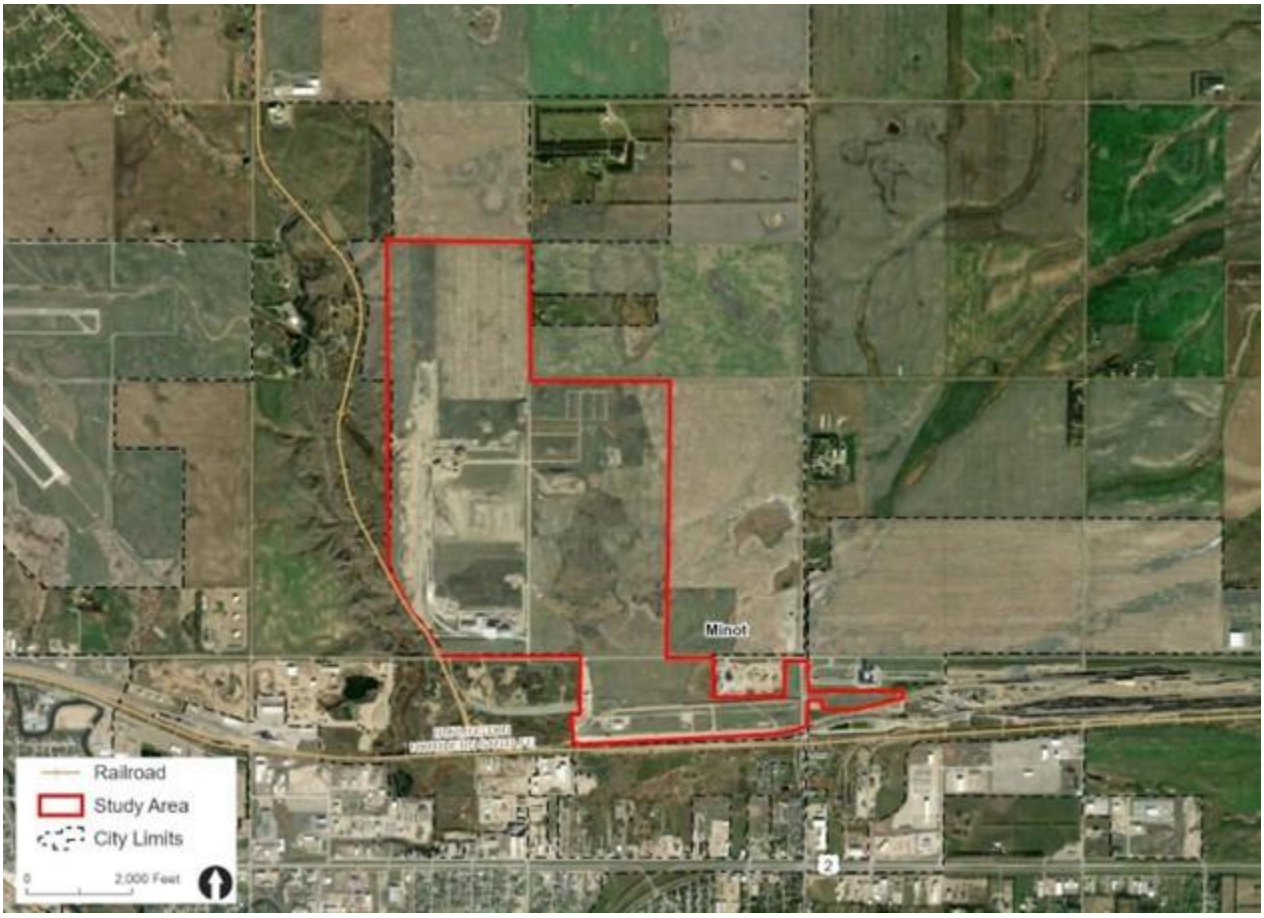
After reviewing the draft market analysis, HDR, with our partner Ackerman-Estvold (A-E), have been developing conceptual designs that address the needs of design flexibility required by market conditions, but also allow for unique and compact track arrangement explained below. Those designs, as well as the Finalized concept laid out in this Memo make use of an HDR-patented rail configuration/ layout known as an “Infinity Loop”, which allows for large scale bulk shipping and small manifest shippers to share the same site in a way that maximizes physical space utilization without hampering fluid rail operations.

Below is a breakdown of basic design criteria used for developing the conceptual design. All turnout sizes and tangent distances between reversing curves are in compliance with the BNSF’s Design Guidelines for Industrial Track Projects (DGFITP). Both layouts assume that on-site storage tracks and/or locomotive servicing facilities for BNSF locomotives are not required.

It should be noted that while BNSF’s DGFITP permits up to 9°30’ of curvature on general industrial trackage, BNSF desires 7°30’ maximum degree of curve on unit train tracks. The conceptual layout utilizes up to 9°30’ curves on unit train tracks. BNSF has historically been willing to allow for this exception in cases where track geometry is constrained, and/or the increased curvature allows for the development of a rail design with enhanced rail operations. However, all exemptions to BNSF's DGFITP are provided on a case-by-case basis by BNSF's engineering department, and there is no guarantee that this design exemption will be granted for this particular site.

In the case of all designs, commodity-specific rail-served facilities such as petroleum, renewables, and automotive are shown as examples only, and are interchangeable with other types of rail-served facilities.

Figure 1: Study Area



Basis of Operations

Rail Operations Methodology

This section describes proposed rail operations of the Logistics Park of North Dakota (Park) in Minot, ND. The operations assumptions are based on what we are calling Concept 1 – developed in conjunction with Ackerman's proposed land development uses and finalized 10/7/2022. The section describes full build out rail operations. However, some information related to phasing of the construction is included in the memo. The actual buildout of the Park and the rail operations will be driven by future industry development and logistics requirements.

The concept includes facilities for the proposed types of rail traffic. These include:

- *Dry Bulk Unit Train* for loading or unloading, up to 8,000 ft long. Dry bulk should be considered products such as food or feed grains or products such as fertilizer or other compounds that are usually transported in covered hoppers. The train would either be carrying entirely the same product throughout the train or blocks of cars with different products combined into a single train, but all cars moving from one origin to one destination.
- *Liquid Bulk Unit Trains* for loading or unloading, up to 8,000 ft long. Liquid Bulk should be considered products such as petroleum or chemicals that would be handled in tank cars. The train would either be carrying entirely the same product throughout the train or blocks of cars with different products combined into a single train but all cars moving from one origin to one destination.
- *Ethanol / Biodiesel (Renewables) Facility* with trains or cuts up to 3,480 ft long. The type of industry in this location of the Park could be something other than Renewables. Examples would include cross dock facility, food processing, or distribution. The cars for this facility could be a mixture of car types and commodities.
- *Intermodal* loading and unloading with trains up to 10,000 ft long. These trains would likely include both containers in well cars and trailers on flatcars for numerous customers and could include both inbound and outbound goods.
- *Transload* traffic with capacity of almost 9,000 feet of rail car cuts on spot at any one time (about 140 each 60' cars). The types of traffic would vary and could include dry bulk products, liquid bulk products, manufactured goods, and machinery. Car types would likely include open hoppers, covered hoppers (including pneumatic), tank cars, flat cars, and box cars of various types.
- *Manifest (Carload)* traffic associated with individual dedicated industry spurs (of which there are 19 new proposed – in addition to the one existing). The type of traffic would be similar to transload traffic with respect to the types of products and types of rail cars used.

The concept also provides miscellaneous rail infrastructure, such as manifest auxiliary tracks, to support general rail operations. For other design detail for the concept layout refer to Appendix C - Rail Concept Details.

The proposed concept can support the following approximate volumes for each type of rail traffic:

Table 1: Volumes

Facility	Cars/Train	Cars/Week	Trains/Week	Locomotives	Assumed Car Length	Notes
Primary Bulk	128	1280	10	4 each train	60' cars	
Liquid Bulk	128	384	3	4 each train	60' cars	2 tracks each at 13 cars, 18 cars, 19 cars, 14, cars, from west to east tracks
Renewables	58	174	3	3 each train	60' cars	
Intermodal	166	1826	11	4 each train		
Transload	75	225	3	3 each train	60' cars	
Carload Manifest	60	720	12	3 each train	60' cars	Includes an assumed traffic for existing AGT, but not their possible north side expansion. 20 Each Manifest / Carload Sites. The new and existing sites are assumed to provide about 14,000 feet of usable track capacity. Car loads per week will be based on approximately 25% of usable capacity of industry spurs per switch event. Manifest would be switched with two jobs per day and each would handle 50% of the cars.
Average		4609				
Annual Total Cars		239668				

The rail operations described are based on the above information. The operations described are only one scenario. Many other scenarios are certainly possible. Actual future operations will be dictated by future rail shipping tenant requirements and what operations the serving railroad is able to provide. The description assumes that all operations within the Park are performed by BNSF except those operations that take place on trackage dedicated and owned by a single industry / shipper. It is possible or even likely that some or all of the trackage within the Park could be operated by a third-party switching company (TPSC) at some point. The most likely portion of the operations that would be performed by a TPSC third party switching company would be the manifest and transload traffic. It would be more likely that the intermodal and unit train traffic to and from the site would continue to be handled directly by BNSF. Note that origins and destinations for the various hypothetical types of traffic and volumes are unknown and therefore can only be discussed in general terms. Also note that rail operations handled on individual industry tracks could be handled by the industry themselves or a TPSC. In this memo we will only refer to these operations as those performed by the industry – not making a further distinction about who is actually performing the rail service.

Operations

All inbound and outbound rail traffic moves to and from the Park to the BNSF main line corridor (running east-west between Interstate 2 and County Route 12) will use the existing Tatman Spur and the existing Park rail infrastructure located in the southwest portion of the site.

The operations are described using track numbers. Track numbers have been assigned using the format provided and described below:

Table 2: Track Numbering

1-XX	LEAD TRACK
101-1XX	INTERMODAL STAGING TRACK
201-2XX	INFINITY LOOP STAGING TRACK
301-3XX	DRY BULK BALLOON TRACK
401-4XX	INTERMODAL WORKING TRACK
501-5XX	MANIFEST AUXILIARY TRACK
601-6XX	TRANSLOAD TRACK
701-7XX	LIQUID BULK TRACK
801-8XX	FOOD PROCESSING TRACK
901-9XX	MISC. INDUSTRY TRACK

See APPENDIX A for Track numbering diagram

Dry Bulk

The Dry Bulk facility consists of a balloon track with a loading or unloading facility for processing trains and at least one staging track. A dedicated bad order setout track would potentially be required. (This track is currently not shown – but could be easily added.)

A Dry Bulk Unit Train for loading or unloading will enter the site and use Track 1 (shown as a red lead) to move towards Staging Tracks 201, 202, 203 (shown in dark blue). After being spotted on one of the Staging tracks, the BNSF crew will disembark, and the industry will operate the train during the loading or unloading process. (It is assumed that the processing of the train will be performed in a limited number of hours and will qualify to have the BNSF locomotives / power stay with the train. This is common for bulk unit trains.) The train then is routed to track 301 (shown in lime green). (The train is routed to the more westerly end point of 301. Track 301 is directional.) As the train traverses this track, the train is loaded or unloaded at the structure in the southwest portion of the "Infinity Loop*".) Following the completion of loading or unloading from the head end of the train to the rear end, the train is either left by the industry on track 301 to be later departed through Track 1 (by a BNSF crew), or industry crew operates train through the crossover between the departure end of 301 and the staging tracks to be staged or "rechambered" in one of the staging tracks 201 through 203 for later departure.

Following staging in one of the staging tracks, the train is then departed using Track 1 (by a BNSF crew) and departs the site. In either scenario, the train is "turned" such that the head end on the way into the site remains the head end of the train leaving the site (as opposed to many "conventional" oval-shaped loop track facilities where the locomotives are often required to be re-positioned between arrival and departure). The use of the dry bulk facility requires the northwesterly portion of Phase 1 to be constructed and a portion of Phase 2 to be built. How many of the staging tracks would be built initially is dependent on initial volumes to be shipped.

Liquid Bulk

The Liquid Bulk facility consists of a dedicated balloon track and 8 rack tracks for loading or unloading tank cars.

A Liquid Bulk Unit Train for loading or unloading will enter the site and use Track 1 (shown as a red lead) to move towards either track 701 (shown in pink) or Staging Tracks 201, 202, 203 (shown in dark blue). If the train arrives directly at 701, the train will proceed on the track and continue through the balloon switch (a right-hand turnout in the north portion of the loop facility). After the train is entirely on the pink balloon and clear of any at-grade roadway crossings, the BNSF crew will disembark from the train. If the train is instead routed to and staged on one of the staging tracks, the BNSF crew will depart the site once the train is positioned entirely in the clear. It may be the case that BNSF would remove the locomotives from the train (including rear end distributed power / "DP" locomotives) and depart the site on the locomotives using Track 701 and Track 1.

If the train is instead staged on one of the staging tracks during arrival, the industry would move the train from one of the staging tracks to Track 701 using connecting lead tracks in the eastern portion of the loop complex.

At this point the industry – either using BNSF locomotives or using industry locomotives – would break the train up into multiple-car cuts and position the entire train on processing Tracks 702 through 709 using switching moves.

Following loading or unloading on the processing tracks< the industry crew would reassemble the train onto track 701 using a series of switching moves. The train is either then left for BNSF to depart from Track 701 (balloon track) or will be repositioned to one of the Staging tracks by the industry crew.

From either of these positions, the train is then departed using Track 1 (by a BNSF crew) and departs the site. In either staging scenario, or whether the BNSF locomotives are used to break up the train for processing, the train is "turned" such that the head end on the way into the site remains the head end of the train leaving the site. The use of the liquid bulk facility requires the northwesterly portion of Phase 1 to be constructed and a portion of Phase 2 to be built. How many of the staging tracks would be built initially is dependent on initial volumes anticipated to be shipped.

Renewables Facility

The Renewables Facility consists of a dedicated balloon track and 4 each loading or unloading tracks. The actual configuration may differ significantly, however if the tracks are arranged as presented in the concept the operations would be very similar to those described below.

The Renewables Facility could be served by shorter dedicated trains or manifest cuts up to 3400' long. The description here presents a scenario where all cars on spot are destined for outbound destinations as well as the facility having inbound spotted to maximum track capacity all at one time /same service event. If served by dedicated trains, these trains would move to track 801 (shown in purple) using Track 1 – in a very similar way to the Liquid Bulk trains move to Track 701. Once on Track 801 (which is a balloon track) the BNSF crew would circulate on the balloon and either break the train up and switch the cars into Tracks 802 through 805 (assuming no cars were already on Tracks 802 through 805) or position the train on the northerly portion of the balloon track between switches. If there were cars on spot on Tracks 802 through 804, these cars would then be switched by BNSF crew into a single block positioned on a combination of Track 803 and the Southerly portion of 801. The BNSF crew would then proceed to temporarily stage the outbound cut on one of the staging tracks (Tracks 201 through 203). The crew would then proceed back to Track 801 with just locomotives and reconnect to the inbound cut and then break the train us using a series of switching moves to spot the train in to Tracks 802 through 805. (If desired and if the BNSF crew had enough locomotives to complete the moves, the inbound cut could be switched into Tracks 802 through 805 while holding onto the outbound cut rather than temporarily staging it to another track.) Following the spotting of the inbound cars, the BNSF crew would return to the outbound cut with their locomotives and once coupled up would depart using Track 1. The moves described above would be essentially identical if the facility were served by the Manifest local train. The operations of switching Tracks 802 through 805 (including pulling and spotting operations) could be performed by an industry crew rather than by BNSF directly. For this to take place, BNSF would potentially need to temporarily stage inbound cars to perform the exchange of inbound and outbound cars for industry crew.

The facility is shown as Phase 2C but can be built at any time and only requires Phase 1 to be built before or concurrently.

Intermodal

The rail aspect of the intermodal facility consists of 2 staging tracks with 10,000 feet of capacity each, and two working tracks which have a combined length of 10,000 feet of capacity.

Intermodal trains of any length are assumed to operate as dedicated trains (and will not be mixed with other types of traffic such as unit trains and manifest trains). Trains will arrive to the site by way of the Tatman Spur from either the east or the west (by making use of the wye connection at the BNSF Mainline). Trains will then typically travel to intermodal staging Tracks 101 or 102 via Track 2 – pulling into the staging track in a clockwise direction. Assuming that a train arrives and is staged on Track 102, the train will be broken at the halfway point by the

BNSF crew to clear the cross-over turnouts in the east-west running portion of Tracks 101 and 102 by either the inbound (BNSF) crew or a utility crew (BNSF or TPSC crew) taking over for the road crew. The two pieces of the train will then be moved to tracks 401 and 402 using a series of switching moves thorough the crossovers. Locomotives can be left with the train or can be departed from the site. (The balance of the description assumes that the power remains with the train.) Following unloading and loading of containers and/or trailers, the two pieces of the train are then repositioned into either Track 101 or 102 for reassembly into a continuous train for departure. If trains arrived at Track 102 rather than 101, they are switched into Tracks 401 and 402 using a similar procedure to the one described above. (It is probably preferable to arrive trains into Track 102 and reserve track 101 for outbound trains where they can be reassembled and not obstruct other trains from being moved from the working tracks to the staging tracks.)

(Also, If the working tracks 401 and 402 are unoccupied, and the northeast portion of Track 102 is unoccupied, an arriving train can be arrived in a more direct fashion than described above by first pulling directly through either Track 401 or 402 onto Track 102 until rear half of train is positioned for unloading/loading, separating the train, and then moving the front half of the train over to the other working track.)

Outbound trains staged on either Track 101 or 102, depart via Track number 1 – continuing in a clockwise direction from the intermodal staging tracks. The train is "turned" such that the head end on the way into the site remains the head end of the train leaving the site.

For intermodal operations to begin, we have suggested only the most easterly of the working tracks (Track 402) be built with a temporary connection to Track 1. This would provide for processing a train up to 5,000 feet in length. Only Phase 1 and a small portion of Phase 2 would be required in addition to Track 402. As Intermodal traffic grows, Tracks 102 and 401 can be added. At that point, the temporary connection to Track 1 at the north end would be removed.

Transload

The rail aspect of the proposed transload facility consists of 4 each double ended tracks with side access (and wider track centers) to allow for adjacent-to-track loading or unloading operations. It is likely that transloading operations would be handled as part of manifest operations until such a time when the volume of traffic would justify a separate operation. The description below is based on a dedicated local / job to perform the service. The below described sequence is one way the transload tracks could be serviced / switched. There are numerous reasonable scenarios. This description assumes all of the tracks will be switched from the north end of each of the transload tracks.

Trains would arrive via the Tatman Spur and Track 1. The crew would then position the inbound train where the head end of the train would be just clear of the switch to Track 906. The crew would then travel with locomotives only north and retrieve using a series of switching moves all outbound cars from Track 601 (north portion), 603 (north transload portion), 602, 601 (south

portion) – potentially in this order, and temporarily stage the cars on the southerly positions of Tracks 603 and Track 1A. Following this, the crew would then move the locomotives to the north end of inbound train that had been positioned on Track 1.

Next the crew would pull the train to the north and spot inbound cars to Tracks 601 (both the north portion and south portion), 602, and 603 using a series of switching moves.

Following spotting car, the locomotives would return to the south ends of the outbound car cuts portioned on the Tracks 603 and Track 1A via Track 1. The train would then depart the site via the Tatman Spur.

Note again this is only one scenario for providing service to the transload tracks. This description has the benefit of minimizing switching moves across the Ward County Highway 12 grade crossing.

The above description is based on full build out and approximately half the capacity of the tracks being released for outbound and being re-spotted with inbound cars each service / switching event. It has been assumed that the transload would be provided rail service 3 days a week. Regarding phasing, the transload tracks can be built from east to west or west to east depending on requirements of shippers and overall volume. The only other necessary phase to be built before or simultaneous is Phase 1.

Manifest (Carload Shipments)

The rail infrastructure for manifest rail operations on the site includes various industry tracks (for serving individual industries located on numerous proposed parcels) as well as numerous auxiliary tracks to support the manifest operations.

Trains would arrive via the Tatman Spur and Track 1. The train would then either travel to Track 4 or continue to Track 3. Using a series of switching moves the crew would service industry tracks 901 through 905 (as well as AGT Foods) as required. As required, the crew would also stage cars (either inbound or outbound) on tracks 501 through 503. After completion of switching Tracks 901 through 905 and AGT Tracks, the train would move to serve industries on the East side of 42nd Street NE via Track 3. The train would then service (if required) industry Track 908. The train would then travel to Track 5 and continue on to position the train adjacent to Auxiliary Track 504. The crew would then uncouple from the train and use a series of moves – move from the south end of the train to the north end of the train using Track 504. After coupling up, the crew would then switch the balance of the industries located on the East side of 42nd St NE, using Lead Tracks 3 and 5, and series of switching moves to service Tracks 907, and 909 through 919. When these moves are complete, the train moves west and crosses 42nd St NE using Track 3. The single remaining industry Track 906 would be switched using Track 1. Following this, the train would pick up any remaining outbound cars staged on Tracks 501-503 using Track 4, and then depart the site using Track 1 and the Tatman Spur.

The above description is based on full build out and approximately 25% of the total capacity of the industry tracks being released for outbound and being re-spotted with inbound cars each service / switching event. It has been assumed that manifest service would be provided rail service with two jobs and 6 days a week. Regarding phasing, the industry tracks will be built as development proceeds. Initially only Phase 1 is required to support initial service. Later as demand dictates, Phases 3A though 3C will be built. It should be noted that to support service to Tracks 904 and 905, at least some of Phase 3A (including track built across 42nd St NE) would be required to be built.

Note that numerous details such as the lining of individual switches, airbrake tests as required by the Federal Railroad Administration (FRA), the handling of defective railcars (often referred to as Bad Orders), and crew shuttle operations are not included as to keep the descriptions as concise as possible.

*Note that the concept design includes Patented Infinity Loop track layout to service the proposed Dry Bulk, Liquid Bulk, and Renewables facilities.

Site Hydraulic and Hydrologic Analysis

A review of the site shows a variety of previous storm water conveyance systems. The conceptual design establishes proposed parcel sizes, rail served and non-served capabilities, as well as example surfacing types. Because parcel sizes vary widely in size and orientation, it is difficult to establish a one size fits all storm water convenience system. Other constraints which limit recommended measures is due to the site soils, noted in the next section. These soils allow for both on-site mitigation through subsoil drainage and a conveyance system for runoff, which may change within each parcel. Below explains the current conditions.

East of 42nd St: One previously developed area in the NE Corner of the property uses mostly overland drainage, flowing east along 19th Ave and south along the east side of 42nd Ave. The water that flows south along 42nd St is through a graded drainage ditch which incorporates storm sewer culverts under approaches and roads. Both routes collect through the series of ponds that constitute wetlands. These wetlands continue to flow south towards Ward County 12, out-letting east along the north side of the road, offsite. If this area is developed based on the conceptual design, each parcel will need to mitigate to an extent required by local and state land development ordinances due to the large impervious surface area needed for their operations. If those parcels discharge the storm water into the common wetlands or roadway ditches, developers will need to coordinate and verify their discharges will not inundate culverts or approaches for current or future parcel development.

West of 42nd St: The existing site has had a variety of previous development and farming land uses. These previous developments occurred over an extended period, which resulted in a series of different methods for storm water conveyance measures to accommodate the storm water runoff. Previous Gravel mining in the middle of the project site incorporated large storm water ponds to capture and mitigate the runoff before releasing into culverts which direct the water both west and south within the disturbed areas. Other development included constructing 4 rail tracks and site grading in a north-south orientation that included ponds and culverts, which have been graded to flow south. The area described for intermodal operations in the conceptual design has mostly been graded and set up for immediate construction when the need arises. The previous Tatum Spur running north-south had culverts constructed which direct the water to Livingston Creek and will help to establish the baseline runoff.

Our Partner (A-E) is working on additional high level storm water hydraulics to determine if there are advantages to incorporating wetland mitigation prior to parcel development which will be included in the environmental documentation.

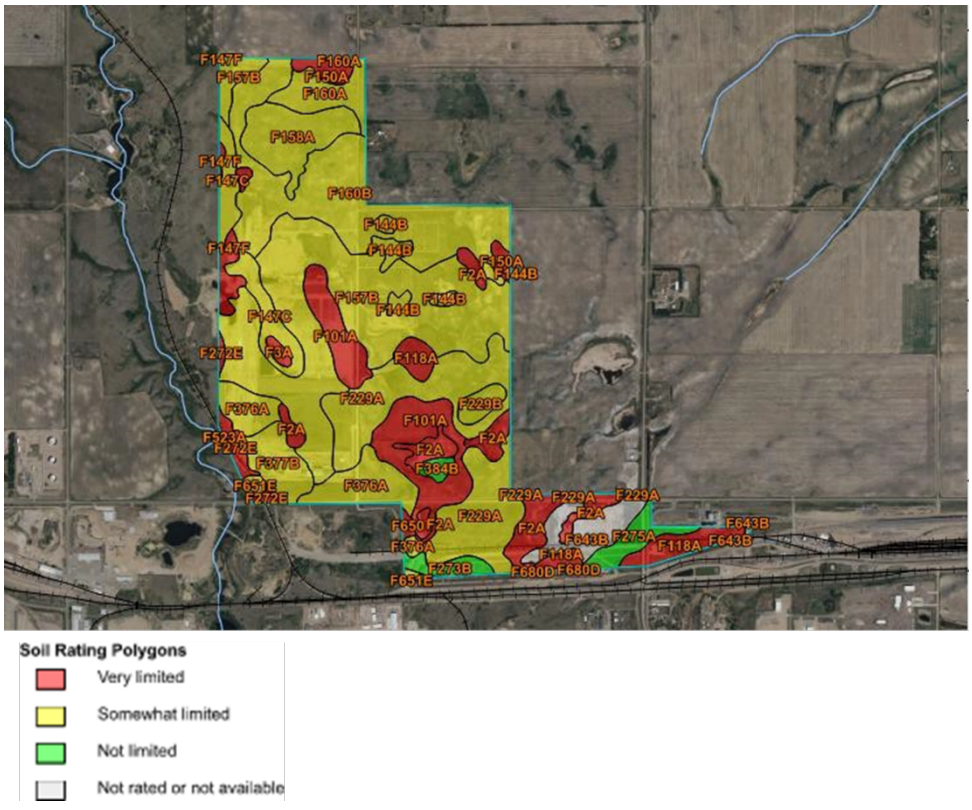
Storm sewer development in regard to track construction will follow a similar methodology which will be required to adequately size pipes and culverts to meet Federal, State, and local laws.

Site Geotechnical Analysis

We have reviewed published information from the United States Department of Agriculture / National Resource Conservation Service Web Soil Survey (NRCS, 2022) for Ward County, North Dakota. The NRCS map indicates primarily cohesive soils indicated as loam, clay loam, silt loam, sandy loam and fine sandy loam. Sandier soils are noted at the southern portion of the site described as gravelly loamy sand, fine sandy loam and sand beneath the loam surface topsoil layer. Unified Soil Classifications are primarily lean clay (CL) and silt (ML) at the surface to a depth on the order of 8 to 18 inches. Below the surface is primarily CL and silty clay (CL-ML). The exception is at the southern portion with silty sand (SM), silty/clayey sand (SC-SM) and sand (SP) soils were noted.

According to NRCS, about 70 to 80 percent or more of the site is rated as “somewhat limited” or better (“not limited”) for local roads, streets, and light commercial construction. The limitation is due to the silt loam at the surface which is highly frost susceptible. Minor excavation may be required to remove the silt loam beneath track embankments, pavements and buildings, and small structures. This excavation is estimated to be on the order of 6 to 18 inches, based on the NRCS soil survey information. These areas rated as “very limited” are indicated in red in Figure 2.

Figure 2: Web Soil Survey



Soil Rating Polygons

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

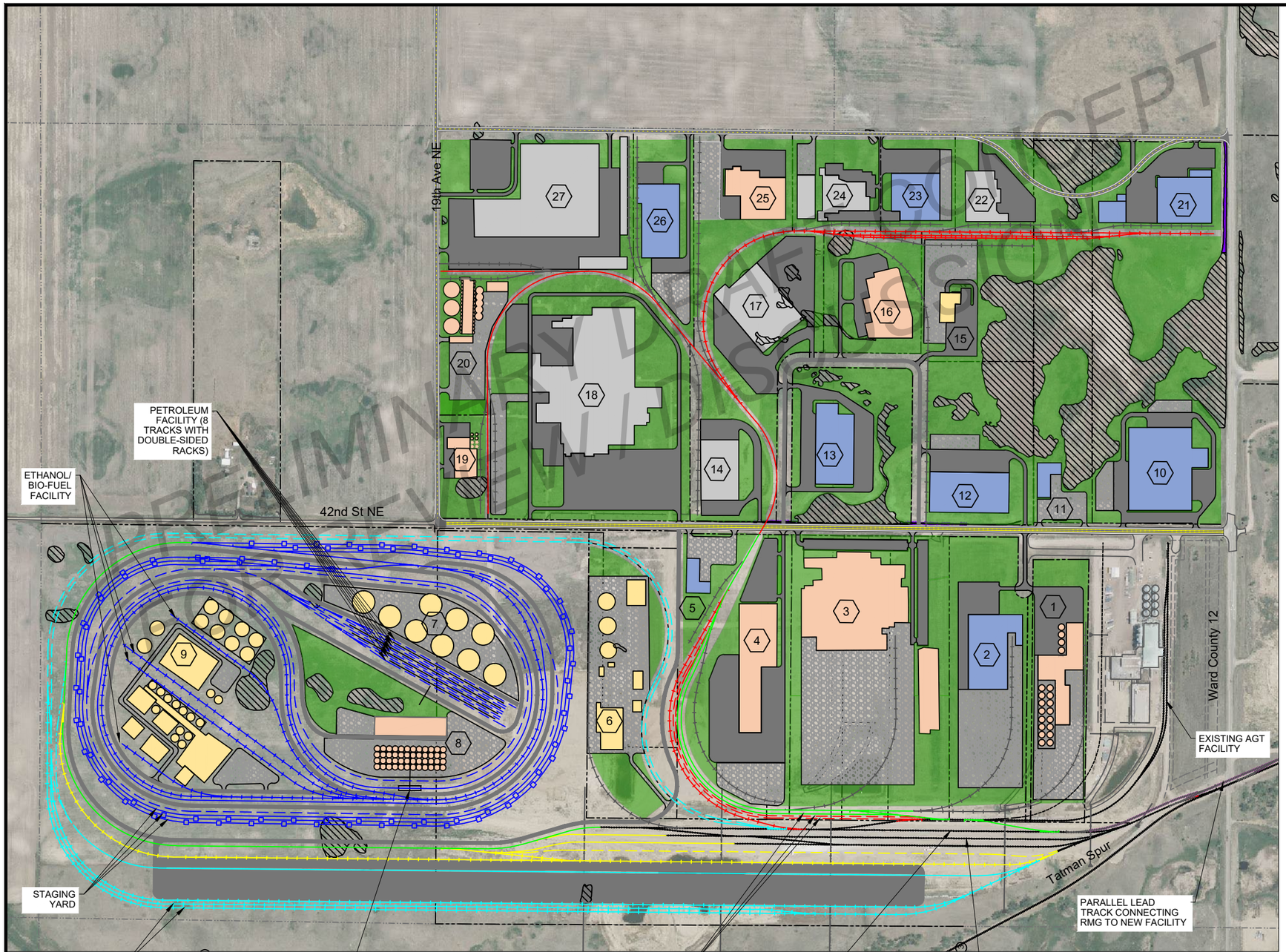
References

APPENDIX A – EXHIBITS

APPENDIX B – Conceptual Rail Design Details

APPENDIX C – BNSF Design Guidelines for Industrial Track Projects

APPENDIX A - Exhibits



LEGEND

INITIAL PHASE
PHASE 1

INFINITY LOOP PHASES
PHASE 2A
PHASE 2B
PHASE 2C
PHASE 2D

MANIFEST SITE PHASES
PHASE 3A
PHASE 3B
PHASE 3C

TRANSLOAD PHASES
PHASE 4A
PHASE 4B
PHASE 4C

INTERMODAL PHASES
PHASE 5A
PHASE 5A TEMP. CONNECTION
PHASE 5B
PHASE 5C

POTENTIAL INDUSTRY TRACKS
EXISTING TRACKS

WETLAND AREA
(#) PARCEL IDENTIFICATION NUMBER

N

0' 375' 750'
GRAPHIC SCALE

THIS DESIGN INCLUDES USE OF THE HDR PATENTED RAILWAY FACILITY WITH HIGH THROUGHPUT LOOP TRACK (INFINITY LOOP) LAYOUT. PATENT NUMBER 11027752. USE OF THIS LAYOUT IS SUBJECT TO LICENSING REQUIREMENTS AND OR OTHER FORMS OF ACKNOWLEDGMENT FROM HDR.

NO.	REVISIONS	BY	DATE	APPR.

HDR

SCALE (H): 1"=800'
SCALE (V): 1"=800'
DRAWN BY: SK
DESIGNED BY: PW/SK
CHECKED BY: PW
DATE: 10/07/22

LOGISTICS PARK OF NORTH DAKOTA
CONCEPT 1 - OVERVIEW
MINOT, ND
EXHIBIT

Project NO.
10315558

Drawing Name
EXHB_MINOT 1

1 OF 1

DRAFT SET

Site	Building Size (SF)	Building Height (Feet)	Site Usage
1	125,000	120	Ag / Food Processing
2	150,000	50	Distribution
3	475,000	100	Ag Production Facility
4	175,000	40	Ag / Food Processing
5	27,000	30	Distribution
6	120,000	60	Product Storage / Sales
7	160,000	60	Petroleum Facility / Storage
8	120,000	120	Ag Storage
9	290,000	100	Ethonal/Bio-fuel Production
10	250,000	50	Distribution
11	27,000	30	Distribution
12	145,000	40	Distribution
13	130,000	40	Distribution
14	100,000	30	Manufacturing
15	25,000	50	Petroleum Storage / Distribution
16	125,000	30	Ag / Food Processing
17	175,000	30	Manufacturing
18	540,000	80	Production Facility
19	45,000	35	Ag / Food Processing
20	95,000	80	Ag Storage / Production
21	150,000	30	Distribution
22	80,000	40	Manufacturing
23	100,000	40	Distribution & Storage
24	110,000	40	Manufacturing
25	110,000	30	Ag / Food Processing
26	130,000	40	Distribution
27	470,000	40	Manufacturing

N

400 0 400 800

NO.	REVISIONS	BY	DATE	APPR.

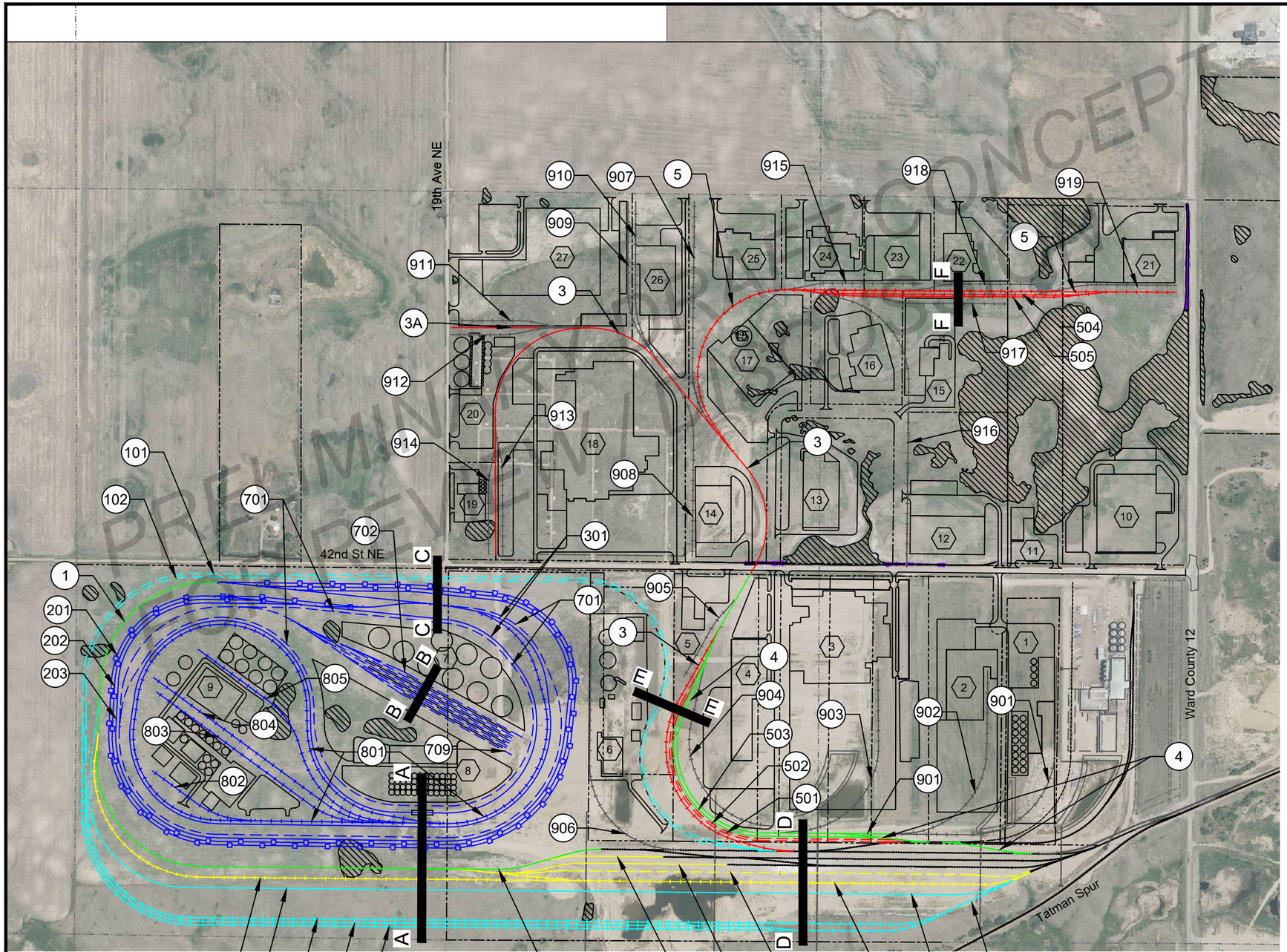
ACKERMAN ESTVOLD
1907 17th St SE · Minot, ND 58701
701.837.8737 · www.ackerman-estvold.com
Minot, ND | Fargo, ND | Williston, ND | Boise, ID

SCALE (H): 1" = 800'
SCALE (V): 1" = 800'
DRAWN BY: ATB
DESIGNED BY: ATB
CHECKED BY: SLE
DATE: 09/26/2022

LOGISTICS PARK OF NORTH DAKOTA BUILDING CONCEPTS MINOT, ND SITE OVERVIEW

Project NO. R21003C
Drawing Name CONCEPT
1 OF 1

DRAFT SET



LEGEND

INITIAL PHASE
- PHASE 1

INFINITY LOOP PHASES
- PHASE 2A
- PHASE 2B
- PHASE 2C
- PHASE 2D

MANIFEST SITE PHASES
- PHASE 3A
- PHASE 3B
- PHASE 3C

TRANSLOAD PHASES
- PHASE 4A
- PHASE 4B
- PHASE 4C

INTERMODAL PHASES
- PHASE 5A
- PHASE 5A TEMP. CONNECTION
- PHASE 5B
- PHASE 5C

- POTENTIAL INDUSTRY TRACKS
- EXISTING TRACKS
- WETLAND AREA
- (#) PARCEL IDENTIFICATION NUMBER
- (#) TRACK NUMBER

N

0' 400' 800'
GRAPHIC SCALE

THIS DESIGN INCLUDES USE OF THE HDR PATENTED RAILWAY FACILITY WITH HIGH THROUGHPUT LOOP TRACK (INFINITY LOOP) LAYOUT. PATENT NUMBER 11027752. USE OF THIS LAYOUT IS SUBJECT TO LICENSING REQUIREMENTS AND OR OTHER FORMS OF ACKNOWLEDGMENT FROM HDR.

NO.	REVISIONS	BY	DATE	APPR.

