**Exhibit No. ___ (KH-10)**
**Dockets TR-100127,**
**TR-100128, TR-100129, and**
**TR-100131 (*consolidated*)**
**Witness: Kathy Hunter**

**BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

| | |
|---|---|
| **WASHINGTON STATE DEPARTMENT OF TRANSPORTATION,**<br><br>**Petitioner,**<br><br>**v.**<br><br>**CENTRAL PUGET SOUND REGIONAL TRANSPORTATION AUTHORITY AND THE CITIES OF LAKEWOOD AND DUPONT,**<br><br>**Respondents.** | **DOCKETS TR-100127, TR-100128, TR-100129, and TR-100131 (*consolidated*)** |

**EXHIBIT TO**

**TESTIMONY OF**

**KATHY HUNTER**

**STAFF OF**

**WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

***U.S. Department of Transportation***
***Guidance on Traffic Control Devices at Highway-Rail Grade Crossings***
***Executive Summary***

**May 7, 2010**

U.S. Department of Transportation
Federal Highway Administration

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

HIGHWAY/RAIL GRADE CROSSING TECHNICAL WORKING GROUP (TWG)

NOVEMBER 2002

# GUIDANCE ON TRAFFIC CONTROL DEVICES AT HIGHWAY-RAIL GRADE CROSSINGS

## EXECUTIVE SUMMARY

The Technical Working Group (TWG) established by the U.S. Department of Transportation, is led by representatives from the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), Federal Transit Administration (FTA), and the National Highway Traffic Safety Administration (NHTSA). The cooperation among the various representatives of the TWG represents a landmark effort to enhance communication between highway agencies, railroad companies and authorities, and governmental agencies involved with developing and implementing policies, rules and regulations.

The report is intended to provide guidance to assist engineers in selection of traffic control devices or other measures at highway-rail grade crossings. It is not to be interpreted as policy or standards. Any requirements that may be noted in this guidance are taken from the Manual on Uniform Traffic Control Devices (MUTCD) or other document identified by footnotes. These authorities should be followed. This guide merely tries to incorporate some of the requirements found in those documents. A number of measures are included which may not have been supported by quantitative research, but are being used by States and local agencies. These are included to inform practitioners of an array of tools used or being explored.

The goal is to provide a guidance document for users who understand general engineering and operational concepts of highway-rail grade crossings. The Guide serves as a reference to aid in decisions to install traffic control devices or otherwise improve such crossings. Additional references are provided as resource for further information.

The Guide discusses a number of existing laws, regulations and policies of the FHWA and FRA concerning highway-rail grade crossings and railroad operations, driver needs concerning various sight distance, and highway and rail system operational requirements and functional classification. There is an extensive description of passive and active traffic control devices, including supplemental devices used in conjunction with active controls. Traffic control devices in the 2000 edition of the MUTCD are listed, together with a few experimental devices. An appendix provides limited discussion on the complex topic of interconnection and preemption of traffic signals near highway-rail grade crossings. There is also discussion concerning closure, grade separation and consideration for installing new grade crossings. A glossary defines a few less familiar and technical terms. (Please note that the term grade crossings is synonymous with both the terms "highway-rail grade crossings" and "highway-rail intersections" in this document.)

A traffic control device selection procedure and extensive list of quantitative guidance are the specific products of this document. However, due to the unique characteristics of each individual crossing, these procedures and practices should not be considered as warrants or standards. Therefore, selection decisions must be made based on engineering studies.

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situation cannot be ignored. This subject is addressed in a 1994 joint FRA/FHWA publication entitled *Highway-Railroad Grade Crossings: A Guide To Crossing Consolidation and Closure*, and a March 1995 AASHTO publication, *Highway-Rail Crossing Elimination and Consolidation*.[18]

Whenever a crossing is closed, it is important to consider whether the diversion of highway traffic may be sufficient to change the type or level of traffic control needed at other crossings. The surrounding street system should be examined to assess the effects of diverted traffic. Often, coupling a closure with the installation of improved or upgraded traffic control devices at one or more adjacent crossings can be an effective means of mitigating local political resistance to the closure.

