Exhibit No. ___ (KH-8)
Docket TR-100572
Witness: Kathy Hunter

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

BENTON COUNTY, **Petitioner,** **v.** **BNSF RAILWAY COMPANY,** **Respondent.**	**DOCKET TR-100572**

EXHIBIT TO TESTIMONY OF

Kathy Hunter

STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION

WSDOT Design Manual M 22-01.07, July 2010
Railroad Grade Crossings, Chapter 1350 (excerpt)

November 29, 2010

Chapter 1350 Railroad Grade Crossings

1350.01 General

Highway-rail grade crossings ("grade crossings") are the intersection of two modes of transportation with very different physical and operational characteristics. Because of the inherent limitations associated with train operations, RCW 46.61.350 gives train traffic the right of way at grade crossings, thereby assigning motorists the primary responsibility to avoid collisions.

There are many variables that influence a motorist's ability to react appropriately at grade crossings, including what information is available to them as they approach the crossing and human factors such as competing decisions, distractions, and impaired driving. Primary factors to consider in the design of grade crossings are roadway and railway geometry; available sight distance; highway and railway speeds; competing decisions or visual distractions; and the types of warning devices at the grade crossing.

Another aspect of grade crossing design is coordination of highway traffic signal operations with grade crossing active warning devices ("railroad preemption") when signalized intersections are located near grade crossings. In such instances, railroad preemption is designed to clear the tracks of any vehicles that may be stopped as a result of the highway traffic signal when a train is approaching the grade crossing. Further guidance on railroad preemption requirements is provided in Chapter 1330.

Grade crossings are also unique due to their multijurisdictional nature. Highway authorities and railroad companies are each legally responsible for different elements at grade crossings. Additionally, the Washington Utilities and Transportation Commission (WUTC) is the state regulatory agency with oversight of public grade crossings in Washington, except within the limits of first class cities in accordance with RCW 81.53.240. Establishing new crossings, altering existing crossings, or closing crossings all require WUTC approval. Therefore, highway projects that include a grade crossing will generally require close coordination with both the railroad company and the WUTC.

Projects that include grade crossings will generally require execution of construction and maintenance agreements between the Washington State Department of Transportation (WSDOT) and the railroad company. These agreements specify the design elements of the crossing, work that the railroad will perform on behalf of the project, payment terms, and legal provisions. It may also be necessary for WSDOT to obtain easements from the

1350.04 Traffic Control Systems

(1) Traffic Control System Elements

There are two categories of railroad warning devices: "passive" and "active." Passive devices include all signs and pavement markings. Active devices include flashing light signals, railroad warning gates, and active advance warning systems, all of which are activated by approaching trains.

(a) Passive Elements

1. The following signing elements are shown in the MUTCD, Part 8, Traffic Control for Highway-Rail Grade Crossings:
   - **Highway-Rail Grade Crossing (Crossbuck) sign**: Crossbuck signs identify the location of the grade crossing and convey the same meaning as a yield sign. The railroad is responsible for installation and maintenance of Crossbuck signs.

   Note: Railroads are required to upgrade standard Crossbuck signs at passive grade crossings to "Crossbuck Assemblies" by December 31, 2019. Crossbuck Assemblies are Crossbuck signs mounted in conjunction with STOP or YIELD signs. Any projects that establish new passive crossings or result in reconstruction of passive crossings should include design of Crossbuck Assemblies. (See Chapter 8 of the MUTCD for additional guidance.)
   - **Supplemental Number of Tracks (inverted "T") sign**: This sign is mounted below the Crossbuck sign to indicate the number of tracks when two or more tracks are involved. The railroad is responsible for installation and maintenance of these signs.
   - **Grade Crossing Advance Warning sign (W10 sign series)**: The road authority is responsible for installation and maintenance of these signs.
   - **Exempt sign**. This is a supplemental sign that, when authorized by the WUTC, may be mounted below the Crossbuck sign. When this sign is approved, certain classes of vehicles, otherwise required to stop before crossing the tracks, may proceed without stopping, provided no train is approaching. The road authority is responsible for installation and maintenance of these signs.
   - **Do Not Stop on Tracks sign**: This sign is used where it is determined that additional emphasis is needed to remind motorists of this legal requirement, such as where nearby roadway intersections result in queuing back across the tracks. The road authority is responsible for installation and maintenance of these signs.
2. Pavement markings on all paved approaches are the responsibility of the road authority and consist of **RR Crossing** markings in accordance with the *Standard Plans*, **No Passing** markings, and **Pullout Lanes**, as appropriate.
3. Consider the installation of illumination at and adjacent to railroad crossings where an engineering study determines that better nighttime visibility of the train and the grade crossing is needed. For example, where:
   - A substantial number of railroad operations are conducted at night.
   - Grade crossings are blocked for long periods at night by slow-speed trains.
   - Collision history indicates that drivers experience difficulty seeing trains during hours of darkness.