HDR

SCALE (H): 1"=800'
SCALE (V): 1"=800'
DRAWN BY: SK
DESIGNED BY: PW/SK
CHECKED BY: PW
DATE: 10/07/22

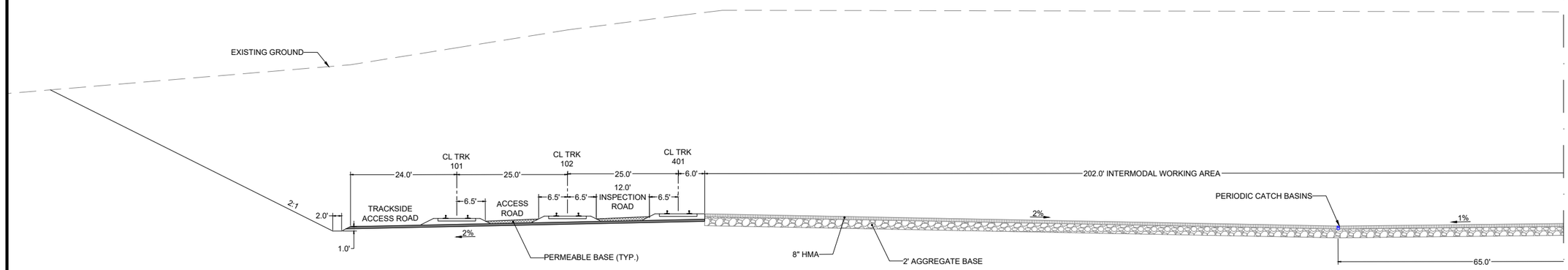
LOGISTICS PARK OF NORTH DAKOTA
CONCEPT 1 - RAIL PHASING -TRACK NUMBERING
MINOT, ND
EXHIBIT

Project NO.
10315558

Drawing Name
EXHB_MINOT 1

1 OF 1

DRAFT SET



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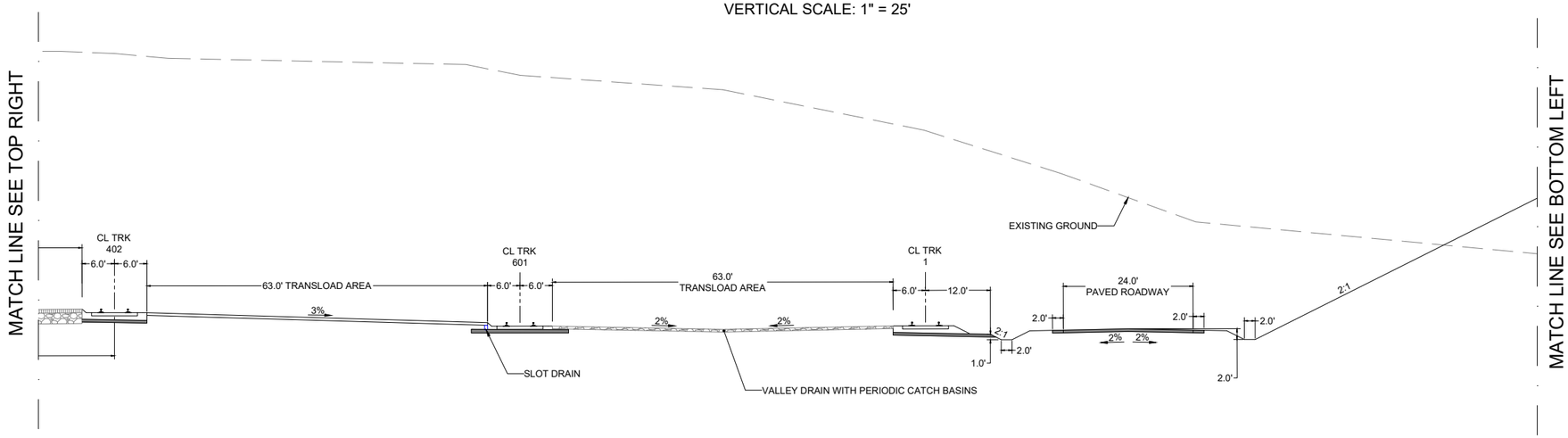

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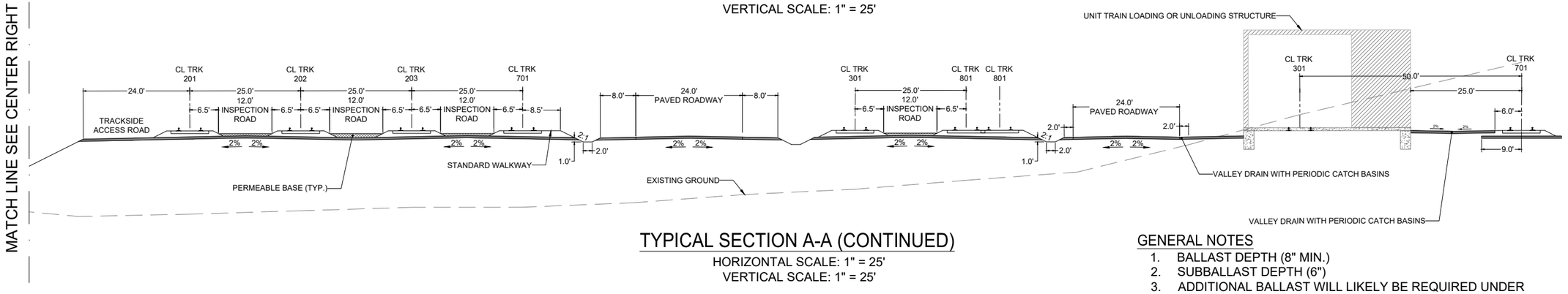

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VERTICAL SCALE: 1" = 25'

0' 12.5' 25'
GRAPHIC SCALE

GENERAL NOTES

1. BALLAST DEPTH (8" MIN.)
2. SUBBALLAST DEPTH (6")
3. ADDITIONAL BALLAST WILL LIKELY BE REQUIRED UNDER LEAD TRACKS AND OTHER HIGH-TONNAGE TRACKS.
4. ADDITIONAL SUBBALLAST DEPTH MAY BE REQUIRED WHERE DICTATED BY SOIL CONDITIONS

NO.	REVISIONS	BY	DATE	APPR.

HDR

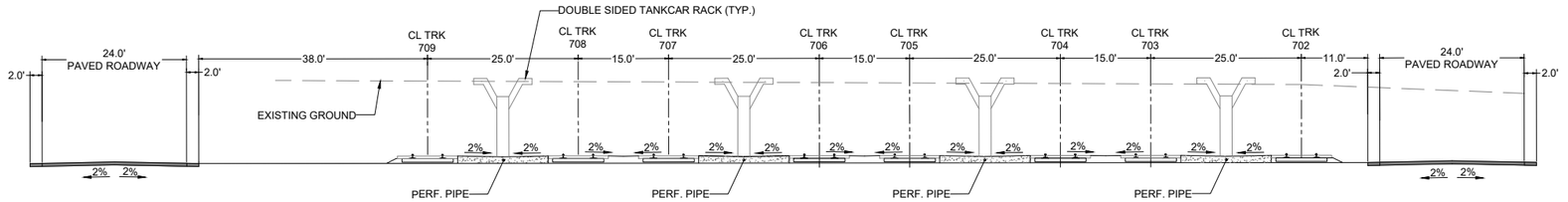
SCALE (H): 1"=800'
SCALE (V): N/A
DRAWN BY: SK
DESIGNED BY: PW/SK
CHECKED BY: N/A
DATE: 10/28/2022

LOGISTICS PARK OF NORTH DAKOTA
CONCEPT 1 - TYPICAL SECTIONS
MINOT, ND
EXHIBIT

Project NO.
10315558

Drawing Name
EXHB_MINOT 1

DRAFT SET



PAVEMENT SECTION IS REPRESENTATIONAL ONLY - NOT BASED ON ACTUAL DESIGN

TYPICAL SECTION B-B

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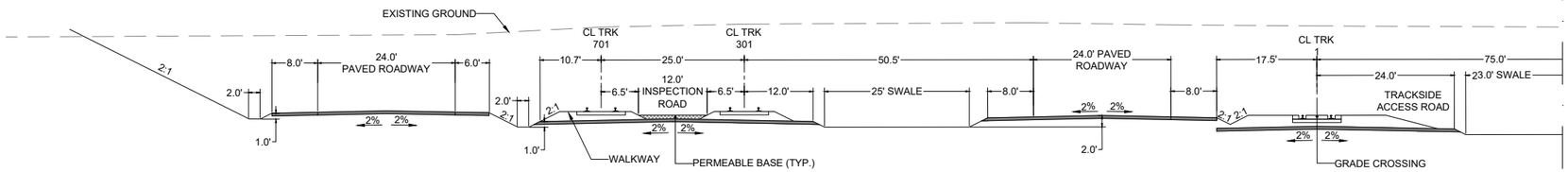

MATCH LINE SEE BOTTOM LEFT

TYPICAL SECTION C-C

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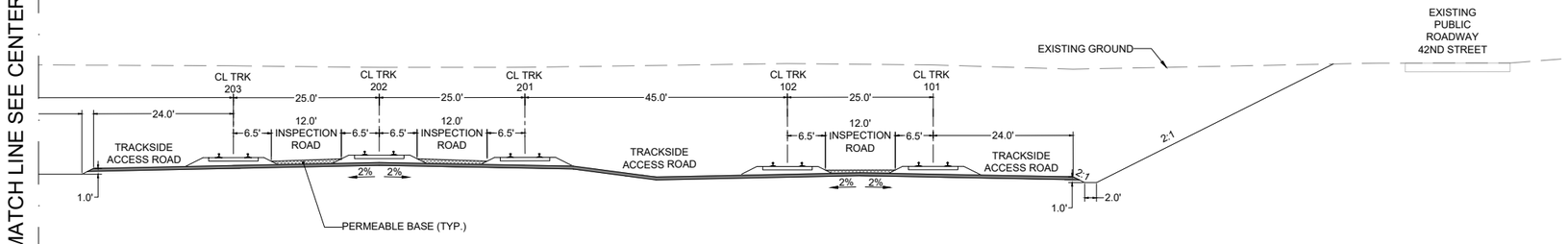

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VERTICAL SCALE: 1" = 25'

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GRAPHIC SCALE

GENERAL NOTES

1. BALLAST DEPTH (8" MIN.)
2. SUBBALLAST DEPTH (6")
3. ADDITIONAL BALLAST WILL LIKELY BE REQUIRED UNDER LEAD TRACKS AND OTHER HIGH-TONNAGE TRACKS.
4. ADDITIONAL SUBBALLAST DEPTH MAY BE REQUIRED WHERE DICTATED BY SOIL CONDITIONS

NO.	REVISIONS	BY	DATE	APPR.

HDR

SCALE (H): 1"=800'
SCALE (V): N/A
DRAWN BY: SK
DESIGNED BY: PW/SK
CHECKED BY: N/A
DATE: 10/28/2022

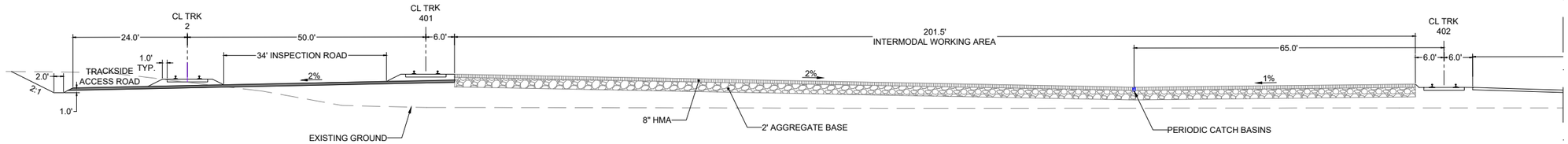
LOGISTICS PARK OF NORTH DAKOTA
CONCEPT 1 - TYPICAL SECTIONS
MINOT, ND
EXHIBIT

Project NO.
10315558

Drawing Name
EXHB_MINOT 4

2 OF 4

DRAFT SET



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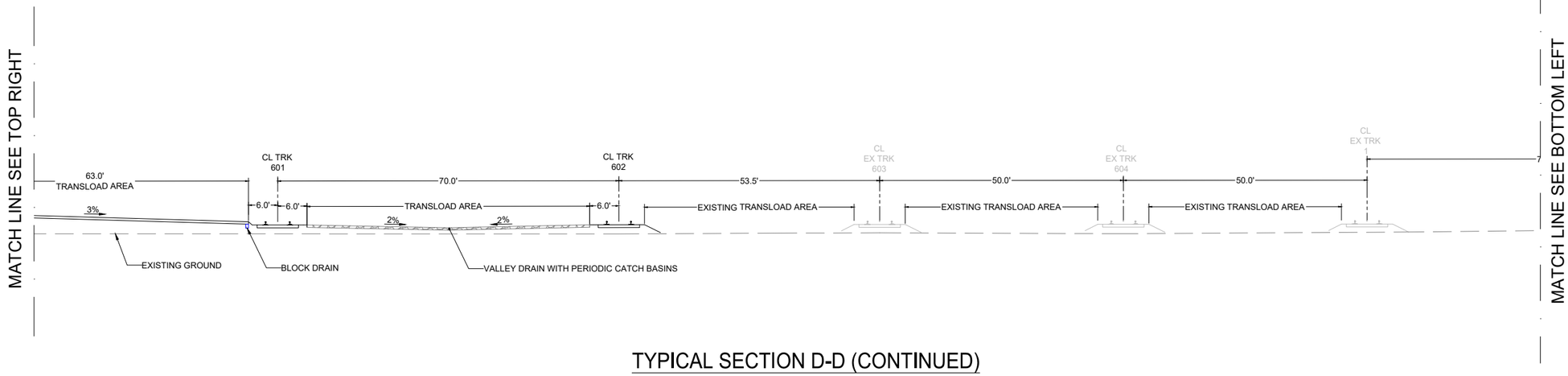

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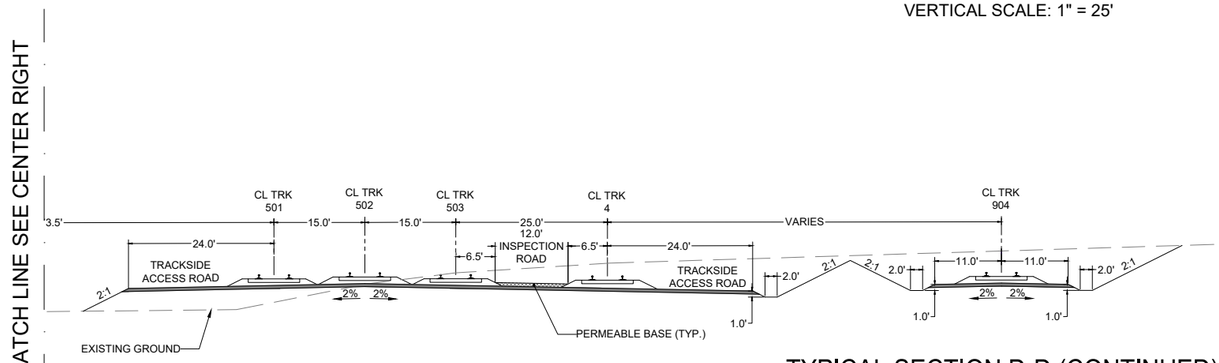

TYPICAL SECTION D-D (CONTINUED)

HORIZONTAL SCALE: 1" = 25'
VERTICAL SCALE: 1" = 25'

0' 12.5' 25'
GRAPHIC SCALE

GENERAL NOTES

1. BALLAST DEPTH (8" MIN.)
2. SUBBALLAST DEPTH (6")
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4. ADDITIONAL SUBBALLAST DEPTH MAY BE REQUIRED WHERE DICTATED BY SOIL CONDITIONS

NO.	REVISIONS	BY	DATE	APPR.

HDR

SCALE (H): 1"=800'
SCALE (V): N/A
DRAWN BY: SK
DESIGNED BY: PW/SK
CHECKED BY: N/A
DATE: 10/28/2022

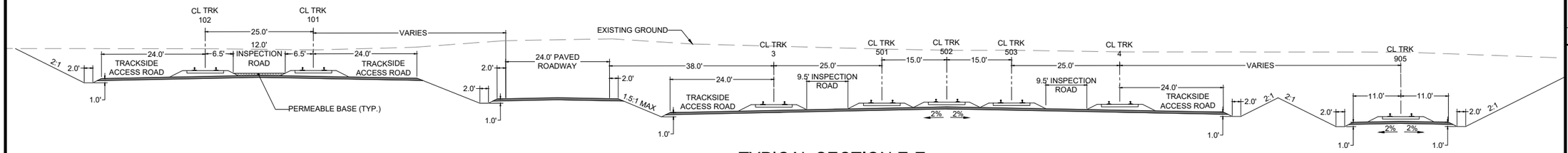
LOGISTICS PARK OF NORTH DAKOTA
CONCEPT 1 - TYPICAL SECTIONS
MINOT, ND
EXHIBIT

Project NO.
10315558

Drawing Name
EXHB_MINOT 4

3 OF 4

DRAFT SET



TYPICAL SECTION E-E

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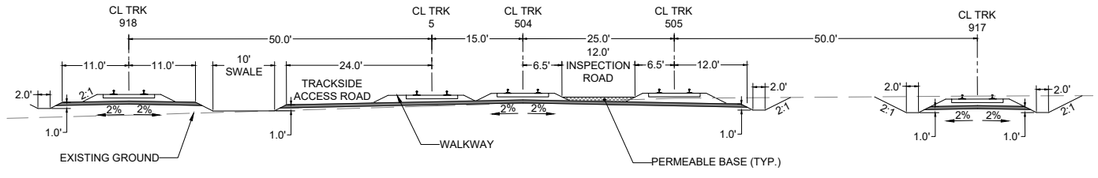
VERTICAL SCALE: 1" = 25'



TYPICAL SECTION F-F

HORIZONTAL SCALE: 1" = 25'
VERTICAL SCALE: 1" = 25'

0' 12.5' 25'
GRAPHIC SCALE

GENERAL NOTES

1. BALLAST DEPTH (8" MIN.)
2. SUBBALLAST DEPTH (6")
3. ADDITIONAL BALLAST WILL LIKELY BE REQUIRED UNDER LEAD TRACKS AND OTHER HIGH-TONNAGE TRACKS.
4. ADDITIONAL SUBBALLAST DEPTH MAY BE REQUIRED WHERE DICTATED BY SOIL CONDITIONS

NO.	REVISIONS	BY	DATE	APPR.

HDR

SCALE (H): 1"=800'
SCALE (V): N/A
DRAWN BY: SK
DESIGNED BY: PW/SK
CHECKED BY: N/A
DATE: 10/28/2022

LOGISTICS PARK OF NORTH DAKOTA
CONCEPT 1 - TYPICAL SECTIONS
MINOT, ND
EXHIBIT

Project NO.
10315558

Drawing Name
EXHB_MINOT 4

DRAFT SET

APPENDIX B - Conceptual Rail Design Details

Lead Tracks:

- Maximum degree of curvature = 9°30’
- Minimum turnout size = #11
- Track Profile = Varies 0% to 1.0%
- Minimum track spacing of 25’ from adjacent tracks

Infinity Loop:

- Maximum degree of curvature = 9°30’
- Minimum turnout size = #11
- Track Profile = Varies 0% to 0.25% (approx.)
- 3 staging tracks (blue) – minimum 8,000’ clear length. Can be used for either unit trains for the bulk facility on the green balloon, or for unit trains related to the pink trackage (petroleum facility) and purple trackage (ethanol / biodiesel or renewables facility).
    - Track centers of 25’ are provided between all staging tracks to allow for small between-track access roads, associated with mandatory inspection of trains prior to departure.
    - For most fluid operations, normally the innermost two staging tracks would be the first ones used for dry bulk unit trains, with the 3rd track only used if the other two are already occupied (to allow for outer track to be used by a train associated with the petroleum and renewables balloon tracks). A parallel lead connected to the inside end of the 3rd staging track allows moves on and off of this track without interfering with dry bulk unit train loading/unloading operations.
- 1 dry bulk unit train facility (green balloon) with a fixed-point railcar loading or unloading structure. Entirety of an 8,000’-long unit train can be processed completely “in the clear” without blocking movements into or out of the petroleum and food processing center balloon tracks.
- Minimum track spacing of 25’ on all balloon tracks, which allows for possibility of train inspection on balloon tracks without needing to move train to a staging track first.
- 1 petroleum unit train facility (pink balloon) with 8 stub-ended tracks for tankcar loading/unloading. Tracks are on alternating 25-15-25-foot track centers, which allows for double-sided tankcar “racks” between each wider-spaced pair of tracks. The example facility shown allows for an 8,000’ train to be broken into 8 pieces such that the entire train is “on spot” on the racks at one time.
- 1 renewables facility (purple balloon). Rail-served facility with spur tracks as shown provide space for approx. 3,500 feet of railcars to be “on spot” at one time.
- The balloon tracks associated with the three operations of the infinity loop “turn” the trains, so repositioning of road locomotives is not needed between arrival and departure.
- Roadways into the interior of both balloons require no grade separations, only grade crossings. Processing of unit trains through dumper/loader building does not block any at-grade crossings. Crossings are normally blocked only by through moves or limited-duration switching movements.
- Wide spacing (75’ track centers) provided around roadways is provided to allow for full-size roadways with comfortable shoulders. Roadways are assumed to be 2 x 12’ lanes, plus shoulders.

Intermodal Facility:

- Maximum degree of curvature = 9°30’
- Minimum turnout size = #11
- Strip Track Profile = 0.5%
- Intermodal Staging Track Profile = Varies 0% to 1.4%
- 2 staging tracks, each capable of holding an 10,000+’ intermodal train in the clear, even when train is split on either side of the midpoint crossover. Staging tracks are slightly conservatively long to account for varying lengths and arrangements of articulated well cars and spine cars.
- 2 strip tracks, each with 5,000’ of working length.
- Midpoint crossover (on north edge of facility) allows for an intermodal train on either of the two staging tracks to be separated into two halves, and then each half moved over to the strip tracks (completely in the clear of any non-intermodal train operations).
- Similarly, intermodal trains can be re-assembled without blocking any other movements.
- Wide track spacing between 2 strip tracks allow for a circulating roadway and 2 rows of angled trailer parking, and/or substantial container storage area between tracks.
- Trains can be “turned” without repositioning of power (due to overall balloon configuration).

Transload (yellow tracks):

- Maximum degree of curvature = 9°30’
- Minimum turnout size = #11
- Track Profile = Varies 0.5% to 0.62% (matches existing)
- 4 transload tracks, ranging from 1,000’ to 2900’ long. Wide track spacing (varies from 50’ to 75’) provides room for loading/unloading. Transload area could potentially become more functional with some reconfiguration of existing (black) tracks to the south to provide wider track centers.
- Connection to lead track at north end allows for locomotives to access north end of transload tracks.

Manifest Staging Yard (3 parallel orange tracks to the south of Infinity Loop):

- Maximum degree of curvature = 9°30’
- Track Profile = 0.5%
- 3 tracks (each approx. 1,800’ to 2,000’ clear)
- Provides a switching area to support the various manifest industrial sites through the Park.

Misc. industrial trackage / conventional spur industrial park trackage

- Maximum degree of curvature = 9°30’
- Track Profile = Varies 0% to 1.5% per BNSF DGFITP, but not to exceed 0.5% where railcars will be spotted for loading/unloading
- For area east of 42nd St. NE, north-south running portion of lead track intentionally biased towards the east to provide a variety of industry sizes.

- On the north-south running lead track tangent east of 42nd St. NE, two auxiliary tracks are provided to enhance switching and/or railcar storage for nearby industries. Lead tracks maintain minimum 25’ track centers from other tracks, while the 2 auxiliary tracks are on 15’ track centers.
- Layout of lead track and rail-served parcels in the area east of 42nd St. NE attempts to minimize/avoid impacts to jurisdictional wetlands.

APPENDIX C - BNSF Design Guidelines for Industrial Track Projects

BNSF RAILWAY COMPANY

GUIDELINES FOR INDUSTRY TRACK PROJECTS

Engineering Services

System Design & Construction

4515 Kansas Avenue Kansas City, KS 66106

August 2018

BNSF RAILWAY COMPANY

Design Guidelines for Industry Track Projects

August 2018

Table of Contents **Page**

Appendix List **Page**

Appendix List (cont.) **Page**

1. General Procedure for Industrial Track Projects

The purpose of this chapter is to guide the process for the development of industry tracks and facilities. Build-ins and tracks other than industrial need to follow BNSF's Main Line Design Guidelines for Track Projects.

1.1. Customer will contact BNSF's Economic Development (ED) representative. Contact information and a questionnaire can be found at http://www.bnsf.com/customers/support-services/.

1.2. After completing the questionnaire the customer will be asked to provide a conceptual layout for the project. This layout should include property boundaries, existing buildings and roads, and a general location of where the proposed tracks will be located.

BNSF will consider the feasibility of constructing the project at the desired location along with operating issues related to product origins and destinations. BNSF will prepare a scaled track layout (project schematic) based on the customer's concept to ensure the desired operation meets design standards. The project schematic will identify both BNSF's and the customer's scopes of work, and then be shared with the Customer (see appendix, page A-10 for an example). After BNSF approval of the opportunity (New Business Review) the customer will be provided a cost estimate for BNSF's track and signal work.

1.3. The Customer may use a designer or contractor of its choice to prepare the track plans. Survey on BNSF right-of-way will require the application of a temporary occupancy permit (see "Requirements for Working on BNSF Right of Way"). The project schematic should be used as a guide for preparing the industrial track plan. Plans should be complete with all the items in the "Final Track Plan Checklist" included. Questions concerning these guidelines should be directed to the BNSF Engineering representative. Customers are encouraged to reference this document, including standard plan drawings, in the construction specifications. BNSF Engineering will review and approve the track design, and if there are significant changes from the original project schematic, the plan may need to be reviewed by other BNSF departments.

1.4. BNSF Engineering will communicate directly with the Customer regarding any plan revisions. Any revisions will be documented on the prints and communicated in writing to the Customer. BNSF Engineering will notify ED when the industrial track plan has been reviewed and approved.

1.5. BNSF Engineering will prepare a cost estimate, chargeable to the Customer, which includes ***BNSF's portion of track and signal construction, as well as an appropriated amount for an Inspector/Coordinator for construction monitoring purposes***. The cost estimate does not include flagging charges as they can vary significantly based on the approach adopted by the customer's contractor. In general, BNSF will construct from point of switch to the 14-ft clearance point for manual switches, and from the point of switch to just beyond the power derail and the approach signal for powered switches. The Inspector/Coordinator will serve as a BNSF representative related to grading on BNSF R/W, utility drops, turnout installation schedules and customer track construction inspection.

1.6. Upon receiving the Firm Bid Cost Estimate, ED will present the formal industrial track package, including all agreements and cost proposal, to the Customer for consideration.

1.7. Upon Customer's acceptance of the proposal (check, fully executed agreements, and submittal of the final plans) ED will notify all concerned the project has been approved and funded.

1.8. The final plans must be approved by BNSF Engineering prior to the execution of the contractor's right of entry, which limits when work can start on BNSF property. Materials for BNSF's portion of the project are then ordered, work scheduled and construction completed, which can take up to 27 weeks. Customers should note that turnout construction pads must be completed 6 weeks or more

(dependent on territorial restrictions) before the target construction completion timeline to allow time to deliver, assemble, and install the turnout at the designed location.

Following is the timeline for a typical industry track project

STAGE	ACTIVITY	START	END	TIMELINE
1	New opportunity conceptual layout request	Conceptual layout request received	Conceptual layout delivered to ED Mgr.	1 week
2	New Business Review (internal BNSF assessment)	NBR created	NBR completed	2 weeks
3	Project schematic approval & cost estimate preparation	NBR completed notification	BNSF cost estimates completed	9 weeks
4	Customer acceptance & payment	Proposal letter sent	Check deposited	9 weeks
5	Request for capital	Check deposited / CPAR approved	AFE approved	3 weeks
6	Track & signal materials ordered and delivered	AFE approved	Track and signal material delivered	13 weeks
7	Track & signal construction	Customer agreements & contracts executed	Track and signal construction complete	13 weeks
8	Engineering & Construction complete	Final customer track inspection completed	Actual project in service date entered in ESI	1 week
9	Customer moves cars into facility Project Closeout	Actual project in service date entered in ESI	CDI, CRF & Credit complete	1 week
	Total Engineering and Construction timeline			52 weeks

2. Standards for Industrial Trackage (Carload, or Non-Unit Facilities)

2.1 Roadbed: Roadbed and ballast section for industrial trackage shall conform to the special roadbed section (see appendix, page A-11), and to the ballast material requirements on page 24.

2.2 Curvature: Maximum degree of curve shall not exceed 9°30' (603.80' radius). All curves are defined using the chord definition. A minimum tangent length of 50 feet must be placed between reversing curves. No turnouts (switches) can be placed in a curve. Mainline turnouts must be placed at least 200 feet from the end of a mainline curve. Industry turnouts within the facility must be placed at least 50 feet from the end of any curve.

2.3 Profile Grade: Track profile grades shall be limited to a maximum of 1.5%.

2.4 Vertical Curves: Vertical curves must be provided at break points in profile grade. The rate of change shall not exceed 2.0 in summits or sags. Vertical curves shall not extend into limits of turnout switch ties. See appendix, pages A-43 and A-44 for BNSF's standard for vertical curves.

2.5 Track: Recommended rail section is 115-lb. or greater. Hardwood ties shall be new 7" X 8" (No. 4) or 7" X 9" (No. 5), 8'-6" long, placed on 21.5" centers with a 6" ballast section. Rail anchorage shall be provided at a minimum rate of 16 anchors per 39' panel. Continuous welded rail (CWR) shall be box-anchored every other tie. Concrete ties can be spaced at 28" center to center with an 8" ballast section. CWR is recommended when using concrete ties. M-8 steel ties (8mm or 5/16" section) can be used in non-unit facility tracks and are spaced at 24" centers with 8" ballast section.

2.6 Turnouts: All main line, controlled siding and passing track turnouts will be a minimum new No. 11-141 lb. and include either a spring-rail frog or a rigid, railbound manganese frog, as specified by BNSF Engineering. For other turnouts maintained by BNSF, the size and weight will be determined dependent upon the transportation commodity, with a No. 11-141 lb. recommended, and a No. 9 - 115 lb. as the minimum (see appendix, pages A-16 to A-33). Main line turnout switch ties shall be new and hardwood. All mainline, controlled siding and passing track turnouts and trackage are to be placed by BNSF personnel out to the 14' clearance point.

Mainline, controlled siding and passing track turnouts will require the placement of a construction pad alongside the track to allow assembly of the turnout, with no disruption to traffic. After the turnout is assembled, a track window is obtained to remove the trackage and insert the turnout. An example of a construction pad is shown in the appendix on page A-14. For turnouts placed off of BNSF property and/or maintained by the Customer, and operated by BNSF, the recommended minimum is a No. 9 - 115 lb. All switch stands need to include a "30 Degree" handle (see appendix, page A-35), and a target with alternating green and yellow colors indicating switch position (page A-36).

Switch heaters are required for mainline turnouts where snow and ice present operational challenges. If a power turnout requires a switch heater, the power derail will require one also. The cost estimate will include installation of the switch heaters when required.

2.7 Derails: A derail shall be placed on all tracks connecting with a main line, siding, or industrial lead. Derails protecting mainline tracks and controlled sidings shall be double switch point (see appendix, page A-34) and installed so that the derailed car is directed away from BNSF trackage. A power derail is required when the mainline turnout is powered, and BNSF will install track and signal from the point of switch to the insulated joints just beyond the power derail. Derails protecting mainline tracks shall be placed a minimum of 100 feet behind the 14' clearance point, and placed on tangent track where possible. Derails protecting other-than-mainline tracks shall be placed a minimum of 50 feet behind the 14' clearance point, and placed on tangent track where possible. The type of derail and actual location may be determined by BNSF Operating Department requirements. A "Derail" sign needs to be placed next to the derail.

2.8 Structures: Bridges, drainage structures, track hoppers, retaining walls, etc. shall be designed to carry Cooper E-80 live load with diesel impact. Structures shall be designed per American Railway Engineering and Maintenance of Way Association (AREMA) Manual chapters 1, 7, 8, or 15 as applicable, and designed by a licensed engineer. See AREMA standards for unloading pits (Chapter 15, Section 8.4). All structural plans will need to be reviewed and accepted by BNSF Engineering. Gratings covering open pits must be bolted in place.

If a project creates the need for existing structures (including BNSF's structures) to be modified, the modifications shall be accounted into the customer's scope of work of the project, subjected to BNSF's review and approval. For drainage related structures, additional information is included in "Culverts" section within the "Specifications for Construction of Industry Trackage by Private Contractor" chapter.

2.9 Road Crossings: The standard for a road crossing surface installed and maintained by the BNSF is concrete plank (for 141-lb. rail) placed on 10-ft. switch ties. Also, ten each 10-ft. switch ties are placed on both ends of the crossing, replacing any standard cross-ties. For crossings installed and maintained by the Customer, a concrete plank is recommended, with a wood plank surface as acceptable (see appendix, pages A-37 to A-39).

2.10 Clearances: BNSF will adhere to the "Clearance Requirements By State," BNSF Dwg. No. 2509, Sheet No. 2 (see appendix, page A-40) for each state. If a state does not have its own clearances, the "BNSF Minimum Clearances Diagram," BNSF Dwg. No. 2509, Sheet No. 1 (see appendix, page A-41) will apply. Side clearances for curves should have an additional 1-1/2" per degree of curvature. All effort should be made to provide adequate clearances. In the event clearances cannot be provided for as prescribed, warning signs will be installed and they must be illuminated at night (see appendix, page A-42).

All loading/unloading equipment that fouls the clearance envelope during operation must positively lock in a non-fouling position when not in use.

All new tracks constructed will maintain a minimum distance of 25 feet for track centers from any main track, controlled siding or passing track. New tracks adjacent to other tracks will maintain a minimum distance of 14 feet for track centers.

At road crossings the set-back distance for storing rail cars on multiple adjacent tracks (track centers less than 25') is 250 feet from the edge of roadway. For single tracks, the setback distance varies for each state and is regulated by the states' appropriate agencies**, but 150 feet from the edge of roadway is the minimum.** However, operating conditions may require greater distances.

2.11 Walkways: Walkways on bridges and adjacent to switches and trackage are governed by the appropriate State Public Service Commission, Railway Commission or other State and/or Federal agencies. However, the example on page A-11 depicts requirements for most states. Walkway ballast shall be Class 2 and no larger than 1" in size (ballast gradation shown on page 24).

2.12 Signals and Utility Service: Customer shall provide electrical service to BNSF property should the proposed trackwork require power for the signal facilities. The requirement and locations will be identified by BNSF Engineering and communicated to the customer. If the service will include providing power to one or more switch heaters, a minimum of 200 Amp, Single Phase, 120/240 volt service, with meter socket and service disconnect is required. The service disconnect shall be a minimum of 200 amp, 2 pole breaker by either Cutler Hammer or Square D (QO style), with the meter socket requirement as per the power company specifications. No additional electrical panels are necessary as BNSF will take a feeder from the load side of the 200 amp service disconnect switch. The service may be either overhead or underground. All electrical installations will be made in accordance with the prevailing State/local electrical code(s), or if there is none, the current edition of the National Electrical Code will govern the installation. If an electric switch heater is not involved, 100 Amp service will be sufficient.

Customer shall also provide natural gas service to BNSF property should the proposed

trackwork require the installation of one or more switch heaters. The requirement and locations will be identified by the BNSF project representative. The service shall be capable of delivering 600-900 thousand BTUs per heater per location required. The actual pressure shall be requested from BNSF for each project specifically (typical pressure should be around 6 psi).

2.13 Inspection of Materials and Track: BNSF's Engineering representative should inspect all track materials prior to placement to avoid subsequent removal of sub-standard material. BNSF personnel will inspect the completed track before placing it into service.

2.14 General:

2.14.1 Loading and unloading tracks must be designed so that they are completely independent of railroad operating lines and passing tracks such that loading and unloading operations in no way interfere with train operations. Design of trackage must be approved by BNSF Engineering.

2.14.2 Utility installations may require a permit. Pipelines under track are to be encased per BNSF requirements. Wirelines are to be installed per BNSF requirements. Refer to "BNSF Utility Accommodation Policy" booklet http://bnsf.com/communities/faqs/pdf/utility.pdf. Utilities within 50 feet beyond the end of track must be underground, and protected as if they were under the track.

2.14.3 The effect on sight distance must be considered when planning construction of trackage in the vicinity of any grade crossings. The required sight distance should be determined and preserved when performing and designing for construction near any grade crossing. Less than the required sight distance will be the liability of the Customer.

2.14.4 Maintenance of Way Operating Rule No. 6.32.4: "Leave cars, engines, or equipment clear of road crossings and crossing signal circuits. If possible, avoid leaving cars, engines, or equipment standing closer than 250 feet from the road crossing when there is an adjacent track (<25' track centers)."

2.14.5 The effect on queuing distance of a crossing must be considered when planning the extension of a track across a grade crossing. The proposed plans shall not cause vehicles to be trapped in between tracks, cause vehicles to have to stop on a track while waiting in queue for a crossing to clear, or to cause excessive highway congestion by reducing the queuing distance of an existing crossing. Adding new public crossings or adding more tracks to an existing public crossing will be reviewed by BNSF Engineering and the appropriate entity with jurisdiction over the crossing (Typically the State's Department of Transportation).

2.14.6 An earthen berm (see appendix, page A-15) or suitable bumping post shall be installed at the end of track. Also, a red retro-reflective marker shall be placed at the end of track.

2.14.7 Customer is responsible for all grading including placing all subballast up to BNSF ballast and the placement of a construction pad.

2.14.8 Customer is to acquire any additional property required to construct grade and drainage. If the proposed trackage or facility will increase runoff onto BNSF property, a detailed drainage plan needs to be submitted for review prior to construction. Drainage should be handled in a manner as not to increase current drainage structures on BNSF property.

2.14.9 Contractor must not at any time foul the main line tracks. A BNSF flagman will be required, at the Contractor's expense, when working within 25 feet from centerline of the track, which would include, but not limited to, work that could foul a track, such as with a large crane, excavation activities that could undermine a track, and overhead wire work which could potentially fall onto the track. Billing for the flagman is separate from the cost for BNSF portion of the track work. Current cost for BNSF flagging is approximately $1,800 per day with billing based on actual charges.

2.14.10 Appropriate access must be provided for BNSF to drive an SU-40 maintenance truck (See AASHTO's "A Policy on Geometric Design of Highways and Streets", a.k.a. the "AASHTO Green Book") to the proposed installations to be installed and/or maintained by BNSF or other existing BNSF infrastructure. If switch heaters are required at locations where the installation of a natural gas supply is infeasible, the access must be sufficient for refueling trucks to access the switch heater area. Depending on the location and the fuel providers of the region, refueling trucks may exceed the size of a SU-40 vehicle. Additional requirements related to the backing up of vehicles may be active in certain operating regions, which affects turnaround designs. Consult your project representative for additional region specific requirements.

3. Standards for Unit Train/Loop Facilities

3.1 Roadbed: Roadbed and ballast section for industrial trackage shall conform to the special roadbed section (see appendix, page A-11), and to the ballast material requirements on page 24.

3.2 Curvature: Maximum degree of curve shall not exceed 7°30' (764.49' radius). All curves are defined using the chord definition method. A minimum tangent length of 100 feet must be placed between reversing curves. No turnouts (switches) can be placed in a curve. Mainline turnouts must be placed at least 200 feet from the end of a mainline curve. Industry turnouts within the facility must be placed at least 100 feet from the end of any curve.

3.3 Profile Grade: Track profile grades shall be limited to a maximum of 1.5%. For loop tracks, the maximum grade will be 0.5%. Other restrictions may be defined for individual projects. A flat grade (0.0%) must be maintained through loading/unloading areas.

3.4 Vertical Curves: Vertical curves must be provided at break points in profile grade. The rate of change shall not exceed 1.0 in summits or 0.5 in sags. Vertical curves shall not extend into limits of turnout switch ties. See appendix, pages A-43 and A-44 for BNSF's standard for vertical curves.

3.5 Track: For New Unit Train Facilities minimum rail section is 115-lb and continuous welded rail (CWR) is recommended. Hardwood ties shall be new 7" X 8" (No. 4) or 7" X 9" (No. 5), 8'-6" long, placed on 21.5" centers with a 6" ballast section. Rail anchorage shall be provided at a minimum rate of 16 anchors per 39' panel. Continuous welded rail (CWR) shall be box-anchored every other tie. Concrete ties can be spaced at 28" center to center with an 8" ballast section. CWR is recommended when using concrete ties. M-10 steel ties (10mm or 13/32" section) can be used in unit facility tracks and are spaced at 24" centers with 8" ballast section.

3.6 Turnouts: All main line, controlled siding and passing track turnouts will be a minimum new No. 11-141 lb. and include either a spring-rail frog or a rigid, railbound manganese frog, as specified by BNSF Engineering. For other turnouts maintained by BNSF, a No. 11-115 lb. is the minimum (see appendix, pages A-22 to A-33). Main line turnout switch ties shall be new and hardwood. All mainline, controlled siding and passing track turnouts and trackage are to be placed by BNSF personnel out to the 14' clearance point. All joints on the side of turnout receiving majority of traffic will be thermite welded.

Mainline, controlled siding and passing track turnouts will require the placement of a construction pad alongside the track to allow assembly of the turnout, with no disruption to traffic. After the turnout is assembled, a track window is obtained to remove the trackage and insert the turnout. An example of a construction pad is shown in the appendix on page A-14.

For turnouts placed off of BNSF property and/or maintained by the Customer, and operated by BNSF, a No. 11 - 115 lb. turnout will be the minimum. All switch stands need to include a "30 Degree" handle (see appendix, page A-35), and a target with alternating green and yellow colors indicating switch position (page A-36).

Switch heaters are required for mainline turnouts where snow and ice present operational challenges. If a power turnout requires a switch heater, the power derail will require one also. The cost estimate will include installation of the switch heaters when required.

3.7 Derails: A derail shall be placed on all tracks connecting with a main line, siding, or industrial lead. Derails protecting mainline tracks and controlled sidings shall be double switch point (see appendix, page A-34) and installed so that the derailed car is directed away from BNSF trackage. A power derail is required when the mainline turnout is powered, and BNSF will install track and signal from the point of switch to the insulated joints just beyond the power derail. Derails protecting mainline tracks shall be placed a minimum of 100 feet behind the 14' clearance point, and placed on tangent track where possible. Derails protecting other-than-mainline tracks shall be

placed a minimum of 50 feet behind the 14' clearance point, and placed on tangent track where possible. The type of derail and actual location may be determined by BNSF Operating Department requirements. A "Derail" sign needs to be placed next to the derail.

3.8 Structures: Bridges, drainage structures, track hoppers, retaining walls, etc. shall be designed to carry Cooper E-80 live load with diesel impact. Structures shall be designed per American Railway Engineering and Maintenance of Way Association (AREMA) Manual chapters 1, 7, 8, or 15 as applicable, and designed by a licensed engineer. See AREMA standards for unloading pits (Chapter 15, Section 8.4). All structural plans will need to be reviewed and accepted by BNSF Engineering. Gratings covering open pits must be bolted in place.

If a project creates the need for existing structures (including BNSF's structures) to be modified, the modifications shall be accounted into the customer's scope of work of the project, subjected to BNSF's review and approval. For drainage related structures, additional information is included in "Culverts" section within the "Specifications for Construction of Industry Trackage by Private Contractor" chapter.

3.9 Road Crossings: The standard for a road crossing surface installed and maintained by the BNSF is concrete plank (for 141-lb. rail) placed on 10-ft. switch ties. Also, ten each 10-ft. switch ties are placed on both ends of the crossing, replacing any standard cross-ties. For crossings installed and maintained by the Customer, a concrete plank is recommended, with a wood plank surface as acceptable (see appendix, pages A-37 to A-39).