## *GRADE SEPARATION*

The decision to grade separate a highway-rail crossing is primarily a matter of economics. Investment in a grade separation structure is long-term and impacts many users. Such decisions should be based on long term, fully allocated *life cycle* costs, including both highway and railroad user costs, rather than on initial construction costs. Such analysis should consider the following:

- eliminating train/vehicle collisions (including the resultant property damage and medical costs, and liability);
- savings in highway-rail grade crossing surface and crossing signal installation and maintenance costs;
- driver delay cost savings;
- costs associated with providing increased highway storage capacity (to accommodate traffic backed up by a train);
- fuel and pollution mitigation cost savings (from idling queued vehicles);
- effects of any "spillover " congestion on the rest of the roadway system;
- the benefits of improved emergency access;
- the potential for closing one or more additional adjacent crossings; and
- possible train derailment costs.

A recently released report, entitled "Grade Separations-When Do We Separate,[19]" provides a stepwise procedure for evaluating the grade separation decision. The report also contains a rough screening method based on train and roadway vehicular volumes. However, as pointed out in the report, the screening method should be used with caution and should be calibrated for values appropriate for the particular jurisdiction.

## *TRAFFIC SEPARATION STUDY APPROACH TO CROSSING CONSOLIDATION*

Both the FRA [20] and the AASHTO [21] have provided guidelines for crossing consolidation. State DOTs, road authorities and local governments may choose to develop their own criteria for closures based on local conditions. Whatever the case, a specific criteria or approach should be used, so as to avoid arbitrarily selecting crossings for closure. An example is provided by the North Carolina DOT.[22]

To improve crossing safety and provide a comprehensive approach to crossing consolidation, the traffic separation study approach is a worthwhile option. As part of a comprehensive evaluation of traffic patterns and road usage for an entire municipality or region, traffic separation studies determine the need for improvements and/or elimination of public highway-rail grade crossings based on specific criteria. Traffic separation studies progress in three phases: preliminary planning, study and implementation.

Crossing information is collected at all public crossings in the municipality. Evaluation criteria include: collision history, current and projected vehicular and train traffic, crossing condition, school bus and emergency routes, types of traffic control devices, feasibility for improvements and economic impact of crossing closures. After discussions with the local road authority, railroad, State DOT, municipal staff and local officials these recommendations may be modified. Reaching a "consensus" is essential prior to scheduling presentations to governing bodies and citizens.

Recommendations may include: installation of flashing-lights and gates, enhanced devices such as four-quadrant gates and longer gate arms, installation of concrete or rubber crossings, median barrier installation, pavement markings, roadway approach modifications, crossing or roadway realignments, crossing closures and/or relocation of existing crossings to safer locations, connector roads, and feasibility studies to evaluate potential grade separation locations.

exists within .4 km (1/4 mi) and the median trip length normally made over the subject crossing would not increase by more than 1.2 km (3/4 mi);

b. AADT less than 100 in rural areas, acceptable alternate access across the rail line exists within 1.61 km (1 mi) and the median trip length normally made over the subject crossing would not increase by more than 4.8 km (3 mi).

3. FRA Class 6 or higher track with active rail traffic, AADT less than 250 in rural areas, an acceptable alternate access across the rail line exists within 2.4 km (1-1/2 mi) and the median trip length normally made over the subject crossing would not increase by more than 6.4 km (4 mi); and

D. An engineering study determines the crossing should be closed to vehicular and pedestrian traffic when railroad operations will occupy or block the crossing for extended periods of time on a routine basis and it is determined that it is not physically or economically feasible to either construct a grade separation or shift the train operation to another location. Such locations would typically include:

1. Rail yards;
2. Passing tracks primarily used for holding trains while waiting to meet or be passed by other trains;
3. Locations where train crews are routinely required to stop their trains because of cross-traffic on intersecting rail lines or to pick up or set out blocks of cars or switch local industries en route;
4. Switching leads at the ends of classification yards;
5. Where trains are required to "double." in or out of yards and terminals;
6. In the proximity of stations where long distance passenger trains are required to make extended stops to transfer baggage, pick up or set out equipment or be serviced en route; and
7. Locations where trains must stop or wait for crew changes.