(b) **Active Elements**

1. **Railroad Flashing Light Signals and Gates**: These are active devices intended to warn motorists of approaching trains and impose a stopping requirement. The railroad is responsible for installation and maintenance of these devices.
2. **Traffic Signal Interconnection** (also known as "railroad preemption"): These provide linkage between the railroad signals and adjacent traffic signals to allow vehicles to clear the tracks at a traffic signal as a train approaches. They are typically funded by the road authority and require cooperation with the railroad for installation. The formation of a Railroad Crossing Evaluation Team is required to determine signal railroad preemption requirements. (See Chapter 1330 for further guidance.)
3. **Pre-Signals**: These are traffic control signal faces that control roadway traffic approaching a grade crossing in conjunction with the traffic control signal faces that control traffic approaching a roadway-roadway intersection beyond the tracks. Pre-signals are typically used where the clear storage distance is insufficient to store one or more design vehicles.
4. **Active Advance Warning Systems**: These are supplemental flashing yellow beacons mounted along with the grade crossing advance warning signs that are interconnected to the railroad active warning devices. Activation of the railroad active warning devices activates the beacons to provide motorists with an advance indication that a train is approaching or occupying the crossing. Active advance warning systems are typically used where roadway geometry prevents a clear view of the grade crossing ahead, or where higher highway speeds may require advance notification of an impending stopping requirement. Use a plaque stating "Train When Flashing" as part of such systems.
5. **Supplemental Safety Devices**: Supplemental safety devices are typically used at locations where it is known that motorists frequently drive around gates, where unique local safety hazards exist, or as part of railroad quiet zones where trains are no longer required to sound the locomotive horn. (For more information about quiet zones, see www.fra.dot.gov/us/Content/1318.)

   Typical supplemental safety devices include:

   - **Four-Quadrant Gate Systems**: These are additional gates placed on the opposite side of the roadway from the primary railroad warning gates that, when lowered, make it impossible for motorists to drive around the lowered gates. (See Chapter 8 of the MUTCD for additional information on four-quadrant gate systems.
   - **Median Separators**: This is a system of raised delineators extending along the roadway centerline back from the tip of a lowered railroad warning gate that prevents motorists from being able to drive around the lowered gates. Make median separators at least 60 feet in length where sufficient space is available.

(c) **Selection of Grade Crossing Warning Devices**

At a minimum:

- All public grade crossings are required to be equipped with Crossbuck signs, a supplemental plaque indicating the presence of multiple tracks (if applicable), and advance warning signs.
- Railroad pavement markings are required at all crossings where active warning devices are present or the posted legal speed limit is 40 mph or higher.

Passive warning devices notify drivers that they are approaching a grade crossing and to be on the lookout for trains. In general, consider stand-alone passive warning devices at grade crossings with low volumes and speeds on both the highway and railway, and where adequate sight distances exist. Active warning devices are to be considered at all other crossings. No national or state warrants have been developed for installation of traffic control devices at grade crossings. Furthermore, due to the large number of significant variables that need to be considered, there is no single system of active traffic control devices universally applicable for grade crossings. Warning systems at grade crossings should be based on an engineering and traffic investigation, including input from the railroad and the WUTC. Primary factors to consider in selecting warning devices are train and highway volumes and speeds; highway and railway geometry; pedestrian volume; accident history; and available sight distance.

Evaluate railroad signal supports and gate mechanisms as roadside features to be considered for mitigation. Use traffic barrier or impact attenuators as appropriate (see Division 16).

1350.05 Nearby Roadway Intersections

Operations at roadway intersections located near grade crossings can present significant challenges for grade crossing safety. In particular, vehicle queues originating from the roadway intersection and extending back to the grade crossing must be clear of the tracks before the arrival of any trains. While RCW 46.61.570 prohibits motorists from stopping on any railroad tracks, it is not uncommon for motorists to stop on tracks when focusing on the downstream highway intersection rather than the immediate grade crossing.

For signalized highway intersections where vehicle queues result from a red signal indication, clearance of vehicles from the grade crossing is accomplished through traffic signal interconnection with the railroad warning signals ("railroad preemption"). When railroad preemption is in place, an approaching train will initiate a special mode within the highway traffic signal specifically designed to clear any vehicles from the tracks prior to the arrival of the train at the grade crossing. Railroad preemption design involves a specialized analysis that considers the distance between the roadway intersection and grade crossing; queue clearance times; train speeds; the capabilities of the railroad active warning devices; and other traffic signal phases.