3.10 Clearances: BNSF will adhere to the "Clearance Requirements By State," BNSF Dwg. No. 2509, Sheet No. 2 (see appendix, page A-40) for each state. If a state does not have its own clearances, the "BNSF Minimum Clearances Diagram," BNSF Dwg. No. 2509, Sheet No. 1 (see appendix, page A-41) will apply. Side clearances for curves should have an additional 1-1/2" per degree of curvature. All effort should be made to provide adequate clearances. In the event clearances cannot be provided for as prescribed, warning signs will be installed and they must be illuminated at night (see appendix, page A-42).

All loading/unloading equipment that fouls the clearance envelope during operation must positively lock in a non-fouling position when not in use.

All new tracks constructed will maintain a minimum distance of 25 feet for track centers from any main track, controlled siding or passing track. New tracks adjacent to other tracks will maintain a minimum distance of 14 feet for track centers.

At road crossings the set-back distance for storing rail cars on multiple adjacent tracks (track centers less than 25') is 250 feet from the edge of roadway. For single tracks, the setback distance varies for each state and is regulated by the states' appropriate agencies**, but 150 feet from the edge of roadway is the minimum.** However, operating conditions may require greater distances.

3.11 Walkways: Walkways on bridges and adjacent to switches and trackage are governed by the appropriate State Public Service Commission, Railway Commission or other State and/or Federal agencies. Due to revised FRA Airbrake and Train Handling Rules, outbound trains are required to have an airbrake inspection on both sides of the train. New shuttle projects will be required to have a minimum 13' inspection road on one side and a minimum 8.5' walkway on the other. See appendix pages A-11 and A-12 for typical sections of roads and walkways. Walkway ballast shall be Class 2 and no larger than 1" in size (ballast gradation shown on page 24).

3.12 Signals and Utility Service: Customer shall provide electrical service to BNSF property should the proposed trackwork require power for the signal facilities. The requirement and locations will be identified by BNSF Engineering and communicated to the customer. If the service is for an electric switch heater, a 200 Amp, Single Phase, 120/240 volt service, with meter socket and service disconnect is required. The service disconnect shall be a 200 amp, 2 pole breaker by either Cutler Hammer or Square D (QO style), with the meter socket requirement as per the power company specifications. No additional electrical panels are necessary as BNSF will take a feeder from the load side of the 200 amp service disconnect switch. The service may be either overhead or underground. All electrical installations will be made in accordance with the prevailing State/local electrical code(s), or if there is none, the current edition of the National Electrical Code will govern the installation. If an electric switch heater is not involved, 100 Amp service will be sufficient.
Customer shall also provide natural gas service to BNSF property should the proposed trackwork require the installation of one or more switch heaters. The requirement and locations will be identified by the BNSF project representative. The service shall be capable of delivering 600-900 thousand BTUs per heater per location required. The actual pressure shall be requested from BNSF for each project specifically (typical pressure should be around 6 psi).

3.13 Access Road: Unless otherwise directed a road will be required that will provide access to inspect the entire train prior to movement from the facility. Due to revised FRA Airbrake and Train Handling Rules, outbound trains are required to have an airbrake inspection on both sides of the train. New shuttle projects will be required to have a minimum 13' inspection road on one side and a minimum 8.5' walkway on the other. See appendix pages A-12 and A-13 for typical sections of roads and walkways. A standard section with a 13-ft wide roadway is shown in the appendix, page A-13. The roadway can be constructed using subballast materials as specified in the Grading & Embankment section of this document, page 20.

3.14 Inspection of Materials and Track: BNSF's Engineering representative should inspect all track materials prior to placement to avoid subsequent removal of sub-standard material. BNSF personnel will inspect the completed track before placing it into service.

3.15 General:

3.15.1 Loading and unloading tracks should be designed so that they are completely independent of railroad operating lines and passing tracks such that loading and unloading operations in no way interfere with train operations. Design of trackage must be approved by BNSF Engineering.

3.15.2 Utility installations may require a permit. Pipelines under track are to be encased per BNSF requirements. Wirelines are to be installed per BNSF requirements. Refer to "BNSF Utility Accommodation Policy" booklet http://bnsf.com/communities/faqs/pdf/utility.pdf. Utilities within 50 feet beyond the end of track must be underground, and protected as if they were under the track.

3.15.3 The effect on sight distance must be considered when planning construction of trackage in the vicinity of any grade crossings. The required sight distance should be determined and preserved when performing and designing for construction near any grade crossing. Less than the required sight distance will be the liability of the Customer.

Maintenance of Way Operating Rule No. 6.32.4:
"Leave cars, engines, or equipment clear of road crossings and crossing signal circuits. If possible, avoid leaving cars, engines, or equipment standing closer than 250 feet from the road crossing when there is an adjacent track (<25' track centers)."

3.15.4 The effect on queuing distance of a crossing must be considered when planning the extension of a track across a grade crossing. The proposed plans shall not cause vehicles to be trapped in between tracks, cause vehicles to have to stop on a track while waiting in queue for a crossing to clear, or to cause excessive highway congestion by reducing the queuing distance of an existing crossing. Adding new public crossings or adding more tracks to an existing public crossing will be reviewed by BNSF Engineering and the appropriate entity with jurisdiction over the crossing (Typically the State's Department of Transportation).

3.15.5 An earthen berm (see appendix, page A-15) or suitable bumping post shall be installed at the end of track. Also, a red retro-reflective marker shall be placed at the end of track.

3.15.6 Customer is responsible for all grading including placing all subballast up to BNSF ballast and the placement of a construction pad, if required.

3.15.7 Customer is to acquire any additional property required to construct grade and drainage. If the proposed trackage or facility will increase runoff onto BNSF property, a detailed drainage plan needs to be submitted for review prior to construction. Drainage should be handled in a manner as not to overload current drainage structures on BNSF property.

3.15.8 Contractor must not at any time foul the main line tracks. A BNSF flagman will be required, at the Contractor's expense, when working within 25 feet from centerline of the track, which would include, but not limited to, work that could foul a track, such as with a large crane, excavation activities that could undermine a track, and overhead wire work which could potentially fall onto the track. Billing for the flagman is separate from the cost for BNSF portion of the track work. Current cost for BNSF flagging is approximately $1,000 per day with billing based on actual charges.

3.15.9 Adequate lighting must be provided for train crews working at night. Work areas near switches, gates, doors, pits and buildings should be illuminated to prevent walking/tripping hazards and allow crewmen riding rail cars to see without reliance upon a flashlight.

3.15.10 A track to set out bad order cars unsuitable for loading or unloading needs to be added to the overall design. Set out track should be long enough to place at least 5 rail cars and be accessible to a repair crew. A locomotive tie-up track may also need to be incorporated into the design. This need will be determined at the on-site meeting.

3.15.11 Appropriate access must be provided for BNSF to drive an SU-40 maintenance truck (See AASHTO's "A Policy on Geometric Design of Highways and Streets", a.k.a. the "AASHTO Green Book") to the proposed installations to be installed and/or maintained by BNSF or other existing BNSF infrastructure. If switch heaters are required at locations where the installation of a natural gas supply is infeasible, the access must be sufficient for refueling trucks to access the switch heater area. Depending on the location and the fuel providers of the region, refueling trucks may exceed the size of a SU-40 vehicle. Additional requirements related to the backing up of vehicles may be active in certain operating regions, which affects turnaround designs. Consult your project representative for additional region specific requirements.

4. Survey and Plan Requirements

4.1 Surveying on BNSF Right of Way: In order to protect BNSF's investment of its Right of Way (ROW) and for the safety of persons coming onto BNSF property, BNSF requires all parties entering or performing work on the right-of-way to secure appropriate agreement and insurance before beginning any type of work. Please consult the BNSF project representative and the section "Requirements for Working on BNSF Right of Way" before proceeding.

4.1.1 Grading and alignment stake out and re-staking is the responsibility of the customer, including the portions to be installed by BNSF forces. ***BNSF project stake out shall not include the point of intersection (PI)***. All stake out locations shall be documented by photographs. We encourage marking up photographs to demonstrate the stakes' corresponding feature to minimize misunderstanding. They shall be sent to the BNSF project representative (the BNSF inspector coordinator) when completed. The stakeout guidelines listed below illustrate the various responsibilities of the customer relative to the stage of the project:

Project Stage	Pt. of Switch (PSw)	Power Switch Projects Only	
		Pt. of Derail (Derail)	Alignment
Conceptual: Allows for proper visualization of preliminary site visit.	✓		
Pad Completion: Enables crews to unload and assemble the switch at the correct locations.	✓	✓	
Pre-Install Stake Out: These staked items will be communicated to the BNSF during the pre-install meeting.	✓	✓	✓

4.1.1.1 Point of Switch: A one page document has been included in A-51 of the appendix. This stake out shall include rail markings and center of track markings at a minimum. An offset stake is encouraged after the pad is completed. A flagger will be needed for this stake out due to the need to foul the track.

4.1.1.2 Point of Derail: BNSF will construct and install up to the entering signal for the power switch's control point for projects involving power switches. The power derail shall be marked with both a centerline feather and an offset stake. The stake out shall follow the format included in the point of switch stake out document on A-51 of the appendix with the only difference being replacing "PSw" by the word "Derail".

4.1.1.3 Alignment: BNSF will construct and install up to the entering signal for the power switch's control point for projects involving power switches. The alignment stake out shall start from the last long tie to the entering signal's location. Stakes should be in intervals of 100' or less, and should include centerline feathers and offset stakes at the edge of the pad or a location that will not be easily damaged by construction equipment.

4.2 Plan Requirements: <u>All plans and drawings need to be prepared electronically in a CADD format</u>. This allows for updates to BNSF's maps and records to be done electronically. All information is to be in English units. Plan submittals should be in Adobe's Acrobat pdf format, with 11" x 17" sheet size. Upon approval, BNSF Engineering will revise the project schematic, if necessary.

Plan View Scale: 1" = 50'
Profile View Scale: 1" = 50' horizontal and 1" = 5' vertical
Cross Sections Scale: 1"=10' horizontal and vertical

4.2.1 BNSF Engineering Plan Submittals - Definitions

Conceptual – An alignment plan showing existing track and features along with proposed changes, and the official operating plan. This will be used for the New Business Review (NBR).

30% Design - All items from the conceptual submittal plus plan/profile sheets, cross-sections, typical sections, xing plans, drainage plans, revisions from changes due to land and utility negotiations, and 30% structure plans. This plan will be used for the walk-thru inspection and schematic approval.

90% Design - All items from the 30% submittal plus revisions from the walk-thru inspection, culvert extensions, road xing plans, and 60% structure plans (e.g. pit plans, catwalks, and sheds).

Final Track Plan – All items in 30% and 90% with all relevant details and revisions incorporated from previous comments. Specifications and details included.

As-Built Submittal – The plan/profile sheets updated with post-construction locations as surveyed.

4.2.2 Provide an Operating Plan

Prepare a sketch (does not have to be to-scale) showing in-bound and out-bound switching plans and lengths of tracks to be used. Prepare multiple sketches to show the position of cars and locomotives at different stages of switching/loading/unloading together with a narrative describing the movements depicted by the multiple sketches.

In developing track lengths for operating plans, designers shall be aware that:

- Switches cannot be thrown unless the closest on track equipment is at least 50' from the point of switch
- Cars shall not come within 25' of the end of track bumper at any time
- Parked cars shall be at least 50' or more from the clearance point of a turnout if the other side of the turnout is to be safely used by BNSF crews.
- If a power turnout is required, industry switching cannot come within 50' of the proposed entering signal location of the control point
- If a manual turnout and derail is used, industry switching cannot come within 50' of the proposed point of derail location

Customers are encouraged to reference this document, including standard plan drawings, in the construction specifications.

Conceptual Plan Submittal Checklist:

- ☐ Furnish Milepost and Line Segment in the Title Block, along with name of Industry and date of plan preparation. Contact information for engineering firm should also be included on plans.
- ☐ BNSF Milepost location and BNSF stationing information for switches on proposed on BNSF tracks (Lat/Long information for power switch projects)
- ☐ Curvatures not exceeding 7-30 (unit train) or 9-30 (manifest)
- ☐ Grades not exceeding 0.5% on receiving/departure tracks
- ☐ Grades not exceeding 1.5% on any tracks
- ☐ Track centerline distances from BNSF mainline and for inspection roads & ATV inspection paths
- ☐ Switch sizes for all switches
- ☐ Culverts to be abandoned/extended/replaced for those under BNSF tracks
- ☐ Designated unit train receiving/departure tracks and/or manifest tracks
- ☐ Added tracks across existing BNSF at grade crossings, or additional crossings proposed across public roadways
- ☐ Additional bridges next to existing BNSF infrastructure
- ☐ Distances from proposed turnouts to existing critical BNSF infrastructure
  - ☐ To abutments of BNSF bridges
  - ☐ To the edge of BNSF crossings
  - ☐ To the closest start of BNSF curve (i.e. the distance from the spiral to the PSw/last long tie)
- ☐ Basic property limits & railroad Right of Way lines
- ☐ Graphical operating plan
- ☐ Include a description of work to be performed by BNSF. Example: "Construct 185 track feet including a #11-141 lb. turnout from point of switch to clearance point, raise railroad pole line, adjust signals."
- ☐ Include a description of work to be performed by the contractor. Example: "Construct remaining trackage from clearance point to end, place wheel stops, install plank crossing and signs, perform all grading, install all drainage structures, install double switch point derail, provide electrical service to a point opposite the proposed switch locations."
- ☐ Include a list of track materials to be used by the contractor. Example: "115-lb continuous welded rail (CWR) on #4 new cross-ties, #11-115lb BNSF standard turnouts, 32-ft full depth timber crossing planks to be placed in new construction.
- ☐ Effective track capacities of proposed/modified tracks

30% Design Drawings Submittal Checklist:

- ☐ 30% checklist with conceptual checklist included
- ☐ Track Plan alignment included
  - ☐ Dimension from proposed BNSF switch locations to an identifiable fix object in the field (For practicality, shall be in the direction of the track)
  - ☐ Derail location stationing and derail type included
  - ☐ Crossing location(s) with stationing and width included
  - ☐ PC/PT stationing on all curves included
  - ☐ Curvature information on all curves included
  - ☐ 14.21' clearance point stationing included
  - ☐ Point of switch stationing included (PSw)
  - ☐ End of track stationing and structures included
  - ☐ Culvert/other pipe crossings included
  - ☐ Location of connection structures to existing drainage systems
- ☐ Access roadway information called out
  - ☐ Turnout pad sizes called out
  - ☐ Turnarounds/Access at turnout pad determined
- ☐ Track profile plan included
  - ☐ Vertical curves included
  - ☐ Vertical curves' lengths included
  - ☐ Culvert/other pipe structures included on profile
  - ☐ Cover information on culvert/other pipe structures to top of subgrade & base of rail
- ☐ BNSF construction coordination sheet for power turnout projects (One page blow up sheet of pad size, signal house locations, key asset locations such as the derail and the signal locations)
- ☐ Cross section drawings with typical sections included
- ☐ Grading limits plan
- ☐ Survey monuments/control point locations
- ☐ Utility relocates on the BNSF right-of-way with owner information
- ☐ Separate sheet for each public crossing proposed / modified including information
  - ☐ Distance from turnouts to nearest crossings
  - ☐ Cross bucks locations / Lights & gates locations
  - ☐ Access roadway locations
  - ☐ Signal house locations (if applicable)
  - ☐ Distance between multiple track crossings (if applicable)

- ☐ DOT # (if crossing is existing)
- ☐ Queuing distance from adjacent roadways (if applicable)
- ☐ Contour information of surrounding terrain (use light gray lines for contours)
  → At least 300’ on each side parallel to the direction of the track
  → At least 100’ on each side parallel to the direction of the roadway
- ☐ City, county, and governing roadway authority information

90% Design Drawings Submittal Checklist:

- ☐ 90% checklist with 30% checklist included
- ☐ Clearance submittal for all structures coming within 15’ of the centerline of the closest track
- ☐ Clearance submittal for all structures crossing above any track in the facility
- ☐ Finalized drainage plan
  - ☐ Culvert extensions finalized
  - ☐ Culvert locations finalized with cover information requested in 30%
  - ☐ Line drawings for all pipe crossings/drainage structures under existing or proposed tracks that will be impacted by the project
  - ☐ Pre-project drainage pattern with pre-project terrain contours
  - ☐ Post-project drainage pattern with (if available, include post-project terrain contours)
- ☐ Finalized access roadway plan
  - ☐ Final turnout pad access routes
  - ☐ Final crossing locations internal to facility
- ☐ Structure locations included (i.e. building sheds, catwalks, etc.)
- ☐ H&H studies included in submittal (if required)
- ☐ 100% signed and sealed plans for structures included (Only structures that affects track stability or track clearance will require reviews. E.g. pit plans, shed plans, catwalks, etc.)

Final Track Plan / 100% Design Plan Submittal Checklist:

- ☐ 100% checklist with 90% checklist included
- ☐ Signage plans included
- ☐ Sign locations included
- ☐ Lighting plan included
- ☐ Details included
  - ☐ Switch geometry details
  - ☐ Stand details
  - ☐ Crossing details
  - ☐ Bumper details
  - ☐ Rail weights and tie specifications
  - ☐ Reference to the specifications within the BNSF design guidelines and applicable AREMA guidelines
  - ☐ Culvert specifications

As-Built Record Drawing Submittal Checklist:

- ☐ Lat/Lon of actual installed BNSF switch location
- ☐ Actual installed location from an identifiable permanent structure in the field
- ☐ Alignment deviations of actual installed track
- ☐ Actual lengths of tracks and effective lengths of tracks

5. Specifications for Construction of Industrial Trackage by Private Contractor

5.1 Contractor's Responsibility: By acceptance of the contract the contractor assumes complete responsibility for construction of the work. The Contractor should understand that any work not specifically mentioned in the written specifications, but which is necessary, either directly or indirectly, for the proper carrying out of the intent thereof, shall be required and applied, and will perform all such work just as though it were particularly delineated or described. Contractor should also understand that final approval of the track for service is the prerogative of BNSF and close contact with BNSF's Engineering Representative is required. No work is to be performed on BNSF's right-of-way, or in such proximity as to interfere with BNSF's tracks or roadbed, without advance permission by BNSF, including insurance and if necessary, flagging protection.

5.2 Insurance Requirements: Contained within the Contract for Industrial Track Agreement to be executed prior to construction.

5.3 Grading & Embankment: The work covered by this section of the specifications consists of furnishing all plant, labor, material and equipment and performing all operations in connection with construction of track roadbed, including clearing and grubbing, excavation, construction of embankments and incidental items, all in accordance with the contract drawings and specifications.

The Contractor shall load, haul, spread, place and compact suitable materials in embankments and shall finish the embankments to the grade, slope and alignment as shown in the plans. Suitable materials shall consist of mineral soils free from organics, debris, and frozen materials. Embankment slopes shall be compacted and dressed to provide a uniform and dense slope. Embankments shall be built with approved materials from excavation of cuts or from borrow unless otherwise shown on the plans.

If materials unsuitable for embankments (organics, debris, brush and trees, etc.) are encountered within the areas to be excavated, or material existing below the designated subgrade in cuts or within areas on which embankments are to be placed are of such nature that stability of the roadbed will be impaired, such materials shall be removed and wasted or stockpiled for other use. Topsoil removed from embankment areas shall be spread uniformly over the embankment slopes.

Unsuitable material removed from embankment foundations or below subgrade elevation in excavation areas shall be replaced to grade with suitable material compacted as specified for embankments in these specifications.

Wherever an embankment is to be placed on or against an existing slope steeper than four horizontal to one vertical, such slope shall be cut into steps as the construction of the new embankment progresses. Such steps shall each have a horizontal dimension of not less than three feet and a vertical rise of one foot.

At all times, the Contractor shall operate sufficient equipment to compact the embankment at the rate at which it is being placed. Compaction shall be accomplished by sheep's foot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Use construction procedures and drainage design that will provide a stable roadbed.

Each layer in embankments made up primarily of materials other than rock shall not exceed 6" in loose depth and shall be compacted to the dry density as specified hereinafter before additional layers are placed. All embankments shall be compacted to a density of not less than 95% of the maximum standard laboratory density, and not more than +4 percentage points above the optimum moisture content, unless otherwise specified on the drawings. The standard laboratory density and optimum moisture content shall be the maximum density and optimum moisture as determined in accordance with ASTM Designation: D 698 (Standard Proctor Test). Copies of soil test results shall be furnished to owner.

On top of the embankment fill, the Contractor shall place a minimum of 6 inches of granular sub-ballast which meets the above criteria and contains no material larger than that which will pass through a (3) inch square sieve. Sub-ballast shall be crushed gravel or crushed stone with a minimum 75% of the material having two fractured faces. Sub-ballast must meet the quality requirements of ASTM Designation: D 1241 and be approved by the Engineer. Additional sub-ballast may be required as determined from an engineering soil analysis.

5.4 Culverts: The minimum diameter for all culverts installed under main tracks or tracks maintained by BNSF is 36 inches. This is to accommodate regular inspection and cleaning. Culverts maintained by the Customer should be 24 inches or larger. Impacts to existing culverts shall be included in the customer's scope of the project.

Culvert extensions with a change in direction or a change in pipe section (including size) is generally not permitted. If the project involves removing/abandoning existing culverts under BNSF tracks, adding additional culverts under BNSF tracks or extending an existing culvert under BNSF tracks, a hydraulic study shall be provided to demonstrate that the post project condition will meet or exceed the existing hydraulic capacity. Projects adjacent to BNSF right-of-way with potential hydraulic impacts to BNSF will also require a hydraulic study. The hydraulic study can be waived if the project area is less than 1.0 Ac and does not have any hydraulic impact to an existing BNSF bridge/drainage structure.

Existing pipes that have to be extended will become the responsibility of the customer in installation, ownership and maintenance. If it is determined by BNSF Structures that an existing pipe cannot be extended in an acceptable manner, the cost of installing an acceptable replacement pipe shall be the responsibility of the customer. Additional guidelines related to pipe installations can be requested from your BNSF engineering project representative.

5.5 Corrugated Metal Culverts: These instructions cover the selection, installation, and fabrication of circular type zinc coated (galvanized) corrugated steel culverts for nominal diameters of 36-inch to 96-inch, inclusive. Additional protective coatings may be specified or allowed by BNSF Engineering.

Galvanized corrugated steel pipe shall be manufactured in accordance with AASHTO Specifications M 36 and M 218. All areas of surface rust on re-corrugated ends or lock seams shall be painted using the hot-dip or metallizing process.

Design, installation, and fabrication shall be in accordance with current American Railway Engineering and Maintenance of Way Association (AREMA) Specifications Chapter 1, Part 4, Culverts. Additionally, all culvert pipes shall meet the requirements shown in Table 1.

TABLE 1

Nominal Diameter (Inches)	Nominal* Corrugation (Inches)	Minimum** Width of Lap (Inches)	Nominal Thickness (Inches)	Thickness U.S. Std. Gage	Rivet** Diameter (Inches)	Max. Cover	Min. Cover
36	2-2/3 x 1/2	2	0.109	12	3/8	40'	***
42	2-2/3 X 1/2	3	0.138	10	3/8	70'	***
42	3 x 1 &5 x 1	3	0.109	12	7/16	70'	***
48	2-2/3 x 1/2	3	0.138	10	3/8	65'	***
48	3 x 1 & 5 x 1	3	0.109	12	7/16	70'	***
54	2-2/3 x 1/2	3	0.168	8	3/8	60'	***
54	3 x 1 & 5 x1	3	0.138	10	7/16	75'	***
60	2-2/3 x 1/2	3	0.168	8	3/8	55'	***
60	3 x 1 & 5 x 1	3	0.138	10	7/16	70'	***
66	3 X 1 & 5 X 1	3	0.138	10	7/16	60'	***
72	3 X 1 & 5 X 1	3	0.168	10	7/16	65'	***
84	3 X 1 & 5 X 1	3	0.168	8	7/16	55'	***
96	3 X 1 & 5 X 1	3	0.168	8	7/16	45'	***

* Where two types of corrugation are acceptable, the use of standard 2-2/3" x 1/2" material is preferred, if available. 5 x 1 corrugations to be used only on helical pipe.

** For riveted pipe.
Pipes 48 inches or greater in diameter shall be shop-elongated 5 percent of their diameter in a vertical direction and have lifting lugs.

*** Minimum cover to be one-half diameter of culvert pipe from top of subgrade to top of pipe.

Due to settlement of culvert pipes, cambering longitudinally is recommended to improve the flow line profile after settlement. This is accomplished by laying the upstream half of the pipe on a flatter grade than the downstream half. Riveted pipe shall be placed with the inside circumferential laps pointing downstream and with the longitudinal laps at the side. Pipes shall be installed with a camber suitable to the height of the cover over the pipe and bearing capacity of the supporting soil.

Firm support must be provided to obtain a satisfactory installation. The filling material adjacent to pipes shall be loose granular material, free from large stones, frozen lumps, cinders, or rubbish. The filling shall be deposited alternately on opposite sides of the pipe in layers not exceeding 6 inches in depth, and each layer shall be thoroughly tamped before placing the next layer. Special care shall be taken in tamping under the lower part of the pipe. For a trench installation, the backfill shall be tamped the entire width of the trench, and for surface installation it shall be tamped not less than one half the pipe diameter out from the sides of the pipe. The density of the backfill after tamping must be at least 95% of its maximum density, as determined by ASTM D 698.

Any other type or size drainage structure shall have approval of BNSF Engineering prior to installation under track locations.

5.6 Utility Crossings: Utility crossings and relocations shall conform to BNSF standards as outlined in the "BNSF Utility Accommodation Policy" http://bnsf.com/communities/faqs/pdf/utility.pdf Applications for utility crossings and relocations are handled by Jones, Lang, LaSalle (JLL), phone number 1- 866-498-6647. Any questions regarding utilities can be directed to the BNSF Engineering representative.

5.7 Curvature and Grades: Tracks will be staked by the customer's surveyor (under flag protection if necessary) and constructed as shown on the approved plans. Any changes to the approved design need to be reviewed by BNSF Engineering or appointed representative.

5.8 Clearances: BNSF will adhere to the "Clearance Requirements By State," BNSF Dwg. No. 2509, Sheet No. 2 (see appendix, page A-38) for each state. If a state does not have its own clearances, the "BNSF Minimum Clearances Diagram," BNSF Dwg. No. 2509, Sheet No. 1 (see appendix, page A-41) will apply. Side clearances for curves should have an additional 1-1/2" per degree of curvature. Warning signs will be installed for all close clearances less than standard (see appendix, page A-42). All loading/unloading equipment that fouls the clearance envelope during operation must positively lock in a non-fouling position when not in use.

5.9 Material: BNSF's Division Engineer representative should inspect all track materials prior to placement to avoid removal of sub-standard material. BNSF personnel will also inspect the track before placing it into service.

5.9.1 **Rail:** For trackage maintained by the Customer the minimum acceptable rail shall be 112# section (5-1/2" base) and shall be compatible with BNSF standard rail section. For locations where trackage will be maintained by BNSF rail and fastenings shall conform to the BNSF standard rail section in use in that area. Contractor shall contact BNSF Engineering for approved section. Transition rails or compromise joints at the BNSF-Customer interface are the responsibility of the customer. Minimum length shall not be less than 39 feet except in turnouts and shall be free from defects. Rail should be minimum full ball relay rail, not exceeding 3/16 inch wear on any surface. Continuous welded rail (CWR) will need to be de-stressed as soon as possible after laying (see "Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR in Industry Tracks" appendix, page A-1 thru A-9). CWR is recommended when using concrete ties. Thermite and flash-butt welds must be placed in crib area between ties. An abrasive rail saw will be used to cut rail—no torch-cutting.

5.9.2 **Anchors:** Rail anchors shall be new or reconditioned, sized to fit the rail section, and shall be provided per industrial track design criteria on pages 3 and 6. High traffic volumes or unusual grade or alignment problems may require additional anchors as determined by BNSF Engineering. Turnouts shall also be anchored.

5.9.3 **Ties:** Hardwood ties shall be new 7" X 8" (AREMA No. 4) or 7" X 9" (No. 5), 8'-6" long, placed on 21.5" centers. Switch ties shall have a minimum cross section of 7" x 9" and minimum lengths shall conform to applicable BNSF Standard plans. Concrete ties shall be pre-stressed, measure 11" wide at the bottom and 9" high with a length of 8' 3" and weight of 630 pounds. Concrete ties can be placed on 28" centers provided there is a minimum ballast section of 8" below the tie. Second-hand, or "3/4" concrete ties can be used after inspection and approval from the BNSF Roadmaster. When placing 3/4 ties, the damaged shoulders should be alternated from left to right sides so that they are not on the same side. Steel ties are spaced at 24" centers with 8" ballast section and can be used with timber or concrete ties. Steel ties should not be used within 200 feet of a signal circuit identified by insulated joints.

5.9.4 **Turnouts (Switches, Frogs & Guardrails):** All parts shall be new or good secondhand, with secondhand parts being free of injurious defects.

5.9.5 **Tie Plates:** Tie plates may be new or secondhand, free of injurious defects and foreign material, conforming to AREMA Specifications, and shall fit rail being used. For rail 110# section and greater, all plates will be double-shouldered.

5.9.6 **Joints:** New or secondhand joints, free of foreign material and without injurious defects, and with 4 or 6 bolt holes, conforming to AREMA requirements, may be furnished to fit rail section for which they are designed. Bolt holes must be drilled with proper equipment. Torch-cutting of bolt holes is not allowed. New or secondhand compromise joints of manufactured type (welded or homemade are not acceptable), free of foreign material and without injurious defects, shall be furnished and used where rail section (weight or design) changes. Rail section by weight shall not be compromised where difference in weight is in excess of 25 lbs. When this becomes necessary, a rail of some weight between the two different rail sections, in excess of 25 lbs., shall be used and the compromise made in two steps. The length of the medium-weight rail should be 39 feet where practical.

5.9.7 **Spikes:** 5/8" x 6" cut track spikes shall be installed. All spikes shall conform to AREMA requirements.

5.9.8 **Track Bolts & Nuts:** Track bolts and nuts shall be installed conforming to AREMA Specifications. Bolts will be correct size and length to fit rail.

5.9.9 **Lock Washers:** One lock washer conforming to AREMA Specifications shall be installed on each track bolt.

5.9.10 **Ballast:** Track ballast shall be Class 2 (1" - 3/8"). Ballast shall be free from loam, dust, and other foreign particles and shall not have less than 75% crushed particles with two or more fractured faces, unless otherwise approved by BNSF. Processed ballast shall be hard, dense, of angular particle structure, providing sharp corners and cubicle fragments and free of deleterious materials. Ballast materials shall provide high resistance to temperature changes, chemical attack, have high electrical resistance, low absorption properties and free of cementing characteristics. Materials shall have sufficient unit weight (measured in pounds per cubic foot) and have a limited amount of flat and elongated particles. Unless it meets or exceeds BNSF requirements, slag is not an approved ballast material. Walkway ballast shall be Class 2 (1" - 3/8").

NOMINAL BALLAST SIZE		PERCENT PASSING (BY WEIGHT)										
SIZE NO.	SQ. OPENING	2 ½"	2"	1 ¾"	1 ½"	1 ¼"	1"	3/4"	1/2"	3/8"	No. 4	
Class 2	1" – 3/8"				100		90-100	40-75	15-35	0-15	0-5	

5.9.11 **Bumping Post:** An earthen berm (see appendix, page A-15) or suitable bumping post, approved by the Railroad, shall be installed at the ends of tracks. Also, a red retro-reflective marker shall be placed at the end of track. Cars shall not be parked or spotted closer than 25 feet to the end of the track.

5.9.12 **Derails:** A derail shall be placed on all tracks connecting with a main line, siding, or industrial lead. Derails protecting mainline tracks and controlled sidings shall be double switch point (see appendix, page A-34) and installed so that the derailed car is directed away from BNSF trackage. A power derail is required when the mainline turnout is powered, and BNSF will install track and signal from the point of switch to the insulated joints just beyond the power derail. Derails protecting mainline tracks shall be placed a minimum of 100 feet behind the 14' clearance point, and placed on tangent track where possible. Derails protecting other-than-mainline tracks shall be placed a minimum of 50 feet behind the 14' clearance point, and placed on tangent track where possible. The type of derail and actual location may be determined by BNSF Operating Department requirements. A "Derail" sign

needs to be placed next to the derail. Timber ties are recommended within 50 feet of a derail.

A second derail may be required where BNSF locomotives are parked during unit train loading operations. BNSF's Operating department will determine the necessity and type. If required, placement will be 275 feet from first derail. A “Derail” sign needs to be placed next to the derail.

5.9.13 **Highway Crossings:** All crossings shall be approved by BNSF Engineering and local governments as to type and design, in advance of placing order. Effect on sight distance of crossings must be considered when planning construction of trackage in vicinity of public grade crossings not equipped with automatic signals.

5.9.14 **Under Track Hoppers or Pits:** Plans shall be approved by BNSF Engineering or authorized representative. Specifications for unloading pits are covered in the "AREMA Manual for Railway Engineering," (Chapter 15, Section 8.4). Gratings covering open pits must be bolted in place.

5.10 Track Construction

5.10.1 **General:** All work shall be of good quality in materials, equipment and workmanship and shall conform in every respect with the specifications and instructions.

5.10.2 **Ties:** Ties will be unloaded and handled in such a manner as not to damage ties, using approved handling equipment. Ties to be placed at design spacing of 21.5-inch center to center (22 ties/39 feet) for wood, and 28-inch centers for concrete, on the finished subgrade, perpendicular to center line of track with the right hand ends of ties being parallel. Exception: On curves, align the ties to the inside of the curve. All joints are to be suspended between ties. Top surface of ties shall be clean and smooth to provide full bearing for tie plates. Lay wood ties with heartwood face down, and if not possible to determine position of the heartwood, lay the widest surface of the tie down. If spikes are pulled from any tie, hole shall be filled by driving in a treated wood tie plug the full depth of the hole. Boring or adzing of ties shall be kept to a minimum.

5.10.3 **Tie Plates:** Double-shouldered tie plates will be used on all ties and set in position with cant surface sloping inward, making sure they are firmly seated and have full bearing. After rails are in place, shoulder of plates shall be in full contact with outside edge of rail base.

5.10.4 **Rails:** Assemble joints before fastening rails to ties, using joint bars with full number of track bolts and spring washer for each bolt, first removing loose mill scale and rust from contact surfaces or joint bars and rails. In laying secondhand rail, care must be taken to rail end mismatch at the joints. Under no circumstances must rail be struck in web with tool or any metal object. The right-hand rail facing in direction of increasing construction shall be spiked to ties, and the opposite rail shall be brought to gage of 4' 8-1/2", measured at right angles between the rails, in a place 5/8" below top of rail. A track gauge manufactured for the purpose of measuring gage should be used rather than a tape measure. Gage is to be checked at every third tie. Do not strike rail directly with a maul, either on top when driving spikes, or on side to obtain track gage. Rail shall be laid with staggered joints. Joints shall be located as nearly as possible to the middle of the opposite rails with the following variation: (a) except through turnouts, the staggering of the joints on one side shall not vary more than 6' in either direction from the center of the opposite rail.

Continuous welded rail (CWR) will need to be de-stressed as soon as possible after laying (see “Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR in

Industry Tracks" appendix, pages A-1 thru A-9). The completed "Record of Neutral Temperature of Welded Rail as Laid" form will be completed and presented to the BNSF Engineering representative at time of final track inspection.

5.10.5 **Joints:** If necessary to force joint bar into position, strike lower edge of bar lightly with 4-lb. maul. Do not drive bolts in place. Tighten bolts in sequence, beginning at joint center and working out to ends. Bolts are to be tightened to a range of 20,000 to 30,000 ft.-lbs. tension. If a bolt tightening machine is not used, a standard track wrench with a 42" long handle may be used. At the time of installation, rail expansion shims of softwood not over 1" width shall be placed between the ends of adjacent rails to insure proper space allowance for expansion required by the rail temperatures in the following table, and shall be left in place:

39-ft Rail

Temperature Deg. F	**Expansion**
Over 85	None
66 to 85	1/16
46 to 65	1/8
26 to 45	3/16
6 to 25	1/4
Below 6	5/16

5.10.6 **Bending Stock Rails:** Use approved rail bending equipment. Make bends uniform and accurate for all stock rails.

5.10.7 **Spiking to Wood Ties:** Rails shall be spiked to every tie, using not less than 2 spikes for each rail at each tie. Drive spikes through tie plate holes into ties, located diagonally opposite each other but not less than 2" from edge of tie. Start and drive spikes vertically and square with rail. Take care to avoid slanting, bending, or causing sideways movement of spike. Each rail will be spiked with two spikes per tie plate on tangent track staggered with inside spikes to the east or north and outside spikes to the west or south. On curves a third spike is required on the gage side of the rail. Spikes should not be placed in the slots on skirted joint bars when such practice can be avoided by providing other plates with a hole pattern that will clear the skirts. When spikes are driven by machine, work shall be closely supervised to see that they are driven with hammer centered exactly over each spike head and drive spike vertically. Set stop bolt on the machine to prevent over-driving. Withdraw spikes that are incorrectly driven and fill hole by driving a tie plug to full depth of hole. Locate replacement spike at another hole in tie plate and tie.

5.10.8 **Ballast and Surfacing:** Raise track by means of jacks placed close enough together to prevent excessive bending of rails or strain on joint. Lift both rails simultaneously and as uniformly as possible. Power jack may also be used. Each track raise shall not exceed 4" with ties tamped prior to additional raise.

5.10.9 **Unloading and Tamping Ballast:** Unload and level down ballast by most practical means, taking care not to disturb grade stakes. Perform tamping, using power tamping machines wherever possible, or manually, using approved AREMA tamping tools appropriate for type of ballast being placed. Tamp each layer of ballast from a line 15" inside each rail, on both sides of and to the ends of ties. Center area between these limits shall be filled lightly with ballast but not tamped. At turnouts and crossovers, tamp ballast uniformly for full length of ties. Tamping shall proceed simultaneously at both ends of same tie, making sure ballast is forced directly under the ties and against sides and ends of ties.

5.10.10 **Finishing and Dressing:** Dress ballast in conformance with dimensions shown on drawings, placing additional ballast material as necessary. When placing pavement up to the track and flush with top of rail it is important to make sure water drains away from the track. This will prevent pooling and freezing which create hazardous walking conditions. Lines should be painted 10 feet parallel to the centerline of track on both sides to serve as visual reminder of the track's foul zone. Crushed rock or fabric should be placed over the ties to keep the pavement from adhering to them. Flange ways need to be kept clean to allow wheels to contact top of rail at all times.

5.10.11 **Final Inspection:** After ballasting and surfacing are completed, inspect track to see that joints are tight and rail attachments to ties are secure. Customer will notify the BNSF Engineering Representative that the track work is complete and ready for inspection. The BNSF Engineering Representative will inspect the finished track work and complete the Project Closeout Checklist (not included in this document). Civil and Track items to be inspected are included in a list in the next section. The Contractor will provide a copy of the "Record of Neutral Temp of Welded Rail as Laid" form to the BNSF Engineering Representative prior to or during inspection. After the BNSF Engineering Representative's approval, the track will be placed in service by the Division's General Manager and can then accept rail cars. Rail cars delivered to site before the track is in service will be stored at another location at an additional cost to the customer, or returned to origination point.

5.11 Miscellaneous

5.11.1 **Fencing and Gates:** Gates and fences must be grounded in accordance with National Electric Safety Code requirements to prevent an injury resulting from an electrical charge. Gates crossing tracks must have the ability to lock in the open position during train operations. If a fence parallel to a track has an angled piece at the top with security wire it must not foul the clearance envelope of the track.

6. Acceptance

CIVIL
All slopes meet design plans
Drainage ditches drain properly
All access roads and Inspection Paths completed
All drainage devices (Culverts, Catch Basins, etc.) Installed as per the plans
All abandoned culverts properly sealed, filled, and communicated to Structures and RIS
Gates/fences installed per plans and are appropriately locked
Paving and grading for disturbed crossings completed per plan
Grade crossing roadway markings established per crossing agreement
Temporary road crossings removed and proper drainage established
Temporary traffic controls removed
All structures placed according to the design plans
All clearances meet the design plans
Full and proper seeding completed

TRACK
All rail joints identified as part of the project scope are welded
Record of target neutral temperature recorded for CWR as laid
Destressing completed
Site cleaned and scrap rail and ties stockpiled
Track surfaced to design plans
Placed ballast meets design standards
Switch stands dressed properly with walkway ballast
All turnouts installed as per the plans
Targets installed and properly oriented
Derails installed in proper locations and positions with appropriate locks
Insulated Joints installed per plan (with 10ft ties and correct plates installed)
All retired insulated joints identified by project scope have been removed (OS, Intermediates, and Turnouts)
All crossings installed according to plans
Crossing approaches paved/graded to provide a smooth transition (if performed by track)
All signage has been installed per plan (Track, road crossings, etc.)
All track work completed to plan

7. Requirements for Working on BNSF Right of Way

In order to protect BNSF's investment in its right-of-way and for the safety of persons coming onto BNSF property, BNSF has established certain requirements. The following constitute minimum requirements for Contractors, Consultants and Surveyors coming on or near BNSF right-of-way. Contractors are encouraged to develop their own safety rules that meet or exceed the following requirements. A web site has been set up to assist in preparation of a safety plan http://www.bnsfcontractor.com/ (or contractororientation.com). Registering on the web site and completing the course is a requirement prior to occupying or working on BNSF right-of-way.

The orientation does not relieve the contractor from the need to secure appropriate flagging protection when working close to BNSF tracks. Flaggers are required whenever there is a potential for men, structures, materials or equipment to enter within 25' of BNSF tracks. See the list below for additional guidance. If in doubt, take the safe course and request a flagger.

It shall be noted that these requirements are complementary to the contractor's right of entry agreement to be executed by the contractor prior to starting work on BNSF right-of-way and is not intended to waive any terms within the right of entry agreement. The permission to work and enter the BNSF right-of-way can be taken away at any time if BNSF deems the contractor's behavior not meeting or exceeding the safety vision of how BNSF intends to have work performed on its right-of-way.