6. ***GRADE SEPARATION***

A. Highway-rail grade crossings should be considered for grade separation or otherwise eliminated across the railroad right-of-way whenever one or more of the following conditions exist:

1. The highway is a part of the designated Interstate Highway System;
2. The highway is otherwise designed to have full controlled access;
3. The posted highway speed equals or exceeds 113 km/h (70 mph);
4. AADT exceeds 100,000 in urban areas or 50,000 in rural areas;
5. Maximum authorized train speed exceeds177 km/h (110 mph);
6. An average of 150 or more trains per day or 300 Million Gross Tons (MGT) per year;
7. An average of 75 or more passenger trains per day in urban areas or 30 or more passenger trains per day in rural areas;
8. Crossing exposure (the product of the number of trains per day and AADT) exceeds 1,000,000 in urban areas or 250,000 in rural areas; or
9. Passenger train crossing exposure (the product of the number of passenger trains per day and AADT) exceeds 800,000 in urban areas or 200,000 in rural areas.
10. The expected accident frequency (EAF) for active devices with gates, as calculated by the USDOT Accident Prediction Formula including 5-year accident history, exceeds 0.5;
11. Vehicle delay exceeds 40 vehicle hours per day.[23]

B. Highway-rail grade crossings should be considered for grade separation across the railroad right-of-way whenever the cost of grade separation can be economically justified based on fully allocated life cycle costs and one or more of the following conditions exist:

1. The highway is a part of the designated National Highway System;
2. The highway is otherwise designed to have partial controlled access;
3. The posted highway speed exceeds 88 km/h (55 mph);
4. AADT exceeds 50,000 in urban areas or 25,000 in rural areas;
5. Maximum authorized train speed exceeds 161 km/h (100 mph);
6. An average of 75 or more trains per day or 150 MGT per year;
7. An average of 50 or more passenger trains per day in urban areas or 12 or more passenger trains per day in rural areas;
8. Crossing exposure (the product of the number of trains per day and AADT) exceeds 500,000 in urban areas or 125,000 in rural areas; or
9. Passenger train crossing exposure (the product of the number of passenger trains per day and AADT) exceeds 400,000 in urban areas or 100,000 in rural areas;

10. The expected accident frequency (EAF) for active devices with gates, as calculated by the USDOT Accident Prediction Formula including 5-year accident history, exceeds 0.2;
11. Vehicle delay exceeding 30 vehicle hours per day;[24]
12. An engineering study indicates that the absence of a grade separation structure would result in the highway facility performing at a level of service below its intended minimum design level 10% or more of the time.

C. Whenever a new grade separation is constructed, whether replacing an existing highway-rail grade crossing or otherwise, consideration should be given to the possibility of closing one or more adjacent grade crossings.

D. Utilize Table 7 for LRT grade separation:

**TABLE 7**

| Trains Per Hour | Peak Hour Volume (vehicles per lane) |
|---|---|
| 40 | 900 |
| 30 | 1000 |
| 20 | 1100 |
| 10 | 1180 |
| 5 | 1200 |

Source:

*Light Rail Transit Grade Separation Guidelines. An Informational Report.* Institute of Transportation Engineers. Technical Committee 6A-42. March 1992

7. ***NEW CROSSINGS***

A. Should only be permitted to cross existing railroad tracks at-grade when it can be demonstrated:

1. For new public highways or streets where there is a clear and compelling public need (other than enhancing the value or development potential of the adjoining property);
2. Grade separation cannot be economically justified, i.e. benefit to cost ratio on a *fully allocated* cost basis is less than 1.0 (generally, when the crossing exposure exceeds 50,000 in urban areas or exceeds 25,000 in rural areas); and
3. There are no other viable alternatives.

B. If a crossing is permitted, the following conditions should apply:

1. If it is a main track, the crossing will be equipped with active devices with gates;
2. The plans and specifications should be subject to the approval of the highway agency having jurisdiction over the roadway (if other than a State agency), the State DOT or other State agency vested with the authority to approve new crossings, and the operating railroad;
3. All costs associated with the construction of the new crossing should be borne by the party or parties requesting the new crossing, including providing financially for the ongoing maintenance of the crossing surface and traffic control devices where no crossing closures are included in the project;
4. Whenever new public highway-rail crossings are permitted, they should fully comply with all applicable provisions of this proposed recommended practice; and
5. Whenever a new highway-rail crossing is constructed, consideration should be given to closing one or more adjacent crossings.

## TRAFFIC CONTROL DEVICE SELECTION PROCEDURE

Step 1 - **Minimum Highway-Rail Grade Crossing Criteria:** (see report for full description)

A. Gather preliminary crossing data:

1. Highway:
   a. Geometric (number of approach lanes, alignment, median);