7.1 All permits and agreements must be in effect, required payments made, and insurance certificates received and approved prior to Contractor entering BNSF right-of-way. All of these documents are included in the packet containing the cost proposal. Prior to performing the preliminary survey, the consultant/surveyor will obtain a "Temporary Occupancy Permit". To obtain a permit contact Jones, Lang, LaSalle (JLL), phone number 1-866-498-6647, or follow the relevant instructions online (http://www.bnsf.com/communities/faqs/permits-real-estate/). The permit requires a preparation fee and some lead time. Copies of all documents should be kept on the job site.

7.2 Flagging requests shall be made at least 30 days prior to the start of flagging.

7.3 Flagging requests cancelled less than 2 days in advance may still be charged to the customer.

7.4 Any de-watering utilizing drains or ditches on BNSF property must be approved by BNSF Engineering.

7.5 Contractor must have BNSF-approved "Final Construction Plans" prior to commencing work on a project, or will be proceeding work at their own risk. No change will be made to "Final Construction Plans" without approval by all parties involved. Approved revised plan will be furnished to all parties prior to implementation of changes.

7.6 Road Authority or Contractor will be responsible for all costs for track work, including flagging, etc., made necessary due to their construction operation.

7.7 Pursuant to BNSF safety rules, flagging protection is always required when equipment crosses or is working within 25 feet of center of any track. When deemed necessary by BNSF, a flagman may be required at all times while working on BNSF right-of-way.

7.8 Crossing of any railroad tracks must be done at approved locations and must be over full depth timbers, rubber, etc. Any equipment with steel wheels, lugs, or tracks must not cross steel rails without aid of rubber tires or other approved protection and proper flagging will be required.

7.9 All temporary construction crossings must be covered by a "Private Roadway & Crossing Agreement," and must be barricaded when not in use.

7.10 Contractor must furnish details on how work will be performed that may affect existing drainage and/or possible fouling of track ballast as well as removal of overhead bridges/structures. (Structures and bridge spans over tracks must be removed intact.)

7.11 Absolutely no piling of construction materials or any other material, including dirt, sand, etc., within 25 feet of any track or on property of BNSF not covered by construction easement, permit, lease or agreement.

7.12 Storage of materials, temporary structures, equipment and etc. shall not be within 250 feet of a public grade crossing. If material haul routes involve crossing a BNSF crossing or traversing a considerable distance parallel to a BNSF track, a trucking coordinator provided by the contractor will be required. Contractors shall supply a radio for communications between the railroad flagger and the roadway flagger/coordinator to ensure activities such as dumping/unloading/other activities that can foul the main will stop until the train has completely passed.

7.13 A 10-foot clear area on both sides of a main track must remain unobstructed at all times to allow for stopped train inspection.

7.14 No construction will be allowed within 25 feet of center of any track unless authorized by BNSF and as shown on Final Plan approved by the Railroad. This includes any excavation, slope encroachment and driving of sheet piles.

7.15 No vehicles or machines should remain unattended within 25 feet of any track. All machines will be disabled with as much potential energy released as practicable, and locked out when not in use to prevent unauthorized operation. (e.g. A mobile crane that has to be left on the BNSF right-of-way will have to be boomed down, with outriggers disengaged.)

7.16 IMPORTANT: Non-compliance to any of these items and requirements within the right-of-entry agreement could result in the job being shut down. The contractor/consultant/surveyor will then be prohibited from working on BNSF right-of-way while the infraction is investigated. Based on findings of the investigation, BNSF will determine whether the non-compliant entity/entities will be allowed to continue its work on BNSF rights-of-way in the future.

7.17 Contractor safety rules, including rules regarding Personal Safety Equipment, must not conflict with BNSF safety policies. Contractor's personnel will complete BNSF's safety orientation prior to entering BNSF property. A job safety briefing will be held prior to beginning work each day and any time work conditions change. All personnel will wear proper personal protective equipment (PPE) while on BNSF property. Any person working on BNSF property may be subjected to a safety audit by BNSF personnel, and is required to comply with the audit. The results of the audit will be presented to the contractor's supervisor immediately upon completion. Any questions regarding safety should be directed to the BNSF project representative.

Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR as Required by CFR 213.118

February 22, 2016

Materials contained within this documents are excerpts from BNSF's Engineering Instructions, and the EI chapter numbers and references are retained. Sections unrelated to construction of industry tracks have been removed.

This document details the Railroad's policy on installing, adjusting, maintaining, and inspecting Continuous Welded Rail (CWR) track. Each chapter details how the Railroad applies its standards and procedures to comply with FRA standards. The procedures listed in this document apply to CWR on all main tracks, sidings, and other tracks over which trains operate at speeds above Class 1.

Table of Contents

Chapter 1 CWR Installation Procedures

Rail length that exceeds 400 feet is considered CWR. Rail installed as CWR remains CWR, regardless of whether a joint or plug is installed into the rail at a later time. Temperature variations affect rail length. Rail expands (lengthens) when heated and contracts (shortens) when cooled.

1.1 Neutral Temperature

The neutral temperature is the temperature at which a rail is neither in tension nor compression. Target neutral temperatures have been established to provide a specific desired neutral temperature to prevent track buckling. When laying or adjusting CWR use Figure 6-1, *Target Rail Laying Temperatures*.

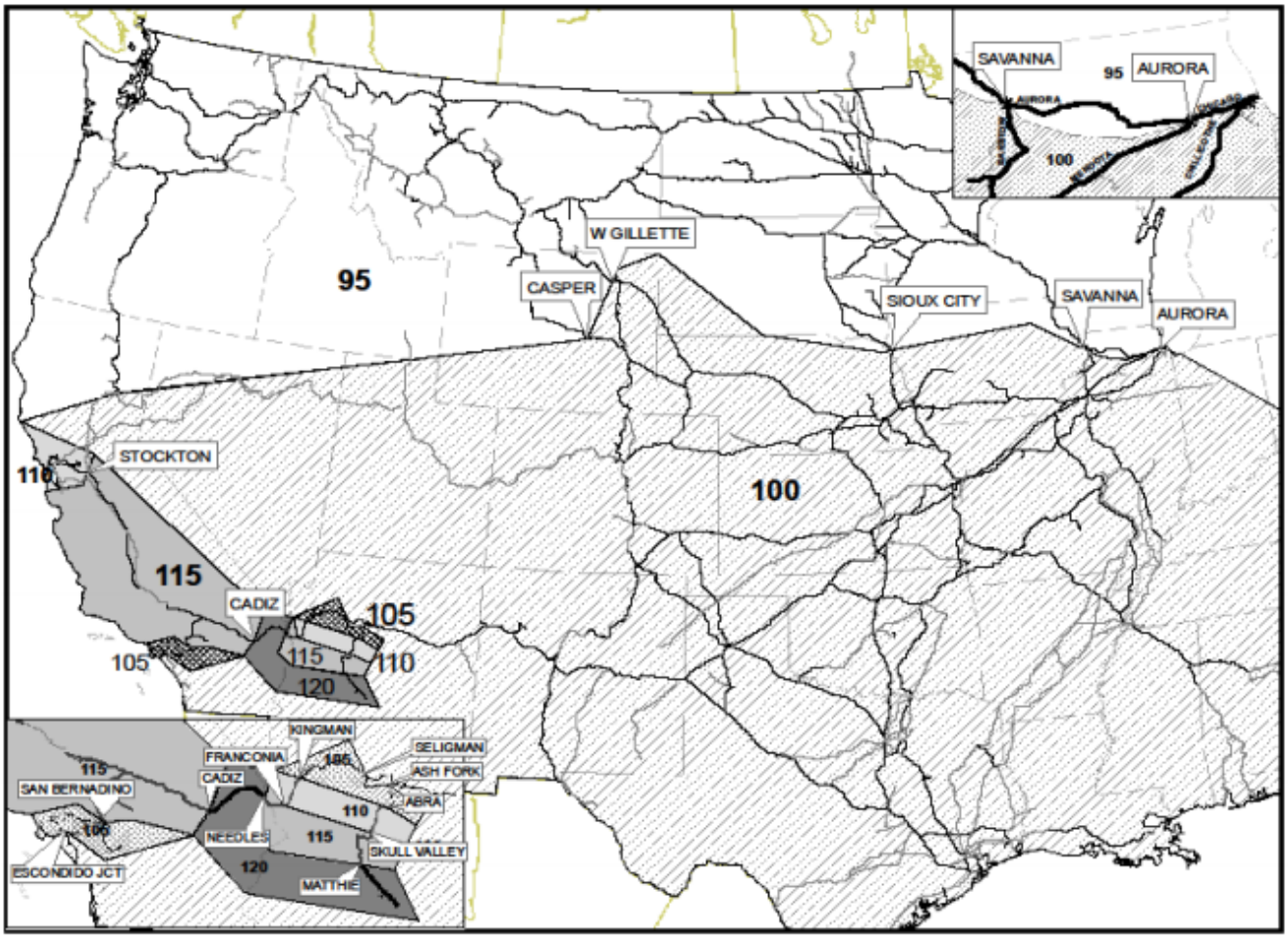


Figure 6-1. Target Rail Laying Temperatures

1.2 Temperature Differential

The difference between the target neutral temperature and the actual rail temperature taken at the time of installation is called the temperature differential. CWR laying and adjusting procedures have been established to compensate for this temperature difference.

1.3 Installing CWR

Follow these general requirements when laying CWR:

- Refer to Figure 6-1 for the target rail laying temperature for your area.
- Take the rail temperature and calculate the expansion required before making adjustments.
- Record the rail laying temperature, location, and date on approved forms. These records may be retained in an electronic format per FRA 213.241.
- Rail does not need to be adjusted when the actual rail temperature exceeds the target neutral temperature.
- Use rail heaters or rail expanders to adjust the rail to the correct length when the actual rail temperature is less than the target neutral temperature. Heat the rail evenly and uniformly so that the rail expansion occurs evenly and uniformly throughout its length. If rail is laid at a rail temperature cooler than 40 F degrees below the target neutral temperature, it must be adjusted or protected with a 40 mph restriction. When tight rail conditions exist excess rail must be adjusted using Figure 6-4 as a guide.

Chapter 2 Rail Anchoring Requirements

Where the anchoring function is otherwise provided by Pandrol clips or concrete ties, rail anchors may be omitted. Anchors should not be applied where they will interfere with signal or other track appliances, where they are inaccessible for adjustment or inspection, or on rail opposite a joint. Anchor pattern may be varied as reasonable to avoid placing anchors against deteriorated ties.

Installation

The following anchoring requirements apply to CWR installations on all main tracks, sidings, and other tracks over which trains operate at speeds above Class 1.

2.1 Standard Box Pattern

When installing CWR, box anchor every other tie except as outlined in Section 2.2 of these CWR Procedures.

2.2 Solid Box Pattern

When installing CWR, box anchor every sound (effective) tie at specific locations listed below to provide additional restraint against rail movement.

Condition	Action
Turnouts*, Crossing Frogs, Joints, Open-Deck Bridges, and where CWR abuts bolted	Anchor every tie for 195 feet in each direction
Bolted joint created during CWR installation/construction when using heater, rail expander, or at or above Target Neutral Temperature	**Within 60 days from date of creation:** Weld joint, **OR** Install joint with 6 bolts**, OR** Anchor every tie for 195' in both directions

*For turnouts connected to Class 1 yard or back tracks, it is only necessary to anchor every tie to the first transition rails/joints of the diverging route.

2.3 Bridge Pattern

When installing CWR, follow these bridge anchoring requirements:

1. Ballast deck bridges should be anchored with the same pattern as in section 2.1 and 2.2 of these CWR Procedures.
2. Open-deck bridges should be anchored according to Engineering Instruction 6.4.5:
   - On open-deck timber bridges, apply anchors to all ties fastened to the stringers.
   - On open-deck steel bridges 150 feet long or less, apply anchors to all ties fastened to the steel structure.
   - On all other structures, apply anchors as directed by the Director Bridge Engineering

Maintenance or Rail Repair

2.4 Legacy Patterns

On CWR installations completed before September 21, 1998, existing anchoring may remain if rail is restrained to prevent track buckles. Rail must be adjusted (by increasing or decreasing the length of rail or by lining curves) or anchors added to rail, if restraint is not sufficient.

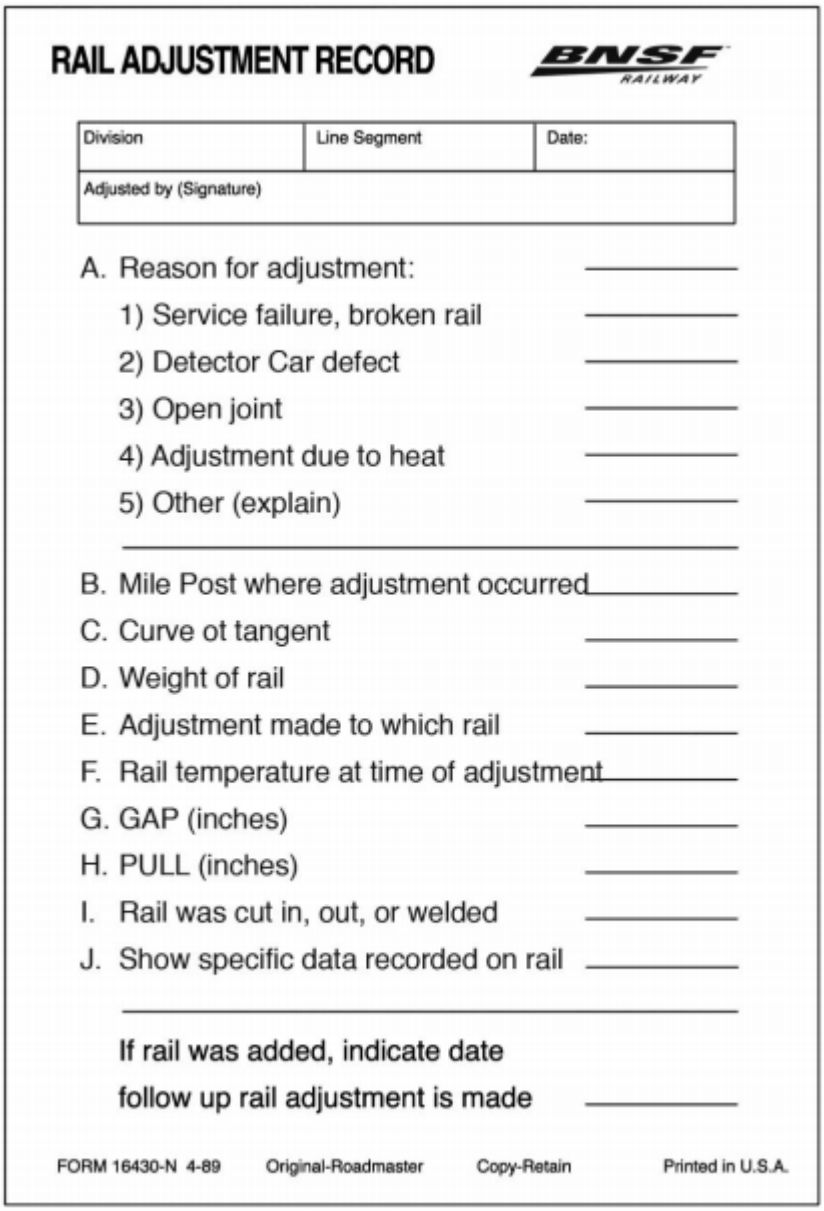
2.5 Anchor Requirements after Rail Repair

When rail repairs result in a joint added to CWR, the anchor pattern shall match the existing pattern in track. At least every other tie will be box anchored for a distance of 195 feet in each direction unless anchoring is otherwise provided. When repairs are made to a stripped joint or failed joint bar, the adjustment or addition of anchors will be as prescribed in the following table.

Condition	Action
Bolted joint in CWR experiencing service failure (stripped joint) or failed bar(s) with gap* present. *gap exists if it cannot be closed by drift pin.	**1.** Weld joint, **OR** **2.** Remediate joint conditions (per Chapter 6.5 CWR) **and** replace bolts (new, in-kind or stronger), **and** weld joint within 30 days, **OR** **3.** Replace failed bar(s), install 2 additional bolts **and** adjust anchors **OR** **4.** Replace bars, bolts (if failed or missing) **and** anchor every tie for 195' in both directions **OR** **5.** Add rail (with provisions for adjusting later, if necessary)

Chapter 3 Preventive Maintenance on Existing CWR Track

Performing track buckling preventive maintenance can reduce the risk of buckles. When tight rail conditions exist excess rail must be adjusted using Figure 6-4 as a guide.



RAIL ADJUSTMENT RECORD BNSF RAILWAY

Division	Line Segment	Date:
Adjusted by (Signature)		

A. Reason for adjustment: _____
1) Service failure, broken rail _____
2) Detector Car defect _____
3) Open joint _____
4) Adjustment due to heat _____
5) Other (explain) _____

B. Mile Post where adjustment occurred _____
C. Curve ot tangent _____
D. Weight of rail _____
E. Adjustment made to which rail _____
F. Rail temperature at time of adjustment _____
G. GAP (inches) _____
H. PULL (inches) _____
I. Rail was cut in, out, or welded _____
J. Show specific data recorded on rail _____

If rail was added, indicate date
follow up rail adjustment is made _____

FORM 16430-N 4-89 Original-Roadmaster Copy-Retain Printed in U.S.A.

Figure 6-4. Rail Adjustment Record

3.1 Maintaining Desired Rail Installation Temperature Range

A record of rail neutral temperature will be maintained where rail has pulled apart, broken, or been cut for defect removal. Record the length of the rail-end gap and rail temperature in addition to the other required information on the Rail Adjustment Record, figure 6-4.

Rail that has pulled apart, broken, or has been cut for defect removal must be readjusted into a safe zone defined as the Target Neutral Temperature minus 20 F degrees or higher for that location.

If the rail has not been readjusted prior to the rail temperature exceeding the values in the TABLE below, a speed restriction not to exceed 25 mph will be placed. A speed restriction of 40 mph can be placed in lieu of the 25 mph but the track must be inspected daily during the heat of the day.
As you can see from the table below, if the rail temperature at the time of break or pull-apart exceeded 60°F, no slow order is necessary.

Rail Temperature Recorded at Time of Break or Pull-Apart (°F)	Readjust or Place Slow Order Before Rail Temperature Reaches (°F)
60	135
50	130
40	125
30	120
20	115
10	110
0	105
-10	100
-20	95
-30	90
-40	85

Effective January 1, 2010, locations where the neutral temperature has been lowered below the safe zone by adding rail must be adjusted to TNT-20 F degrees or higher within 365 days of the date of the addition (broken rail/pull apart).

When rail is added for any reason, measure and record the Gap, Pull, and Rail Temperature at the time of repair. Where rail has been added to re-establish the TNT this requirement need not apply. This measurement will be made by the use of match marks.

- Prior to cutting rail, make match marks outside of the rail section to be repaired or removed. Match marks should be made:
  - On the field side of the rail using a ball-point paint marker
  - At least 4 feet from any planned cuts or drilled holes in the rail
  - A whole number of feet apart
- Write the match mark measurement on the web of the rail next to both of the match marks. The markings should not be between the match marks.
- If there is a gap due to broken rail or a pulled-apart joint, consider the gap when making match marks.
- Install the rail.
- Record and document the information on the rail.
- Take Gap, Pull, and Rail Temperature at each repair.

When welding rail ends together, the required weld gap or rail consumption must be taken into consideration when determining the amount of rail adjustment.

3.2 De-Stressing Rail

Rail can be de-stressed by cutting rail out or by re-aligning a curve. When cutting rail out, use this procedure:

1. Cut rail to be de-stressed.
2. Remove or reposition anchors or clips for a minimum of 200 feet in both directions from the cut or up to a restriction that prevents rail movement.
3. Wait until the rails stop moving. The rail ends may need to be trimmed more than one time to allow for expansion.
4. Make match marks on either side of the cut after the unrestrained rail is relaxed.
5. Take the rail temperature (far enough away from the cut so that the reading is not affected by the cutting procedure).
6. Use Figure 6-1 in Engineering Instruction 6.2.3 A to compare the rail temperature with the target neutral temperature for the territory. This is known as the temperature differential.
7. If the actual rail temperature is lower than the target neutral temperature for the territory, use Table 6-3, *Change in Length of Welded Rail to Change Neutral Temperature*, located in Engineering Instruction 6.2.3 B, to determine the rail length to be removed based on the total distance the anchors or clips have been removed.
8. If the rail temperature is at or above the Target Neutral Temperature, no additional adjustments are needed. When destressing rail near fixed objects, de-stress each rail to a temperature that is 10 degrees higher than the TNT.
9. Weld the joint or apply joint bars.
10. Replace the rail anchors or clips.
11. Document match marks, employee name, date work performed, rail temperature at time of adjustment, amount of rail added or removed (PULL) per Table 6-3 on Page 9, and feet of rail adjusted.

Chapter 9 Recordkeeping

9.1 Report of CWR Installations

Rail temperature, location, and date of CWR installations must be recorded on the prescribed form ,"Record of Neutral Temperature of Welded Rail as Laid", can be found as Figure 6-2 in the appendix of this document.

9.2 Report Maintenance Work in CWR

Because track maintenance can disturb the lateral and longitudinal resistance of the track, records of the following must be kept until corrections or adjustments are made:

- Rail that is cut, broken, or added for any reason, including repair of broken or defective rail, pull-aparts, and welding of rail joints.
- A curve that has been staked and inward lateral curve movement exceeds 3". Record offset measurements on BNSF form ENG00018 "Curve Offset Measurements Record." Check them again after the curve has been surfaced. Hand deliver the completed form to the Track Inspector, who, in turn, will copy the Territory Roadmaster so that the curve can be monitored.
- CWR installation or maintenance work that does not conform to these written procedures. A record of rail neutral temperature will be maintained where rail has pulled apart, broken or been cut for defect removal.

Record of Neutral Temperature of Welded Rail as Laid

Division _____ Subdivn _____ Line Segment _____

Relay Between _____ and _____ Recorded by _____

Target Neutral Temperature = ____°F (see figure 6-1.)

Date Rail Laid	Curve No and/or MP Loca	Position		Trk No	Actual Rail Temp.	Temp Diff	Distance to Match mark	Expansion at Matchmark		Length of String	Remarks
		N/W Rail	S/E Rail					Required	Actual		

3-part form to be distributed as follows: White - Division Engineer, Canary - Roadmaster, and Pink - Foreman.

Figure 6-2. Record of Neutral Temperature of Welded Rail as Laid

Table 6-3. Change in Length of Welded Rail to Change Neutral Temperature.

Temp. Diff. (°F)	Length of Unrestrained Rail							
	200'	400'	600'	800'	1,000'	1,200'	1,400'	1,600'
5°	1/8"	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	1/2"
10°	1/8"	1/4"	1/2"	1/2"	3/4"	1"	1"	1-1/4"
15°	1/4"	1/2"	3/4"	1"	1-1/4"	1-1/2"	1-3/4"	1-3/4"
20°	1/4"	1/2"	1"	1-1/4"	1-1/2"	1-3/4"	2-1/4"	2-1/2"
25°	3/8"	3/4"	1-1/4"	1-1/2"	2"	2-1/4"	2-3/4"	3"
30°	1/2"	1"	1-1/2"	1-3/4"	2-1/4"	2-3/4"	3-1/4"	3-3/4"
35°	1/2"	1"	1-3/4"	2-1/4"	2-3/4"	3-1/4"	3-3/4"	4-1/4"
40°	5/8"	1-1/4"	1-3/4"	2-1/2"	3"	3-3/4"	4-1/4"	5"
45°	3/4"	1-1/2"	2"	2-3/4"	3-1/2"	4-1/4"	5"	5-1/2"
50°	3/4"	1-1/2"	2-1/4"	3"	4"	4-3/4"	5-1/2"	6-1/4"
55°	7/8"	1-3/4"	2-1/2"	3-1/2"	4-1/4"	5-1/4"	6"	6-3/4"
60°	7/8"	1-3/4"	2-3/4"	3-3/4"	4-3/4"	5-1/2"	6-1/2"	7-1/2"
65°	1"	2"	3"	4"	5"	6"	7"	8"
70°	1-1/8"	2-1/4"	3-1/4"	4-1/4"	5-1/2"	6-1/2"	7-3/4"	8-3/4"
75°	1-1/8"	2-1/4"	3-1/2"	4-3/4"	5-3/4"	7"	8-1/4"	9-1/4"
80°	1-1/4"	2-1/2"	3-3/4"	5"	6-1/4"	7-1/2"	8-3/4"	10"
85°	1-3/8"	2-3/4"	4"	5-1/4"	6-3/4"	8"	9-1/4"	10-1/2"
90°	1-3/8"	2-3/4"	4-1/4"	5-1/2"	7"	8-1/2"	9-3/4"	11-1/4"
95°	1-1/2"	3"	4-1/2"	6"	7-1/2"	9"	10-1/4"	11-3/4"
100°	1-1/2"	3"	4-3/4"	6-1/4"	7-3/4"	9-1/4"	11"	12-1/2"

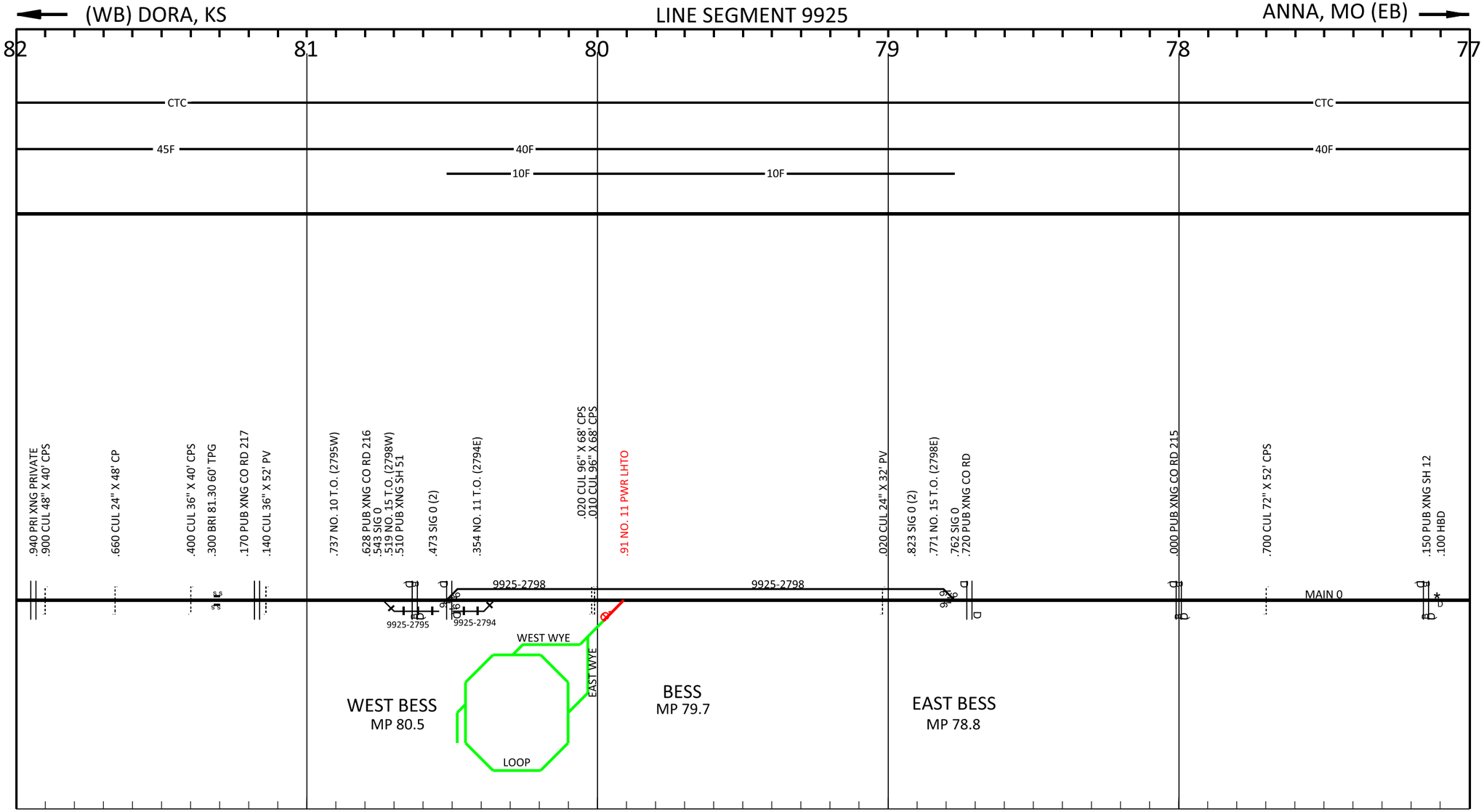
Note: The above amounts do not allow for rail added during thermite welding nor rail removed in upset during flash-butt welding.

LEGEND:
- EXISTING TRACK
- CONSTRUCT - BNSF
- CONSTRUCT - INDUSTRY
- REMOVE
- UPGRADE TRACK
- FOREIGN RAILROAD
- NEW ACCESS ROAD
- POTENTIAL ADDITIONAL ROW
- SOLD ROW
- CTC — REVISED OPERATION
- P79 F50 — REVISED SPEED

CUSTOMER WORK:
INSTALL 2 NO. 11 RHTO
INSTALL 2 NO. 11 LHTO
CONSTRUCT 10,919 TF

BNSF WORK:
INSTALL 1 NO. 11 PWR LHTO
INSTALL 1 PWR DSPD
CONSTRUCT 285 TF

CLEAR LENGTHS:
WEST WYE TRACK - 1,490'
EAST WYE TRACK - 1,197'
LOOP TRACK - 6,002'
BAD ORDER TRACK - 300'



CONCEPTUAL DRAWING ONLY!
THIS LAYOUT HAS NOT BEEN ENGINEERED AND NEEDS TO BE VERIFIED BY FIELD SURVEY

APPROVALS - (NAME - TITLE)	DATE	APPROVALS - (NAME - TITLE)	DATE

DRAWN | CHECKED | BNSF RAILWAY COMPANY - ENGINEERING SERVICES | SF NO. | CSI NO. | STATUS PRELIMINARY

CENTRAL DIVISION
SAMPLE SUBDIVISION
LINE SEGMENT 9925

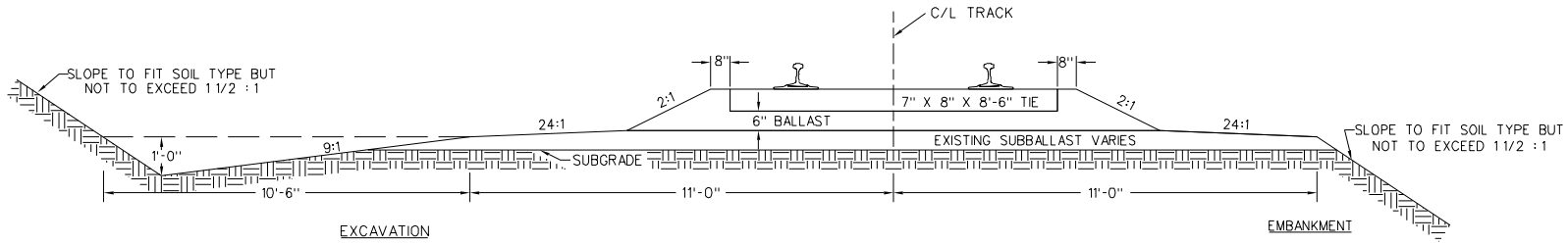
REVISIONS

NO.	DESCRIPTION	DATE	BY

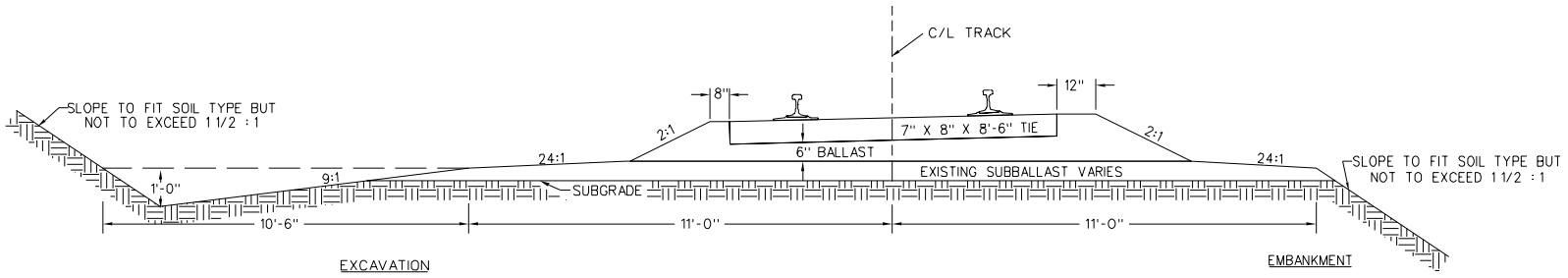
BNSF RAILWAY

NEW AG LOOP FACILITY
BESS, KS

FILE: | SHEET 1 OF 1 | DATE: 4/04/2017



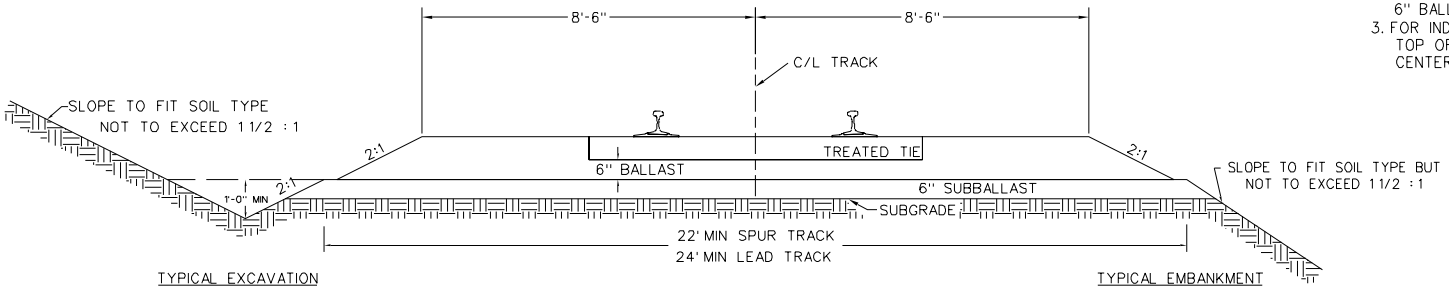
TANGENT TRACK LIGHT TRAFFIC LINES



CURVED TRACK LIGHT TRAFFIC LINES

NOTE:

1. 6" MIN. GRANULAR SUBBALLAST OR AS REQUIRED PER LOCAL SUBGRADE CONDITION.
2. BALLAST PER MILE OF TRACK:
   6" BALLAST 2,435 CU. YARDS TANGENT
3. FOR INDUSTRY TRACK BALLAST SECTION TO BE LEVEL WITH TOP OF TIE WHERE WALKING REQUIRED, 8'-6" MIN FROM CENTER LINE.



SLOPE DITCH LONGITUDINALLY TO DRAIN

INDUSTRY TRACK

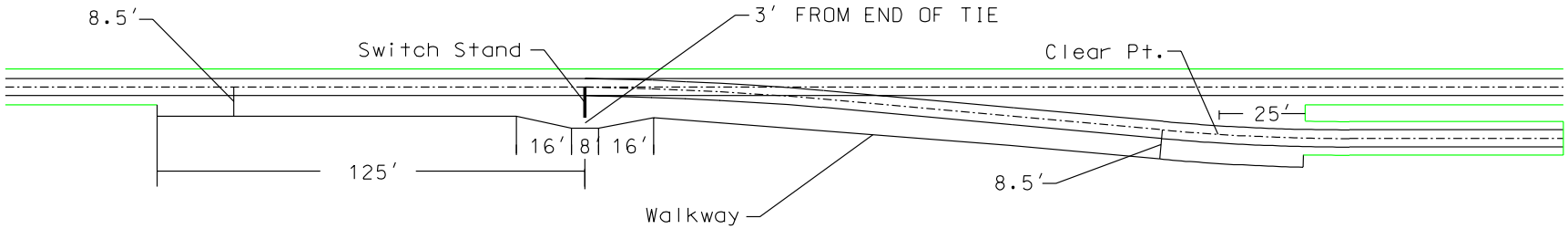
BURLINGTON NORTHERN SANTA FE
STANDARD PLAN
ENGINEERING DEPT., FORT WORTH, TEXAS

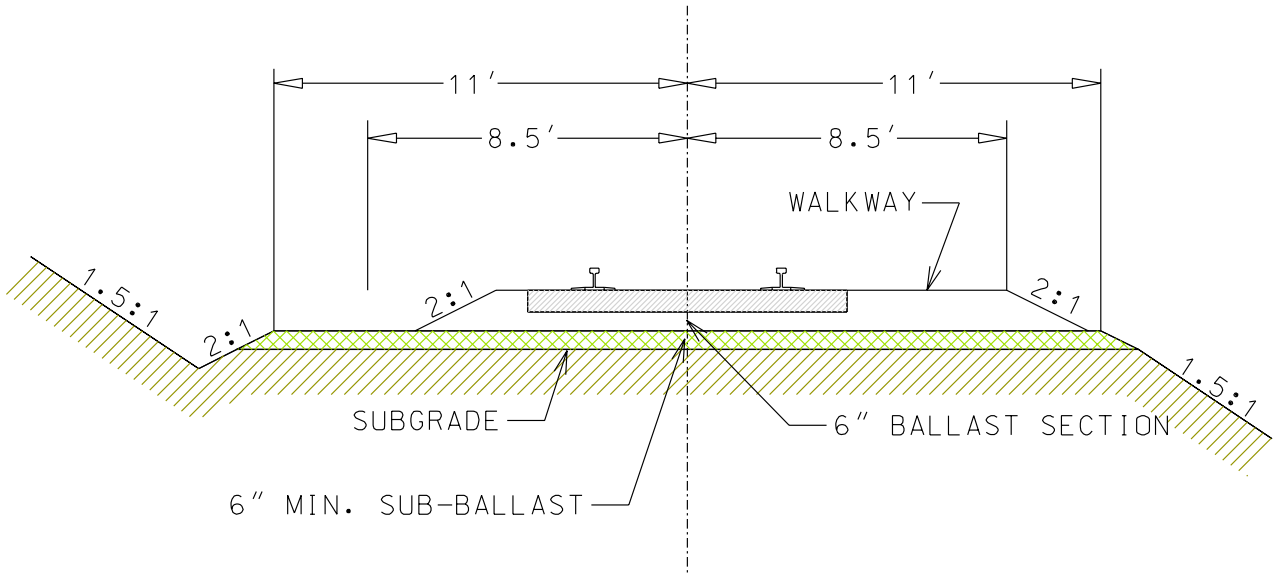
LIGHT TRAFFIC LINES
AND
INDUSTRY TRACK

RAIL:

DATE: 10/29/97 | SCALE: NONE

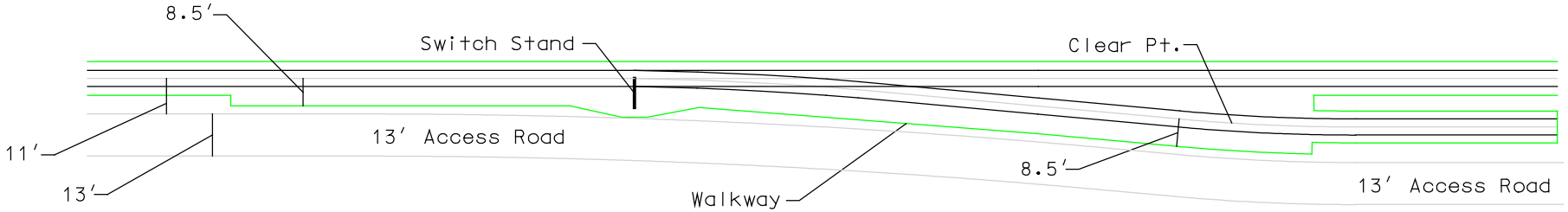
DWG. NO.	SHEET NO.	REV. NO.
1000	03	01

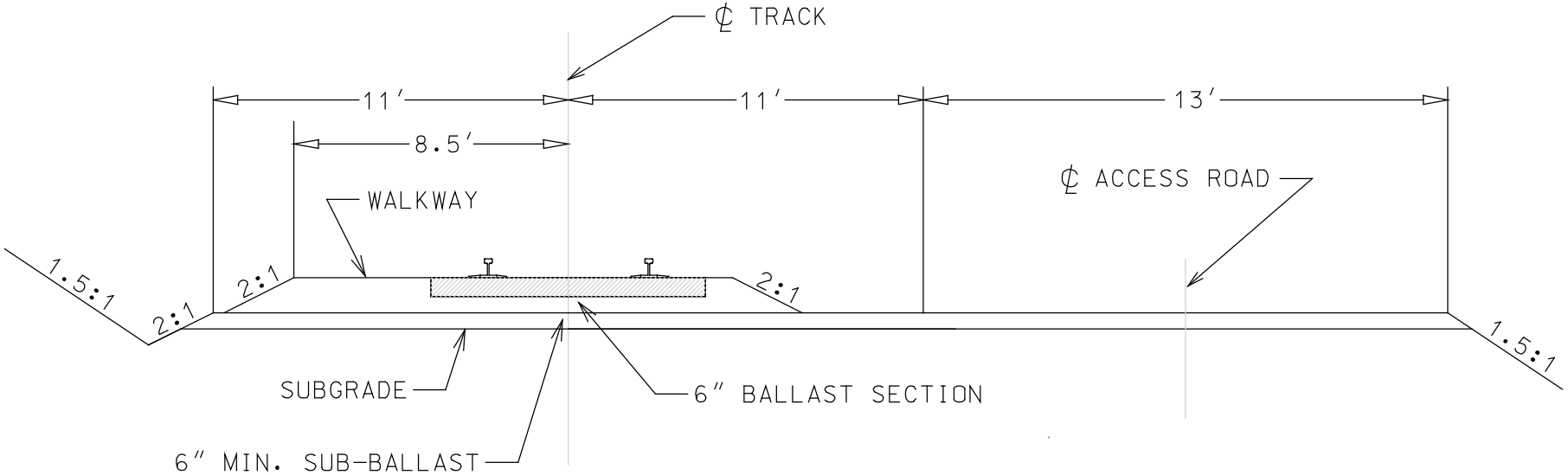




INDUSTRY TRACK STD SECTION WITH 8.5′ WALKWAY

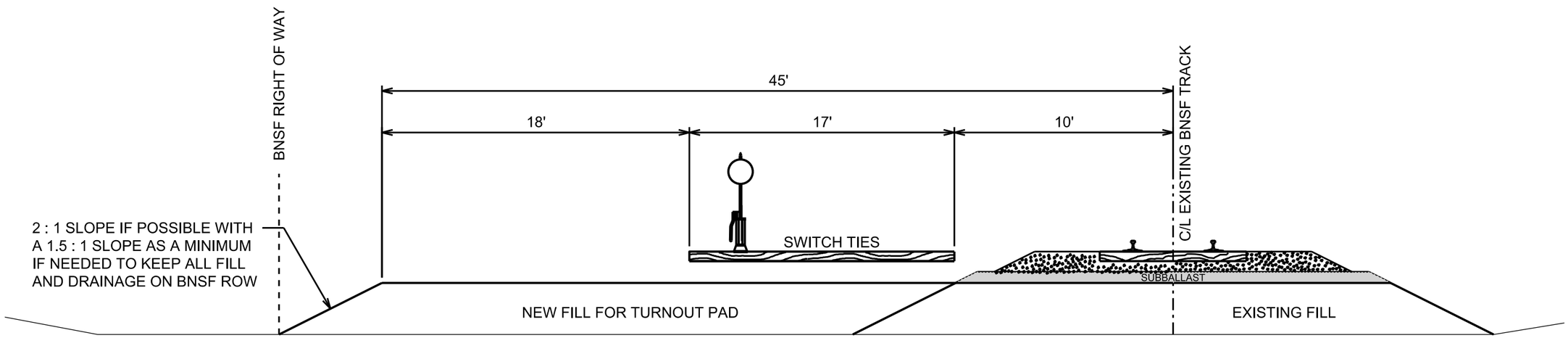
BNSF ENG SVCS – 10/12/01

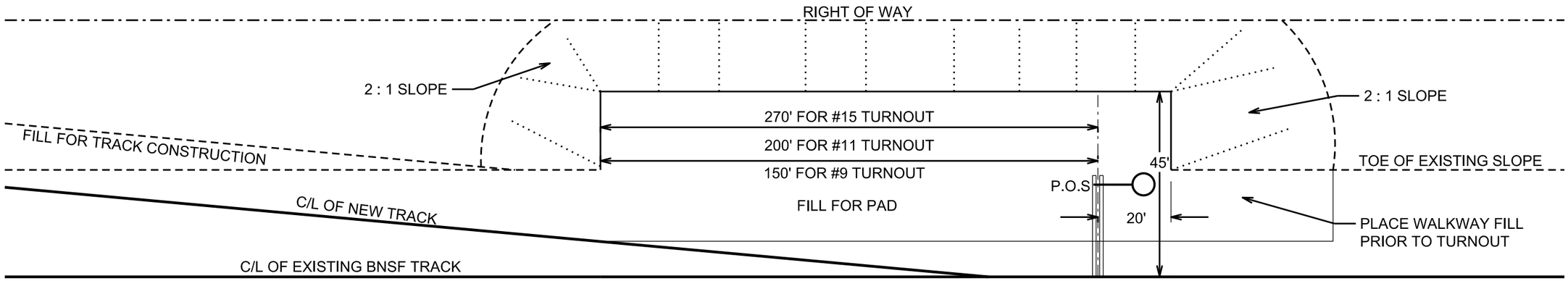




INDUSTRY TRACK STD SECTION WITH 13′ ACCESS ROAD

BNSF ENG SVCS – 04/02/04





NOTE: CONSTRUCTION OF INDUSTRY TURNOUT PAD IS FOR THE PLACEMENT OF THE PROPOSED PACKAGE TURNOUT FOR ASSEMBLY AND INSTALLATION. TURNOUT PAD IS ALSO TO PROVIDE FOUNDATION FOR ANY REQUIRED SIGNAL EQUIPMENT

TURNOUT PAD FILL MATERIAL SHALL BE PLACED BY THE INDUSTRY AS PART OF THE GRADING FOR THE NEW INDUSTRY SPUR. PAD IS TO BE CONSTRUCTED USING STANDARD COMPACTION AND FILL PLACEMENT PROCESSES AS PER THE BNSF INDUSTRY TRACK GUIDELINES. TOP OF PAD IS TO BE 2' BELOW THE EXISTING TOP OF RAIL.

CONTRACTOR SHALL COORDINATE WITH THE ROADMASTER AND ASSOCIATED PROJECT ENGINEER FOR ANY DEVIATION OF FILL AND FOR FLAGMAN PROTECTION.

APPROVALS - (NAME - TITLE)	DATE	APPROVALS - (NAME - TITLE)	DATE

DRAWN	CHECKED		ESTIMATE NO	STATUS
GLE		BNSF RAILWAY COMPANY - ENGINEERING SERVICES		A-14

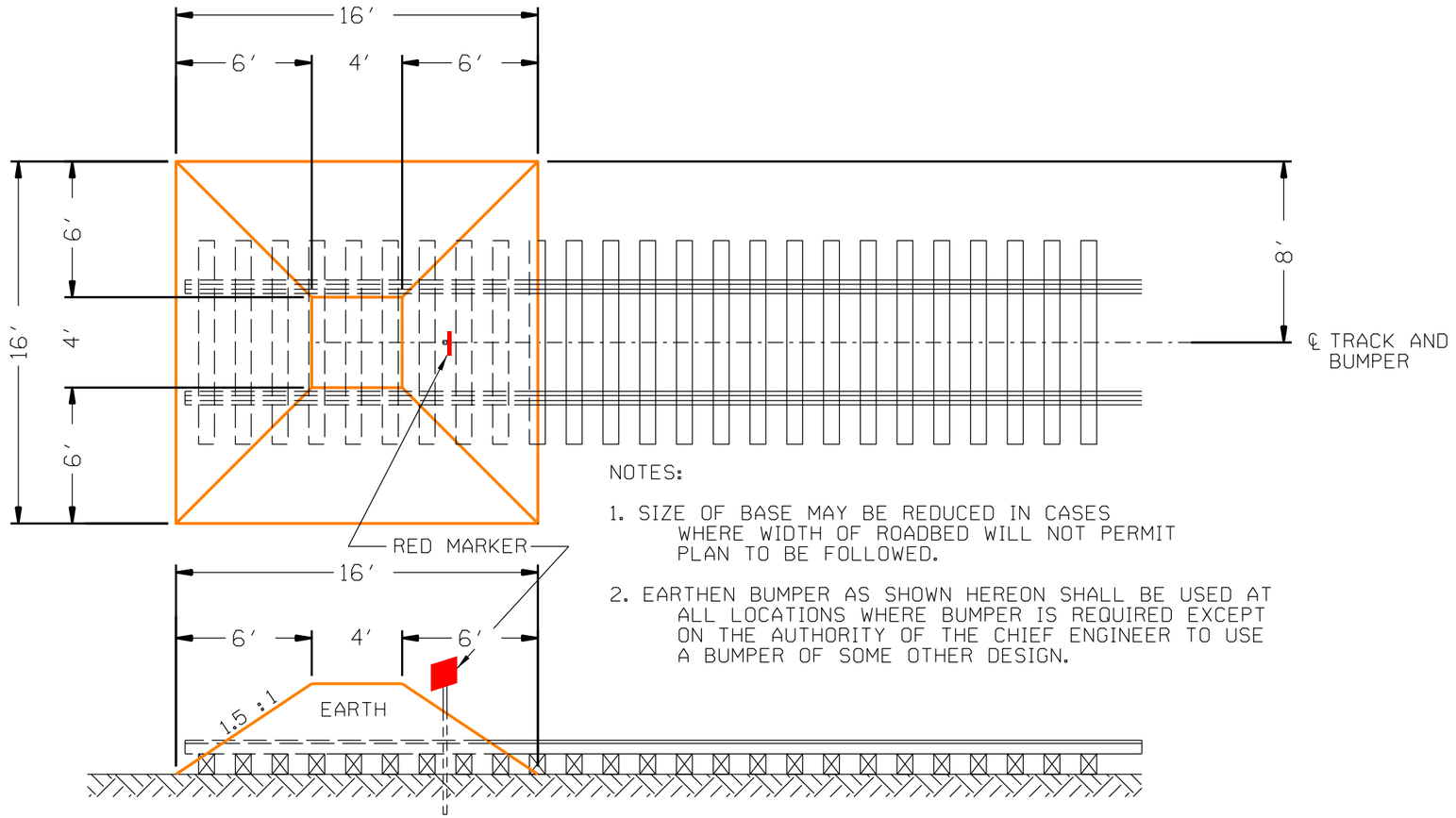
REVISIONS

NO.	DESCRIPTION	DATE	BY
1	Rev'd pad dimensions to match ML Trk Stds	4/4/17	JRG

BNSF RAILWAY

BNSF STANDARD TURNOUT PAD FOR INDUSTRY TRACKS NOT TO SCALE

FILE: turnoutpad.dgn	SHEET 1 OF 1	DATE: 9/23/2005



NOTES:

1. SIZE OF BASE MAY BE REDUCED IN CASES WHERE WIDTH OF ROADBED WILL NOT PERMIT PLAN TO BE FOLLOWED.

2. EARTHEN BUMPER AS SHOWN HEREON SHALL BE USED AT ALL LOCATIONS WHERE BUMPER IS REQUIRED EXCEPT ON THE AUTHORITY OF THE CHIEF ENGINEER TO USE A BUMPER OF SOME OTHER DESIGN.

TYPICAL PLAN & SECTION FOR EARTHEN BUMPER FOR END OF TRACK

SCALE: N.T.S.

APPROVALS - (NAME - TITLE)	DATE	APPROVALS - (NAME - TITLE)	DATE

DRAWN	CHECKED	BNSF RAILWAY COMPANY - ENGINEERING SERVICES	PROJECT SEQ NO	STATUS A-15

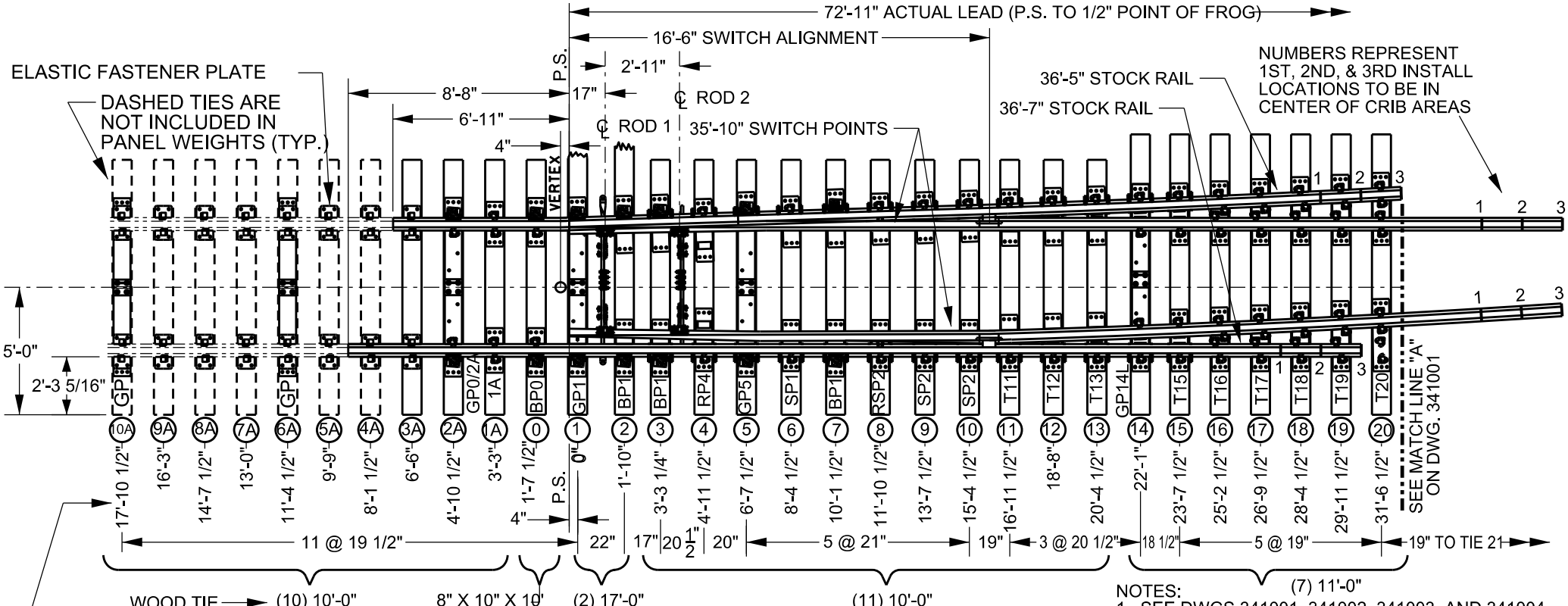
REVISIONS

NO.	DESCRIPTION	DATE	BY

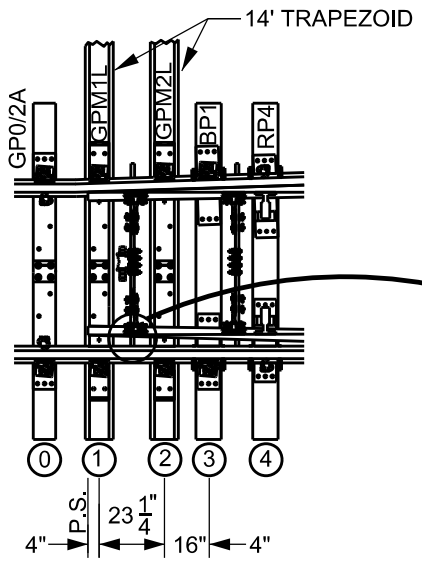
BNSF RAILWAY℠

FILE: earthen bumper.dgn

DATE: 04/05/2017

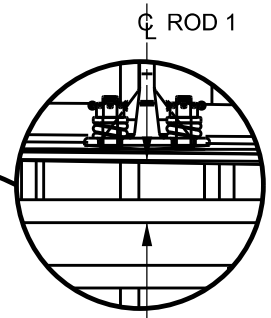


NOTES:
1. SEE DWGS 341001, 341002, 341003, AND 341004 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
3. SEE DWG 341100 FOR TURNOUT GEOMETRY.
4. SEE DWG 341200 FOR TURNOUT BILL OF MATERIAL.
5. FULLY BOX ANCHOR STOCK RAILS, TIES 3-15 FOR SHIPPING OF PANELS ONLY.
6. APPLY 5" SAFE BOND WIRES ONE CRIB AHEAD OF HEEL OF SWITCH ON STOCK AND SWITCH POINT RAILS.



POWER OPERATED
PANEL WEIGHT: 20,000 LBS.

MANUAL OPERATED
PANEL WEIGHT: 20,000 LBS.



THROW DETAIL

	UPRR	BNSF RH	BNSF LH
POWER	N/A	518030061	518030073
MANUAL	N/A	518030074	518030075

BNSF RAILWAY

COMMON STANDARDS

NO. 9 TURNOUT 136 LB PANEL NO. 1

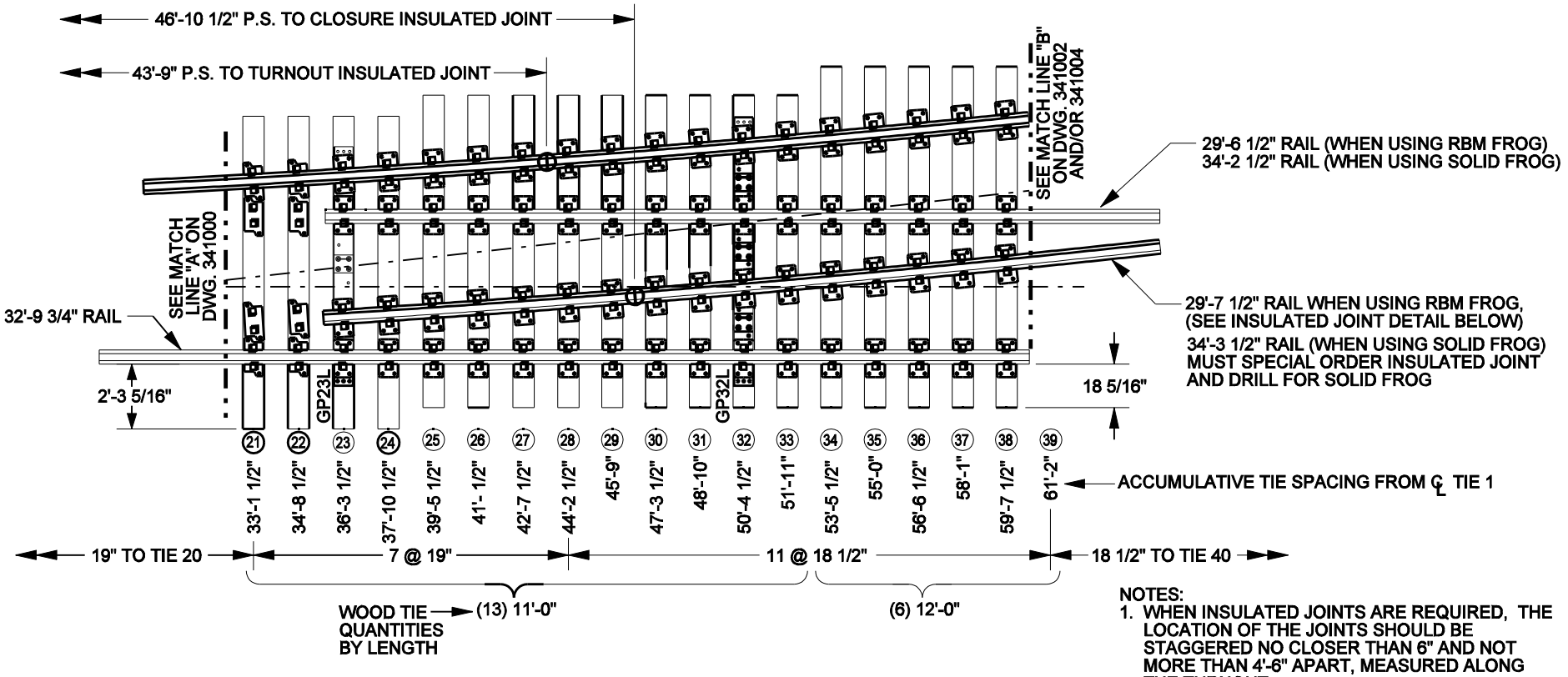
UPRR VP ENGINEERING

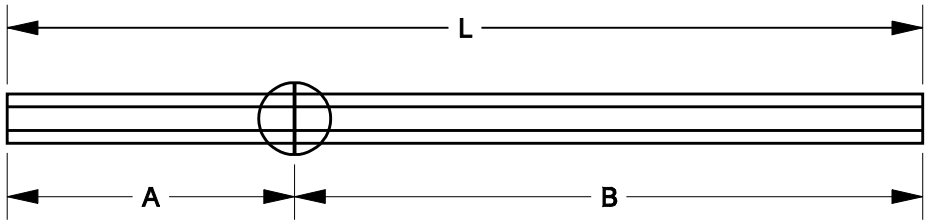
BNSF VP ENGINEERING

FILE OWNER: BNSF | DATE: OCT. 5, 2010

REV. NO.: 4 | DWG NO: 341000

22-1





	A	B	L	BNSF ITEM N0.
TURNOUT INSULATED JOINT RAIL	14'-3 1/4"	17'-0 3/4"	31'-4"	524400027
CLOSURE INSULATED JOINT RAIL	11'-0 1/2"	18'-7"	29'-7 1/2"	524400030

INSULATED JOINT DETAIL
(FOR USE WITH RBM FROG ONLY)

NOTES:
1. WHEN INSULATED JOINTS ARE REQUIRED, THE LOCATION OF THE JOINTS SHOULD BE STAGGERED NO CLOSER THAN 6" AND NOT MORE THAN 4'-6" APART, MEASURED ALONG THE TURNOUT.
2. SEE DWGS 341000, 341002, 341003, AND 341004 FOR THE BALANCE OF LAYOUT PLANS.
3. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
4. SEE DWG 341100 FOR TURNOUT GEOMETRY.
5. SEE DWG 341200 FOR TURNOUT BILL OF MATERIAL.
6. PANEL WEIGHT = 14,500 LBS.

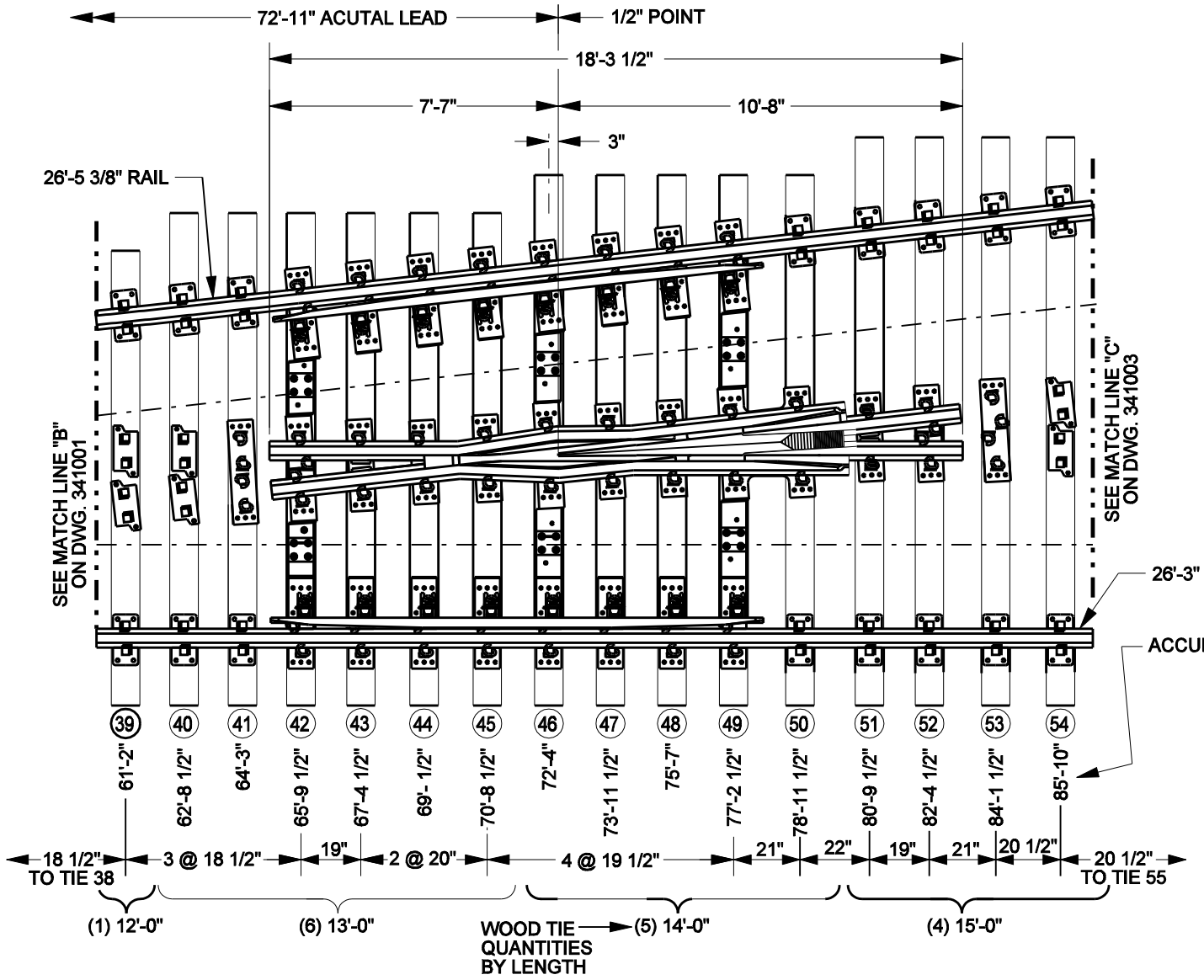
BNSF RAILWAY

COMMON STANDARDS

NO. 9 TURNOUT 136 LB.
PANEL NO. 2

FILE OWNER: BNSF	DATE: MAR. 1, 2007
REV. NO.: 4	DWG NO: 341001

22-2



NOTES:
1. SEE DWGS 341000, 341001, 341003, AND 341004 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
3. SEE DWG 341100 FOR TURNOUT GEOMETRY.
4. SEE DWG 341200 FOR TURNOUT BILL OF MATERIAL.
5. PANEL WEIGHT = 18,000 LBS.
6. SEE DWG 3413004 FOR SOLID MANGANESE FROG PANEL.

	UPRR	BNSF RH	BNSF LH
RBM	N/A	513450048	513450049
SOLID	N/A	513450050	513450051

BNSF RAILWAY

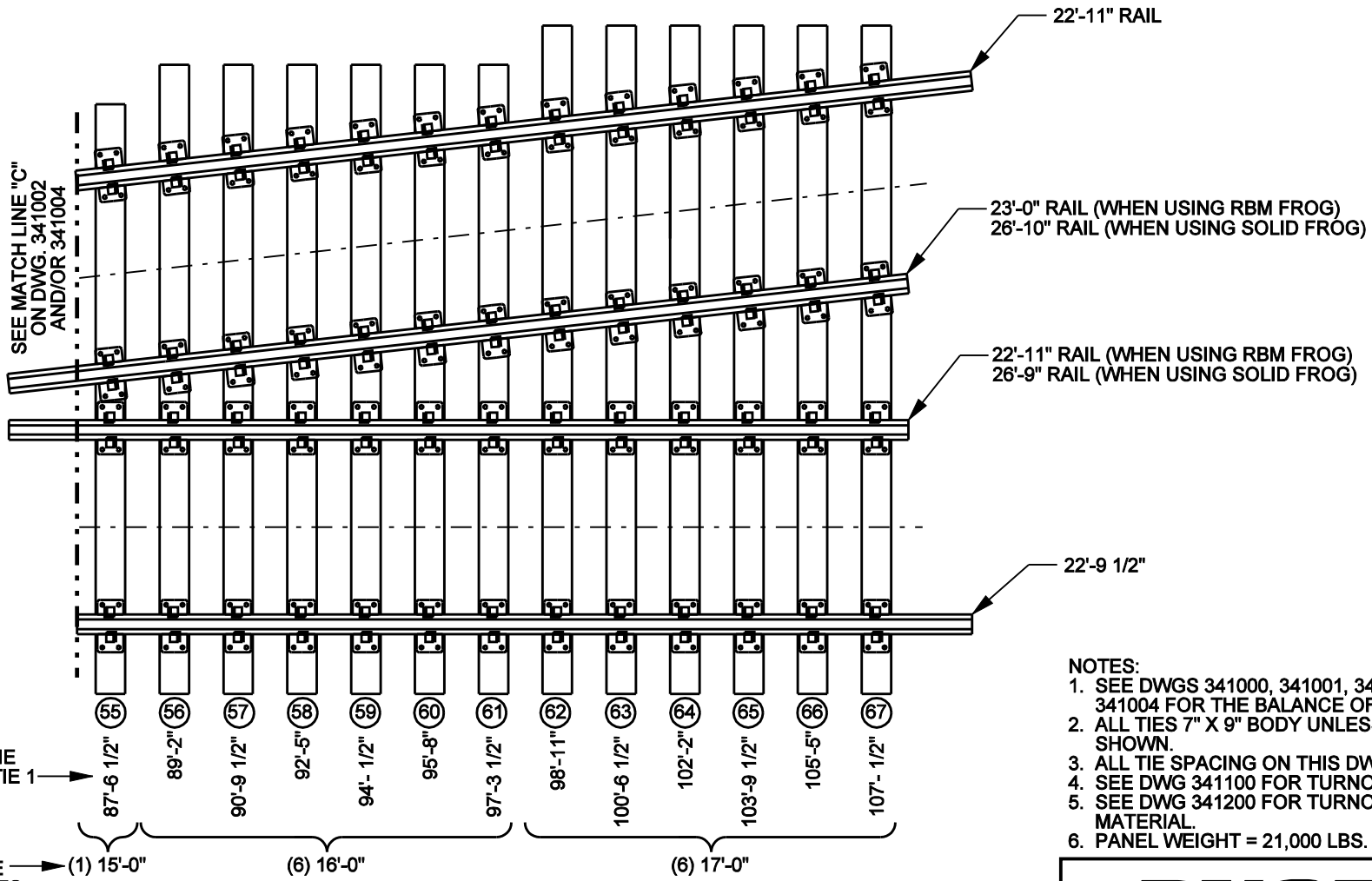
COMMON STANDARDS

NO. 9 TURNOUT 136 LB. PANEL NO. 3 WITH OPTIONAL RBM FROG

FILE OWNER: BNSF | DATE: MAY 19, 2008

REV. NO.: 5 | DWG NO: 341002

22-3



NOTES:
1. SEE DWGS 341000, 341001, 341002, AND 341004 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
3. ALL TIE SPACING ON THIS DWG IS 19 1/2".
4. SEE DWG 341100 FOR TURNOUT GEOMETRY.
5. SEE DWG 341200 FOR TURNOUT BILL OF MATERIAL.
6. PANEL WEIGHT = 21,000 LBS.

BNSF RAILWAY

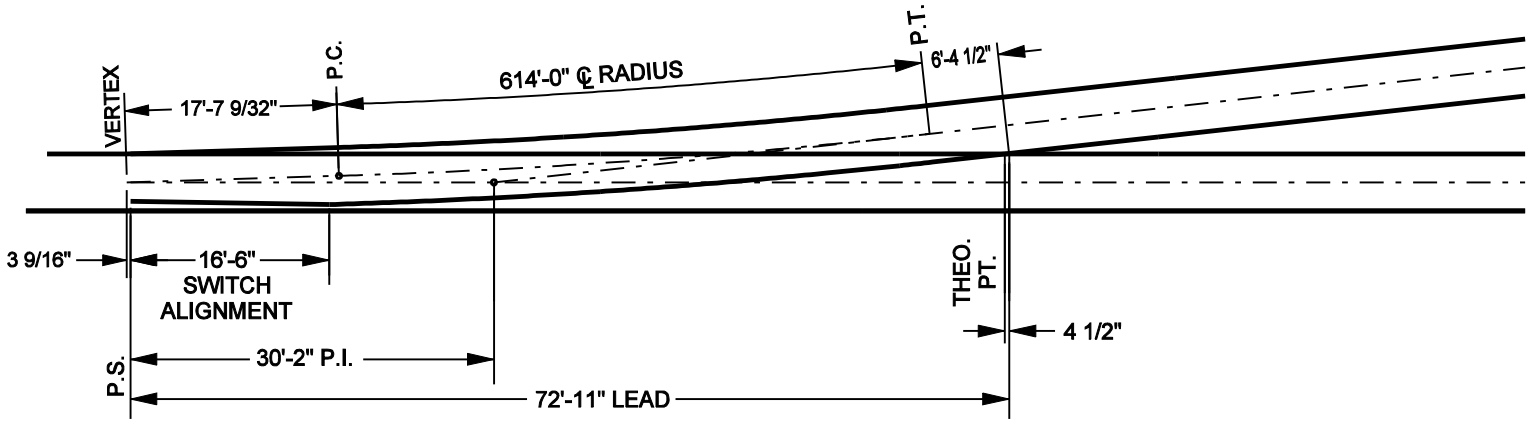
UNION PACIFIC

COMMON STANDARDS

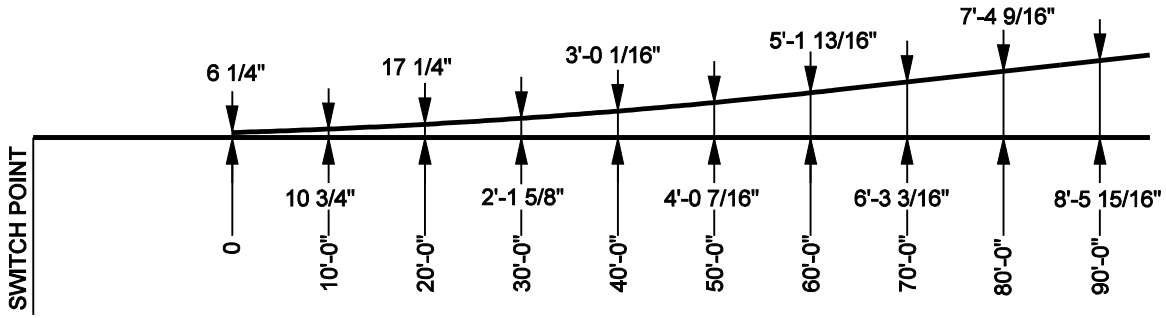
NO. 9 TURNOUT 136 LB.
PANEL NO. 4

FILE OWNER: BNSF	DATE: FEB 28, 2007
REV. NO.: 2	DWG NO: 341003

22-4



GENERAL LAYOUT



SPREAD LAYOUT

SWITCH DATA	
SWITCH LENGTH	16'-6"
HEEL SPREAD	6 1/4"
HEEL ANGLE	1°-46'-22"
SWITCH ANGLE	1°-46'-22"
THROW AT ROD #1	4 3/4"
TURNOUT POINT — THICKNESS AT POINT	0"
TURNOUT POINT — RADIUS (CLOSURE CURVE)	616.3542'
TURNOUT POINT — VERTEX DISTANCE	7 1/16"

FROG DATA	
ANGLE	6°-21'-35"
LENGTH	VARIES

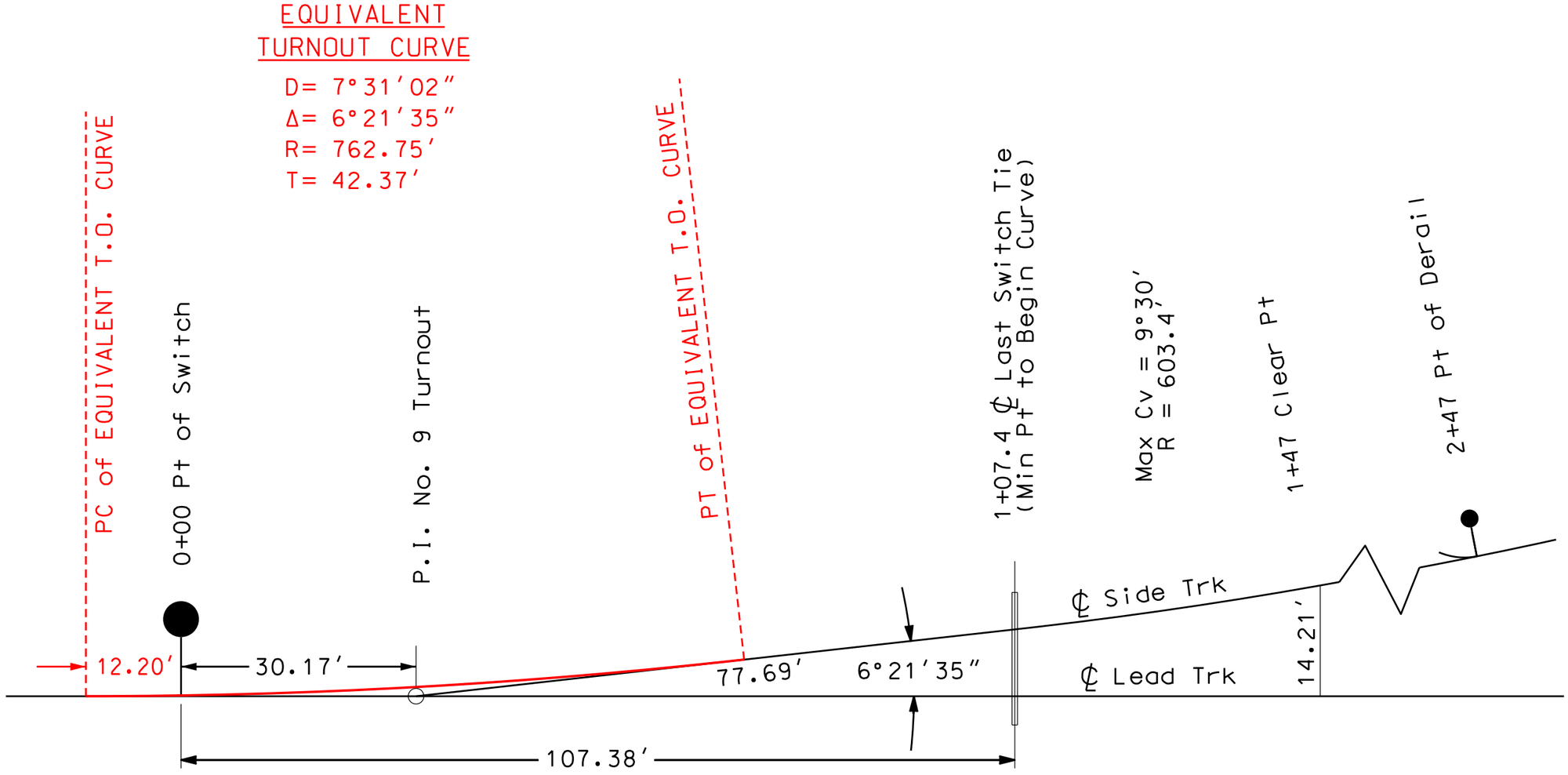
TURNOUT DATA	
RADIUS OF CENTER LINE	614'
T =	24.59'
CENTRAL ANGLE - CLOSURE CURVE	4°35'13"
DEGREE OF CURVE	9°20'31"

BNSF RAILWAY

COMMON STANDARDS

NO. 9 TURNOUT 16-6" STRAIGHT SWITCH TURNOUT GEOMETRY

FILE OWNER: BNSF	DATE: JAN. 8, 2003
REV. NO.: 0	DWG NO: 341100



APPROVALS - (NAME - TITLE)	DATE	APPROVALS - (NAME - TITLE)	DATE

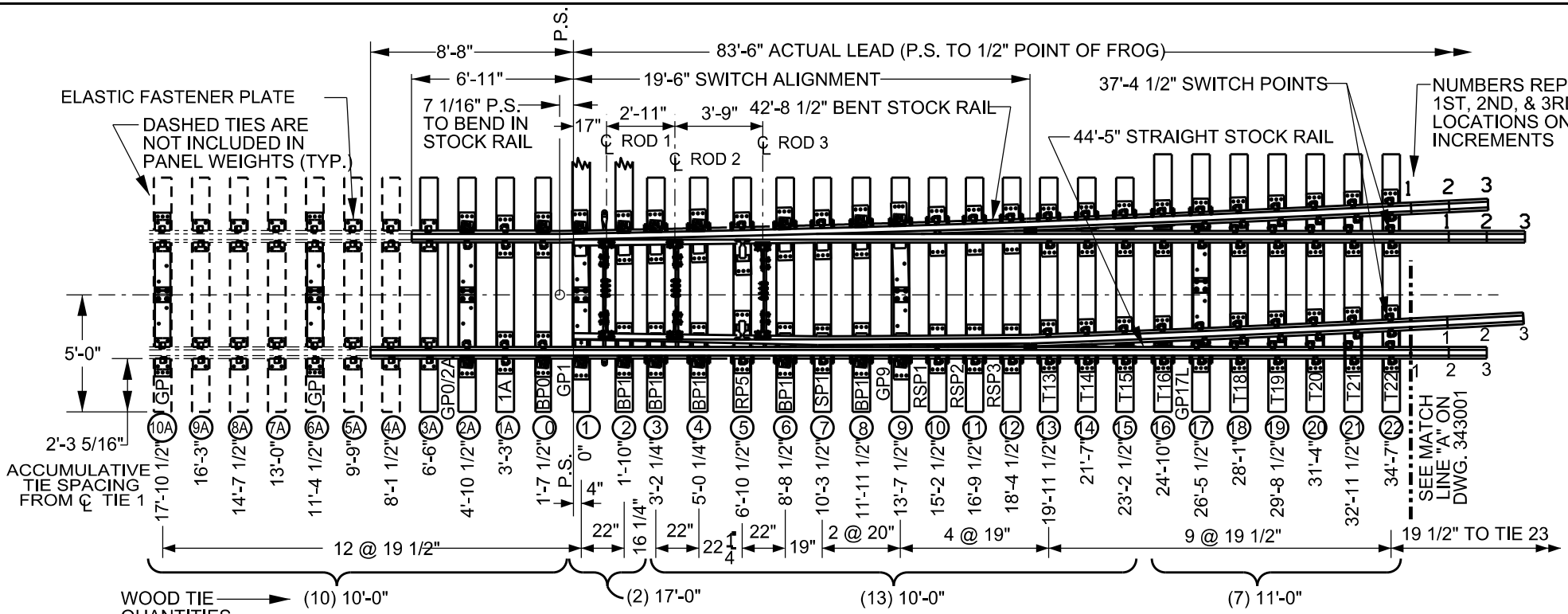
REVISIONS

NO.	DESCRIPTION	DATE	BY
1	Added CP and Derail info	4/5/17	JRG

BNSF RAILWAY

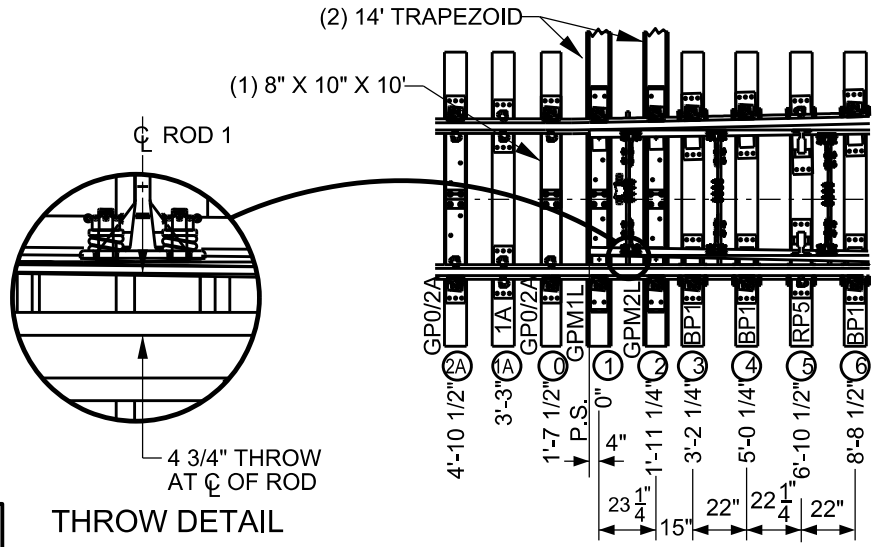
NUMBER 9 TURNOUT TRACK ALIGNMENT GEOMETRY

DRAWN	CHECKED	BNSF RAILWAY COMPANY - ENGINEERING SERVICES	PROTRAK SEQ NO	STATUS PRELIMINARY	FILE: TURNOUTS.DGN	SHEET 1 OF 1	DATE: 05/06/2011



MANUAL OPERATED
PANEL WEIGHT: 20,000 LBS.

NOTES:
1. SEE DWGS 343001 THRU 343005 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
3. SEE DWG 343100 FOR TURNOUT GEOMETRY.
4. SEE DWG 343200 FOR TURNOUT BILL OF MATERIAL.
5. FULLY BOX ANCHOR STOCK RAILS, TIES 3-15 FOR SHIPPING OF PANELS ONLY.
6. APPLY 5" SAFE BOND WIRES ONE CRIB AHEAD OF HEEL OF SWITCH ON STOCK AND SWITCH POINT RAILS
7. ALL SWITCH POINT AND STOCKRAIL DIMENSIONS ARE TO FIRST INSTALL, SEE PLAN 241500 FOR FULL LENGTH.



THROW DETAIL

POWER OPERATED
PANEL WEIGHT: 20,000 LBS.

	UPRR	BNSF RH	BNSF LH
136LB. POWER	N/A	004734653	004734810
136LB. MANUAL	N/A	004734828	004734836
136LB. MAN. SPR. SW.	N/A	004734869	004734877
141LB. POWER	N/A	005253505	005253497
141LB. MANUAL	N/A	005253521	005253513
141LB. MAN. SPR. SW.	N/A	005253547	005253539

BNSF RAILWAY

COMMON STANDARDS

NO. 11 TURNOUT136/141 LB. PANEL NO. 1

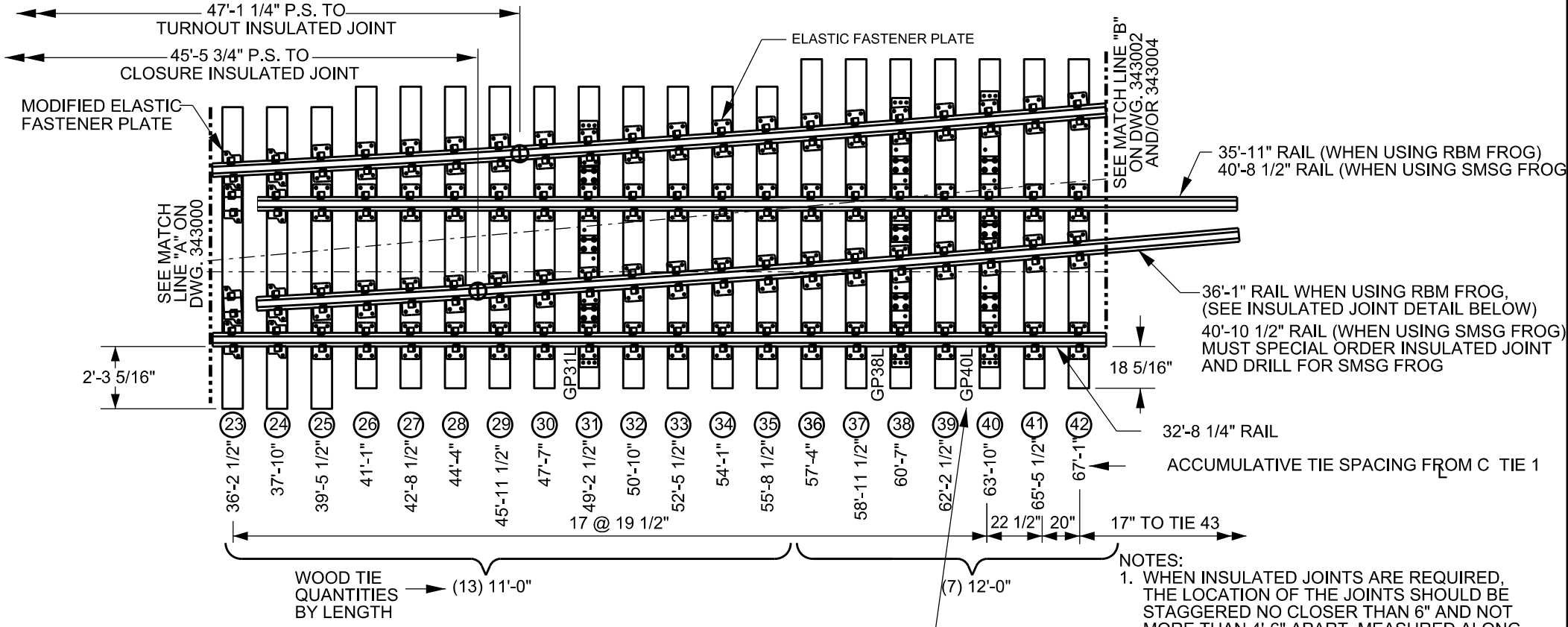
UPRR VP ENGINEERING

BNSF VP ENGINEERING

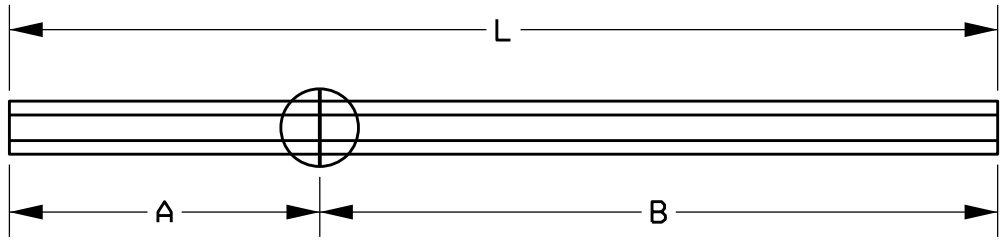
FILE OWNER: BNSF | DATE: OCT. 5, 2010

REV. NO.: 6 | DWG NO: 343000

22-7



NOTES:
1. WHEN INSULATED JOINTS ARE REQUIRED, THE LOCATION OF THE JOINTS SHOULD BE STAGGERED NO CLOSER THAN 6" AND NOT MORE THAN 4'-6" APART, MEASURED ALONG THE TURNOUT.
2. SEE DWGS 343000, 343002, 343003, 343004, AND 343005 FOR THE BALANCE OF LAYOUT PLANS.
3. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
4. SEE DWG 343100 FOR TURNOUT GEOMETRY.
5. SEE DWG 343200 FOR TURNOUT BILL OF MATERIAL.
6. PANEL WEIGHT = 17,000 LBS.



INSULATED JOINT DETAIL
(FOR USE WITH RBM FROG ONLY)

	A	B	L
TURNOUT INSULATED JOINT RAIL	11'-4"	21'-5"	32'-9"
CLOSURE INSULATED JOINT RAIL	8'-2"	27'-11"	36'-1"

	BNSF STOCK CODE	
	136LB.	141LB.
LH TURNOUT INSULATED JOINT RAIL	005253760	005253554
LH CLOSURE INSULATED JOINT RAIL	005253778	005253562
RH TURNOUT INSULATED JOINT RAIL	005253786	005253570
RH CLOSURE INSULATED JOINT RAIL	005253794	005253588

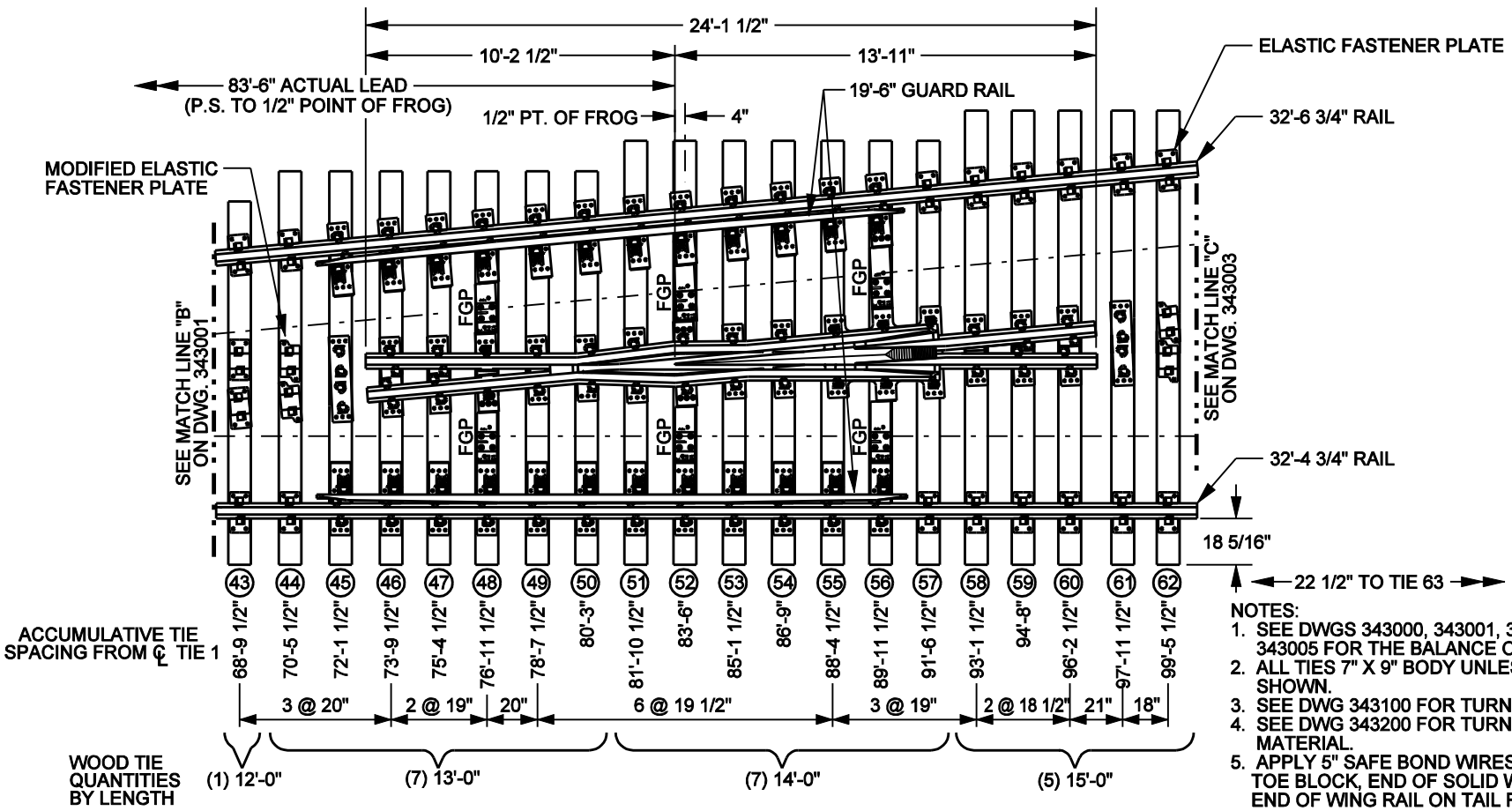
BNSF RAILWAY

COMMON STANDARDS

NO. 11 TURNOUT 136/141 LB.
PANEL NO. 2

FILE OWNER: BNSF | DATE: MAY 6, 2011
REV. NO.: 7 | DWG NO: 343001

22-8



NOTES:
1. SEE DWGS 343000, 343001, 343003, 343004, AND 343005 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
3. SEE DWG 343100 FOR TURNOUT GEOMETRY.
4. SEE DWG 343200 FOR TURNOUT BILL OF MATERIAL.
5. APPLY 5" SAFE BOND WIRES ONE CRIB AHEAD OF TOE BLOCK, END OF SOLID WING RAIL, BEHIND END OF WING RAIL ON TAIL RAIL AND ONE CRIB BEHIND HEEL BLOCK OF FROG.
6. PANEL WEIGHT = 22,000 LBS.
7. SEE DWGS 343004 AND 343005 FOR SMSG AND LIFT FROG PANELS.

	UPRR	BNSF RH	BNSF LH
136LB. RBM	N/A	004710299	004710307
136LB. SPR	N/A	004710315	004710323
136LB. SOLID	N/A	004710331	004710349
141LB. RBM	N/A	005252739	005252721
141LB. SPR	N/A	005252754	005252747
141LB. SOLID	N/A	N/A	N/A

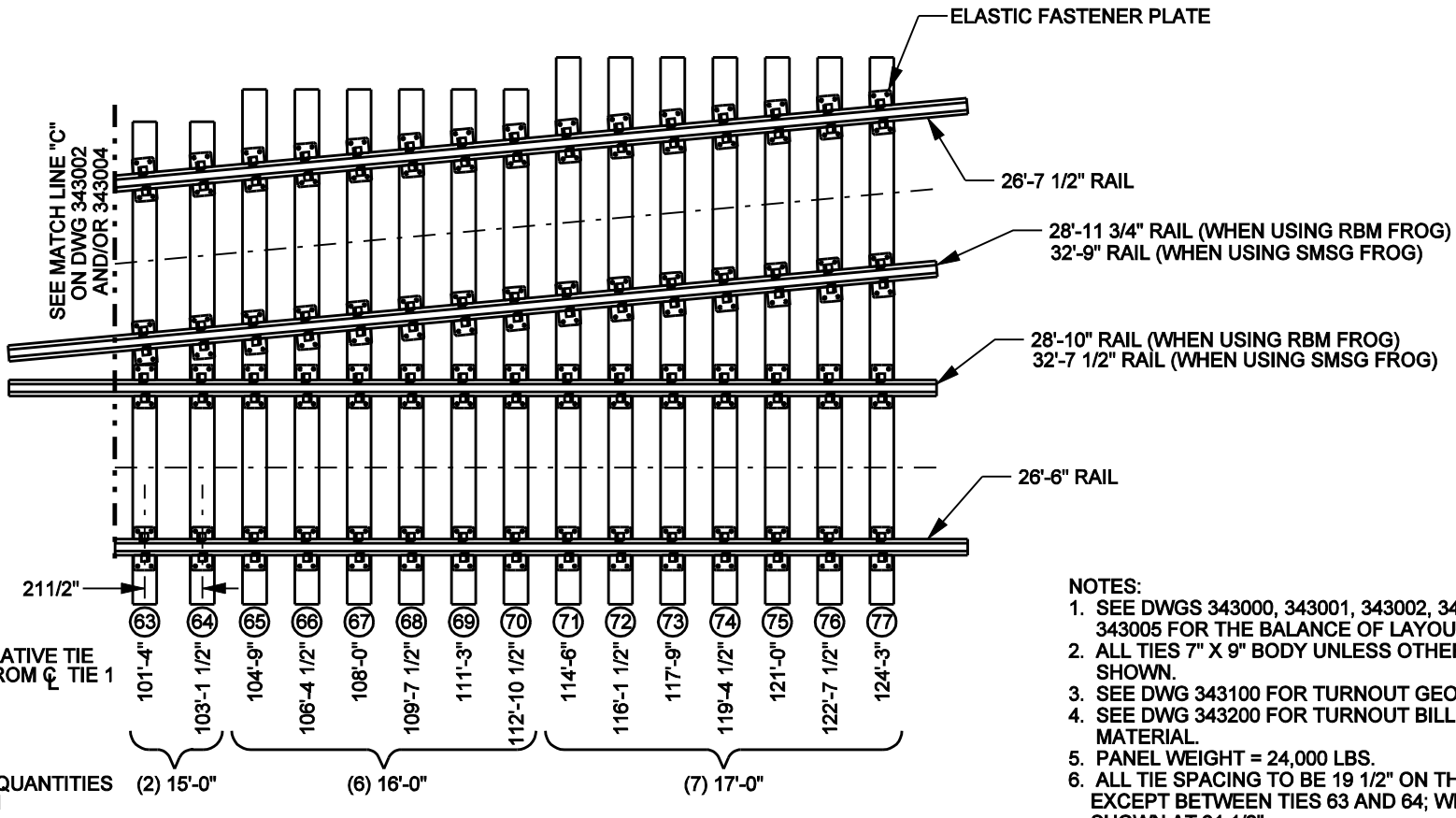
BNSF RAILWAY

COMMON STANDARDS

NO. 11 TURNOUT 136/141 LB. PANEL NO. 3 WITH OPTIONAL RBM FROG

FILE OWNER: BNSF | DATE: AUG. 26, 2009

REV. NO.: 5 | DWG NO: 343002



NOTES:
1. SEE DWGS 343000, 343001, 343002, 343004, AND 343005 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
3. SEE DWG 343100 FOR TURNOUT GEOMETRY.
4. SEE DWG 343200 FOR TURNOUT BILL OF MATERIAL.
5. PANEL WEIGHT = 24,000 LBS.
6. ALL TIE SPACING TO BE 19 1/2" ON THIS DWG. EXCEPT BETWEEN TIES 63 AND 64; WHICH ARE SHOWN AT 21 1/2".

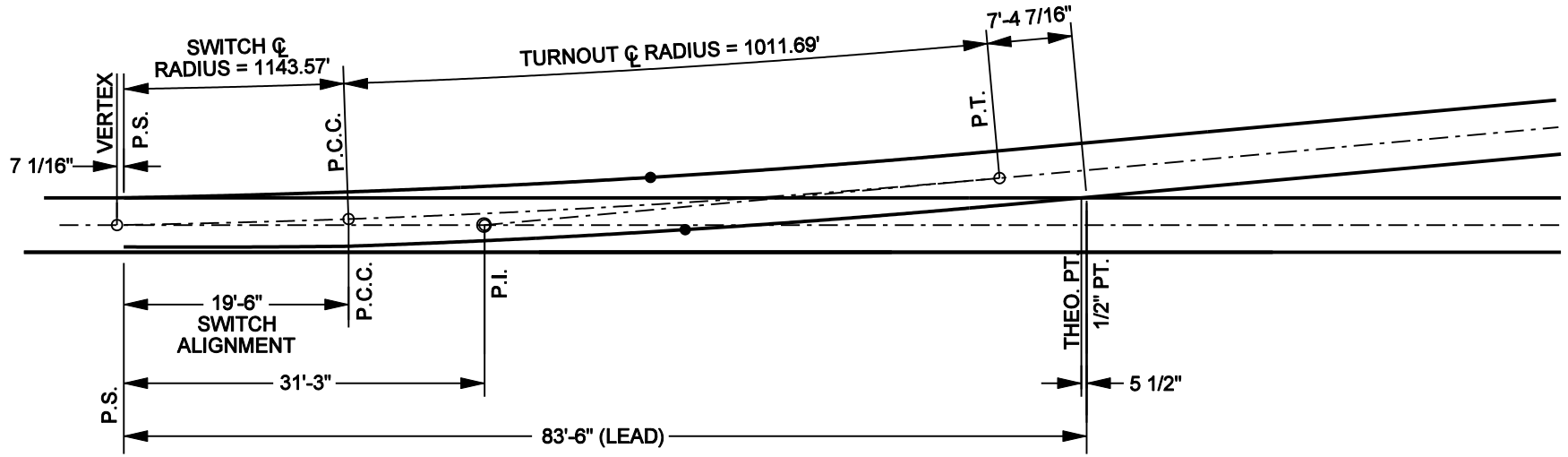
BNSF RAILWAY

COMMON STANDARDS

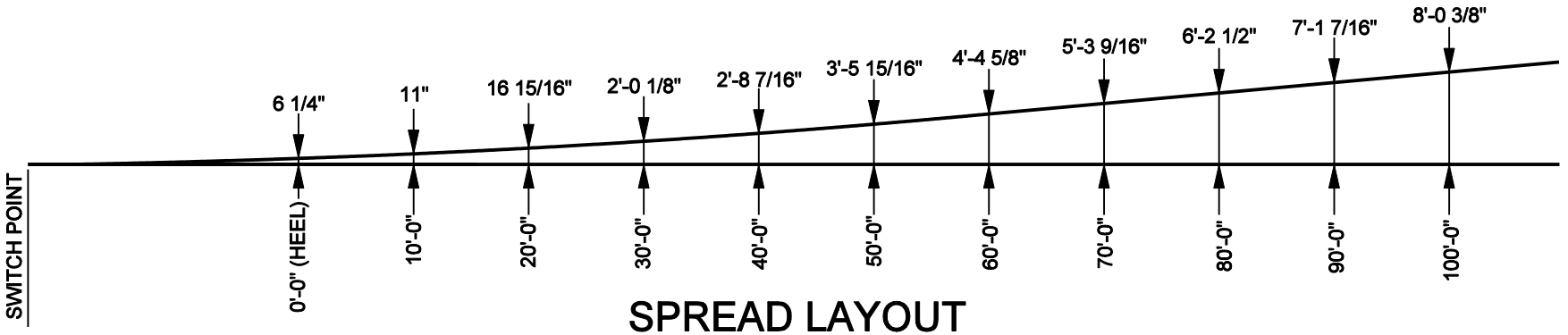
NO. 11 TURNOUT 136/141 LB. PANEL NO. 4

FILE OWNER: BNSF	DATE: AUG. 26, 2009
REV. NO.: 3	DWG NO: 343003

21-10



GENERAL LAYOUT



SPREAD LAYOUT

SWITCH DATA	
SWITCH LENGTH	19'-6"
HEEL SPREAD	6 1/4"
HEEL ANGLE	1°-59'-16"
SWITCH ANGLE	1°-00'-40"
THROW AT ROD #1	4 3/4"
RADIUS (CENTER LINE)	1143.57'
T =	9.69'
CENTRAL ANGLE - CLOSURE CURVE	0°58'16"
DEGREE OF CURVE	5°00'06"
TURNOUT POINT: THICKNESS AT POINT	1/8"
TURNOUT POINT: RADIUS (CLOSURE CURVE)	1145.92'
TURNOUT POINT: VERTEX DISTANCE	7 1/16"

FROG DATA	
ANGLE	5°-12'-18"
LENGTH	VARIES

TURNOUT DATA	
RADIUS OF CENTER LINE	1011.69'
T =	28.35'
CENTRAL ANGLE - CLOSURE CURVE	3°13'02"
DEGREE OF CURVE	5°40'44"

NOTES:

COMMON STANDARDS

NO. 11 TURNOUT 19'-6" CURVED SWITCH TURNOUT GEOMETRY

FILE OWNER: BNSF	DATE: JAN. 9, 2003
REV. NO.: 0	DWG NO: 343100

22-11

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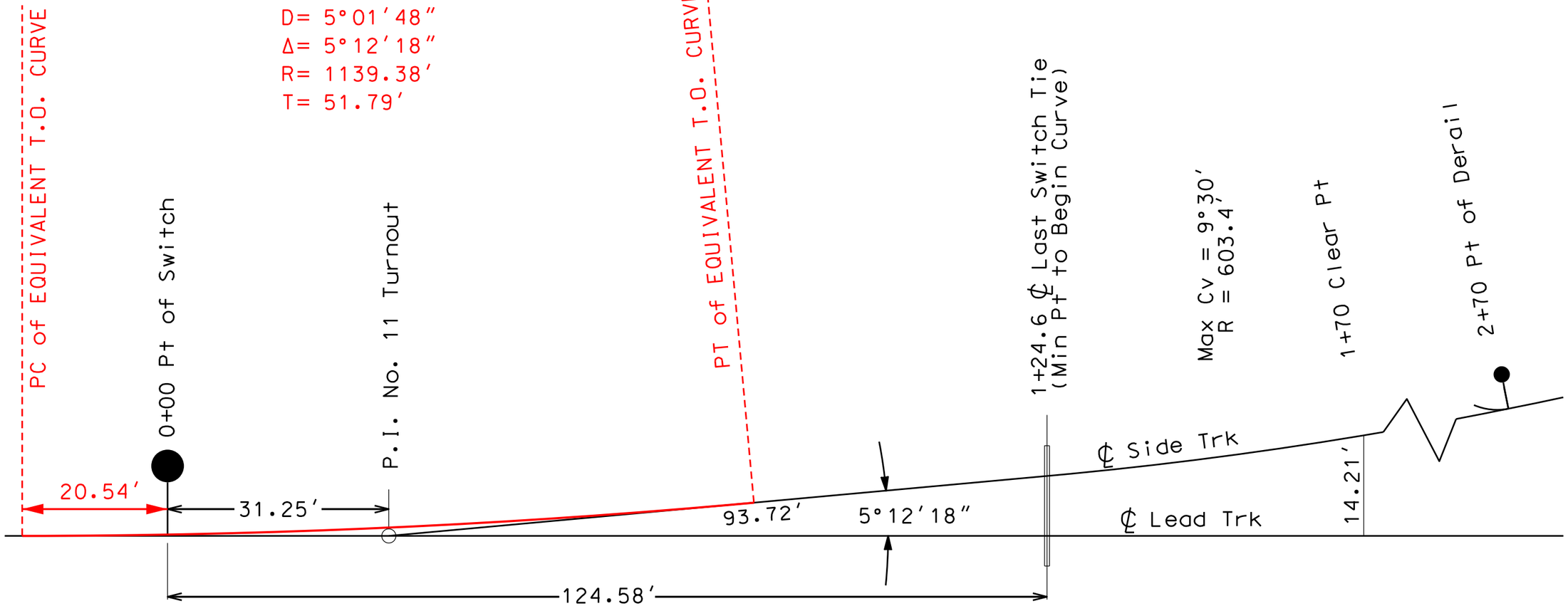
EQUIVALENT
TURNOUT CURVE
D= 5°01'48"
Δ= 5°12'18"
R= 1139.38'
T= 51.79'



APPROVALS - (NAME - TITLE)	DATE	APPROVALS - (NAME - TITLE)	DATE

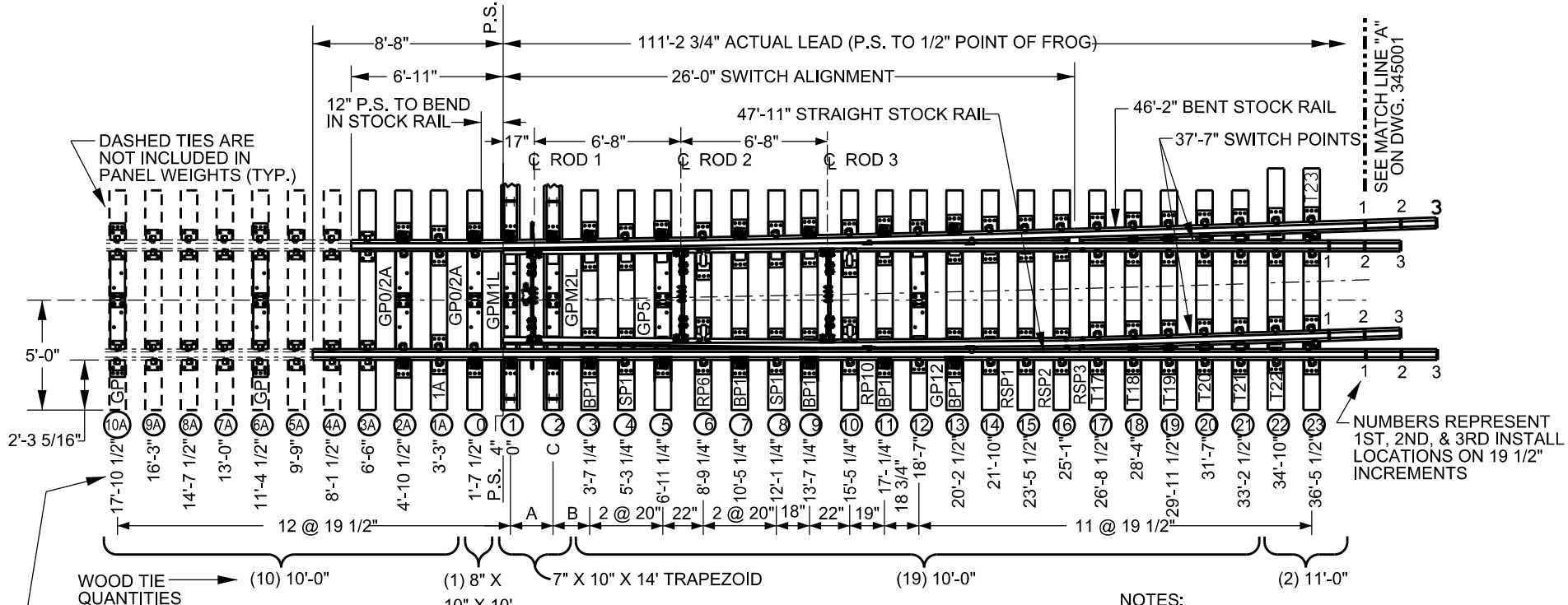
REVISIONS

NO.	DESCRIPTION	DATE	BY
1	Added CP and Derail info	4/5/17	JRG

BNSF RAILWAY

NUMBER 11 TURNOUT
TRACK ALIGNMENT GEOMETRY

DRAWN	CHECKED	BNSF RAILWAY COMPANY - ENGINEERING SERVICES	PROTRAK SEQ NO	STATUS PRELIMINARY	FILE: TURNOUTS.DGN	SHEET 1 OF 1	DATE: 05/06/2011



VARIABLE TIE SPACING		
VARIABLE	UPRR	BNSF
A	23 1/4"	22"
B	20"	21 1/4"
C	23 1/4"	22"

NOTES:
1. SEE DWGS 345001, 345002, AND 345003 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIE SPACING 19 1/2" EXCEPT WHERE NOTED.
3. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
4. SEE DWG 345100 FOR TURNOUT GEOMETRY.
5. SEE DWG 345200 FOR TURNOUT BILL OF MATERIAL.
6. APPLY 5" SAFE BOND WIRES ONE CRIB AHEAD OF HEEL OF SWITCH ON STOCK AND SWITCH POINT RAILS.
7. BNSF MANUAL AND MANUAL SPRING SWITCHES WILL BE SUPPLIED WITH UHMWPE PADS ON TIES 1 THROUGH 14.
8. PANEL WEIGHT = APPROXIMATELY 20,900 LBS.

	UPRR	BNSF LH	BNSF RH
136LB. POWER	N/A	518030091	518030065
136LB. MANUAL	N/A	518030093	518030092
136LB. MAN. SPRG.	N/A	518030095	518030094
141LB. POWER	N/A	518030134	518030135
141LB. MANUAL	N/A	518030136	518030137
141LB. MAN. SPRG.	N/A	518030138	518030139

BNSF RAILWAY

UNION PACIFIC

COMMON STANDARDS

NO. 15 TURNOUT 136/141 LB. PANEL NO. 1

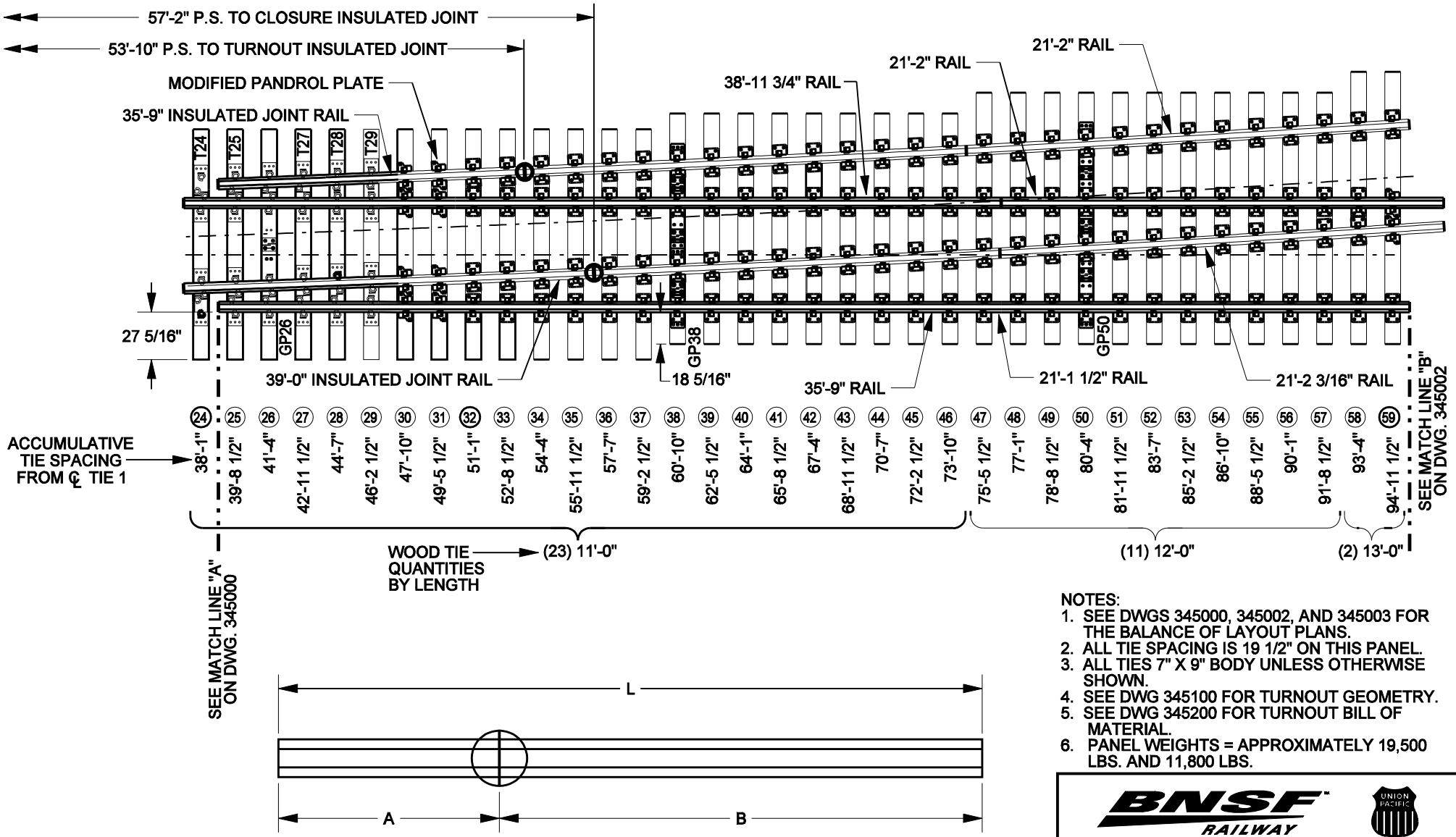
UPRR VP ENGINEERING

BNSF VP ENGINEERING

FILE OWNER: UPRR | DATE: OCT. 5, 2010

REV. NO.: 5 | DWG NO: 345000

22-13



NOTES:
1. SEE DWGS 345000, 345002, AND 345003 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIE SPACING IS 19 1/2" ON THIS PANEL.
3. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
4. SEE DWG 345100 FOR TURNOUT GEOMETRY.
5. SEE DWG 345200 FOR TURNOUT BILL OF MATERIAL.
6. PANEL WEIGHTS = APPROXIMATELY 19,500 LBS. AND 11,800 LBS.

	A	B	L
TURNOUT INSULATED JOINT RAIL	14'-8"	21'-1"	35'-9"
CLOSURE INSULATED JOINT RAIL	19'-7"	19'-5"	39'-0"

	BNSF ITEM NUMBER	
	136LB.	141LB.
LH TURNOUT INSULATED JOINT RAIL	518030155	518030140
LH CLOSURE INSULATED JOINT RAIL	518030156	518030141
RH TURNOUT INSULATED JOINT RAIL	518030157	518030142
RH CLOSURE INSULATED JOINT RAIL	518030158	518030143

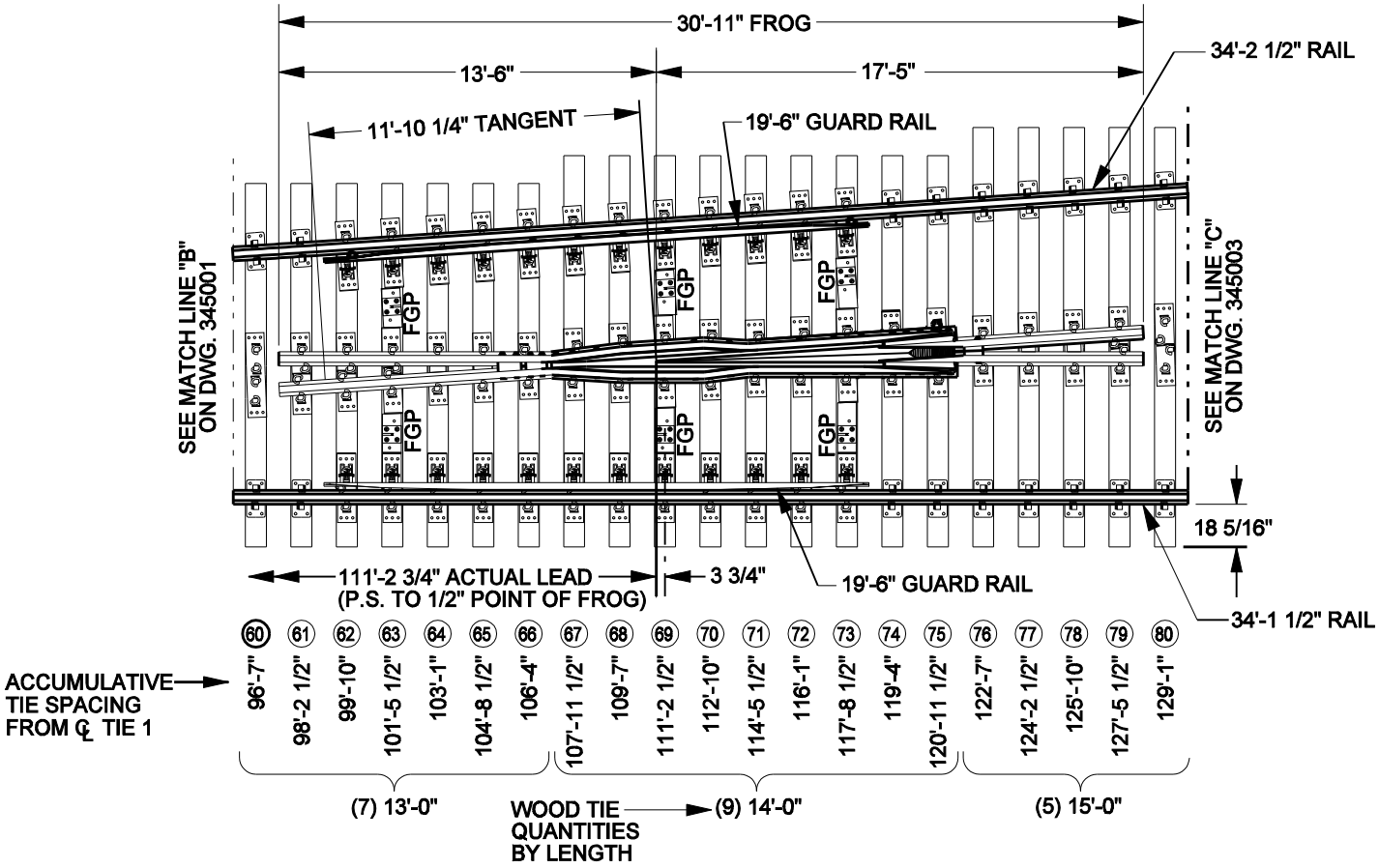
BNSF RAILWAY

COMMON STANDARDS

NO. 15 TURNOUT 136/141 LB. PANELS NO. 2 AND NO. 3

FILE OWNER: UPRR	DATE: MAY 19, 2008
REV. NO.: 3	DWG NO: 345001

22-14



NOTES:
1. SEE DWGS 345000, 345001, AND 345003 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIE SPACING IS 19 1/2" ON THIS PANEL.
3. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
4. SEE DWG 345100 FOR TURNOUT GEOMETRY.
5. SEE DWG 345200 FOR TURNOUT BILL OF MATERIAL.
6. PANEL WEIGHT = APPROXIMATELY 28,800 LBS.

BNSF RAILWAY

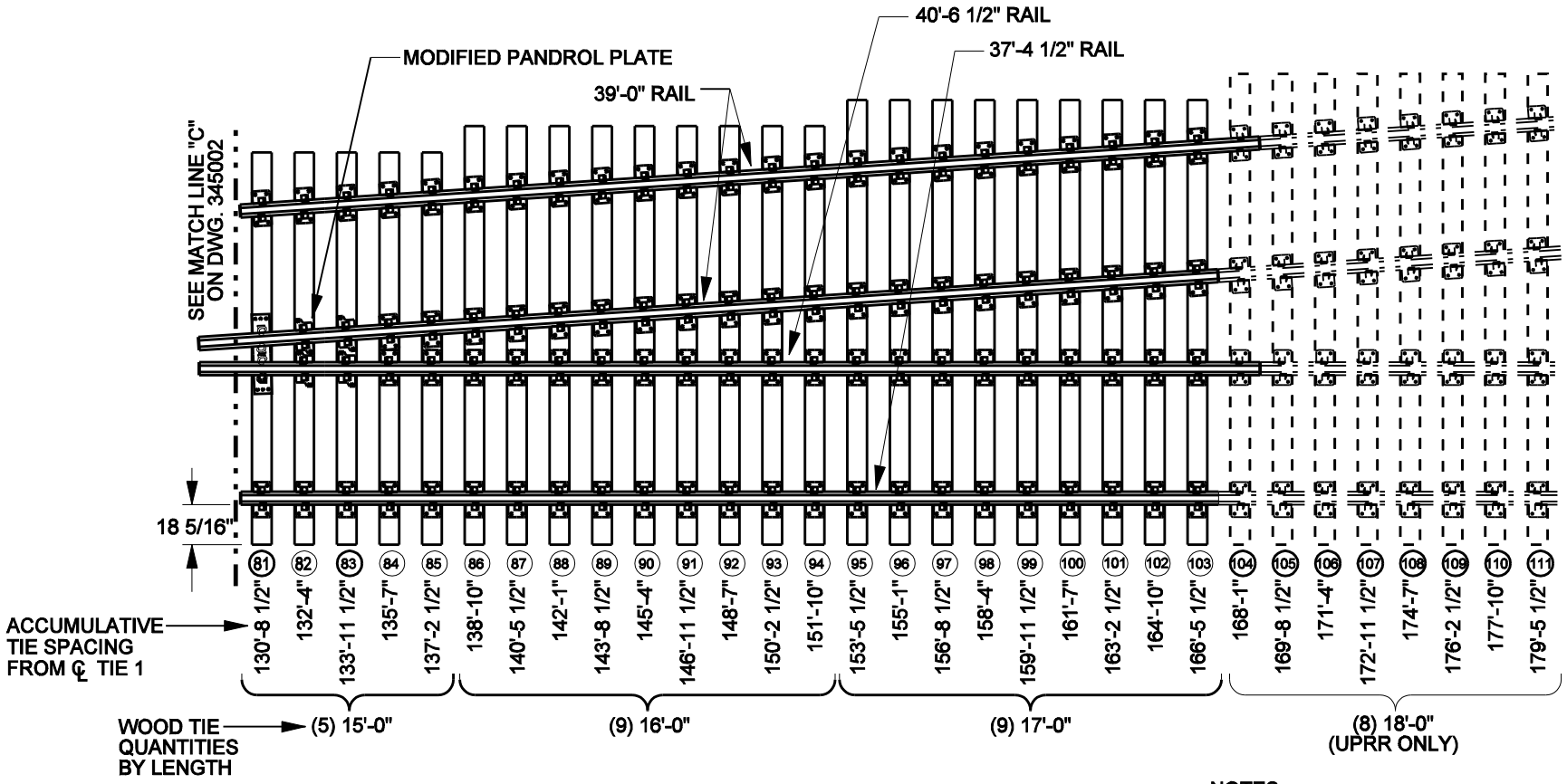
COMMON STANDARDS

NO. 15 TURNOUT 136/141 LB. PANEL NO. 4

	UPRR	BNSF LH	BNSF RH
136LB. RBM	N/A	513450060	513450059
136 LB. SPRING	N/A	513450063	513450061
141 LB. RBM	N/A	513450232	513450233
141 LB. SPRING	N/A	513450234	513450235

FILE OWNER: UPRR | DATE: MAY 16, 2008
REV. NO.: 3 | DWG NO: 345002

22-15



NOTES:
1. SEE DWGS 345000, 345001, AND 345002 FOR THE BALANCE OF LAYOUT PLANS.
2. ALL TIE SPACING IS 19 1/2" ON THIS PANEL.
3. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN.
4. SEE DWG 345100 FOR TURNOUT GEOMETRY.
5. SEE DWG 345200 FOR TURNOUT BILL OF MATERIAL.
6. PANEL WEIGHT = APPROXIMATELY 23,650 LBS.

BNSF RAILWAY

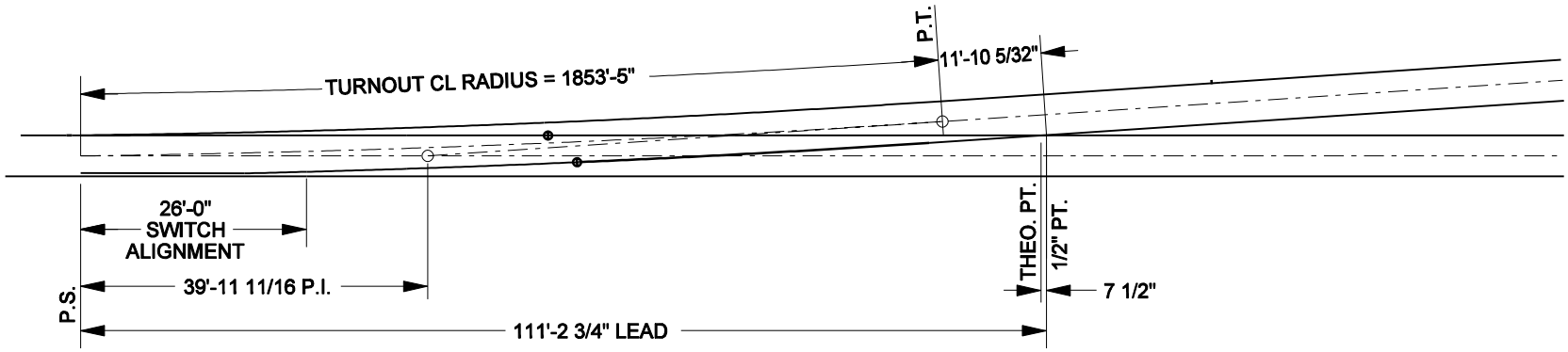
UNION PACIFIC

COMMON STANDARDS

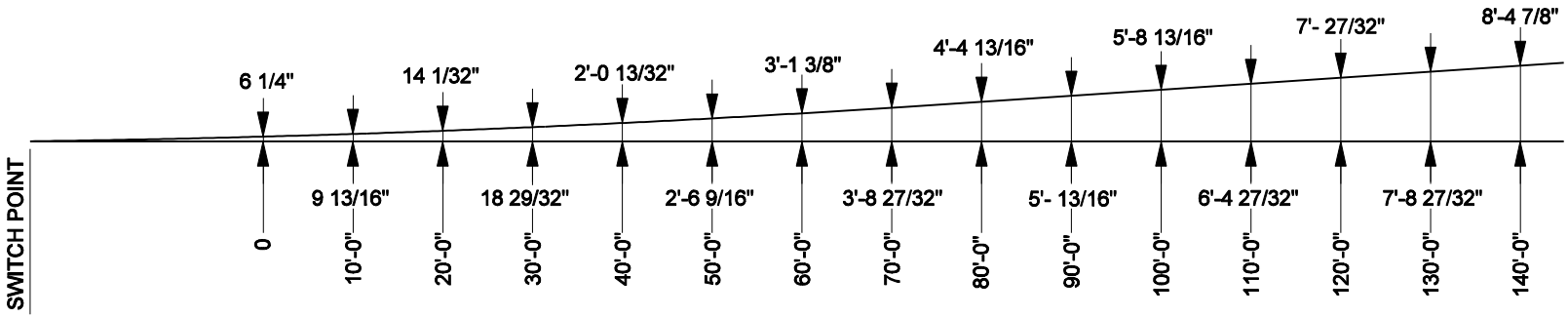
NO. 15 TURNOUT 136/141 LB. PANEL NO. 5

	FILE OWNER: UPRR	DATE: MAY 2, 2008
	REV. NO.: 1	DWG NO: 345003

22-16



GENERAL LAYOUT



SPREAD LAYOUT

SWITCH DATA	
SWITCH LENGTH	26'-0"
HEEL SPREAD	6 1/4"
HEEL ANGLE	1°-33'-2"
SWITCH ANGLE	0°-44'-47"
THROW AT ROD #1	4 3/4"
RADIUS (CENTER LINE)	1853.42'
T =	49.68'
CENTRAL ANGLE - CLOSURE CURVE	3°-04'-16"
DEGREE OF CURVE	3°-05'-30"
TURNOUT POINT: THICKNESS AT POINT	1/4"
TURNOUT POINT: RADIUS (CLOSURE CURVE)	1855.77'
TURNOUT POINT: VERTEX DISTANCE	0"

FROG DATA	
ANGLE	3°-49'-06"
LENGTH	VARIES

TURNOUT DATA	
RADIUS OF CENTER LINE	1853.42'
T =	49.68'
CENTRAL ANGLE - CLOSURE CURVE	3°-04'-16"
DEGREE OF CURVE	3°-05'-30"

NOTES:

COMMON STANDARDS

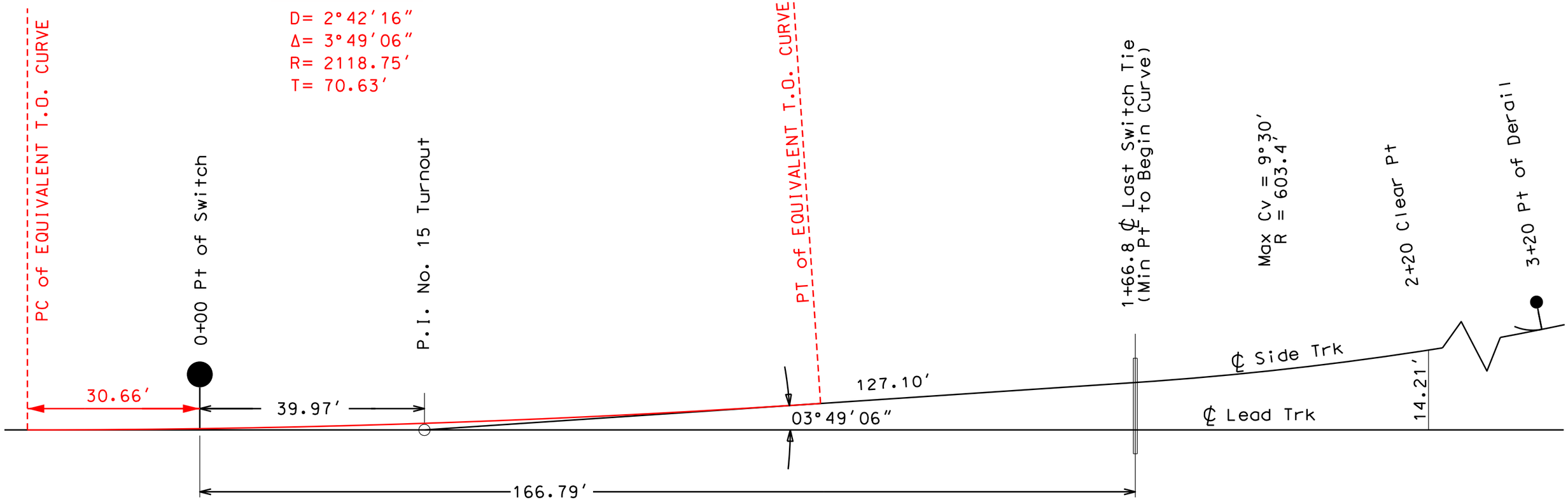
NO. 15 TURNOUT 26'-0" CURVED SWITCH, TURNOUT GEOMETRY

FILE OWNER: UPRR	DATE: JAN. 14, 2003
REV. NO.: 0	DWG NO: 345100

345100

...\No 15\345100.dgn 03/07/2003 03:07:20 PM

EQUIVALENT
TURNOUT CURVE
D= 2°42'16"
Δ= 3°49'06"
R= 2118.75'
T= 70.63'



APPROVALS - (NAME - TITLE)	DATE	APPROVALS - (NAME - TITLE)	DATE

DRAWN | CHECKED | BNSF RAILWAY COMPANY - ENGINEERING SERVICES | PROTRAK SEQ NO | STATUS PRELIMINARY

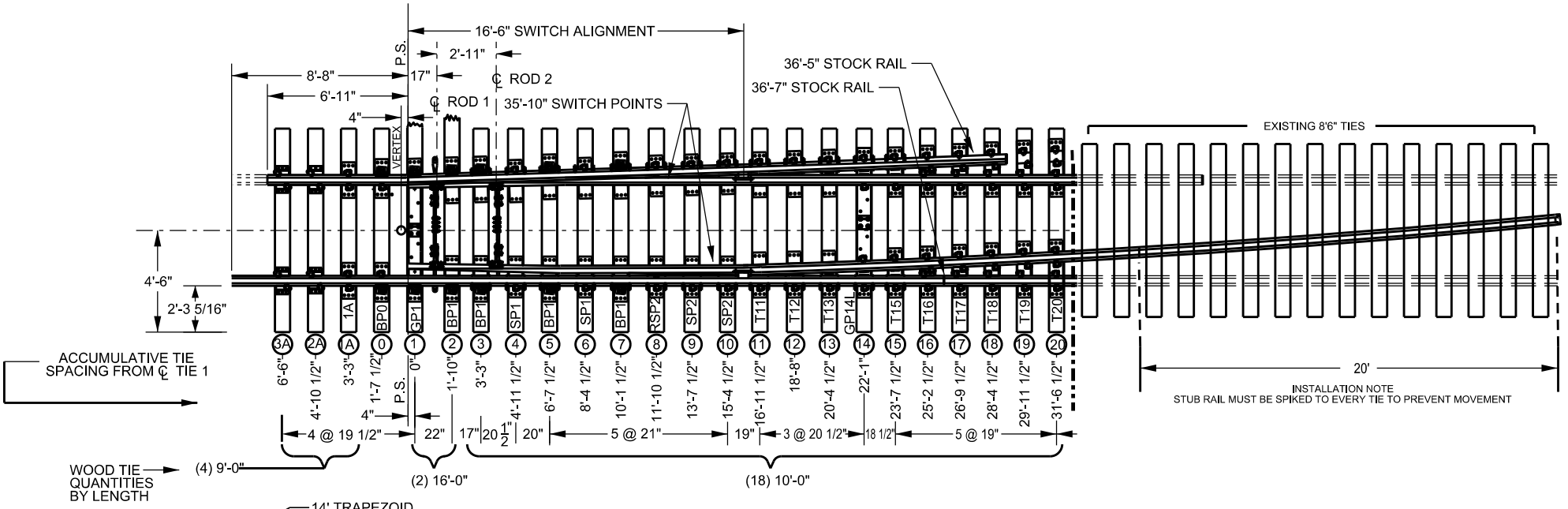
REVISIONS

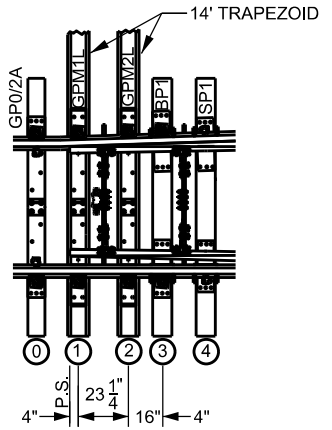
NO.	DESCRIPTION	DATE	BY
1	Added CP and Derail info	4/5/17	JRG

BNSF RAILWAY

NUMBER 15 TURNOUT TRACK ALIGNMENT GEOMETRY

FILE: TURNOUTS.DGN | SHEET 1 OF 1 | DATE: 05/06/2011

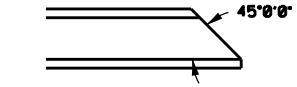




POWER OPERATED
PANEL WEIGHT: 20,000 LBS.

MANUAL OPERATED
PANEL WEIGHT: 20,000 LBS.
Panel Length 44' 6"

END RAMP $45^{33}/_{64}$



NOTES:
1. ALL TIES 7" X 9" BODY UNLESS OTHERWISE SHOWN ABOVE.
2. SEE DWG 341100 FOR TRACK GEOMETRY.
3. FULLY BOX ANCHOR STOCK RAILS, TIES 3-15 FOR SHIPPING OF PANELS ONLY.
4. SWITCH POINT DERAIL FURNISHED AS A COMPLETE PANEL.
5. WHEN ORDERING SPECIFY LEFT OR RIGHT HAND AND POWER OR MANUAL OPERATION. SUPPLIER TO PROVIDE CORRECT PLATING AND TIES FOR POWER APPLICATIONS.
6. FOR OPERATING STANDS SEE STANDARD PLANS 2501.02 & 2153.01.
   FOR ROD PLAN SEE DRAWING 2156.01 AND DERAIL SIGN ON PLAN 3020.01.
7. SEE STANDARD PLAN 24000202 FOR DOUBLE SWITCH POINT DERAIL REQUIREMENTS.
8. SEE LATEST REVISED ENGINEERING INSTRUCTIONS 9.3.3 FOR INSTALLATION AND USE.
9. MANUFACTURER WILL PROVIDE A DRILLED 20' STUB RAIL, A DRILLED TURNOUT SWITCH POINT AND ANGLE BARS FOR HOOK UP.
10. END RAMPS REQUIRED ON STUB RAIL AND TURNOUT STOCK RAIL.

	LH	RH
POWER 141	054333703	054333711
POWER 136	054333646	054333653
POWER 115	054333687	054333695
MANUAL 141	054333661	054333679
MANUAL 136	54590633	54590641
MANUAL 115	054333638	54590658

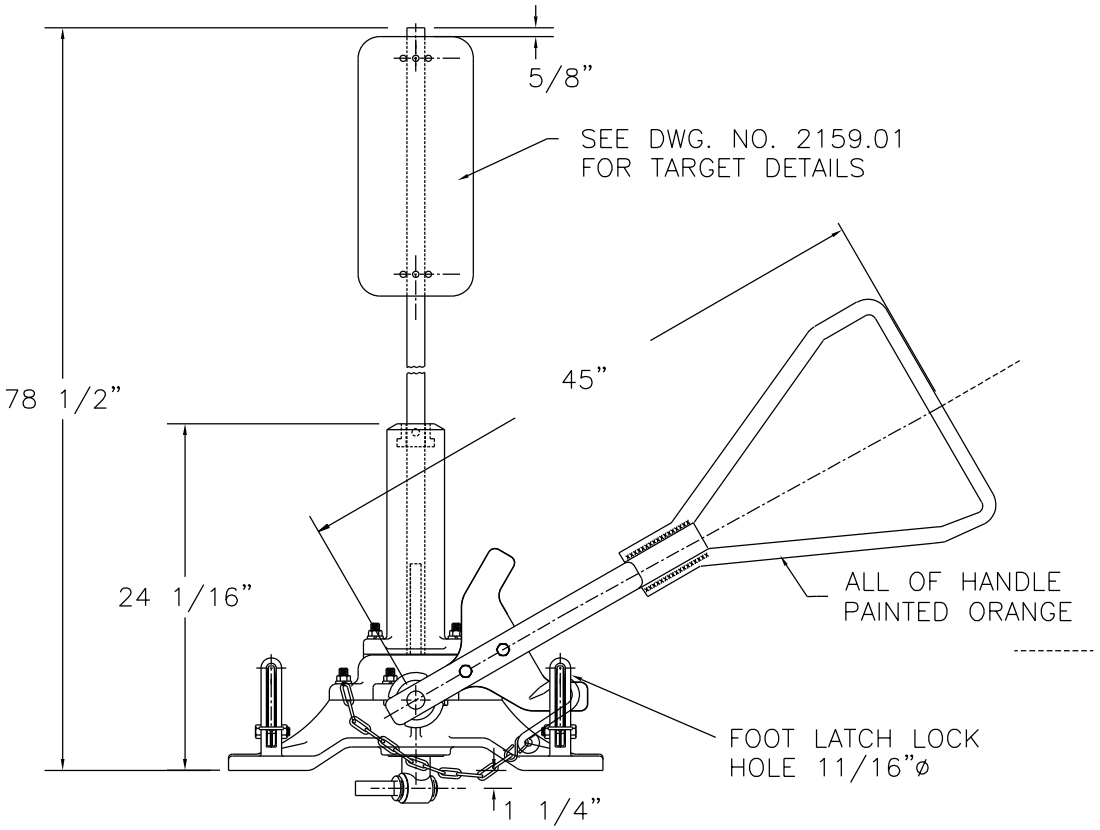
BNSF RAILWAY

STANDARD PLAN

DOUBLE SWITCH POINT DERAIL
16' 6" POINTS 136 LB

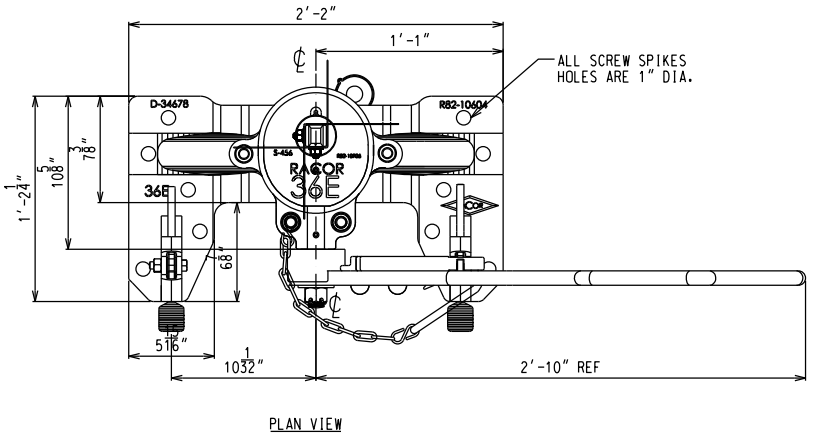
DATE: SEPTEMBER 8, 2011 | FILE OWNER: BNSF
DWG NO: 2400 | SHEET NO: 04 | REV NO: 00

3 - 6



ELEVATION VIEW

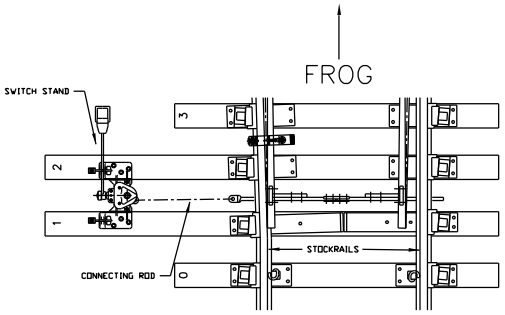
36 EH STANDS,
SHOWN WITH HIGH STAFF
AND TRI-HANDLE.



PLAN VIEW

PLAN VIEW

36 E STANDS,
SHOWN WITH LOW STAFF
AND TRI-HANDLE.



INSTALLATION VIEW

BILL OF MATERIALS

QUANTITY	SWITCH STAND DESCRIPTION	
1 EA.	36E LOW TARGET WITH TRI-HANDLE @ 30°	ITEM NO. 517740985N
1 EA.	36EH HIGH TARGET WITH TRI-HANDLE @ 30°	ITEM NO. 517740995N
1 EA.	36D RETRO-FIT KIT WITH TRI-HANDLE @ 30°	ITEM NO. 513960006N

NOTES:

1. SEE DWG. 2156 & 2160 FOR SPINDLE AND CRANK EYE DETAILS.
2. HANDLE KITS (STRAIGHT OR TRI-HANDLE) ARE AVAILABLE FOR FIELD RETRO FIT OF EXISTING 36 STYLE SWITCH STANDS.
3. STAND 36EH IS FOR MAIN LINE USE ONLY. FURNISHED WITH NO. 1.2 STAFF, SEE DWG. 2160.01.
4. STAND 36E IS FOR MAIN LINE OR YARD USE, FURNISHED WITH NO. 2 STAFF, SEE DWG. 2160.01.
5. 16:1 MECHANICAL ADVANTAGE.
6. SWITCH STANDS ARE TO BE INSTALLED WITH HANDLE DIRECTED TOWARDS FROG WHEN LINED TO THE STRAIGHT SIDE OF SWITCH.
6. STAND INCLUDES ½" DIAMETER HOOK ON 19" CHAIN

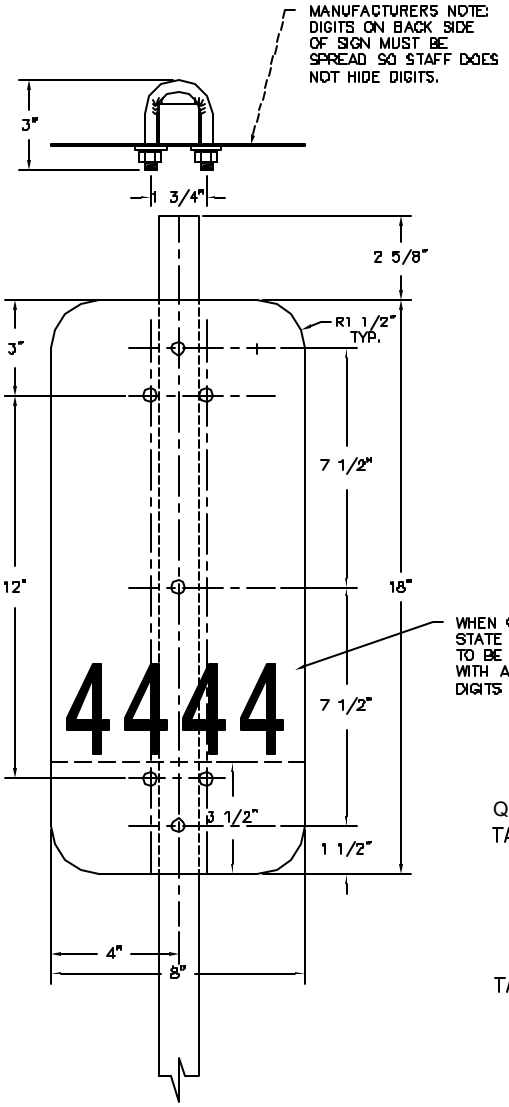
BNSF RAILWAY

STANDARD PLAN

RACOR STYLE 36E & 36EH
SWITCH STAND
WITH 45" TRI-HANDLE

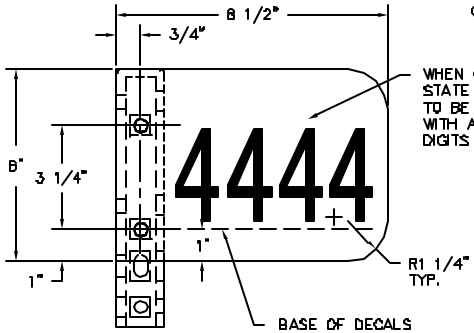
FILE OWNER BNSF	DATE: DECEMBER 10, 2010
REV. NO.: 13	DWG NO: 215301

19-15



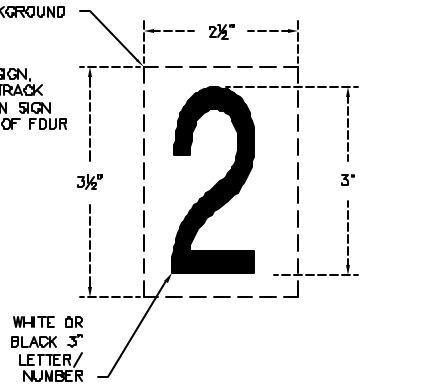
NO. 1 UNIVERSAL TARGET

1. MAIN LINE HIGH STANDS (RED)
2. NON-MAIN LINE HIGH STANDS (YELLOW)



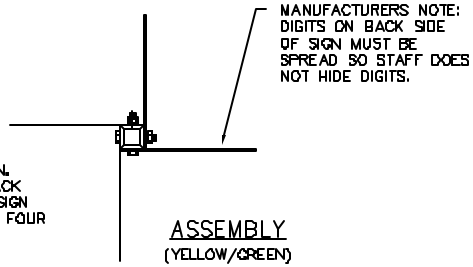
TARGET NO. 2

1. MAIN LINE LOW STANDS (RED ONLY)
2. NON-MAIN LINE LOW STANDS (YELLOW/GREEN)



ALPHANUMERIC DECAL

WHITE OR BLACK LETTER ON CLEAR BACKGROUND



ASSEMBLY

(YELLOW/GREEN)

FOR RETROFITTING EXISTING TARGET SIGNS, ORDER SHEETS AS STATED BELOW.

16 LETTERS/NUMBERS TO THE 8½" x 11" SHEET. ONE CHARACTER TYPE PER SHEET. MUST STATE NUMBERS AND LETTERS REQUIRED WHEN ORDERING.

THEY ARE SELF-ADHESIVE AND ARE APPLIED AS SHOWN ON TARGETS NO. 1 AND 2. CHARACTERS WILL HAVE TO BE TEST SPACED PRIOR TO ADHERRING TO SIGN. THE DECAL IS WIDER THAN WILL FIT ACCROSS THE SIGNS DEPENDING ON NUMBER OF CHARACTERS REQUIRED. OVERLAP THE CHARACTERS AS NECESSARY.

CLEAN THE AREA THE LETTERS / NUMBERS ARE TO BE APPLIED WITH WINDEX, AMMONIA BASE OR BEST OF ALL A CITRUS BASE CLEANERS. AFTER THE SURFACE HAS DRIED, APPLY CHARACTERS IN TEMPERATURES ABOVE 60°. IF APPLIED AS ABOVE THE LETTERS/NUMBERS WILL STICK. BELOW 60° THEY MAY NOT.

APPLY THE LETTERS/NUMBERS ON THE TARGET APPROPRIATE FOR THAT TRACK NAME WHEN THE SWITCH HAS BEEN THROWN FOR THAT MOVEMENT.

YOU MAY SPECIAL ORDER TARGETS WITH NUMBERS/LETTERS BUT YOU MUST SPECIFY THE LABEL YOU WANT ON THE TARGET AT TIME OF ORDERING.

YELLOW TARGET REQUIRES BLACK LETTERS/NUMBERS WITH CLEAR BACKGROUND.

NOTES:

1. ALL SIGNS LISTED IN THIS PLAN ARE 6" X 8 1/2" OR 8" X 18" SIZED WITH RED, YELLOW, OR GREEN REFLECTIVE BACKGROUND AS SHOWN.
2. TARGETS TO BE MADE OF .081" 5052 H38 SHEET ALUMINUM.
3. REFLECTORIZED MATERIAL TO BE APPLIED TO BOTH SIDES OF TARGET FOR BIDIRECTIONAL VIEWING.
4. GREEN SCOTCHLITE SERIES 3877, YELLOW SCOTCHLITE SERIES 3871, AND RED SCOTCHLITE SERIES 3872 TO BOTH SIDES. HIGH INTENSITY GRADE.
5. ALL HOLES IN TARGETS ARE 7/16"ø.
6. SEE PLAN 2160.01 FOR TARGET STAFFS.

BILL OF MATERIALS

QUANTITY SIGN PANEL

TARGETS BLANK WITH NO DIGITS

1 EA.	TARGET NO. 1 UNIVERSAL, (HIGH)-RED.....	ITEM NO. 518250994
1 EA.	TARGET NO. 1 UNIVERSAL (HIGH)-YELLOW	ITEM NO. 518250996
1 EA.	TARGET NO. 2 (LOW)-RED.....	ITEM NO. 518250005
1 EA.	TARGET NO. 2 (LOW)-YELLOW.....	ITEM NO. 518250006
1 EA.	TARGET NO. 2 (LOW)-GREEN.....	ITEM NO. 518250007

TARGETS WITH DIGITS

1 EA.	TARGET NO. 1 REFL. WHITE DIGITS ON RED BACKGROUND.....	ITEM NO. 518250003
1 EA.	TARGET NO. 1 BLACK DIGITS ON YELLOW BACKGROUND.....	ITEM NO. 518250004
1 EA.	TARGET NO. 2 REFL. WHITE DIGITS ON RED BACKGROUND....	ITEM NO. 518250008
1 EA.	TARGET NO. 2 BLACK DIGITS ON YELLOW BACKGROUND.....	ITEM NO. 518250010
1 EA.	TARGET NO. 2 REFL. WHITE DIGITS ON GREEN BACKGROUND	ITEM NO. 518250009

HARDWARE

2 EA.	3/8" X 1 3/4" X 3 1/2" U-BOLTS CADMIUM PLATED WITH FLAT WASHERS, AND ELASTIC STOP NUTS. (NO.1 TARGET)
3 EA.	3/8" X 2 1/2" BOLTS, CADMIUM PLATED WITH FLAT WASHERS, AND ELASTIC STOP NUTS. (NO. 1 TARGET)
2 EA.	3/8" X 2 1/2" BOLTS, CADMIUM PLATED WITH FLAT WASHERS, AND ELASTIC STOP NUTS. (NO. 2 TARGET)

BURLINGTON NORTHERN SANTA FE
STANDARD PLAN
ENGINEERING DEPT., FORT WORTH, TEXAS

SWITCH STAND TARGETS

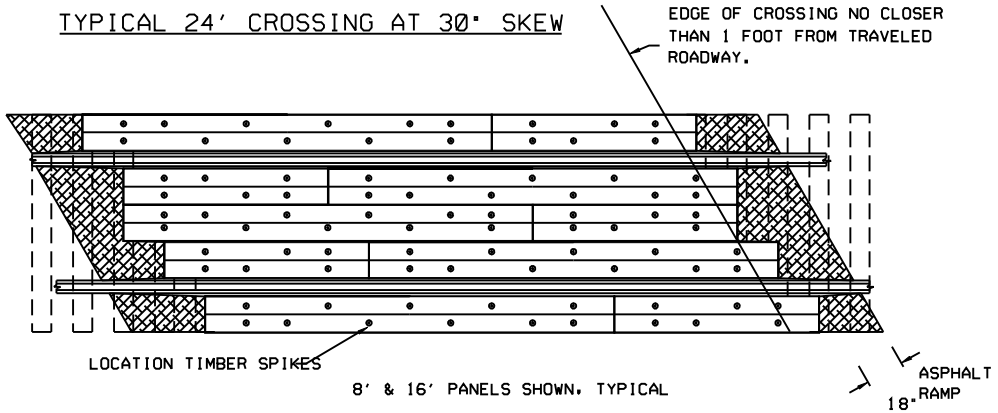
RAIL: N/A

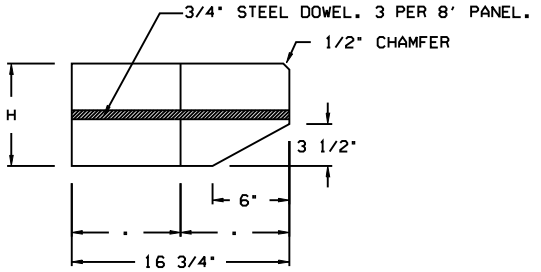
DATE: 05/22/03 | SCALE: NONE

DWG. NO.	SHEET NO.	REV. NO.
2159	01	12

19-18

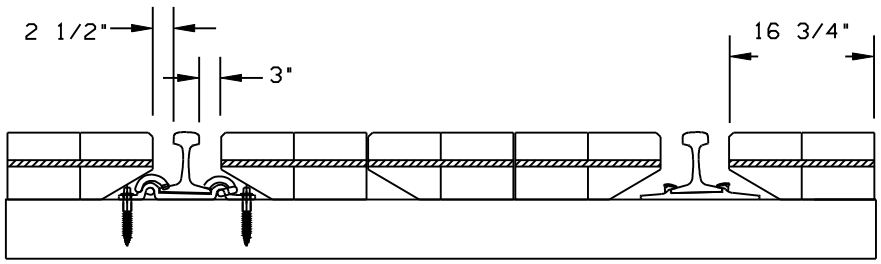
TYPICAL 24' CROSSING AT 30° SKEW





TWO PIECE PANEL

H = 7" FOR 100 LB RAIL
H = 7 1/2" FOR 115 LB RAIL
H = 8" FOR 136 LB. RAIL



8'6" CROSS TIE

MATERIAL & FABRICATION

1. HARDWOOD PANELS TO BE TREATED (BNSF SPECIFICATIONS) MIXED HARDWOOD, FREE OF WANE.
2. BRANDING: EACH CROSSING PANEL SHALL BE IDENTIFIED ON THE END WITH MANUFACTURER ID, MO/YR MANUFACTURED, WEIGHT RAIL.

INSTALLATION

1. BALLAST THROUGH CROSSING AREA SHALL BE CLEAN CRUSHED ROCK BALLAST, 12" BELOW BOTTOM OF TIES. TOP OF BALLAST TO BE 2" BELOW TOP OF TIES. TIES THROUGH CROSSING SHALL BE NO. 5 TREATED HARDWOOD 19 3/16" ON CENTERS, IN GOOD CONDITION.
2. IF REQUIRED BY GDLM, PERFORATED DRAINAGE PIPE RECOMMENDED FOR PROPER DRAINAGE PER BNSF DWG. 2259.01.
3. ENDS OF CROSSING PANELS SHOULD BE CENTERED ON TIE.
4. THERMITE WELDS OR RAIL JOINTS SHOULD BE LOCATED OUTSIDE THE CROSSING. WHEREVER POSSIBLE, WELDED RAIL SHOULD BE RELAYED THROUGH CROSSING (MINIMUM RAIL WEIGHT, 112 LB.) BEFORE NEW TIES AND CROSSING PANELS ARE INSTALLED.
5. PANELS SHALL BE HANDLED CAREFULLY, SLATTED AND STACKED ON LEVEL GROUND TO PREVENT WORPAGE.
6. PUBLIC CROSSINGS SHALL BE OF SUCH WIDTH AS PRESCRIBED BY LAW, BUT IN NO CASE SHALL THE WIDTH BE LESS THAN THAT OF THE ADJACENT TRAVELED ROADWAY PLUS 2 FEET.
7. TWIN LEAD TIMBER SPIKES FURNISHED SEPARATELY.
8. 3/8" DIA. HOLES SHOULD BE BORED IN FIELD, TO PATTERN SHOWN.
9. GAGE SIDE AND FIELD SIDE PANELS ARE INTERCHANGEABLE.
10. ALL CROSSING PANELS HAVE CLEARANCE FOR PANDROL PLATES AND CLIPS.
11. USE OF 10' TIES IS REQUIRED IN HEAVILY RAIL TRAFFIC CROSSINGS SEE DWG. 2253.03.
12. PANELS ARE FURNISHED FOR ANY LENGTH CROSSING IN INCREMENTS OF 8 AND 16 FEET. THE ITEM NUMBERS LISTED BELOW COVERS THE REQUIRED PANELS BY THE TRACK FOOT.

	BILL OF MATERIAL	
WT. RAIL	DESCRIPTION	STOCK CODE
100 LB	8' FULL DEPTH PANEL (2 PCS. DOWELED)	004938916
115 LB	8' FULL DEPTH PANEL (2 PCS. DOWELED)	004938940
115 LB	16' FULL DEPTH PANEL (2 PCS. DOWELED)	004938932
136 LB	8' FULL DEPTH PANEL (2 PCS. DOWELED)	004938866
136 LB	16' FULL DEPTH PANEL (2 PCS. DOWELED)	004938957
	3/4" X 12" TWIN LEAD TIMBER SPIKE	004744074
	3/4" X 13" TWIN LEAD TIMBER SPIKE	004743985

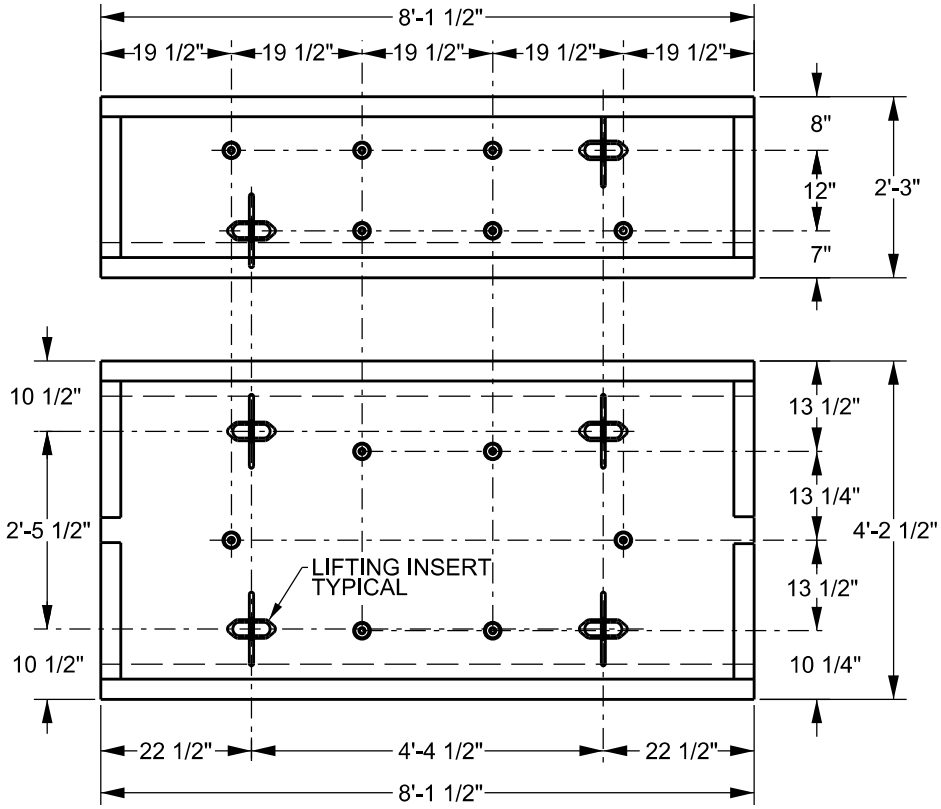
BNSF RAILWAY

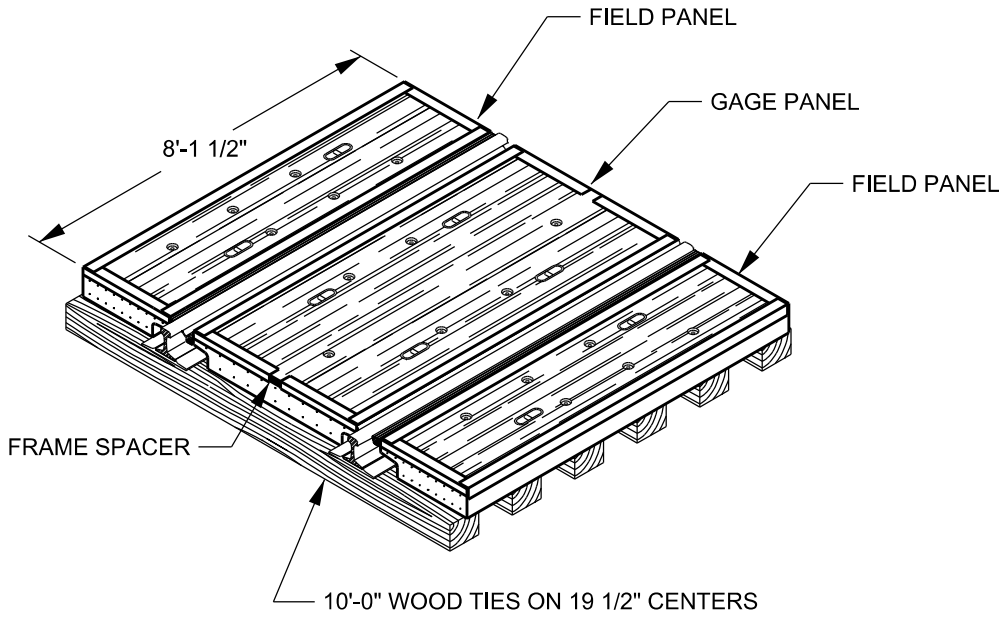
STANDARD PLAN

TIMBER CROSSING PANELS FOR LOW DENSITY RAIL TRAFFIC ON 8'6" WOOD TIES

SCALE: NONE	FILE OWNER BNSF	DATE: MAY 11, 2010
	REV. NO.: 07	DWG NO: 225302

15-17





NOTES:
1/4" RUBBER INTERFACE PAD TO BE PLACED BETWEEN PANEL AND TIES FOR 141 LB. RAIL SECTION. PAD TO BE NAILED TO TIES,

CROSSING TYPE - 10W

RAIL SIZE	PANEL HEIGHT	GAGE PANEL WEIGHT	FIELD PANEL WEIGHT
115	7 1/8"	2850 LBS.	1550 LBS.
132-141	7 7/8"	3125 LBS.	1675 LBS.

ITEM NUMBERS				
141 LB. BNSF	133-141 LB. UPRR	132-136 LB. BNSF	115 LB. UPRR	115 LB. BNSF
054374616	540-1301	004935722	540-0202	004935706

BNSF RAILWAY

UNION PACIFIC

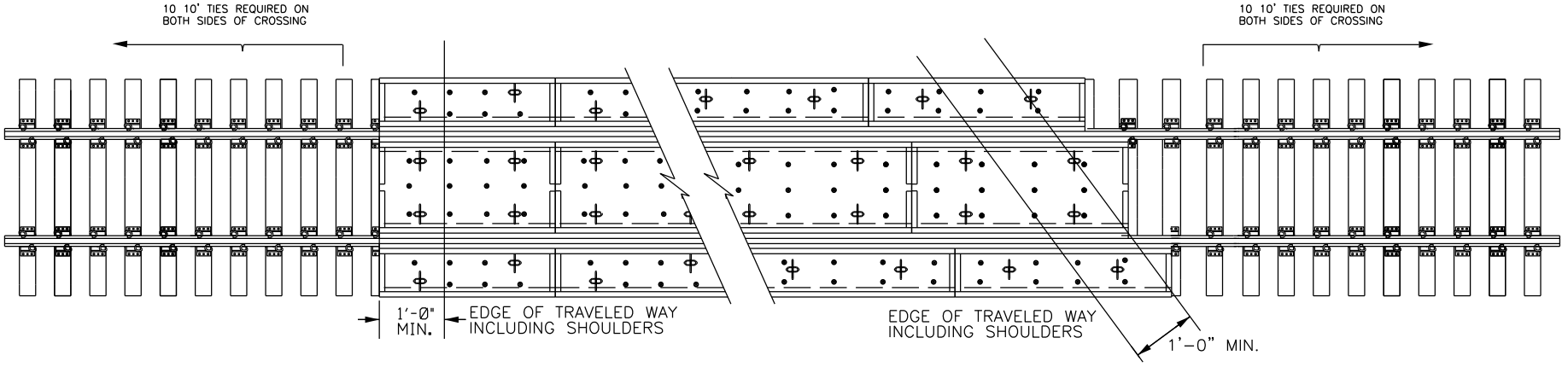
COMMON STANDARDS

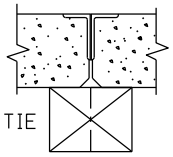
LAYOUT FOR CONCRETE PANELS ON 10'-0" LONG WOOD TIES (10W)

FILE OWNER: UPRR | DATE: DEC. 6, 2010

REV. NO.: 2 | DWG NO: 200100

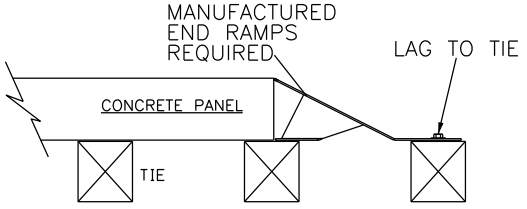
15-1



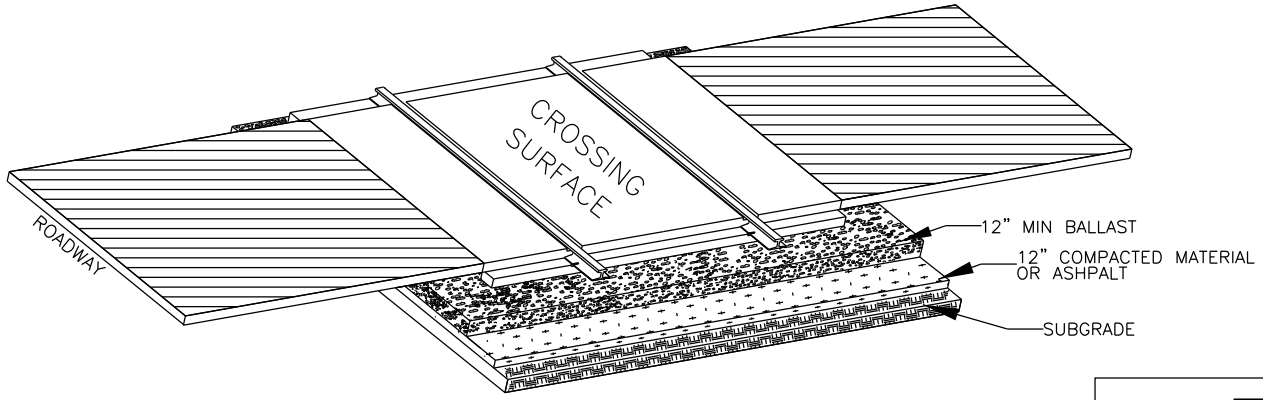


CONCRETE PANELS MUST BE SUPPORTED BY TIE AS SHOWN

CONCRETE CROSSING ON WOOD TIES



SIDE VIEW– FIELD RAMP SHOWN



BALLAST SECTION

NOTES:

SEE E.I. 10 FOR ROAD CROSSING REQUIREMENTS

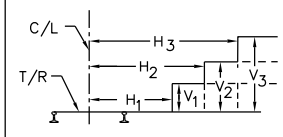
1. DIRECT DRAINAGE AWAY FROM THE TRACK
2. PREVENT MATERIAL FROM FOULING THE ROAD CROSSING BALLAST SECTION
3. DIVERT SURFACE WATER FLOWING ALONG THE ROADWAY OR APPROACHES AWAY FROM THE TRACK
4. SEE BNSF STANDARD PLANS 2258.03, 2258.04 AND 2258.05 FOR END RAMP SYSTEM

BNSF RAILWAY

ROAD CROSSING LAYOUT

DRAWING: 2259	SHEET: 01	REVISION: 07
DATE: OCTOBER 29, 2013	OWNER: BNSF	

15-22

		TRACK CENTERS									VERTICAL						HORIZONTAL																			
																							PLATFORMS H=HORIZONTAL CLEARANCE (MIN) V=VERTICAL CLEARANCE (MAX) 						SIGNALS											
STATE	REGULATION REFERENCE	YEAR OF LATEST AMENDMENT	MAIN TRACKS	ANY TWO SUBSIDIARY TRACKS	ADJACENT SUBSIDIARY TRACK TO ANY MAIN TRACKS	LADDER TRACK ADJACENT TO ANY PARALLEL TRACK	TWO ADJACENT PARALLEL LADDER TRACKS	LEAD, REPAIR AND CABOOSE TRACKS	TEAM TRACKS IN PAIRS	UNLOADING TRACKS AT PLATFORMS	GENERAL	THRU BRIDGES	HIGHWAY BRIDGES	TUNNELS	BUILDING DOORS	IN BUILDINGS	GENERAL	THRU BRIDGES	HIGHWAY BRIDGES	TUNNELS	BUILDING DOORS	IN BUILDINGS	V_1	H_1	V_2	H_2	V_3	H_3	HIGH	LOW BETWEEN TRACKS HEIGHT (MAX)	LOW BETWEEN TRACKS CLEARANCE	SWITCH BOXES, ETC. HEIGHT (MAX)	SWITCH BOXES, ETC. CLEARANCE	POLES	ORE AND COAL DOCKS	CATTLE CHUTES
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
ALABAMA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
ARIZONA	CHPTR. 5, ART. 1	1987	14-0	14-0	15-0	20-0	20-0	NR	13-0	13-6	22-0	22-0	23-0	22-0	$18^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$7^{2}8$	8-6	0-8	4-8			4-6	8-0	8-6	3-0	6-0	0-5	3-0	8-6	8-6	8-6
ARKANSAS	CASE R-1012	1956	14-0	14-0	14-0	17-0	20-0	14-0	13-0	13-0	22-0	22-0	22-0	23-0	$17^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$7^{4}0^{2}$	$7^{5}0$	0-8	5-0	4-0	$5^{6}9$	4-0	8-0	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
CALIFORNIA	G.O. 26-D	1988	14-0	14-0	15-0	20-0	20-0	14-0	13-0	13-0	22-6	22-6	22-6	22-6	18-0	$18^{3}0$	8-6	8-0	8-6	8-0	8-6	8-6	0-8	4-8	NR	NR	4-0	$7^{8}6$	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
CANADA	CHPTR. 1189	1983	13-0	13-6	14-0	15-0	18-0	13-6	12-0	12-0	22-6	22-6	22-6	22-6	22-6	22-6	8-4 1/4	8-0	8-4 1/4	8-0	8-4 1/4	8-4 1/4	12	12	12	12	4-0	12	8-4 1/4	3-0	8-4 1/4	NR	NR	8-4 1/4	8-4 1/4	8-4 1/4
COLORADO	DEC. 55621	1987	14-0	14-0	15-0	17-0	20-0	14-0	13-0	13-6	22-6	22-0	22-6	23-0	$17^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	7-0	$8^{5}0$	0-8	5-0	4-0	$5^{6}9$	4-0	8-6	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
IDAHO	G.O. NO. 158	1980	14-0	14-0	15-0	20-0	20-0	14-0	13-0	13-0	23-6	22-6	22-6	22-6	$18^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$8^{2}6$	$8^{2}6$	0-8	4-8	4-0	7-3	4-0	$8^{8}6$	8-0	3-0	6-0	0-4	3-0	8-6	8-6	8-6
ILLINOIS	TITLE 92 I.A.C.	1986	$13^{11}6$	13-6	15-0	$17^{15}0$	$19^{16}0$	NR	13-6	13-6	21-6	21-3	21-6	$21^{1}6$	H	21-6	8-0	8-0	8-0	$8^{1}0$	$7^{2}0$	8-0	0-4	4-6	0-8	$5^{7}1$	CFH	6-2	8-6	NR	NR	NR	NR	9-0	8-0	8-0
IOWA	NR	1982	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
KANSAS	ART. 5 -RSR	1987	14-0	14-0	14-0	17-0	20-0	14-0	13-0	13-6	22-6	22-6	22-6	23-0	17-0	18-0	8-6	8-6	8-6	8-0	$7^{13}0$	$7^{14}0$	0-8	5-0	4-0	$6^{6}2$	4-0	8-6	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
KENTUCKY	277.240	1942	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	22-0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
MINNESOTA	219.47	1980	14-0	14-0	14-0	17-0	19-0	14-0	14-0	14-0	22-0	22-0	22-0	22-0	$22^{2}0$	22-0	8-6	8-6	8-6	8-6	$8^{2}6$	8-6	NR	NR	NR	NR	NR	NR	8-6	NR	NR	NR	NR	8-6	8-6	8-6
MISSISSIPPI	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
MISSOURI	TTL 4 CSR 265-8.060	1987	14-0	14-0	14-0	17-0	19-0	14-0	13-6	14-0	22-0	22-0	22-0	22-0	22-0	22-0	8-6	8-0	8-0	8-6	$8^{2}6$	8-6	0-4	4-6	0-8	$5^{7}1$	CFH	8-6	8-6	4-0	$5-0^{10}_{8-0}$	0-3	4-2	8-6	8-6	8-6
MONTANA	ADM. RULES	1980	14-0	14-0	15-0	20-0	20-0	14-0	13-0	13-0	22-6	22-6	22-6	22-6	$18^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$8^{2}6$	8-6	0-8	4-8	4-0	$5^{6}9$	4-0	$8^{8}6$	8-0	3-0	6-0	0-4	3-0	8-6	8-6	8-6
NEBRASKA	ORD 16, CHPT 5, ART 4	1987	14-0	14-0	15-0	17-0	20-0	14-0	13-0	13-6	22-6	22-0	23-0	23-0	$17^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$7^{2}0$	$8^{5}6$	0-8	5-0	4-0	$5^{5}9$	4-0	8-6	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
NEW MEXICO	NMAC 18.14.2.9(B)	2011	14-0	14-0	15-0	17-0	20-0	14-0	13-0	13-0	22-6	22-0	22-6	23-0	$17^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$7^{4}0$	$7^{5}0$	0-8	4-8	4-0	$5^{5}9$	4-0	8-0	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
NORTH DAKOTA	SEC.49.10.1-13	1981	NR	NR	NR	NR	NR	NR	NR	NR	21-0	$21^{1}0$	21-0	$21^{1}0$	21-0	21-0	$8^{1}0$	$8^{1}0$	8-0	$8^{1}0$	8-0	8-0	NR	NR	NR	NR	4-0	8-0	8-0	NR	NR	NR	NR	8-0	8-0	8-0
OKLAHOMA	ORDER 33847	1987	14-0	14-0	14-0	17-0	20-0	14-0	13-0	13-6	22-0	22-0	22-0	23-0	$17^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$7^{2}0^{4}$	$7^{5}0$	0-8	4-8	4-0	$5^{5}9$	4-0	8-6	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
OREGON	ORDER 83-313	1983	15-0	14-0	15-0	20-0	20-0	14-0	14-0	13-0	20-9	20-9	20-9	20-9	$18^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	8-6	8-6	0-8	4-8	NR	NR	4-0	$7^{8}3$	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
SOUTH DAKOTA	ORDER F2465	1957	NR	NR	NR	NR	NR	NR	NR	NR	22-6	22-6	$22^{1}6$	22-6	17-0	22-6	8-6	8-0	$8^{1}0$	8-6	7-0	8-6	0-8	4-8	CFH	$5^{6}9$	NR	NR	8-0	NR	NR	0-4	3-0	8-6	8-6	8-6
TENNESSEE	RULE 1220-3-1-.12	1970	14-0	13-0	14-0	18-0	18-0	14-0	13-0	13-0	22-0	22-0	22-0	22-0	17-0	$17^{3}0$	8-0	8-0	8-0	8-0	8-0	8-0	0-8	4-8	4-0	5-9	4-0	7-6	8-0	NR	6-6	0-4	3-0	8-0	8-0	8-0
TEXAS	SEC. 5, CHPT 11	1988	NR	NR	NR	NR	NR	NR	NR	NR	22-0	22-0	22-0	NR	$22^{2}0$	22-0	8-6	7-6	8-6	NR	$8^{2}6$	8-6	1-0	4-6	NR	NR	4-0	8-6	8-6	2-6	5-6	0-6	4-0	8-6	8-6	8-6
WASHINGTON	CHPTR. 480-60	1969	14-0	14-0	15-0	20-0	20-0	14-0	13-0	13-0	22-6	22-6	22-6	22-6	$18^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$8^{2}6$	8-6	0-8	4-8	4-0	$7^{6}3$	4-0	$8^{8}6$	8-0	3-0	6-0	0-4	3-0	8-6	8-6	8-6
WISCONSIN	CHPTR. TC-3	1982	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0	22-0	$22^{1}0$	22-0	$22^{1}0$	22-0	22-0	8-6	E	8-6	$8^{1}6$	8-6	8-6	$\frac{0-4}{0-8}$	$\frac{4-6}{5-1}$	1-9	$6^{7}0$	5-0	6-4	8-6	E	E	E	E	12-0	8-6	8-6
WYOMING	CHPTR. XIII	1979	14-0	14-0	15-0	17-0	20-0	14-0	13-0	13-0	22-6	22-0	23-6	23-0	$17^{2}0$	$18^{3}0$	8-6	8-0	8-6	8-0	$7^{2}0^{4}$	$7^{5}0$	0-8	5-0	4-0	$5^{6}9$	4-0	8-6	8-6	3-0	6-0	0-4	3-0	8-6	8-6	8-6
BNSF RY. CO.	18	1997	$25^{19}0$	14-0	25-0	20-0	20-0	14-0	14-0	20	23-0	23-0	23-6	23-0	20	20	$8^{17}6$	8-6	21	8-6	20	20	20	20	20	20	20	20	8-6	20	$6^{12}0$	20	20	8-6	8-6	8-6

THIS CHART FOR INFORMATION ONLY – NO LIABILITY CAN BE ASSUMED
ARCHITECTS, CONTRACTORS, ETC., SHOULD CHECK WITH STATE INVOLVED.

DIMENSIONS:
SHOWN IN FEET AND INCHES.
ARE FOR TANGENT TRACK – MOST LAWS SPECIFY INCREASES FOR CURVED AND SUPERELEVATED TRACK.
VERTICAL – MEASURED FROM TOP OF RAIL. EXCEPT CANADA BASE OF RAIL FOR OTHER THAN PLATFORMS.
HORIZONTAL – MEASURED FROM CENTER LINE OF TRACK.
APPLY TO NEW CONSTRUCTION. SOME RECONSTRUCTION AND SOME EXTENSIONS SOME CAN BE VARIED UPON APPROVAL OF APPLICATION BY GOVERNING BODY.
ARE BASED ON MAXIMUM CAR SIZE FOR CALIFORNIA, IDAHO, MINNESOTA, MONTANA, NORTH DAKOTA, OREGON AND WASHINGTON.
ALL ARE MINIMUM EXCEPT COLUMNS 24, 26, 28, 31 AND 33 WHICH ARE MAXIMUM.

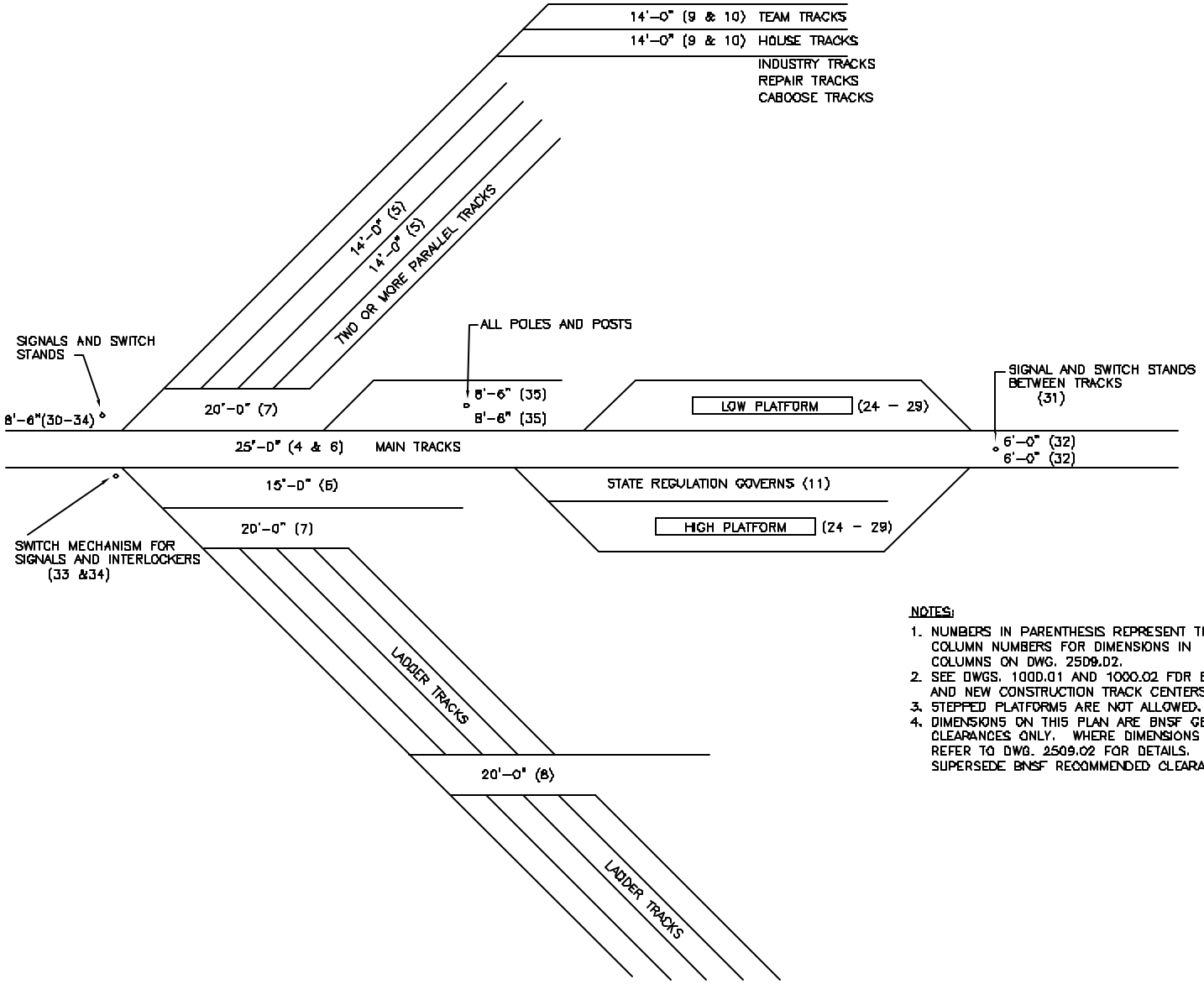
ABBREVIATIONS
CFH – CAR FLOOR HEIGHT
E – EXEMPT
H – HEIGHT OF CAR GOVERNS
NR – NO CURRENT REGULATION TO COVER

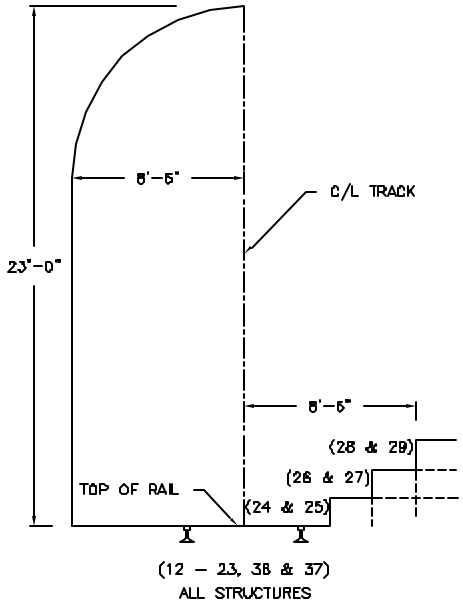
COLUMN HEADINGS
2 SHOWS BASIC REGULATION
3 SHOWS EFFECTIVE YEAR OR YEAR OF LATEST AMENDMENT
7 & 8 APPLY TO HAND AND MECHANICALLY OPERATED SWITCHES EXCEPT AS NOTED
12 & 18 PREVAILS FOR ALL ITEMS NOT OTHERWISE PROVIDED FOR
13 & 19 BRIDGES SUPPORTING TRACKS
14 & 20 BRIDGES SPANNING TRACKS
24 & 25 PASSENGER PLATFORMS
26 & 27 PASSENGER/FREIGHT PLATFORMS ON SIDE TRACKS EXCEPT AS NOTED.
28 & 29 FREIGHT PLATFORMS ON SIDE TRACKS STEPPED PLATFORMS ARE NOT ALLOWED.
35 OTHER THAN TROLLEY CONTACT POLES.
36 TO CENTER OF STAND EXCEPT AS NOTED.
37 APPLIES TO BOTH SUPPORTS AND PLATFORMS EXCEPT AS NOTED.

FOOTNOTES:
1 LESSER CLEARANCES NOT PERMITTED IN QUADRANTS
2 ENGINE HOUSES AND SHOP BUILDINGS EXEMPT OR PERMITTED LESSER DIMENSIONS
3 ONLY IF TRACKS END WITHIN BUILDINGS.
4 MAY BE REDUCED TO 5-9 IF 8-3 (8-6 FOR WY) PROVIDED ON OPPOSITE SIDE
5 MAY BE REDUCED TO 5-9 IF 8-0 (8-6 FOR NE, MO & WY) PROVIDED ON OPPOSITE SIDE
6 ONLY IF 8-0 (7-3 FOR MT & WY; 8-6 FOR WA & SD) PROVIDED ON OPP. SIDE
7 PASSENGER PLATFORMS ONLY.
8 MAY BE 8-0 AT 4-6 FOR REFRIGERATOR CAR PLATFORMS ONLY.
9 TO ENDS OF ARMS IN OPERATING POSITION.
10 FOR PLATFORMS AT CAR EAVE HEIGHT – SUPPORTS TO BE 8-0 (8-6 FOR TEXAS).
11 FOR FREIGHT TRACKS – CAN BE 13-0 FOR PASSENGER TRACKS.
12 REGARDING CANADA – CHECK STANDARD CLEARANCE DIAGRAM APPROVED BY BOARD OF TRANSPORT COMMISSIONERS FOR CANADA FOR RAILWAY INVOLVED.
13 MAY BE REDUCED TO 6-2 IF 8-3 PROVIDED ON OPPOSITE SIDE.
14 MAY BE REDUCED TO 6-2 IF 8-0 PROVIDED ON OPPOSITE SIDE.
15 FOR HAND OPERATED SWITCHES – MAY BE 15-0 FOR MECHNICALLY OPERATED SWITCHES.
16 FOR HAND OPERATED SWITCHES – MAY BE 17-0 FOR MECHANICALLY OPERATED SWITCHES.
17 MUST HAVE ADDITIONAL SIDE CLEARANCE OF 1 1/2 INCH PER DEGREE OF CURVATURE.
18 IF NO FIGURE IS GIVEN USE STATUORY CLEARANCE.
19 NEW CONSTRUCTION 25-0 CENTER TO CENTER MAIN TRACK/CONTROL SIDING.
20 STATE REGULATION GOVERNS.
21 CENTER LINE OF TRACK TO CLOSEST EDGE OF PIER: MAIN LINE-25'0", OTHERS-18'-0".

2-3

BURLINGTON NORTHERN SANTA FE STANDARD PLAN ENGINEERING DEPT., FORT WORTH, TEXAS	CLEARANCE REQUIREMENTS BY STATE AND RECOMMENDED BNSF CLEARANCE	DATE: 04/01/2013 USE OF THIS DRAWING IS LIMITED TO BURLINGTON NORTHERN SANTA FE AND THE PARTY DESIGNATED ON THE ATTACHED EXHIBIT "A". USE MAY NOT BE MADE BY ANY THIRD PARTY WITHOUT THE WRITTEN CONSENT OF BURLINGTON NORTHERN SANTA FE.	DWG. NO. 2509	SHEET NO. 02	REV. NO. 03





NOTES:

1. NUMBERS IN PARENTHESIS REPRESENT THE COLUMN NUMBERS FOR DIMENSIONS IN COLUMNS ON DWG. 2509.02.
2. SEE DWGS. 1000.01 AND 1000.02 FOR EXISTING AND NEW CONSTRUCTION TRACK CENTERS.
3. STEPPED PLATFORMS ARE NOT ALLOWED.
4. DIMENSIONS ON THIS PLAN ARE BNSF GENERAL CLEARANCES ONLY. WHERE DIMENSIONS ARE NOT SHOWN, REFER TO DWG. 2509.02 FOR DETAILS. STATE REGULATIONS SUPERSEDE BNSF RECOMMENDED CLEARANCES.

BURLINGTON NORTHERN SANTA FE
STANDARD PLAN
ENGINEERING DEPT., FORT WORTH, TEXAS

BNSF
MINIMUM CLEARANCES
DIAGRAM

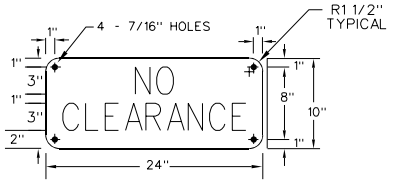
RAIL: NONE

DATE: 10/29/97 | SCALE: NONE

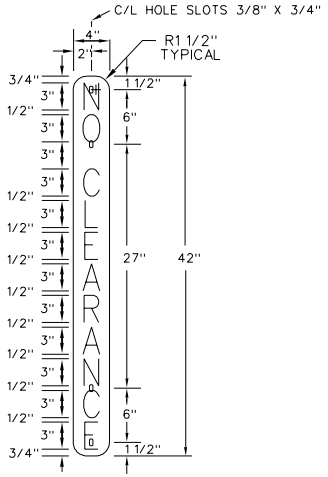
DWG. NO.	SHEET NO.	REV. NO.
2509	01	09

2-2

EXAMPLE 1



EXAMPLE 2



SIGNS:

NO. 44 - "NO CLEARANCE"

PLACE NO CLEARANCE SIGN ON BUILDING STRUCTURE OVER C/L TRACK WHERE VERTICAL CLEARANCE IS LESS THAN REQUIRED. LETTERED AND MOUNTED AS SHOWN IN EXAMPLE 1.

NO. 44A - "NO CLEARANCE"

PLACE NO CLEARANCE SIGN ON BUILDING STRUCTURE OR POST WHERE HORIZONTAL CLEARANCE IS LESS THAN REQUIRED. LETTERED AND MOUNTED AS SHOWN IN EXAMPLE 2.

NOTES:

1. THE SIGNS LISTED IN THIS PLAN ARE 10" X 24" AND 4" X 42" SIZED WITH WHITE BACKGROUND AND BLACK LETTERS, ONE SIDE ONLY, AS SHOWN IN EXAMPLES 1 AND 2.
2. SEE PLAN 3000.01 FOR ADDITIONAL SPECIFICATIONS AND INFORMATION CONCERNING THE REFLECTIVE AND PANEL MATERIAL.
3. FOR USE IN THE STATE OF MINNESOTA AS ORDERED BY THE PUB. SERV. COMM. AT POINTS WHERE CLEARENCE IS LESS THAN THE LEGAL REQUIREMENT.

BILL OF MATERIALS

QUANTITY	SIGN PANEL
1 EA.	SIGN NO. 44-NO CLEARANCE ITEM NO. 047220983
1 EA.	SIGN NO. 44A-NO CLEARANCE ITEM NO. 047220984
	OPTIONAL HARDWARE
1 EA.	2 LB. PER LIN. FT. GALVANIZED FLANGED CHANNEL STEEL POST, 8'-0" LONG WITH 3/8"0 MONTING HOLES, 1" CENTERS, WITH POINTED END.
2 EA.	5/16" DIA. X 2" GALVANIZED ROUND HEAD SQUARE NECK MACHINE BOLT, ALL THREAD, WITH LOCK NUT AND WASHER.

BURLINGTON NORTHERN SANTA FE
STANDARD PLAN
ENGINEERING DEPT., FORT WORTH, TEXAS

CLEARANCE
SIGNS

RAIL:

DATE: 06/10/96 | SCALE:

DWG. NO.	SHEET NO.	REV. NO.
3044	01	04

VERTICAL CURVES

Vertical curves should be used to round off all intersecting grades.

The length of a vertical curve is determined by the grades to be connected and the speed of the traffic.

The rate of change for tracks with a vertical curve concave upwards (sag) should be one-half the rate of change of a vertical curve concave downward (summit).

The rate of change for high-speed main tracks (> 50 MPH) should not be more than 0.05 feet per station (of 100 feet) in sags, and not more than 0.10 feet per station on summits.

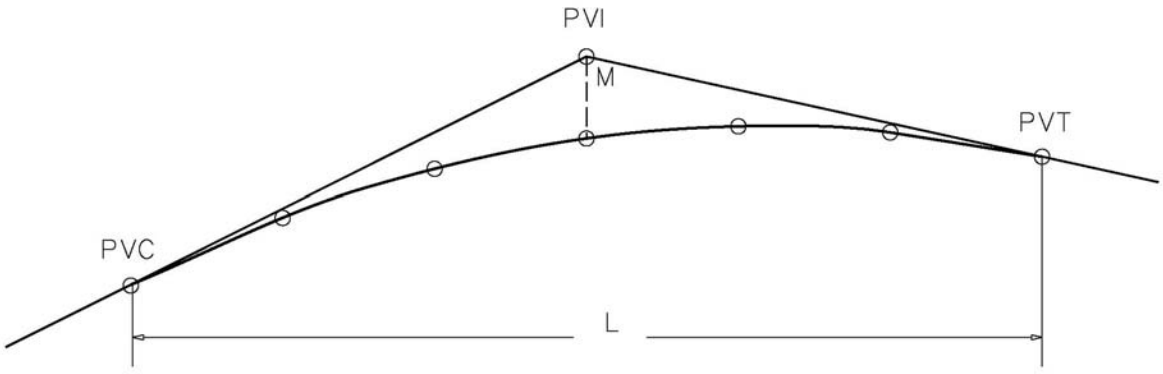
For secondary main tracks (speed < 50 MPH), the rate of change should not be more than 0.10 feet per station in sags, and not more than 0.20 feet per station on summits.

For industry tracks and non-main tracks with speeds not greater than 20 MPH, the rate of change should not be more than 2.0 feet per station for both sags and summits.

The rate of change per station is calculated as follows: R = D/L Where:

R = Rate of change per station
D = Algebraic difference of the two intercepting grades
L = Length of vertical curve in 100-ft. stations
M = Correction from the straight grade to the vertical curve

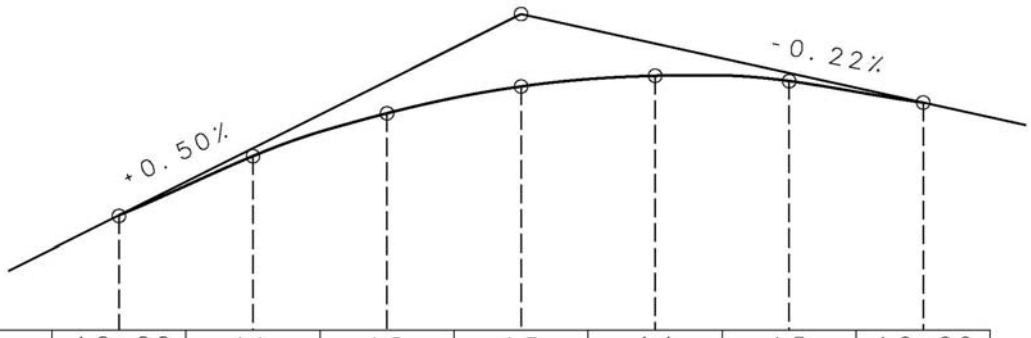
A parabola is used for the vertical curve in which the correction from the straight grade for the first station is one half the rate of change, and the others vary as the square of the distance from the point of tangency. Where points fall on full stations, it will be necessary to figure these for only one half the vertical curve, as they are the same for corresponding points each side of the vertex. Corrections are (-) when the vertical curve is concave downwards (summit), and (+) when the vertical curve is concave upwards (sag). The rate of change may be assumed and the length of vertical curve computed, or preferable the length assumed and the rate computed.



VERTICAL CURVES

For example:

Assume length = 600 feet (6 stations)
D – 0.50 minus –0.22 = 0.72
R = 0.72/6 = 0.12



Station	10+00	11	12	13	14	15	16+00
Elevation	90.00	90.50	91.00	91.50	91.28	91.06	90.84
Correction	0.00	0.06	0.24	0.54	0.24	0.06	0.00
Elevation	90.00	90.44	90.76	90.96	91.04	91.00	90.84
Percent Grade		+.44	+.32	+.20	+.08	-.04	-.16	

Calculate the straight-grade elevations for each station.

The correction for the first station is one-half the rate of change (R). So, the correction for station 11 is 0.06 (minus since it concaves downwards).

The correction for the Station 12 is 4(0.06) = 0.24. This is the correction to the first station (one-half the rate of change) multiplied by the square of the length, in stations, from the PVC. At Station 13 (the PVI), the correction is 9(0.06) = 0.54. Notice the corrections for Stations 11 and 15 are the same. Likewise, for 12 and 14, since they are the same distance from the PVC and PVT. So, only one-half of the curve's corrections need to be calculated.

Next, apply the correction at each station to the straight-grade elevation to obtain the elevation on the vertical curve.

A simpler method of computing this and one that furnishes check throughout is the following:

Sta. 10	90.00	
	+0.44	(% grade sta. 9 to 10) minus one half rate = 0.50 – 0.06
Sta. 11	90.44	
	+0.32	(% grade sta. 10 to 11) minus rate = 0.44 – 0.12
Sta. 12	90.76	
	+0.20	(% grade sta. 11 to 12) minus rate = 0.32 – 0.12
Sta. 13	90.96	
	+0.08	(% grade sta. 12 to 13) minus rate = 0.20 – 0.12
Sta. 14	91.04	
	-0.04	(% grade sta. 13 to 14) minus rate = 0.08 – 0.12
Sta. 15	91.00	
	-0.16	(% grade sta. 14 to 15) minus rate = -0.04 – 0.12
Sta. 16	90.84	

BNSF Railway

Underground Cable Location and Acknowledgement

Date: _____ Project: _____

Meeting Location: _____ Time: _____

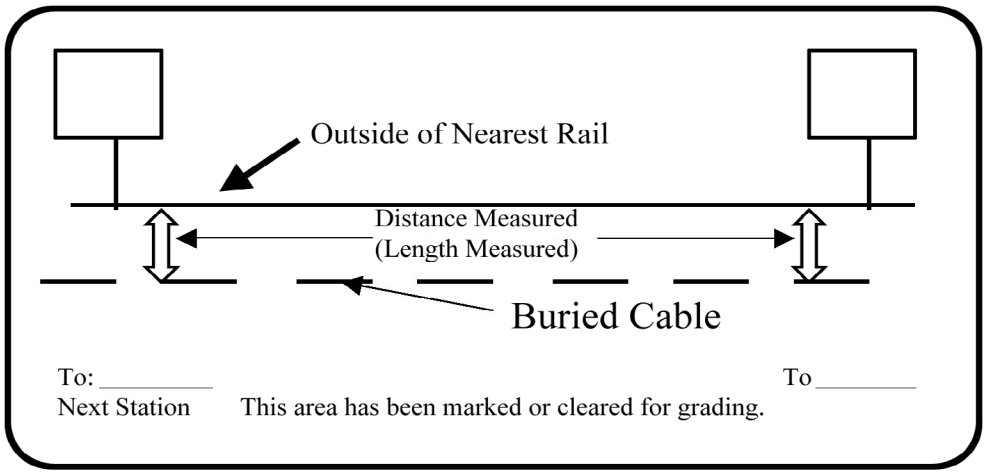
Attendees at proposed work site (Signature of representative)

☐ BNSF Telecom _____

☐ BNSF Signal _____ ☐ Grading Contractor _____

☐ Project Inspector _____ ☐ Flag Person on Duty _____

No grading will be permitted in this area without this completed form in the possession of the above.



Notes:
All signal cables must be marked with paint and flags (as ground conditions permit) prior to any grading.

_____

_____

_____

_____

_____

_____

 Revision: October 15, 2004

Figure 26-1. Underground Cable Location and Acknowledgement

STAKING OUT REQUIRES A
RAILROAD QUALIFIED LOOKOUT
FLAGGER TO PROVIDE
AUTHORITY TO WORK WITHIN 25'
OF THE TRACKS

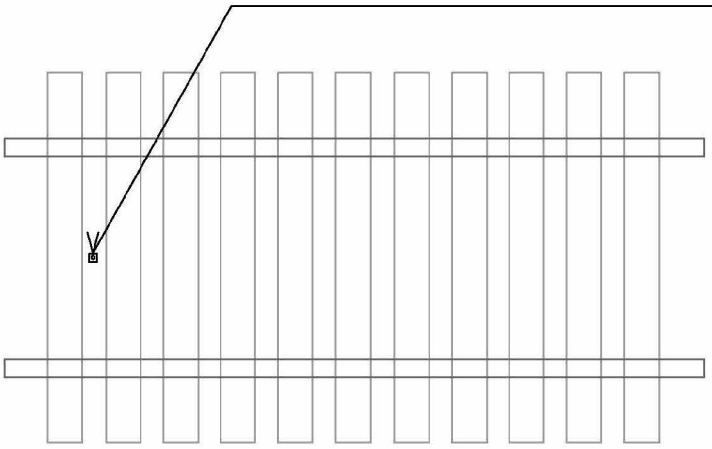
Stake additional offset stake at around the edge
of the turnout pad (~45'-56'+) and write on the stake:

(PSw - mm/dd/yy location type - project description)

Example:
PSw - 1/1/15 E WILLISTON ED - NFC/EVR

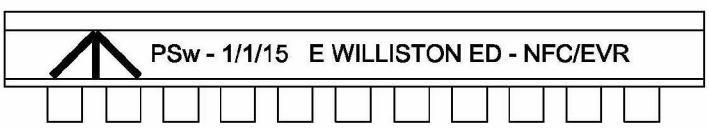
Insert stake/pin with a highly visible ribbon
Write information on ribbon or spray on ground

Stake must be completely hammered into the ground
and shall not pose a tripping hazard for crews



PLAN VIEW

(PSw - mm/dd/yy location type - project description)



SIDE VIEW

STAKE OUT GUIDELINES
BNSF RAILWAY SWITCH INSTALLS

DIVISION
SUBDIVISION
LINE SEGMENT

BNSF RAILWAY COMPANY - ENGINEERING SERVICES

I acknowledge that I have received the internet link and/or hard copy of BNSF's "Guidelines for Industry Track Projects" dated August 2018. I understand that the design and construction of this facility will follow the Guidelines. Questions concerning the Guidelines are to be directed to the BNSF Project Engineer listed below.

http://www.bnsf.com/customers/pdf/indytrkstds.pdf <<Industrial Track Guidelines

http://www.bnsf.com/communities/faqs/pdf/utility.pdf << Utility Specs

Owner Representative

_____ _____

Signature Date

_____ _____

Printed Company Name

_____

BNSF Project Engineer